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Math Genius!

Teacher's Resource Manual

ORANGE

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PREFACE

The Teacher's Resource Manual is specially developed for teachers using **Orange Education's Math Genius!** Coursebooks. The manual has been designed to provide the teacher with additional materials and support that they may require to effectively teach the coursebook. Each **Teacher's Resource Manual** is completely mapped with its coursebook. The method of teaching/learning suggested in the book is completely based on the Learning-by-doing method which supports guidelines and aids of classroom teaching as per the New Education Policy 2020. The classroom teaching/learning activity helps to allay the fear of Mathematics from the minds of the learners and develops an inherent link for the subject.

Each **Teacher's Resource Manual** has three segments—Chapter-wise detailed **Lesson Plans**, **Practice Materials** in the form of **Worksheets** and **Hints and Solutions** of the textbook exercises as well as in-text questions under different sections.

Features of the Teacher's Resource Manual:

- **Detailed Lesson Plan:** It contains topics to be covered in the chapter, suggested allocation of periods, learning objectives and suggested teaching aids, etc. Each lesson plan is based on an instructional model that enhances students' curiosity, interest, and engagement. It provides students with opportunities to construct learning experience through activities. It helps the teacher to think, plan, investigate, and organize the information.
- **Worksheets:** This segment has worksheets for each chapter which can be used for practice and evaluation of learners' understanding of the concepts taught. At the end, answers to each worksheet have been given.
- **Hints and Solutions:** This section of the teacher's manual is a powerful ally for teachers in a mathematics class. It provides teachers with insight into how to approach and solve problems step-by-step, ensuring they can effectively guide students. It serves as a reference to clarify any doubts or alternative methods that students might be curious about, enriching the lesson with diverse problem-solving strategies.

A teacher has to use his/her experience and expertise in teaching the subject. This **Teacher's Resource Manual** provides some methodology in this regard but in no way does it limit the scope of the teaching. As per the interest, experience and proficiency of the teaching, you are advised to make suitable additions and modifications to the methodology being discussed.

Suggestions for the improvement of the book will be gratefully acknowledged by the teacher's community.

—**Publisher**

CONTENTS

1 Integers

Learning Objectives

After studying this chapter, students will be able to...

- recall the concept of integers and addition and subtraction of integers and their properties
- understand the multiplication of integers and their properties
- understand the division of integers and their properties

LESSON PLAN

Suggested number of periods: 14

Suggested Teaching Aids: Textbook (Math Genius! 7), teaching board, pen, pencils, chalk/marker, notebook, paper chits/number cards/flash cards, newspapers, A-4 sheets, an empty box/bowl, etc.

Keywords: Integers, positive and negative integers, absolute value, ordering, number line, sense of opposites.

Pre-requisite knowledge: Students must be familiar with different types of numbers, such as natural numbers, whole numbers and integers and able to perform arithmetic operations on them.

NEP feature: This method of teaching provides experiential learning opportunities to the students and allows them to work with each other, which helps in their holistic development.

Periods: 1–3	**Topic: Recall the Concept of Integers (including Positive and Negative Integers; Representation of Integers on a Number Line; Absolute Value of Integers, etc.)**	**NEP Skills: Collaborative Learning, Experiential Learning, Discussion-Based Learning**

TEACHER-PUPIL ACTIVITY

- Write some pairs of words that have opposite senses, like above-below, increase-decrease, gain-loss, deposit-withdrawal, etc. on the board. Instruct the students to recall the concept of sense of opposites in daily life situations that can also be represented mathematically by positive and negative numbers.

  Ask a few questions to recall the concept of integers such as:

  1. Which among the following are positive integers and negative integers?

     12, –6, 0, –8, 10, –1

  2. The average monthly temperature of the two cities is described below.

     City A: 8°C below 0°C   City B: 27°C above 0°C.

     The average monthly temperature of which city is represented by a positive integer and by a negative integer?

- Divide the class into groups of 4-5 students. Take a long and thick ribbon and tie it as a straight line along with the horizontal edge of your board. Mark the equal divisions on the ribbon using a marker and mark the middle division as zero ‘0’. Choose a group of students at a time and ask the students of the group to make a number line on the ribbon by hanging some positive and negative integer cards. (Students will pick cards randomly from teacher’s desk). Based on it recapitulate the concept of representation of integers on number line.

  To reinforce the concept of representation of integers on a number line, instruct the students of the class to represent the following integers: 0, 5, –18, 20, –30, –12, 2 on the number line in their notebooks. On extension of this activity ask them to identify which integer is greater or smaller. With the help of the number line, also ask them to arrange the integers in ascending or descending order.

  Also, reiterate the class that the absolute value of a positive or a negative integer is always positive.

EXPLANATION

Take reference from pages 7-9 (including Get Ready!) of the textbook ‘Math Genius! 7’ to recall about the integers taught in the previous class.

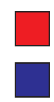
ASSIGNMENTS

Classwork: Let’s Recall; Think and Answer on page 8.

Homework: Q.1-3 of Practice Time 1A.

Periods: 4–7	**Topic: Addition and Subtraction of Integers and their properties**	**NEP Skills: Collaborative Learning, Creative Thinking, Logical Thinking**

TEACHER-PUPIL ACTIVITY

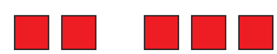


- Divide the class into pairs and distribute a red and a blue colour glaze paper to them and instruct them to cut out the papers into small squares. Each red unit square will represent +1 and each blue unit square will represent –1.

  Write some pairs of integers (2, 3; 3, –4; –4, 2; –5, –3; etc.) on the board. Instruct the students to add or subtract the integers within the pairs by using unit squares cutouts of red and blue colours.

  For example:

  (*a*) Add two positive integers, say, 2 and 3. Place 2 red unit squares and 3 more red unit squares in the same row as shown.

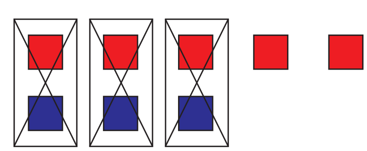
  Ask the students to count the total number of red unit squares and note down their sum. So, 2 + 3 = 5.

  Similarly, we can add two negative integers (say –3, –4) by taking 3 and 4 blue unit squares.

  As (–3) + (– 4) = –7

  (*b*) Add +5 and (–3)

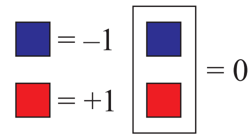
  First, take 5 red unit squares and put them in a row. Now, take 3 blue unit squares and place them in the second row.

  Since, a red and a blue unit squares cancel each other and give the numerical value ‘0’.

  So, we are left with two red unit squares and its numerical value = + 2. Hence, +5 + (–3) = +2.

Similarly, in the case of subtraction of integers, use red and blue unit squares to represent the given integers. Cross out the unit squares according to the number of integers to be subtracted. If you need to remove more squares than are present, add zero pairs (one red and one blue unit squares).

Reiterate class that a red unit square and a blue unit square cancel to each other, as shown.



After the students have gone through the activity, make the students understand addition and subtraction by doing/solving different examples on the board.

For properties of addition and subtraction of integers, identify the properties such as closure, commutativity and associativity along with their identity and property of zero and explain them through examples and make the children understand the properties through verification.

Ask some oral questions to check the students' progress such as:

(*i*) What are different types of properties of integers?

(*ii*) In which property do two or three integers are used?

(*iii*) How the properties vary between addition and subtraction?

(*iv*) Why except the closure property all other properties do not hold true for subtraction?, etc.

EXPLANATION

Take reference from pages 9-10 of the textbook 'Math Genius! 7' to explain the topics mentioned to the class.

ASSIGNMENTS

Classwork: Quick Check on page 9; Question given in 'Life Skills' on page 10.

Homework: Questions (Q. 4 to 12) of Practice Time 1A.

Periods: 8–10	**Topic: Multiplication of Integers and their properties**	**NEP Skills: Collaborative Learning, Creative Thinking, Logical Thinking**

TEACHER-PUPIL ACTIVITY

- Divide the class into pairs of students and distribute them same cutouts of red and blue coloured units squares. Instruct the pairs to paste one blue unit square and one red unit square together so that one side of the square is blue and the other is red.

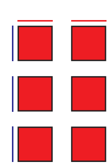
  Write a few pairs of integers on the board such as (2, 3), (–2, 3), (–2, –3), etc.

  Instruct them to multiply the integers within the pair of integers.

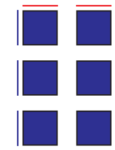
  For example:

  (*a*) **For two positive integers: 2 × 3.**

  Draw 5 (= 2 + 3) red squares of unit length on a paper sheet and complete the rectangular shape using red unit squares as shown here. Number of red unit squares in the rectangle is 6. Thus, 2 × 3 = 6.

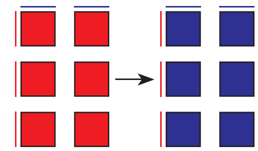


(*b*) **For one negative and one positive integer, say (–2) × 3.**



Complete the rectangle using red unit squares. Since, one side of the rectangle has blue squares, so, invert each red square. Thus, there are six blue unit squares. So, (–2) × 3 = –6.

(*c*) **For two negative integers, say, (–2) × (–3).**



Draw 5 blue squares each of unit length. Complete the rectangle using red unit squares and then invert the squares, two times (red to blue and then blue to red). There are now, 6 blue squares in the rectangle. So, (–2) × (–3) = 6.

Similarly, perform this activity for finding other products such as (–4) × 3, 4 × 3, (–3) × (–5), etc.

Observe the students' work as you go around the classroom and correct the mistakes, if any are done improperly. Based on the above activity, Reiterate to the class that

❖ The product of two integers having opposite signs is negative, i.e., + × – = – or – × + = –

❖ The product of two integers having same signs is positive, i.e., + × + = + or – × – = +

Take the help of examples given on pages 12-14 (Examples 1-4) for better explanation of the topic.

- Take some paper chits having integers written on them on a bowl and shuffle them. To verify the properties of multiplication of integers, divide the class into groups of four or five students and instruct each student of the groups to pick a chit and check different properties of multiplication of integers (closure, commutative, associative, distributive property, etc.) by multiplying them. Accept their responses. Are the integers verifying the properties of multiplication? Based on their responses explain the properties. Suppose,

Commutative property of multiplication for 8, (–3)	8 × (–3) = –24 or (–3) × 8 = –24 8 × (–3) = (–3) × 8 = –24 Hence, it holds commutative property of multiplication

Involve students in discussions to find their ways of multiplying integers. Examples given in table on pages 14-15 can be used for practice and related questions can be used for verification of the properties of multiplication of integers.

EXPLANATION

Take reference from pages 11-17 of the textbook 'Math Genius! 7' including in-text examples to explain the topics mentioned to the class.

ASSIGNMENTS

Classwork: Quick Check on pages: 12, 13 and 16 respectively; Q.1-4 of Practice Time 1B.

Homework: Q.5-10 of Practice Time 1B; 'Think and Answer' given on page 14; and question given in 'Life Skills' on page 17.

Periods: 11–12	Topic: Division of Integers and their properties; Simplification	NEP Skills: Collaborative Learning, Creative Thinking, Logical Thinking

TEACHER-PUPIL ACTIVITY

- Write some multiplication sentences on the board and call the students one by one and write the corresponding division facts against one of the chosen multiplication sentence and recall the class that multiplication and division are inverse operation to each other.

Also, take reference from page 18 to explain division of integers.

Reiterate to the class that

- ❖ The quotient of two integers having opposite signs is negative, i.e., + ÷ – = – or – ÷ + = –
- ❖ The quotient of two integers having same signs is positive, i.e., + ÷ + = + or – ÷ – = –

Even though properties do not hold true for division of integers. They should be taught with examples to let students understand why the properties are not applicable for division.

Think about the daily life problems where they can use integers in different situations. For instance, MCQs are commonly asked in exams where positive marks are awarded for correct answers and negative for incorrect answers.

Take the help of examples given on pages 18-19 (Examples 7-10) for more explanation of the topic.

Also, engage the class with Maths Fun activity given on page 22.

The next topic is Simplification of Integers in which numerical expressions are simplified using BODMAS rule. Example 11 given on page 21 can be used for practice in class.

ASSIGNMENTS

Classwork: Q.1 and 3 of Practice Time 1C; Q. 1 to 3 Practice Time 1D.

Homework: Remaining questions of Practice Time 1C and 1D.

Periods: 13–14	Topic: Revision	NEP Skills: Critical Thinking, Logical Thinking

TEACHER-PUPIL ACTIVITY

Make students comfortable, so that they can ask any question on any previously taught topics. Clarify their doubts or queries and start the revision of the exercise.

Divide the students into small groups and guide them to do the activity given in the 'Learning by Doing' section.

Start the revision of the exercise, by using Encapsulate, Brain Sizzlers, Chapter Assessment, Maths Connect, Life Skills and Mental Maths sections.

ASSIGNMENTS

Classwork: Brain Sizzlers on page 25, Q.A-D of Chapter Assessment.

Homework: Remaining questions of Chapter Assessment, Maths Connect, Mental Maths on page 22.

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ASSIGNMENT–1

Marks Obtained: __________

Student's Name: ________________________________ Section: ______

Roll Number: ______________________________ Date: ______________

A. Multiple Choice Type Questions

Identify the correct answer.

1. On a number line, when we add a positive integer, we

(*a*) move to the left (*b*) move to the right (*c*) do not move at all (*d*) none of these.

2. When the integers –17303, 17030, –1, 1, –17330, 17033, 0, –17034, and 17043 are arranged in descending or ascending order, then which of the following integers always remains in the middle?

(*a*) –1 (*b*) 0 (*c*) 17033 (*d*) 1

3. Which of the following is true?

(*a*) $(-302) + (-203) > (-302) - (-203)$ (*b*) $(-507) + (-407) < (-507) - (-407)$

(*c*) $(-352) + (-352) = (-352) - (-352)$ (*d*) none of these.

4. The value of $15 \div (-3)$ does not lie between

(*a*) 0 and 15 (*b*) 0 and –15 (*c*) –4 and –10 (*d*) – 7 and 7

5. Identify the property reflected in the following:

$$(-8) \times (-11 + 8) = (-8) \times (-11) + (-8) \times 8$$

(*a*) Associative property (*b*) Commutative property

(*c*) Distributive property (*d*) Closure property

6. The sum of two integers is –42. If one of them is 15, the other one is

(*a*) –27 (*b*) 57 (*c*) –57 (*d*) 27

7. $(-13) \times |-7 + 5|$ is not the same as

(*a*) $(-13) \times 2$ (*b*) $13 \times (-7) + 13 \times 5$

(*c*) $(-13) \times (-7) + (-13) \times 5$ (*d*) –26

8. Which of the following does not represent an integer?

(*a*) $0 \div |-5 - 7|$ (*b*) $105 \div (-21)$ (*c*) $(-9) \div 3 \times 2$ (*d*) $(-36) \div 72$

B. Assertion and Reason Type Questions

In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.

(*a*) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(*b*) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

(*c*) Assertion (A) is true but Reason (R) is false.

(*d*) Assertion (A) is false but Reason (R) is true.

9. Assertion: Value of $-7 \times |-5 + 2|$ is the same as that of $-7 \times |-2 + 5|$.

Reason: Integers hold the distributive property for multiplication over addition.

10. Assertion: If a and b are two integers, then $a \div b$ may not be an integer.

Reason: Closure property does not hold for the division of integers.

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ASSIGNMENT–2

Marks Obtained: __________

Student's Name: ____ Section: ______

Roll Number: ______________________________________ Date: ________________________

A. Fill in the blanks.

1. The .... property of multiplication states that any number multiplied by one equals the number itself.
2. $(-7) + 8 = 8 +$ Additive inverse of ....
3. $(-5) \times (-5) \times (-5) =$ .... $\times 125$
4. A submarine submerges at a rate of 7 m/min. If it descends from 15 m below sea level, it will take .... minutes to reach 162 m below sea level.
5. $11 \times (-5 - 7) = -(11 \times$ .... $+ 11 \times$ ....$)$

B. Label True or False.

1. If x and y are two negative integers such that $x > y$, then $(-x) + (-y)$ is a positive integer. ....
2. The sum of two negative integers always gives a number smaller than both integers. ....
3. We can write a pair of integers whose difference is not an integer. ....
4. $-2 + (3 - 8)$ is the same as $3 - (2 + 8)$. ....
5. $|-7| + 3$ is greater than $3 - (-7)$. ....

C. Match the following.

Column I	Column II
1. $0 \div a$	(*a*) -1
2. $7 + \|-7\|$	(*b*) 1
3. $-3 \div 3 \times (-1)$	(*c*) -7
4. Additive inverse of 1	(*d*) 0
5. $-343 \div 7 \div 7$	(*e*) 14

D. Do as directed.

1. Write a pair of integers whose product is an integer between –13 and –11, and there are seven integers between them.
2. Greek mathematician Archimedes lived between 287 BC and 212 BC and Aristotle lived between 380 BC and 322 BC. Who lived during an earlier period?

2 Fractions and Decimals

Learning Objectives

After studying this chapter, students will be able to...

- ✦ recall basic concepts of fractions and decimals
- ✦ understand the concept of addition and subtraction of fractions and decimals
- ✦ understand how to multiply and divide fractions
- ✦ understand how to multiply and divide decimal numbers

LESSON PLAN

Suggested number of periods: 14

Suggested Teaching Aids: Textbook (Math Genius! 7), teaching board, pens, pencils, chalk/marker, notebook, paper chits/number cards/flash cards, newspapers, A-4 sheets, marbles, an empty box/bowl, etc.

Keywords: Fractions, proper fractions and improper fractions, unit fractions, mixed fractions, like fractions, unlike fractions, equivalent fractions, operator , multiplicative inverse, reciprocal, simplification, decimals, etc.

Pre-requisite knowledge: Students must be familiar with fractions and their types and able to perform arithmetic operations on fractions.

NEP feature: This method of teaching provides experiential collaborative learning, opportunities to the students and allows them to work with each other, which helps in their holistic development.

Periods: 1–3	Topic: Fractions and their Types	NEP Skills: Collaborative Learning, Discussion-Based Learning, Experiential Learning

TEACHER-PUPIL ACTIVITY

- Divide the class into pairs and distribute a paper strip to each of the pair. Instruct the pairs to mark the equal divisions on the given paper strips using a pencil or a pen and ask them to count the divisions made on the paper strips. Now, then ask them what part of a whole does each division represent. Based on the responses that come from the class recapitulate the concept of fractions.

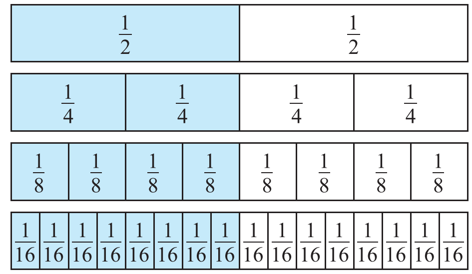
  Ask the students, oral questions to get familiar with fractions and their types such as proper, improper, unit, mixed, like and unlike fractions with definition and examples that they have learnt in class 6 by working out the introductory theme GET READY.

  While converting a mixed fraction to an improper fraction or vice versa, refer Example 1 on page 30 related to this can be done in class for more explanation.

  Oral questions for recapitulate above topics can be asked in the class.

- An activity related to fractions equivalent to a given fraction, say $\frac{1}{2}$ need to be found out. For this white chart paper, soft cardboard, glue, ruler, pencil, sketch pens and a pair of scissors can be taken as materials require.

Divide the class into groups of 4 students and give them a white chart paper and ask them to draw four rectangular strips of dimensions, say 16 cm × 2 cm on the chart paper and cut out using a scissor. Instruct the groups that each student of the group will fold the strip into different equal parts, say $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}$, etc. Unfold the strip and colour as many parts as come in the half of the strips as shown.



Accept the response form the class about the fractional parts for the folded portion of the strips. Based on their responses explain to them the equivalent fractions by taking the reference of example 2 on page 31.

Reiterate to the class that:

(*i*) Equivalent fractions are obtained by multiplying or dividing both the numerator and the denominator by the same non-zero number.

(*ii*) Fractions $\frac{a}{b}$ and $\frac{c}{d}$ are equivalent, if $ad = bc$.

Take the reference of example 3 on page 31 to recall a fraction can be reduced to its simplest form by dividing both the numerator and the denominator by their common factors or by the Highest Common Factor (HCF).

- Write some pairs of like and unlike fractions on the board and ask the students of the class to compare the fractions within the pairs. By taking reference to pages 32-33, recall comparing and ordering fractions. Also, reiterate to the class that

(*i*) $\frac{a}{b} > \frac{c}{d}$, if $ad > bc$ (*ii*) $\frac{a}{b} < \frac{c}{d}$, if $ad < bc$ (*iii*) $\frac{a}{b} = \frac{c}{d}$, if $ad = bc$.

The following rules is given on page 32 for practice. In case of ordering the fractions, first set of simple cases for ordering fractions without requiring computations, in-text examples given on page 32 can be used.

Explain how to find the least common denominator and convert fractions to equivalent fractions with the same denominator.

EXPLANATION

Take reference from pages 28-33 (including Get Ready!) of the textbook 'Math Genius! 7' to recall the fractions taught in the previous class.

ASSIGNMENTS

Classwork: Let's Recall, subparts (*a*) and (*b*) of Q.1-6 of Practice Time 2A.

Homework: Remaining subparts of Q.1-6 of Practice Time 2A.

Periods: 4–5	Topic: Addition and Subtraction of like Fractions; Addition and Subtraction of Unlike Fractions	NEP Skills: Logical Thinking, Experiential Learning

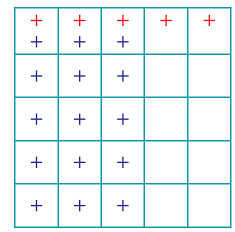
TEACHER-PUPIL ACTIVITY

Write some pairs of fractions on the board and ask the class to add them.

For example: Add fractions with same denominators, say $\frac{1}{5}+\frac{3}{5}$.

Instruct the class to make a 5 × 5 square grid .

To represent $\frac{1}{5}$, Mark each small square of any row, say first row, by '+' sign with red sketch pen. To represent $\frac{3}{5}$. Mark each small square of first three columns by '+' with blue sketch pens as shown.



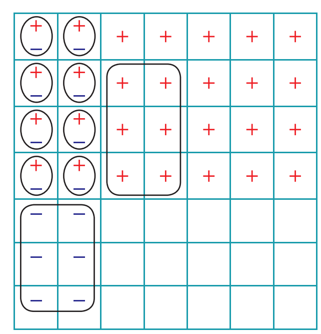
Count the total number of + signs, that are 20 and the number of small square boxes, that are 25.

Fraction represented by 20 '+' signs = $\frac{20}{25}$ will be the sum of $\frac{1}{5}+\frac{3}{5}$. So, $\frac{1}{5}+\frac{3}{5}=\frac{20}{25}=\frac{4}{5}$

In the same way, addition of two unlike fractions can be done.

Reiterate the class that the size of the grid must be taken according the denominator of given fractions, for like fractions $\left(\text{say } \frac{3}{4}+\frac{1}{4}\right)$ it will be of 4 × 4 size and for unlike fractions $\left(\text{say } \frac{1}{4}+\frac{3}{5}\right)$ it will be of 4 × 5.

Perform subtraction of two like and unlike fractions through the above activity with a little amendment that represents the second fraction by marking '–' sign in respective number of columns as per the numerator of the second fraction, and then pairs the '+' and '–' signs. The fractions formed by the number of remaining unenclosed signs to the total number of small squares will be the result of the subtraction of two like and unlike fractions. For example, the adjoining figure shows the subtraction of $\frac{4}{7}-\frac{2}{7}$.



$$\frac{4}{7}-\frac{2}{7}=\frac{28}{49}-\frac{14}{49}=\frac{14}{49}=\frac{2}{7}$$

After these activities, take the reference of Example 4 on page 33 to more practice of addition and subtraction problems in the class. And with the help of these examples draw the rules for addition and subtraction of fractions.

EXPLANATION

Take reference from pages 33-34 of 'the textbook 'Math Genius! 7' to recall the fractions taught in the previous class.

ASSIGNMENTS

Classwork: Q.7 of Practice Time 2A.

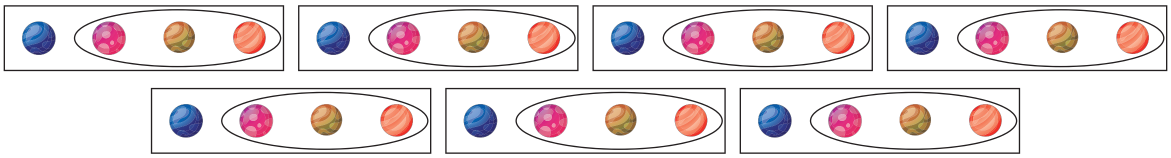
Homework: Q. 8 to 12 of Practice Time 2A.

Periods: 6–7	Topic: Multiplication and Division of Fractions	NEP Skills: Experiential Learning, Collaborative Learning, Discussion-Based Learning

TEACHER-PUPIL ACTIVITY

- Talk about a few everyday applications for fractions, like:
  1. Sharing a watermelon, pizza, cake, or other item in fractions
  2. Eating a fraction of apples or biscuits from a quantity.

  Take some marbles and place them in seven groups of 4 marbles each. Call out a student randomly and instruct him to take out 3 marbles from each group of the marbles.



In each group, the 3 marbles taken out represent the fraction $\frac{3}{4}$.

Since, there are 7 groups of marbles. So, he took $\frac{3}{4}$ of marbles 7 times, i.e., $\frac{3}{4}$ added 7 times or $\frac{3}{4}\times 7$.

Total number of marbles taken out from 7 groups = 21.

Each remaining marble represents the fraction $\frac{1}{4}$.

So, the fraction represented by 21 marbles = $\underbrace{\frac{1}{4}+\frac{1}{4}+\frac{1}{4}+\ldots+\frac{1}{4}}_{\text{21 times}} = \frac{21}{4}$

So, $\frac{3}{4}\times 7 = \frac{21}{4}$

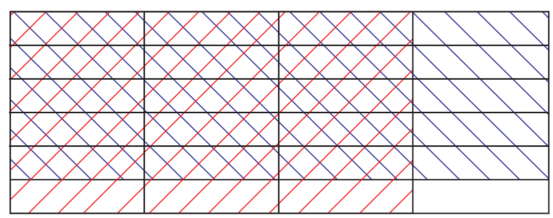
This activity is useful in explaining multiplication of a fraction by a number.

Repeat this activity with different students and with different number of marbles.

Take the reference of example 5 on page 35 for more practice of multiplying a fraction by a whole number.

- Ask the students of the class to make a rectangle of suitable dimensions, say 8 cm × 3 cm in their notebook.

  Now, instruct them to divide it into 4 equal parts along the length. Shade 3 parts out of it. Similarly divide it along the breadth into 6 equal parts and shade 5 parts out of it using different colour sketch pen as shown.



The shaded portion in both colour represents $\frac{5}{6}\times\frac{3}{4}=\frac{15}{24}$.

This activity will help to teach the topic 'Multiplication of a fraction with another fraction'.

Take reference to example 7 on page 37 for more explanation of this topic.

Division of fractions can be taught using multiplication of fractions, there is only one thing is that division of fractions is the reverse process of multiplication of fractions.

Before start teaching division of fractions, first write some fractions on the board and ask the class about the reciprocals of the fractions. Take reference to page 38 (last para), and explain the class that 'the reciprocal of a fraction is made by interchanging the numerator and the denominator'. Thus, the reciprocal of fraction $\frac{a}{b}$ $(a \neq 0, b \neq 0)$ is $\frac{b}{a}$.

Reiterate to the class that the product of any number and its reciprocal is always 1.

Also, reiterate to the class that to divide a fraction, multiply it by its reciprocal.

Take reference to example 8 on page 38 and example 9 on pages 39-40 for more explanation of this topic.

EXPLANATION

Take reference from pages 35-40 of the textbook 'Math Genius! 7' to explain the concept of multiplication and division of fraction.

ASSIGNMENTS

Classwork: Quick Check on page 35, 37; Think and Answer on page 36, Maths Connect on page 36 and Q.1-3 of Practice Time 2B, Q.1-3 of Practice Time 2C.

Homework: Q. 4 to 9 of Practice Time 2B, Q. 4 to 11 of Practice Time 2C, and question under section 'Life skills' on page 41.

Periods: 8–9	**Topic: Decimal Numbers and their Types**	**NEP Skills: Experiential Learning, Collaborative Learning**

TEACHER-PUPIL ACTIVITY

- Divide the class into pairs and distribute a square grid paper having 100 small squares in it to each of the pairs of students. Instruct the pairs to shade a complete row or a complete column having 10 small squares and then only 1 small square respectively. Reiterate the class that the complete shaded row/column out of 100 small squares represents one-tenths $\left(\frac{1}{10}\right)$, written as 0.1 and the only a shaded small square out of the 100 small squares represents one-hundredths $\left(\frac{1}{100}\right)$, written as 0.01. and if we divide a square grid into 1000 small squares, then 1 small square will represent one-thousandths $\left(\frac{1}{1000}\right)$, written as 0.001.

  Also, reiterate the class that while reading a decimal number, digits in the decimal part are read digit-wise.

- Make a place value table with decimal points and also write some decimal numbers on the board. Instruct the pairs to fill the table by filling the number according to their position in the table as shown below.

Hundreds (100)	Tens (10)	Ones (1)	Point (.)	Tenths $\left(\frac{1}{10}\right)$	Hundredths $\left(\frac{1}{100}\right)$	Thousandths $\left(\frac{1}{1000}\right)$	Number
		3	.	5	7		3.57
	6	4	.	1	2	3	64.123
1	4	9	.	0	9	9	149.099

By taking the reference of the above table, explain the place values for decimals and in decimals, the number before the decimal point is called the whole part or integral part, whereas the number after the decimal point is called the fractional part.

Now, ask the class to express the following decimal numbers in the above table into their expanded form. Accept their responses and reiterate the class that the expanded form means writing the given decimal numbers as the sum of the place values of the digits in fractions with denominators $\frac{1}{10}, \frac{1}{100}, \frac{1}{1000}, ...,$ etc.

- write some pairs of decimals on the board and ask the class to identify like and unlike decimals. Reiterate the class that decimals having the same number of decimals places are like decimals other than unlike.
- Ask the students of the class to compare the decimal numbers in the given pairs. Accept the response and based on these reiterate them that first compare the whole number parts, if whole number parts are same, then compare the digits at the tenths place and if the digits at the tenths are same then compare hundredths place digit and similarly compare the digits at the thousandths place and by following the above rules, arrange the decimals in ascending or descending order.

EXPLANATION

Take reference from pages 41-43 of the textbook 'Math Genius! 7' including examples 10 and 11 to explain the concept of decimals.

ASSIGNMENTS

Classwork: Few sub-parts of Q. 1-4 of Practice Time 2D.

Homework: Remaining sub-parts of Q. 1-4 of Practice Time 2D.

Periods: 10–12	Topic: Addition, Subtraction, Multiplication and Division of Decimals	NEP Skills: Experiential Learning, Logical Thinking

TEACHER-PUPIL ACTIVITY

Give some real-life mathematical statements of addition and subtraction involving decimals. Such as:

(*i*) Ruhi has two ribbons of length 1.5 m and 2.25 m respectively. What is the total length of both ribbons together?

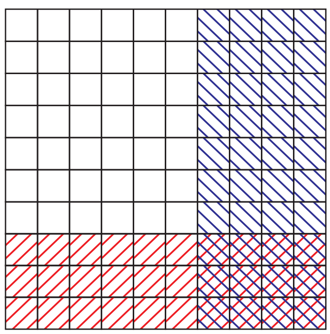
(*ii*) A 2.000 L beaker is partially filled with 0.475 mL of oil. How much part of the beaker is empty?

(*iii*) Sunil spent ₹84.59 to buy 3 notebooks. And he gives a ₹100-note to the shopkeeper. How much money does he get back?

Ask the class to solve the above word problems by performing addition and subtraction. Accept the response from them and based on this reiterate to the class that to add or subtract decimals write down the numbers to be added or subtracted, keeping 'decimal point' below 'decimal point' and add or subtract them as done for whole numbers. Also, reiterate to the class that in case of unlike decimals, first add the required number of zeros to have the same number of decimal places.

Take reference to example 13 on page 43 to explain this.

Distribute some 10×10 square grid to the class and ask them to multiply 0.3×0.4 using the grid. Instruct them to shade three rows using red colour and four columns using blue colour sketch pens as shown in adjacent figure.



The common shaded portion will represent $\frac{12}{100}$ or 0.12.

Thus, $0.3 \times 0.4 = 0.12$.

Now, write some mathematical sentences with decimals, such as: 0.5×3, 1.32×1.5, 1.7×1.2, etc.

Instruct the class to multiply them to get the product. Accept the responses and based on them reiterate the class that first multiply numbers as we do with whole numbers, ignoring the decimal point, and then place the decimal point by finding the total number of decimal places in the multiplicand and the multiplier.

$$1.\underbrace{32}_{\text{2 decimal places}} \times 1.\underbrace{5}_{\text{1 decimal place}} = 1.\underbrace{980}_{\text{3 decimal places}}$$

Work out with some examples related to division of decimals.

EXPLANATION

Take reference from pages 43-47 of the textbook 'Math Genius! 7' including examples 14-19 to explain how to add, subtract, multiply and divide decimals.

ASSIGNMENTS

Classwork: Quick Check on page 45, Few sub-parts of Q.1-3, Q. 4 and Q. 5 of Practice Time 2E and Practice Time 2F.

Homework: Remaining questions of Practice Time 2E and Practice Time 2F, Think and Answer on page 44.

Periods: 13–14	Topic: Revision	NEP Skills: Experiential Learning, Logical Thinking

TEACHER-PUPIL ACTIVITY

- Make students comfortable, so that they can ask any question on any previously taught topics. Clarify their doubts or queries and start the revision of the exercise.
- Divide the students into small groups and guide them to do the activity given in 'Learning by Doing' section.
- Start the revision of the exercise, by using Encapsulate, Brain Sizzlers, Chapter Assessment

ASSIGNMENTS

Classwork: Brain Sizzlers on page 51, Q. A-C of Chapter Assessment.

Homework: Remaining questions of Chapter Assessment.

ORANGE

ASSIGNMENT–3

Marks Obtained: __________

Student's Name: ____________________ Section: _______

Roll Number: ____________________ Date: ____________________

A. Multiple Choice Type Questions

Identify the correct answer.

1. Equivalent fraction of $\frac{14}{17}$ with denominator 153 is

(*a*) $\frac{126}{153}$ (*b*) $\frac{111}{153}$ (*c*) $\frac{153}{126}$ (*d*) $\frac{152}{153}$

2. Reciprocal of the fraction $3\frac{2}{4}$ is

(*a*) $3\frac{4}{2}$ (*b*) $\frac{7}{2}$ (*c*) $\frac{2}{7}$ (*d*) $3\frac{5}{9}$

3. The product of 5 and $4\frac{3}{4}$ is

(*a*) $9\frac{3}{4}$ (*b*) $4\frac{20}{4}$ (*c*) $20\frac{3}{4}$ (*d*) $23\frac{3}{4}$

4. The product of 0.07×1.9 is

(*a*) 0.133 (*b*) 0.0133 (*c*) 1.033 (*d*) 1.330

5. There are 15 balls in a basket in which $\frac{4}{5}$ of the balls are red, $\frac{1}{3}$ non-red balls are black, and the rest are white. How many balls are white?

(*a*) 5 (*b*) 3 (*c*) 1 (*d*) 2

6. What part of an hour is a second (in terms of decimals)?

(*a*) 0.028 (*b*) 0.00028 (*c*) 0.28 (*d*) 0.0028

7. Which of the following is correct?

(*a*) $\frac{16}{125} = 0.128$ (*b*) $\frac{16}{125} > 1.28$ (*c*) $\frac{16}{125} < 0.0128$ (*d*) $\frac{16}{125} = 1.280$

B. Assertion and Reason Type Questions

In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.

(*a*) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(*b*) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(*c*) Assertion (A) is true but Reason (R) is false.
(*d*) Assertion (A) is false but Reason (R) is true.

8. Assertion: $\frac{3}{7} = \frac{3\times2}{7\times2} = \frac{3\times4}{7\times4}$

Reason: Equivalent fractions are obtained by multiplying or dividing the numerator and the denominator of the given fraction by the same non-zero number.

9. Assertion: $\frac{4.5}{1000} = 0.045$

Reason: When dividing a decimal number by 10, 100, 1000, etc., we move the decimal point in the quotient as many places to the left as there are zeros in the divisor.

ORANGE

ASSIGNMENT–4

Marks Obtained: __________

Student's Name: ______________________________ Section: _______

Roll Number: ______________________________ Date: ______________________

A. Fill in the blanks.

1. The reciprocal of $\left(1+\frac{3}{5}\right)$ is ....
2. Kapil ate $\frac{2}{9}$ part of a pizza while Komal ate $\frac{3}{7}$ of the remaining. Part of the pizza left is ....
3. While dividing a fraction by another fraction, we multiply the first fraction by the .... of the other fraction.
4. The product of two distinct improper fractions is .... than each of the fractions that are multiplied.
5. $\frac{1}{1000} \div \frac{1}{7.5} =$ ....

B. Label True or False.

1. The reciprocal of an improper fraction is a mixed fraction. ....
2. To multiply a decimal number by 100, we move the decimal point in the number to the left by two places. ....
3. The reciprocal of –1 is –1. ....
4. $\frac{3}{4}+\frac{1}{4}=\frac{3+1}{4+4}$ ....

C. Match the following.

Column I	Column II
1. Reciprocal of 0.5	(*a*) $\frac{3}{5}$
2. Standard form of $\frac{254}{381}$	(*b*) 4
3. Fractional form of 0.6	(*c*) $\frac{2}{3}$
4. An integer between $\frac{9}{4}$ and $\frac{25}{5}$	(*d*) 2

D. Do as directed.

1. If 9 is added to the numerator and the denominator of the fraction $\frac{9}{11}$, will the value of the fraction be changed? If so, will the value increase or decrease?
2. Which letter comes $\frac{2}{3}$ of the way among A and I?

3

Rational Numbers

Learning Objectives

After studying this chapter, students will be able to...

- understand the need of rational numbers
- identify the positive and negative rational numbers
- represent the rational numbers on a number line
- determine the standard form, and equivalent rational numbers of a given rational numbers
- compare and order of rational numbers
- find rational numbers between two given rational numbers
- perform the basic operations on rational numbers

LESSON PLAN

Suggested number of periods: 12

Suggested Teaching Aids: Textbook (Math Genius! 7), teaching board, pens, pencils, chalk/marker, notebook, paper chits/number cards/flash cards, newspapers, an empty box/bowl, etc.

Keywords: Rational numbers, positive and negative rational numbers, equivalent rational numbers, standard form, absolute value, reciprocal.

Pre-requisite knowledge: Students must be familiar with fractions and their types; Representation of fractions and integers on a number line; Comparison and ordering of fractions; Addition, subtraction, multiplication and division of fractions.

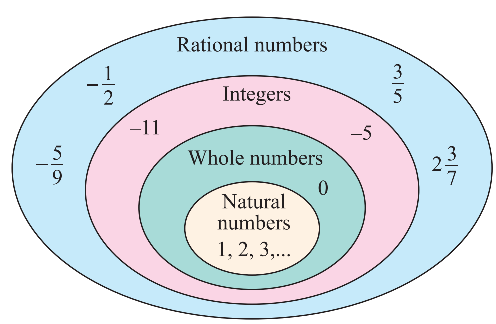
NEP feature: This method of teaching provides experiential learning opportunities to the students and allows them to work with each other, which helps in their holistic development.

Periods: 1–4	**Topic: Rational Numbers (Positive and Negative Rational Numbers); Representation of Rational Numbers on a Number Line; Equivalent Rational Numbers; Standard Form of a Rational Number; Absolute Value of a Rational Number**	**NEP Skills: Discussion-Based Learning, Experiential Learning**

TEACHER-PUPIL ACTIVITY

- Start with asking some oral questions to the students about fractions and its types which they have learnt in previous chapter. Make the children understand what is a rational number and how it is different from a fraction. Get Ready! on page 53 will help the teacher to initiate the class and develop a sense how rational numbers are differ from fractions.

  Start the introduction of rational numbers by giving definition of rational number in the form of $\frac{p}{q}$, where $q \neq 0$ with suitable



examples and important facts. Reiterate to the class that, all these different kinds of numbers form a number system and rational numbers include all natural numbers, whole numbers, integers, fractions and decimals.

- Write some rational numbers having a numerator and denominator with the same and opposite signs such as $\frac{1}{2}, \frac{3}{5}, \frac{4}{9}, \frac{-1}{3}, \frac{2}{-3}, \frac{-4}{-5}$.

  Ask the class which type of rational numbers (positive or negative) are there in the number set?

  Accept the response from the class and on the basis of these explain them about positive and negative rational numbers.

  Reiterate to the class that:

  (*i*) A rational number is said to be positive if its numerator and denominator are either both positive or both negative.

  (*ii*) A rational number is said to be negative if either of its numerator or denominator is negative.

- In case of representing rational numbers on a number line, instruct the students of the class to make a number line in their notebooks. Dictate the rational numbers to the students while writing simultaneously on the teaching board. The students will try to represent them on the number line as they did for fractions. Based on their response teach them how to represent rational numbers on a number line. Take the reference of page 56 to reiterate the class that for representing positive rational numbers we divide the distance between two positive integers into equal parts and for negative rational numbers divide the distance between two negative integers into equal parts according to the denominator of the rational number.

The next most important topic is that of equivalent rational numbers in which the rules for obtaining another rational number should be mentioned.

Write some rational numbers on the blackboard. Ask the class to tell their equivalent fractions. Based on their responses explain to the class that we can find the equivalent rational numbers same as we find the equivalent fractions.

Reiterate to the class that rational numbers equivalent to a given rational number can be obtained by multiplying or dividing by the same non-zero integer to both numerator and denominator.

Take the reference of Examples 1-3 on page 57 for more explanation.

In the same way, explain the class that we can convert a rational number into its standard form by dividing the numerator and the denominator of the rational number by their HCF and if the denominator of a rational number is negative, then to write its standard form we multiply the numerator and denominator by (–1) to make the denominator positive. Take the reference of Example 4 on pages 57-58 for more explanation.

Take reference from page 58, to explain the class that the absolute value of a rational number is its positive numerical value and is denoted by writing the given rational number between two vertical bars.

EXPLANATION

Take reference from pages 53-58 (including Get Ready!) of the textbook 'Math Genius! 7' to explain the topics mentioned.

ASSIGNMENTS

Classwork: Quick check on page 54, Think and Answer on pages 55 and 57 and subparts (*a*) and (*b*) of Q. 1-4 of Practice Time 3A.

Homework: Remaining subparts of Q. 1-4 and Q. 5-11 of Practice Time 3A and question under section 'Life Skills' on page 58.

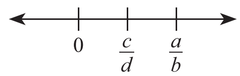
Periods: 5–7	**Topic: Comparison and Ordering of Rational Numbers; Finding Rational Numbers between two given Rational Numbers**	**NEP Skills: Discussion-Experiential Learning, Collaborative Learning**

TEACHER-PUPIL ACTIVITY

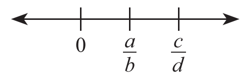
- Write some rational numbers on the board and question the class how can they compare those numbers. Based on their response, explain them that there are two ways to compare them.

  (*i*) **By using a number line:** Explain the class that if rational number $\frac{a}{b}$ lies to the right of $\frac{c}{d}$, then $\frac{a}{b} > \frac{c}{d}$.

  If rational number $\frac{a}{b}$ lies to the left of $\frac{c}{d}$, then $\frac{a}{b} < \frac{c}{d}$.

  $\frac{a}{b}$ is located on the right of $\frac{c}{d}$

  $\frac{a}{b}$ is located on the left of $\frac{c}{d}$

  Also, reiterate the class that like integers, positive rational number is always greater than a negative rational number.

  (*ii*) **By making equivalent fractions:** Write some rational numbers on the blackboard and take reference of page 60 to explain this method.

  Both parts of Example 5 on page 60 can be used for practice in class.

  Again, write a group of like and unlike rational numbers on the board and ask the students of the class to arrange the rational numbers in ascending or descending order. Take the help of Example 6 given on page 61.

- Explain to the students how to insert a required number of rational numbers between a given pair of rational numbers by making the denominators same. Make the students understand that there are infinite rational numbers between the given rational numbers.

  Take the reference of Example 7 on page 62 to more explanation or practice it.

EXPLANATION

Take reference from pages 59-62 of the textbook 'Math Genius! 7' to explain the topics mentioned above.

ASSIGNMENTS

Classwork: Think and Answer on page 62, Q.1 of Practice Time 3B.

Homework: Remaining questions of Practice Time 3B; Maths Connect on page 61.

Periods: 8–10	**Topic: Operations on Rational Numbers**	**NEP Skills: Discussion-Based Learning, Experiential Learning**

TEACHER-PUPIL ACTIVITY

Talk about how the students can do four fundamental operations on rational numbers by oral questions based on the rules associated with fundamental operations on rational numbers to simplify arithmetic operations.

Write a pair of rational numbers on the blackboard and do all four operations for them.

Then, engage the whole class in a paper-pen activity.

- Prepare some paper chits each having a question to do based on any one arithmetic operation and keep them in a bowl on the table.

- Split the class into groups of four students, and instruct each group to select a number chit randomly from the bowl without examining it. Instruct them to complete at least one problem in their notebook and double-check with other students' calculations. Observe the students' work as you go around the classroom. The winning team will be the one that completes all four tasks in the shortest duration of time.

  Students might be asked to do operations by rearranging the order of two numbers on the number chits by extending the paper-pen activity. Additionally, you can ask them to perform the procedures by selecting any three rational numbers. By altering the sequence of events, they can swap out the paper used to complete the task.

To further make the students understand the concepts of these operations, some points along with the Example 8-9 on page 64 for addition and subtraction of rational numbers with the same or with different denominator.

Also, take reference of the topic '**Strategy: Use a number line**' to explain how to add or subtract rational numbers using a number line.

Example 10-12 on pages 67-68 for multiplication of a rational number by an integer and by another rational number.

Example 13-14 on pages 69-70 for the division of a rational numbers by an integer and by another rational number.

EXPLANATION

Take reference from pages 64-70 of the textbook 'Math Genius! 7' to explain the topics mentioned.

ASSIGNMENTS

Classwork: Think and Answer on page 65; and Quick Check on page 66, subparts (*a*), (*b*) and (*c*) of Q.1-2 of Practice Time 3D.

Homework: All questions from 1 to 9 of Practice Time 3C and remaining subparts of Q. 1-2 and Q. 3-8 of Practice Time 3D.

Periods: 11–12	Topic: Revision	NEP Skills: Logical Thinking, Critical Thinking

TEACHER-PUPIL ACTIVITY

- Make students comfortable, so that they can ask any question on any previously taught topics. Clarify their doubts or queries and start the revision of the exercise.
- Divide the students into small groups and guide them to do the activity given in the 'Learning by Doing' section.
- Start the revision of the exercise, by using Encapsulate, Brain Sizzlers, Chapter Assessment.

ASSIGNMENTS

Classwork: A few subparts of Q. A-E of Chapter Assessment.

Homework: Remaining questions of Chapter Assessment, question under section 'Maths Connect' on page 74, 'Mental Maths' on page 75.

ORANGE

ASSIGNMENT–5

Marks Obtained: ___________

Student's Name: ______________________________________ Section: _______

Roll Number: ______________________________ Date: __________________

A. Multiple Choice Type Questions

Identify the correct answer.

1. Which of the following rational numbers is equivalent to $\frac{-63}{210}$?

(*a*) $\frac{189}{-420}$ (*b*) $\frac{-21}{35}$ (*c*) $\frac{-126}{630}$ (*d*) $\frac{3}{-10}$

2. Which of the following rational numbers is in standard form?

(*a*) $\frac{30}{40}$ (*b*) $\frac{1}{-2}$ (*c*) $\frac{5}{2}$ (*d*) $\frac{-4}{10}$

3. The sum of $\frac{-2}{5}$ and $\frac{1}{7}$ is

(*a*) $\frac{9}{35}$ (*b*) $\frac{-9}{35}$ (*c*) $\frac{19}{35}$ (*d*) $\frac{-1}{12}$

4. Which of the following rational numbers is not equal to its reciprocal?

(*a*) 1 (*b*) –1 (*c*) –3 (*d*) $\frac{5}{-5}$

5. Which is the greatest number in the following?

(*a*) $\frac{-5}{7}$ (*b*) 0 (*c*) $\frac{5}{7}$ (*d*) $\frac{7}{5}$

6. The difference between the smallest positive integer and the greatest non-positive rational number is:

(*a*) –2 (*b*) 0 (*c*) 1 (*d*) not possible

B. Assertion and Reason Type Questions

In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.

(*a*) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(*b*) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

(*c*) Assertion (A) is true but Reason (R) is false.

(*d*) Assertion (A) is false but Reason (R) is true.

7. **Assertion:** The sum of the rational numbers $\frac{3}{13}$ and $\frac{5}{-13}$ is $\frac{-2}{13}$.

Reason: To find the sum of two rational numbers with common denominator, we must add their numerators with their respective signs and then write the result with the common denominator.

8. **Assertion:** $\frac{3}{0}$ is not a rational number.

Reason: A number is called a rational number if it can be expressed in the form of $\frac{p}{q}$, where p and q are integers and $q \neq 0$.

ORANGE

ASSIGNMENT–6

Marks Obtained: __________

Student's Name: ______________________________ Section: ______

Roll Number: ______________________________ Date: ______________

A. Fill in the blanks.

1. The equivalent rational number of $\frac{-8}{-36}$ with denominator 9 is ....
2. On a number line, $\frac{3}{5}$ is to the .... of 2.
3. $\frac{-3}{5}$ is .... than $\frac{-5}{7}$.
4. $\frac{-2}{9}-\left(\frac{-4}{15}\right)=$ ....
5. The smallest rational numbers among $\frac{-1}{2}, -1, \frac{-3}{5}$ and $\frac{-7}{9}$ is ....

B. Label True or False.

1. A rational number can be expressed in the form of $\frac{p}{q}$, where p and q are rational numbers and $q \neq 0$. ....
2. Zero is a rational number, an integer, but not a natural number. ....
3. The greatest negative integer is the same as the greatest negative rational number. ....

C. Match the following.

Column I		Column II
1. Additive inverse of $\frac{-3}{6}$	(*a*)	$\frac{-1}{3}$
2. A rational number between $\frac{-5}{9}$ and $\frac{-2}{9}$	(*b*)	$\frac{-5}{13}$
3. A rational number between $\left\|\frac{-4}{9}\right\|$ and $\left\|\frac{-1}{9}\right\|$	(*c*)	$\frac{1}{3}$
4. Reciprocal of $-2\frac{3}{5}$	(*d*)	$\frac{1}{2}$

D. Do as directed.

1. What should be added to $\frac{-1}{2}$ to obtain the nearest natural number?
2. What should be subtracted from $\frac{-2}{5}$ to obtain the nearest integer?

4

Exponents and Powers

Learning Objectives

After studying this chapter, students will be able to...

- understand the concept of exponents (or powers) by repeated multiplication
- describe various laws of exponents
- write large numbers in standard form using exponents

LESSON PLAN

Suggested number of periods: 8

Suggested Teaching Aids: Textbook (Math Genius! 7), teaching board, pen, pencils, chalk/marker, notebook, paper chits/number cards/flash cards, newspapers, an empty box/bowl, etc.

Keywords: Power, index, exponents, laws of exponents, base, exponential notation, scientific notation, etc.

Pre-requisite knowledge: Students must be familiar with basic mathematical operations (+, –, ×, ÷) on numbers, prime factorisation of given numbers.

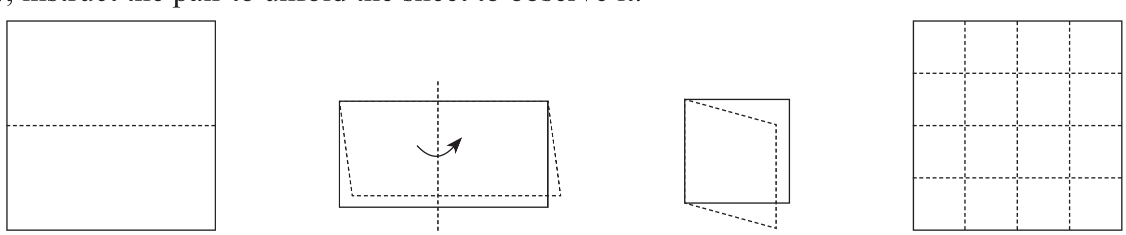
NEP feature: This method of teaching provides experiential learning opportunities to the students and allows them to work with each other, which helps in their holistic development.

Periods: 1–2	Topic: Concept of Exponents; How to Read an Exponential Expression	NEP Skills: Collaborative Learning, Experiential Learning, Logical Thinking

TEACHER-PUPIL ACTIVITY

- Write some addition and multiplication expressions with repetition of a number such as 2 + 2 + 2 + 2 + 2 + 2; 3 × 3 × 3 × 3 × 3 × 3 × 3; etc. Divide the class into pairs of students. Call the pairs of students one by one to the blackboard. Instruct the pair of student to take help of your partner and add and multiply those repeated numbers as many ways as they can. Based on the outcomes come from the pairs of the students explain to the class that how can they add and multiply the repeated numbers using various ways.
- Divide the class into pairs and distribute some squared paper sheets to them. Instruct them to fold this sheet so that one part exactly covers the other. This fold will divide the sheet into two equal parts. Similarly, fold the sheet again and again 4 or 5 more times as they did in the first fold as shown.

  Now, instruct the pair to unfold the sheet to observe it.



And make table as shown below:

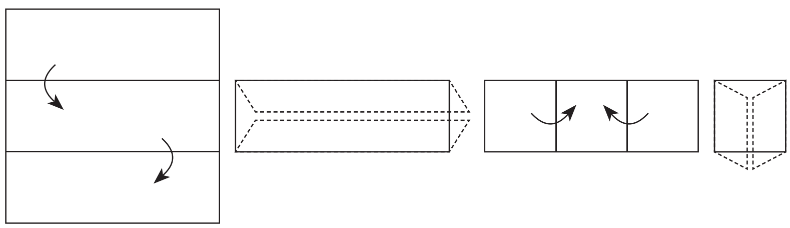
Number of equal parts in which sheet divide each time	Number of folds	Total number of equal parts
2	1	$2 \times 1 = 2$
2	2	$2 \times 2 = 4$
2	3	$(2 \times 2) \times 2 = 8$
2	4	$(2 \times 2 \times 2) \times 2 = 16$
2	5	$(2 \times 2 \times 2 \times 2) \times 2 = 32$
...	...	...

Based on their observations, explain to the class that the above activity reflects the concept of repeated multiplication and it can be written in a simpler and shorter way by using the 'number of equal parts in which sheet divided each time' by taking a number as base. As

$$\text{base} \rightarrow 2^{5 \rightarrow \text{Index or power or exponent (Number of folds)}}$$

Reiterate to the class that it is called exponential form, a shorter way of writing repeated multiplication of a number by itself and is used by raising the factor (called base) to an exponent called a power (number of folds). Take the reference of examples 1 and 2 on page 80 for this.

Again, instruct the class to fold this sheet into three equal parts and so on for 3 or 4 times for more clarity. And write them in a table as done above.



Also, reiterate to the class that **power 2** is also called **a square** and **power 3** is also called **a cube**. We read $3 \times 3 = 3^2$ as **3 square** and $2 \times 2 \times 2 = 2^3$ as **2 cube**.

Write some numbers on the blackboard and ask the class to express those numbers in exponential form. Accept their response and based on these, explain them that to express a number in exponential form, first factorise the number using base as a factor and then express in exponential form.

Suppose, number 81 has to be expressed in exponential form with base 3.

By prime factorisation,

3	81
3	27
3	9
3	3
	1

$81 = 3 \times 3 \times 3 \times 3$, i.e., 3 is multiplied by itself 4 times.

$\therefore$ $81 = 3^4$ read it as '3 raised to power 4'.

Take the reference of examples 3 to 8 on pages 81-82 for more explanation.

EXPLANATION

Take reference from pages 78-80 (including Get Ready!) of the textbook 'Math Genius! 7' to explain the topics mentioned.

ASSIGNMENTS

Classwork: Sub-parts (*a*), (*b*) and (*c*) of Q.1-4 of Practice Time 4A.

Homework: Remaining subparts of Q. 1-4 and Q. 5 and 6 of Practice Time 4A. Also, solve questions under section 'Create and Solve ', Think and Answers on page 81.

Periods: 3–5	Topic: Laws of Exponents; Miscellaneous Examples using the Laws of Exponents	NEP Skills: Logical Thinking, Experiential Learning

TEACHER-PUPIL ACTIVITY

Take reference to above mentioned pages 83-88 to explain the laws of exponents to the class by following up with the examples along with the respective laws.

Take reference of additional examples under the section 'Miscellaneous examples using the laws of exponents' (examples 15-19) for more practice and clarity of laws of exponents.

EXPLANATION

Take reference from pages 83-88 of the textbook 'Math Genius! 7' to explain the topics mentioned above.

ASSIGNMENTS

Classwork: Quick Check on pages 85-87, sub-parts (*a*), (*b*) and (*c*) of Q. 1-3 of Practice Time 4B.

Homework: Remaining sub-parts of Q. 1-3 and Q. 4-6 of Practice Time 4B; 'Maths Talk' on page 86 and 'Create & Solve' on page 88.

Period: 6	Topic: Standard Form of Large Numbers	NEP Skills: Discussion-Based Learning, Logical Thinking

TEACHER-PUPIL ACTIVITY

Start a discussion with the students of the class about our Solar system (about the distances and masses of planetary objects, like Sun, Earth, etc.) and make familiar with them.

Divide the class into pairs, and put some chits having the name of any planetary objects on them into a bowl. Call one of the pair of students and tell one of the students of the pair to pick a chit. Instruct him/her to read aloud the name of the planet written on the chit and tell the distance and mass of that planet to the Sun.

Instruct another student of the pair to write that distance in the numeral form on blackboard. Suppose, the distance of the earth from the sun is 149,600,000 km

Ask the class, 'can they read such type of bigger number easily?'. Based on the outcomes from the class, explain them that there is another way to read and write such bigger numbers called 'Scientific notation'.

Reiterate the class that a 'Scientific notation' of a bigger number has two factors. One factor is a number between 1 and 10. The second factor is a power of 10. That is

$$\underbrace{149,600,000 \text{ km}}_{\text{Standard form}} = \underbrace{1.496 \times 10^{8} \text{ km}}_{\text{Scientific notation}}$$

Also, reiterate the class to convert scientific notation into its standard form, by shifting the decimal point moving to the right power of 10 which tells you how many places to move it.

EXPLANATION

Take reference from pages 91-92 of the textbook 'Math Genius! 7' to explain the topics mentioned above.

ASSIGNMENTS

Classwork: Sub-parts (*a*) and (*b*) of Q.1-4 of Practice Time 4C.

Homework: Remaining subparts of Q. 1-4 of Practice Time 4C.

Periods: 7–8	Topic: Revision	NEP Skills: Logical Thinking, Critical Thinking

TEACHER-PUPIL ACTIVITY

- Make students comfortable, so that they can ask questions on any previously taught topics.
- Clarify their doubts or queries and start the revision of the exercise.
- Divide the students into small groups and guide them to do the activity given in the 'Learning by Doing' section.
- Start the revision of the exercise, by using Encapsulate, Brain Sizzlers, and Chapter Assessment.

ASSIGNMENTS

Classwork: Brain Sizzlers on page 96, Q. A-B of Chapter Assessment.

Homework: Remaining questions of Chapter Assessment, 'Mental Maths' on page 96 and 'Maths Connect' given on page 96.

ORANGE

ASSIGNMENT–7

Marks Obtained: __________

Student's Name: ____ Section: ______

Roll Number: ____________________________________ Date: ____________________

Multiple Choice Type Questions

Identify the correct answer.

1. The cube of the square of $\left(\frac{-3}{4}\right)$ is

(a) $\frac{-729}{4096}$ (b) $\frac{243}{1024}$ (c) $\frac{-243}{1024}$ (d) $\frac{729}{4096}$

2. Which of the following is not equal to $\left(\frac{-3}{5}\right)^3$?

(a) $\left(\frac{-3}{5}\right)\times\left(\frac{-3}{5}\right)\times\left(\frac{-3}{5}\right)$ (b) $-\frac{(-3)^3}{5^3}$ (c) $-\frac{3^3}{5^3}$ (d) $\frac{3^3}{(-5)^3}$

3. Which of the following is not equal to 1?

(a) $\frac{0^2\times196}{2^0\times14^2}$ (b) $\frac{13^3\times14^0}{13\times169}$ (c) $[(-2)^6\times(-2)^2]^2\div2^{16}$ (d) $[\{(5^3)^0\}^2]^3$

4. Which of the following is a whole number?

(a) $(-12)^{197}$ (b) $\frac{225\times0^2}{25^0\times(-15)^2}$ (c) $\frac{225\times25^0}{5^2\times15^2}$ (d) $9^2\div(3^2\times27)$

5. $\left(\frac{3}{7}\right)^4\times\left(\frac{2}{3}\right)^4$ is equal to

(a) $\left(\frac{6}{21}\right)^4$ (b) $\left(\frac{2}{7}\right)^{16}$ (c) $\left(\frac{2}{7}\right)^8$ (d) $\left(\frac{2}{7}\right)^0$

6. In standard form, the number 705210000 is written as $k\times10^8$, where k is equal to

(a) 705.221 (b) 7.0521 (c) 70.5221 (d) 7052.21

7. Which of the following has the largest value?

(a) $10^5\div0.01$ (b) $0.000001\div10^4$ (c) 0.00001×10^5 (d) $\frac{1}{10^5}$

8. Which of the following is not true?

(a) $\frac{1}{10^6}<\frac{1}{10^4}$ (b) $9^3=3^6$ (c) $8^3=2^3$ (d) $13^3>7^4$

9. Which power of 27 is equal to 3^{12}?

(a) 3 (b) 2 (c) 6 (d) 4

10. $13^5\times3^5$ cannot be written as

(a) $(13\times3)^5$ (b) $39^5\div39^0$ (c) $(13\times3)^6\div(39)$ (d) $(13^5\times3^5)\div3^5$

ORANGE

ASSIGNMENT–8

Marks Obtained: __________

Student's Name: ______________________________ Section: _______

Roll Number: ______________________ Date: ______________

A. Fill in the blanks.

1. The value of $2^3 + \frac{1}{2^3}$ is ....
2. $1000^6 \div 10^{15}$ = ...
3. If $2^6 \times 8^2 = 2^n \times 2^5$, then n = ...
4. 4.307×10^5 in usual form is ....
5. If $\left[\frac{1}{(-5)^3} \div \frac{1}{5^8}\right] \div p = 1$, then p = ...

B. Label True or False.

1. $\frac{9^5 \times 4^5}{(36)^5 \times 5^3} = \frac{1}{125}$ ....
2. If a is a non-zero integer, then $a^0 = 0^a = 1$. ....
3. $\{(-1)^{142}\}^{137} = -1$ ....
4. $(3 + 5)^2 = 3^2 + 5^2$ ....

C. Match the following.

Column I	Column II
1. $1^0 - 0^1 =$	(a) 2
2. The value of $2^0 + 3^0 + 4^0 - 5^0$	(b) 126
3. $(7 + 9)^2 - (7^2 + 9^2)$	(c) 1.26×10^2
4. Standard form of 126	(d) 1

D. Do as directed.

1. By which number should $\left(\frac{2}{3}\right)^3$ be divided so that the quotient is $\left(\frac{4}{27}\right)^2$?
2. What number should be multiplied by $\frac{1}{(-8)}$ to obtain a product equal to $\frac{1}{10}$?

5

Introduction to Algebra

Learning Objectives

After studying this chapter, students will be able to...

- explore more about the patterns and frame the generalize rule using variables to describes their formation
- explain and recognise the variables
- use variables in common rules from geometry and arithmetic
- form algebraic expressions in mathematical statements and formulae
- identify the variables, constants, coefficients, powers and terms in an algebraic expression
- identify like and unlike terms
- identify different types of algebraic expressions
- find the value of an algebraic expression by substituting the values of the variables
- add and subtract two or more algebraic expressions

LESSON PLAN

Suggested number of periods: 14

Suggested Teaching Aids: Textbook (Math Genius! 7), teaching board, pen, pencils, chalk/marker, notebook, paper chits/number cards/flash cards, newspapers, an empty box/bowl, etc.

Keywords: Pattern, variables, constant, powers, algebraic expression, factors, terms, coefficient, monomial, binomial, trinomial, polynomial.

Pre-requisite knowledge: Students must be familiar with patterns, various properties of arithmetic operations.

NEP feature: This method of teaching provides experiential learning opportunities to the students and allows them to work with each other, which helps in their holistic development.

Periods: 1–4	**Topic: Introduction to Algebra; Matchstick Patterns; The Idea of a Variable; Use of Variables in Common Rules from Geometry and Arithmetic; Constant and Variables**	**NEP Skills: Collaborative Learning, Creative Thinking, Experiential Learning**

TEACHER-PUPIL ACTIVITY

Write some mathematical expressions using numbers, letters and basic mathematical operations (+, –, × or ÷) such as:

$$5 + 8,\ 4 - 3,\ 2 + x,\ y - 5,\ 4p,\ \frac{z}{7}, \text{ etc.}$$

Instruct the class to read aloud the mathematical sentences. Accept the response from the class and based on these introduce new branch of mathematics called algebra, where letters are used for unknown quantities, numbers, arithmetic operations and rules for manipulating those symbols.

Get Ready! and Let's Recall on pages 98-99 will help in getting to an introductory phase in learning steps associated with algebra.

- Divide the class into pairs and distribute some matchsticks to them. Instruct them to make some interesting patterns using matchsticks. Based on their response let the students explore more about the patterns and frame the generalise rules using letters to describe their formations.

  (For this, matchstick patterns to form Ls and Cs can be taught with the help of the activity described on page 99).

  Take reference of Example 1 on page 101 for more explanation.

  'Create and Solve' on page 100 can also be asked in class as students' assessment and oral questions can also be asked from this. Different shapes like a triangle and a square can be formed using matchsticks to form patterns and general rules can be deduced from these.

  Based on the above driven general rules formulae for matchstick patterns using letters gives an idea of a variable to the class.

  Also, reiterate them that the letter that represents an unknown quantity is called a variable and it means something that can vary, i.e., change.

- Make some chits with a mathematical statement written on them and put them into a bowl. Instruct the students of the class to choose any one chit from the bowl and read aloud the statement written on it, like:

  'There is a basket having some apples and if you add 10 more apples to the basket, then how many apples are there in the basket?', etc.

  Ask them to understand the statements and write on the blackboard mathematically using letters as variables to represent unknown quantities/numbers. Accept the response from the class and explain them the correct answer.

  As, from the above statement, let there were x apples in the basket and since they added 10 more apples to the basket. Thus, the total number of apples in the basket will be $x + 10$.

  By taking more statements explain to the class that solving problems often becomes easier, if we use letters to represent unknown numbers.

  Also, reiterate to the class that every numeral has a specific value, such value is the same everywhere in all unchanged situations. These numerals are called constants.

Take reference of Examples 2-3 given on page 102 to explore more about the uses of variables for unknown quantities.

Extend the above activity to explore students' learning of how variables can be used in common rules from geometry as well as arithmetic.

Take reference to Examples 4-5 on page 105 to explain the students above mentioned rules.

Also, take reference to Example 6 on page 106 to teach how can the students of the class identify the constants and variables.

EXPLANATION

Take reference from pages 98-107 (including Get Ready!), of the textbook 'Math Genius! 7' to explain the topics mentioned.

ASSIGNMENTS

Classwork: Sub-parts (*a*) and (*b*) of Qs.1-3 and Qs. 4 and 5 of Practice Time 5A, Q.1 of Practice Time 5B.

Homework: Remaining questions of Practice Time 5A.

Periods: 5–7	**Topic: Power on Variables; Form Algebraic Expressions from Mathematical Statements and Formulae; Identify the Variables, Constants, Coefficients, Powers and Terms in an Algebraic Expression; Identity Like and Unlike terms**	**NEP Skills: Experiential Learning, Logical Thinking**

TEACHER-PUPIL ACTIVITY

- Write some multiplicative sentences with repeated multiplication of a number itself or a variable itself such as:

  $3 \times 3 \times 3 \times 3 \times 3$; $a \times a \times a \times a \times a \times a$; $2 \times 2 \times 2 \times 5 \times 5 \times x \times x \times x$; etc.

Instruct the class to write these expressions into their exponential form. Accept the response from the class and based on these explain them that the exponent is the power of variables or numbers indicates that the number of time the variables or the numbers are multiplied by itself.

Take the reference of Examples 7-8 on pages 107-108 to explore more about the powers on variables.

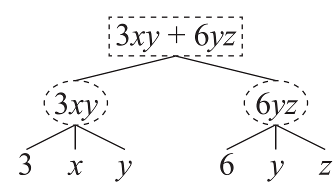
- Ask the students of the class to write some mathematical sentences using numerals, and variables involving one or two arithmetical operations as they have learnt in earlier periods and read them aloud. (Sometimes they can use brackets.) Accept the response and based on these reiterate them that the combination of variables (literals) and constants (numbers) including mathematical operations (+, –, × or ÷) is known as algebraic expression.

Formation of few expressions given in a table on page 109 can be used for practice in the class and Example 10 on page 110 can also be used in practice in the class. ‘Create and Solve’, ‘Quick Check’ given on page 109 can be used for oral assessment.

Reiterate the class that parts of an algebraic expression which are separated by the arithmetical operations: Addition (+) and subtraction (–) are called the terms of the algebraic expression.

Take reference of Example 11 for more practice in class to find terms of algebraic expressions. During practicing example 11, ask them ‘Can they find the factors of terms in the expression?’

Reiterate the class that a term in an algebraic expression is a product of all its factors. Explain the tree diagram method to write the factors of each term in an algebraic expression.



Tell the class that any of the factors of a term is called the coefficient of the product of the remaining factors.

As, in term $3xy$

y → Coefficient of $3x$

x → Coefficient of $3y$

3 → Numerical coefficient of xy

Follow up the class with some more examples to clear the doubts about the coefficient.

Reiterate the class that the numerical part of an algebraic term is called the numerical coefficient, e.g., in the term $3xy$, 3 is the numerical coefficient and xy is the literal coefficient.

Examples 12-13 can be worked out to examine the given algebraic expression in order to determine its terms and their factors; to distinguish between the terms which are constants and those which are not; to determine the numerical coefficient of the given variable.

Write some more algebraic expressions on the teaching board and ask the students of the class to categories like and unlike terms from the expressions.

Based on the outcomes from the class, tell the class that the terms whose variable parts are exactly same, meaning they have the same algebraic factors, are called like terms and the terms whose variable parts, i.e., whose algebraic factors are different, are called unlike terms. Example 14 given on page 114 can be used for practice in class. Oral questions can be asked from 'Quick Check' on page 114.

EXPLANATION

Take reference from pages 107-110; pages 112-115 of the textbook 'Math Genius! 7' to explain the topics mentioned.

ASSIGNMENTS

Classwork: Q. 2-3 of practice Time 5B; Q.1, sub-parts (*a*), (*b*), and (*c*) of Q. 2-4 of Practice Time 5C; Subparts (*a*) to (*c*) of Q. 1-5 of Practice Time 5D.

Homework: Remaining questions of Practice Time 5B and 5C; Remaining subparts of Q. 1 to 5 and Q. 7-8 of Practice Time 5D; 'Life Skills' on page 110; 'Maths Talk' on page 115.

Periods: 8–10	**Topic: Types of Algebraic Expressions; Finding the Value of an Expression**	**NEP Skills: Collaborative Learning, Experiential Learning**

TEACHER-PUPIL ACTIVITY

- Divide the students of the class into pairs. Put some chits having different types of algebraic expressions (monomial, binomial, trinomial, etc.) written on them in a bowl and make a table with three columns on the board for monomial, binomial and trinomial. Call pairs of students one by one and instruct them that one of the students of the pair will pick one chit from the bowl and other student of the pair will identify the expression written on the chit and write that expression on the blackboard in its respective column as shown below:

Monomial	Binomial	Trinomial
$2xy$	$x + 3y$	$3x + xy + 1$
y^2	$3x - 1$	$x^2 + 3x + 1$
$-5x$	$x^2 - 4xy$	$x + y - 1$
1	$xy + 1$	$5 - 4x - 3x^2$

Based on the outcomes from the class, explain to the class that

(*i*) expressions having a single term with whole number exponents are called monomials.

(*ii*) a binomial is an algebraic expression containing a sum or difference of exactly two monomials or terms.

(*iii*) A trinomial is an algebraic expression containing the sum or difference of exactly three monomials or terms.

To examine the given algebraic expressions to classify them as monomial, binomial, trinomial, or polynomial. Questions like the one can be given for practice.

Consider the expressions below.

A : $3r - 2s - 12rs + 1$ B; $4rs - 12r$

Which of these statements is correct?

Option 1: Expression A is a trinomial and expression B is a binomial.

Option 2: Expression A is a polynomial and expression B is a monomial.

Option 3: Expression A is a trinomial and expression B is a monomial.

Option 4: Expression A is a polynomial and expression B is a trinomial.

Example 15 given on page 115 can be used for practice in class. To find the value of an expression for the given values of the variables, Examples 16-17 given on page 117 can be used for practice in class.

EXPLANATION

Take reference to pages 115-117 of the textbook 'Math Genius! 7' to explain the topics mentioned.

ASSIGNMENTS

Classwork: 'Maths Talk' on pages 115-117; sub-parts (*a*) to (*c*) of Q. 1 to 2 of Practice Time 5E.

Homework: Q. 6 of Practice Time 5D; Remaining sub-parts of Q.1 and 2 and Qs. 3 to 5 of Practice Time 5E .

Periods: 10–12	Topic: Addition and Subtraction of Algebraic Expressions	NEP Skills: Logical Thinking, Experiential Learning

TEACHER-PUPIL ACTIVITY

Write some pairs of algebraic expressions on the board and ask the class to add or subtract them. Based on the response that come from them, make the children understand that while adding two like terms the coefficients are added without any change in the variable. And unlike terms cannot be added or subtracted as we added like terms, they are connected by the appropriate sign while adding or subtracting. Take reference to Examples 18-26 on pages 118-121 for more explanation to the class.

EXPLANATION

Take reference to pages 118-121 of the textbook 'Math Genius! 7' to explain the topics mentioned.

ASSIGNMENTS

Classwork: Q. 1 and 2; Sub-parts (*a*) and (*b*) of Q. 3 and 4 of Practice Time 5F.

Homework: Remaining questions of Practice Time 5F.

Periods: 13–14	Topic: Revision	NEP Skills: Logical Thinking, Critical Thinking

TEACHER-PUPIL ACTIVITY

- Make students comfortable, so that they can ask any question on any previously taught topics. Clarify their doubts or queries and start the revision of the exercise.
- Divide the students into small groups and guide them to do the activity given in the 'Learning by Doing' section.
- Start the revision of the exercise, by using Encapsulate, Maths Fun, Chapter Assessment.

ASSIGNMENTS

Classwork: Few sub-questions of Q. A-D of Chapter Assessment.

Homework: Remaining questions of Chapter Assessment, 'Maths Connect' on page 126, 'Mental Maths' on page 122.

ORANGE

ASSIGNMENT–9

Marks Obtained: __________

Student's Name: ______________________________ Section: _______

Roll Number: ______________________________ Date: ______________________

A. Multiple Choice Type Questions

Identify the correct answer.

1. If there are k books, and each shelf can hold 30 books, the number of shelves required to arrange all the books is

(*a*) $30k$ (*b*) $k \div 30$ (*c*) $k + 30$ (*d*) $30 \div k$

2. Ananya's age is x years now and her father is 30 years older than her. 5 years ago her father's age was

(*a*) $x + 25$ (*b*) $x + 35$ (*c*) $x + 30$ (*d*) $5x + 30$

3. If x takes the value 7, then the value of $3x - 9$ is

(*a*) 1 (*b*) –6 (*c*) 12 (*d*) 17

4. If the perimeter of a regular heptagon is $(y - 6)$ metres, then the length of each of its sides is

(*a*) $[(y - 6) + 7]$ m (*b*) $[(y - 6) \div 7]$ m (*c*) $7(y - 6)$ m (*d*) $[(y - 6) \div 6]$ m

5. For any two integers p and q, which of the following suggests that multiplication is distributive over subtraction?

(*a*) $p(p + q) = p^2 + pq$ (*b*) $p(p - q) = p^2 - pq$ (*c*) $pq = qp$ (*d*) $-p(p + q) = p(q - p)$

6. $37 - 37n$ means

(*a*) 37 is subtracted n times (*b*) n is subtracted 37 times

(*c*) $37n$ is subtracted from 37 (*d*) 37 is subtracted from $37n$

7. Rahul has a sum of ₹x. He spent ₹800 on books, ₹600 on a birthday gift, and ₹300 on travel, and received ₹500 as cashback. How much money (in ₹) is left with him?

(*a*) $x - 1400$ (*b*) $x - 1700$ (*c*) $x + 500$ (*d*) $x - 1200$

8. The expression obtained when p is multiplied by 5 and then subtracted from 7 is

(*a*) $5(7 - p)$ (*b*) $7p - 5$ (*c*) $5p - 7$ (*d*) $7 - 5p$

9. Identify the monomial out of the following.

(*a*) $4pq^2 + 5p - 4p^2q$ (*b*) $3p^2q - 5p - 3qp^2$ (*c*) $pq - qr + rp$ (*d*) $4pq^2 + 3p - pq^2$

B. Assertion and Reason Type Questions

In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.

(*a*) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(*b*) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

(*c*) Assertion (A) is true but Reason (R) is false.

(*d*) Assertion (A) is false but Reason (R) is true.

10. **Assertion (A):** $(2mn^2 + 5m - 2n^2m)$ is a trinomial.

Reason (R): A polynomial containing three unlike terms is called a trinomial.

11. **Assertion (A):** The value of $p^2 - 2p^3 - 2$, for $p = -1$ is greater than zero.

Reason (R): $(-1)^2 - 2(-1)^3 - 2 = 1 > 0$.

ORANGE

ASSIGNMENT–10

Marks Obtained: __________

Student's Name: ____ Section: ______

Roll Number: ____________________________________ Date: ______________________

A. Fill in the blanks.

1. The additive inverse of an integer $(-3 + p)$ is ....
2. In the expression πr, the numerical constant is ....
3. The speed of a bus is 45 km/hr. The time taken by bus to cover x km distance is ....
4. The number of unlike terms in a binomial is ....
5. $p + q - 2p$ is an expression which is neither trinomial nor ....

B. Label True or False.

1. The sum or difference of two like terms is a like term. ....
2. The area of a circle $= \pi r^2$, and the algebraic variables of expression πr^2 are π and r. ....
3. If k is a whole number, then $4k + 1$ is an odd number. ....
4. $(2x - y + 5) - (2x + y)$ is a binomial. ....
5. In like terms, variables and their powers are the same. ....

C. Match the following.

Column I	Column II
1. A term of the expression $ax + by + c$	(*a*) $9y + 5$
2. The sum of $(2y + x)$ and $(-y - x)$	(*b*) y
3. 5 added to the product of 9 and y	(*c*) $5y + 9$
4. 9 more than the product of 5 and y	(*d*) ax
5. A like term of $5xy$	(*e*) $-xy$

D. Do as directed.

1. From the sum of $a^2 + b^2 + 4$, $b^2 - a^2 - 4$ and $4 - a^2 - b^2$ subtract $-(4 - a^2)$.
2. What should be added to $p^3 + 4p^2q + 4q^2p + q^3$ to get $p^3 - q^3$?

ANSWERS OF THE ASSIGNMENTS

ASSIGNMENT-1

1. (*b*) **2.** (*b*) **3.** (*b*) **4.** (*a*) **5.** (*c*)
6. (*c*) **7.** (*c*) **8.** (*d*) **9.** (*b*) **10.** (*a*)

ASSIGNMENT-2

A. 1. identity **2.** 7 **3.** –1 **4.** 21
5. 5, 7

B. 1. True **2.** True **3.** False **4.** True **5.** False

C. 1. (*d*) **2.** (*e*) **3.** (*b*) **4.** (*a*) **5.** (*c*)

D. 1. –2, 6 or –6, 2 **2.** Archimedes

ASSIGNMENT-3

1. (*a*) **2.** (*c*) **3.** (*d*) 4. (*a*) **5.** (*d*)
6. (*b*) **7.** (*a*) **8.** (*a*) 9. (*d*)

ASSIGNMENT-4

A. 1. $\frac{5}{8}$ **2.** $\frac{4}{9}$ **3.** reciprocal
4. greater than **5.** 0.0075

B. 1. False **2.** False **3.** True **4.** False

C. 1. (*d*) **2.** (*c*) **3.** (*a*) **4.** (*b*)

D. 1. Yes, the value will increase. **2.** F

ASSIGNMENT-5

1. (*d*) **2.** (*c*) **3.** (*b*) **4.** (*c*) **5.** (*d*)
6. (*c*) **7.** (*a*) **8.** (*a*)

ASSIGNMENT-6

A. 1. $\frac{2}{9}$ **2.** left **3.** greater **4.** $\frac{2}{45}$ **5.** –1

B. 1. False **2.** True **3.** False

C. 1. (*d*) **2.** (*a*) **3.** (*c*) **4.** (*b*)

D. 1. $\frac{3}{2}$ **2.** $\frac{-2}{5}$

ASSIGNMENT-7

1. (*d*) **2.** (*b*) **3.** (*a*) **4.** (*b*) **5.** (*c*)
6. (*b*) **7.** (*a*) **8.** (*c*) **9.** (*d*) **10.** (*d*)

ASSIGNMENT-8

A. 1. $\frac{65}{8}$ **2.** 10^3 **3.** $n = 7$ **4.** 430700 **5.** $(-5)^5$

B. 1. True **2.** False **3.** False **4.** False

C. 1. (*d*) **2.** (*a*) **3.** (*b*) **4.** (*c*)

D. 1. $\frac{27}{2}$ **2.** $\left(\frac{-8}{10}\right)$

ASSIGNMENT-9

1. (*b*) **2.** (*a*) **3.** (*c*) **4.** (*b*) **5.** (*b*)
6. (*c*) **7.** (*d*) **8.** (*d*) **9.** (*b*) **10.** (*d*)
11. (*a*)

ASSIGNMENT-10

A. 1. $-(p - 3)$ **2.** π **3.** $(x \div 45)$ hr
4. 2 **5.** monomial

B. 1. True **2.** False **3.** True **4.** True **5.** True

C. 1. (*d*) **2.** (*b*) **3.** (*a*) **4.** (*c*) **5.** (*e*)

D. 1. $-2a^2 + b^2 + 8$
2. $-4p^2q - 4q^2p - 2q^3$

HINTS & SOLUTIONS

CHAPTER 1 : INTEGERS

Let's Recall

1. Three such numbers are –1, 0 and –9 as
$(-1) + 0 + (-9) = -10$ (Answer may vary)

2. $(-4) + 3 + (-6) = -7$ and $(-3) + 4 + (-6) = -5$
Since $(-5) > (-7)$, we have
$[(-3) + 4 + (-6)] > [(-4) + 3 + (-6)]$
So, $(-3) + 4 + (-6)$ is greater.

3. Two such integers are –4 and 1 whose difference is –5.
$(-4) - 1 = -5$ (Answer may vary)

4. Height of place A = 1850 m above sea level
= +1850 m
Depth of place B = 910 m below sea level
= –910 m
∴ Difference between the levels of these two places
= 1850 m – (–910 m)
= 1850 m + 910 m = 2760 m

5. (*a*) $(-7) + (-4) = -11 = (-4) + (-7)$
(*b*) $18 + (-18) = 18 - 18 = 0$
(*c*) $[11 + (-9)] + 10 = [11 - 9] + 10$
$= 11 - 9 + 10 = 11 + (-9) + 10$
$= 11 + [(-9) + 10]$

Think and Answers (Page 9)

1. 1 is the smallest positive integer.
2. –1 is the greatest negative integer.

Quick Check (Page 9)

(*a*) $(-6) + (-7) = -(6 + 7) = -13$
(*b*) $(+13) - (-11) = (+13) + (11)$
$= +(13 + 11) = +24$
$= 24$
(*c*) $(+5) + (-6) = -(6 - 5) = -1$
(*d*) $(-7) - (-15) = (-7) + (15)$
$= (15 - 7) = 8$
(*e*) $(-9) + (-10) - (-19) = [(-9) + (-10) - (-19)$
$= [-(9 + 10)] - (-19)$
$= (-19) - (-19)$
$= (-19) + 19 = 0$

Life Skills (Page 10)

Ruhi's total score
$= 85 + (-7) + 40 + 68 + (-12) + 50$
$= (85 - 7) + 40 + (68 - 12) + 50$
$= 78 + 40 + 56 + 50 = 224$
Roma's total score
$= 70 + 24 + (-17) + 46 + 58 + 48$
$= 70 + (24 - 17) + 46 + 58 + 48$
$= 70 + 7 + 46 + 58 + 48 = 229$
Since 229 > 224, Roma scored more.
Also, 229 – 224 = 5
Therefore, Roma scored 5 marks more than Ruhi.

Practice Time 1A

1. (*a*) $-|17| = -(17) = -17$
(*b*) $|11 + (-3)| = |11 - 3| = |8| = 8$
(*c*) $|(-11) - (-89)| = |(-11 + 89)| = |78| = 78$
(*d*) $|18 - 118| = |-100| = 100$

2. (*a*) Since $-17 < -13 < -7 < 3 < 11 < 15$, the ascending order of the given integers is –17, –13, –7, 3, 11, 15.
(*b*) Since $-15 < -10 < -9 < -1 < 0 < 2 < 12$, the ascending order of the given integers is –15, –10, –9, –1, 0, 2, 12.

3. (*a*) Since $51 > 10 > -2 > -6 > -15 > -27 > -35$, the descending order of the given integers is 51, 10, –2, –6, –15, –27, –35.
(*b*) Since $-59 > -70 > -79 > -84 > -100$, the descending order of the given integers is –59, –70, –79, –84, –100

4. (*a*) For $a = -5$, $b = 2$,
LHS $= a - (-b) = -5 - (-2) = -5 + 2 = -3$
RHS $= a + b = -5 + 2 = -3$
Since, LHS = RHS ∴ $a - (-b) = a + b$
(*b*) For $a = -25$, $b = 35$
LHS $= a - (-b) = -25 - (-35) = -25 + 35 = 10$
RHS $= a + b = -25 + 35 = 10$
Since, LHS = RHS ∴ $a - (-b) = a + b$

5. (*a*) LHS $= -5 + (-8) + 15 = -(5 + 8) + 15$
$= -13 + 15 = 2$
RHS $= 13 - 16 + (-5) = 13 - (16 + 5)$
$= 13 - 21 = -8$
Since $2 > -8$, so, LHS > RHS.
Therefore, $-5 + (-8) + 15 > 13 - 16 + (-5)$.

(*b*) LHS = 12 – (–18) – 50 = 12 + 18 – 50
= 30 – 50 = –20
RHS = 12 + (–29) + 18 = (12 – 29) + 18
= –17 + 18 = 1
Since –20 < 1, so, LHS < RHS.
Therefore, 12 – (–18) –50 < 12 + (–29) + 18

(*c*) LHS = –10 + (–6) + 12 = –(10 + 6) + 12
= –16 + 12 = –4
RHS = –15 – 11 + (–25) = –(15 + 11) + (–25)
= –26 – 25 = –(26 + 25) = –51
Since –4 > – 51, so, LHS > RHS.
Therefore, –10 + (–6) + 12 > –15 –11 + (–25)

6. (*a*) (–1) – (–8) = –1 + 8 = 7
Therefore, –1 and –8 is a pair of negative integers whose difference is 7.
(Answer may vary)

(*b*) One such pair is –10 and 1.
As –10 + 1 = –9 (Answer may vary)

(*c*) One such pair is –3 and 1.
As (–3) – (1) = –4 (Answer may vary)

7. Sum of –44 and 18 = –44 + 18 = –26
Now, we need to subtract –26 from –60. Therefore,
–60 – (–26) = –60 + 26 = –(60 – 26) = –34
Therefore, the correct answer is –34.

8. Given, 63 + the other integer = –92
∴ The other integer = –92 – 63 = –155
Thus, the other integer is –155.

9. (*a*) The sum of an integer and its additive inverse is zero.
This property is called existence of additive inverse.

(*b*) 18 + (–18) = 0, here –18 is the additive inverse of 18. So, the property shown is existence of additive inverse.

(*c*) (–7) + (–4) = (–4) + (–7) by commutative property of addition of integers.

(*d*) 13 + [(–28) + 12] = [13 + (–28)] + 12 by associative property of addition.

(*e*) (–11) + 0 = (–11).
Here, 0 is the additive identity.

10. Height of the fighter plane above the sea level = +33500 ft
Depth of the submarine below the sea level = 13500 ft
∴ Vertical distance between the fighter plane and the submarine at that time = (33500 + 13500) ft = 47000 ft.

11. Total deposits in Rama's savings account
= ₹1500 + ₹2550 = ₹4050
Total withdrawals = ₹2600
∴ Total amount in Rama's savings account = Total deposits – total withdrawals
= ₹4050 – ₹2600 = ₹1450
Thus, Rama has ₹1450 in her savings account.

12. The total score obtained by all the students in the test
= (–10) + 20 +(–5) + (–3) + 10
= (–10 + 20) – (5 + 3) + 10 = 10 – 8 + 10
= (10 – 8) + 10 = 2 + 10 = 12

Quick Check (Page 12)

The complete square integer grid is

×	–3	–2	–1	0	1	2	3
–3	9	6	3	0	–3	–6	–9
–2	6	4	2	0	–2	–4	–6
–1	3	2	1	0	–1	–2	–3
0	0	0	0	0	0	0	0
1	–3	–2	–1	0	1	2	3
2	–6	–4	–2	0	2	4	6
3	–9	–6	–3	0	3	6	9

From the pattern, we observe that the product of 0 and an integer is always 0. Also, the product of integers having the same sign is always positive and the product of integers having the opposite sign is always negative.

(*a*) (–2) × 3 = –(2 × 3) = –6
(*b*) 3 × (–3) = –(3 × 3) = –9

Quick Check (Page 13)

(*a*) When a (–ve) number is multiplied odd number of times, the product is always (–ve). So, when (–1) is multiplied odd number of times by itself the product is (–1).
Therefore, (–1) × (–1) × ... 197 times = –1

(*b*) When a (–ve) number is multiplied even number of times, the product is always (+ve). So, when (–1) is multiplied even number of times by itself the product is 1.
Therefore, (–1) × (–1) × ... 216 times = 1.

Think and Answer (Page 14)

The 3°C drop in the temperature can be represented by the integer –3. Five times drop by 3°C can be represented by 5 times (–3).

Thus, from the given options, only option (*c*) does not represent 5 times (–3). Therefore, option (*c*) is the correct answer.

Quick Check (Page 16)

(*a*) For the statement
$(-2) \times [(-4) - (-5)] = (-2) \times (-4) - (-2) \times (-5)$,
Distributive property of multiplication over subtraction has been used.

(*b*) For the statement
$\{(-3) \times (-7)\} \times (-2) = (-3) \times \{(-7) \times (-2)\}$,
Associative property of multiplication has been used.

(*c*) For the statement
$0 \times (-7) = 0$,
Multiplicative property of 0 has been used.

(*d*) For the statement
$(-15) \times 1 = -15$,
Multiplicative identity has been used.

Practice Time 1B

1. (*a*) Multiplication of 7 by 11 = $7 \times 11 = 77$

(*b*) Multiplication of (–12) by 11 = $(-12) \times 11$
$= -(12 \times 11) = -132$

(*c*) Multiplication of 9 by (–1) = $9 \times (-1)$
$= -(9 \times 1) = -9$

(*d*) Multiplication of (–4) by (–107)
$= (-4) \times (-107) = +(4 \times 107) = 428$

2. (*a*) $16 \times 8 = 128$

(*b*) $-(13 \times 17) = -(13 \times 17) = -221$

(*c*) $19 \times (-21) = -(19 \times 21) = -399$

(*d*) $(-10) \times (-98) = +(10 \times 98) = 980$

(*e*) $(15) \times (-22) \times (-5) \times (-8)$
$= -(15 \times 22) \times (-5) \times (-8)$
$= (-330) \times (-5) \times (-8) = (1650) \times (-8)$
$= -(1650 \times 8) = -13200$

(*f*) $(-4) \times (-5) \times (-6) \times (-1)$
$= (4 \times 5) \times (-6) \times (-1) = (20) \times (-6) \times (-1)$
$= -(20 \times 6) \times (-1) = (-120) \times (-1)$
$= 120 \times 1 = 120$

3. (*a*) (–1) has been multiplied 4 times (an even number of times) in the given product. Therefore,
$(-1) \times (-1) \times (-1) \times (-1) = 1$

(*b*) (–1) has been multiplied 6 times (an even number of times), therefore,
$(-1) \times (-1) \times (-1) \times (-1) \times (-1) \times (-1) = 1$

(*c*) (–1) has been multiplied odd number of times, therefore,
$(-1) \times (-1) \times (-1) \times \ldots$ (149 times) $= -1$

(*d*) (–1) has been multiplied even number of times, therefore,
$(-1) \times (-1) \times (-1) \times \ldots$ (240 times) $= 1$

4. (*a*) $(-7) \times 0 = 0$

(*b*) –8 can be written as $(-1) \times 8$ or $8 \times (-1)$, therefore,
$8 \times (-1) = -8$

(*c*) $(-23) \times 1 = -23$

(*d*) $(-11) \times 1 = (-11)$

(*e*) $(-5) \times (103 - 3) = (-5) \times (103) - (-5) \times 3$
by using distributive property of multiplication over subtraction.

(*f*) $(-1) \times [(-2) + 3] = (-1) \times (-2) + (-1) \times 3$
by using distributive property of multiplication over addition.

5. (*a*) $(-25) \times 203 = -(25) \times 203$
$= -(25) \times (200 + 3)$ ($\because$ $203 = 200 + 3$)
$= -[25 \times 200 + 25 \times 3]$
(Using distributive property)
$= -[5000 + 75] = -[5075] = -5075$

(*b*) $(-11) \times (-12) \times (-13) = [-11 \times -12] \times (-13)$
$= [132] \times (-13)$
$= 132 \times [(-10) + (-3)]$ [$\because$ $-13 = (-10) + (-3)$]
$= 132 \times (-10) + 132 \times (-3)$
(Using distributive property)
$= -1320 - 396 = -1716$

(*c*) $(-4) \times [7 + (-6)] = (-4) \times 7 + (-4) \times (-6)$
(Using distributive property)
$= -28 + 24 = -4$

(*d*) $(-12) \times (-99) + (-12) \times (-1) = -12 \times [(-99) + (-1)]$
(Using reverse of distributive property)
$= (-12) \times (-100) = 1200$

(*e*) $(-4) \times [(-100) - 9] = (-4) \times (-100) - (-4) \times 9$
(Using distributive property)
$= 400 - (-36) = 400 + 36 = 436$

(*f*) $1927 \times 101 - 1927 \times (-9) = 1927 \times [101 - (-9)]$
(Using reverse of distributive property)
$= 1927 \times [101 + 9] = 1927 \times [110]$
$= 1927\ [100 + 10] = 1927 \times 100 + 1927 \times 10$
(Using distributive property)
$= 192700 + 19270 = 211970$

6. (*a*) For $x = -2$, $y = -1$ and $z = 3$,
LHS $= x \times (y + z) = (-2) \times [(-1) + 3]$
$= (-2) \times [2] = (-2) \times 2 = -4$

RHS = $(x \times y) + (x \times z)$
$= [(-2) \times (-1)] + [(-2) \times 3] = 2 + (-6) = -4$

$\therefore$ LHS = RHS, verified.

(*b*) For $x = -2$ and $y = -1$

LHS = $x \times (y \times z) = (-2) \times [(-1) \times z] = 2z$

RHS = $(x \times y) \times z = [(-2) \times (-1)] \times z = 2z$

$\therefore$ LHS = RHS, verified.

7. (*a*) Sign of the product of 17 negative integers will be negative, sign of the product of 3 positive integers will be positive.

$\therefore$ Sign of the product of 17 negative integers × 3 positive integers
= (–ve) × (+ve) = negative (–ve)

(*b*) Sign of the product of 28 negative integers × 4 positive integers = (+ve) × (+ve) = positive

(*c*) Sign of the product of 7 positive × 2 negative integers = (+ve) × (+ve) = positive

(*d*) Sign of the product of 27 negative integers multiplied together is negative.

8. At $x = 1$,

$$(-1) \times x + x \times 0 + x \times \frac{1}{x} = (-1) \times 1 + 1 \times 0 + 1 \times \frac{1}{1}$$
$$= -1 + 0 + 1 = 0$$

9. Profit per loaf of bread = ₹10

$\therefore$ Profit on selling 2500 loaves of bread = 2500 × ₹10 = ₹25000

Loss per cake = ₹7

Loss on selling 4000 cakes = 4000 × (₹7)
= ₹28000

Total profit or loss of the month
= ₹25000 – ₹28000 = –₹3000

(–ve value shows the loss)

Therefore, there was a loss of ₹3000.

10. The temperature after first 3 hours
= 35°C – 3 × (4°C) = (35 – 12)°C = 23°C

The temperature after next 4 hours
= 23°C – 4 × (3°C) = (23 – 12)°C = 11°C

Further, the temperature after next 3 hours
= 11°C – 3 × (3°C) = 2°C

Thus, the temperature after 10 hours will be 2°C. The general room temperature is defined as around (20 – 22)°C or (68 – 72)°F.

Life Skills (Page 17)

Since the submarine is diving at the rate of 63 feet per minute, the depth of the submarine after 8 minutes = 8 × 63 ft = 504 feet.

A person can dive safely in the sea up to 130 feet. Trained technical divers can dive safely upto 300 feet.

Practice Time 1C

1. (*a*) $28 \div (-7) = -(28 \div 7) = -4$

(*b*) $(-14) \div 2 = -(14 \div 2) = -7$

(*c*) $32 \div 4 = 8$

(*d*) $(-125) \div (-25) = +(125 \div 25) = 5$

(*e*) $(-72) \div 72 = -(72 \div 72) = -1$

2. (*a*) $(-51) \div (+3) = -(51 \div 3) = -17$

(*b*) $36 \div (-18) = -(36 \div 18) = -2$

(*c*) $232 \div (-8) = -(232 \div 8) = -29$

(*d*) $0 \div (-115) = 0$

(*e*) $(-144) \div 12 = -(144 \div 12) = -12$

(*f*) $(-200) \div 10 = -(200 \div 10) = -20$

(*g*) $4050 \div (-18) = -(4050 \div 18) = -225$

3. (*a*) $\because (-101) \times 1 = -101$

Therefore, $(-101) \div (-101) = 1$

(*b*) $\because (-1) \times 34 = -34$

Therefore, $(-34) \div 34 = -1$

(*c*) $\because 9 \times (-9) = -81$

Therefore, $(-81) \div (-9) = 9$

(*d*) $256 \div (-16) = -(256 \div 16) = -16$

$\therefore 256 \div (-16) = -16$

4. (*a*) $[(-6) + 5] \div [(-2) + 1] = [-1] \div [-1] = +(1 \div 1)$
$= 1$

(*b*) $-|(-630) \div (-7)| = -|+(630 \div 7)| = -|90| = -90$

(*c*) $|117 \div (-13)| - |(-119) \div 17)|$
$= |-(117 \div 13)| - |-(119 \div 17)|$
$= |-9| - |-7| = 9 - 7 = 2$

(*d*) $[(-24) \div (-12)] \div 4$
$= [+(24 \div 12)] \div 4 = [2] \div 4 = 2 \div 4 = 0.5$

5. We are given that

(the integer) ÷ (–4) = 36

$\because 36 \times (-4) = -144$

$\Rightarrow (-144) \div (-4) = 36$

Hence, the required integer is –144.

6. Given that,

(–12) × (the other integer) = 288

$\because 288 \div (-12) = -(288 \div 12) = -24$

$\Rightarrow (-12) \times (-24) = 288$

Therefore, the required integer is –24.

7. (*a*) The temperature at noon = 12°C

Final temperature = –6°C

Difference between the final temperature and the temperature at noon = [12 – (–6)]°C = 18°C

Since the temperature is decreasing at the rate of 1.5°C per hour.

$\therefore$ Time taken = $\frac{18°C}{1.5°C} = 12$ hours.

So, the temperature will be 6°C below zero degree after 12 hours from the noon, i.e., at midnight.

(*b*) The temperature at midnight will be –6°C.

8. (*a*) Total score of Roma = 24 marks

Marks for 10 correct answers

= (+3) × 10 = 30 marks

Marks deducted = 30 – 24 = 6 marks

Since 0.5 marks is deducted for every incorrect answer, then the total number of incorrect answers = $\frac{6}{0.5} = \frac{60}{5} = 12$.

So, Roma's 12 answers were incorrect.

(*b*) Total of marks for 4 correct answers

= 4 × 3 = 12 marks

Marks scored by Ruhi = 3

Marks deducted for incorrect answers

= 12 – 3 = 9

Since 0.5 mark is deducted for every incorrect answer, so, total number of incorrect answers

= $\frac{9}{0.5}$ = 18

$\therefore$ Total number of questions attempted by Ruhi = 4 + 18 = 22

So, Ruhi attempted a total of 22 questions.

9. (*a*) Profit earned on each pen = ₹2

$\therefore$ The profit earned on selling 32 pens

= 32 × ₹2 = ₹64

Since, there is a loss of ₹8 on the total transaction, so, loss from pencils – profit from pens = 8 or, Loss from pencils = Profit from pens + 8 = ₹64 + ₹8 = ₹72

Since, there is a loss of 15 paise or ₹0.15 per pencils, then

$\therefore$ No. of pencils sold = $\frac{₹\ 72}{₹\ 0.15}$ = 480

So, the shopkeeper sold 480 pencils.

(*b*) Profit on selling 6 dozen pens = (6 × 12) × ₹2 = 72 × ₹2 = ₹144

For no profit and no loss in the whole transactions, the amount of loss should also be the same as profit earned.

For the loss of ₹144, the number of pencils to be sold = $\frac{₹\ 144}{₹\ 0.15}$ = 960

So, the shopkeeper sold 960 pencils.

Practice Time 1D

1. 12 − (16 − 8 ÷ 2) = 12 – (16 – 4) = 12 – 12 = 0
2. (–4) − (–12) ÷ (–6) + (–4) × 5
   = (–4) – (12 ÷ 6) – (4 × 5) = (–4) – (2) – (20)
   = –4 – 2 – 20 = –26
3. 14 ÷ (3 of 2 − 3 + 4) − 9(5 − 3)
   = 14 ÷ (6 + 1) – 9(2) = 14 ÷ 7 – 18 = 2 – 18 = –16
4. 32 − {10 + 12 − (14 + 3 − 1 + 2)}
   = 32 – {22 – (18)} = 32 – {22 – 18} = 32 – {4}
   = 32 – 4 = 28
5. 36 − [20 − {12 − (14 − 2 ÷ 2) × 1}]
   = 36 – [20 – {12 – (14 – 1) × 1}]
   = 36 – [20 – {12 – (13) × 1}]
   = 36 – [20 – {12 – 13}] = 36 – [20 – {–1}]
   = 36 – [20 + 1] = 36 – 21 = 15
6. (–5) × [6 + (–7) + 8] − [6 × {–8 + 7 + (–6)}]
   = (–5) × [6 – 7 + 8] – [6 × {–8 + 7 – 6}]
   = –5 × [7] – [6 × {–7}] = –35 – [–42]
   = –35 + 42 = 7
7. $17 – [17 – \{17 – (17 − \overline{16 – 17})\}]$
   = 17 – [17 – {17 – (17 + 1)}]
   = 17 – [17 – {17 – 18}] = 17 – [17 + 1]
   = 17 – 18 = –1
8. $36 – \{15 + 14 – (13 + \overline{2 – 1 + 3})\}$
   = 36 – {29 – (13 + 4)} = 36 – {29 – (17)}
   = 36 – {29 – 17} = 36 – 12 = 24

Maths Connect (Page 22)

(*a*) Since there are equal number of electrons and protons in an atom, the charge of an atom is zero.

(*b*) If an atom losses 4 electrons, then its charge will be – (– 1) × 4 = (+1) × 4 = +4.

(*c*) If an atom gains 8 electrons, then its charge will be + (– 1) × 8 = (–1) × 8 = –8.

Mental Maths (Page 22)

1. According to the given riddle,

$[-(-6) - \{-(-7)\}] + -(-7)$

$= [6 - \{7\}] + 7 = -1 + 7 = 6$

Hence, the correct answer is 6.

2. Value of riddle 1 is 6.

Now, according to the given conditions,

$[6 + (-4) - (-2)] \div (-2)$

$= [6 + (-4) + 2] \div (-2) = 4 \div (-2) = -2$

Hence, the value is –2.

Chapter Assessment

A.

1. Given that: $-8 + (\text{the other integer}) = -14$

$\therefore$ The other, integer $= -14 - (-8)$

$= -14 + 8 = -6$

Hence, the correct option is (*b*).

2. Multiplicative identity of any integer is 1.

Therefore, the correct option is (*b*).

3. $(-23) \times 8 = -(23 \times 8)$

But $(-23) \times (-8) = +(23 \times 8)$

$\therefore$ $(-23) \times 8 \neq (-23) \times (-8)$

Hence, the correct option is (*c*).

4. $(-3) + (-14) \div (-7) + 8 = (-3) + (14 \div 7) + 8$

$= -3 + 2 + 8 = -3 + 10 = 7$

Hence, the correct option is (*c*).

5. $-5 + 1 = -(5 - 1) = -4$

So, $-5 + 1 = 4$ is a wrong statement.

Hence, the correct option is (*d*).

6. $(-5) \times (-4) = (-4) \times (-5)$ is showing the commutative property of multiplication.

Therefore, the correct option is (*b*).

B.

1. Associative property does not hold for integers, i.e.,

$a \div (b \div c) \neq (a \div b) \div c$

Therefore, the assertion is wrong and the reason is correct. Hence the correct answer is option (*d*).

2. For all integers *a*, *b* and *c*,

$(a \times b) \times c = a \times (b \times c)$

this is associative property of multiplication.

Also, the multiplication of integers is commutative, i.e., $a \times b = b \times a$

Therefore, both A and R are true but R is not the correct explanation of A.

Hence, the correct answer is option (*b*).

C. (*a*) – (*vi*); (*b*) – (*iii*); (*c*) – (*v*); (*d*) – (*vii*); (*e*) – (*viii*); (*f*) – (*iv*); (*g*) – (*ii*); (*h*) – (*ix*); (*i*) – (*i*)

D.

1. By using associative property of addition of integers, we have

if *x*, *y* and *z* are integers, then

$(x + y) + z = x + (y + z)$

2. Additive inverse of *a* is $(-a)$. Therefore,

$(-a) + b = b + (-a) = b +$ additive inverse of *a*.

3. Using associative property of multiplication, we get

$[12 \times (-7)] \times 5 = 12 \times [(-7) \times 5]$

4. $\because (-16) \div 4 = -4 \quad \Rightarrow \quad (-16) \div (-4) = 4$

$\therefore$ When –16 is divided by –4, the quotient is 4.

5. $\because (-920) \div (-23) = 40 \Rightarrow 40 \times (-23) = -920$

E.

1. (*a*) $(-4) \times (-5) \times (-6) \times (-2) \times (-1)$

$= (4 \times 5) \times (6 \times 2) \times (-1)$

$= (20) \times (12) \times (-1) = (20 \times 12) \times (-1)$

$= (240) \times (-1) = -240$

(*b*) $[(-4) \times (-12)] \div (-16)$

$= [4 \times 12] \div (-16) = [48] \div (-16)$

$= -(48 \div 16) = -3$

(*c*) $(-14) + (-8) \div (-2) \times (-3)$

$= (-14) + (8 \div 2) \times (-3) = (-14) + (4) \times (-3)$

$= (-14) - (4 \times 3) = -14 - 12$

$= -(14 + 12) = -26$

(*d*) $16 - [16 - 16 - (16 - 16 - 16)]$

$= 16 - [16 - 16 - (-16)]$

$= 16 - [16 - 16 + 16] = 16 - [16] = 16 - 16 = 0$

(*e*) $26 \times (-50) + (-50) \times (-36)$

$= (-50) \times \{26 + (-36)\}$

(Using reverse distributive property)

$= -(50) \times (-10) = 500$

2. (*a*) Using the relation

$a * b = a \times a + b \times b - a \times b$

We get

$(-3) * 2 = (-3) \times (-3) + 2 \times 2 - (-3) \times 2$

$= 9 + 4 + 6 = 19$

(*b*) $3 * (-1) = 3 \times 3 + (-1) \times (-1) - 3 \times (-1)$

$= 9 + 1 + 3 = 13$

3. Such pair of integers are 5, –3 as

product $= 5 \times (-3) = -15$

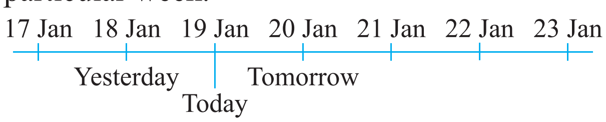
difference $= 5 - (-3) = 8$ (Answer may vary)

4. Since the caterpillar crawls up 5 cm in one second and then falls down 2 cm over the next second, so in two seconds it climbs up (5 –2) cm = 3 cm
Since the rod is 60 cm long. So, in 38 seconds it will crawl up (19 times × 3 cm) = 57 cm and in 39th second it will climb 57 cm + 5 cm = 62 cm
Hence, the caterpillar will climb the rod in 39 seconds.

5. The temperature of the iron rod after 10 minutes
= 320°C – 10 × (6°C) = 320° – 60°C = 260°C.

6. As we know that –ve ÷ –ve = +ve
Here it seems Ruhi missed the concept that in the given case the answer will be positive.
–27 ÷ (–3) = 27 ÷ 3 = 9

7. Change in each day = $\frac{140}{7} = 20$
Therefore, 20 bees decreases per day in that particular week.

8.


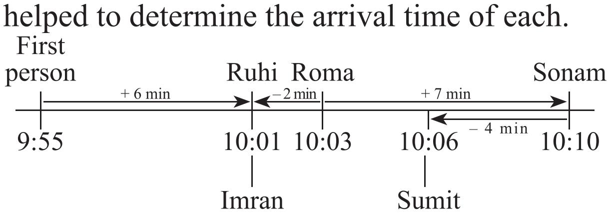
So, the date, three days after tomorrow is 23 January.

9. The water level in summer = 20 m below ground level.
Since the water level rose 5 m above the previous level, the new water level = 20 m – 5 m = 15 m below ground level.

∴ Minimum length of the rope required
= Water level + height of the wall of the well + height of the pulley
= 15 m + 1m 20 cm + 80 cm
= 15 m + 2 m = 17 m

Brain Sizzlers (Page 25)

As per the given condition,
Imran –10:01 pm; Ruhi –10:01 pm;
Roma – 10:03 pm; Sumit – 10:06 pm;
Sonam – 10:10 pm
Roma's and the first person's arrival information helped to determine the arrival time of each.



CHAPTER 2 : FRACTIONS AND DECIMALS

Let's Recall

1. (*a*) In $\frac{3}{2}$, 3 > 2. So, $\frac{3}{2}$ is an improper fraction.
Also, the HCF of 3 and 2 is 1. So, it is in the simplest form.

(*b*) In $\frac{13}{12}$, 13 > 12. So, $\frac{13}{12}$ is an improper fraction.
Also, the HCF or 13 and 12 is 1. So, it is in the simplest form.

(*c*) In $7\frac{9}{10}$, 7 is a whole number, and $\frac{9}{10}$ is a proper fraction.
So, $7\frac{9}{10}$ is a mixed fraction.
Also, the HCF of 9 and 10 is 1. So, it is in the simplest form.

(*d*) In $\frac{14}{28}$, 14 < 28. So, $\frac{14}{28}$ is a proper fraction.
Also, HCF of 14 and 28 is 14. So, it is not in the simplest form.

(*e*) In $1\frac{15}{80}$, 1 is a whole number and $\frac{15}{80}$ is a proper fraction.
So, $1\frac{15}{80}$ is a mixed fraction. Also, HCF of 15 and 80 is 5. So, it is not in the simplest form.

(*f*) In $\frac{5}{12}$, 5 < 12. So, $\frac{5}{12}$ is a proper fraction.
Also, HCF of 5 and 12 is 1. So, it is in its simplest form.

(*g*) In $\frac{3}{4}$, 3 < 4. So, $\frac{3}{4}$ is a proper fraction.
Also, HCF of 3 and 4 is 1. So, it is in the simplest form.

2. To arrange the given fractions in ascending order, first find the LCM of the denominators.

∵ LCM of 5, 3, 10 and 12 is 60.

∴ $\frac{3}{5} = \frac{3\times12}{5\times12} = \frac{36}{60}$

$\frac{2}{3} = \frac{2\times20}{3\times20} = \frac{40}{60}$

$\frac{7}{10} = \frac{7\times6}{10\times6} = \frac{42}{60}$

$$\frac{5}{12} = \frac{5\times5}{12\times5} = \frac{25}{60}$$

$\because\ 25 < 36 < 40 < 42 \qquad \therefore\ \frac{25}{60} < \frac{36}{60} < \frac{40}{60} < \frac{42}{60}$

$\Rightarrow \frac{5}{12} < \frac{3}{5} < \frac{2}{3} < \frac{7}{10}$

3. Fractions with the same denominators are like fractions. Therefore,

(*a*) Like fractions: $\frac{8}{5}$ and $\frac{2}{5}$

(*b*) Like fractions: $\frac{1}{11}$ and $1\frac{9}{11}$

(*c*) Simplify: $7\frac{110}{224} = 7\frac{55}{112}$

Like fractions: $3\frac{7}{112}$ and $7\frac{55}{112}$

4. LCM of 20 and 9 is 180.

$$\therefore\ \frac{7}{20} = \frac{7\times9}{20\times9} = \frac{63}{180}$$

$$\frac{4}{9} = \frac{4\times20}{9\times20} = \frac{80}{180}$$

Now, $\frac{80}{180} - \frac{63}{180} = \frac{80-63}{180} = \frac{17}{180}$

So, the required fraction is $\frac{17}{180}$.

Practice Time 2A

1. (*a*) $\frac{29}{7} = 4\frac{1}{7}$ (*b*) $\frac{34}{13} = 2\frac{8}{13}$

(*c*) $\frac{83}{9} = 9\frac{2}{9}$ (*d*) $\frac{101}{50} = 2\frac{1}{50}$

2. (*a*) $6\frac{3}{7} = \frac{6\times7+3}{7} = \frac{42+3}{7} = \frac{45}{7}$

(*b*) $11\frac{1}{7} = \frac{11\times7+1}{7} = \frac{77+1}{7} = \frac{78}{7}$

(*c*) $4\frac{5}{11} = \frac{11\times4+5}{11} = \frac{44+5}{11} = \frac{49}{11}$

(*d*) $7\frac{2}{9} = \frac{7\times9+2}{9} = \frac{63+2}{9} = \frac{65}{9}$

3. (*a*) $\frac{3}{4} = \frac{3\times2}{4\times2} = \frac{6}{8},\ \frac{3}{4} = \frac{3\times3}{4\times3} = \frac{9}{12},$

$\frac{3}{4} = \frac{3\times4}{4\times4} = \frac{12}{16}$

So, three equivalent fractions of $\frac{3}{4}$ are $\frac{6}{8}, \frac{9}{12}$ and $\frac{12}{16}$.

(*b*) $\frac{12}{21} = \frac{12\div3}{21\div3} = \frac{4}{7} = \frac{4\times2}{7\times2} = \frac{8}{14} = \frac{8\times2}{14\times2} = \frac{16}{28}$

$\therefore$ The three equivalent fractions of $\frac{12}{21}$ are $\frac{4}{7}, \frac{8}{14}$ and $\frac{16}{28}$.

(*c*) $\frac{11}{14} = \frac{11\times2}{14\times2} = \frac{22}{28}, \frac{11\times3}{14\times3} = \frac{33}{42}, \frac{11\times4}{14\times4} = \frac{44}{56}$

$\therefore$ The three equivalent fractions of $\frac{11}{14}$ are $\frac{22}{28}, \frac{33}{42}$ and $\frac{44}{56}$.

(*d*) $\frac{14}{25} = \frac{14\times2}{25\times2} = \frac{28}{50}, \frac{14\times3}{25\times3} = \frac{42}{75}, \frac{14\times4}{25\times4} = \frac{56}{100}$

$\therefore$ The three equivalent fractions of $\frac{14}{25}$ are $\frac{28}{50}, \frac{42}{75}$ and $\frac{56}{100}$. (Answer may vary)

4. (*a*) Since $21 = 3 \times 7$, the equivalent fraction of $\frac{3}{7}$ with numerator 21 is $\frac{3\times7}{7\times7} = \frac{21}{49}$.

(*b*) $\because\ 5 = 45 \div 9$

$\therefore$ The equivalent fraction of $\frac{18}{45}$ with denominator 5 is $\frac{18\div9}{45\div9} = \frac{2}{5}$.

(*c*) $\because\ 3 = 36 \div 12$

$\therefore$ The equivalent fraction of $\frac{36}{84}$ with numerator 3 is $\frac{36\div12}{84\div12} = \frac{3}{7}$.

(*d*) $\because\ 6 = 126 \div 21$

$\therefore$ The equivalent fraction of $\frac{84}{126}$ with denominator 6 is $\frac{84\div21}{126\div21} = \frac{4}{6}$.

5. (*a*) LCM of 12 and 18 = 36

$$\frac{7}{12} = \frac{7\times3}{12\times3} = \frac{21}{36}, \frac{21}{18} = \frac{21\times2}{18\times2} = \frac{42}{36}$$

$\because\ 42 > 21$

$\Rightarrow \frac{42}{36} > \frac{21}{36} \qquad \Rightarrow \frac{21}{18}$ is greater.

(*b*) LCM of 21 and 35 is 105.

So, $\frac{4}{21} = \frac{4\times5}{21\times5} = \frac{20}{105}, \frac{11}{35} = \frac{11\times3}{35\times3} = \frac{33}{105}$

$\because\ 33 > 20$

$\Rightarrow \frac{33}{105} > \frac{20}{105} \qquad \Rightarrow \frac{11}{35}$ is greater.

6. (a) (i) LCM of denominators is 42. So, the fractions with common denominator 42 are

$$\frac{6}{21}=\frac{12}{42},\frac{3}{42},\frac{11}{14}=\frac{33}{42},\frac{5}{7}=\frac{30}{42}$$

$\because$ 3 < 12 < 30 < 33

$$\therefore \frac{3}{42}<\frac{12}{42}<\frac{30}{42}<\frac{33}{42} \Rightarrow \frac{3}{42}<\frac{6}{21}<\frac{5}{7}<\frac{11}{14}$$

(ii) LCM of denominators is 48. So, fractions with common denominator 48 are

$$\frac{3}{8}=\frac{18}{48},\frac{5}{6}=\frac{40}{48},\frac{1}{2}=\frac{24}{48},\frac{7}{48}$$

$\because$ 7 < 18 < 24 < 40

$$\therefore \frac{7}{48}<\frac{18}{48}<\frac{24}{48}<\frac{40}{48} \Rightarrow \frac{7}{48}<\frac{3}{8}<\frac{1}{2}<\frac{5}{6}$$

(b) (i) LCM of denominators is 210. So, writing the equivalent fractions with common denominator 210, we will get

$$\frac{16}{21}=\frac{160}{210},\frac{13}{35}=\frac{78}{210},\frac{5}{14}=\frac{75}{210},\frac{11}{10}=\frac{231}{210}$$

$\because$ 231 > 160 > 78 > 75

$$\therefore \frac{231}{210}>\frac{160}{210}>\frac{78}{210}>\frac{75}{210}$$

$$\Rightarrow \frac{11}{10}>\frac{16}{21}>\frac{13}{35}>\frac{5}{14}$$

(ii) LCM of the denominators of the given fractions is 144. So, writing the equivalent fractions with common denominator 144, we get

$$\frac{3}{18}=\frac{24}{144},\frac{1}{12}=\frac{12}{144},\frac{5}{16}=\frac{45}{144},\frac{2}{3}=\frac{96}{144}$$

$\because$ 96 > 45 > 24 > 12

$$\therefore \frac{96}{144}>\frac{45}{144}>\frac{24}{144}>\frac{12}{144}$$

$$\Rightarrow \frac{2}{3}>\frac{5}{16}>\frac{3}{18}>\frac{1}{12}$$

7. (a) First convert the mixed fractions into improper fractions as $2\frac{2}{3}=\frac{8}{3},4\frac{1}{4}=\frac{17}{4}$

Now, rewrite these improper fractions with a common denominator

$$\frac{8}{3}=\frac{8\times4}{3\times4}=\frac{32}{12},\frac{17}{4}=\frac{17\times3}{4\times3}=\frac{51}{12}$$

$$\because 2\frac{2}{3}+4\frac{1}{4}=\frac{32}{12}+\frac{51}{12}=\frac{32+51}{12}=\frac{83}{12}=6\frac{11}{12}$$

(b) $1\frac{2}{9}=\frac{11}{9},4\frac{5}{6}=\frac{29}{6}$

Now, $\frac{11}{9}=\frac{22}{18},\frac{29}{6}=\frac{87}{18}$

[$\because$ LCM of 6 and 9 = 18]

$$\therefore 1\frac{2}{9}+4\frac{5}{6}=\frac{22}{18}+\frac{87}{18}=\frac{109}{18}=6\frac{1}{18}$$

(c) $4\frac{8}{10}=\frac{48}{10},2\frac{5}{8}=\frac{21}{8}$

Now, $\frac{48}{10}=\frac{192}{40},\frac{21}{8}=\frac{105}{40}$

[$\because$ LCM of 10 and 8 = 40]

$$\therefore 4\frac{8}{10}-2\frac{5}{8}=\frac{192}{40}-\frac{105}{40}=\frac{192-105}{40}$$

$$=\frac{87}{40}=2\frac{7}{40}$$

(d) $7\frac{1}{3}=\frac{22}{3},5\frac{1}{2}=\frac{11}{2}$

Now, $\frac{22}{3}=\frac{44}{6},\frac{11}{2}=\frac{33}{6}$

[$\because$ LCM of 2 and 3 = 6]

$$\therefore 7\frac{1}{3}-5\frac{1}{2}=\frac{44}{6}-\frac{33}{6}=\frac{11}{6}=1\frac{5}{6}$$

(e) $2\frac{7}{12}=\frac{31}{12},3\frac{9}{16}=\frac{57}{16},1\frac{11}{18}=\frac{29}{18}$

Now, $\frac{31}{12}=\frac{372}{144},\frac{57}{16}=\frac{513}{144},\frac{29}{18}=\frac{232}{144}$

[$\because$ LCM of 12, 16 and 18 = 144]

$$\therefore 2\frac{7}{12}+3\frac{9}{16}-1\frac{11}{18}=\frac{372}{144}+\frac{513}{144}-\frac{232}{144}$$

$$=\frac{372+513-232}{144}=\frac{653}{144}$$

$$=4\frac{77}{144}$$

8. To get the required number, we need to subtract $3\frac{56}{84}$ from $8\frac{64}{102}$.

$$8\frac{64}{102}=8\frac{32}{51}=\frac{440}{51}$$

$$3\frac{56}{84}=3\frac{2}{3}=\frac{11}{3}=\frac{187}{51}$$

$$\therefore 8\frac{64}{102}-3\frac{56}{84}=\frac{440}{51}-\frac{187}{51}=\frac{253}{51}=4\frac{49}{51}$$

Hence, the required number is $4\frac{49}{51}$.

9. To find the required number, we need to subtract the sum of $3\frac{9}{24}$ and $6\frac{15}{16}$ from $15\frac{11}{24}$.

$$3\frac{9}{24} = 3\frac{3}{8} = \frac{27}{8}$$

$$6\frac{15}{16} = \frac{111}{16}$$

Now, $\frac{27}{8} = \frac{27\times 6}{8\times 6} = \frac{162}{48}$

$$\frac{111}{16} = \frac{111\times 3}{16\times 3} = \frac{333}{48}$$

$$15\frac{11}{24} = \frac{371}{24} = \frac{371\times 2}{24\times 2} = \frac{742}{48}$$

[$\because$ LCM of 8, 16, and 24 = 48]

$\therefore$ Sum of $3\frac{9}{24}$ and $6\frac{15}{16} = \frac{162}{48} + \frac{333}{48} = \frac{495}{48}$

Now, $\frac{742}{48} - \frac{495}{48} = \frac{247}{48} = 5\frac{7}{48}$

Thus, the required number is $5\frac{7}{48}$.

10. We need to subtract $2\frac{3}{16}$ from $4\frac{11}{12}$ to get the required number

$$4\frac{11}{12} - 2\frac{3}{16} = \frac{59}{12} - \frac{35}{16} = \frac{59\times 4}{12\times 4} - \frac{35\times 3}{16\times 3}$$

$$= \frac{236}{48} - \frac{105}{48} = \frac{131}{48} = 2\frac{35}{48}$$

Hence, the required number is $2\frac{35}{48}$.

11. Sum of $2\frac{4}{5}$ and $1\frac{3}{4}$

$$= 2\frac{4}{5} + 1\frac{3}{4} = \frac{14}{5} + \frac{7}{4}$$

$$= \frac{14\times 4}{5\times 4} + \frac{7\times 5}{4\times 5} = \frac{56}{20} + \frac{35}{20} = \frac{91}{20}$$

Now, $7 - \frac{91}{20} = \frac{7\times 20 - 91}{20} = \frac{140-91}{20}$

$$= \frac{49}{20} = 2\frac{9}{20}$$

Hence, the required number is $2\frac{9}{20}$.

12. The time devoted for other subjects = Total time – time for science and maths

$$= 5\frac{3}{4} - 3\frac{3}{5} = \frac{23}{4} - \frac{18}{5} = \frac{23\times 5}{4\times 5} - \frac{18\times 4}{5\times 4}$$

$$= \frac{115}{20} - \frac{72}{20} = \frac{43}{20} = 2\frac{3}{20}$$

Hence, Sumit devotes $2\frac{3}{20}$ hours daily for other subjects.

Quick Check (Page 35)

1. $5\times\frac{1}{2} = \frac{1}{2}+\frac{1}{2}+\frac{1}{2}+\frac{1}{2}+\frac{1}{2} = \frac{1+1+1+1+1}{2} = \frac{5}{2}$

2. (*a*) $1\frac{4}{9}\times 7 = \frac{9\times 1+4}{9}\times 7 = \frac{13}{9}\times 7 = \frac{91}{9} = 10\frac{1}{9}$

(*b*) $\frac{3}{9}\times 27 = \frac{3\times 27}{9} = 3\times 3 = 9$

Think and Answer (Page 36)

One-quarter of a day = $\frac{1}{4}\times 24$ hours = $\frac{24}{4}$ hours = 6 hours.

Therefore, one-quarter of a day is 6 hours.

Maths Connect (Page 36)

Weight on the moon = $\frac{1}{6}\times$ weight on the earth

$$= \frac{1}{6}\times 54\text{ kg} = \frac{54}{6} = 9\text{ kg}$$

Quick Check (Page 37)

1. $\frac{3}{4}\times\frac{2}{7} = \frac{3\times 2}{4\times 7} = \frac{6}{28} = \frac{3}{14}$

Now, $\frac{3}{4}, \frac{2}{7}$ and $\frac{3}{14}$ can be rewritten with a common denominator 28 as:

$$\frac{3}{4} = \frac{21}{28}, \frac{2}{7} = \frac{8}{28}, \frac{3}{14} = \frac{6}{28}$$

$\because$ $6 < 8 < 21$, $\frac{21}{28}$ or $\frac{3}{4}$ is the greatest among all the three factors.

2. $\frac{13}{12}\times\frac{15}{2} = \frac{13\times 15}{12\times 2} = \frac{65}{8}$

Now, $\frac{13}{12}, \frac{15}{2}$ and $\frac{65}{8}$ can be rewritten with a common denominator 24 as:

$$\frac{13}{12} = \frac{26}{24}, \frac{15}{2} = \frac{180}{24}, \frac{65}{8} = \frac{195}{24}$$

$\because$ $195 > 180 > 26$

$\therefore$ $\frac{195}{24}$ or $\frac{65}{8}$ is the greatest among all the three.

Practice Time 2B

1. (*a*) 6 dozens = 6 × 12 = 72

$\therefore$ $\frac{3}{4}$ of 6 dozens = $\frac{3}{4}\times 72$ = 3 × 18 = 54

Thus, $\frac{3}{4}$ of 6 dozens of bananas = 54 bananas.

(*b*) $\frac{2}{3}$ of 225 = $\frac{2}{3}\times 225$ = 2 × 75 = 150

Therefore, $\frac{2}{3}$ of ₹225 = ₹150.

(*c*) 1 year = 365 days

and $\frac{4}{5}$ of 365 = $\frac{4}{5}\times 365 = 292$

Therefore, $\frac{4}{5}$ of 1 year = 292 days

(*d*) $\frac{1}{5}$ of 10 = $\frac{1}{5}$ × 10 = 2

Therefore, $\frac{1}{5}$ of 10 m ribbon = 2 m ribbon.

2. (*a*) $\frac{7}{9}$ of 81 = $\frac{7}{9}\times 81 = 7\times 9 = 63$

(*b*) $\frac{9}{3}$ of 5 = $\frac{9}{3}\times 5 = 3\times 5 = 15$

(*c*) $14\frac{1}{2}$ of 5 = $\frac{29}{2}$ of 5 = $\frac{29}{2}\times 5 = \frac{145}{2} = 72\frac{1}{2}$

(*d*) $6\frac{2}{7}$ of 7 = $\frac{44}{7}$ of 7 = $\frac{44}{7}\times 7 = 44$

(*e*) $18\frac{1}{4}$ of 12 = $\frac{73}{4}$ of 12 = $\frac{73}{4}\times 12 = 73\times 3 = 219$

(*f*) $13\frac{1}{3}$ of 93 = $\frac{40}{3}$ of 93

$= \frac{40}{3}\times 93 = 40\times 31 = 1240$

3. (*a*) $4\times\frac{1}{2} = \frac{4}{2} = 2$

(*b*) $\frac{5}{4}\times 16 = \frac{5\times 16}{4} = 5\times 4 = 20$

(*c*) $4\times 10\frac{21}{24} = 4\times 10\frac{7}{8} = 4\times\frac{87}{8} = \frac{4\times 87}{8}$

$= \frac{87}{2} = 43\frac{1}{2}$

(*d*) $14\times 11\frac{2}{7} = 14\times\frac{79}{7} = \frac{14\times 79}{7} = 2\times 79 = 158$

(*e*) $12\frac{2}{3}\times 4 = \frac{38}{3}\times 4 = \frac{38\times 4}{3} = \frac{152}{3} = 50\frac{2}{3}$

(*f*) $11\times\frac{91}{121} = \frac{11\times 91}{121} = \frac{91}{11} = 8\frac{3}{11}$

(*g*) $\frac{7}{9}\times\frac{9}{3} = \frac{7\times 9}{9\times 3} = \frac{7}{3} = 2\frac{1}{3}$

(*h*) $\frac{1}{3}\times\frac{2}{5} = \frac{2}{3\times 5} = \frac{2}{15}$

(*i*) $6\frac{2}{7}\times 7\frac{1}{2} = \frac{44}{7}\times\frac{15}{2} = \frac{44\times 15}{7\times 2} = \frac{22\times 15}{7}$

$= \frac{330}{7} = 47\frac{1}{7}$

(*j*) $7\frac{1}{5}\times 3\frac{1}{4} = \frac{36}{5}\times\frac{13}{4} = \frac{36\times 13}{5\times 4}$

$= \frac{9\times 13}{5} = \frac{117}{5} = 23\frac{2}{5}$

(*k*) $9\frac{1}{5}\times\frac{20}{3}\times\frac{4}{9} = \frac{46}{5}\times\frac{20}{3}\times\frac{4}{9} = \frac{46\times 20\times 4}{5\times 3\times 9}$

$= \frac{46\times 16}{27} = \frac{736}{27} = 27\frac{7}{27}$

(*l*) $4\frac{1}{7}\times\frac{7}{9}\times 1\frac{1}{3} = \frac{29}{7}\times\frac{7}{9}\times\frac{4}{3} = \frac{29\times 7\times 4}{7\times 9\times 3}$

$= \frac{29\times 4}{9\times 3} = \frac{116}{27} = 4\frac{8}{27}$

4. (*a*) $2\frac{1}{2}\times 4\frac{3}{6}\times 1 = \frac{5}{2}\times\frac{27}{6}\times 1 = \frac{5\times 27}{2\times 6}$

$= \frac{5\times 9}{2\times 2} = \frac{45}{4} = 11\frac{1}{4}$

(*b*) $1\frac{3}{9}\times 2\frac{1}{5}\times 3\frac{1}{3} = \frac{12}{9}\times\frac{11}{5}\times\frac{10}{3} = \frac{12\times 11\times 10}{9\times 5\times 3}$

$= \frac{4\times 11\times 2}{9} = \frac{88}{9} = 9\frac{7}{9}$

(*c*) $1\frac{3}{19}\times 4\times 8\frac{5}{6} = \frac{22}{19}\times 4\times\frac{53}{6} = \frac{22\times 4\times 53}{19\times 6}$

$= \frac{11\times 4\times 53}{19\times 3} = \frac{2332}{57} = 40\frac{52}{57}$

(*d*) $\frac{7}{9}\times 3\frac{1}{7}\times 14\frac{3}{7}\times 7 = \frac{7}{9}\times\frac{22}{7}\times\frac{101}{7}\times 7$

$= \frac{7\times 22\times 101\times 7}{9\times 7\times 7}$

$= \frac{22\times 101}{9} = \frac{2222}{9} = 246\frac{8}{9}$

5. Total length of cloth = $2\frac{1}{2}$ m

Rate of cloth per metre = ₹$215\frac{3}{4}$

$\therefore$ Total cost of the cloth = Total length × rate per metre

= $2\frac{1}{2}$ × ₹$215\frac{3}{4}$

= $\frac{5}{2}$ × ₹ $\frac{863}{4}$ = ₹ $\left(\frac{5}{2}\times\frac{863}{4}\right)$

= ₹ $\left(\frac{4315}{8}\right)$ = ₹ $539\frac{3}{8}$

6. Soil for 2nd garden

$$= \frac{1}{5} \text{ of } 3\frac{2}{5} = \frac{1}{5} \times 3\frac{2}{5} = \frac{1}{5} \times \frac{17}{5} = \frac{17}{25}$$

Therefore, total soil required $= \frac{17}{5} + \frac{17}{25}$

$$= \frac{85}{25} + \frac{17}{25} = \frac{102}{25} = 4\frac{2}{25} \text{ bags}$$

7. Water filled in the tank $= \frac{3}{5}$ of its capacity

$$= \frac{3}{5} \text{ of } 1000 \text{ L} = \frac{3}{5} \times 1000 \text{ L}$$

$$= 3 \times 200 \text{ L} = 600 \text{ L}$$

8. The weight of the rotten apples $= \frac{4}{15}$ of 250 kg

$$= \frac{4}{15} \times 250 \text{ kg} = \frac{4 \times 250}{15} \text{ kg}$$

$$= \frac{4 \times 50}{3} \text{ kg} = \frac{200}{3} \text{ kg} = 66\frac{2}{3} \text{ kg}$$

So, $66\frac{2}{3}$ kg of apples are rotten.

The quantity of apples in the good condition

$$= 250 \text{ kg} - \frac{200}{3} \text{ kg} = \frac{750 - 200}{3} \text{ kg}$$

$$= \frac{550}{3} \text{ kg} = 183\frac{1}{3} \text{ kg}$$

9. Since, $\frac{12}{35} = \frac{4 \times 3}{5 \times 7} = \frac{4}{5} \times \frac{3}{7}$

Thus, $\frac{4}{5} \times \boxed{\frac{3}{7}} = \frac{12}{35}$

Now, $\frac{4}{5}, \frac{3}{7}, \frac{12}{35}$ can be written with common denominator 35 as

$$\frac{4}{5} = \frac{28}{35}, \frac{3}{7} = \frac{15}{35}, \frac{12}{35}$$

$\because$ $28 > 15 > 12$

$\therefore$ $\frac{28}{35}$ or $\frac{4}{5}$ is the greatest among all the given fractions.

Enrichment (Page 40)

(*a*) $3\frac{1}{4} \div \left\{1\frac{1}{4} - \frac{1}{2}\left(2\frac{1}{2} - \overline{\frac{1}{4} - \frac{1}{6}}\right)\right\}$

$$= \frac{13}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\left(\frac{5}{2} - \overline{\frac{1}{4} - \frac{1}{6}}\right)\right\}$$

$$= \frac{13}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\left(\frac{5}{2} - \overline{\frac{3}{12} - \frac{2}{12}}\right)\right\}$$

$$= \frac{13}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\left(\frac{5}{2} - \frac{1}{12}\right)\right\}$$

$$= \frac{13}{4} \div \left\{\frac{5}{4} - \frac{1}{2}\left(\frac{30}{12} - \frac{1}{12}\right)\right\}$$

$$= \frac{13}{4} \div \left\{\frac{5}{4} - \frac{1}{2} \times \frac{29}{12}\right\} = \frac{13}{4} \div \left\{\frac{5}{4} - \frac{29}{24}\right\}$$

$$= \frac{13}{4} \div \left\{\frac{30}{24} - \frac{29}{24}\right\} = \frac{13}{4} \div \frac{1}{24} = \frac{13}{4} \times \frac{24}{1}$$

$$= 13 \times 6 = 78$$

(*b*) Do it yourself (same as above)

Practice Time 2C

1. (*a*) Reciprocal of $\frac{2}{3} = \frac{1}{\frac{2}{3}} = \frac{3}{2}$.

(*b*) Reciprocal of $\frac{4}{7} = \frac{1}{\frac{4}{7}} = \frac{7}{4}$.

(*c*) Reciprocal of $2\frac{2}{9}$ = Reciprocal of $\frac{20}{9}$

$$= \frac{1}{\frac{20}{9}} = \frac{9}{20}$$

(*d*) Reciprocal of $\left(\frac{5}{4} + \frac{4}{5}\right)$

= Reciprocal of $\left(\frac{25}{20} + \frac{16}{20}\right)$

= Reciprocal of $\frac{41}{20} = \frac{1}{\frac{41}{20}} = \frac{20}{41}$

(*e*) Reciprocal of $5 \times \frac{3}{5}$ = Reciprocal of $\frac{5 \times 3}{5}$

= Reciprocal of 3 = $\frac{1}{3}$

2. (*a*) $5 \div \frac{2}{3} = 5 \times \frac{3}{2} = \frac{15}{2} = 7\frac{1}{2}$

(*b*) $\frac{2}{15} \div 6 = \frac{2}{15} \times \frac{1}{6} = \frac{1}{15} \times \frac{1}{3} = \frac{1}{45}$

(*c*) $1\frac{2}{5} \div 2 = \frac{7}{5} \div 2 = \frac{7}{5} \times \frac{1}{2} = \frac{7}{10}$

(*d*) $2\frac{1}{7} \div 15 = \frac{15}{7} \div 15 = \frac{15}{7} \times \frac{1}{15} = \frac{1}{7}$

(*e*) $15 \div 2\frac{3}{5} = 15 \div \frac{13}{5} = 15 \times \frac{5}{13} = \frac{75}{13} = 5\frac{10}{13}$

(*f*) $36 \div 1\frac{1}{17} = 36 \div \frac{18}{17} = \frac{36 \times 17}{18} = 34$

3. (a) $\frac{4}{3} \div \frac{7}{5} = \frac{4}{3} \times \frac{5}{7} = \frac{20}{21}$

(b) $2\frac{1}{7} \div \frac{7}{2} = \frac{15}{7} \div \frac{7}{2} = \frac{15}{7} \times \frac{2}{7} = \frac{30}{49}$

(c) $6\frac{2}{3} \div 4\frac{1}{5} = \frac{20}{3} \div \frac{21}{5} = \frac{20}{3} \times \frac{5}{21} = \frac{100}{63} = 1\frac{37}{63}$

(d) $13\frac{1}{6} \div \frac{7}{21} = \frac{79}{6} \div \frac{7}{21} = \frac{79}{6} \times \frac{21}{7} = \frac{79}{2} = 39\frac{1}{2}$

(e) $7\frac{1}{8} \div 8\frac{1}{16} = \frac{57}{8} \div \frac{129}{16} = \frac{57}{8} \times \frac{16}{129} = \frac{114}{129} = \frac{38}{43}$

(f) $3\frac{1}{4} \div 4\frac{1}{28} = \frac{13}{4} \div \frac{113}{28} = \frac{13}{4} \times \frac{28}{113} = \frac{91}{113}$

(g) $2\frac{5}{8} \div 8\frac{1}{6} = \frac{21}{8} \div \frac{49}{6} = \frac{21}{8} \times \frac{6}{49} = \frac{9}{28}$

4. We are given that $2\frac{1}{7} \times$ (the other fraction) $= 8\frac{4}{7}$

$\Rightarrow$ The other fraction $= 8\frac{4}{7} \div 2\frac{1}{7} = \frac{60}{7} \div \frac{15}{7}$

$= \frac{60}{7} \times \frac{7}{15} = \frac{60}{15} = 4$

5. Since, the other fraction $= 4\frac{3}{4} \div 38 = \frac{19}{4} \div 38$

$= \frac{19}{4} \times \frac{1}{38} = \frac{1}{8}$

Thus, the required number is $\frac{1}{8}$.

6. $\frac{5}{7}$ of the total seats in the auditorium = 540

$\therefore$ Total seats in the auditorium $= 540 \div \frac{5}{7}$

$= 540 \times \frac{7}{5} = 756$

7. To find the total number of pieces, we need to divide the total length by length of one piece.
Therefore, the total number of pieces

$= 10\frac{2}{5}$ m $\div 10\frac{2}{5}$ cm

$= 100 \times 10\frac{2}{5}$ cm $\div 10\frac{2}{5}$ cm $= 100$

8. Number of hour periods

$= 24 \div 4\frac{2}{3} = 24 \div \frac{14}{3}$

$= 24 \times \frac{3}{14} = \frac{12 \times 3}{7} = \frac{36}{7} = 5\frac{1}{7}$

Therefore, the number of periods of $4\frac{2}{3}$ hours in 24 hours is $5\frac{1}{7}$.

9. The required number of days = Total length of the road to be repaired ÷ the length of the road that can be repaired in 1 days.

$= 24\frac{3}{5} \div 2\frac{1}{5} = \frac{123}{5} \div \frac{11}{5}$

$= \frac{123}{5} \times \frac{5}{11} = \frac{123}{11} = 11\frac{2}{11}$ days

10. The length of the side of the square = Perimeter ÷ 4

$= 12\frac{2}{3}$ m $\div 4 = \frac{38}{3}$ m $\div 4 = \frac{38}{3} \times \frac{1}{4}$ m

$= \frac{19}{6}$ m $= 3\frac{1}{6}$ m

11. The product of $4\frac{4}{5}$ and $3\frac{1}{4} = 4\frac{4}{5} \times 3\frac{1}{4} = \frac{24}{5} \times \frac{13}{4}$

$= \frac{78}{5}$

Now, the difference from 20 is

$20 - \frac{78}{5} = \frac{100-78}{5} = \frac{22}{5} = 4\frac{2}{5}$

Life Skills (Page 41)

Total number of children = Total amount of milk distributed ÷ the amount of milk each child get

$= 225 \div \frac{3}{5} = \frac{225 \times 5}{3} = 75 \times 5 = 375$

Thus, there were 375 children in the village.

Practice Time 2D

1. (a) $25.78 = 20 + 5 + \frac{7}{10} + \frac{8}{100}$

(b) $78.063 = 70 + 8 + \frac{6}{100} + \frac{3}{1000}$

(c) $300.05 = 300 + \frac{5}{100}$

(d) $4151.782 = 4000 + 100 + 50 + 1 + \frac{7}{10} + \frac{8}{100} + \frac{2}{1000}$

2. (a) The place value of 6 in 60.27 is $6 \times 10 = 60$ or 6 tens.

(b) The place value of 6 in 162.58 is $6 \times 10 = 60$ or 6 tens.

(c) The place value of 6 in 13.562 is $6 \times \frac{1}{100} = \frac{6}{100}$ or 6 hundredths.

(d) The place value of 6 in 359.136 is

$6 \times \frac{1}{1000} = \frac{6}{1000}$ or 6 thousandths.

3. (*a*) In the given decimals, the highest number of decimal places in a number is thousandths. So, we will add zeros to the right of each number till thousandths to make them like decimals.

Therefore, 14.25 = 14.250, 0.002 = 0.002, 8.363 = 8.363 and 0.7 = 0.700

Thus, the like decimals are: 14.250, 0.002, 8.363 and 0.700.

(*b*) Same as part (*a*), the like decimals are: 12.000, 1.030, 15.690, 23.897

(*c*) Same as part (*a*), the like decimals are: 7.40, 4.79, 5.63, 0.67

4. (*a*) Since, $1 \text{ cm} = \frac{1}{100} \text{ m}$

$\therefore \quad 7 \text{ cm} = \frac{7}{100} \text{ m} = 0.07 \text{ m}$

(*b*) Since, $1 \text{ mm} = \frac{1}{1000} \text{ m}$

$\therefore \quad 2526 \text{ mm} = \frac{2526}{1000} \text{ m} = 2.526 \text{ m}$

(*c*) Since, $1 \text{ g} = \frac{1}{1000} \text{ kg}$

$\therefore \quad 15 \text{ g} = \frac{15}{1000} \text{ kg} = 0.015 \text{ kg}$

$\therefore$ 15 kg 15 g = (15 + 0.015) kg
= 15.015 kg

(*d*) Since, $1 \text{ paise} = \frac{1}{100} \text{ rupee}$

$\therefore 7595 \text{ paise} = ₹\frac{7595}{100} = ₹75.95$

(*e*) Since, $1 \text{ mL} = \frac{1}{1000} \text{ L}$

$\therefore \quad 7860 \text{ mL} = \frac{7860}{1000} \text{ L} = 7.86 \text{ L}$

5. First convert the given decimal numbers into like decimals, and then add as follows:

(*a*)
$$\begin{array}{r} 23.250 \\ 21.321 \\ 26.584 \\ +\ 0.020 \\ \hline 71.175 \\ \hline \end{array}$$

(*b*)
$$\begin{array}{r} 113.870 \\ 2.005 \\ 177.400 \\ +\ 61.090 \\ \hline 354.365 \\ \hline \end{array}$$

(*c*)
$$\begin{array}{r} 23.354 \\ 85.260 \\ 10.100 \\ +\ 9.450 \\ \hline 128.164 \\ \hline \end{array}$$

(*d*)
$$\begin{array}{r} 85.102 \\ 93.170 \\ 145.260 \\ +\ 225.000 \\ \hline 548.532 \\ \hline \end{array}$$

6. First convert the given decimal numbers into like decimals, and then subtract as follows:

(*a*)
$$\begin{array}{r} 98.51 \\ -\ 13.63 \\ \hline 84.88 \end{array}$$

(*b*)
$$\begin{array}{r} 5.0900 \\ -\ 0.2896 \\ \hline 4.8004 \end{array}$$

(*c*)
$$\begin{array}{r} 27.000 \\ -\ 9.399 \\ \hline 17.601 \end{array}$$

(*d*) Here, the number to be subtracted is greater. So, we will subtract 3.96 from 25.69 and will write the result with negative sign.

$$\begin{array}{r} 25.69 \\ -\ 3.96 \\ \hline 21.73 \end{array}$$

$\therefore$ 25.69 – 3.96 = 21.73

7. (*a*) 45.63 – 58.6 + 13.06
= 45.63 + 13.06 – 58.6
= 58.69 – 58.6 = 0.09

(*b*) 72.89 + 7.68 – 48.009 – 13.87
= (72.890 + 7.680) – (48.009 + 13.870)
= 80.570 – 61.879 = 18.691

(*c*) 83.20 – 45.67 + 9.96 – 25.93
= (83.20 + 9.96) – (45.67 + 25.93)
= 93.16 – 71.60 = 21.56

(*d*) 25.02 – 3.61 – 7.11 – 0.056
= 25.020 – (3.610 + 7.110 + 0.056)
= 25.020 – 10.776 = 14.244

8. 56.23 – 23.16 = 33.07

⇒ 33.07 + 23.16 = 56.23

Therefore, 33.07 need to be added to 23.16 to get 56.23.

9. 9.6 – 0.562 = 9.038

⇒ 9.6 – 9.038 = 0.562

Thus, the correct answer is 9.038.

10. 85.109 – 56.34 = 28.769

⇒ 56.34 + 28.769 = 85.109

Thus, the correct answer is 28.769.

11. 112.79 – 36.97 = 75.82

⇒ 112.79 – 75.82 = 36.97

Therefore, 112.79 should be decreased by 75.82 to get 36.97, and hence the correct answer is 75.82.

12. (The other number) – 5.22 = 18.11

⇒ The other number = 18.11 + 5.22 = 23.33

13. 2L = 2000 mL

∴ The empty part of the beaker = (2000 – 475) mL

= 1525 mL = 1.525 L

Think and Answer (Page 44)

Total amount of money spent

= ₹850.50 + ₹75.75 + ₹500 + ₹675.25

= ₹2101.50

∴ Money left with Swastik = ₹4000 – ₹2101.50

= ₹1898.50

Quick Check (Page 45)

(*a*) The product as whole number is 37 × 3 = 111

Since there is one decimal place in the multiplicand, so we need to put a decimal point in the product one place from the right.

Therefore, 3.7 × 3 = 11.1

(*b*) Same as part (*a*),

47 × 12 = 564 ⇒ 4.7 × 1.2 = 5.64

(*c*) Same as part (*a*),

3 × 3 = 9 ⇒ 0.3 × 0.3 = 0.09

Now, 11.1 > 5.64 > 0.09

Practice Time 2E

1. To multiply the given decimals, we will multiply them as whole numbers. Then we count the number of digits to the right of decimal point in both the numbers we are multiplying and put the decimal point in the product with the same number of places from the right.

(*a*) 3265 × 9 = 29385

⇒ 32.65 × 9 = 293.85

(2 + 0 = 2 decimal places)

(*b*) 595 × 14 = 8330

⇒ 5.95 × 14 = 83.30

(2 + 0 = 2 decimal places)

(*c*) Do it yourself (same as above)

(*d*) Do it yourself (same as above)

2. (*a*) 464 × 62 = 28768

∴ 4.64 × 0.62 = 2.8768

(2 + 2 = 4 decimal places)

(*b*) 18 × 518 = 9324

∴ 1.8 × 5.18 = 9.324

(1 + 2 = 3 decimal places)

(*c*) 2564 × 21 = 53844

⇒ 256.4 × 2.1 = 538.44

(1 + 1 = 2 decimal places)

(*d*) 18 × 7 = 126

⇒ 1.8 × 0.007 = 0.0126

(1 + 3 = 4 decimal places)

3. (*a*) 0.765 × 10 = 7.65

(Multiplication by 10, the decimal point is shifted one place to the right).

(*b*) 5.98 × 100 = 598

(Multiplication by 100, the decimal point is shifted two places to the right).

(*c*) 96.394 × 1000 = 96394

(Multiplication by 1000, the decimal point is shifted three places to the right).

(*d*) 0.0082 × 1000 = 8.2

(Multiplication by 1000, the decimal point is shifted three places to the right).

4. The cost of 23.56 kg of wheat

= 23.56 × the cost of 1 kg wheat

= 23.56 × ₹36.25 = ₹(23.56 × 36.25) = ₹854.05

5. Weight of the 46 bottles

= 46 × weight of 1 bottle = 46 × 0.254 kg

= 11.684 kg

6. The cost of 12.56 m cloth = 12.56 × the cost of 1 m cloth

= 12.56 × ₹58.90 = ₹739.784

7. 18 × 23 = 414

⇒ 1.8 × 2.3 = 4.14 (1 + 1 = 2 decimal places)

8. (*a*) Since, the finger nails grow 0.1 mm per day.

∴ The finger nails will grow in 7 days

= 7 × 0.1 mm = 0.7 mm

(*b*) Since, the finger nails grow 0.1 mm per day.

∴ The finger nails will grow in 30 days

= 30 × 0.1 mm = 3 mm

[∵ 1 month ≈ 30 days]

Practice Time 2F

1. (*a*) $36.24 \div 12 = \dfrac{36.24}{12} = \dfrac{36.24 \times 100}{12 \times 100}$

$= \dfrac{3624}{1200} = 3.02$

(*b*) $66.5 \div 7 = \dfrac{66.5}{7} = \dfrac{66.5 \times 10}{7 \times 10} = \dfrac{665}{70} = 9.5$

(*c*) $2.9 \div 58 = \frac{2.9}{58} = \frac{2.9\times10}{58\times10} = \frac{29}{580} = 0.05$

(*d*) $74.64 \div 24 = \frac{74.64}{24} = \frac{74.64\times100}{24\times100} = \frac{7464}{2400}$

$= 3.11$

2. (*a*) $8.432 \div 1.36 = \frac{8.432}{1.36} = \frac{8.432\times1000}{1.36\times1000}$

$= \frac{8432}{1360} = 6.2$

(*b*) $0.052 \div 1.3 = \frac{0.052\times1000}{1.3\times1000} = \frac{52}{1300} = 0.04$

(*c*) $1.064 \div 0.4 = \frac{1.064}{0.4} = \frac{1.064\times1000}{0.4\times1000} = \frac{1064}{400}$

$= 2.66$

(*d*) $12.45 \div 1.5 = \frac{12.45}{1.5} = \frac{12.45\times100}{1.5\times100} = \frac{1245}{150}$

$= 8.3$

3. (*a*) $4.96 \div 10 = 0.496$

(Shifting decimal point 1 place to left)

(*b*) $3.6 \div 1000 = 0.0036$

(Shifting decimal point 3 places to left)

(*c*) $1.485 \div 100 = 0.01485$

(Shifting decimal point 2 places to left)

(*d*) $92.782 \div 1000 = 0.092782$

(Shifting decimal point 3 places to left)

4. $14.7 \times$ (the other number) $= 345.45$

$\Rightarrow$ The other number $= \frac{345.45}{14.7} = \frac{34545}{1470} = 23.5$

Thus, the other number is 23.5.

5. The cost of each perfume bottle

$= \frac{\text{Total cost of the bottles}}{\text{Total number of bottles}}$

$= \frac{₹3719}{25} = ₹148.76$

6. 6 dozen bananas = 6 × 12 bananas = 72 bananas

$\because$ The cost of 72 bananas = ₹302.50

$\therefore$ The cost of 1 banana $= \frac{₹302.50}{72} \approx ₹4.20$

7. Since, 22.8 L of juice can be hold by 1 tin.

$\therefore$ 775.2 L of juice can be hold by

$\frac{775.2}{22.8}$ tins = 34 tins

Thus, the required number of tins is 34.

8. Since, in 3.6 litres of petrol, the distance covered = 68.4 km

$\therefore$ In 1 litre of petrol, the distance covered

$= \frac{68.4}{3.6}$ km $= \frac{684}{36}$ km = 19 km

Chapter Assessment

A.

1. The reciprocal of $\left(3 \div \frac{2}{3}\right)$

$=$ The reciprocal of $\left(3 \times \frac{3}{2}\right)$

$=$ The reciprocal of $\frac{9}{2} = \frac{2}{9}$

Hence, the correct answer is option (*c*).

2. $\frac{1}{3}$ of $\frac{1}{3}$ of $\frac{1}{3} = \frac{1}{3}\times\frac{1}{3}\times\frac{1}{3} = \frac{1}{27}$

Hence, the correct answer is option (*b*).

3. Since, 13 × 13 = 169

$\therefore$ The equivalent fraction of $\frac{12}{13}$ with denominator 169 is $\frac{12\times13}{13\times13} = \frac{156}{169}$

Hence, the correct answer is option (*c*).

4. If 95 × 4 = 380, then

0.95 × 0.4 = 0.380

(2 + 1 = 3 decimal places)

Hence, the correct answer is option (*d*).

5. The required number of days

$= 26 \div 3\frac{1}{4} = 26 \div \frac{13}{4} = 26 \times \frac{4}{13} = 8$ days

Hence, the correct answer is option (*d*).

B.

1. Here, the assertion $\frac{7}{11}\times\frac{11}{7} = 1$ is correct.

Also the product of a fraction, with its reciprocal is always 1 is also the correct explanation of the assertion.

Therefore, the correct answer is option (*a*).

2. 2.43 × 12 = 29.16 (Assertion is correct)

The reason R is also correct.

Therefore, the correct answer is option (*a*).

C. (*a*) – (*iv*); (*b*) – (*i*); (*c*) – (*v*); (*d*) – (*ii*); (*e*) – (*iii*)

D.

1. $65 \div 0.25 = \frac{65}{0.25} = \frac{6500}{25} = 260$

As, 260 × 28 = 7280 $\Rightarrow$ 7280 ÷ 28 = 260

Hence, required number is 7280.

2. (*a*) Length of the diagonal

$= 1.414 \times$ length of a side

$= 1.414 \times 8.3$ cm $= 11.7362$ cm

(*b*) Length of the diagonal

$= 1.414 \times$ length of a side

$= 1.414 \times 7.875 = 11.13525$ cm

3. Initial share of Papiha $= \frac{1}{3}$

Since she gave half of her share to her sister, the remaining part with Papiha = half of $\frac{1}{3}$

$= \frac{1}{2}$ of $\frac{1}{3} = \frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$

4. The total number of tickets sold

= total collection ÷ price of each ticket

$= ₹1087\frac{1}{2} \div ₹43\frac{1}{2} = 25$

Thus, 25 tickets were sold by the ticket counter person.

5. Total earning of Rahul = ₹985.50 + ₹874.75

= ₹1860.25

6. Area of the field = length × width

$= 93.45$ m $\times 58.95$ m

$= 5508.8775$ m^2

7. (*i*) (*a*) Since, 17 trees are required to make 1 ton of paper

∴ For 5 ton of paper, number of trees required

$= 5 \times 17 = 85$ trees

Now, $\frac{85}{221} = \frac{5}{13}$

Thus, $\frac{5}{13}$ of 221 trees are required to make 5 ton of paper.

(*b*) Number of trees required to make 10 ton of paper $= 10 \times 17 = 170$

Now, $\frac{170}{221} = \frac{10}{13}$

Thus, $\frac{10}{13}$ of 221 trees are required to make 10 tons of paper.

(*ii*) $\frac{7}{13}$ part of 221 trees $= 7 \times 17$ trees

Since 17 trees are required for 1 ton of paper. Then 7×17 trees are required for 7 ton of paper.

So, we need to save 7 ton of paper to save $\frac{7}{13}$ of the forest.

8. Ruhi has multiplied the whole number part together and fractional part together, that is not the correct way. The correct way to find this product is as follows.

$$3\frac{4}{5} \times 2\frac{1}{4} = \frac{19}{5} \times \frac{9}{4} = \frac{19 \times 9}{5 \times 4} = \frac{171}{20} = 8\frac{11}{20}$$

9. The change received by Iqra's father

= ₹500 – ₹385.70 = ₹114.30

10. (*a*) The distance of the race is divided into 9 equal parts.

Therefore, $\frac{1}{3}$ of the way $= \frac{1}{3} \times 9$ parts $= 3$ parts

Thus, Arjun will be at C.

(*b*) $\frac{2}{3}$ of the 9 parts $= \frac{2}{3} \times 9$ parts $= 6$ parts.

So, Arjun will be at F.

(*c*) Hurdle D is the 4th part out of 9 parts.

So, the fraction is $\frac{4}{9}$.

11. As per the given condition,

$\frac{11}{15}$ of the largest container's height = 13.2 cm

∴ The height of the largest container

$= \frac{13.2 \times 15}{11}$ cm $= 18$ cm

12. (*a*) The number of refreshment packs required

$= 30 \times \frac{1}{4}$ packs $= \frac{30}{4}$ packs $= 7\frac{1}{2}$ packs

(*b*) The number of refreshment packs required

$= 40 \times \frac{1}{2}$ packs $= 20$ packs

(*c*) The number of refreshment packs required

$= 25 \times \frac{3}{4}$ packs $= \frac{75}{4}$ packs $= 18\frac{3}{4}$ packs

(*d*) Number of remaining students

$= 120 - (30 + 40 + 25) = 120 - 95 = 25$

∴ Number of packs required for remaining students $= 25 \times 1 = 25$ packs

Brain Sizzlers (Page 51)

Since the tenths digit is 2 less than hundredths digit and hundredths digit is 4, so tenths digit is 2.

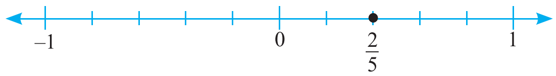
Also it is 2 less than thousandths digit, so the thousandths digit is also 4.

Hence, the number is 0.244.

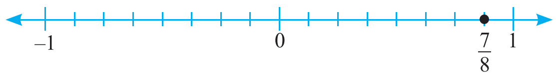
CHAPTER 3 : RATIONAL NUMBERS

Let's Recall

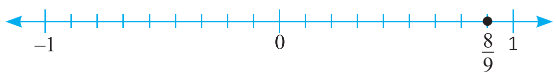
1. (*a*) To represent $\frac{2}{5}$ on the number line, split the distance between 0 and 1 in 5 equal parts, then starting from 0 count two parts and mark $\frac{2}{5}$ there as shown below.



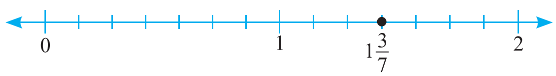
(*b*) Same as part (*a*)



(*c*)



(*d*) To represent $1\frac{3}{7}$, divide the distance between 1 and 2 in 7 equal parts, then starting from 1 count 3 parts to mark $1\frac{3}{7}$ as shown below.



2. Multiply both numerator and denominator by the same number.

$$\frac{14\times 2}{18\times 2} = \frac{28}{36}; \frac{14\times 3}{18\times 3} = \frac{42}{54}; \frac{14\times 4}{18\times 4} = \frac{56}{72}$$

(Answer may vary)

3. $\frac{3}{7}\times\frac{9}{9} = \frac{27}{63}$ [LCM of 7 and 9 is 63]

$\frac{7}{9}\times\frac{7}{7} = \frac{49}{63}$

Since $\frac{49}{63} > \frac{27}{63}$, we conclude that $\frac{7}{9}$ is greater than $\frac{3}{7}$.

4. Given, $\frac{5}{8}$ + (other fraction) = $\frac{3}{4}$

$\Rightarrow$ Other fraction $= \frac{3}{4} - \frac{5}{8} = \frac{3}{4}\times\frac{2}{2} - \frac{5}{8}$

$= \frac{6}{8} - \frac{5}{8} = \frac{1}{8}$

Quick Check (Page 54)

(*a*) $\frac{(-2)}{7}$ (*b*) $\frac{6}{(-4)}$ (*c*) $\frac{(-4)}{(-7)}$ (*d*) $\frac{9}{2}$

(Answer may vary)

Think and Answer (Page 55)

- Yes, 0 is a rational number, it can be written in the form of $\frac{p}{q}$ as $\frac{0}{1}$, where p, q are integers and $q \neq 0$.
- Rehan said "Milky Way for $\frac{-3}{5}$ and "Milky Way" is for integers whereas $\frac{-3}{5}$ is a rational number but not an integer. Therefore, he lost.

Think and Answer (Page 57)

Each term in the given pattern is obtained by multiplying the numerator and denominator of the previous term by 3. Therefore, next four terms of the given pattern are

$$\frac{-81\times 3}{135\times 3} = \frac{-243}{405}, \frac{-243\times 3}{405\times 3} = \frac{-729}{1215}$$

$$\frac{-729\times 3}{1215\times 3} = \frac{-2187}{3645}, \frac{-2187\times 3}{3645\times 3} = \frac{-6561}{10935}$$

Hence, next four rational numbers are

$$\frac{-243}{405}, \frac{-729}{1215}, \frac{-2187}{3645}, \frac{-6561}{10935}$$

Practice Time 3A

1. (*a*) $\frac{-5}{11}$ is a rational number as it is written in the form of $\frac{p}{q}$, where $p = -5$, $q = 11$ are integers and $q \neq 0$.

(*b*) $\frac{-11}{-47}$ is a rational number with $p = -11$ and $q = -47$.

(*c*) $\frac{0}{7}$ is a rational number. Here, $p = 0$, $q = 7$.

(*d*) $\frac{-37}{0}$ is not a rational number because here $q = 0$.

(*e*) $-11 = \frac{-11}{1}$ is a rational number with $p = -11$, $q = 1$.

2. (*a*) Numerator = –4, denominator = 23

(*b*) Numerator = 16, denominator = –29

(*c*) Numerator = 0, denominator = –67

(*d*) Numerator = 7, denominator = 12

3. (*a*) $\frac{7}{-25}$ is a negative rational number as the numerator and denominator have different signs.

(*b*) $\frac{56}{-113}$ is a negative rational number as the numerator and denominator have different signs.

(*c*) $\frac{19}{24}$ is a positive rational number, as the numerator and denominator have the same signs.

(*d*) $\frac{5}{14}$ is a positive rational number, as the numerator and denominator have the same sign.

(*e*) Same as above

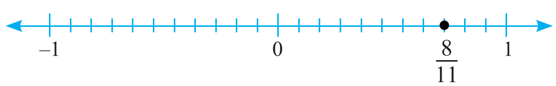
$\frac{-12}{19}$ is a negative rational number.

(*f*) $\frac{1}{-28}$ is a negative rational number.

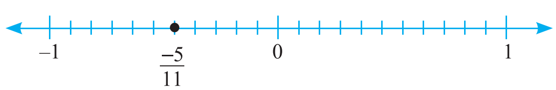
(*g*) $\frac{-52}{-55}$ is a positive rational number.

(*h*) $\frac{-37}{-94}$ is a positive rational number.

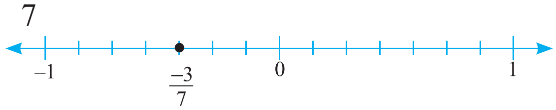
4. (*a*) On a number line divide the distance between 0 and 1 in 11 equal parts. Then start from 0 and count 8 parts to mark $\frac{8}{11}$ as shown below.



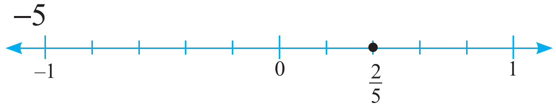
(*b*) Divide the distance between –1 and 0 into 11 equal parts. Now, starting from 0 count 5 parts to mark $\frac{-5}{11}$ as shown below.



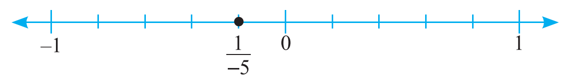
(*c*) $\frac{-3}{7}$



(*d*) $\frac{-2}{-5}$



(*e*) $\frac{1}{-5}$



5. (*a*)
$$\frac{5}{17} = \frac{5\times 2}{17\times 2} = \frac{10}{34}$$
$$\frac{5}{17} = \frac{5\times 3}{17\times 3} = \frac{15}{51}$$
$$\frac{5}{17} = \frac{5\times 4}{17\times 4} = \frac{20}{68}$$

Therefore, three equivalent rational numbers of $\frac{5}{17}$ are $\frac{10}{34}, \frac{15}{51}$, and $\frac{20}{68}$.

(Answer may vary)

(*b*) Three equivalent rational numbers of $\frac{7}{8}$ are $\frac{14}{16}, \frac{21}{24}$, and $\frac{28}{32}$.

(*c*) Three rational numbers equivalent to $\frac{2}{11}$ are $\frac{4}{22}, \frac{8}{44}, \frac{10}{55}$.

6. Since, $72 \div (-6) = -12$

$$\therefore \quad \frac{5}{-6} = \frac{5\times(-12)}{-6\times(-12)} = \frac{-60}{72}$$

Thus, the equivalent rational number of $\frac{5}{-6}$ with denominator 72 is $\frac{-60}{72}$.

7. Since, $\frac{-3}{10} = \frac{-3\times(-7)}{10\times(-7)} = \frac{21}{-70}$

Thus, the equivalent rational number of $\frac{-3}{10}$ with numerator 21 is $\frac{21}{-70}$.

8. Since, $\frac{-72}{81} = \frac{-72\div(-9)}{81\div(-9)} = \frac{8}{-9}$

Therefore, the equivalent rational number of $\frac{-72}{81}$ with denominator –9 is $\frac{8}{-9}$.

9. Since, $\frac{48}{66} = \frac{48\div(-6)}{66\div(-6)} = \frac{-8}{-11}$

Thus, the rational number equivalent to $\frac{48}{66}$ with numerator –8 is $\frac{-8}{-11}$.

10. (*a*) HCF of 70 and 136 = 2

$\therefore \quad \dfrac{-70 \div 2}{136 \div 2} = \dfrac{-35}{68}$

Thus, the standard form of $\dfrac{-70}{136}$ is $\dfrac{-35}{68}$.

(*b*) HCF of 48 and 72 = 24

$\therefore \quad \dfrac{-48}{-72} = \dfrac{-48 \div 24}{-72 \div 24} = \dfrac{-2}{-3} = \dfrac{2}{3}$

Thus, the standard form of $\dfrac{-48}{72}$ is $\dfrac{2}{3}$.

(*c*) HCF of 112 and 144 is 16

$\therefore \quad \dfrac{112}{-144} = \dfrac{112 \div 16}{-144 \div 16} = \dfrac{7}{-9} = \dfrac{-7}{9}$

Thus, the standard form of $\dfrac{112}{-144}$ is $\dfrac{-7}{9}$.

(*d*) The HCF of 36 and 44 is 4.

$\therefore \quad \dfrac{36}{44} = \dfrac{36 \div 4}{44 \div 4} = \dfrac{9}{11}$

Thus, the standard form of $\dfrac{36}{44}$ is $\dfrac{9}{11}$.

11. (*a*) $\left|\dfrac{-11}{13}\right| = \dfrac{11}{13}$ (*b*) $\left|\dfrac{4}{-7}\right| = \dfrac{4}{7}$

(*c*) $\left|\dfrac{-18}{-23}\right| = \dfrac{18}{23}$ (*d*) $\left|\dfrac{4}{9}\right| = \dfrac{4}{9}$

Think and Answer (Page 62)

LCM of 4 and 12 is 12.

Now, write both the rational numbers with denominators 12.

$\dfrac{3}{4} = \dfrac{3 \times 3}{4 \times 3} = \dfrac{9}{12}$

So, the rational numbers become $\dfrac{9}{12}$ and $\dfrac{4}{12}$

$\because$ There are only 4 numbers between 4 and 9, we need to multiply $\dfrac{4}{12}$ and $\dfrac{9}{12}$ by $\dfrac{2}{2}$ to get more numbers between the numerators.

$\dfrac{4}{12} = \dfrac{4 \times 2}{12 \times 2} = \dfrac{8}{24}$, and $\dfrac{9}{12} = \dfrac{9 \times 2}{12 \times 2} = \dfrac{18}{24}$

Clearly, $\dfrac{8}{24} < \dfrac{9}{24} < \dfrac{10}{24} < \dfrac{11}{24} < \dfrac{12}{24} < \dfrac{13}{24} < \dfrac{14}{24} < \dfrac{18}{24}$

Thus, the six rational numbers between $\dfrac{4}{12}$ and $\dfrac{3}{4}$ are:

$\dfrac{9}{24}, \dfrac{10}{24}, \dfrac{11}{24}, \dfrac{12}{24}, \dfrac{13}{24}, \dfrac{14}{24}$ (Answer may vary)

Practice Time 3B

1. (*a*) Since (–3) > (–7)

$\Rightarrow \dfrac{-3}{11}$ is greater than $\dfrac{-7}{11}$

(*b*) $-1 = \dfrac{-1 \times 7}{7} = \dfrac{-7}{7}$

$\because$ (–5) > (–7) $\quad \therefore \dfrac{-5}{7} > \dfrac{-7}{7}$

$\Rightarrow \dfrac{-5}{7} > (-1)$

(*c*) LCM of 8 and 12 is 24

$\therefore \quad \dfrac{-3}{-8} = \dfrac{(-3) \times (-3)}{(-8) \times (-3)} = \dfrac{9}{24}$

and $\dfrac{7}{12} = \dfrac{7 \times 2}{12 \times 2} = \dfrac{14}{24}$

Since, 14 > 9, so $\dfrac{14}{24}$ is greater than $\dfrac{9}{24}$

$\Rightarrow \dfrac{7}{12}$ is greater than $\dfrac{-3}{-8}$.

(*d*) LCM of 15 and 9 is 45.

$\dfrac{-7}{15} = \dfrac{-7 \times 3}{15 \times 3} = \dfrac{-21}{45}$

and $\dfrac{5}{-9} = \dfrac{5 \times (-5)}{-9 \times (-5)} = \dfrac{-25}{45}$

$\because$ (–21) > (–25). So, $\dfrac{-21}{45} > \dfrac{-25}{45}$

$\Rightarrow \dfrac{-7}{15}$ is greater than $\dfrac{5}{-9}$.

2. (*a*) LCM of 13 and 3 is 39.

$\therefore \quad \dfrac{-8}{13} = \dfrac{-8 \times 3}{13 \times 3} = \dfrac{-24}{39}$

and $\dfrac{1}{-3} = \dfrac{1 \times (-13)}{-3 \times (-13)} = \dfrac{-13}{39}$

Now, $-24 < -13 \quad \Rightarrow \dfrac{-24}{39} < \dfrac{-13}{39}$

$\Rightarrow \dfrac{-8}{13} < \dfrac{1}{-3}$

(*b*) LCM of 7 and 9 is 63

$\therefore \quad \dfrac{-4}{-7} = \dfrac{-4 \times (-9)}{-7 \times (-9)} = \dfrac{36}{63}$

and $\dfrac{5}{9} = \dfrac{5 \times 7}{9 \times 7} = \dfrac{35}{63}$

Now, $36 > 35 \quad \Rightarrow \dfrac{36}{63} > \dfrac{35}{63}$

$\Rightarrow \dfrac{-4}{-7} > \dfrac{5}{9}$

(*c*) 0 is always greater than all the negative rational numbers.

$\therefore \quad 0 > \frac{-12}{13}$

(*d*) $\frac{4}{-9} = \frac{4\times5}{-9\times5} = \frac{20}{-45}$

$\therefore \quad \frac{4}{-9} = \frac{20}{-45}$

3. (*a*) LCM of 4, 6, 9, 8 and 12 is 72

Now, $\frac{-1}{4} = \frac{-1\times18}{4\times18} = \frac{-18}{72}$,

$\frac{-5}{6} = \frac{-5\times12}{6\times12} = \frac{-60}{72}$,

$\frac{4}{-9} = \frac{4\times(-8)}{-9\times(-8)} = \frac{-32}{72}$,

$\frac{-7}{12} = \frac{-7\times6}{12\times6} = \frac{-42}{72}$,

$\frac{1}{-8} = \frac{1\times(-9)}{-8\times(-9)} = \frac{-9}{72}$

$\therefore \quad \frac{-60}{72} < \frac{-42}{72} < \frac{-32}{72} < \frac{-18}{72} < \frac{-9}{72}$

$\Rightarrow \quad \frac{-5}{6} < \frac{-7}{12} < \frac{4}{-9} < \frac{-1}{4} < \frac{1}{-8}$

(*b*) LCM of 2, 8, 5, 3 and 10 is 120

Now, $\frac{1}{-2} = \frac{1\times(-60)}{-2\times(-60)}, = \frac{-60}{120}$

$\frac{-5}{8} = \frac{-5\times15}{8\times15} = \frac{-75}{120}$,

$\frac{-3}{5} = \frac{-3\times24}{5\times24} = \frac{-72}{120}$,

$\frac{2}{-3} = \frac{2\times(-40)}{-3\times(-40)} = \frac{-80}{120}$,

$\frac{-3}{10} = \frac{-3\times12}{10\times12} = \frac{-36}{120}$

$\therefore \quad \frac{-80}{120} < \frac{-75}{120} < \frac{-72}{120} < \frac{-60}{120} < \frac{-36}{120}$

$\Rightarrow \quad \frac{2}{-3} < \frac{-5}{8} < \frac{-3}{5} < \frac{1}{-2} < \frac{-3}{10}$

4. (*a*) LCM of 5, 7, 35, 14 and 2 is 70

Now, $\frac{-2}{5} = \frac{-2\times14}{5\times14} = \frac{-28}{70}$,

$\frac{5}{7} = \frac{5\times10}{7\times10} = \frac{50}{70}$,

$\frac{1}{-35} = \frac{1\times(-2)}{-35\times(-2)} = \frac{-2}{70}$,

$\frac{-9}{14} = \frac{-9\times5}{14\times5} = \frac{-45}{70}$,

$\frac{1}{-2} = \frac{1\times(-35)}{-2\times(-35)} = \frac{-35}{70}$

$\therefore \quad \frac{50}{70} > \frac{-2}{70} > \frac{-28}{70} > \frac{-35}{70} > \frac{-45}{70}$

$\Rightarrow \quad \frac{5}{7} > \frac{1}{-35} > \frac{-2}{5} > \frac{1}{-2} > \frac{-9}{14}$

(*b*) LCM of 12, 16, 9, 3, and 8 is 144.

Same as part (*a*), we can write all the given rational numbers with denominator 144 and then compare the numerators.

The descending order of the given rational numbers is

$\frac{7}{12} > \frac{2}{-9} > \frac{-5}{16} > \frac{1}{-3} > \frac{-3}{8}$

5. (*a*) $-2 = \frac{-2\times7}{7} = \frac{-14}{7}$ and $\frac{-4}{7} = \frac{-4}{7}$

$\because \quad -14 < -13 < -12 < -11 < -10 < -4$

$\therefore$ The four rational numbers between –2 and $\frac{-4}{7}$ are

$\frac{-13}{7}, \frac{-12}{7}, \frac{-11}{7}$ and $\frac{-10}{7}$ (Answer may vary)

(*b*) $-2 = \frac{-2}{1} = \frac{-16}{8}$

$-1 = \frac{-1}{1} = \frac{-8}{8}$

$\because \quad -16 < -15 < -14 < -13 < -12 < -8$

$\therefore$ Four rational numbers between –2 and –1 are:

$\frac{-15}{8}, \frac{-14}{8}, \frac{-13}{8}$, and $\frac{-12}{8}$

(Answer may vary)

(*c*) LCM of 5 and 3 is 15

So, $\frac{-4}{5} = \frac{-4\times3}{5\times3} = \frac{-12}{15}$, and

$\frac{-2}{3} = \frac{-2\times5}{3\times5} = \frac{-10}{15}$

To find 4 or more numbers between $\frac{-12}{15}$ and $\frac{-10}{15}$ we need to multiply again as

$\frac{-12\times3}{15\times3} = \frac{-36}{45}, \frac{-10\times3}{15\times3} = \frac{-30}{45}$

$\because \quad -36 < -35 < -34 < -33 < -32 < -30$

$\therefore$ The four rational numbers between $\frac{-4}{5}$ and $\frac{-2}{3}$ are: $\frac{-35}{45}, \frac{-34}{45}, \frac{-33}{45}, \frac{-32}{45}$.

Think and Answer (Page 65)

Rohan is $\left(1\frac{5}{7}-\frac{2}{7}\right)$ km west from P. That is $\left(\frac{12}{7}-\frac{2}{7}\right)$km west $= \frac{10}{7}$km west $= 1\frac{3}{7}$ km west.

Quick Check (Page 66)

1. To find the difference between those depths, the operation used is subtraction.

$$-4\frac{2}{10}-\left(-1\frac{5}{10}\right)$$

2. To subtract means to add its opposite.

$$-4\frac{2}{10}-\left(-1\frac{5}{10}\right)=-4\frac{2}{10}+1\frac{5}{10}=-2\frac{7}{10}$$

3. Locate the difference in depth $\left(-2\frac{7}{10}\right)$ on the number line.

Start from $-1\frac{5}{10}$ move $2\frac{7}{10}$ units to reach $-4\frac{2}{10}$.

Practice Time 3C

1. (*a*) $\frac{8}{13}+\frac{-7}{13}=\frac{8+(-7)}{13}=\frac{8-7}{13}=\frac{1}{13}$

(*b*) $\frac{13}{-48}+\frac{(-15)}{48}=\frac{(-13)}{48}+\frac{(-15)}{48}$

$=\frac{(-13)+(-15)}{48}$

$=\frac{-(13+15)}{48}=\frac{-28}{48}$

(*c*) $\frac{-7}{22}+\frac{5}{11}=\frac{-7}{22}+\frac{10}{22}=\frac{(-7)+10}{22}=\frac{10-7}{22}=\frac{3}{22}$

(*d*) $\frac{3}{-5}+\frac{-8}{15}=\frac{-3}{5}+\frac{-8}{15}=\frac{-9}{15}+\frac{-8}{15}$

$=\frac{-(9+8)}{15}=\frac{-17}{15}=-1\frac{2}{15}$

2. (*a*) $\left(\frac{-4}{11}\right)-\frac{5}{11}=\frac{(-4)-5}{11}=\frac{(-4)+(-5)}{11}=\frac{-9}{11}$

(*b*) $\left(\frac{1}{-8}\right)-\left(\frac{-7}{8}\right)=\left(\frac{-1}{8}\right)-\left(\frac{-7}{8}\right)=\frac{(-1)-(-7)}{8}$

$=\frac{(-1)+(7)}{8}=\frac{6}{8}=\frac{3}{4}$

(*c*) $\left(\frac{-7}{5}\right)-\left(\frac{-5}{-11}\right)=\left(\frac{-7}{5}\right)-\left(\frac{5}{11}\right)$

$\because$ LCM of 5 and 11 is 55

$\therefore\ \left(\frac{-7}{5}\right)-\left(\frac{5}{11}\right)=\left(\frac{-77}{55}\right)-\left(\frac{25}{55}\right)=\frac{(-77)-(25)}{55}$

$=\frac{-102}{55}=-1\frac{47}{55}$

(*d*) $\frac{11}{12}-1\frac{2}{18}=\frac{11}{12}-\frac{20}{18}=\frac{11}{12}-\frac{10}{9}$

$\because$ LCM of 12 and 9 is 36

$\therefore\ \frac{11}{12}-\frac{10}{9}=\frac{33}{36}-\frac{40}{36}=\frac{33-40}{36}=\frac{-7}{36}$

3. (*a*) $\left(\frac{-9}{20}\right)-\left(\frac{-13}{32}\right)+\left(\frac{-5}{-28}\right)=\left(\frac{-9}{20}\right)-\left(\frac{-13}{32}\right)+\left(\frac{5}{28}\right)$

$\because$ LCM of 20, 32 and 28 is 1120.

$\therefore\ \left(\frac{-9}{20}\right)-\left(\frac{-13}{32}\right)+\left(\frac{5}{28}\right)$

$=\left(\frac{-9\times56}{1120}\right)-\left(\frac{-13\times35}{1120}\right)+\left(\frac{5\times40}{1120}\right)$

$=\left(\frac{-504}{1120}\right)-\left(\frac{-455}{1120}\right)+\frac{200}{1120}$

$=\frac{(-504)+(455)+200}{1120}=\frac{(-504)+655}{1120}$

$=\frac{151}{1120}$

(*b*) $\left(\frac{1}{-12}\right)-\left(\frac{-4}{15}\right)-\left(\frac{-7}{18}\right)=\left(\frac{-1}{12}\right)-\left(\frac{-4}{15}\right)-\left(\frac{-7}{18}\right)$

$\because$ LCM of 12, 15 and 18 is 180

$\therefore\ \left(-\frac{1}{12}\right)-\left(\frac{-4}{15}\right)-\left(\frac{-7}{18}\right)$

$=\left(\frac{-1\times15}{180}\right)-\left(\frac{-4\times12}{180}\right)-\left(\frac{-7\times10}{180}\right)$

$=\left(\frac{-15}{180}\right)-\left(\frac{-48}{180}\right)-\left(\frac{-70}{180}\right)$

$=\frac{-15+48+70}{180}=\frac{103}{180}$

(*c*) $\frac{8}{19}+\left(\frac{-7}{76}\right)-\left(\frac{3}{-38}\right)=\frac{8}{19}+\left(\frac{-7}{76}\right)-\left(\frac{-3}{38}\right)$

$\because$ LCM of 19, 76, and 38 is 76

$\therefore\ \frac{8}{19}+\left(\frac{-7}{76}\right)-\left(\frac{3}{-38}\right)=\frac{8\times4}{76}+\left(\frac{-7}{76}\right)-\left(\frac{-3\times2}{76}\right)$

$=\frac{32}{76}+\left(\frac{-7}{76}\right)-\left(\frac{-6}{76}\right)=\frac{32-7+6}{76}=\frac{31}{76}$

4. We are given that

$$\frac{15}{8} + \text{(The other number)} = \frac{-7}{8}$$

$\Rightarrow$ The other number

$$= \frac{-7}{8} - \frac{15}{8} = \frac{-7-15}{8} = \frac{-22}{8} \text{ or } -\frac{11}{4}$$

5. We are given that

$$\frac{4}{9} + \text{(The other number)} = \frac{5}{6}$$

$\Rightarrow$ The other number

$$= \frac{5}{6} - \frac{4}{9} = \frac{15}{18} - \frac{8}{18} = \frac{15-8}{18} = \frac{7}{18}$$

6. To find the required number, we need to subtract $\frac{11}{15}$ from $\frac{-13}{20}$.

Therefore, the required number

$$= \frac{-13}{20} - \frac{11}{15} = \frac{-39}{60} - \frac{44}{60} = \frac{-39-44}{60} = \frac{-83}{60}$$

or $-1\frac{23}{60}$

7. To find the required number, we need to subtract $\frac{-7}{18}$ from $\frac{-5}{9}$.

Therefore, the required number

$$= \frac{-5}{9} - \left(\frac{-7}{18}\right) = \frac{-10}{18} - \left(\frac{-7}{18}\right) = \frac{-10+7}{18}$$

$$= \frac{-3}{18} = -\frac{1}{6}$$

8. To find the required number, we need to subtract $\left(\frac{8}{9} + \frac{-11}{6} - \frac{11}{18}\right)$ from $\left(\frac{5}{12} + \frac{-5}{18}\right)$.

Therefore, the required number

$$= \left(\frac{5}{12} + \frac{-5}{18}\right) - \left(\frac{8}{9} + \frac{-11}{6} - \frac{11}{18}\right)$$

$$= \frac{5}{12} + \frac{-5}{18} - \frac{8}{9} - \left(\frac{-11}{6}\right) + \frac{11}{18}$$

LCM of the denominator is 36.

Therefore, we have

$$\frac{5}{12} + \frac{-5}{18} - \frac{8}{9} - \left(\frac{-11}{6}\right) + \frac{11}{18}$$

$$= \frac{5\times3}{36} + \frac{-5\times2}{36} - \frac{8\times4}{36} - \left(\frac{-11\times6}{36}\right) + \frac{11\times2}{36}$$

$$= \frac{15}{36} + \frac{-10}{36} - \frac{32}{36} - \left(\frac{-66}{36}\right) + \frac{22}{36}$$

$$= \frac{15-10-32+66+22}{36} = \frac{61}{36}$$

9. In $\frac{p-q}{p+q}$, to find the maximum possible value, we need to choose p and q such that $p - q$ has maximum possible value and $p + q$ is as smaller as possible. This can happen when p is the largest number and q is the smallest number,

i.e., $\frac{100-1}{100+1} = \frac{99}{101}$, here $p = 100$ and $q = 1$

To have $\frac{p+q}{p-q}$ the maximum possible value we need to choose p and q as large as possible and p and q should be as close as possible.

Let $p = 100$ and $q = 99$, then

$$\frac{p+q}{p-q} = \frac{100+99}{100-99} = \frac{199}{1},$$

is the largest possible value.

Think and Answer (Page 68)

$\times$	$\frac{-2}{5}$	$\frac{-1}{7}$	$\frac{-4}{13}$
$\frac{3}{4}$	$\frac{-3}{10}$	$\frac{-3}{28}$	$\frac{-3}{13}$
$\frac{-5}{6}$	$\frac{1}{3}$	$\frac{5}{42}$	$\frac{10}{39}$
$\frac{-3}{2}$	$\frac{3}{5}$	$\frac{3}{14}$	$\frac{6}{13}$

Practice Time 3D

1. (*a*) $\frac{2}{7}\times(-49) = \frac{2\times(-49)}{7} = \frac{-(2\times49)}{7}$

$= -2 \times 7 = -14$

(*b*) $\left(\frac{-11}{5}\right)\times10 = \frac{(-11)\times10}{5} = (-11)\times2 = -22$

(*c*) $(-2)\times\left(\frac{6}{-13}\right) = \frac{(-2)\times(-6)}{13} = \frac{12}{13}$

(*d*) $\left(\frac{-14}{5}\right)\times\left(\frac{19}{-36}\right) = \frac{(-14)\times(19)}{(5)\times(-36)} = \frac{14\times19}{5\times36}$

$= \frac{7\times19}{5\times18} = \frac{133}{90}$

(*e*) $\frac{3}{11}\times\left(\frac{-55}{12}\right) = \frac{3\times(-55)}{11\times12} = \frac{-5}{4}$

(*f*) $\left(\frac{-7}{6}\right)\times7\frac{8}{5} = \left(\frac{-7}{6}\right)\times\frac{43}{5} = \frac{(-7)\times(43)}{6\times5} = \frac{-301}{30}$

(*g*) $\frac{5}{13}\times\frac{-13}{-35} = \frac{5\times(-13)}{13\times(-35)} = \frac{-1}{-7} = \frac{1}{7}$

(*h*) $\left(\frac{12}{-11}\right)\times\left(\frac{-121}{-144}\right)=\frac{(12)\times(-121)}{(-11)\times(-144)}=\frac{11}{-12}$

$=\frac{-11}{12}$

2. (*a*) $\left(\frac{-5}{6}\right)\div 24=\left(\frac{-5}{6}\right)\times\frac{1}{24}=\frac{-5}{6\times 24}=\frac{-5}{144}$

(*b*) $121\div\left(\frac{-11}{7}\right)=121\times\left(\frac{7}{-11}\right)=\frac{121\times 7}{-11}$

$=-11\times 7=-77$

(*c*) $\left(\frac{13}{-19}\right)\div 78=\left(\frac{13}{-19}\right)\times\frac{1}{78}=\frac{13}{(-19)\times 78}$

$=\frac{1}{(-19)\times 6}=\frac{1}{-114}$

(*d*) $\left(\frac{-10}{27}\right)\div\frac{5}{2}=\left(\frac{-10}{27}\right)\times\frac{2}{5}=\frac{(-10)\times 2}{27\times 5}$

$=\frac{(-2)\times 2}{27}=\frac{-4}{27}$

(*e*) $\left(\frac{-30}{-49}\right)\div\left(\frac{3}{-7}\right)=\left(\frac{-30}{-49}\right)\times\left(\frac{-7}{3}\right)=\frac{30\times(-7)}{49\times 3}$

$=\frac{10\times(-1)}{7\times 1}=\frac{-10}{7}$

(*f*) $\frac{55}{28}\div\left(\frac{-11}{4}\right)=\frac{55}{28}\times\frac{4}{(-11)}=\frac{5\times 1}{7\times(-1)}=\frac{5}{-7}$

$=\frac{-5}{7}$

(*g*) $\left(\frac{40}{-33}\right)\div\left(\frac{3}{-2}\right)=\left(\frac{40}{-33}\right)\times\left(\frac{-2}{3}\right)$

$=\frac{40\times(-2)}{(-33)\times 3}=\frac{-80}{-99}=\frac{80}{99}$

(*h*) $\frac{7}{12}\div\frac{3}{7}=\frac{7}{12}\times\frac{7}{3}=\frac{49}{36}$

3. (*a*) $\left[\frac{2}{21}\times(-7)\right]+\left(\frac{5}{13}\times\frac{6}{15}\right)=\left[\frac{2\times(-7)}{21}\right]+\frac{5\times 6}{13\times 15}$

$=\left[\frac{-2}{3}\right]+\frac{2}{13}=\frac{-2\times 13}{39}+\frac{2\times 3}{39}$

$=\frac{-26+6}{39}=\frac{-20}{39}$

(*b*) $\left[\frac{13}{8}\times\left(\frac{12}{-91}\right)\right]-\left[\left(\frac{-28}{9}\right)\times\left(\frac{45}{-7}\right)\right]$

$=\left[\frac{13\times 12}{8\times(-91)}\right]-\left[\frac{(-28)\times 45}{9\times(-7)}\right]$

$=\left[\frac{3}{2\times(-7)}\right]-[4\times 5]=\frac{3}{(-14)}-20$

$=\frac{-3}{14}-20=\frac{-3-280}{14}=\frac{-283}{14}$

(*c*) $\left[\left(\frac{-1}{6}\right)\div\frac{3}{8}\right]\times\left[\frac{3}{13}\div\left(\frac{-24}{39}\right)\right]$

$=\left[\left(\frac{-1}{6}\right)\times\frac{8}{3}\right]\times\left[\frac{3}{13}\times\left(\frac{39}{-24}\right)\right]$

$=\frac{(-1)\times 8}{6\times 3}\times\frac{3\times 39}{13\times(-24)}$

$=\frac{(-1)\times 8\times 3\times 39}{6\times 3\times 13\times(-24)}=\frac{(-1)}{6\times(-1)}=\frac{1}{6}$

(*d*) $\left[\frac{48}{17}\div\frac{12}{7}\right]\times\left[\frac{63}{5}\div\left(\frac{-9}{20}\right)\right]$

$=\left(\frac{48}{17}\times\frac{7}{12}\right)\times\left[\frac{63}{5}\times\left(\frac{20}{-9}\right)\right]$

$=\frac{48\times 7\times 63\times 20}{17\times 12\times 5\times(-9)}=\frac{4\times 7\times 7\times 4}{-17}$

$=\frac{-784}{17}$

4. We are given that

$\frac{4}{7}\times$ (The other rational number) $=\frac{-8}{21}$

$\Rightarrow$ The other number $=\frac{-8}{21}\div\frac{4}{7}=\frac{-8}{21}\times\frac{7}{4}=\frac{-2}{3}$

5. To find the required number, we need to divide $\frac{-3}{10}$ by $\frac{-35}{12}$

Therefore, the required number

$=\frac{-3}{10}\div\frac{-35}{12}=\frac{(-3)}{10}\times\frac{12}{(-35)}=\frac{18}{175}$

6. Speed $=41\frac{1}{3}$ km/h $=\frac{124}{3}$ km/h

Time $=3\frac{1}{5}$ h $=\frac{16}{5}$ h

Distance covered = Speed × Time

$=\frac{124}{3}\times\frac{16}{5}$ km $=\frac{1984}{15}$ km $=132\frac{4}{15}$ km

7. The sum of $\frac{8}{9}$ and $\frac{-11}{6}$

$=\frac{8}{9}+\frac{-11}{6}=\frac{16}{18}+\frac{-33}{18}=\frac{16-33}{18}$

$=\frac{-17}{18}$

Product of $\frac{5}{4}$ and $\frac{3}{10}=\frac{5}{4}\times\frac{3}{10}=\frac{15}{40}$

Therefore, $\frac{-17}{18}\div\frac{15}{40}=\frac{-17}{18}\times\frac{40}{15}=\frac{-68}{27}$

8. Sum of $5\frac{2}{3}$ and $3\frac{1}{6}$

$$= 5\frac{2}{3}+3\frac{1}{6}=\frac{17}{3}+\frac{19}{6}=\frac{34}{6}+\frac{19}{6}=\frac{53}{6}$$

Difference $= 5\frac{2}{3}-3\frac{1}{6}=\frac{17}{3}-\frac{19}{6}=\frac{34}{6}-\frac{19}{6}=\frac{15}{6}$

Therefore, $\frac{53}{6}\div\frac{5}{2}=\frac{53}{6}\times\frac{2}{5}=\frac{53}{15}$

Chapter Assessment

A.

1. HCF of 48 and 72 is 24.

$\therefore \quad \frac{48}{-72}=\frac{48\div(-24)}{-72\div(-24)}=\frac{-2}{3}$

So, the standard form of $\frac{48}{-72}$ is $\frac{-2}{3}$.

Hence, the correct option is (*b*).

2. $\frac{-4}{7}=\frac{-4\times(-3)}{7\times(-3)}=\frac{12}{-21}$

So, $\frac{-4}{7}$ can be expressed as a rational number with denominator –21 as $\frac{12}{-21}$.

Hence, the correct option is (*c*).

3. In the standard form of a rational number, the common factor of numerator and denominator is always 1.

Hence, the correct answer is (*b*).

4. There are unlimited rational numbers between any two rational numbers.

Hence, the correct option is (*c*).

5. $\frac{-4}{5}=\frac{-4\times5}{5\times5}=\frac{-20}{25}$

Hence, the correct option is (*c*).

6. Additive inverse of $\frac{-2}{3}$ is $-\left(\frac{-2}{3}\right)=\frac{2}{3}$

Hence, the correct option is (*c*).

7. A rational number is defined as a number that can be expressed in the form of $\frac{p}{q}$, where p and q are integers and $q \neq 0$.

Hence, the correct option is (*d*).

8. $\frac{p}{q}=\frac{m\times t}{n\times t}=\frac{m}{n}$

Hence, the correct option is (*a*).

B.

1. The given A and R both are correct but R is not the correct explanation for writing a rational number in the standard form. Therefore, the correct answer is option (*b*).

2. $\frac{23}{-52}=\frac{-23}{52} \qquad \Rightarrow \frac{-11}{52}>\frac{-23}{52}$

Here, A and R both are true and R is the correct explanation of A. Therefore, the correct answer is option (*a*).

3. $-\frac{9}{8}$ is a rational number, where $p = -9$, $q = 8$ are integers and $q \neq 0$.

So, A is correct and R is wrong. Hence, the correct option is (*c*).

C. (*a*) – (*v*); (*b*) – (*iv*); (*c*) – (*ii*); (*d*) – (*iii*); (*e*) – (*i*)

D.

1. The rational number 0 is neither positive nor negative.

2. The reciprocal of $\left(\frac{1}{-2}\right)$ is $1\div\left(\frac{1}{-2}\right)=1\times\frac{(-2)}{1}=-2$

Hence, the correct answer is –2.

3. The sum of a rational number and its additive inverse is always 0. Therefore, the correct answer is 0.

4. $\frac{-3}{2}+\frac{1}{2}=\frac{-3+1}{2}=\frac{-2}{2}=-1$

$\therefore$ The sum of $\left(\frac{-3}{2}\right)$ and $\frac{1}{2}$ is –1.

5. Negative rational numbers always lie to the left of zero.

E.

1. (*a*) At $x=\frac{-2}{5}, y=\frac{3}{4}$, and $z=\frac{1}{-2}$

$$(x+y)\times z=\left(\frac{-2}{5}+\frac{3}{4}\right)\times\left(\frac{1}{-2}\right)$$
$$=\left(\frac{-8}{20}+\frac{15}{20}\right)\times\left(\frac{1}{-2}\right)$$
$$=\frac{7}{20}\times\left(\frac{1}{-2}\right)=\frac{-7}{40}$$

(*b*) At $x=\frac{5}{-8}$ and $y=\frac{11}{12}$

$$(x+y)\div(x-y)=\left(\frac{5}{-8}+\frac{11}{12}\right)\div\left(\frac{5}{-8}-\frac{11}{12}\right)$$
$$=\left(\frac{-15}{24}+\frac{22}{24}\right)\div\left(\frac{-15}{24}-\frac{22}{24}\right)$$

$$= \left(\frac{22-15}{24}\right) \div \left(\frac{-15-22}{24}\right)$$
$$= \frac{7}{24} \div \left(\frac{-37}{24}\right) = \frac{7}{24} \times \frac{24}{-37}$$
$$= \frac{7}{-37} = \frac{-7}{37}$$

2. $3 = \frac{3 \times 7}{7} = \frac{21}{7}$

Therefore, $\frac{-6}{7} < \frac{1}{7} < \frac{2}{7} < \frac{3}{7} < \frac{21}{7}$

Thus, 3 rational numbers between $\frac{6}{-7}$ and 3 are

$\frac{1}{7}, \frac{2}{7}, \frac{3}{7}$. (Answer may vary)

3. To get the required number, we need to subtract $\frac{-3}{8}$ from 15.

Therefore, the required number

$$= 15 - \left(\frac{-3}{8}\right) = 15 + \frac{3}{8} = \frac{120+3}{8} = \frac{123}{8}$$

4. The sum of $\frac{2}{5} + \frac{5}{2} = \frac{4}{10} + \frac{25}{10} = \frac{29}{10}$

Now, $\frac{29}{10} - \frac{7}{10} = \frac{22}{10} = \frac{11}{5}$

Therefore, $\frac{11}{5}$ should be subtracted from the sum of $\frac{2}{5}$ and $\frac{5}{2}$ to get $\frac{7}{10}$.

5. $\left(\frac{7}{15} \times \frac{-5}{21}\right) \div 2\frac{5}{6} = \left(\frac{-1}{9}\right) \div \frac{17}{6} = -\frac{1}{9} \times \frac{6}{17} = -\frac{2}{51}$

6. The greatest negative integer is –1.

Now, $(-1) \times \frac{2}{3} = \frac{-2}{3}$

Therefore, $\frac{2}{3}$ should be divided by $\frac{-2}{3}$ to get the greatest negative integer.

7. Clearly, $14\frac{51}{500} > 3\frac{2}{3} > \frac{7}{3}$

Also, $\frac{-2}{5} = \frac{-6}{15} > \frac{-12}{15}$

$\therefore$ The ascending order of the given water level is

$$\frac{-12}{15} < \frac{-2}{5} < \frac{7}{3} < 3\frac{2}{3} < 14\frac{51}{500}$$

8. $\left(\frac{2}{-3}\right) \div \frac{2}{5} = \frac{2}{-3} \times \frac{5}{2} = \frac{5}{-3}$

So, the correct answer is $\frac{5}{-3}$.

It seems Roma missed the negative sign while cancelling out common terms in numerator and denominator.

9. (*a*) Total chocolate that Ravi and Priya got

$$= \frac{3}{4} + \frac{2}{3} = \frac{9}{12} + \frac{8}{12} = \frac{17}{12} \text{ of chocolate bar}$$

(*b*) Ravi got $\frac{5}{6}$ of a pizza. He gave $\frac{1}{4}$ of his pizza to Priya.

The pizza left with Ravi

$$= \frac{5}{6} - \frac{1}{4} \text{ of } \frac{5}{6} = \frac{5}{6} - \frac{5}{24}$$
$$= \frac{20}{24} - \frac{5}{24} = \frac{15}{24} \text{ of the pizza}$$
$$= \frac{5}{8} \text{ of the pizza}$$

(*c*) Total cake $= \frac{1}{4} + \frac{3}{4} = \frac{4}{4} = 1$

If 1 cake is divided equally between Ravi and Priya, each one will get $\frac{1}{2}$ of cake.

Maths Connect (Page 74)

The part of the volume of the steamer boat that is submerged $= 1 - \frac{5}{7} = \frac{7-5}{7} = \frac{2}{7}$.

UNIT TEST – 1

A.

1. 0 is less than every positive integer.

Hence, the correct option is (*d*).

2. $\frac{-125}{611} + \left|\frac{-125}{611}\right| = \frac{-125}{611} + \frac{125}{611} = 0$

Hence, the correct option is (*a*).

3. In $\frac{29}{15}$, the denominator is less than numerator, so $\frac{29}{15}$ is an improper fraction.

Hence, the correct option is (*d*).

4. 6.389 × 100 = 638.9

(The decimal point has shifted two places to the right).

Hence, the correct option is (*d*).

5. (–15) + (–19) – (–45) = (–15) + (–19) + 45

= –(15 + 19) + 45

= –34 + 45 = 11

Hence, the correct option is (*b*).

6. The successor of $m = m + 1 = [8 - (-6) - (-18)] + 1$
$= [8 + 6 + 18] + 1 = 33$
Hence, the correct option is (c).
7. The sum of a rational number and its additive inverse is always 0.
Hence, the correct option is (c).
8. $\left[7\frac{1}{9} \div 2\frac{1}{3}\right] \times \frac{21}{64} = \left[\frac{64}{9} \div \frac{7}{3}\right] \times \frac{21}{64}$
$= \frac{64}{9} \times \frac{3}{7} \times \frac{21}{64} = 1$
So, reciprocal of $\left[7\frac{1}{9} \div 2\frac{1}{3}\right] \times \frac{21}{64}$ is 1.
Hence, the correct option is (d).
9. Here, both A and R are correct and R is the correct explanation for R.
Hence, the correct option is (a).
10. Decimals having same number of decimal places are called like decimals.
Therefore, A is false and R is correct.
Hence, the correct option is (d).

B.

1. $(-303) \div (-1) = 303 \div 1 = 303$
$\therefore$ $(-303) \div 303 = -1$
2. $984.8 \times 1000 = 984800$
(Decimal point shifted three places to the right)
3. $a = (-249 \div 5) \times (-5 \div 249) = \frac{(-249)}{5} \times \frac{(-5)}{249} = 1$
$\therefore$ Additive inverse of $a = -1$.
4. Additive inverse of $\frac{-5}{8} = -\left(\frac{-5}{8}\right) = \frac{5}{8}$
5. $[17 + (-8) + 24] = 17 + [(-8) + 24]$
(Using associative property of integers)

C.

1. Every rational number can be expressed in the form of $\frac{p}{q}$, where p, q are integers and $q \neq 0$.
Hence, the given statement is false (F).
2. $(-1) \times (-1) \times (-1) \times ....$ even number of times $= 1$
$\Rightarrow$ $(-1) \times (-1) \times (-1) \times ....$ 502 times $= 1$
Hence, the given statement is false (F).
3. LCM of 4 and 11 is 44.
$\therefore$ $\frac{1}{4} = \frac{1 \times 11}{4 \times 11} = \frac{11}{44}$, and $\frac{3}{11} = \frac{3 \times 4}{11 \times 4} = \frac{12}{44}$
$11 < 12 \quad \Rightarrow \frac{11}{44} < \frac{12}{44}$
$\Rightarrow \frac{1}{4} < \frac{3}{11}$
Hence, the given statement is false (F).
4. In an improper fraction, numerator is greater. So, in its reciprocal the denominator will be greater. Thus, reciprocal of an improper fraction is a proper fraction.
Hence, the given statement is true (T).
5. $\frac{3}{5} = \frac{3 \times 2}{5 \times 2} = \frac{6}{10}$, also $\frac{3}{5} = \frac{3 \times 7}{5 \times 7} = \frac{21}{35}$
So, $\frac{6}{21}$ and $\frac{10}{35}$ are not the equivalent fractions of $\frac{3}{5}$.
Hence, the given statement is false (F).

D.

1. (a) LHS $= (-1) \times [8 + (-9)] = (-1) \times [-1] = 1$
RHS $= (-1) \times 8 + 1\ (-1) \times (-9) = -8 + 9 = 1$
$\therefore$ LHS = RHS
(b) LHS $= (-29) \times [(-152) + 205]$
$= (-29) \times 53 = -1537$
RHS $= (-29) \times (-152) + (-29) \times (205)$
$= 4408 - 5945 = -1537$
$\therefore$ LHS = RHS
2. To find the total number of tickets sold, we need to divide the total amount collected by the price of each ticket.
Therefore, the total number of tickets sold
$= \frac{\text{Total amount collected}}{\text{Price of a ticket}}$
$= \frac{₹12834.50}{₹675.50} = 19$
Thus, 19 tickets were sold.
3. Total marks obtained by Karan for 20 correct answers $= 20 \times 3 = 60$
Total marks deducted = Total marks for correct answers – final score $= 60 - 55 = 5$
Total number of wrong answers
$= \frac{\text{Total marks deducted}}{1} = 5$
For Kavya, total marks obtained for 5 correct answers
$= 5 \times 3 = 15$
Total marks deducted = 15 – final score
$= 15 - (-5) = 20$
Total wrong answers given by Kavya
$= \frac{20}{1} = 20$
$\therefore$ Total wrong answers by Karan and Kavya
$= 20 + 5 = 25$

4. $\frac{2}{15}$ of 750 kg = $\frac{2\times750}{15}=100$ kg

Thus, 100 kg apples are rotten.

The quantity of apples in good condition

= 750 kg – 100 kg = 650 kg

5. $\left[\frac{17}{8}\times\left(\frac{24}{-119}\right)\right]-\left[\left(\frac{-28}{9}\right)\times\left(\frac{54}{-7}\right)\right]$

$=\left[\frac{3}{-7}\right]-[4\times6]=\frac{-3}{7}-24=-\frac{171}{7}$

6. (*a*) $2419 \times 112 + 2419 \times (-12) = 2419\,(112 - 12)$

(Using reverse of distributive property)

$= 2419 \times 100 = 241900$

(*b*) $125 \times 96 = 125 \times (100 - 4)$

(Using distributive property)

$= 12500 - 500 = 12000$

7. $x=\left[\frac{7}{8}+\left(\frac{-1}{2}\right)+\left(\frac{-3}{4}\right)\right]=\left[\frac{7}{8}+\left(\frac{-4}{8}\right)+\left(\frac{-6}{8}\right)\right]$

$=\frac{7-4-6}{8}=\frac{-3}{8}$

$y=\left[\frac{2}{5}+\left(\frac{-1}{9}\right)+\frac{1}{3}\right]=\left[\frac{18}{45}+\left(\frac{-5}{45}\right)+\frac{15}{45}\right]$

$=\frac{18-5+15}{45}=\frac{28}{45}$

$z=\left[\frac{-2}{5}+\left(\frac{-1}{4}\right)+\frac{2}{7}\right]=\frac{(-2\times28)}{140}+\frac{-35}{140}+\frac{40}{140}$

$=\frac{-56-35+40}{140}=\frac{-51}{140}$

Now, z and x can be written as

$x=\frac{-3}{8}=\frac{-3\times35}{280}=\frac{-105}{280}$

$z=\frac{-102}{280}$ $\Rightarrow z > x$

Since y is positive, we have $x < z < y$.

8. Temperature difference = –32°C – (–51°C)

= (51 – 32)°C = 19°C

CHAPTER 4 : EXPONENTS AND POWERS

Create and Solve (Page 80)

- 10^2
- $(-2)^3$
- $32578 = 3 \times 10^4 + 2 \times 10^3 + 5 \times 10^2 + 7 \times 10^1 + 8 \times 10^0$
- 3^2, 3^3 (Answer may vary)

Think and Answer (Page 81)

$8^2 = (2 \times 2 \times 2)^2 = (2^3)^2 = 2^6$

$\therefore\ 2^8 > 8^2$

Think and Answer (Page 81)

$(5^2)^3 = (25)^3 = 25 \times 25 \times 25 = 15625$

Practice Time 4A

1. (*a*) $5 \times 5 \times 5 \times 5 = 5^4$

(*b*) $11 \times 11 \times 11 \times 11 \times 11 = 11^5$

(*c*) $(-7) \times (-7) \times (-7) \times (-7) \times (-7) = (-7)^5$

(*d*) $2 \times 2 \times 2 \times 3 \times 3 = 2^3 \times 3^2$

(*e*) $(-5) \times (-5) \times 7 \times (-3) \times (-3) \times (-3)$
$= (-5)^2 \times 7 \times (-3)^3$

(*f*) $(-1) \times (-1) \times 3 \times 3 = (-1)^2 \times (3)^2$

(*g*) $(-10) \times (-10) \times (-10) \times (-10) \times (-10) \times (-10)$
$= (-10)^6 = 10^6$

2. (*a*) $2^7 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 128$

(*b*) $5^6 = 5 \times 5 \times 5 \times 5 \times 5 \times 5 = 15625$

(*c*) $(-7)^4 = (-7) \times (-7) \times (-7) \times (-7) = 2401$

(*d*) $(-5)^4 = (-5) \times (-5) \times (-5) \times (-5) = 625$

(*e*) $(-3)^5 = (-3) \times (-3) \times (-3) \times (-3) \times (-3) = -243$

3. (*a*) $81 = 3 \times 3 \times 3 \times 3 = 3^4$

(*b*) $216 = 2 \times 2 \times 2 \times 3 \times 3 \times 3 = 2^3 \times 3^3$

(*c*) $1331 = 11 \times 11 \times 11 = 11^3$

(*d*) $1024 = 4 \times 4 \times 4 \times 4 \times 4 = 4^5$

4. (*a*) $256 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 2^8$

(*b*) $432 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 = 2^4 \times 3^3$

(*c*) $2401 = 7 \times 7 \times 7 \times 7 = 7^4$

(*d*) $3200 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 5 \times 5$
$= 2^7 \times 5^2$

(*e*) $15625 = 5 \times 5 \times 5 \times 5 \times 5 \times 5 = 5^6$

5. (*a*) $(-2)^6 = 2^6 = 64$, and $6^2 = 36$

$\therefore\ (-2)^6 > 6^2$

(*b*) $(-3)^2 = 3^2 = 9$, and $(-2)^3 = -(2)^3 = -8$

$\therefore\ (-3)^2 > (-2)^3$

(*c*) $100^2 = 10000$, and $2^{50} = (2^{10})^5 = (1024)^5$

$\because\ 1024 > 1000$ $\Rightarrow (1024)^5 > (1000)^5$

$\Rightarrow (1024)^5 > 1,000,000,000,000,000$

$\Rightarrow (1024)^5 > 10000$ $\therefore\ 2^{50} > 100^2$

6. (*a*) $3 \times 10^3 = 3 \times 1000 = 3000$

(*b*) $3^2 \times 4^2 = 9 \times 16 = 144$

(*c*) $7^3 \times 5^1 = 343 \times 5 = 1715$

(*d*) $0 \times 2^4 = 0$

(*e*) $2^5 \times 3^3 = 32 \times 27 = 864$

(f) $(-3)^3 \times (-2)^3 = (-27) \times (-8) = 216$

(g) $(-3)^3 \times (-5)^2 = (-27) \times 25 = -675$

(h) $(-2)^4 \times (-10)^4 = (16) \times (10000) = 160000$

Quick Check (Page 85)

1. $(-1^3)^{51} = (-1)^{51} = -1$, $(1^{51})^3 = 1^3 = 1$

$\therefore\ (1^{51})^3 > (-1)^3)^{51}$

2. Since, $20 = 4 \times 5$ $\quad \therefore\ (3^4)^5 = 3^{20}$

Quick Check (Page 87)

$$\left(\frac{-x}{3}\right)^3 = \left(\frac{-x}{3}\right)\cdot\left(\frac{-x}{3}\right)\cdot\left(\frac{-x}{3}\right) = \frac{(-x)\cdot(-x)\cdot(-x)}{3\cdot3\cdot3} = \frac{(-x)^3}{3^3}$$

$$\left(\frac{-x}{y}\right)^5 = \left(\frac{-x}{y}\right)\cdot\left(\frac{-x}{y}\right)\cdot\left(\frac{-x}{y}\right)\cdot\left(\frac{-x}{y}\right)\cdot\left(\frac{-x}{y}\right)$$

$$= \frac{(-x)\cdot(-x)\cdot(-x)\cdot(-x)\cdot(-x)}{y\cdot y\cdot y\cdot y\cdot y} = \frac{(-x)^5}{y^5}$$

Practice Time 4B

1. (a) $3^3 \times 3^4 \times 3^7 = 3^{3+4+7} = 3^{14}$

(b) $(-100)^{15} \div (-100)^{10} = \dfrac{(-100)^{15}}{(-100)^{10}} = (-100)^{15-10}$

$= (-100)^5$

(c) $(7^2)^3 \times 7^5 = (7^{2\times3}) \times 7^5 = 7^6 \times 7^5 = 7^{6+5} = 7^{11}$

(d) $x^4 \times y^4 = (x \times y)^4 = (xy)^4$

(e) $(10^5)^3 \div 10^4 = (10^{5\times3}) \div 10^4 = 10^{15} \div 10^4$

$= 10^{15-4} = 10^{11}$

(f) $(3^5 \div 3^2) \times 4^3 = (3^{5-2}) \times 4^3 = 3^3 \times 4^3$

$= (3 \times 4)^3 = 12^3$

(g) $(5^2 \times 7^2) \div 35^2 = (5 \times 7)^2 \div 35^2 = 35^2 \div 35^2 = 1$

(h) $\dfrac{2^0 + 3^0}{3^2} = \dfrac{1+1}{3^2} = \dfrac{2}{3^2}$

(i) $\left[\left\{\left(\dfrac{-2}{3}\right)^2\right\}^2\right]^2 = \left[\left(\dfrac{-2}{3}\right)^{2\times2}\right]^2 = \left(\dfrac{-2}{3}\right)^{2\times2\times2}$

$= \left(\dfrac{-2}{3}\right)^8 = \left(\dfrac{2}{3}\right)^8$

2. (a) $(3^2)^3 \times (-2)^2 = (3)^6 \times (-2)^2$ $\quad [\because (a^m)^n = a^{mn}]$

$= (3)^6 \times (2)^2$

$[\because (-1)^2 = 1$ as 2 is an even number$]$

$= 3^6 \times 2^2$

(b) $(2^4 \times 3^2) \times 6^2 = (2^4 \times 3^2) \times (2 \times 3)^2$

$[\because 6 = 2 \times 3]$

$= 2^4 \times 3^2 \times 2^2 \times 3^2$

$[\because (a \times b)^m = a^m \times b^m]$

$= 2^4 \times 2^2 \times 3^2 \times 3^2$

$= 2^6 \times 3^4$ $\quad [\because a^m \times a^n = a^{m+n}]$

(c) $(a^5 \div a^3) \times a^8 = (a^{5-3}) \times a^8$

$[\because a^m \div a^n = a^{m-n}]$

$= a^2 \times a^8 = a^{8+2}$

$[\because a^m \times a^n = a^{m+n}]$

$= a^{10}$

(d) $\dfrac{5^3 \times 5^2}{15^2} = \dfrac{5^3 \times 5^2}{(3\times5)^2} = \dfrac{5^3 \times 5^2}{3^2 \times 5^2}$

$[\because (ab)^m = a^m \times b^m]$

$= \dfrac{5^5}{3^2 \times 5^2}$ $\quad [\because a^m \times a^n = a^{m+n}]$

$= \dfrac{5^{5-2}}{3^2} = \dfrac{5^3}{3^2}$ $\quad \left[\because \dfrac{a^m}{a^n} = a^{m-n}\right]$

(e) $\dfrac{3^4 \times 2^3}{2^0 \times 3} = \dfrac{3^4 \times 2^3}{3}$ $\quad [\because a^0 = 1]$

$= 3^{4-1} \times 2^3$ $\quad \left[\because \dfrac{a^m}{a^n} = a^{m-n}\right]$

$= 3^3 \times 2^3 = (3 \times 2)^3 = 6^3$

$[\because a^m \times b^m = (ab)^m]$

(f) $(3^2 + 2^2 + 3) \times (3 + 3^0)$

$= (3^2 + 2^2 + 3) \times (4)$ $\quad [\because a^0 = 1]$

$= 16 \times 4$

$= 2^4 \times 2^2$

$= 2^6$

(g) $(a^4 \times 2^8) \div (4^2 \times a) = (a^4 \times 2^8) \div [(2 \times 2)^2 \times a]$

$= (a^4 \times 2^8) \div 2^4 \times a$

$= a^{4-1} \times 2^{8-4}$ $\quad [\because a^m \div a^n = a^{m-n}]$

$= a^3 \times 2^4$

(h) $(4^0 + 1^0) \times (-2)^0 = (1 + 1) \times (1)$

$= 2 \times 1 = 2$ $\quad [\because a^0 = 1]$

(i) $\{(4^2)^3 \times 4^4\} \div 4^8 = \{4^6 \times 4^4\} \div 4^8$

$[\because (a^m)^n = a^{mn}]$

$= 4^{10} \div 4^8$ $\quad [\because a^m \times a^n = a^{m+n}]$

$= 4^{10-8} = 4^2$ $\quad [\because a^m \div a^n = a^{m-n}]$

$= 16$

3. (a) $\dfrac{5^2\times10^5\times3^5}{6^5\times5^7}=\dfrac{5^2\times(2\times5)^5\times3^5}{(2\times3)^5\times5^7}$

$=\dfrac{5^2\times2^5\times5^5\times3^5}{2^5\times3^5\times5^7}$ [$\because (a\times b)^m=a^m\times b^m$]

$=\dfrac{5^7\times3^5\times2^5}{5^7\times3^5\times2^5}=1$

(b) $\dfrac{7^3\times(2^2)^5}{2^6\times7}=\dfrac{7^3\times2^{10}}{2^6\times7}$ [$\because (a^m)^n=a^{mn}$]

$=7^{3-1}\times2^{10-6}$ [$\because a^m\div a^n=a^{m-n}$]

$=7^2\times2^4=784$

(c) $\dfrac{a^8\times5^4}{10^3\times a^4}=\dfrac{a^8\times5^4}{(2\times5)^3\times a^4}=\dfrac{a^8\times5^4}{2^3\times5^3\times a^4}$

[$\because (a\times b)^m=a^m\times b^m$]

$=\dfrac{a^{8-4}\times5^{4-3}}{2^3}=\dfrac{a^4\times5}{2^3}=\dfrac{5}{8}a^4$

$\left[\because \dfrac{a^m}{a^n}=a^{m-n}\right]$

(d) $\dfrac{3\times2^3\times a^4}{10^2\times a^3}=\dfrac{3\times2^3\times a^4}{(2\times5)^2\times a^3}=\dfrac{3\times2^3\times a^4}{2^2\times5^2\times a^3}$

[$\because (ab)^m=a^m\times b^m$]

$=\dfrac{3\times2^{3-2}\times a^{4-3}}{5^2}$ $\left[\because \dfrac{a^m}{a^n}=a^{m-n}\right]$

$=\dfrac{3\times2\times a}{5^2}=\dfrac{6a}{5^2}=\dfrac{6a}{25}$

(e) $\dfrac{a^5b^3\times2^8}{32\times a^3b^2}=\dfrac{a^5b^3\times2^8}{2^5\times a^3b^2}$ [$\because 32=2^5$]

$=\dfrac{a^5\times b^3\times2^8}{2^5\times a^3\times b^2}$

$=a^{5-3}\times b^{3-2}\times2^{8-5}$ $\left[\because \dfrac{a^m}{a^n}=a^{m-n}\right]$

$=a^2\times b\times2^3$

$=2^3a^2b=8a^2b$

(f) $\dfrac{3^4\times2^3\times2^2}{3\times2^5}=\dfrac{3^4\times2^5}{3\times2^5}$ [$\because a^m\times a^n=a^{m+n}$]

$=\dfrac{3^4}{3}=3^{4-1}=3^3=27$ $\left[\because \dfrac{a^m}{a^n}=a^{m-n}\right]$

(g) $\dfrac{7^2\times3^2\times11^8}{11^3\times7\times3}=7^{2-1}\times3^{2-1}\times11^{8-3}$

$\left[\because \dfrac{a^m}{a^n}=a^{m-n}\right]$

$=7\times3\times11^5=21\times11^5$

(h) $\dfrac{-3ab^2\times8a^3b}{(2a^2b)^2}=\dfrac{-24a^4b^3}{(2a^2b)^2}$ [$\because a^m\times a^n=a^{m+n}$]

$=\dfrac{-24a^4b^3}{4a^4b^2}=\dfrac{-24a^{4-4}b^{3-2}}{4}$ $\left[\because \dfrac{a^m}{a^n}=a^{m-n}\right]$

$=-6a^0b=-6b$ [$\because a^0=1$]

(i) $\dfrac{(-2a^2b)^2\times a^3b^2}{(-3a^2b)^3}=\dfrac{4a^4b^2\times a^3b^2}{-27a^6b^3}$

$=\dfrac{4a^{4+3}\times b^{2+2}}{-27a^6b^3}$ [$\because a^m\times a^n=a^{m+n}$]

$=\dfrac{4a^7\times b^4}{-27a^6\times b^3}=\dfrac{4a^{7-6}\times b^{4-3}}{-27}$

$=\dfrac{-4}{27}ab$ $\left[\because \dfrac{a^m}{a^n}=a^{m-n}\right]$

4. To find the required number, we need to divide $(9)^8$ by $(-3)^6$.

$\therefore$ The required number $=9^8\div(-3)^6=(3^2)^8\div3^6$

$=3^{16}\div3^6=3^{16-6}=3^{10}$

5. To find the required number, we need to divide $(-12)^6$ by 144.

$\therefore$ The required number $=\dfrac{(-12)^6}{144}=\dfrac{12^6}{12\times12}=\dfrac{12^6}{12^2}$

$=12^{6-2}=12^4$

6. $2^{2+3}=2^5=32$, $(2^2)^3=2^6=64$, $2\times2^2=2^3=8$, $\dfrac{3^5}{3^2}=3^3=27$, $3^2\times3^0=3^2=9$, and $2^3\times5^2=8\times25=200$

$\because 200>64>32>27>9>8$

$\therefore 2^3\times5^2>(2^2)^3>2^{2+3}>\dfrac{3^5}{3^2}>3^2\times3^0>2\times2^2$

Practice Time 4C

1. (a) $8\times10^4+6\times10^3+0\times10^2+4\times10^1+5\times10^0$

$=86045$

(*b*) $4 \times 10^5 + 5 \times 10^3 + 3 \times 10^2 + 2 \times 10^0$
$= 4 \times 10^5 + 0 \times 10^4 + 5 \times 10^3 + 3 \times 10^2 + 0 \times 10^1 + 2 \times 10^0$
$= 405302$

(*c*) $3 \times 10^4 + 7 \times 10^2 + 5 \times 10^0$
$= 3 \times 10^4 + 0 \times 10^3 + 7 \times 10^2 + 0 \times 10^1 + 5 \times 10^0$
$= 30705$

(*d*) $9 \times 10^5 + 2 \times 10^2 + 3 \times 10^1$
$= 9 \times 10^5 + 0 \times 10^4 + 0 \times 10^3 + 2 \times 10^2 + 3 \times 10^1 + 0 \times 10^0$
$= 900230$

2. (*a*) $109{,}852{,}000 = 1.09852000 \times 10^8$
$= 1.09852 \times 10^8$

(*b*) $14{,}539{,}500{,}000 = 1.4539500000 \times 10^{10}$
$= 1.45395 \times 10^{10}$

(*c*) $125{,}403{,}000{,}000 = 1.25403000000 \times 10^{11}$
$= 1.25403 \times 10^{11}$

(*d*) $283{,}124{,}000{,}000{,}000 = 2.83124000000000 \times 10^{14}$
$= 2.83124 \times 10^{14}$

(*e*) $53154.547 = 5.3154547 \times 10^4$

3. (*a*) $384{,}400{,}000$ m $= 3.844 \times 10^8$ m

$\therefore$ The distance of the Moon from the Earth is 3.844×10^8 m.

(*b*) $86{,}800{,}000{,}000{,}000{,}000{,}000{,}000{,}000$ kg
$= 8.68 \times 10^{25}$ kg

$\therefore$ Mass of Uranus is 8.68×10^{25} kg.

(*c*) $73{,}480{,}000{,}000{,}000{,}000{,}000{,}000$ kg
$= 7.348 \times 10^{22}$ kg

$\therefore$ Mass of the Moon is 7.348×10^{22} kg.

(*d*) $300{,}000{,}000$ m/s $= 3 \times 10^8$ m/s

$\therefore$ Speed of the light in vacuum is 3×10^8 m/s.

(*e*) $1{,}400{,}000{,}000$ m $= 1.4 \times 10^9$ m

$\therefore$ The diameter of the Sun is 1.4×10^9 m.

4. (*a*) 1.39×10^6 km $= 1{,}390{,}000$ km

$\therefore$ The diameter of the Sun is 1,390,000 km.

(*b*) 1.274×10^7 m $= 12{,}740{,}000$ m

$\therefore$ The diameter of the Earth is 12,740,000 m.

(*c*) 3×10^8 m/s $= 300{,}000{,}000$ m/s

$\therefore$ Speed of the light is 300,000,000 m/s.

(*d*) 1.5×10^8 km $= 150{,}000{,}000$ km

$\therefore$ The distance between the Sun and the Earth is 150,000,000 km.

Chapter Assessment

A.

1. $(-1)^{17} = -1$ ($\because$ 17 is an odd number)

Hence, the correct answer is option (*b*).

2. $(-2) \times (-2) \times (-2) \times (-3) \times (-3) = (-2)^3 \times (-3)^2$

Hence, the correct answer is option (*c*).

3. $[(-2)^3]^0 = 1$ $[\because a^0 = 1]$

Hence, the correct answer is option (*c*).

4. $(-1)^{16} \div (-1)^5 = 1 \div (-1) = -1$

Hence, the correct answer is option (*b*).

5. $\dfrac{8^{22} + 8^{20}}{8^{20}} = \dfrac{8^{20}(8^2 + 1)}{8^{20}} = 8^2 + 1$

Hence, the correct answer is option (c).

6. $(-2)^3 \times (-3)^3 = [(-2) \times (-3)]^3 = 6^3$

Hence, the correct answer is option (*d*).

7. In standard form of a number, there must be one and only one non-zero digit left to the decimal point.

Hence, the correct answer is option (*a*).

8. $32100000 = 3.2100000 \times 10^7 = 3.21 \times 10^7$

Hence, the correct answer is option (*d*).

B.

1. $a^m \times a^n = a^{m+n}$ $\Rightarrow 3^7 \times 3^8 = 3^{7+8} = 3^{15}$

So, the A and R both are true and R is the correct explanation of A.

Hence, the correct answer is option (*a*).

2. The standard form of 4285.3 is 4.2853×10^3 and any number can be expressed as a decimal number between 1.0 and 10.0 (including 1.0) multiplied by a power of 10. Such form is called the standard form. This is the correct explanation.

Hence, the correct answer is option (*a*).

3. $3 \times 2^n = 24$ $\Rightarrow 2^n = \dfrac{24}{3} = 8 = 2^3$

$2^n = 2^3$ $\Rightarrow n = 3$

$a^m = a^n$ $\Rightarrow m = n$

Hence, the correct answer is option (*a*).

C.

1. (*a*) $\dfrac{(-5)^5 \times (-5)^3}{\left[(-5)^2\right]^4} = \dfrac{(-5)^{5+3}}{(-5)^{2\times4}} = \dfrac{(-5)^8}{(-5)^8} = 1$

(*b*) $1^0 + 2^0 + 3^0 = 1 + 1 + 1 = 3$

(*c*) $\left(\frac{-5}{4}\right)^4 = \frac{(-5)^4}{4^4} = \frac{5^4}{4^4} = \frac{625}{256}$

(*d*) $(-7)^{2\times7-6-8} = (-7)^{14-6-8} = (-7)^{14-14} = (-7)^0 = 1$

2. (*a*) $\frac{5^2\times10^5\times3^5}{6^5\times5^7} = \frac{5^2\times(2\times5)^5\times3^5}{(2\times3)^5\times5^7}$

$= \frac{5^2\times2^5\times5^5\times3^5}{2^5\times3^5\times5^7}$

$= 5^{2+5-7}\times2^{5-5}\times3^{5-5}$

$= 5^0\times2^0\times3^0 = 1\times1\times1 = 1$

(*b*) $\frac{7^2\times3^2\times11^5}{11^3\times7\times3} = 7^{2-1}\times3^{2-1}\times11^{5-3}$

$= 7\times3\times11^2 = 21\times121$

$= 2541$

(*c*) $\frac{(3^2)^3\times(-2)^2}{6} = \frac{3^{2\times3}\times(2)^2}{2\times3} = \frac{3^6\times2^2}{2\times3}$

$= 3^{6-1}\times2^{2-1} = 3^5\times2 = 486$

(*d*) $\frac{7^3\times(2^2)^5}{2^6\times7} = \frac{7^3\times2^{10}}{2^6\times7} = 7^{3-1}\times2^{10-6}$

$= 7^2\times2^4 = 49\times16 = 784$

(*e*) $\frac{a^5b^3\times2^8}{32\times a^3b^2} = 2^3a^2b$

(*f*) $\frac{343\times32^2\times9^2}{49\times2^4\times36^2} = \frac{7^3\times(2^5)^2\times9^2}{7^2\times2^4\times(4\times9)^2}$

$= \frac{7^3\times2^{10}\times9^2}{7^2\times2^4\times4^2\times9^2}$

$= \frac{7^3\times2^{10}\times9^2}{7^2\times2^4\times2^4\times9^2}$

$= 7^{3-2}\times2^{10-8} = 7\times2^2$

$= 7\times4 = 28$

3. $\frac{p}{q} = \left(\frac{3}{2}\right)^2 \div \left(\frac{9}{4}\right)^0 = \left(\frac{3}{2}\right)^2 \div 1 = \left(\frac{3}{2}\right)^2$

$\Rightarrow \left(\frac{p}{q}\right)^3 = \left[\left(\frac{3}{2}\right)^2\right]^3 = \left(\frac{3}{2}\right)^6 = \frac{729}{32}$

4. $2^{n+2} - 2^{n+1} + 2^n = k\times2^n$

$\Rightarrow 2^n(2^2 - 2 + 1) = k\times2^n$

$\Rightarrow 2^2 - 2 + 1 = k \quad \Rightarrow 4 - 2 + 1 = k$

$\Rightarrow k = 3$

5. $3^{1998} - 3^{1997} - 3^{1996} + 3^{1995} = k\times3^{1995}$

$\Rightarrow 3^{1995+3} - 3^{1995+2} - 3^{1995+1} + 3^{1995} = k\times3^{1995}$

$\Rightarrow 3^{1995}(3^3 - 3^2 - 3 + 1) = k\times3^{1995}$

$\Rightarrow k = 3^3 - 3^2 - 3 + 1 = 27 - 9 - 3 + 1 = 27 - 11 = 16$

6. (*a*) $100{,}000{,}000{,}000 = 1.00000000000\times10^{11} = 1.0\times10^{11}$

$\therefore$ In a galaxy there are on an average 1.0×10^{11} stars.

(*b*) 12,000,000,000 years = 1.2×10^{10} years

$\therefore$ The universe is estimated to be about 1.2×10^{10} years old.

(c) 300,000,000,000,000,000,000 m = 3×10^{20} m

$\therefore$ The distance of the Sun from the centre of the Milky Way Galaxy is estimated to be 3×10^{20} m.

(*d*) 60,230,000,000,000,000,000,000 = 6.023×10^{22}

$\therefore$ 6.023×10^{22} molecules are contained a drop of water weighing 1.8 g.

(*e*) 1,353,000,000 = 1.353×10^9

$\therefore$ The Earth has 1.353×10^9 cubic km of sea water.

(*f*) 1,210,726,932 = 1.210726932×10^9

$\therefore$ The population of India was about 1.210726932×10^9 in March, 2011.

7. $\frac{\text{Number of cupcakes}}{\text{Number of doughnuts}} = \frac{2^8}{2^6} = 2^{8-6} = 2^2 = 4$

$\therefore$ Number of cupcakes = 4 × number of doughnuts

Thus, the baker has 4 times more cupcakes than the doughnuts.

8. $729 = 27^2$ or 9^3 or 3^6.

9. Let us evaluate both the module for some values of *n*.

For $n = 1$

₹$(25n - 1)$ = ₹$(25\times1 - 1)$ = ₹24

₹$(25^n - 1)$ = ₹$(25^1 - 1)$ = ₹24

For $n = 2$

₹$(25n - 1)$ = ₹$(25\times2 - 1)$ = ₹49

₹$(25^n - 1)$ = ₹$(25^2 - 1)$ = ₹$(625 - 1)$ = ₹624

For $n = 3$

₹$(25n - 1)$ = ₹$(25\times3 - 1)$ = ₹74

₹$(25^n - 1)$ = ₹$(25^3 - 1)$ = ₹$(15625 - 1)$ = ₹15624

It is clear that the module ₹$(25^n - 1)$ is growing exponentially as the value of *n* increases, while module ₹(25n – 1) is growing very slowly as compared to it.

So, Zoya should choose the module ₹$(25^n - 1)$ for the payment.

10. $\dfrac{4^5}{16^5} = \dfrac{4^5}{(4\times4)^5} = \dfrac{4^5}{4^5\times4^5} = \dfrac{1}{4^5}$

The student missed the exponents while dividing.

11. 1 light year = 9,460,000,000,000 km

$= 9.46 \times 10^{12}$ km

∵ 1 light year = 9,460,000,000,000 km

∴ 28000 light years

$= 28000 \times 9.46 \times 10^{12}$ km

$= 264.88 \times 10^{15}$ km

∴ The distance between the sun and the centre of the Galaxy = 264,880,000,000,000,000 km

In scientific notation = 2.6488×10^{17} km

12. 1 light year = 9.46×10^{12} km = 946×10^{10} km

The distance between the Earth and the Jupiter

$= 5.88 \times 10^{10}$ km

∵ 946 > 5.88

∴ The distance between the Earth and the Jupiter is less than one light year.

13. $361{,}419{,}000 = 3.61419 \times 10^8$

and $148{,}647{,}000 = 1.48647 \times 10^8$

⇒ $361{,}419{,}000 - 148{,}647{,}000$

$= (3.61419 - 1.48647) \times 10^8$

∴ The difference between the area covered with water to area covered by land = 2.12772×10^8 sq. km

14. (*a*) The rice grains given by the king to the man in first five days

$= 2^0 + 2^1 + 2^2 + 2^3 + 2^4$

$= 1 + 2 + 4 + 8 + 16 = 31$ grains

(*b*) Since the man was getting each day double the grains than the previous day, so on 29th day he got half the number of rice grains that he got on 30th day.

(*c*) The man got the rice grains in the following pattern.

$2^0, 2^1, 2^2, ..., 2^{29}$

So, on 30th day he got 2^{29} grains that is

$2^{29} = 536{,}870{,}912$ grains.

Mental Maths (Page 96)

1. $(6^2 - 3^2) \times (-2)^3 = [(3 \times 2)^2 - 3^2] \times (-2)^3$

$= [3^2 \times 2^2 - 3^2] \times (-2)^3$

$= 3^2\,[2^2 - 1] \times (-2)^3$

$= 3^2 \times 3 \times (-2)^3$

$= 3^3 \times (-2)^3 = (-6)^3$

2. $\left(\dfrac{2}{3}\right)^2 \div \left(\dfrac{3}{2}\right)^4 = \left(\dfrac{2^2}{3^2}\right) \div \left(\dfrac{3^4}{2^4}\right) = \dfrac{2^2}{3^2} \times \dfrac{2^4}{3^4} = \dfrac{2^6}{3^6}$

Reciprocal of $\dfrac{2^6}{3^6} = \dfrac{3^6}{2^6} = \left(\dfrac{3}{2}\right)^6$

3. $x^2y^3 = x \times x \times y \times y \times y$

$x^3y^2 = x \times x \times x \times y \times y$

So, x^2y^3 and x^3y^2 are not the same.

4. $(1)^7 = 1, (-1)^3 = -1, (-1)^4 = 1$

So, all the answers are not positive.

5. For $m = 2$, $n = 3$, we have

$m^n = 2^3 = 8$ and $n^m = 3^2 = 9$

⇒ $m^n < n^m$ for $m = 2$ and $n = 3$

So, the given statement is false.

Maths Connect (Page 96)

In each 15 minutes the number of bacteria becomes thrice the previous number.

8 hours = 8 × 60 = 480 minutes = 32 × 15 minutes

So, number of bacteria after 32 fifteen minutes period

$= 3^{32}$ bacteria

Brain Sizzlers (Page 96)

Distance = Speed × time

$= 3 \times 10^8$ m/s × 8 minutes

$= 3 \times 10^8$ m/s × 480 seconds

$= 1440 \times 10^8$ m $= 1.44 \times 10^{11}$m

So, the distance of the Sun from Earth is 1.44×10^{11}m.

CHAPTER 5 : INTRODUCTION TO ALGEBRA

Let's Recall

1. (*a*) In the given pattern each term is obtained by adding 200 m to the previous pattern.

750 + 200 = 950, 950 + 200 = 1150,

1150 + 200 = 1350

Therefore, the missing terms of the given pattern are: 950, 1150, 1350 (*b*) In the given pattern each term is double of the previous term.

$24 \times 2 = 48$, $48 \times 2 = 96$, $96 \times 2 = 192$

Therefore, the missing terms of the given pattern are 48, 96 and 192.

(*c*) The terms of the given pattern are squares of consecutive natural numbers.

$6^2 = 36$, $7^2 = 49$, $8^2 = 64$

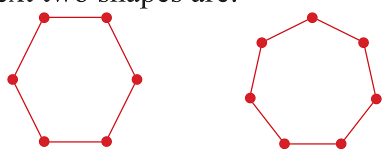
Therefore, the missing terms of the given pattern are 36, 49 and 64.

2. Starting from 1 each shape of the given pattern is obtained by adding 1 vertex to the previous shape.

So, the number pattern involved is

1, 2, 3, 4, 5, 6, 7, ...

And, next two shapes are:



3. Cost of 3 erasers = 3 × ₹3 = ₹9

Cost of 4 erasers = 4 × ₹3 = ₹12

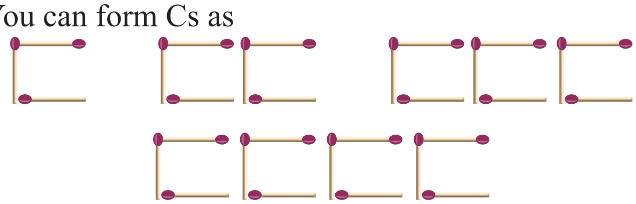
Cost of 5 erasers = 5 × ₹3 = ₹15

Therefore, the complete table is:

Number of Eraser	1	2	3	4	5
Cost (in ₹)	3	6	9	12	15

Create and Solve (Page 100)

You can form Cs as

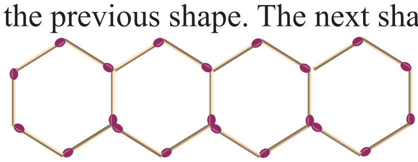


The complete table is:

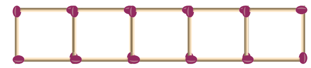
Number of Cs formed	1	2	3	4	5	6	7
Number of matchsticks used	3	6	9	12	15	18	21

Practice Time 5A

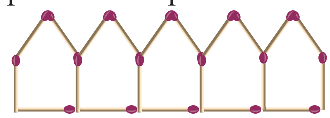
1. (*a*) Each shape is formed by adding 5 matchsticks to the previous shape. The next shape is



(*b*) Each shape is formed by adding 3 matchsticks to the previous shape. The next shape is



(*c*) Each shape is formed by adding 4 matchsticks to the previous shape. The next shape is



2. (*a*) It can be observed from the given figures that 2 matchsticks are fixed and 3 matchsticks are added at each step. The general term for the number of matchsticks in a figure will be $3n + 2$. The complete table is

Number of figures formed	1	2	3	4	25	n
Number of matchsticks used	5	8	11	14	77	$3n + 2$

(*b*)

Number of figures formed	1	2	3	4	25	50	n
Number of matchsticks used	8	15	22	29	176	351	$7n + 1$

(*c*)

Number of figures formed	1	2	3	4	25	100	n
Number of matchsticks used	5	8	11	14	77	302	$3n + 2$

3. (*a*) In the given figure there are 4 matchsticks. To get the two similar figures we need 8 matchsticks, for three similar figures 12 matchsticks, and so on.

So, the number of matchsticks in nth figure is $4n$.

(*b*) Same as part (*a*).

General term is 5n.

(*c*) To get the two similar figures, we just need to add 4 more matchsticks and so on.

The general rule is $4n + 2$.

(*d*) To get the two similar figures, we just need to add 5 more matchsticks in the given figure, and so on. The general rule is $5n + 2$.

(*e*) To get the two similar figures, we just need to add 4 more matchsticks in the given figure, and so on. The general rule is $4n + 1$.

4. Distance covered in one step = x cm.

$\therefore$ Distance covered in 100 steps = $100 \times x$ cm

= $100x$ cm.

5. Number of pages read by Swami in 1 day = 54 pages

$\therefore$ Number pages read by Swami in n days

= $n \times 54$ pages = $54n$ pages

6. Let there are b boxes. Since 50 mangoes are there in one box, total number of mangoes in b boxes

= $b \times 50$ mangoes = $50b$ mangoes

7. The number of oranges in the larger box = Number of oranges in the two smaller boxes + 10 oranges

= 2 × number of oranges in one smaller box + 10 oranges

= $2 \times x$ oranges + 10 oranges

= $(2x + 10)$ oranges

8. Let Ruhi's age be n years.

Leena's age = Ruhi's age – 4 = $(n – 4)$ years.

9. Total number of laddoos made = Number of laddoos gave to the guests and family members + number of laddoos remained = $(l + 5)$ laddoos

10. Total amount of water collected = $8 \times x$ litres

= $8x$ litres

Amount of water already had = 100 litres

$\therefore$ Total amount of water in the tank that day

= $(8x+100)$ litres

Quick Check (Page 108)

Total number of mango saplings in the field

$= x^2y^2 \times y^2z = x^2y^4z$

Practice Time 5B

1. (*a*) Constant: $-\frac{1}{2}$

(*b*) Constant: 0; variable: x

(*c*) Constant: –4

(*d*) Constant: 11; variables: x, z

(*e*) Constant: 11; variable: a

(*f*) Constant: 1; variables: x, y, z

(*g*) Constant: 29; variables: p, q

(*h*) Constant: $\frac{1}{3}$; variable: a

2. (*a*) $p \times p \times q \times q \times q = p^2 \times q^3 = p^2q^3$

(*b*) $x \times x \times x \times y \times y \times y = x^3 \times y^3 = x^3y^3$

(*c*) $3 \times a \times a \times b \times b \times c = 3 \times a^2 \times b^2 \times c$

$= 3a^2b^2c$

(*d*) $2 \times 2 \times 2 \times m \times m \times m = 8 \times m^3 = 8m^3$

(*e*) $2 \times 2 \times 2 \times m \times m \times 3 \times n \times n \times 5 \times l \times l \times l$

$= 2 \times 2 \times 2 \times 3 \times 5 \times m \times m \times n \times n \times l \times l \times l$

$= 120 \times m^2 \times n^2 \times l^3 = 120m^2n^2l^3$

(*f*) $2 \times 2 \times x \times x \times x \times y \times y \times y \times 7 \times z \times z$

$= 2 \times 2 \times 7 \times x \times x \times x \times y \times y \times y \times z \times z$

$= 28 \times x^3 \times y^3 \times z^2 = 28x^3y^3z^2$

(*g*) $7 \times 7 \times (a \times a \times a \times \ldots$ 9 times$) \times 6 \times 6 \times 6 \times (b \times b \times b \times \ldots$ 11 times$)$

$= 49 \times (a^9) \times 216 \times (b^{11})$

$= 49 \times 216 \times (a^9) \times (b^{11}) = 10584a^9b^{11}$

3. (*a*) $x^2y^3 = x \times x \times y \times y \times y$

(*b*) $x^2y^2z^3 = x \times x \times y \times y \times z \times z \times z$

(*c*) $14p^2q^2 = 2 \times 7 \times p \times p \times q \times q$

(*d*) $9pqr^3 = 3 \times 3 \times p \times q \times r \times r \times r$

(*e*) $12m^2n^3 = 2 \times 2 \times 3 \times m \times m \times n \times n \times n$

(*f*) $15a^3b^2 = 3 \times 5 \times a \times a \times a \times b \times b$

(*g*) $2x^2 \times y^3 \times 8z^3 = 2 \times 8 \times x^2 \times y^3 \times z^3$

$= 2 \times 2 \times 2 \times 2 \times x \times x \times y \times y \times y \times z \times z \times z$

(*h*) $8m^2 \times n^2 \times 4p^3 = 8 \times 4 \times m^2 \times n^2 \times p^3$

$= 2 \times 2 \times 2 \times 2 \times 2 \times m \times m \times n \times n \times p \times p \times p$

4. The total cost of all bananas = Cost of one banana × Total number of bananas

= ₹$xy \times x^2y^3$ = ₹$x \times x^2 \times y \times y^3$ = ₹x^3y^4

5. The total amount of money collected = Total number of students × The amount collected from each student

$= a^2b^2 \times$ ₹c^2 = ₹$a^2 \times b^2 \times c^2$ = ₹$a^2b^2c^2$

Create and Solve (Page 109)

The expressions using y, 2 and 7 are: $2y + 7$, $\frac{y}{7} - 2$

(Answer may vary)

Quick Check (Page 109)

The sum of x and double of $p = x + 2p$

$\therefore$ 13 less than the sum of x and double of p

$= x + 2p – 13$

Life Skills (Page 110)

Total amount collected = Total number of children × the amount collected from each child

= (Number of boys + number of girls) × ₹10

= $(x + y)$ × ₹10

= ₹$10(x + y)$

Practice Time 5C

1. (*a*) The length of the knife = x cm + 4 cm
$= (x + 4)$ cm

(*b*) The length of the handle of the screwdriver
$= x$ cm – 3 cm $= (x - 3)$ cm

(*c*) Perimeter of the notebook
= 2(length + breadth) = $2(4x + 2y)$ units

Area of the notebook
= length × breadth sq units
$= 4x \times 2y$ sq units $= 8xy$ sq units

(*d*) Total cost of the fruits = Total cost of apples + total cost of bananas
$= ₹5 \times x + ₹2 \times y = ₹5x + ₹2y = ₹(5x + 2y)$

2. (*a*) 5 more than $y = y + 5$

(*b*) 3 less than $z = z - 3$

(*c*) product of 4 and $x = 4x$

(*d*) dividing 6 by n $\Rightarrow 6 \div n = \dfrac{6}{n}$

(*e*) 4 times of $z = 4 \times z = 4z$

(*f*) 4 is added to 3 times $x = 3 \times x + 4 = 3x + 4$

(*g*) 11 is subtracted from the sum of y and z
= sum of y and $z - 11 = y + z - 11$

(*h*) Product of x and the sum of 7 and y
$= x \times$ (sum of 7 and y) $= x \times (7 + y) = x(7 + y)$

(*i*) Difference of 5 times of x and 4 times of y
$= (5 \times x) - (4 \times y) = 5x - 4y$

(*j*) Quotient of the sum of z and 4 by 3
$= \dfrac{\text{sum of } z \text{ and } 4}{3} = \dfrac{z+4}{3}$

(*k*) $\dfrac{\text{Product of } a \text{ and } b}{\text{Sum of } c \text{ and } 2} = \dfrac{a \times b}{c+2} = \dfrac{ab}{c+2}$

(*l*) (Quotient of x by y) + (product of y and z)
$= \dfrac{x}{y} + yz$

(*m*) $\{y \times (-8)\} + 5 = -8y + 5$

3. (*a*) $3x + y \Rightarrow y$ is added to three times of x.

(*b*) $4 \times (a + b) \Rightarrow 4$ is multiplied by the sum of a and b.

(*c*) $100 - 2xy \Rightarrow$ The product of 2, x and y is subtracted from 100.

(*d*) $\dfrac{7}{5-x} \Rightarrow 7$ is divided by the difference of 5 and x.

(*e*) $11\dfrac{a}{b} \Rightarrow 11$ is multiplied by the quotient of a and b.

(*f*) $b^2 - 4ac \Rightarrow$ The product of 4, a and c is subtracted from the square of b.

4. (*a*) A book costs three times than a notebook's cost.

(*b*) Tony has eight times more marbles in a box than on a table.

(*c*) The students in the school are 20 times the number of students in our class.

(*d*) Jaggu's uncle's age is four times Jaggu's age and his aunt is three years younger than his uncle.

(*e*) The number of dots is five times the number of rows.

5. According to the given information
$85 + x + y$ + marks in Hindi = 350
$\Rightarrow$ Marks in Hindi $= 350 - 85 - x - y$
$= 265 - x - y$ marks

6. The perimeter, P = 3 × length of its each side
$= 3 \times a$ units $= 3a$ units
$\Rightarrow \text{P} = 3a$

7. Diameter of the circle, D = 2 × radius of the circle
$= 2 \times r = 2r$ units
$\Rightarrow \text{D} = 2r$

8. The perimeter, P of a triangle is the sum of lengths of its sides a, b and c.

9. The perimeter, P of a regular hexagon
$= 6 \times$ length of its side $= 6 \times l$
$\therefore \quad \text{P} = 6l$

10. Total number of edges in a cube = 12
$\therefore$ Total length of edges of a cube = 12 × length of an edge
$= 12 \times l = 12l$
Therefore, total length of edges of a cube $= 12l$.

11. (*a*) Ruhi's age after 5 years from now = Her present age + 5 years
$= x$ years + 5 years $= (x + 5)$ years

(*b*) Ruhi's age 3 years back = Her present age – 3 years $= x$ years – 3 years $= (x - 3)$ years

(*c*) Grandfather's age = 6 × Ruhi's age
$= 6 \times x$ years $= 6x$ years

(*d*) Grandmother's age = Grandfather's age – 2 years
$= 6x$ years – 2 years $= (6x - 2)$ years

(*e*) Ruhi's father's age = 3 × Ruhi's age + 5 years
$= 3 \times x$ years + 5 years $= 3x$ years + 5 years
$= (3x + 5)$ years

Quick Check (Page 114)

(a) $-3m^2n$

Numerical coefficient = -3

Coefficient of $m^2 = -3n$

Coefficient of $n = -3m^2$

(b) $-4pqr$

Numerical coefficient = -4

Coefficient of $p = -4qr$

Coefficient of $q = -4pr$

Coefficient of $r = -4pq$

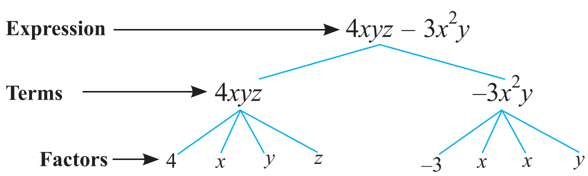
Coefficient of $pq = -4r$

Quick Check (Page 114)

11, –24, 1; x, $11x$, $-24x$; $-24y$, $11y$, y

Practice Time 5D

1. (a)



(b)–(f) Do it yourself (same as above)

2. (a) $6abc = 6bc \times a$

$\therefore$ The coefficient of a in $6abc$ is $6bc$.

(b)–(d) Do it yourself (same as above)

3. (a) $-xyz = -1 \times xyz = -yz \times x$

$\therefore$ The numerical coefficient is –1 and the coefficient of x is $-yz$.

(b)–(d) Do it yourself (same as above)

4. (a) In the expression $3 - xy^2$, the term $-xy^2$ contains xy as $-xy^2 = -1 \times xy \times y$. Also, the coefficient of y^2 in $-xy^2$ is $-x$.

(b)–(c) Do it yourself (same as above)

5.

S. No.	Like Terms	Unlike terms
(a)	$a^2b, -2a^2b, \frac{-3}{2}a^2b$	$-a^2bc$
	$ab^2, 4ab^2$	
(b)	$2xy, -xy, 4yx$	
	$-3yz, \frac{-1}{2}zy$	
(c)	$4xy^2, -3y^2x, -7y^2x$	$-4xyz, 3x^2yz$
(d)	$p^2qr^2, 4p^2qr^2$	$p^2q^2r^2, -8p^2qr$

6. (a) In the expression $pq + r$, there are two unlike terms pq and r. So, pq + r is a binomial.

(b)–(l) Do it yourself (same as above)

7. For the 1 km, the charge will be ₹10 + ₹50

$\therefore$ For the x km, the charge will be ₹$10x$ + ₹50

So, the algebraic expression for the charge of the taxi hired for x km is $10x + 50$.

8. Total number of mangoes = Number of mangoes in 3 smaller baskets + 16 mangoes

= $3x$ + 16 mangoes

Practice Time 5E

1. (a) Putting $p = -3$, we get

$$3p - 7 = 3 \times (-3) - 7 = -9 - 7 = -16$$

(b) Putting $m = 2$, we get

$$4m + \frac{1}{2} = 4 \times 2 + \frac{1}{2} = 8 + \frac{1}{2} = \frac{17}{2}$$

(c) Putting $a = -\frac{1}{2}$ and $b = 1$, we get

$$3a - 2ab - 7 = 3\left(-\frac{1}{2}\right) - 2\left(-\frac{1}{2}\right) \times (1) - 7$$

$$= -\frac{3}{2} + 1 - 7 = -\frac{3}{2} - 6 = -\frac{15}{2}$$

$$= -\frac{15}{2}$$

(d)–(f) Do it yourself (same as above)

2. (a) Putting $x = 3$, $y = -2$,

$$x^2 - y^2 = 3^2 - (-2)^2 = 9 - 4 = 5$$

(b) Putting $x = 3$, $y = -2$, and $z = -1$

$$x^2 - y^2 - z^2 = 3^2 - (-2)^2 - (-1)^2 = 9 - 4 - 1 = 4$$

(c)–(g) Do it yourself (same as above)

3. Area of the rectangular field = $l \times b$ sq. units

Putting $l = 200$ m and $b = 160$ m, we get

Area = $l \times b$ sq units = 200 × 160 sq m

= 32000 sq. m = 32000 m^2

4. (a) Putting $a = 2^3$ cm, we get

Perimeter = $4 \times a = 4 \times 2^3 = 4 \times 8 = 32$ cm

(b) Putting $a = \frac{3}{4}$ cm, we get

Perimeter = $4 \times \frac{3}{4}$ cm = 3 cm

5. (a) Putting $\theta = 30°$, we get

Number of sides = $\frac{360°}{30°} = 12$

So, the polygon has 12 sides and hence it is a dodecagon.

(b)–(d) Do it yourself (same as above)

Practice Time 5F

1. (*a*) $2x + (-3x) + 7x = (2 - 3 + 7)x = 6x$

(*b*) $3a + 2a + (-4a) = (3 + 2 - 4)a = a$

(*c*)–(*d*) Do it yourself (same as above)

2. (*a*) $7xy - 3xy = (7 - 3)xy = 4xy$

(*b*) $-7xy - 3xy = (-7 - 3)xy = -10xy$

(*c*)–(*d*) Do it yourself (same as above)

3. (*a*) **Horizontal method**

$2x - 3y + 4y - z + 2z + x$

$= 2x + x - 3y + 4y - z + 2z$ (Rearranging like terms)

$= (2 + 1)x + (-3 + 4)y + (-1 + 2)z$

$= 3x + y + z$

Column method

$$\begin{array}{rrr} 2x & -\ 3y & \\ & 4y & -\ z \\ +\ x & & +\ 2z \\ \hline 3x & +\ y & +\ z \end{array}$$

(*b*)–(*d*) Do it yourself (same as above)

4. (*a*) **Horizontal method**

$(5a - b + 3c) - (7a + 8b - c)$

$= 5a - b + 3c - 7a - 8b + c$

$= 5a - 7a - b - 8b + 3c + c$ (Rearranging like terms)

$= (5 - 7)a + (-1 - 8)b + (3 + 1)c$

$= -2a - 9b + 4c$

Column method

$$\begin{array}{r} (5a - b + 3c) \\ (7a + 8b - c) \\ -\quad -\quad + \\ \hline -2a - 9b + 4c \end{array}$$

(*b*)–(*d*) Do it yourself (same as above)

5. Sum of $(x - 2xy + y)$ and $(3x + 2xy - 2y)$

$= (x - 2xy + y) + (3x + 2xy - 2y)$

$= (1 + 3)x + (-2 + 2)xy + (1 - 2)y = 4x - y$

Now, we will subtract $2x + y$ from $4x - y$ as

$4x - y - (2x + y) = 4x - 2x - y - y = 2x - 2y$

Therefore, the correct answer is $2x - 2y$.

6. To get the required expression, we need to subtract $(3mn - 2m + 1)$ from $(5mn + n - 2)$.

Therefore, the required expression

$(5mn + n - 2) - (3mn - 2m + 1)$

$= 5mn + n - 2 - 3mn + 2m - 1$

$= 2m + 2mn + n - 3$

7. To get the required expression, we need to subtract $(p - 2q + 6)$ from $(2p + q - 1)$

$\therefore$ $(2p + q - 1) - (p - 2q + 6) = 2p + q - 1 - p + 2q - 6$

$= p + 3q - 7$

8. (*i*) Putting $A = x - xy + y$, $B = 1 + xy$ and $C = y - x - xy$, we get

$A + B + C = (x - xy + y) + (1 + xy) + (y - x - xy)$

$= x - x - xy + xy - xy + y + y + 1$

$= -xy + 2y + 1$

(*ii*) Putting the values of A, B and C, we get

$A + B - C = (x - xy + y) + (1 + xy) - (y - x - xy)$

$= x - xy + y + 1 + xy - y + x + xy$

$= x + x - xy + xy + xy + y - y + 1$

$= 2x + xy + 1$

9. Perimeter of the triangle = Sum of lengths of its sides

$= (2x + y) + (3x - y) + (x + 3y)$

$= (2 + 3 + 1)x + (1 - 1 + 3)y = 6x + 3y$ units

10. Third side of the triangle = Perimeter – Sum of the two sides

$= (3x + 4y) - [(x + 2y) + (2x + y)]$

$= 3x + 4y - [3x + 3y] = y$ units

Mental Maths (Page 122)

1. At $x = 0$, $2x^2 + x - k = 0 + 0 - k = 5$

$\because$ $-k = 5$ (Given) $\Rightarrow k = -5$

2. Total number of orange saplings $a^2b \times ab^2 = a^3b^3$

At $a = 2$, $b = 5$,

$a^3b^3 = 2^3 \times 5^3 = 8 \times 125 = 1000$

3. At $p = -5$, $13p = 13 \times (-5) = -13 \times 5$

-13×5 is a negative number that is less than 13.

Chapter Assessment

A.

1. The required number of matchsticks $= 50 \times n = 50n$

$\therefore$ The correct answer is option (*b*).

2. $4 \times 6 = 24$

The correct answer is option (*c*).

3. Variable means that it can take different values.

$\therefore$ Correct answer is option (*a*).

4. Total number of pencils $= x + y$ pencils

The correct answer is option (*a*).

5. $-xy^2 = -1 \times x \times y \times y$

The correct answer is option (*d*).

6. "One-third of y is added to x" can be expressed as $\frac{y}{3}+x$.
The correct answer is option (*c*).

7. $3yz$ and $-5yz$ are like terms.
Therefore, the correct answer is option (*b*).

8. Putting the given values of l, m and n, we get
$(l + m + n)^2 = [3 + (-2) + 1]^2 = (3 - 2 + 1)^2$
$= 2^2 = 4$
Therefore, the correct answer is option (*a*).

9. At the given values,
$a^3 + b^3 + c^3 = 3^3 + (-2)^3 + (-1)^3 = 27 - 8 - 1 = 18$
$3abc = 3 \times 3 \times (-2) \times (-1) = 18$
Therefore, the correct answer is option (*d*).

10. The expression $2xy - x^2 + y^2$ has three unlike terms. So, it is a trinomial and hence the correct answer is option (*c*).

B.

1. Like terms are the terms having same variable factors. A is correct but R is wrong, hence the correct answer is option (*c*).
2. A binomial is a polynomial that consists of exactly two terms. A is correct and R correctly explains A. Hence, the correct answer is option (*a*).
3. At $x = 1$,
$x^3 - 2x + 1 = (1)^3 - 2(1) + 1 = 1 - 2 + 1 = 0$
Therefore, the correct answer is option (*a*).

C. (*a*) – (*v*); (*b*) – (*iii*); (*c*) – (*iv*); (*d*) – (*i*); (*e*) – (*vii*); (*f*) – (*viii*); (*g*) – (*vi*); (*h*) – (*ii*)

D.

1. (*a*) Putting $a = 2$, $b = -3$, $c = -1$ in the given expression, we get
$2a^3 - b^2 + 3abc = 2(2)^3 - (-3)^2 + 3 \times 2 \times (-3) \times (-1)$
$= 2 \times 8 - 9 + 18$
$= 16 - 9 + 18 = 25$
(*b*)–(*c*) Do it yourself (same as above)

2. The cost of 1 pen and 1 pencil = ₹x + ₹y
∴ The cost of 3 dozens and 2 dozen pencils
= 36 × ₹x + 24 × ₹y = ₹$36x$ + ₹$24y$
= ₹$(36x + 24y)$
If $x = 3$ and $y = 2$, then
$36x + 24y = 36 \times 3 + 24 \times 2 = 108 + 48 = 156$
So, the cost of 3 dozen pens and 2 dozen pencils = ₹156.

3. (*a*) 5 men + 7 women = 12 people
∴ 12 people left during the interval.
(*b*) People in the concert before the interval
$= x + 2x = 3x$
∵ 12 people left during the interval
∴ Number of people after the interval = $3x - 12$
(*c*) At $x = 700$, we have
$3x - 12 = 3 \times 700 - 12 = 2100 - 12 = 2088$

4. Sum of 1 and twice of a number $n = 1 + 2n$
If n is an odd number, then $2n$ is an even number and $2n + 1$ is an odd number.
If n is an even number, then $2n$ is an even number and $2n + 1$ is an odd number.
Therefore, $2n + 1$ is an odd number.

5. Area of the triangular lawn $= \frac{1}{2} \times y \times z \text{ m}^2 = \frac{1}{2} yz \text{ m}^2$
∴ The cost of planting the grass
$=$ ₹$x \times \frac{1}{2} yz$ = ₹$\frac{1}{2} xyz$

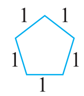
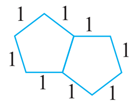
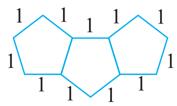
6. 5 less than twice of a number x divided by 3 = $\frac{2x}{3} - 5$
Leena added 2 to x instead of multiplying x by 2.

7. Total number of hours = $(7 + x)$ hours
∴ Money paid to Subham for $(7 + x)$ hours
= ₹50 × $(7 + x)$ = ₹$(350 + 50x)$
∴ The required algebraic expression is $50x + 350$

8. (*a*) At $n = 5$,
$$\frac{1}{2}n^2 + \frac{1}{2}n = \frac{1}{2}(5)^2 + \frac{1}{2} \times 5 = \frac{25}{2} + \frac{5}{2} = \frac{30}{2} = 15$$
∴ The sum of first 5 natural numbers = 15
(*b*) At $n = 13$,
$$\frac{1}{2}n^2 + \frac{1}{2}n = \frac{(13)^2}{2} + \frac{13}{2} = \frac{169+13}{2} = \frac{182}{2} = 91$$
At $n = 29$,
$$\frac{1}{2}n^2 + \frac{1}{2}n = \frac{1}{2} \times (29)^2 + \frac{1}{2} \times 29 = \frac{841+29}{2}$$
$$= \frac{870}{2} = 435$$
∴ The sum of natural numbers from 13 to 29
= The sum of first 29 natural numbers – The sum of first 13 natural numbers + 13
= 435 – 91 + 13 = 344 + 13 = 357

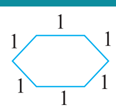
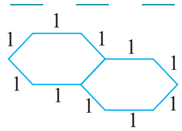
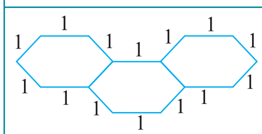
9. The perimeter of the figure
$= 2[(5x - y) + 2(x + y)] = 2[5x - y + 2x + 2y]$
$= 2[7x + y] = 14x + 2y$ units.

10. (*a*)

Pattern	Perimeter	No. of unit shapes (n)
	5	1
	8	2
	11	3

Rule → $3n + 2$

(*b*)

Pattern	Perimeter	No. of unit shapes (n)
	6	1
	10	2
	14	3

Rule → $4n + 2$

11. In the given pattern 18 red sticks and 6 blue sticks are used.

∴ Total length of the sticks = $18r + 6b$.

Maths Connect (Page 126)

(*a*) Amount of carbohydrates (in g) for x units of potatoes and y units of rajma = $22x + 60y$

(*b*) Amount of carbohydrates (in g) for $2x$ units of tomatoes and y units of apples

$= 4 \times 2x + 14 \times y = 8x + 14y$

CHAPTER 6 : SIMPLE EQUATIONS

Let's Recall

1. Binomial expressions are the expressions having two unlike terms. Following are two binomial expressions: $4x + 3$, $7pq - pr$ (Answer may vary)

2.

Terms	Irreducible Factors
$-5xy^2$	$-5, x, y, y$
$-6x^2y$	$-1, 2, 3, x, x, y$
$18xy$	$2, 3, 3, x, y$

3. The coefficient of $(-a^2)$ in $-\frac{1}{2}a^2b^3c$ is $\frac{1}{2}b^3c$.

4. (*a*) At $p = -2$, $q = -1$, we have

$$\frac{q-p}{p} = \frac{(-1)-(-2)}{(-2)} = \frac{-1+2}{-2} = -\frac{1}{2}$$

(*b*)–(*d*) Do it yourself (same as above)

5. (*a*) $3x + 4y - z + 2y - x = 3x - x + 4y + 2y - z$ (Rearranging like terms)

$= 2x + 6y - z$

(*b*) Do it yourself (same as above)

Think and Answer (Page 131)

Let the lowest mark is l, then the highest mark

$= 2l + 7$

∵ The highest mark is 18, we have

$2l + 7 = 18$

Quick Check (Page 132)

Value of Variable (x)	LHS = $\frac{x}{2} + 2$	RHS = 8	LHS = RHS Yes/No
1	$\frac{1}{2} + 2 = \frac{5}{2}$	8	$\frac{5}{2} \neq 2$, No
2	$\frac{2}{2} + 2 = 3$	8	$3 \neq 8$, No
4	$\frac{4}{2} + 2 = 4$	8	$4 \neq 8$, No
6	$\frac{6}{2} + 2 = 5$	8	$5 \neq 8$, No
8	$\frac{8}{2} + 2 = 6$	8	$6 \neq 8$, No
10	$\frac{10}{2} + 2 = 7$	8	$7 \neq 8$, No
12	$\frac{12}{2} + 2 = 8$	8	$8 \neq 8$, Yes

∴ The solution of the given equation is $x = 12$.

Practice Time 6A

1. (*a*) 8 more than number x gives 17. This can be expressed in a simple equation as

$x + 8 = 17$

(*b*)–(*e*) Do it yourself (same as above)

2. (*a*) $7 + x = 63$ can be written in statement form as "7 more than number x gives 63".

(*b*)–(*h*) Do it yourself (same as above)

3. (*a*) At $a = 2$,

$$\text{LHS} = 3a + 7 = 3 \times 2 + 7 = 13$$

And RHS = 16

$\Rightarrow$ For $a = 2$, LHS $\neq$ RHS

Hence, $a = 2$ is not the solution of the equation $3a + 7 = 15$.

(*b*) At $y = -2$, we have

$$\text{LHS} = 11 - 3y = 11 - 3 \times (-2)$$
$$= 11 + 6 = 17$$

And RHS = 17

$\therefore$ For $y = -2$, LHS = RHS

Hence, $y = -2$ is the solution of the equation $11 - 3y = 17$.

(*c*)–(*f*) Do it yourself (same as above)

4. (*a*)

Variable (x)	LHS = $5x + 2$	RHS = 17	LHS = RHS Yes/No
1	$5 \times 1 + 2 = 7$	17	LHS $\neq$ RHS, No
2	$5 \times 2 + 2 = 12$	17	LHS $\neq$ RHS, No
3	$5 \times 3 + 2 = 17$	17	LHS = RHS, Yes

$\therefore$ $x = 3$ is the solution of the equation $5x + 2 = 17$.

(*b*)–(*c*) Do it yourself (same as above)

5. (*a*) Let length of the plot be l m and breadth be b m

$\because$ Length is three times breadth, we have $l = 3b$.

$\therefore$ Perimeter $= 2 \times (l + b) = 2(3b + b) = 2 \times 4b$
$= 8b$

We are given that the perimeter of the plot is 150 m. Therefore, we have $8b = 150$.

(*b*)–(*c*) Do it yourself (same as above)

Maths Connect (Page 133)

Let x be the speed of the car (in km/h), then using

$\text{speed} = \dfrac{\text{distance}}{\text{time}}$, we get

$$x = \frac{398 - 32}{8} \qquad \Rightarrow 8x = 398 - 32$$

$$\Rightarrow \quad 8x + 32 = 398 - 32 + 32 \qquad \Rightarrow 8x + 32 = 398$$

Practice Time 6B

1. (*a*)

$$x + 7 = 12$$
$$x + 7 - 7 = 12 - 7$$

(Subtracting 7 from both sides)

$$x = 5$$

Answer check: Let's substitute $x = 5$ in the given equation.

$$\text{LHS} = x + 7 = 5 + 7 = 12 = \text{RHS}$$

Thus, LHS = RHS at $x = 7$ and hence $x = 7$ is the correct solution of the given equation.

(*b*)

$$x - 8 = 3$$
$$x - 8 + 8 = 3 + 8 \quad \text{(Adding 8 on both sides)}$$
$$\Rightarrow \quad x = 11$$

Answer check: At $x = 11$,

$$\text{LHS} = x - 8 = 11 - 8 = 3 = \text{RHS}$$

Thus, LHS = RHS and hence $x = 11$ is the solution of the given equation.

(*c*)

$$4x = 32$$
$$\frac{4x}{4} = \frac{32}{4} \quad \text{(Dividing both sides by 4)}$$
$$\Rightarrow \quad x = 8$$

Answer check: At $x = 8$,

$$\text{LHS} = 4x = 4 \times 8 = 32 = \text{RHS}$$

Thus, LHS = RHS and hence $x = 8$ is the solution of the given equation.

(*d*)

$$\frac{y}{4} = 6$$
$$\frac{y \times 4}{4} = 6 \times 4$$

(Multiplying both sides by 4)

$$\Rightarrow \quad y = 24$$

Answer check: At $y = 24$,

$$\text{LHS} = \frac{y}{4} = \frac{24}{4} = 6 = \text{RHS}$$

$$\therefore \quad \text{LHS} = \text{RHS}$$

Thus, the correct solution of the given equation is $y = 24$.

(*f*)–(*n*) Do it yourself (same as above)

Practice Time 6C

1. (*a*)

$$3x + 2 = 11$$
$$3x = 11 - 2 = 9$$

(Transposing +2 to RHS as –2)

$$x = \frac{9}{3} = 3$$

(Transposing ×3 to RHS as ÷3)

$$\therefore \quad x = 3$$

(*b*)

$$9 - 7y = 54$$
$$9 - 54 = 7y$$

(Transposing $-7y$ to RHS as $7y$ and 54 to LHS as –54) or $7y = -45$

$$y = \frac{-45}{7}$$

(Transposing ×7 to RHS as ÷ 7)

(*c*)–(*l*) Do it yourself (same as above)

2. (*a*) (*i*) $x = -2$

$\Rightarrow 4x = -8$ (Multiplying 4 on both sides)

(*ii*) $x = -2$

$\Rightarrow x + 4 = -2 + 4$ (Adding 4 on both sides)

$\Rightarrow x + 4 = 2$

(*iii*) $x = -2$

$5x = -10$ (Multiplying 5 on both sides)

$5x + 2 = -8$ (Adding 2 on both sides)

(*iv*) $x = -2$

$x - 3 = -5$ (Subtracting 3 on both sides)

(Answer may vary)

(*b*) Do it yourself (same as above)

Think and Answer (Page 140)

Let the number be x, then as per the given conditions

$$7x + 50 = 300$$

Now, subtracting 50 from both sides, we get

$$7x = 250$$

Dividing both sides by 7, we get

$$x = \frac{250}{7}$$

Hence, the required number is $\frac{250}{7}$.

Practice Time 6D

1. Let the number be x, then according to the given condition, we get

$4x - 7 = 29$

$4x = 36$ (Transposing –7 to RHS)

$x = 9$ (Transposing ×4 to RHS

∴ The required number is 9.

2. Let the number be x, then according to the given condition,

$9x = x + 16$

$8x = 16$ (Subtracting x on both sides)

$\Rightarrow x = 2$ (Dividing both sides by 8)

∴ The required number is 2.

3. Do it yourself, same as Q1.

4. Let the consecutive multiples of 5 be $5x$ and $5(x + 1)$, then according to the given condition, we have

$5x + 5(x + 1) = 75$

$\Rightarrow x + (x + 1) = 15$ (Dividing both sides by 5)

$\Rightarrow 2x + 1 = 15$

$\Rightarrow x = \frac{14}{2} = 7$

$\therefore 5x = 5 \times 7 = 35$

and $5(x + 1) = 5 \times 8 = 40$

Hence, the required consecutive multiples are 35 and 40.

5. Let the breadth of the rectangle be x cm, then its length = $2x$ cm.

Since the perimeter is given as 48 cm, we have

$2(x + 2x) = 48 \Rightarrow 6x = 48$

$\Rightarrow x = \frac{48}{6} = 8$

∴ The length of the rectangle = $2x$ cm = 2×8 = 16 cm

The breadth of the rectangle = x cm = 8 cm.

6. Let the number of boys be x, then number of girls $= \frac{x}{3}$

Since total number of students is 48, we have

$x + \frac{x}{3} = 48$

$\Rightarrow 3x + x = 144$

(Multiplying both sides by 3)

$\Rightarrow 4x = 144$

$\Rightarrow x = \frac{144}{4} = 36$

∴ The number of boys in the class is 36.

7. Let the number be x, then according to the given conditions we have,

$\frac{x}{5} + \frac{x}{2} = x - 9 \Rightarrow \frac{2x + 5x}{10} = x - 9$

$\Rightarrow 7x = 10x - 90$

(Transposing ÷10 to RHS)

$\Rightarrow 90 = 10x - 7x$

(Transposing $7x$ to RHS and –90 to RHS)

or $3x = 90 \Rightarrow x = \frac{90}{3} = 30$

∴ The required number is 30.

8. Let the number be x, then

Thrice the number decreased by 5 = $3x - 5$

Twice the number = $2x$

$\therefore$ As per given condition, we have

$$3x - 5 = 2x + 1$$

$$\Rightarrow \quad 3x - 2x = 1 + 5$$

(Transposing $2x$ to LHS and -5 to RHS)

$$\Rightarrow \quad x = 6$$

$\therefore$ The required number is 6.

9. Do it yourself, same as Q8.

10. Let Rohan's age be x years, then his father's age $= 3x + 9$ years.

Since Rohan's father's age is 54 years, we have

$$3x + 9 = 54$$

$$\Rightarrow \quad 3x = 54 - 9 = 45$$

$$\Rightarrow \quad x = \frac{45}{3} = 15$$

$\therefore$ Rohan's age = 15 years.

11. Let the numerator of the fraction be x, then its denominator = $3x$.

According to the given condition, we have

$$\frac{x-4}{3x-4} = \frac{1}{5}$$

On multiplying

$$5(x - 4) = 3x - 4 \quad \text{or} \quad 5x - 20 = 3x - 4$$

$$\Rightarrow \quad 5x - 3x = 20 - 4$$

$$2x = 16$$

$$\Rightarrow \quad x = \frac{16}{2} = 8$$

$\therefore$ Numerator = 8, denominator = $3 \times 8 = 24$

The fraction is $\frac{8}{24}$ or $\frac{1}{3}$.

12. Let the number of 5-rupee coins be n, then

Number of two-rupee coins = 2n

Number of 1-rupee coins = 2(2n) = 4n

Now, the value of the total 5-rupee coins = 5n

the value of the total 2-rupee coins = $2 \times 2n$
$= 4n$

the value of the total 1-rupee coins
$= 1 \times (4n) = 4n$

Therefore, according to the given condition, we have

$$5n + 4n + 4n = 780 \quad \Rightarrow \quad 13n = 780$$

$$\Rightarrow \quad n = \frac{780}{13} = 60$$

So, $2n = 120$, and $4n = 240$

Thus, there are 240 one-rupee coins, 120 two-rupee coins, and 60 five-rupee coins.

Brain Sizzlers (Page 141)

Let the unit place digit of the original number be x, then tens place digit = $2x$

So, the number is $10(2x) + x = 20x + x = 21x$

The number by reversing the digits is

$$10(x) + 2x = 10x + 2x = 12x$$

According to the given condition,

$$21x - 27 = 12x \quad \Rightarrow \quad 21x - 12x = 27$$

$$\Rightarrow \quad 9x = 27 \quad \Rightarrow \quad x = 3$$

Tens digit = 2(3) = 6.

So, the required number is 63.

Life Skills (Page 142)

Let the number of girls be x, then number of boys = $x + 3$

So, the number of trees planted by the girls = $3x$

Number of tree planted by the boys = $4(x + 3)$
$= 4x + 12$

According to the given condition, we have

$$4x + 12 + 3x = 306 \quad \Rightarrow \quad 7x + 12 = 306$$

$$7x = 294$$

$$x = \frac{294}{7} = 42$$

Number of boys = $x + 3 = 42 + 3 = 45$

Therefore, total number of students

$= x + x + 3 = 2x + 3$

$= 2 \times 42 + 3 = 84 + 3 = 87$

Chapter Assessment

A.

1. $$4x + 3 = 19$$

$$4x = 19 - 3 = 16$$

(Subtracting 3 from both sides)

$$2x = 8$$

$\therefore$ The correct answer is option (d).

2. $$31 = 0.0093$$

$$\Rightarrow \quad x = \frac{0.0093}{31} = 0.0003$$

$\therefore$ The correct answer is option (b).

3. $3 + x = 8$

Substituting $x = 5$, we get

$$\text{LHS} = 3 + 5 = 8 = \text{RHS}$$

$\therefore$ The correct answer is option (d).

4. p exceeds 4 by 9 $\Rightarrow p - 4 = 9$

$\therefore$ The correct answer is option (c).

5. Let the number be x, then

$$6(7 + x) = 48x \quad \Rightarrow 42 + 6x = 48x$$

$$\Rightarrow \quad 42 = 48x - 6x = 42x$$

or $$4x = 42 \quad \Rightarrow x = \frac{42}{42} = 1$$

$\therefore$ The correct answer is option (a).

6. $2(x + 9) = 8$

$$x + 9 = 4 \quad \Rightarrow x + 10 = 5$$

$\therefore$ The correct answer is option (c).

B.

1. $2x - 3 = 9$ is an equation as two mathematical statements are connected by '=' sign.

Hence, the correct answer is option (a).

2. $6x = 1 \quad \Rightarrow \frac{6x}{6} = \frac{1}{6} \Rightarrow x = \frac{1}{6}$

So, the solution of $6x = 1$ is $x = \frac{1}{6}$ which is a fraction not a whole number.

Hence, the correct answer is option (a).

3. Putting $x = 2$, we get

$$\text{LHS} = 2x - 3 = 2 \times 2 - 3 = 1$$

$$\text{RHS} = k$$

If $x = 2$ is a solution, then

$$\text{LHS} = \text{RHS} \quad \Rightarrow k = 1$$

Thus, the correct answer is option (a).

C. (a) – (iv); (b) – (i); (c) – (v); (d) – (ii); (e) – (iii)

D.

1. Let the missing number be y, then

$$2 \times (-4) + y = 11 \quad \Rightarrow y = 11 + 8 = 19$$

$\therefore$ $2x + 19 = 11$ has the solution -4.

2. $7x + 4 = 25 \quad \Rightarrow 7x = 21 \quad \Rightarrow \quad x = 3$

$\therefore$ If $7x + 4 = 25$, then x is equal to 3.

3. $k + 7 = 16 \quad \Rightarrow k = 9$

$$\Rightarrow \quad 8(9) - 72 = 0 \quad \Rightarrow 72 - 72 = 0$$

Hence, the value of $8k - 72$ is 0.

4. Let the number be x, then

$$x - 10 = 65 \quad \Rightarrow x = 75$$

$\therefore$ The number is 75.

5. $ax + b = 0 \quad \Rightarrow ax = -b \quad \Rightarrow x = -\frac{b}{a}$

$\therefore$ The solution of the equation $ax + b = 0$ is $x = -\frac{b}{a}$

E.

1. (a) Total number of prizes = 30

Number of 1st prizes = x

$\therefore$ Number of 2nd prizes = $30 - x$

(b) Value of the x first prizes = ₹$2000x$

Value of the $(30 - x)$ 2nd prizes = ₹$1000(30 - x)$

$\therefore$ The total value of the prizes

= ₹$2000x$ + ₹$1000(30 - x)$

(c) The total value of the prizes is given as ₹52000

Therefore, the equation formed is

₹$2000x$ + ₹$1000(30 - x)$ = ₹52000

or $2000x + 30000 - 1000x = 52000$

or $1000x + 30000 = 52000$

(d) $1000x + 30000 = 52000$

$$\Rightarrow \quad 1000x = 22000$$

$$\Rightarrow \quad x = 22$$

$\therefore$ The solution of the equation is $x = 22$.

(e) The number of first prizes = $x = 22$

The number of second prizes

$$= 30 - x = 30 - 22 = 8$$

2. Let the present age of Mansi is x years, then her age after 18 years = $18 + x$

4 years ago her age was $(x - 4)$

According to the given condition,

$$3(x - 4) = x + 18 \Rightarrow 3x - 12 = x + 18$$

$$3x - x = 18 + 12$$

$$2x = 30 \quad \Rightarrow x = \frac{30}{2} = 15$$

$\therefore$ The present age of Mansi is 15 years.

3. Let the breadth of the rectangle be x m, then its length = $(2 + x)$ m

$\therefore$ Area of the rectangle = $x(2 + x)\text{ m}^2$

Now, if the length is increased by 3 m and breadth is decreased by 2m, its new area will be

$(2 + x + 3) \times (x - 2)\text{m}^2 = (x + 5)(x - 2)\text{m}^2$

According to the given condition,

$$x(x + 2) = (x + 5)(x - 2)$$

$$\Rightarrow \quad x^2 + 2x = x^2 - 2x + 5x - 10$$

$$\Rightarrow x^2 + 2x - x^2 + 2x - 5x = -10$$

$\Rightarrow$ $-x = -10$ $\Rightarrow$ $x = 10$

$\therefore$ Length of the rectangle

$= (x + 2)\text{m} = (10 + 2)\text{m} = 12 \text{ m}$

Breadth of the rectangle = x m = 10 m

4. Let the total amount Pihu's father donated was ₹x, then according to the given conditions

$$\frac{1}{3}x + \frac{1}{4}\left(\frac{2}{3}x\right) + 24000 = x$$

$$\Rightarrow \quad \frac{x}{3} + \frac{x}{6} + 24000 = x$$

$$\Rightarrow \quad x - \frac{x}{3} - \frac{x}{6} = 24000$$

$$\Rightarrow \quad \frac{x}{2} = 24000$$

$$\Rightarrow \quad x = 48000$$

$\therefore$ The amount that Pihu's father donates is ₹48,000.

5. Let the interest received by Suresh is ₹x, then the interest received by Dinesh = ₹x + ₹950

According to the given condition,

$$x + x + 950 = 1800$$

$$\Rightarrow \quad 2x + 950 = 1800$$

$$2x = 1800 - 950 = 850$$

$$\Rightarrow \quad x = \frac{850}{2} = 425$$

$\therefore$ The interest received by Suresh is ₹425.

6. Let Sonam had x chocolates, then the number of chocolates Rehana had = $2x$.

After giving 5 chocolates to her brother the number of chocolates Rehana had = $2x - 5$.

According to the given condition,

$$x = 3(2x - 5) \quad \Rightarrow \quad x = 6x - 15$$

$$15 = 5x \qquad \text{or} \quad 5x = 15$$

$$x = 3$$

$\therefore$ Sonam had 3 chocolates.

7. Given that

$$\triangle\triangle\triangle = \bullet\bullet\bullet{*}{*}{*} \text{ and } \bullet\bullet{*}{*} = \triangle\triangle$$

$$\Rightarrow \quad \triangle = \bullet{*}$$

Also given that

$$\bullet\bullet\triangle\triangle = {*}{*}{*}{*}{*}$$

Substituting $\triangle = \bullet{*}$

$$\bullet\bullet\bullet\bullet{*}{*} = {*}{*}{*}{*}{*}$$

$$\Rightarrow \quad \bullet\bullet\bullet\bullet = {*}{*}{*}$$

$\because$ $\bullet = 4$, we have

$$4 + 4 + 4 + 4 = {*}{*}{*}$$

$$16 = {*}{*}{*} \qquad \Rightarrow \quad {*} = \frac{16}{3}$$

$\because$ $\triangle = \bullet{*}$

Substituting the values, we get

$$\triangle = 4 + \frac{16}{3} = \frac{28}{3}$$

$$\therefore \quad \triangle = \frac{28}{3}, {*} = \frac{16}{3}$$

8. When a scale is balanced, left side of the weight is equal to the right side of the weight. Observing the given scale, it is clear that

Total weight of the two triangles = Weight of the square 1 + weight of I + weight of a circle + weight of a square 2 + weight of *

$\Rightarrow$ 40 kg = weight of the square 1 + 14 kg + weight of the circle + weight of the square 2 + 4 kg...(1)

Now, comparing weights on the second level scale on the right side, we have

Weight of the square 1 + 14 kg = weight of the circle + weight of the square 2 + 4kg ...(2)

From equation (1) and (2), we get

Weight of the square 1 + 14 kg = 20 kg

$\Rightarrow$ Weight of the square 1 = (20 – 14) kg = 6 kg

Also, comparing the third level balance on the right side, we get

Weight of the circle = 10 kg

Weight of the square 2 + 4 kg = 10 kg

$\Rightarrow$ Weight of the square 2 = 6 kg

Hence, weight of square 2 = 6 kg, weight circle = 10 kg

9. (*a*) Let Pihu's present age is x years, then according to condition I,

Mrs. Sharma's age = $5x$ years

6 years later Pihu's age = $x + 6$ years

6 years later Mrs. Sharma's age = $5x + 6$ years

As per the given condition,

$$5x + 6 = 3(x + 6)$$

$$\Rightarrow \quad 5x + 6 = 3x + 18$$

$$5x - 3x = 18 - 6$$

$$2x = 12$$

$$x = \frac{12}{2} = 6$$

$$\therefore \quad 5x = 5 \times 6 = 30$$

Hence, Mrs. Sharma's present age is 30 years.

(*b*) According to condition II,

Mr. Sharma's present age = 8 years + Mrs. Sharma's age

$$= (8 + 30) \text{ years}$$
$$= 38 \text{ years}$$

(*c*) Let Mr. Dinesh's age is y years, then according to condition III, we have

Dadaji's present age = $30 + y$ years

In two years Mr. Dinesh's age = $2 + y$ years

In two years Dadaji's age = $(30 + y) + 2$ years

According to the given condition,

$$(30 + y) + 2 = 2(2 + y)$$
$$\Rightarrow \quad 32 + y = 4 + 2y$$
$$32 - 4 = 2y - y \quad \text{or} \quad y = 28$$

Dada ji's is present age = $30 + y = 30 + 28$

$$= 58 \text{ years}$$

Mr. Dinesh's present age is 28 years.

CHAPTER 7 : LINES AND ANGLES

Let's Recall

1. (*a*) A line segment has two end points. Therefore, the correct answer is option (*iii*).
   (*b*) A line segment has two end points, so it has a definite length. Therefore, the correct answer is option (*ii*).
   (*c*) A line segment PQ is denoted by $\overline{PQ}$. Therefore, the correct answer is option (*iii*).
2. (*a*) There are three points A, B and C on the given line.
   (*b*) There are three line segments on the given line, namely $\overline{CA}$, $\overline{AB}$ and $\overline{CB}$.
3. Do it yourself.
4. Do it yourself.

Quick Check (Page 149)

Do it yourself.

Think and Answer (Page 151)

1. Yes, two acute angles can be complement of each other. For example, $60° + 30° = 90°$.
2. No, because the measure of an obtuse angle is always greater than 90° and hence sum of any two obtuse angle will always be greater than 90°.
3. No, because measure of a right angle is 90° and hence sum of two right angles is greater than 90°.

Think and Answer (Page 152)

The measure of the angle formed between south-east to the south-west is

$$45° + 45° = 90°$$

The measure of related angle formed between south-west to north-west is

$$45° + 45° = 90° \qquad \because 90° + 90° = 180°$$

$\therefore$ The angles between south-east to south-west and the angle between south-west to north-west makes supplementary angle.

Practice Time 7A

1. (*a*) $63° + 117° = 180°$
   Therefore, 63° and 117° are supplementary angles
   (*b*) $59° + 31° = 90°$
   Therefore, 59° and 31° are complementary angles.
   (*c*)–(*f*) Do it yourself (same as above)
2. (*a*) $90° - 22° = 68°$
   Therefore, complementary angle of 22° is 68°.
   (*b*)–(*d*) Do it yourself (same as above)
3. (*a*) $180° - 83° = 97°$
   Therefore, the supplementary angle of 83° is 97°.
   (*b*)–(*d*) Do it yourself (same as above)
4. Do it yourself.
5. Let the measure of one angle be $x°$ and the other angle be $3x°$.
   Since the angles are complementary, we have
   $$x + 3x = 90 \quad \Rightarrow 4x = 90$$
   $$\Rightarrow \quad x = \frac{90}{4} = 22.5$$
   Therefore, the angles are
   $$x = 22.5° \text{ and } 3x = 3 \times 22.5° = 67.5°.$$
6. Let the measure of the smaller angle be $x°$, then the measure of the larger angle = $(24 + x)°$.
   Since the angles are supplementary, we have
   $$(x + 24) + x = 180 \quad \Rightarrow 2x + 24 = 180$$
   $$\Rightarrow \quad 2x = 180 - 24 = 156$$

$$\Rightarrow \qquad x = \frac{156}{2} = 78$$

$$\therefore \qquad x + 24 = 78 + 24 = 102$$

Therefore, the measures of the required angles are 78° and 102°.

7. Let the measure of the angle be $x°$.

Since the angle is two-third of its complement, its complement will be $\frac{3}{2}x°$

Since the angles are complementary, we have

$$x + \frac{3}{2}x = 90° \quad \Rightarrow \quad \frac{5}{2}x = 90$$

$$\Rightarrow \qquad x = \frac{2 \times 90}{5} = 36$$

Therefore, the required angle is 36°.

8. Let the angle be $x°$, then

its supplement = $(180 - x)°$

its complement = $(90 - x)°$

According to the given condition,

$$\frac{1}{3}(180 - x) = 10 + (90 - x)$$

$$\Rightarrow \qquad 180 - x = 30 + 270 - 3x$$

$$\Rightarrow \qquad 3x - x = 270 + 30 - 180$$

$$\Rightarrow \qquad 2x = 120 \qquad \Rightarrow \qquad x = 60$$

Therefore, the required angle is 60°.

9. (*a*) In the given figure, the sum of all the three angles is 90°. Therefore, we have

$$x + 3° + x - 1° + x + 1° = 90°$$

$$\Rightarrow \qquad 3x + 3° = 90°$$

$$\Rightarrow \qquad x = \frac{90° - 3°}{3} = 29°$$

(*b*) The sum of all the three angles is 180°. Therefore, we have

$$8x + 7x + 22° + 3x - 4° = 180°$$

$$\Rightarrow \qquad 18x + 18° = 180°$$

$$\Rightarrow \qquad x = \frac{180° - 18°}{18} = 9°$$

10. In the given figure,

$$\angle XYZ + \angle ZYP = 180°$$

$$\Rightarrow \qquad \angle ZYP = 180° - \angle XYZ$$

$$= 180° - 64° = 116°$$

Now, $\angle ZYQ = \frac{\angle ZYP}{2} = \frac{116°}{2} = 58°$

($\because$ YQ bisects $\angle ZYP$)

$$\therefore \qquad \angle XYQ = \angle XYZ + \angle ZYQ$$

$$= 64° + 58° = 122°$$

Also, reflex $\angle QYP = 360° - \angle QYP$

$= 360° - \angle ZYQ$

($\because$ YQ bisects $\angle ZYQ$)

$= 360° - 58°$

$= 302°$

Quick Check (Page 155)

A line that intersects two or more lines at distinct points is called a transversal. In the given figure the line *p* intersects both the lines at same point. Therefore, *p* is not a transversal.

Quick Check (Page 156)

(*a*) $\angle 1$ and $\angle 2$ are on the same side of the transversal and in corresponding positions to the lines. So, $\angle 1$ and $\angle 2$ are corresponding angles.

(*b*) $\angle 3$ and $\angle 4$ are on opposite sides of the transversal and are located between the two lines. Therefore, $\angle 3$ and $\angle 4$ are alternate interior angles.

(*c*) $\angle 5$ and $\angle 6$ are the pair of interior angles on the same side of the transversal.

(*d*) Same as part (*a*) $\angle 7$ and $\angle 8$ are corresponding angles.

(*e*) Same as part (*b*) $\angle 9$ and $\angle 10$ are alternate interior angles.

(*f*) $\angle 11$ and $\angle 12$ are linear pair of angles as they form 180° angles on the line.

Practice Time 7B

1. (*a*) $\angle 1$ and $\angle 2$ have common vertex and a common arm between them, so $\angle 1$ and $\angle 2$ are adjacent angles.

(*b*)–(*f*) Do it yourself (same as above)

2. (*a*) $\angle BEF + \angle CFE = 60° + 120° = 180°$

So, the pair of interior angles on the same side of the transversal are supplementary. Therefore, lines AB and CD are parallel.

(*b*) $\angle EFC = 180° - 70° = 110°$

$\therefore$ $\angle PEA = \angle EFC = 110°$

So, the pair of corresponding angles are equal and hence lines AB and CD are parallel.

3. Do it yourself.

4. In the given figure, EF || CD, so

$\angle CEF + \angle ECD = 180°$ (Sum of interior angles on the same side)

$\therefore \quad 130° + \angle ECD = 180°$

$\Rightarrow \quad \angle ECD = 180° - 130° = 50°$

Now, AB || CD, so

$\angle ABC = \angle BCD$ (Alternate interior angles)

$\Rightarrow \quad \angle ABC = x + 50°$

$\Rightarrow \quad x = 70 - 50 = 20°$

Therefore, $x = 20°$.

5. In the given figure, AB || CD, therefore

$\angle x = 45°$ (Alternate interior angles)

$\angle y = 35°$ (Alternate interior angles)

$\because \quad \angle x + \angle y + \angle z = 180°$ (Linear angles)

$\Rightarrow \quad \angle z = 180° - (\angle x + \angle y)$

$= 180° - (45° + 35°)$

$= 180° - 80° = 100°$

Thus, $\angle x = 45°$, $\angle y = 35°$, $\angle z = 100°$.

6. $\angle a = 132°$ (Corresponding angles)

$\angle b = 132°$ (Vertically opposite angles)

$\therefore \quad 2a + b = 2 \times 132° + 132° = 396°$

7. $\angle x + 120° = 180°$ (Linear pairs)

$\Rightarrow \quad \angle x = 180° - 120° = 60°$

$\Rightarrow \quad \angle x + \angle y = 180° = \angle x + \angle z$

(Sum of interior angles)

$\Rightarrow \quad 2\angle x + \angle y + \angle z = 360°$

$\Rightarrow \quad 120° + \angle y + \angle z = 360°$ $(\because \angle x = 60°)$

$\angle y + \angle z = 360° - 120° = 240°$

$\therefore \quad \angle x + \angle y + \angle z = 60° + (\angle y + \angle z)$

$= 60° + 240° = 300°$

Therefore, $x + y + z = 300°$.

8. $\angle AGE + \angle EGB = 180°$ (Linear pair)

$\Rightarrow \quad \angle AGE = 180° - \angle EGB$

$= 180° - (2x + 4)°$

$= 176° - 2x°$

$\because$ AB || CD, $\angle AGE = \angle GHC$ (Corresponding angles)

$\Rightarrow \quad 4x - 10 = 176 - 2x$

$\Rightarrow \quad 6x = 186$

$x = \frac{186}{6} = 31$

$\therefore \quad \angle AGE = 176° - 2x°$

$= 176° - 2 \times 31°$

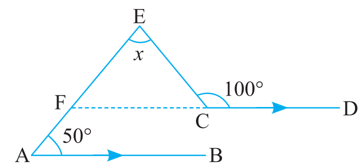
$= 176° - 62° = 114°$

$\angle GHD = 180° - \angle CHG$ (Linear pair)

$\Rightarrow \quad \angle GHD = 180° - (4 \times 31° - 10°)$

$= 180° - 114° = 66°$

9. (*a*) Let us produce CD towards AE such that it intersects AE at F.



$\angle EFC = \angle FAB = 50°$ (Corresponding angles)

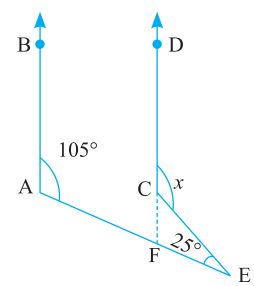
Now, $\angle FCE = 180° - 100° = 80°$ (Linear pair)

$\angle EFC + \angle FEC + \angle FCE = 180°$ (Angles of a triangle)

$\Rightarrow \quad 50° + x + 80° = 180°$

$\Rightarrow \quad x = 180° - 50° - 80° = 50°$

(*b*) Produce DC towards AE such that it intersects AE at F.



$\angle CFE = \angle BAE$ (Corresponding angles)

$\Rightarrow \quad \angle CFE = 105°$

Now, $\angle FCE + \angle CEF + \angle EFC = 180°$ (Angles of a triangle)

$\Rightarrow \quad \angle FCE = 180° - \angle CEF - \angle EFC$

$= 180° - 25° - 105° = 50°$

Again,

$\angle x + \angle FCE = 180°$ (Linear pair)

$\therefore \quad \angle x = 180° - \angle FCE$

$= 180° - 50° = 130°$

10. (*a*) $\angle z = 90°$ (Alternate interior angles)

$\angle y + \angle z + 30° = 180°$ (Straight angle)

$\Rightarrow \quad \angle y = 180° - 30° - \angle z$
$= 180° - 30° - 90° = 60°$

Now,

$\angle x + \angle y + 90° = 180°$ (Angles of a triangle)

$\Rightarrow \quad \angle x = 180° - 90° - \angle y$
$= 180° - 90° - 60° = 30°$

(*b*) $\angle PRQ = \angle z$

(Alternate interior angles)

$\Rightarrow \quad \angle z = 50°$

Now,

$50° + 40° + \angle y = 180°$(Angles of a triangle)

$\Rightarrow \quad \angle y = 180° - 50° - 40° = 90°$

Also

$\angle x + \angle y + \angle z = 180°$ (Straight angle)

$\Rightarrow \quad \angle x = 180° - \angle y - \angle z$
$= 180° - 90° - 50° = 40°$

Therefore, $x = 40°$, $y = 90°$ and $z = 50°$

(*c*) $\angle x + 130° = 180°$

(Interior angles on the same side)

$\Rightarrow \quad \angle x = 180° - 130° = 50°$

$\angle z + 70° = 180°$

(Interior angles on the same side

$\Rightarrow \quad \angle z = 180° - 70° = 110°$

$\angle(y + z) = 130°$

(Alternate interior angles)

$\Rightarrow \quad \angle y + \angle z = 130°$

$\angle y = 130° - \angle z$
$= 130° - 110° = 20°$

Therefore, $x = 50°$, $y = 20°$ and $z = 110°$

(*d*) $\angle x + 80° = 180°$

(Interior angles on the same side)

$\Rightarrow \quad \angle x = 180° - 80° = 100°$

Next,

$\angle y + 90° + 30° = 180°$ (Angles of a triangle)

$\Rightarrow \quad \angle y = 180° - 90° - 30° = 60°$

Next,

$\angle y + \angle z + 80° = 180°$ (Straight angle)

$\Rightarrow \quad \angle z = 180° - \angle y - 80°$
$= 180° - 60° - 80° = 40°$

Therefore, $x = 100°$, $y = 60°$ and $z = 40°$

Brain Sizzlers (Page 162)

Let the one of the interior angles be $x°$, then the other interior angle $= (x + 20)°$.

We know that the sum of interior angles on the same side of a transversal of a pair of parallel lines.

$\therefore \quad x + x + 20 = 180$

$\Rightarrow \quad 2x = 180 - 20 = 160$

$\Rightarrow \quad x = \frac{160}{2} = 80$

Thus, the angles are 80° and 100°.

Chapter Assessment

A.

1. Let the angle x, then by the given condition, we have

$2x = 3(180° - x)$

$\Rightarrow \quad 2x = 540° - 3x$

$\Rightarrow \quad 5x = 540° \quad$ or $\quad x = \frac{540°}{5} = 108°$

$\therefore$ The correct option is (*b*).

2. Let the angle be x, then as per the given condition,

$(180° - x) = 3(90° - x)$

$\Rightarrow \quad 180° - x = 270° - 3x$

$\Rightarrow \quad 3x - x = 270° - 180°$

$\Rightarrow \quad 2x = 90° \quad \Rightarrow \quad x = \frac{90°}{2} = 45°$

$\therefore$ The correct option is (*c*).

3. Let one angle is x, then as per the given condition,

$x + 60° = 2(180° - x)$

$\Rightarrow \quad x + 60° = 360° - 2x$

or $\quad 3x = 360° - 60° = 300°$

$\Rightarrow \quad x = \frac{300°}{3} = 100°$

So, the supplementary angles are 100° and 80° and the greater angle is 100°

$\therefore$ The correct option is (*a*).

4. All the given options are correct except $\angle 4 = \angle 8$

$\angle 4 = \angle 2$ (corresponding angles)

But $\quad \angle 8 = 180° - \angle 2 \neq \angle 2$

$\therefore$ $\angle 4 \neq \angle 2$ by the given information.

$\therefore$ The correct option is (*d*).

B.

1. By the definition of supplementary angles, both the assertion and reason are true and reason is the correct explanation.

Thus, the correct option is (*a*).

2. Both the assertion and reason are correct, but reason is not the correct explanation for the fact. Thus, the correct option is (*b*).

3. $\angle A + \angle B = x + 10° + x - 10° = 2x$

$\because$ $\angle A$ and $\angle B$ are supplementary, then

$$2x = 180° \quad \Rightarrow x = 90°$$

$\therefore$ $\angle A = 90° + 10 = 100°$

and $\angle B = 90° - 10° = 80°$

Also, in the reason part

$$x - 10° + 190° - x = 180°$$

So, both the angles are supplementary but reason is not the correct explanation for the assertion. Thus, the correct option is (*b*).

C. (*a*) – (*ii*); (*b*) – (*iv*); (*c*) – (*v*); (*d*) – (*i*); (*e*) – (*iii*)

D.

1. Parallel lines.
2. Arm, Interior points.
3. $x + (90° - x) = 90°$. So, these angles are complementary.
4. $60° + 120° = 180°$, also $60°$ is half of $120°$. Therefore, the angle that is half of its supplement is of $60°$.
5. Sum of interior angles on the same side of a transversal is $180°$.

E.

1. Let the magnitude of the angles be $3x$ and $5x$.

According to the given condition,

$$3x + 30° + 5x + 30° = 180°$$
$$\Rightarrow \quad 8x + 60° = 180°$$
$$8x = 180° - 60° = 120°$$
$$x = \frac{120°}{8} = 15°$$

Therefore, $3x = 3 \times 15° = 45°$, $5x = 5 \times 15° = 75°$

Thus, the measure of the angles are $45°$ and $75°$.

2. Since $\angle A$ and $\angle B$ are supplementary, we have

$$\angle A + \angle B = 180°$$
$$\Rightarrow \quad (2x + 5°) + (x - 5°) = 180°$$
$$2x + 5° + x - 5° = 180°$$
$$3x = 180°$$
$$x = \frac{180°}{3} = 60°$$

Therefore, $\angle A = 2x + 5° = 2 \times 60 + 5° = 125°$

$\angle B = x - 5 = 60° - 5 = 55°$

3. Let the measure of the one angle be x, then the other angle is $x + 30°$.

According to the given condition,

$$x + x + 30° = 52°$$
$$\Rightarrow \quad 2x + 30° = 52°$$
$$2x = 52° - 30° = 22°$$
$$x = \frac{22°}{2} = 11°$$
$$\Rightarrow \quad x + 30° = 11° + 30 = 41°$$

Thus, the measures of the angles are $11°$ and $41°$.

4. Let the measure of the angle be x.

Then, its complement $= 90° - x$, and its supplement $= 180° - x$

According to the given condition,

$$90° - x = \frac{2}{5}(180° - x)$$
$$\Rightarrow \quad 450° - 5x = 360° - 2x$$
$$\Rightarrow \quad 450° - 360° = 5x - 2x \quad \text{or} \quad 3x = 90°$$
$$x = \frac{90°}{3} = 30°$$

Thus, the measure of the angle is $30°$.

5. Since the measure of the angles are consecutive odd integers.

Let the angles are $2x + 1°$ and $2x + 3°$.

Also, since the angles are supplementary, we have

$$2x + 1° + 2x + 3° = 180°$$
$$\Rightarrow \quad 4x = 180° - 4° = 176°$$
$$\Rightarrow \quad x = \frac{176°}{4} = 44°$$

Therefore, $2x + 1° = 2 \times 44° + 1 = 89°$

$2x + 3° = 2 \times 44° + 3 = 91°$

Thus, the measure of the angles are $89°$ and $91°$.

6. In the given figure,

$\angle GFB = \angle HGD = 54°$ (Corresponding angles)

$\angle AFE = \angle GFB = 54°$ (Vertically opposite angles)

7. (*a*) In the given figure, the angle between *b* and *c* is vertically opposite to the angle marked as $30°$. Since vertically opposite angles are equal in measures, the angle between *b* and *c* is $30°$.

(*b*) The angle between *d* and *e*, and the angle marked as $75°$ are the pair of interior angles on the same side of transversal *e*. Therefore, these are supplementary angles, and hence the angle between *d* and *e* is $180° - 75° = 105°$.

(*c*) The angle between d and f, and d and e are the pair of interior angles on the same side of transversal d. Therefore, these are supplementary angles, and hence the angle between d and f is $180° – 105° = 75°$.

(*d*) The angle between c and f and the angle marked as 75° are alternate interior angles and hence have equal measures. Therefore, the angle between c and f is 75°.

8. Since $c \parallel f$, $\angle x$ and $\angle(180° – 120°)$ are alternate interior angles,

$$\angle x = 180° – 120° = 60°$$

Since $d \parallel a$, $\angle x$ and $\angle(180° – y)$ are alternate interior angles, so

$$60° = 180° – \angle y$$

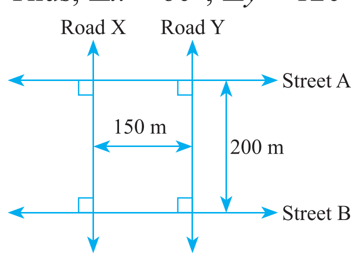
$$\Rightarrow \quad \angle y = 180° – 60° = 120°$$

Since $a \parallel d$, $\angle z$ and the vertically opposite angle of 120° marked angle are pair of interior angles on the same side of the transversal f, and hence

$$\angle z = 180° – 120° = 60°$$

Thus, $\angle x = 60°$, $\angle y = 120°$ and $\angle z = 60°$.

9.



(*a*) The short distance to street B will be the perpendicular distance between street A and street B, that is 200 m.

(*b*) Do it yourself.

(*c*) Since the angles formed between street A and road Y are all right angles, the angles formed between street B and road Y also be all right angles because A || B.

Therefore, the corresponding and alternate interior angles will also be of 90°.

UNIT TEST – 2

A.

1. Let the angle be x, then

$$2x = 90° – x \qquad \Rightarrow \quad 3x = 90°$$

$$x = \frac{90°}{3} = 30°$$

Thus, the correct option is (*a*).

2. $1350 = 2 \times 3 \times 3 \times 3 \times 5 \times 5 = 2 \times 3^3 \times 5^2$

Thus, the correct option is (*b*).

3. The distance covered by Kamal is 135 steps

$$= 135 \times y \text{ cm} = 135y \text{ cm}$$

Thus, the correct option is (*d*).

4. $$x = y \text{ and } x + y = 180°$$

$$\Rightarrow \quad 2x = 180° \quad \text{or} \quad x = 90°$$

So, $x + 30° = 90° + 30° = 120°$

Thus, the correct option is (*b*).

5. The required number $= \dfrac{4^6}{(-2)^4} = \dfrac{(2^2)^6}{2^4} = 2^{12-4}$

$$= 2^8 = 256$$

Thus, the correct option is (*b*).

6. $(x – 20°) + (200° – x) = 200° – 20° = 180°$

Thus, the correct option is (*a*).

7. Twice of 19 = 38, sum of y and $z = y + z$

So, the given statement can be represented as

$y + z – 38$

Thus, the correct option is (*d*).

8. $$\frac{3^2 \times x^5 \times 5y^2}{225x^3y} = \frac{9 \times 5 \times x^5 \times y^2}{225 \times x^3 \times y} = \frac{1}{5} \times x^{5-3} \times y^{2-1}$$

$$= \frac{x^2y}{5}$$

The correct option is (*b*).

9. Both the assertion and reason are correct and reason is the correct explanation.

Thus, the correct option is (*a*).

10. The assertion is incorrect because 540 can be written in standard form as 5.40×10^2.

Thus, the correct option is (*d*).

B.

1. $$\frac{p}{s} = \frac{t^2q}{t^5q^4} = \frac{1}{t^{5-2}q^{4-1}} = \frac{1}{t^3q^3}$$

The correct answer is $\dfrac{1}{t^3q^3}$

2. $mx – n = 0 \qquad \Rightarrow \quad mx = n$

$$\Rightarrow \quad x = \frac{n}{m}$$

The correct answer is $\dfrac{n}{m}$.

3. $(3^4 \times 3^3) \div 3^{14} = 3^{4+3} \div 3^{14} = 3^{7-14} = 3^{-7}$

The correct answer is 3^{-7}.

4. $(3p + q - qr) - (6p + q - qr)$

$= 3p + q - qr - 6p - q + qr = -3p$

The correct answer is $-3p$.

5. Perimeter $= (3x + y) + (6x + 2y) + (9x - y)$

$= (3 + 6 + 9)x + (1 + 2 - 1)y$

$= 18x + 2y$ units

The correct answer is $(18x + 2y)$ units.

C.

1. The given statement is true.

$$mx = n \qquad \Rightarrow \quad x = \frac{n}{m}$$

So, if m and n are negative integers, then the solution $\frac{n}{m}$ be always positive but it cannot be always an integer.

2. The given statement is true.

$A + B + C = (6xy - x + 3y) + (4x - 2xy - 9y) + (6y - 3x - 4xy)$

$= (6 - 2 - 4)xy + (-1 + 4 - 3)x + (3 - 9 + 6)y$

$= (0)xy + (0)x + (0)y = 0$

3. The given statement is true.

$$\frac{(4)^6}{(4)^3} \times (4)^{29} = (4)^{6+29-3} = (4)^{32} = \left(2^2\right)^{32} = 2^{64}$$

4. The given statement is false.

A number is said to be in standard form if it is expressed as $a \times 10^m$, where $1 \le a < 10$ and m is an integer.

5. The given statement is false.

$2x + 1 = x - 15 \quad \Rightarrow \; 2x - x = -15 - 1$

$\Rightarrow \qquad x = -16$

D.

1. $\angle TXP + \angle PXR + \angle RXU = 180°$

(Angles on a line)

$\Rightarrow 35° + \angle PXR + 37° = 180°$

$\Rightarrow \angle PXR = 180° - 37° - 35° = 108°$

Now, $\angle QXS = \angle PXR = 108°$

(Vertically opposite angles)

2. (*a*) $$\frac{20^3 \times 9^3 \times 16^2}{4^6 \times 3^4} = \frac{(4\times5)^3 \times \left(3^2\right)^3 \times \left(4^2\right)^2}{4^6 \times 3^4}$$

$$= \frac{4^7 \times 5^3 \times 3^6}{4^6 \times 3^4} = 4^{7-6} \times 5^3 \times 3^{6-4}$$

$= 4 \times 125 \times 9 = 4500$

(*b*) Do it yourself. Same as above (*a*).

3. Let the measure of the smaller angle is x, then the measure of the bigger angle $= x + 48°$.

Since the angles are supplementary, we have

$x + x + 48° = 180°$

or $\quad 2x + 48° = 180°$

or $\quad 2x = 180° - 48° = 132°$

or $\quad x = \frac{132°}{2} = 66°$

$\therefore \quad x + 48° = 66° + 48° = 114°$

Thus, the measures of angles are 66° and 114°.

4. $A + B + C = (-5x + 9y + 2z) + (9x - 7y + 4z) + (10x - 2y - 6z)$

$= (-5 + 9 + 10)x + (9 - 7 - 2)y + (2 + 4 - 6)z$

$= 14x + 0 + 0 = 14x$

Since $A + B + C = kx$, we have

$14x = kx$

$\Rightarrow \quad k = \frac{14x}{x} = 14$

5. The money left with Jatin = Total money he had – the money he spend

$= [₹7xy^2 + ₹(6xy^3 + 10)] - ₹(15 + 4xy^3)]$

$= ₹[7xy^2 + 6xy^3 - 4xy^3 + 10 - 15]$

$= ₹(7xy^2 + 2xy^3 - 5]$

6. Sum of $(2p + 9q - 7pqr)$ and $(8pqr - 4p - 2q)$

$= (2p + 9q - 7pqr) + (8pqr - 4p - 2q)$

$= 2p - 4p + 9q - 2q - 7pqr + 8pqr$

$= -2p + 7q + pqr$

Now, $12p + 15q + 18pqr - (-2p + 7q + pqr)$

$= 12p + 15q + 18pqr + 2p - 7q - pqr$

$= 14p + 8q + 17pqr$

Thus, the correct answer is $14p + 8q + 17pqr$.

7. Let the number be x, then

$9x + 21 = 16x$

$\Rightarrow \quad 16x - 9x = 21$

$7x = 21$

$x = \frac{21}{7} = 3$

Thus, the required number is 3.

CHAPTER 8 : THE TRIANGLE AND ITS PROPERTIES

Let's Recall

Do it yourself.

Think and Answer (Page 172)

The median of a triangle is the line segment from a vertex to the mid point of the opposite side and it always lies in the interior of the triangle.

Quick Check (Page 173)

Do it yourself.

Think and Answer (Page 175)

No, the exterior angle of a triangle can never be a straight angle. Exterior angle of a triangle is equal to the sum of interior opposite angles, and the sum of two angles of a triangle is always less than 180°.

Think and Answer (Page 177)

1. No, we cannot have a triangle with obtuse angles. Sum of any two angles of a triangle must always be less than 180°, while sum of two obtuse angles is always greater than 180°.
2. No, we cannot have a triangle with two right angles. Sum of any two angles of a triangle must always be less than 180°, while the sum of two right angles is 180°.
3. Yes, we can have a triangle with two acute angles. For example, a triangle with angles 45°, 45° and 90°.

Practice Time 8A

1. We know that a line segment passing through the vertex of a triangle and perpendicular to the side opposite to it is called altitude. Therefore, AM is altitude.

   Next, a line segment from a vertex of a triangle to the mid point of its opposite side is called its median. Therefore, AD is the median.

   Clearly, AMD is a right angled triangle where AM is height and AD is hypotenuse of the triangle, and the hypotenuse is always greater than other two sides.

   Therefore, AM ≠ AD.
2. In the given figure line segment AL is drawn from the vertex A and is perpendicular to the side opposite to A. So, AL represents an altitude of the ΔABC.
3. Sum of all the three interior angles of a triangle is always 180°.

   (*a*) $33° + 42° + 115° = 190° \neq 180°$.

   So, a triangle cannot have three angles whose measures are 33°, 42° and 115°.

   (*b*) Same as part (*a*).

   (*c*) $28° + 59° + 93° = 180°$.

   So, a triangle is possible with these angles.
4. (*a*) Using the angle sum property of a triangle, we have

   $$x + 60° + 60° = 180°$$
   $$\Rightarrow \quad x + 120° = 180°$$
   $$\Rightarrow \quad x = 180° - 120° = 60°$$

   (*b*) $$x + 90° + 30° = 180°$$
   $$\Rightarrow \quad x = 180° - 30° - 90° = 60°$$

   (*c*) Same as part (*a*).

   (*d*) $$x + 3x + 2x = 180°$$
   $$\Rightarrow \quad 6x = 180°$$
   $$\Rightarrow \quad x = \frac{180°}{6} = 30°$$

   Therefore, $x = 30°$, $2x = 60°$ and $3x = 90°$

   (*e*) Do it yourself.

   (*f*) Do it yourself.
5. The measure of exterior angle of a triangle is equal to the sum of opposite interior angles.

   (*a*) $x = 70° + 50° = 120°$

   (*b*) $x = 65° + 45° = 110°$

   (*c*)–(*f*) Do it yourself (same as above)
6. (*a*) Using exterior angle property of a triangle, we get

   $$150° = x + 110°$$
   $$\Rightarrow \quad x = 150° - 110° = 40°$$

   (*b*) Using exterior angle property of a triangle, we get

   $$125° = x + 90°$$
   $$\Rightarrow \quad x = 125° - 90° = 35°$$

   (*c*) In the given figure

   $$x = 60°$$

   (Vertically opposite angles)

Now, using angle sum property, we get

$$x + y + 30° = 180°$$
$$\Rightarrow \quad 60° + y + 30° = 180°$$
$$\Rightarrow \quad y = 180° - 60° - 30° = 90°$$

(*d*) Since two opposite sides of the given triangle are equal, angles opposite to both sides are also equal.

Therefore, $x = 50°$.

Practice Time 8B

1. A triangle can be formed only when the sum of the lengths of any two sides is always greater than the third side.

(*a*) $5 + 4 = 9 > 6$

$6 + 4 = 10 > 5$

$6 + 5 = 11 > 4$

So, a triangle can be formed with the given side lengths.

(*b*) Triangle cannot be formed.

Since $1.4 + 1.8 = 3.2$ cm $= 3.2$ cm (3rd side)

(*c*) Triangle can be formed.

(*d*) Triangle cannot be formed.

Since $1.2 + 2.2 = 3.4$ cm < 4.6 cm (3rd side)

2. In ΔABD using triangle inequality property, we get

$$AB + BD > AD \qquad ...(i)$$

Similarly in ΔADC, we get

$$AC + DC > AD \qquad ...(ii)$$

Adding (*i*) and (*ii*), we get

$$AB + BD + DC + AC > 2AD$$

or $$AB + BC + AC > 2AD$$

$$(\because BD + DC = BC)$$

3. (*a*) The statement is true.

In ΔAPB, AP + PB > AB (Triangle inequality)

(*b*) The statement is false.

Since AB + BP > AP.

(*c*) In ΔBPC, PB + PC > BC (Triangle inequality)

Thus, the statement is true.

(*d*)–(*f*) Do it yourself (same as above)

4. In a triangle the length of third side is always less than the sum of length of other two sides and always greater than the difference of the lengths. Therefore, for the given two sides, we get

$(9 - 6)$ cm < Third side < $(9 + 6)$ cm

or 3 cm < Third side < 15 cm

Thus, the measure of the third side fall between 3 cm and 15 cm.

5. Same as Question 4,

$(9 - 7)$ cm < Third side < $(9 + 7)$ cm

or 2 cm < Third side < 16 cm

Now, the integers between 2 and 16 are 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 and 15

So, all possible integer values of the third side are 3 cm, 4 cm, 5 cm, 6 cm, 7 cm, 8 cm, 9 cm, 10 cm, 11 cm, 12 cm, 13 cm, 14 cm, and 15 cm.

Quick Check (Page 183)

If (8, 15, *k*) is a Pythagorean triplet, then

$$k^2 = 8^2 + 15^2 = 64 + 225 = 289 = 17^2$$
$$\therefore \quad k = 17$$

Practice Time 8C

1. (*a*) To check the given sides for the sides of a right-angled triangle, we use the Pythagoras property.

$$\therefore \quad (6.5)^2 = 42.25$$
$$(2.5)^2 + 6^2 = 6.25 + 36$$
$$= 42.25$$
$$\therefore \quad (6.5)^2 = (2.5)^2 + 6^2$$

Thus, these are the sides of a right-angled triangle.

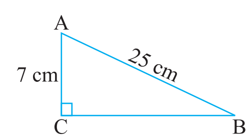
(*b*)–(*d*) Do it yourself (same as above)

2. (*a*) Using Pythagoras property for the right angled triangle ABC, we get

$$AC^2 = AB^2 + BC^2$$
$$x^2 = (8 \text{ cm})^2 + (6 \text{ cm})^2$$
$$= 64 \text{ cm}^2 + 36 \text{ cm}^2$$
$$= 100 \text{ cm}^2 = (10 \text{ cm})^2$$
$$\Rightarrow \quad x = 10 \text{ cm}$$

(*b*)–(*d*) Do it yourself (same as above)

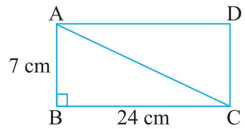
3. Using Pythagoras Property for the right-angled triangle ABC, we get



$$25^2 = 7^2 + CB^2$$
$$\Rightarrow \quad CB^2 = 25^2 - 7^2$$
$$= 625 - 49 = 576$$
$$= 24 \times 24 = 24^2$$

Thus, CB = 24 cm.

4. Let ABCD is the rectangle and AC is its diagonal.



Using Pythagoras property for the right-angled triangle ABC, we get

$$AC^2 = 7^2 + 24^2 = 49 + 576$$
$$= 625 = 25 \times 25 = 25^2$$
$$\therefore \quad AC = 25$$

Therefore, length of the diagonal is 25 cm.

5. Breadth of the plot $= \dfrac{\text{Perimeter}}{2} - \text{length}$

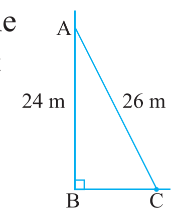
$$= \frac{56 \text{ m}}{2} - 16 \text{ m}$$
$$= 28 \text{ m} - 16 \text{ m} = 12 \text{ m}$$

Let the diagonal be x m, then using Pythagoras property, we get

$$x^2 = 16^2 + 12^2 = 256 + 144 = 400$$
$$= 20 \times 20 = 20^2$$
$$\therefore \quad x = 20$$

Hence, the diagonal of the plot is 20 m.

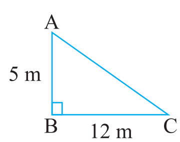
6. Let AC be the ladder and AB is the wall. In right-angled ΔABC, we get



$$AC^2 = AB^2 + BC^2$$
$$\Rightarrow \quad BC^2 = AC^2 - AB^2$$
$$= (26 \text{ m})^2 - (24 \text{ m})^2$$
$$= 676 \text{ m}^2 - 576 \text{ m}^2$$
$$= 100 \text{ m}^2 = (10 \text{ m})^2$$
$$\Rightarrow \quad BC = 10 \text{ m}$$

Therefore the distance between the foot of the ladder and foot of the wall is 10 m.

7. Let the tree is broken at A and touches the ground at C.



Therefore, in right-angled triangle ABC, we get

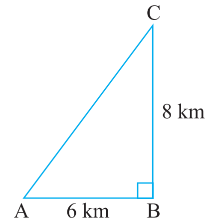
$$AC^2 = AB^2 + BC^2$$
$$= (5 \text{ m})^2 + (12 \text{ m})^2$$
$$= 25 \text{ m}^2 + 144 \text{ m}^2$$
$$= 169 \text{ m}^2 = (13 \text{ m})^2$$
$$\Rightarrow \quad AC = 13 \text{ m}$$

Therefore, original height of the tree

$$= AB + BC = 5\text{m} + 13 \text{ m} = 18 \text{ m}.$$

8. Do it yourself.

9. Let Somya started from point A, walked to B and then to C.



In right-angled triangle ABC,

$$AC^2 = AB^2 + BC^2$$
$$= (6 \text{ km})^2 + (8 \text{ km})^2$$
$$= 36 \text{ km}^2 + 64 \text{ km}^2$$
$$= 100 \text{ km}^2 = (10 \text{ km})^2$$
$$\Rightarrow \quad AC = 10 \text{ km}$$

Thus, Somya is 10 km far from her starting point.

Practice Time 8D

1. If ΔPQR ≅ ΔZYX, under the correspondence PQR ↔ ZYX, then P ↔ Z, Q ↔ Y, R ↔ X

$$\therefore \quad PQ = ZY,\ QR = YX \text{ and } RP = XZ$$
$$\angle P = \angle Z,\ \angle Q = \angle Y \text{ and } \angle R = \angle X$$

2. (*a*) In the given triangles,

$\angle B = \angle E$, $\angle C = \angle F$ and BC = FE

That is two angles and the included side of one triangle are respectively equal to the two angles and the included side of the other triangle.

Therefore, ΔABC ≅ ΔDEF by ASA congruence criterion.

(*b*)–(*d*) Do it yourself (same as above)

3. In ΔPQS and ΔRSQ, we have

PQ = RS (Opposite sides of a rectangle)

PS = QR (Opposite sides of a rectangle)

SQ is a common side for both the triangles.

∴ ΔPQS ≅ ΔRSQ by SSS congruence criterion

The corresponding parts are:

PQ = RS, PS = RQ and SQ is common

$\angle P = \angle R$, $\angle PSQ = \angle RQS$, $\angle RSQ = \angle PQS$

4. (*a*) Three pairs of equal parts in ΔAOC and ΔBOD are

OA = OB (O is the mid-point of AB)

OC = OD (O is the mid-point of CD)

$\angle COA = \angle BOD$ (Vertically opposite angles)

(*b*) (*i*) True, in ΔAOC and ΔBOD from part (*a*), we have

OA = OB, OC = OD, $\angle COA = \angle BOD$

∴ ΔAOC ≅ ΔBOD

(By SAS congruence criterion)

(*ii*) True, $\angle AOC = \angle DOB$

[(As shown in part (*a*)]

5. Since AX bisects $\angle BAC$ as well as $\angle BDC$, we have $\angle BAD = \angle CAD$, $\angle BDA = \angle CDA$

In ΔABD and ΔACD, we have

$$\angle BAD = \angle CAD$$
$$\angle BDA = \angle CDA$$

AD is a common side for both the triangles.

$\therefore \quad \Delta ABD \cong \Delta ACD$

(by ASA congruence criterion)

The congruent parts are

$$AB = AC,\ BD = CD,$$
$$\angle ABD = \angle ACD$$

6. In ΔBAD and ΔCAD, we have

$$\angle BAD = \angle CAD \qquad (\because AD \text{ bisects } \angle A)$$
$$\angle ADB = \angle ADC = 90^\circ \qquad (\because AD \perp BC)$$

Side AD is common for both the triangles

$\therefore \quad \Delta BAD \cong \Delta CAD$ by ASA congruence criterion

$\therefore \quad AB = AC$

Thus, in ΔABC, $AB = AC$, and hence ΔABC is an isosceles triangle.

Chapter Assessment

A.

1. In ΔABC, $\angle B = 90^\circ$

$\Rightarrow$ AC is the hypotenuse of the triangle.

Hence, by Pythagoras property,

$$AC^2 = AB^2 + BC^2$$

Hence, the correct option is (*b*).

2. Exterior angle of a triangle is the sum of the two interior opposite angles.

If the interior opposite angles are equal, then measure of each interior opposite angle is $\dfrac{130^\circ}{2}$ $= 65^\circ$.

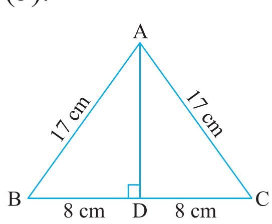
Hence, the correct option is (*b*).

3. $AB = AC = 17$ cm

So, ΔABC is isosceles.

Since AD is the altitude, $\angle D = 90^\circ$

and $BD = DC$



$$= \frac{BC}{2} = \frac{16 \text{ cm}}{2} = 8 \text{ cm}$$

In right-angled triangle ABD, we have

$$AB^2 = BD^2 + AD^2$$
$$\Rightarrow \quad AD^2 = AB^2 - BD^2$$
$$= (17 \text{ cm})^2 - (8 \text{ cm})^2$$
$$= 289 \text{ cm}^2 - 64 \text{ cm}^2$$
$$= 225 \text{ cm}^2 = (15 \text{ cm})^2$$
$$\therefore \quad AD = 15 \text{ cm}$$

Hence, the correct option is (*b*).

4. By providing three angles of a triangle is equal to the corresponding angles of another triangle, we cannot prove that the two triangles are congruent.

Hence, the correct option is (*a*).

5. If a, b, c are the sides of a triangle, then by triangle inequality property,

$$a + b > c$$

Hence, the correct option is (*c*).

6. $67^\circ + 42^\circ + 81^\circ = 190^\circ \neq 180^\circ$

Therefore, by angle sum property of triangles, a triangle is not possible with the given measures of angles.

Hence, the correct option is (*d*).

B.

1. As $4 - 2.5 = 1.5$

So, the length of the third side must always be greater than 1.5 cm.

Hence, the correct option is (*a*).

2. A triangle cannot have two obtuse angles as the sum of two obtuse angles is always greater than 180°.

Hence, the correct option is (*d*).

3. The correct option is (*a*).

4. $(1.5)^2 + (3.6)^2 = 2.25 + 12.96$

$$= 15.21 = 3.9 \times 3.9 = (3.9)^2$$

$\therefore \quad (1.5)^2 + (3.6)^2 = (3.9)^2$

Both the assertion and reason are true, and the reason correctly explain the assertion.

Hence, the correct option is (*a*).

C.

1. Median is also called altitude in an equilateral triangle.
2. In an isosceles triangle, angles opposite to equal sides are equal.
3. The obtuse-angled triangle always has altitude outside itself.

4. In the given figure for ΔPQR and ΔDRQ, $\angle DQR = \angle PRQ$, $\angle DRQ = \angle PQR$, side QR is common

$\therefore \quad \Delta DRQ \cong \Delta PQR$

(by ASA congruence criterion)

5. $6 + 5 = 11$, so by triangle inequality property, the length of third side of triangle whose two sides are 5 cm and 6 cm, must be less than 11 cm.

D.

1. False

   All angles of an equilateral triangle are of 60° but one angle of a right-angled triangle must be of 90°.

2. False

   By triangle inequality property, the sum of two sides of a triangle is always greater than the third side, not equal to the third side.

3. True

   By AAS or by ASA the triangles will be always congruent.

4. False

   If all the three angles of a triangle are less than 60°, then their sum will be less than 180°. By angle sum property of triangles, such a triangle is not possible.

5. False

   Equal areas do not show that all the corresponding sides are equal.

6. True

   By the definition of congruent triangles.

E.

1. In ΔABC,

$AB = AC$ (Given)

So, $\angle ABC = \angle ACB$ (Angles opposite to equal sides)

Also, $x + x + 50° = 180°$

(By angle sum property)

$\Rightarrow \quad 2x = 180° - 50° = 130°$

$$x = \frac{130°}{2} = 65°$$

Next MN || BC

$\Rightarrow \quad \angle MAB = \angle x$ (Alternate interior angles)

$= 65°$

Similarly $\angle NAC = 65°$

$\therefore \quad \angle BAN = 50° + \angle NAC$

$= 50° + 65° = 115°$

2. (*a*) In ΔAEC,

$\angle ECA = \angle EAC = 40°$

(Angles opposite to equal sides)

In ΔABD,

$\angle ABD = \angle DAB = 30°$

(Angles opposite to equal sides)

In ABC,

$\angle A + \angle B + \angle C = 180°$ (Angle sum property)

$\Rightarrow (30° + x + 40°) + 30° + 40° = 180°$

$\Rightarrow x + 70° + 30° + 40° = 180°$

or $\quad x = 180° - 140° = 40°$

(*b*) In the given figure AB || CD, we get

$\angle DCE = \angle ABC = 35°$

(Alternate interior angles)

In ΔECD,

$\angle CED + \angle ECD + \angle EDC = 180°$

(By angle sum property)

$\Rightarrow 75° + 35° + x = 180°$

$\Rightarrow x = 180° - 75° - 35° = 70°$

(*c*) In the given figure, in ΔABD,

$\angle DAB = \angle BDA = 30°$

(Angle opposite to equal sides)

$\angle DBC = 30° + 30° = 60°$

(By exterior angle property)

In ΔDBC,

$\angle DBC = \angle DCB = 60°$

(Angles opposite to equal sides)

$\therefore \quad \angle BDC = 60°$ (By angle sum property)

Now,

$\angle EDA + \angle ADB + \angle BDC = 180°$

(Straight angle)

$\Rightarrow x + 30° + 60° = 180°$

$\Rightarrow x = 180° - 60° - 30° = 90°$

(*d*) In ΔPQR,

$(3x + 1)° + 90° + (4x + 5)° = 180°$

(By angle sum property of triangles)

$\Rightarrow 3x + 4x + 1° + 90° + 5° = 180°$

$\Rightarrow 7x = 180° - 96° = 84°$

$$x = \frac{84°}{7} = 12°$$

(*e*) Do it yourself [same as part (*d*)].

(*f*) In ΔHGF,

$50° + 80° + x = 180°$ (By angle sum property)

$\Rightarrow \quad x = 180° - 50° - 80° = 50°$

3. (*a*) $\angle x = 60° + 40°$

(By exterior angle property)

$= 100°$

Next, $\angle x + \angle y + 30° = 180°$

(By angle sum property)

$\Rightarrow 100° + \angle y + 30° = 180°$

$\angle y = 180° - 30° - 100° = 50°$

Thus, $x = 100°, y = 50°$

(*b*) Do it yourself [same as part (*a*)].

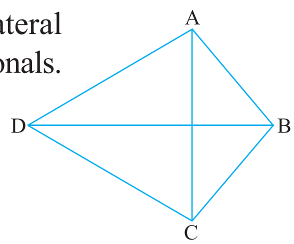
4. In ΔOLD and ΔEWN,

OL = NE, LD = EW and DO = WN

$\therefore \quad \Delta OLD = \Delta NEW$

(By SSS congruence criterion)

5. Let ABCD be the quadrilateral and AC and BD are its diagonals.



In ΔABD,

$AD + AB > BD \quad ...(i)$

Similarly,

In ΔBCD,

$BC + CD > BD \quad ...(ii)$

In ΔABC,

$AB + BC > AC \quad ...(iii)$

In ΔACD,

$AD + DC > AC \quad ...(iv)$

On adding (*i*), (*ii*), (*iii*) and (*iv*), we get

$2(AB + BC + CD + AD) > 2(BD + AC)$

$\Rightarrow AB + BC + CD + AD > AC + BD$

6. In ΔDFE and ΔDFG,

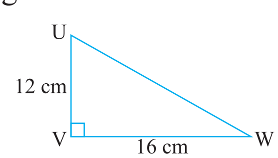
FE = FG (Given)

DE = DG (Given)

DF is a common side for both the triangles

$\therefore$ $\Delta DFE \cong \Delta DFG$ by SSS congruence criterion.

7. In the right-angled triangle, UVW,



$WU^2 = UV^2 + VW^2$

$\Rightarrow \quad WU^2 = (12 \text{ cm})^2 + (16 \text{ cm})^2 = 144 \text{ cm}^2 + 256 \text{ cm}^2$

$= 400 \text{ cm}^2 = (20 \text{ cm})^2$

$\Rightarrow \quad WU = 20$ cm

$\therefore$ The hypotenuse is 20 cm.

8. (*a*) In ΔPQS and ΔPRS, we have

PQ = PR (Given)

$\angle QPS = \angle RPS$ ($\because$ PS bisects $\angle P$)

PS is the common side for both the triangles

$\therefore \quad \Delta PQS \cong \Delta PRS$

(by SAS congruence criterion)

(*b*) $\because \Delta PQS \cong \Delta PRS$

$\therefore \quad QS = SR$

$\Rightarrow$ S is the mid point of QR.

(*c*) $\because \Delta PQS \cong \Delta PRS$

$\therefore \quad \angle PSQ = \angle PSR$ (CPCT)

Now, $\angle PSQ + \angle PSR = 180°$ (Straight angle)

$\therefore \quad \angle PSQ = \dfrac{180°}{2} = 90°$

9. In ΔZLX and ΔZMY, we have

XL = YM (Given)

$\angle XLZ = \angle YMZ$ (90° angles)

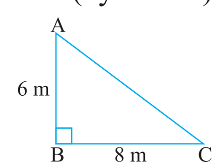
$\angle XZL = \angle MZY$ (Vertically opposite angles)

$\therefore \quad \Delta ZLX \cong \Delta ZMY$

(by AAS congruence criterion)

$\Rightarrow \quad ZL = ZM$ (by CPCT)

10. Let A be the top of the roof, B is bottom, and C is the peg on the ground.



In right-angled triangle ABC,

$AC^2 = AB^2 + BC^2$

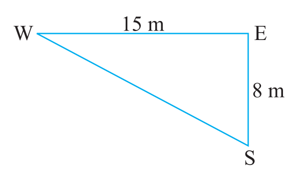
$= (6 \text{ m})^2 + (8 \text{ m})^2$

$= 36 \text{ m}^2 + 64 \text{ m}^2 = 100 \text{ m}^2 = (10 \text{ m})^2$

$\Rightarrow \quad AC = 10$ m

$\therefore$ The shortest length of rope is 10 m.

11. The diagonal length of 15 m east and 8 m south distance is WS as shown in the figure.



In right-angled triangle WES,

$WS^2 = WE^2 + ES^2$

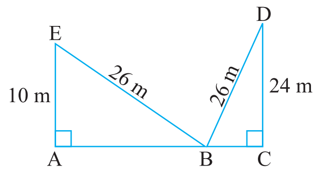
$= (15 \text{ m})^2 + (8 \text{ m})^2$

$= 225 \text{ m}^2 + 64 \text{ m}^2 = 289 \text{ m}^2 = (17 \text{ m})^2$

$\Rightarrow \quad WS = 17$ m

Thus, the distance covered by Neeraj is 17 m.

12. First we will draw a rough figure to represent the given question. In the figure, B represents the foot of the ladder, E and D are the top of the windows and AC is the width of the street.



In the right-angled triangle ABE

$$EB^2 = AE^2 + AB^2$$

$$\Rightarrow \quad AB^2 = EB^2 - AE^2 = (26\text{ m})^2 - (10\text{ m})^2$$

$$= 676\text{ m}^2 - 100\text{ m}^2 = 576\text{ m}^2 = (24\text{ m})^2$$

$$\therefore \quad AB = 24\text{ m}$$

Next, in right-angled triangle BCD,

$$BD^2 = BC^2 + CD^2$$

$$\Rightarrow \quad BC^2 = BD^2 - CD^2 = (26\text{ m})^2 - (24\text{ m})^2$$

$$= 676\text{ m}^2 - 576\text{ m}^2$$

$$= 100\text{ m}^2 = (10\text{ m})^2$$

$$\therefore \quad BC = 10\text{ m}$$

Therefore, the length of the street

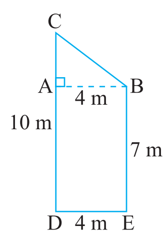
$$= AC = AB + BC$$

$$= 24\text{ m} + 10\text{ m} = 34\text{ m}$$

13. Do it yourself.

14. (*a*) Let CD and BE represent the trees and DE is the width of the root.

To find the distance between the top of the trees (BC), we need to use Pythagoras property.



(*b*) If the distance between roots is 4 m, then width of the river will also be the same, that is 4 m.

(*c*) In the diagram, in right-angled triangle ABC

$$BC^2 = AC^2 + AB^2$$

$$= (10\text{ m} - 7\text{ m})^2 + (4\text{ m})^2$$

$$= (3\text{ m})^2 + (4\text{ m})^2 = 9\text{m}^2 + 16\text{ m}^2$$

$$= 25\text{ m}^2 = (5\text{ m})^2$$

$\therefore$ The distance between the tops of both trees is 5 m.

Brain Sizzlers (Page 194)

Using Pythagoras property, we have

$$AC^2 = (30\text{ m})^2 + (40\text{ m})^2$$

$$= 900\text{ m}^2 + 1600\text{ m}^2$$

$$= 2500\text{ m}^2 = (50\text{ m})^2$$

$$\Rightarrow \quad AC = 50\text{ m}$$

The length of the pond = AB = AC – BC

= 50 m – 12 m = 38 m

MODEL TEST PAPER – 1

A.

1. $$x = \frac{2^{19} \times 5^{26} \times 9^{10}}{2^{18} \times 5^{25} \times 9^{9}}$$

$$= 2^{19-18} \times 5^{26-25} \times 9^{10-9}$$

$$= 2 \times 5 \times 9 = 90$$

$$\therefore \quad \frac{1}{x} = \frac{1}{90}$$

Hence, the correct option is (*d*).

2. The reciprocal of 0 is not defined.

Hence, the correct option is (*c*).

3. The correct option is (*b*).

4. The correct option is (*a*).

5. Median from a vertex divides the opposite side of the vertex in two equal parts.

Hence, the correct option is (*c*).

6. $$y - 9 = 15$$

$$y = 15 + 9 = 24$$

Hence, the correct option is (*d*).

7. $15^5 \times 15^{-3} \times 15^8 = 15^{5-3+8} = 15^{10}$

Hence the correct option is (*b*).

8. $$\frac{5}{8} = \frac{5 \times 9}{8 \times 9} = \frac{45}{72}$$

Hence, the correct option is (a).

9. The correct option is (*a*).

10. $$3^2 + 4^2 = 9 + 16 = 25 = 5^2$$

$$\therefore \quad 3^2 + 4^2 = 5^2$$

The reason is the correct explanation of the assertion.

Hence the correct option is (*a*).

B.

1. greater

2. Complement of 39° = 90 – 39° = 51°

3. Perimeter of the triangle $= \frac{y}{2}$ cm + $2y$ cm + y cm

$$= \left(\frac{1}{2} + 2 + 1\right) y\text{ cm} = \frac{7}{2} y\text{ cm}$$

4. 3.4×10^4

5. $$\frac{9}{57} + \left(\frac{-3}{57}\right) = \frac{9-3}{57} = \frac{6}{57}$$

C.

1. False

$(-1) \times (-1) \times \ldots$ odd number of times $= -1$

2. True

$7.943 \times 100 = 794.3$ (Decimal point shifted two places to the right)

3. True

$$\frac{7}{9} = \frac{7 \times 9}{9 \times 9} = \frac{63}{81}$$

4. False

$(-2)^{59} \times (-2)^{41} = (-2)^{59+41} = (-2)^{100}$

5. False

In one day she can read 36 pages.

In 't' days she can read $t \times 36$ pages $= 36t$ pages.

D.

1. (*a*) We know that exterior angle of a triangle is the sum of two opposite interior angles.

$\therefore \quad \angle PRZ = 60° + 52° = 112°$

(*b*) In ΔPQR,

$60° + 52° + \angle PRQ = 180°$

$\therefore \quad \angle PRQ = 180° - 60° - 52° = 68°$

2. (*a*) In the given figure,

$\angle PBC + 60° = 180°$ (Straight angle)

$\Rightarrow \quad \angle PBC = 180° - 60° = 120°$

$\Rightarrow \quad \angle PBC = \angle DCA = 120°$

$\therefore$ The corresponding angles are equal and hence DE || PQ.

(*b*) $\because$ MN || ST,

$\angle x = \angle 25°$ (Alternate interior angles)

$\angle z + 65° = 180°$ (Interior angles on the same side of transversal)

$\Rightarrow \quad \angle z = 180° - 65° = 115°$

$\angle x + \angle y + \angle z = 180°$ (Straight angle)

$\Rightarrow 25° + \angle y + 115° = 180°$

$\angle y = 180° - 115° - 25° = 40°$

Thus, $x = 25°$, $y = 40°$ and $z = 115°$

3. $$\frac{7u+5}{2} + 9 = 3$$

$\Rightarrow \quad \dfrac{7u+5}{2} = 3 - 9$ (Transposing 9 to RHS)

$7u + 5 = 2 \times (3 - 9)$

(Transposing $\div$ 2 to RHS)

$7u = 2 \times (3 - 9) - 5$

(Transposing 5 to RHS)

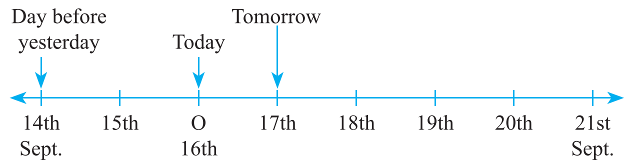
$$u = \frac{2 \times (3-9) - 5}{7}$$

(Transposing $\times 7$ to RHS)

$$= \frac{2 \times (-6) - 5}{7} = \frac{-17}{7}$$

$$\therefore \quad u = \frac{-17}{7}$$

4.



So, 4 days after tomorrow will be 21st September.

5. (*a*) $621 \times 50 = 31050$

$\therefore \quad 6.21 \times 0.50 = 3.1050$

(2 + 2 = 4 decimal places)

$= 3.105$

(*b*) $3225 \div 15 = 215$

$\therefore \quad 32.25 \div 15 = 2.15$ (2 decimal places)

6. Substituting the values of x, y and z in the given expression, we get

$$(x + y) \times z = \left(\frac{-3}{5} + \frac{1}{7}\right) \times \left(\frac{-16}{35}\right)$$

$$= \frac{(-21+5)}{35} \times \frac{(-16)}{35} = \frac{16 \times 16}{35 \times 35}$$

$$= \frac{256}{1225}$$

7. Since 45 kg tomatoes gone bad, therefore 45 kg tomatoes are spoiled.

The quantity of tomatoes in good condition

$= 300$ kg $- 45$ kg $= 255$ kg

Next,

Fraction of tomatoes that are spoiled

$$= \frac{45 \text{ kg}}{300 \text{ kg}} = \frac{3}{20}$$

Fraction of fresh tomatoes $= \dfrac{255 \text{ kg}}{300 \text{ kg}} = \dfrac{17}{20}$

8. (*a*) Ravi's total expenses for August

$= 5000 + 2x + x$

$\because$ Ravi spent ₹3000 on transport, we have

$x =$ ₹3000

Substituting the value of x in the expression, we get

$$5000 + 2x + x = 5000 + 2 \times 3000 + 3000 = 14000$$

$\therefore$ Ravi's total expenses for August is ₹14,000.

(*b*) If Ravi plans to spend no more than ₹17000 in September, we have

$$5000 + 2x + x = 17000$$

$$\Rightarrow \quad 3x + 5000 = 17000$$

$$3x = 17000 - 5000 = 12000$$

$$x = \frac{12000}{3} = 4000$$

$\therefore$ Ravi can spend maximum amount of ₹4000 on transport in September.

(*c*) From part (*b*) $2x = 2 \times 4000 = 8000$

$\therefore$ His grocery budget for September is ₹8000

Now, $\frac{1}{4} \times$ ₹8000 = ₹2000

So, Ravi want to increase his budget by ₹2000

Hence, his total new budget

= ₹17000 + ₹2000 = ₹19000

CHAPTER 9 : RATIO AND PROPORTION

Quick Check (Page 202)

Good apples = Total apples – Rotten apples

= 90 – 7 = 83

$$\text{Ratio} = \frac{83}{90} = 83 : 90$$

Quick Check (Page 203)

$$\text{Ratio} = \frac{9 \div 3}{12 \div 3} = \frac{3}{4}$$

Yes, both the ratios are equivalent.

Think and Answer (Page 205)

No. of chocolates ball you will get: $\frac{3}{7} \times 21 = 9$

No. of chocolates ball your siblings will get:

$\frac{4}{7} \times 21 = 12$

Practice Time 9A

1. (*a*) $\text{Ratio} = \frac{148 \div 4}{360 \div 4} = \frac{37}{90} = 37 : 90$

(*b*)–(*h*) Do it yourself (same as above)

2. (*a*) $\text{Ratio} = \frac{28 \div 4}{44 \div 4} = \frac{7}{11} = 7 : 11$

(*b*)–(*g*) Do it yourself (same as above)

3. (*a*) Equivalent ratios

$$\frac{4}{9} = \frac{4\times2}{9\times2} = \frac{4\times3}{9\times3} = \frac{4\times4}{9\times4} = \frac{4\times5}{9\times5} = \frac{4\times6}{9\times6}$$

$$= \frac{8}{18} = \frac{12}{27} = \frac{16}{36} = \frac{20}{45} = \frac{24}{54}$$

Thus, the required ratios are 8 : 18, 12 : 27, 16 : 36, 20 : 45 and 24 : 54.

(*b*)–(*d*) Do it yourself (same as above)

4. For $\frac{21}{28} = \frac{21\div7}{28\div7} = \frac{3}{4}$

For next, $\frac{3\times2}{4\times2} = \frac{6}{8}$

Similarly, we can find rest missing term.

Antecedent (*a*)	21	3	6	36	9
Consequent (*b*)	28	4	8	48	12

5. (*a*) $\frac{9}{8}$ or $\frac{7}{3}$

LCM of 8, 3 = 24

$$\frac{9}{8} = \frac{9\times3}{8\times3} = \frac{27}{24} \text{ or } \frac{7}{3} = \frac{7\times8}{3\times8} = \frac{56}{24}$$

$$\frac{27}{24} < \frac{56}{24} \quad \Rightarrow \frac{9}{8} < \frac{7}{3} \quad \Rightarrow \quad 9 : 8 < 7 : 3$$

(*b*)–(*d*) Do it yourself (same as above)

6. (*a*) $\text{Ratio} = \frac{\text{No. of girls}}{\text{No. of boys}} = \frac{615}{485} = \frac{123}{97} = 123 : 97$

(*b*)–(*d*) Do it yourself (same as above)

7. (*a*) $\text{Ratio} = \frac{\text{No. of males}}{\text{No. of females}} = \frac{28}{28} = \frac{1}{1} = 1 : 1$

(*b*)–(*c*) Do it yourself (same as above)

8. $\text{Ratio} = \frac{\text{Length of field}}{\text{Width of field}} = \frac{172}{84} = \frac{43}{21} = 43 : 21$

9. 1st person = $\frac{3}{8} \times 3196$ = ₹1198.50

2nd person = $\frac{5}{8} \times 3196$ = ₹1997.50

10. Share of A = $\frac{2}{16} \times 7712$ = ₹964

Share of B = $\frac{5}{16} \times 7712$ = ₹2410

Share of C = $\frac{9}{16} \times 7712$ = ₹4338

11. Angles of a triangle = 180°

$3x + 4x + 11x = 180$

$$18x = 180 \quad \text{or} \quad x = \frac{180}{18} = 10$$

The angles are 30°, 40° and 110° respectively.

12. Ratio = $\frac{12}{17} = \frac{108}{x}$ $\quad \therefore \quad x = \frac{17}{12} \times 108 = 153$

13. Ratio = $\frac{9}{13} = \frac{x}{169}$ $\quad \therefore \quad x = \frac{9}{13} \times 169 = 117$

14. Ratio = $\frac{\text{Red colour}}{\text{Blue colour}} = \frac{5}{4} = \frac{15}{x}$

$$x = \frac{4}{5} \times 15 \text{ L} = 12 \text{ L}$$

Quick Check (Page 208)

Ratio of heights = $\frac{\text{Shreya's height}}{\text{Rohan's height}} = \frac{144}{128} = \frac{9}{8}$

$= 9 : 8$

Ratio of weights = $\frac{\text{Shreya's weight}}{\text{Rohan's weight}} = \frac{45}{36} = \frac{5}{4}$

$= 5 : 4$

No, the heights and weights are not in proportion.

Life Skills (Page 210)

Box 1 = $\frac{\text{Price}}{\text{Total Ounces}} = \frac{300}{10} =$ ₹30 per ounce

Box 2 = $\frac{\text{Price}}{\text{Total Ounces}} = \frac{500}{20} =$ ₹25 per ounce

20-ounce box offer better price.

Practice Time 9B

1. (*a*) Ratio$_1$ = $\frac{15}{45} = \frac{1}{3} = 1 : 3$

Ratio$_2$ = $\frac{40}{120} = \frac{1}{3} = 1 : 3$

The ratios are in proportion.

(*b*) Ratio$_1$ = $\frac{33}{121} = \frac{3}{11} = 3 : 11$

Ratio$_2$ = $\frac{9}{96} = \frac{3}{32} = 3 : 32$

The ratios are not in proportion.

(*c*)–(*f*) Do it yourself (same as above)

2. (*a*) Ratio$_1$ = $\frac{35}{7} = 5 = 5 : 1$

Ratio$_2$ = $\frac{10}{2} = 5 = 5 : 1$

The ratios are in proportion.

(*b*)–(*d*) Do it yourself (same as above)

3. (*a*) $\frac{15}{90} = \frac{x}{78}$ $\quad \therefore \quad x = \frac{15}{90} \times 78 = 13$

(*b*)–(*d*) Do it yourself (same as above)

4. 9 : 18 :: 18 : x

$$\frac{9}{18} = \frac{18}{x}$$

$$x = \frac{18}{9} \times 18 = 36$$

5. 27 : x :: x : 3

$$\frac{27}{x} = \frac{x}{3}$$

$$x^2 = 27 \times 3 = 81 \qquad \therefore \quad x = \sqrt{81} = 9$$

6. Do it yourself. Same as Q4 above.

7. Shekhar earns per month:

$$\frac{5}{9} = \frac{38450}{x}$$

$$x = \frac{9}{5} \times 38450 = ₹69210$$

8. $\frac{\text{Distance}_1}{\text{Time}_1} = \frac{\text{Distance}_2}{\text{Time}_2}$

$$\frac{14}{25} = \frac{56}{x}$$

$$x = \frac{25}{14} \times 56 = 100 \text{ min} = 1 \text{ hr } 40 \text{ min}$$

9. Ratio = $\frac{\text{Length}}{\text{Breadth}}$

$$\frac{12}{7} = \frac{108}{x}$$

$$x = \frac{108}{12} \times 7 = 63 \text{ m}$$

Chapter Assessment

A.

1. Ratio = $\frac{20}{12} = \frac{5}{3} = 5 : 3$

Equivalent ratio = $\frac{5 \times 3}{3 \times 3} = \frac{15}{9} = 15 : 9$

Hence, the correct option is (*d*).

2. Ratio = $\frac{\text{Number of boys}}{\text{Number of girls}} = \frac{42}{22} = \frac{21}{11} = 21 : 11$

Hence, the correct option is (*b*).

3. (*a*) $\text{Ratio}_1 = \frac{3}{5}$

$\text{Ratio}_2 = \frac{12}{20} = \frac{12 \div 4}{20 \div 4} = \frac{3}{5}$

The ratios are in proportions.

(*b*) $\text{Ratio}_1 = \frac{3}{5} = \frac{12}{20} \quad \Rightarrow \frac{3}{5} = \frac{12 \div 4}{20 \div 4} = \frac{3}{5}$

$\text{Ratio}_2 = \frac{5}{8} = \frac{10}{16} \quad \Rightarrow \frac{5}{8} = \frac{10 \div 2}{16 \div 2} = \frac{5}{8}$

(*c*) $\text{Ratio}_3 = \frac{12}{3} = \frac{24}{6} \quad \Rightarrow 4 = 4$

(*d*) $\text{Ratio}_4 = \frac{12}{15} = \frac{10}{16} \quad \Rightarrow \frac{12 \div 3}{15 \div 3} = \frac{10 \div 2}{16 \div 2}$

$\Rightarrow \frac{4}{5} = \frac{5}{8}$

Hence, the correct option is (*d*).

4. $\frac{48}{40} = \frac{30}{x}$

$x = \frac{40}{48} \times 30 = 25$

Hence, the correct option is (*c*).

5. $\text{Ratio} = \frac{\text{No. of boys}}{\text{No. of boys} + \text{girls}} = \frac{b}{b+g}$

Hence, the correct option is (*a*).

B.

1. **Assertion:** In a ratio 4 : 7, 4 is called antecedent and 7 is called consequent respectively.

Hence, the correct option is (*d*).

2. **Assertion:** If 44 : 36 : : x : 9, then the value of x is 11.

Hence, the correct option is (*d*).

C. (*a*) – (*iv*); (*b*) – (*v*); (*c*) – (*i*); (*d*) – (*ii*); (*e*) – (*iii*)

D. 1. The ratio 120 : 360 in its simples of form is written as **1 : 3**.

2. In the ratio $a : b$, b is called **consequent**.

3. A proportion is an equation in which two ratios are set **equal** to each other.

4. If $a : b : : c : d$, then a and d are called **extremes**.

5. If $15 : x : : 3 : 7$, then x is equal to **35**.

E.

1. (*a*) Since the ratio is 2 : 3, this means Shreya's distance is less.

(*b*)

2 × 2 = 4	2 × 4 = 8	2 × 8 = 16	2 × 5 = 10
3 × 2 = 6	3 × 4 = 12	3 × 8 = 24	3 × 5 = 15

2. $\text{Ratio} = \frac{1}{18} = \frac{1}{3} = 1:3$

3. $\text{Ratio} = \frac{1}{3} = \frac{60}{x}$

$x = \frac{3}{1} \times 60 = 180 \text{ kg}$

4. $\text{Ratio} = \frac{30}{510} = \frac{1}{17} = 1 : 17$

5. Increase in temperature in 30 days $= \frac{5}{30}$

Temperature increase in 12 days $= \frac{5}{30} \times 12 = 2°\text{C}$

6. $\text{Ratio} = \frac{\text{No. of cups of lemon juice}}{\text{No. of cups of water}} = \frac{1}{3}$

7. $\text{Ratio} = \frac{\text{Height of flagpole A}}{\text{Height of flagpole B}} = \frac{500 \text{ cm}}{40 \text{ cm}} = \frac{25}{2}$

8. Balancing the two children on seesaw is:

$\frac{24}{2} = \frac{x}{3}$

$x = \frac{24}{2} \times 3 = 36 \text{ kg}$

9. Cost of 1 tablet $= \frac{28}{10} = ₹2.80$

Amount to be paid for 2 weeks

$= 14 \times 2 \times 2.80 = ₹78.40$

10. Two ratios are proportional if

$\frac{3}{4} = \frac{9}{16}$

We can check by cross-multiplication

$3 \times 16 = 4 \times 9$

$48 \neq 36$

Therefore, the given ratios are not proportional.

11. (*a*) $\text{Ratio} = \frac{\text{1 cricket bat}}{\text{1 puzzle book}} = \frac{1750}{875} = \frac{2}{1}$

(*b*) No, since units are different, we cannot find the ratio between price and quantity.

(*c*) $\frac{y}{x} = \frac{\text{1 puzzle book}}{\text{1 cricket bat}} = \frac{875}{1750} = \frac{1}{2}$

$\frac{z}{w} = \frac{\text{5 chocolate bars}}{\text{2 pizzas}}$

$= \frac{5 \times 75}{2 \times 375} = \frac{375}{750} = \frac{1}{2}$

Thus, $y : x : : z : w$ is true.

Maths Connect (Page 215)

$$\text{Ratio} = \frac{\text{Weight of copper}}{\text{Weight of brass}} = \frac{2}{5} = \frac{x}{240}$$

$$x = \frac{2}{5} \times 240 = 96 \text{ kg}$$

Brain Sizzlers (Page 215)

$$\frac{\text{Height of tower}}{\text{Length of tower's shadow}} = \frac{\text{Height of pole}}{\text{Length of pole's shadow}}$$

$$\frac{h}{100} = \frac{12}{16}$$

$$h = \frac{12}{16} \times 100 = 75 \text{ m}$$

CHAPTER 10 : PERCENTAGE AND ITS APPLICATIONS

Let's Recall

1. (*a*) Since ₹1 = 100 paise, so, ₹5 = 500 paise

$$\text{Ratio} = \frac{75 \text{ p}}{500 \text{ p}} = \frac{3}{20} = 3 : 20$$

(*b*)–(*f*) Do it yourself (same as above)

2. Let the shopkeeper's income be x. Using the given ratio:

$$\frac{8}{5} = \frac{x}{12000}$$

$$x = \frac{8}{5} \times 12000 = ₹19200$$

Income = ₹19200

Expenditure = ₹19200 – ₹12000 = ₹7200

3. (*a*) $\text{Ratio} = \dfrac{\text{shaded portion}}{\text{unshaded portion}} = \dfrac{15}{33} = \dfrac{5}{11} = 5 : 11$

(*b*)–(*c*) Do it yourself (same as above)

Quick Check (Page 219)

$$\% \text{ of red beads} = \frac{8}{20} \times 100 = 40\%$$

$$\% \text{ of green beads} = \frac{12}{20} \times 100 = 60\%$$

Think and Answer (Page 219)

Money saved = ₹50 – ₹28 = ₹22

$$\% \text{ of pocket money he saves} = \frac{22}{50} \times 100 = 44\%$$

Quick Check (Page 220)

$$\% \text{ voted to B} = \frac{90}{150} \times 100 = 60\%$$

Think and Answer (Page 220)

$$\% \text{ of fraction} = \frac{125.6}{100} = \frac{1256}{1000} = \frac{157}{125}$$

Practice Time 10A

1. (*a*) $\text{Percentage} = \dfrac{45}{100} \times 100 = 45\%$

(*b*)–(*e*) Do it yourself (same as above)

2. (*a*) $\text{Fraction} = \dfrac{84}{100} = \dfrac{21}{25}$

(*b*)–(*e*) Do it yourself (same as above)

3. (*a*) Percentage = 6.98 × 100 = 698%

(*b*)–(*e*) Do it yourself (same as above)

4. (*a*) $27\% = \dfrac{27}{100} = 0.27$

(*b*)–(*e*) Do it yourself (same as above)

5. (*a*) $\text{Percentage} = \dfrac{12}{35} \times 100 = \dfrac{240}{7}\% = 34.29\%$

(*b*)–(*e*) Do it yourself (same as above)

6. (*a*) $57\% = \dfrac{57}{100}$ or 57 : 100

(*b*)–(*e*) Do it yourself (same as above)

Quick Check (Page 222)

1. 100% – 35% = 65%

2. 100% – (64 + 20)% = 16%

3. 100% – 55% = 45%

4. 100% – 30% = 70%

Think and Answer (Page 223)

Desi ghee = 100 – (30 + 40) = 30%

Think and Answer (Page 223)

% of tangram shaded

$$= \frac{\frac{1}{4} + \frac{1}{8} + \frac{1}{8}}{\frac{1}{16} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \frac{1}{4} + \frac{1}{8} + \frac{1}{8}}$$

$$= \frac{\frac{2+1+1}{8}}{\frac{1+4+2+1+4+2+2}{16}} = \frac{\frac{4}{8}}{\frac{16}{16}} = \frac{1}{2} \times 100 = 50\%$$

Think and Answer (Page 224)

No. of absent students = 18% of 50 = $\frac{18}{100} \times 50 = 9$

Quick Check (Page 224)

1. Let the number be x.

$$20\% \text{ of } x = 14$$
$$\frac{20}{100} \times x = 14$$
$$x = \frac{100}{20} \times 14 = 70$$

2. Let the total quantity be x.

$$28\% \text{ of } x = 140$$
$$\frac{28}{100} \times x = 140$$
$$x = \frac{100}{28} \times 140 = 500 \text{ kg}$$

Think and Answer (Page 225)

1. Let the number be x.

$$18\% \text{ of } x = 360$$
$$\frac{18}{100} \times x = 360$$
$$x = \frac{100}{18} \times 360 = 2000$$
$$64\% \text{ of } 2000 = \frac{64}{100} \times 2000 = 1280$$

2. $x\%$ of $20 = 4$

$$\frac{x}{100} \times 20 = 4$$
$$x = \frac{100}{20} \times 4 = 20$$

Think and Answer (Page 226)

Sunil : Anil : Raj = 3 : 4 : 5

$$\text{Sunil} = \frac{3}{3+4+5} \times 3000 = \frac{3}{12} \times 3000 = ₹750;$$
$$\text{Percentage} = \frac{750}{3000} \times 100 = 25\%$$
$$\text{Anil} = \frac{4}{3+4+5} \times 3000 = \frac{4}{12} \times 3000 = ₹1000;$$
$$\text{Percentage} = \frac{1000}{3000} \times 100 = 33.33\%$$
$$\text{Raj} = \frac{5}{3+4+5} \times 3000 = \frac{5}{12} \times 3000 = ₹1250;$$
$$\text{Percentage} = \frac{1250}{3000} \times 100 = 41.67\%$$

Practice Time 10B

1. (*a*) 42% of 225 = $\frac{42}{100} \times 225 = 94.5$

(*b*)–(*e*) Do it yourself (same as above)

2. (*a*) Let the quantity be x

$$51\% \text{ of } x = 170$$
$$\frac{51}{100} \times x = 170$$
$$x = \frac{100}{51} \times 170 = 333.33$$

(*b*)–(*e*) Do it yourself (same as above)

3. (*a*) $x\%$ of 800 = 180

$$x = \frac{180}{800} \times 100 = 22.5\%$$

(*b*)–(*e*) Do it yourself (same as above)

4. (*a*) $x\%$ of 72 = 12

$$\frac{x}{100} \times 72 = 12$$
$$x = \frac{12}{72} \times 100 = 16.67$$

(*b*)–(*e*) Do it yourself (same as above)

5. Since 1 day = 24 hour and 1 hour = 60 minutes

$$x = \frac{10}{5 \times 24 \times 60} \times 100 = 0.14\%$$

6. Let the number x.

$$13\% \text{ of } x = 65$$
$$\frac{13}{100} \times x = 65$$
$$x = \frac{100}{13} \times 65 = 500$$

7. Do it yourself.

8. $\text{1st angle} = \frac{7}{18} \times 180° = 70°;$

$$\text{Percentage} = \frac{70}{180} \times 100 = 38.89\%$$
$$\text{2nd angle} = \frac{5}{18} \times 180° = 50°;$$
$$\text{Percentage} = \frac{50}{180} \times 100 = 27.78\%$$
$$\text{3rd angle} = \frac{6}{18} \times 180° = 60°;$$
$$\text{Percentage} = \frac{60}{180} \times 100 = 33.33\%$$

9. $\text{Radha} = \frac{4}{12} \times 4800 = ₹1600;$

$$\text{Percentage} = \frac{1600}{4800} \times 100 = 33.33\%$$

$$\text{Meera} = \frac{3}{12} \times 4800 = ₹1200;$$

$$\text{Percentage} = \frac{1200}{4800} \times 100 = 25\%$$

$$\text{Reena} = \frac{5}{12} \times 4800 = ₹2000;$$

$$\text{Percentage} = \frac{2000}{4800} \times 100 = 41.67\%$$

10. (*a*) $78 + 20\% \text{ of } 78 = 78 + \frac{20}{100} \times 78 = 93.6$

(*b*) $150 - 12\% \text{ of } 150 = 150 - \frac{12}{100} \times 150 = 132$

11. Given number $= x + x \times 14\% = x + \frac{14}{100}x = \frac{114}{100}x$

$= 1.14x$

The number should be multiplied by 1.14.

12. The depreciation formula is given by

$$V = P(1 - r)^n$$

$$= 24000 \times \left(1 - \frac{6}{100}\right)^3$$

$$= 24000 \times \frac{94}{100} \times \frac{94}{100} \times \frac{94}{100}$$

$$= ₹19934$$

13. No. of good oranges $= (100 - 8)\%$ of 550 oranges

$$= \frac{92}{100} \times 550 = 506 \text{ oranges}$$

14. No. of students failed = (100 – 92)% of total students

$$24 = 8\% \text{ of } x$$

$$24 = \frac{8}{100} \times x$$

$$x = \frac{100}{8} \times 24 = 300 \text{ students}$$

15. % increase in height $= \frac{(5.4 - 5.0)}{5.0} \times 100 \times 100$

$$= \frac{0.4}{5.0} \times 100 = 8\%$$

Think and Answer (Page 229)

Gain and loss Percent are always calculated on cost price as cost price is the base price.

S.P. = C.P. + Profit = 500 + 50 = ₹550.

Practice Time 10C

1. (*a*) Since S.P. > C.P., gain/profit is incurred.

S.P. – C.P. = 235 – 190 = ₹45

$$\text{Profit \%} = \frac{\text{S.P.} - \text{C.P.}}{\text{C.P.}} \times 100 = \frac{235 - 190}{190} \times 100$$

$$= \frac{45}{190} \times 100 = 23.68\%$$

(*b*)–(*e*) Do it yourself (same as above)

2. Since S.P. > C.P., gain/profit is incurred.

$$\text{Profit \%} = \frac{\text{S.P.} - \text{C.P.}}{\text{C.P.}} \times 100 = \frac{160 - 150}{150} \times 100$$

$$= \frac{10}{150} \times 100 = 6.67\%$$

3. Do it yourself. Same as Q.2 above.

4. C.P. = S.P. + Loss = 15000 + 500 = 15500

$$\text{Loss \%} = \frac{\text{C.P.} - \text{S.P.}}{\text{C.P.}} \times 100 = \frac{500}{15500} \times 100$$

$$= 3.23\%$$

5. $$\text{Profit \%} = \frac{\text{S.P.} - \text{C.P.}}{\text{C.P.}} \times 100$$

$$5 = \frac{95 - \text{C.P.}}{\text{C.P.}} \times 100$$

$$5 \text{ C.P.} = 9500 - 100 \text{ C.P.}$$

$$105 \text{ C.P.} = 9500$$

$$\text{C.P.} = \frac{9500}{105} = ₹90.48$$

6. $$\text{Loss \%} = \frac{\text{C.P.} - \text{S.P.}}{\text{C.P.}} \times 100$$

$$22 = \frac{4000 - \text{S.P.}}{4000} \times 100 = \frac{4000 - \text{S.P.}}{40}$$

$$880 = 4000 - \text{S.P.}$$

$$\text{S.P.} = 4000 - 880 = ₹3120$$

7. Do it yourself. Same as Q.4 above.

8. Given the selling price of 20 articles is equal to the cost price of 23 articles.

Let S.P. of 20 articles be ₹x.

C.P. of 23 articles is also ₹x.

S.P. of 1 article = ₹$\frac{x}{20}$

S.P. of 23 articles = ₹$\frac{23x}{20}$

Since S.P. > C.P.

$$\text{Profit \%} = \frac{\text{S.P.} - \text{C.P.}}{\text{C.P.}} \times 100 = \frac{\frac{23x}{20} - x}{x} \times 100$$

$$= 15\%$$

9. $$\text{Loss \%} = \frac{\text{C.P.} - \text{S.P.}}{\text{C.P.}} \times 100$$

$$10 = \frac{\text{C.P.} - 1440}{\text{C.P.}} \times 100$$

$$10\ \text{C.P.} = 100\ \text{C.P.} - 144000$$

$$90\ \text{C.P.} = 144000$$

$$\text{C.P.} = \frac{144000}{90} = ₹1600$$

10. Let the total price of a pencil be ₹x.

$$\text{C.P. of 24 pencils} = \frac{x}{24}$$

$$\text{S.P. of 18 pencils} = \frac{x}{18}$$

$$\text{Profit per pencil} = \frac{x}{18} - \frac{x}{24} = \frac{4x - 3x}{72} = \frac{x}{72}$$

$$\text{Profit \%} = \frac{\frac{x}{72}}{\frac{x}{24}} \times 100 = \frac{24}{72} \times 100 = 33.33\%$$

Quick Check (Page 231)

$$\text{S.I.} = \frac{\text{P} \times \text{R} \times \text{T}}{100}$$

$$= \frac{250000 \times 7.5 \times \frac{18}{12}}{100} = ₹28125$$

Think and Answer (Page 232)

$$\text{Amount} = \text{P} + \text{S.I.} = \text{P} + \frac{\text{P} \times \text{R} \times \text{T}}{100}$$

$$70250 = 50000 + \frac{50000 \times 4.5 \times \text{T}}{100}$$

$$20250 = \frac{50000 \times 4.5 \times \text{T}}{100}$$

$$\text{T} = \frac{20250 \times 100}{50000 \times 4.5} = 9 \text{ years}$$

Practice Time 10D

1. (*a*) $$\text{S.I.} = \frac{\text{P} \times \text{R} \times \text{T}}{100}$$

$$= \frac{4800 \times 15 \times 2}{100} = ₹1440$$

Amount = Principal + S.I.

= ₹4800 + ₹1440 = ₹6240

(*b*) Amount = Principal + S.I.

S.I. = ₹12750 – ₹12500 = ₹250

$$\text{S.I.} = \frac{\text{P} \times \text{R} \times \text{T}}{100}$$

$$250 = \frac{12500 \times 6 \times \text{T}}{100}$$

$$\text{T} = \frac{250 \times 100}{12500 \times 6} = \frac{1}{3} \text{ years}$$

$$= 4 \text{ months} \qquad \left(\frac{12}{3} \text{ months} = 4\right)$$

(*c*) Amount = Principal + S.I.

Principal = 9362 – 1812 = ₹7550

$$\text{S.I.} = \frac{\text{P} \times \text{R} \times \text{T}}{100}$$

$$1812 = \frac{7550 \times \text{R} \times 3}{100}$$

$$\text{R} = \frac{1812 \times 100}{7550 \times 3} = 8\%$$

(*d*) Amount = P + S.I.

4944 = P + 144

P = 4944 – 144 = ₹4800

$$\text{S.I.} = \frac{\text{P} \times \text{R} \times \text{T}}{100}$$

$$144 = \frac{4800 \times \text{R} \times \frac{73}{365}}{100}$$

$$\text{R} = \frac{144 \times 365}{48 \times 73} = 15\%$$

2. P = ₹2920, R = 10%, T = 109 days (Interest is calculated for 109 days)

$$\text{S.I.} = \frac{\text{P} \times \text{R} \times \text{T}}{100}$$

$$= \frac{2920 \times 10 \times \frac{109}{365}}{100} = ₹87.20$$

Amount = P + S.I. = 2920 + 87.20 = ₹3007.20

3. Amount = P + S.I.

4P = P + S.I.

S.I. = 4P – P = 3P

$$\text{S.I.} = \frac{\text{P} \times \text{R} \times \text{T}}{100}$$

$$3\text{P} = \frac{\text{P} \times 20 \times \text{T}}{100}$$

$$\text{T} = \frac{3\text{P} \times 100}{\text{P} \times 20} = 15 \text{ years}$$

4. Amount = P + S.I.

10763.50 = 8360 + S.I.

S.I. = 10763.50 – 8360 = Rs 2403.50

$$\text{S.I.} = \frac{\text{P} \times \text{R} \times \text{T}}{100}$$

$$2403.50 = \frac{8360 \times R \times \frac{5}{2}}{100}$$

$$R = \frac{2403.50 \times 100 \times 2}{8360 \times 5} = 11.5\%$$

5. Amount borrowed $= \frac{45000 \times 8 \times 3}{100} = ₹10800$

Amount lent $= \frac{45000 \times 10 \times 3}{100} = ₹13500$

Amount Nandini earn = ₹13500 – ₹10800

= ₹2700

6. Do it yourself, same as Q4.

7. Let the principal be ₹x.

$$A = P + \frac{P \times R \times T}{100}$$

$$1500 = x + \frac{x \times R \times 10}{100}$$

$$15000 = 10x + Rx$$

$$x = \frac{15000}{10 + R} \quad ...(i)$$

And $$1725 = x + \frac{x \times R \times 13}{100}$$

$$172500 = 100x + 13Rx$$

$$x = \frac{1725000}{100 + 13R} \quad ...(ii)$$

From (i) and (ii)

$$\frac{15000}{10 + R} = \frac{1725000}{100 + 13R}$$

$$15000\,(100 + 13R) = 172500\,(10 + R)$$

$$6(100 + 13R) = 69\,(10 + R)$$

$$600 + 78R = 690 + 69R$$

$$78R - 69R = 690 - 600$$

$$9R = 90$$

$$R = 10\%$$

Putting R in eq. (i), we get

$$x = \frac{15000}{10 + 10} = \frac{15000}{20} = ₹750$$

Maths Talk (Page 232)

Let the number of managers be x and the number of employees be $5x$.

According to the given information

$$\frac{30}{100}x + \frac{40}{100} \times 5x = 70$$

$$0.3x + 2x = 70$$

$$2.3x = 70$$

$$x = \frac{70}{23} \times 10 = 100$$

$$x \approx 30$$

No. of managers = 30

No. of employees = $5x = 5(30) = 150$

Maths Connect (Page 233)

Approximate land area of Asia

= 30% of 14,84,28,950 sq. km.

$= \frac{30}{100} \times 14{,}84{,}28{,}950 = 44528685$ sq. km

Approximate land area of India

= 7% of 44528685 sq. km

$= \frac{7}{100} \times 44528685$ sq. km = 3117008 sq. km

Chapter Assessment

A.

1. Oil price after increase = x + 5% of x

$$84 = x + \frac{5}{100} \times x$$

$$84 = \frac{105}{100} \times x$$

$$x = \frac{100}{105} \times 84 = ₹80$$

Hence, the correct option is (d).

2. Let the cost price of one pencil = ₹x

Let the cost price of 3 pencils = ₹$3x$

S.P. of 2 pencils = cost price of 3 pencils = ₹$3x$

C.P. of 2 pencils = ₹$2x$

$$\text{Gain \%} = \frac{\text{S.P.} - \text{C.P.}}{\text{C.P.}} \times 100$$

$$= \frac{3x - 2x}{2x} \times 100 = \frac{x}{2x} \times 100 = 50\%$$

Hence, the correct option is (b).

3. % of scouts from Ahmedabad = 20% of 40% of x

$$= \frac{20}{100} \times \frac{40}{100} \times x$$

$$= \frac{8}{100} \times x = 8\% \text{ of } x$$

Hence, the correct option is (c).

4. For buffalo, Loss% $= \frac{\text{Loss}}{\text{C.P.}} \times 100$

$$5 = \frac{\text{Loss}}{44000} \times 100$$

$$\text{Loss} = \frac{5}{100} \times 44000 = ₹2200$$

For cow, $\text{Profit\%} = \frac{\text{Profit}}{\text{C.P.}} \times 100$

$$10 = \frac{\text{Profit}}{18000} \times 100$$

$$\text{Profit} = \frac{10}{100} \times 18000 = ₹1800$$

Net result = ₹2200 – ₹1800 = ₹400 (Loss)

Hence, the correct option is (*c*).

5. Amount = P + S.I.

2P = P + S.I.

S.I. = 2P – P = P

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$P = \frac{P \times 20 \times x}{100} \text{ or } x = \frac{P \times 100}{P \times 20} = 5 \text{ years}$$

Hence, the correct option is (*c*).

6. S.I. for Rohan $= \frac{30000 \times 10 \times 3}{100} = ₹9000$

$$\text{SI for Mansi} = \frac{40000 \times 10 \times \frac{5}{2}}{100} = ₹10000$$

Difference of interests = ₹10000 – ₹9000 = ₹1000

Hence, the correct option is (*b*).

B.

1. Assertion (A): The total cost price = ₹15,000.

The selling price at a profit of 26.67% is:

$$\text{S.P.} = \text{C.P.} + \left(\frac{26.67}{100} \times 15,000\right)$$

$$\text{S.P.} = 15000 + 4000.5 \approx 19000$$

So, Assertion (A) is true.

Reason (R): The correct formula for selling price is:

Selling Price = Cost Price + Profit

Since this formula correctly explains Assertion (A),

Hence, the correct answer is (*a*).

2. Assertion (A): Using the simple interest formula:

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$\text{S.I.} = \frac{1000 \times 8.5 \times 2}{100} = \frac{17000}{100} = 170$$

Since the calculation is correct, Assertion (A) is true.

Reason (R): The formula provided is correct.

Hence, the correct answer is (*a*).

3. Assertion (A): 50 paise = ₹0.50, and ₹1 = ₹1.

$$\text{Ratio} = \frac{0.50}{1} = \frac{50}{100} = 1:2$$

So, Assertion (A) is true.

Reason (R): The definition of ratio is correct. However, it does not explain why the ratio is 1:2.

Hence, the correct answer is (*b*).

4. Assertion (A): Using the formula:

$$\text{S.I.} = \frac{P \times R \times T}{100} = \frac{100 \times 36 \times 1}{100} = 36$$

Since ₹24 is incorrect, Assertion (A) is false.

Reason (R): The formula provided is correct.

Hence, the correct answer is (*d*).

5. Assertion (A): Cost Price = ₹10,000, Selling Price = ₹8,000.

Loss = C.P. – S.P. = ₹10,000 – ₹8,000

= ₹2,000.

$$\text{Loss \%} = \frac{2000}{10000} \times 100 = 20\%$$

Since the loss percentage is correct, Assertion (A) is true.

Reason (R): The definition of loss percentage is correct, but it does not explain the specific case of Mithlesh's T.V.

Hence, the correct answer is (*b*).

C. (*a*) – (*iii*); (*b*) – (*i*); (*c*) – (*v*); (*d*) – (*vi*); (*e*) – (*iv*); (*f*) – (*ii*)

D. **1.** $\frac{2}{25} = \mathbf{8}\%$.

2. $5\frac{1}{4}\% = \frac{\mathbf{21}}{400}$

3. Profit and loss of an item is calculated on **cost price**.

4. 45% of 225 is equal to **101.25**.

5. Amount = **Principal** + Interest.

E.

1. No. of other types of plants

$$= \frac{100 - 12}{100} \times 250 = \frac{88}{100} \times 250 = 220$$

2. Aggregate % $= \frac{99 + 76 + 61 + 84 + 95}{5} = \frac{415}{5}$

$= 83\%$

3. C.P. = S.P. – Profit = 48 – 8 = ₹40

$$\text{Profit }\% = \frac{\text{Profit}}{\text{C.P.}}\times 100 = \frac{8}{40}\times 100 = 20\%$$

4. Reduction in consumption (%)

$$= \frac{20}{100+20}\times 100 = \frac{20}{120\times 100} = 16\frac{2}{3}\%$$

5. Cost per banana = $\frac{60}{12}$ = ₹5

Total C.P. = 1200 × ₹5 = ₹6000

Total S.P. = 50 × ₹0 + 600 × ₹5.50 + $\frac{550}{2}\times 12$

= ₹0 + 3300 + 3300 = ₹6600

$$\text{Gain}\% = \frac{6600-6000}{6000}\times 10 = 10\%$$

6. Amount = P + S.I.

3120 = 2400 + S.I.

S.I. = 3120 – 2400 = ₹720

$$\text{S.I.} = \frac{\text{P}\times\text{R}\times\text{T}}{100}$$

$$720 = \frac{2400\times 12\times x}{100}$$

$$x = \frac{720\times 100}{2400\times 12} = 2\frac{1}{2}\text{ years}$$

or 2 years 6 months.

7. Amount = P + S.I.

8806 = P + S.I.

S.I. = 8806 – P

$$\text{S.I.} = \frac{\text{P}\times\text{R}\times\text{T}}{100}$$

$$8806 - \text{P} = \frac{\text{P}\times 9\times\frac{146}{365}}{100}$$

880600 – 100 P = 3.6 P

103.6 P = 880600

$$\text{P} = \frac{880600}{103.6} = ₹8500$$

8. Amount = P + S.I.

$2x = x$ + S.I.

S.I. $= 2x - x = x$

$$\text{S.I.} = \frac{\text{P}\times\text{R}\times\text{T}}{100}$$

$$x = \frac{x\times\text{R}\times 6}{100}$$

$$\text{R} = \frac{100}{6} = \frac{50}{3}\% = 16.67\%$$

9.

$$\text{S.I.} = \frac{\text{P}\times\text{R}\times\text{T}}{100}$$

$$= \frac{10240\times\frac{25}{2}\times\frac{9}{12}}{100} = \frac{10240\times 25\times 9}{100\times 2\times 12}$$

= ₹960

10. 84% of x + 32 = x

$$\frac{84x}{100} + 32 = x$$

$100x - 84x = 3200$

$16x = 3200$

$x = 200$ seats

11. S.P. of 12 articles = C.P. of 15 articles = 15 x

C.P. of 12 articles = $12x$

$$\text{Gain }\% = \frac{\text{Gain}}{\text{C.P.}}\times 100 = \frac{15x-12x}{12x}\times 100 = 25\%$$

12. S.I. for money borrowed by Raman

$$= \frac{20000\times 8\frac{18}{12}}{100} = ₹2400$$

S.I. for money borrowed by Aman

$$= \frac{2000\times 12\times\frac{219}{365}}{100} = ₹1440$$

Raman, Difference = ₹2400 – ₹1440 = ₹960.

13. S.I. for money borrowed = $\frac{30000\times 5\times 4\frac{10}{12}}{100}$

= ₹7250

Amount = ₹30000 + ₹7250 = ₹37250

Amount returned = ₹32000 + Goat

Value of Goat = ₹37250 – ₹32000 = ₹5250

14.

$$\text{S.I.} = \frac{\text{P}\times\text{R}\times\text{T}}{100}$$

$$= \frac{1000000\times 18\times 1}{100} = ₹1,80,000$$

Sum of all scholarships = ₹1,80,000

1st scholarship

= ₹(180000 – 50000 – 30000 – 25000)

= ₹75000

15. (*a*) % of crust to that of Earth's radius

$$= \frac{\text{Crust thickness}}{\text{Earth's radius}} = \frac{34}{6435}\times 100$$

= 0.54%

(*b*) % of lower mantle layer to that of Earth's radius

$$= \frac{\text{Lower mantle layer thickness}}{\text{Earth's radius}}$$

$$= \frac{2200}{6435} \times 100 = 34.19\%$$

(*c*) % of outer core to that of whole core

$$= \frac{\text{Outer core thickness}}{\text{Whole core thickness}}$$

$$= \frac{2300}{3400} \times 100 = 65.71\%$$

Brain Sizzlers (Page 236)

For the 1st shopkeeper,

Cost of item with 0% profit = ₹300 + 0% of 300 = ₹300

Amount returned to the buyer = ₹200

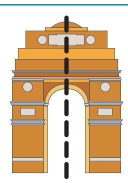
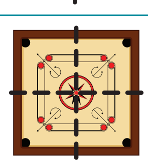
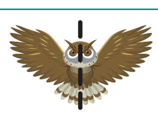
Total expenses incurred to the buyer = ₹300 + 200 = ₹500

Amount returned to the 2nd shopkeeper = ₹500

Loss = ₹500 + ₹500 = ₹1000

CHAPTER 11 : SYMMETRY

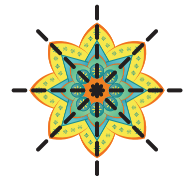
Let's Recall

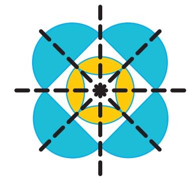
	Objects	No. of line symmetry	Horizontal/vertical line of symmetry
1.		1	Horizontal
2.		1	Vertical
3.		1	Vertical
4.		2	Both horizontal and vertical
5.		1	Vertical

Think and Answer (Page 240)

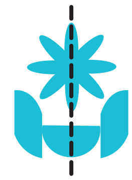
The human body is not completely symmetrical. However eyes, ears, arms, hands, legs and wrists show mostly symmetrical features.

Quick Check (Page 241)

(*a*) 

(*b*) 

(*c*) 

(*d*) 

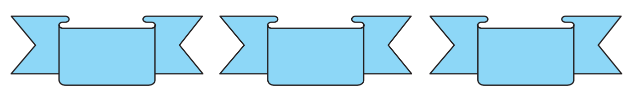
Think and Answer (Page 246)

When a ceiling fan rotates in an anticlockwise direction, it creates a downdraft of air that circulates around the room. This downdraft can help to cool the room by circulating the air and creating a wind chill effect.

Quick Check (Page 248)

Order of symmetry of isosceles triangle will be 1 and the angle of rotational symmetry is 360 degrees.

Think and Answer (Page 249)

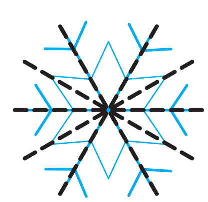
(*a*) 

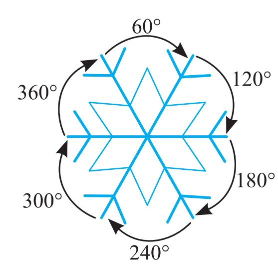
Initial position 180° 360°

On rotation through the angles 180° and 360° the given picture looks exactly the same. Thus, we can say it has a rotational symmetry of order 2.

(*b*)–(*c*) Do it yourself (same as above)

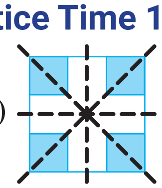
Think and Answer (Page 250)

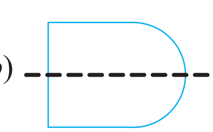


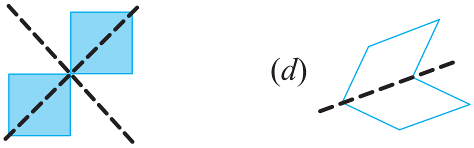


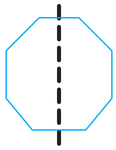
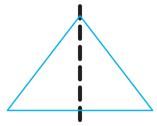
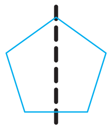
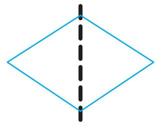
Line of symmetry = 6 Order of rotational symmetry = 6

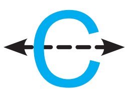
Practice Time 11A

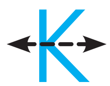
1. (*a*) 

(*b*) 

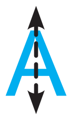
(c) (d)


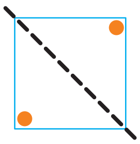
2. (a)

(b)

(c)

(d)


3. (a)


(b)


(c)


(d)


4. (a)

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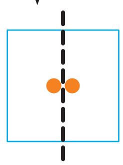
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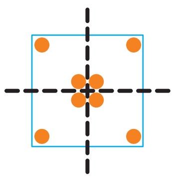
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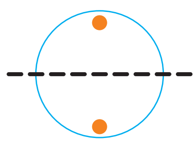
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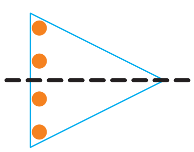
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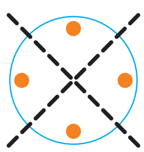

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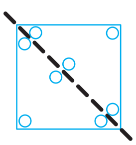
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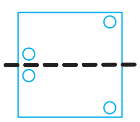
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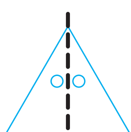
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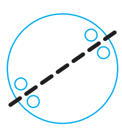
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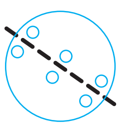

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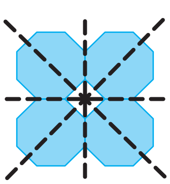
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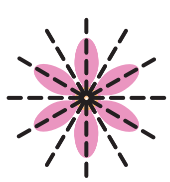
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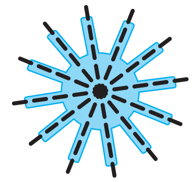
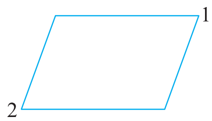


7. (a) Two (b) one (c) One
(d) Ten (e) Zero (f) Four

8. Parallelogram, Scalene triangle, Trapezium.

Practice Time 11B

1. (a)

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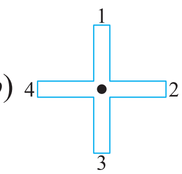
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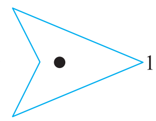
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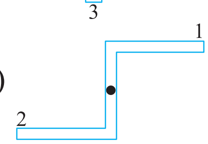
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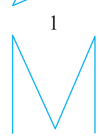

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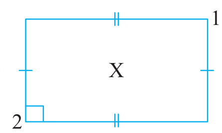
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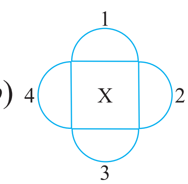
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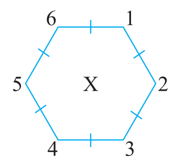
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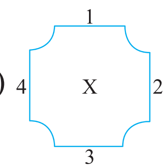

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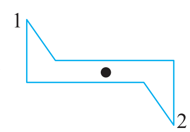
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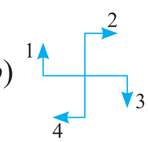
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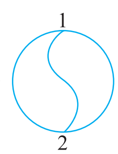
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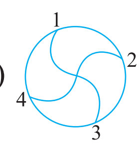
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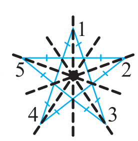
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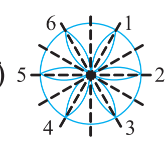
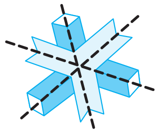


Mental Maths (Page 251)

1.


180° 360°

Order of rotational symmetry = 2

2.  3 lines of symmetry

3. Alphabet Z has only one line of symmetry.
4. Since, the circle has infinite number of sides and when rotating, at each angle circle looks the same as original. So, the order of rotational symmetry for a circle is infinite.
5. BOOK DICE HOOK

(Answer may vary)

Chapter Assessment

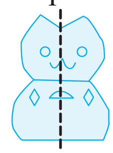
A.

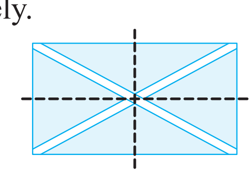
1. (*d*) The angle of rotation is at 90°, 180°, 270° and 360° respectively.
2. (*b*) The angle of rotation is at 180° and 360° respectively.
3. (*d*) Order of rotational symmetry = $\frac{360}{36} = 10$
4. (*c*) B A M
5. (*b*) H and S show more than one order of rotational symmetry.

B.

1. A square has four lines of symmetry (two diagonals, one vertical, and one horizontal). The definition of a line of symmetry given in Reason (R) is correct and explains why a square has four lines of symmetry.
   Hence the correct option is (*a*).
2. The formula for the order of rotational symmetry is:
   Order of Rotational Symmetry
   $$= \frac{360°}{\text{Angle of Rotation}}$$
   If the angle of rotation is 72°, then:
   $$\frac{360°}{72°} = 5$$
   Thus, both the assertion and reason are correct, and Reason (R) explains Assertion (A) correctly.
   Hence the correct option is (*a*).
3. The letter H has 2 lines of symmetry (one vertical and one horizontal).
   The letter H has a rotational symmetry of order 2 (it looks the same after a 180° rotation).
   The angle of rotation for order 2 is 180°, which is correct but does not directly explain why H has 2 lines of symmetry.
   Thus, Reason (R) is true but does not explain Assertion (A).
   Hence the correct option is (*b*).

D.

4. (*a*) The angle of rotation is at 120°, 240° and 360° respectively.
   (*b*) The angle of rotation is at 180° and 360° respectively.
   (*c*) 
   The angle of rotation is at 360°.
   (*d*) The angle of rotation is at 120°, 240° and 360° respectively.
   (*e*) The angle of rotation is at 180° and 360° respectively.



UNIT TEST – 3

A.

1. Ratio = $\frac{60 \div 12}{48 \div 12} = \frac{5}{4} = 5 : 4$
   Thus, the correct option is (*c*).
2. $\frac{85}{100} = 0.85$
   Thus, the correct option is (*d*).
3. Only 1 line of symmetry in an isosceles triangle
   Thus, the correct option is (*a*).
4. Ratio = $\frac{\text{No. of girls}}{\text{No. of boys}} = \frac{515}{400} = \frac{103}{80} = 103 : 80$
   Thus, the correct option is (*b*).
5. The angles of rotation are 90°, 180°, 270° and 360° respectively.
   Thus, the correct option is (*a*).
6. $\frac{x}{100} \times 1700 = 867$
   $$x = \frac{867 \times 100}{1700} = 51$$
   Thus, the correct option is (*c*).

7. % of good oranges = 100 – 9 = 91%

No. of good oranges = $\frac{91}{100} \times 600 = 546$

Thus, the correct option is (*b*).

8. A's share = $\frac{3}{8} \times 4000 = ₹1500$

Thus, the correct option is (*a*).

9. **Reason:** A line of symmetry is a line that divides an object into two identical parts. So, the given reason is incorrect.

Hence, the correct option is (*c*).

10. **Assertion:** The simple interest on ₹2000 for 2 years at 8.5% per annum is ₹340.

Hence, the correct option is (*d*).

B.

1. $$\text{Ratio} = \frac{2}{9} = \frac{x}{108}$$
$$x = \frac{108 \times 2}{9} = 24$$

2. $$4 : x = x : 16$$
$$\frac{4}{x} = \frac{x}{16}$$
$$x = \sqrt{4 \times 16} = \sqrt{64} = 8$$

3. $$\text{Ratio} = \frac{65}{1500} = \frac{13}{300} = 13 : 300$$

4. $$0.9\% = \frac{0.9}{100} = \frac{9}{1000} = 9 : 1000$$

5. A rectangle has **two** lines of symmetry.

C.

1. True

2. $x = \frac{55}{100} \times 550 = 302.5$ kg. True

3. Profit or loss per cent is always calculated on C.P. False

4. $t : s :: s : m$, s is the mean proportional. True

5. Ratio = $\frac{\text{No. of girls}}{\text{No. of boys}} = \frac{m}{t} = m : t$. False

D.

1. The letters H, I, O of the English alphabet have both lines of symmetry.

2. (*a*) Ratio = $\frac{1180 \div 20}{560 \div 20} = \frac{59}{28} = 2.11$

(*b*) Ratio = $\frac{350 \div 50}{300 \div 50} = \frac{7}{6} = 1.17$

Since, 2.11 > 1.17, the ratio 59 : 28 is greater.

3. Let the number be x.
$$48\% \text{ of } x = 984$$
$$\frac{48}{100} \times x = 984$$
$$x = \frac{984}{48} \times 100 = 2050$$
$$90\% \text{ of } 2050 = \frac{90}{100} \times 2050 = 1845$$

4. Do it yourself.

5. % increase in price
$$= \frac{48-46}{46} \times 100 = \frac{100}{23} = 4\frac{8}{23}\%$$

6. CP = ₹35,500 + ₹2500 = ₹38000

SP = ₹40,000
$$\text{Profit \%} = \frac{\text{SP} - \text{CP}}{\text{CP}} \times 100 = \frac{40000 - 38000}{38000} \times 100$$
$$= \frac{2000}{38000} \times 100 = \frac{100}{19} = 5\frac{5}{19}\%$$

7. $$\text{Ratio} = \frac{8}{7} = \frac{l}{105}$$
$$l = \frac{8}{7} \times 105 = 120 \text{ m}$$

8. Do it yourself.

CHAPTER 12 : VISUALISING SOLID SHAPES

Maths Talk (Page 261)

- A hexagonal prism is a prism with two bases that are in the shape of hexagons (6-sided) and 6 lateral faces that are in the shape of rectangles.
- A heptagonal prism is a three-dimensional solid consisting of two identical heptagonal (7-sided) bases joined together by seven rectangular lateral faces.

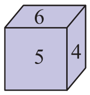
Yes, a pattern is followed with increasing the number of sides in a base, the lateral rectangular faces also increases.

If you can put in any number for n, representing the number of edges of the base (and top). You know this also represents the number of faces that make up the sides. You then add the base as a face and the top as another face, adding two more faces. Therefore, if the base has n number of edges, then the prism will have n+2 number of faces.

Think and Answer (Page 262)

Yes, The Great Pyramid of Giza is the largest Egyptian pyramid. Square pyramid due to its square base.

Think and Answer (Page 263)

Yes, 

Practice Time 12A

1.

	Number of Faces	Number of Vertices	Number of edges
Cube	6	8	12
Cuboid	6	8	12
Cylinder	3	0	2
Cone	2	1	1
Sphere	1	0	0
Triangular Prism	5	6	9
Square Pyramid	5	5	8
Triangular Pyramid	4	4	6

(*a*) – (*iii*); (*b*) – (*i*); (*c*) – (*v*); (*d*) – (*vi*); (*e*) – (*iv*);

2. (*a*) – (*ii*); (*b*) – (*vi*); (*c*) – (*iv*); (*d*) – (*i*); (*e*) – (*v*); (*f*) – (*iii*)

3. (*a*) EF

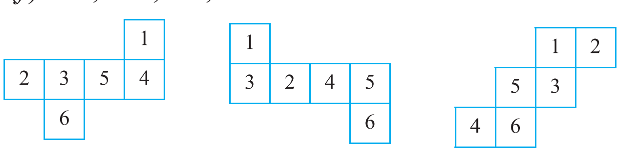
(*b*) EFBA, FGCB

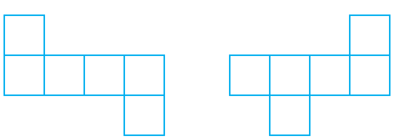
(*c*) AEHD, AEFB, ADCB

(*d*) Vertex D

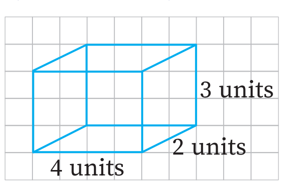
(*e*) CD, EF, HG

(*f*) AE, AD, BF, BC

4. 

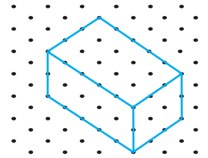
5. 

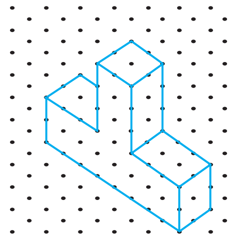
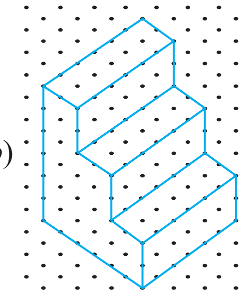
Quick Check (Page 266)

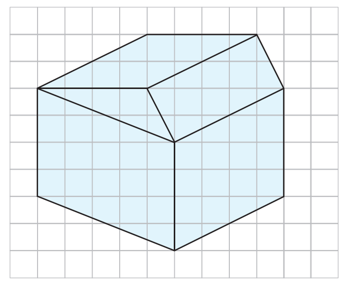


Practice Time 12B

1. You can draw the isometric sketch of cuboid of dimensions 5 cm × 3 cm × 2 as:



4. (*a*)  (*b*) 

5. 

Practice Time 12C

4. (*a*) **A brick**

Vertical cut: We get 2 rectangle-shape pieces of length half the length of brick but breadth will be the same.

Horizontal cut: We get 2 rectangle-shape pieces each of the same lengths but with half the breadth of the brick.

(*b*) **An orange**

Horizontal cut: We get 2 circle-shape pieces of the same diameter.

Vertical cut: We get 2 circle-shape pieces of the same diameter.

(*c*) **A cylindrical pipe**

Vertical cut: We get 2 rectangular shape pieces. Length will be equal to the height of circular pipe and breadth will be equal to the diameter of circular pipe.

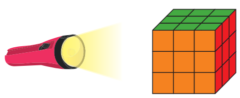
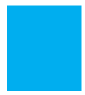
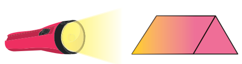
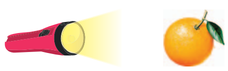
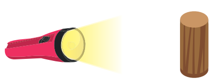
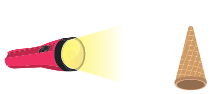
Horizontal cut: We get 2 pieces of circular pipe but their height will be half of the original circular pipe. The cross-section is in the shape of circle.

(*d*) An ice cream cone

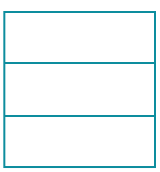
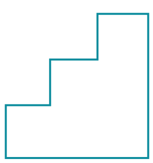
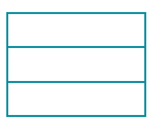
Vertical cut: We get 2 triangular shape pieces.

Horizontal cut: We get 1 piece of small cone shape and 1 frustum shape piece. The cross-section is in the shape of circle.

5.

Shadow diagram	Name of 2-D shapes formed in shadow	
		Square
		Parallelogram
		Circle
		Rectangle
		Triangle

Mental Maths (Page 275)

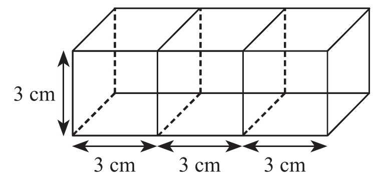
1. If we cut a corner of a cube, then we get a cut-out of a piece in the form of a triangular pyramid.
2.   

Top view **Side view** **Front view**

Chapter Assessment

A.

1. $6 + 1 = 7; 5 + 2 = 7; 4 + 3 = 7$
   Hence, the correct option is (*c*).
2. If we cut a cone horizontally, the cross-section we get is a circle.
   Hence, the correct option is (*a*).
3. A net is a flat, unfolded 2D shape that can be folded into a 3D figure.
   Hence the correct option is (*b*).
4. The given net consists of:
   A rectangle (curved surface of the cylinder).
   Two circles (top and bottom faces of the cylinder).
   Hence the correct option is (*c*).
5. A cuboid has 6 rectangular faces. If it is a cube (a special type of cuboid), all faces are squares.
   Hence the correct option is (*c*).
6. The shadow of a cube, when light falls along one vertical edge, will be rectangular.
   Hence the correct option is (*b*).
7. (*a*) 9 cm × 3 cm × 3 cm



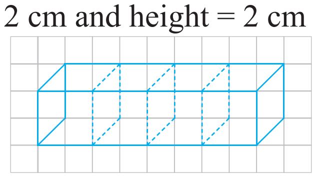
Hence, the correct option is (*a*).

B.

1. A square pyramid is actually a three-dimensional shape, not two-dimensional. So the assertion is false.
   A square pyramid does indeed have 8 edges (4 around the square base + 4 rising to the apex). So the reason is true.
   Hence, the correct option is (*d*).
2. The side-view of a cone appears as a triangle. So the assertion is true.
   A cone is a 3D shape that tapers from a circular base to a point (apex), which explains why its side-view is triangular. So the reason is true and it does explain the assertion.
   Hence the correct option is (*a*).
3. If the 2D arrangement of 6 squares can indeed be folded into a cube, then it is a net of a cube. Such standard arrangements of 6 squares are indeed valid nets of a cube. So the assertion is true.
   The reason is simply the definition of a net: a 2D figure that folds into a 3D shape. This definition explains what a net is and supports why the given shape qualifies as a net.
   Hence the correct option is (*a*).

D.

1. Length = 4 × 2 = 8 cm,
   breadth = 2 cm and height = 2 cm



4. (*a*) A pencil box when placed either vertically or horizontally will give a rectangle as shadow.
(*b*) A glass when placed vertically will give a rectangle as shadow.
(*c*) A tennis ball will give a circle as shadow.
(*d*) A cone cap will look like a triangle as shadow.
5. (*a*) oval shape, circular or oval shape
(*b*) rectangle, rectangle
(*c*) rectangle, rectangle or square or circle
(*d*) oval shape, circular or oval shape

Brain Sizzlers (Page 278)

(*a*) (*i*) GH (*ii*) DC
(*b*) (*i*) In a dice, the number opposite to 5 is always 2 and to 6 is 1.
(*ii*) the number opposite to 4 is always 3 and 3 is always 4.

CHAPTER 13 : PERIMETER AND AREA

Let's Recall

1. (*a*) Perimeter $= 2(l + b) = 2(5 + 3)$
$= 2 \times 8 = 16$ cm
Area $= l \times b = 5 \times 3 = 15$ cm^2
(*b*)–(*d*) Do it yourself (same as above)
2. (*a*) Perimeter of square $= 4 \times 8 = 32$ cm
Area of square $= 8 \times 8 = 64$ cm^2
(*b*)–(*c*) Do it yourself (same as above)
3. Perimeter $= 14 + 33 + 25 = 72$ cm.
5. Side length of a square $= \dfrac{68}{4} = 17$ cm
Area of square $= 17 \times 17 = 289$ cm^2
6. Perimeter of rectangular field $= 2(102 + 68)$
$= 340$ m
Cost of fencing 3 rounds @ ₹18 $= 3 \times 340 \times 18$
$=$ ₹18,360
Area of laying the grass $= 102 \times 68 = 6936$ m^2
Cost of laying the grass @ ₹10.5 per sq m
$= 10.5 \times 6936 =$ ₹72,828

Quick Check (Page 282)

Perimeter of square field = Perimeter of rectangular field

$4 \times 65 = 2(85 + b)$

$85 + b = \dfrac{4 \times 65}{2} = 130$ or $b = 130 - 85 = 45$ m

Maths Talk (Page 283)

Figure 1: Yes, Increased side length (after cutoff portion) $= 24 - 5 + 15 = 34$ cm
Perimeter will increase.
Increased perimeter $= 24 + 17 + 34 + 17 = 92$ cm
Figure 2: Perimeter will increase.
Increased perimeter $= 34 + 17 + 34 + 17 = 102$ cm
Area will decrease.
Original area $= 24 \times 17 = 408$ cm^2
Decreased area $= 24 \times 17 - 5 \times 5 - 5 \times 5$
$= 408 - 25 - 25 = 358$ cm^2

Think and Answer (Page 284)

Perimeter of kitchen garden $= 20 + 12 + 12$
$= 44$ m
Cost of fencing @ ₹150 per metre $= 150 \times 44$
$=$ ₹6600

Quick Check (Page 285)

Area of triangle $= \dfrac{\text{Area of rectangle}}{2}$

$= \dfrac{8 \times 4}{2} = 16$ cm^2

Practice Time 13A

1. (*a*) Perimeter = 2 (length + breadth)
$= 2(17 + 9) = 2 \times 26 = 52$ cm
Area $= 17 \times 9 = 153$ cm^2
(*b*)–(*d*) Do it yourself (same as above)
2. (*a*) Perimeter $= 4 \times$ side
$= 4 \times 9.5$ cm $= 38$ cm
Area $= 9.5 \times 9.5 = 90.25$ cm^2
(*b*)–(*d*) Do it yourself (same as above)
3. Area of shaded part $= \dfrac{1}{2}(a + b)h$
$= \dfrac{1}{2}(1 + 3) \times 5 = 10$ cm^2
4. Area of each rectangle = Length × breadth
$= 12 \times 8 = 96$ cm^2
Area of each triangle $= \dfrac{1}{2} \times$ area of rectangle
$= \dfrac{1}{2} \times 96 = 48$ cm^2

5. Area of each triangle = $\frac{1}{2}$ × area of square

$= \frac{1}{2} \times (5)^2$

$= \frac{1}{2} \times 25 = 12.5 \text{ cm}^2$

6. Width of rectangular sheet

$\frac{\text{Area of rectangular sheet}}{\text{Length of sheet}} = \frac{500}{25} = 20 \text{ cm}$

Perimeter of rectangular sheet

$2(l + b) = 2(25 + 20) = 90$ cm.

7. Breadth of rectangular plot

$\frac{\text{Area of rectangular plot}}{\text{Length of plot}} = \frac{440}{22} = 20 \text{ m}$

Perimeter = $2(l + b) = 2(22 + 20) = 84$ m.

8. Perimeter of rectangular sheet = $2(l + b)$

$100 = 2(35 + b)$

$50 = 35 + b$

$b = 50 - 35 = 15$ cm

Area = length × breadth

$= 35 \times 15 = 525 \text{ cm}^2$

9. Perimeter of square = Perimeter of rectangle

$4 \times 10 = 2(12 + b)$

$b = \frac{40}{2} - 12 = 8$ cm

Area of square = $10 \times 10 = 100 \text{ cm}^2$

Area of rectangle = $12 \times 8 = 96 \text{ cm}^2$

Area of square is the largest.

10. Do it yourself (same as above)

11. Do it yourself (same as Q9).

12. Area of the wall = $4.5 \times 3.6 = 16.2 \text{ m}^2$

Area of door = $1.1 \times 2 = 2.2 \text{ m}^2$

Area of wall to be painted = $16.2 - 2.2 = 14 \text{ m}^2$

Cost of whitewashing @ ₹20 per m^2

$= 14 \times 20 =$ ₹280

13. Area of horizontal path = $40 \times 2 = 80 \text{ m}^2$

Area of vertical path = $30 \times 2 = 60 \text{ m}^2$

Area of intersection of two paths = $2 \times 2 = 4 \text{ m}^2$

Area of two paths = $80 + 60 - 4 = 136 \text{ m}^2$

14. Area of outer square park

$= 120 \times 120 = 14400 \text{ m}^2$

Area of park inside park

$= (120 - 8 - 8) \times (120 - 8 - 8)$

$= 104 \times 104 = 10816 \text{ m}^2$

Area of path = $14400 - 10816 = 3584 \text{ m}^2$

Cost of cementing @ ₹175 per 10 m^2

$= \frac{3584 \times 175}{10} =$ ₹62,720

15. Do it yourself (same as above)

Quick Check (Page 290)

Area of ||gm = base × height = $11 \times 3 = 33 \text{ cm}^2$

Rest same as above.

Think and Answer (Page 292)

Area of original triangle = $\frac{1}{2} \times b \times h$

Area of new triangle = $\frac{1}{2} \times 2b \times h = 2\left(\frac{1}{2} \times b \times h\right)$

= 2 × Area of original triangle

Practice Time 13B

1. (*a*) Area of ||gm = base × height

$= 8 \times 6 = 48 \text{ cm}^2$

(*b*)–(*d*) Do it yourself (same as above)

2. (*a*) Area of triangle = $\frac{1}{2}$ × base × height

$154 = \frac{1}{2} \times 18 \times \text{height}$

Height = $\frac{154 \times 2}{18} = 17.1$ cm

(*b*)–(*c*) Do it yourself (same as above)

3. (*a*) Area of ||gm = base × height

$= 4 \times 7 = 28 \text{ cm}^2$

(*b*)–(*d*) Do it yourself (same as above)

4. (*a*) Area of triangle = $\frac{1}{2}$ × base × height

$= \frac{1}{2} \times 5 \times 8 = 20 \text{ cm}^2$

(*b*)–(*d*) Do it yourself (same as above)

5. Area of rectangle ABCD

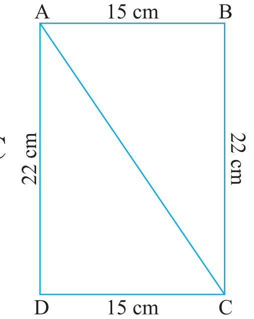
= 15 cm × 22 cm

= 330 cm^2

Area of ΔADC = area of ΔBAC

$= \frac{1}{2} \times 15 \text{ cm} \times 22 \text{ cm}$

$= 165 \text{ cm}^2$



6. Do it yourself (same as Q4).

7. Area of ||gm = base × height

$= 13 \times 9 = 117 \text{ cm}^2$

Perimeter of parallelogram

$= 2(\text{base} + \text{height}) = 2(13 + 9)$

$= 2(22) = 44$ cm

8. Base $= \dfrac{\text{Area of ||gm}}{\text{Height}} = \dfrac{6.76}{52} = 0.13$ cm

9. Given Height = 5 × base

Area of ||gm = base × height

$320 = b \times 5 \times b$

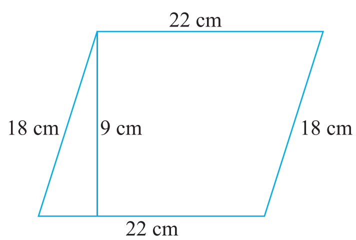
$b^2 = \dfrac{320}{5} = 64$ cm

$b = 8$ cm

Height = 5 × base = 5 × 8 = 40 cm

10. Area of ||gm with base 22 cm and height 9 cm = 22 × 9

$= 198 \text{ cm}^2$



Area of ||gm with base 18 cm and height h cm

$198 = 18 \times h$

$\dfrac{198}{18} = 18 \times h$

$h = 11$ cm

11. Base $= 6x$, height $= 5x$

Area of triangle $= \dfrac{1}{2} \times$ base × height

$153.6 \times 2 = 6x \times 5x$

$30x^2 = 307.2$

$x^2 = \dfrac{307.2}{30} = 10.24$

$x = \sqrt{10.24} = 3.2$ m

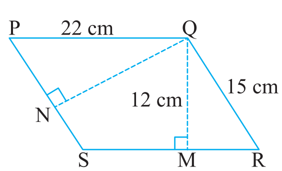
base = 6 × 3.2 = 19.2 m

height = 5 × 3.2 = 16 m

12. Area of ||gm = PS × QN

$= 15 \times 22$

$= 330 \text{ cm}^2$



Area of ||gm = SR × QM

= SR × 12

From above,

330 = SR × 12

$\text{SR} = \dfrac{330}{12} = 27.5$ cm

Perimeter of ||gm = PQ + QR + SR + PS

= 27.5 + 15 + 27.5 + 15 = 85 cm

13. Area of ΔABC with base 12 cm and height 5 cm

$= \dfrac{1}{2} \times$ base × height

$= \dfrac{1}{2} \times 12 \times 5 = 30 \text{ cm}^2$

Now, Area of ΔABC with base 13 cm and height AD

$= \dfrac{1}{2} \times \text{BC} \times \text{AD}$

$30 = \dfrac{1}{2} \times 13 \times \text{AD}$

$\text{AD} = \dfrac{30 \times 2}{13} = 4.6$ cm

14. Area of Δ XYZ with base YZ and height XM

$= \dfrac{1}{2} \times \text{YZ} \times \text{XM}$

$= \dfrac{1}{2} \times 12 \times 6 = 36 \text{ cm}^2$

Area of Δ XYZ with base XY and height ZN

$= \dfrac{1}{2} \times \text{XY} \times \text{ZN} = \dfrac{1}{2} \times 9 \times \text{ZN}$

From above,

$36 = \dfrac{1}{2} \times 9 \times \text{ZN}$

$\text{ZN} = \dfrac{1}{2} = 8$ cm

15. Perimeter of a ||gm = 140 + 90 + 140 + 90

= 460 m

Cost of fencing @ ₹30 per m = 460 × 30 = ₹13,800

Think and Answer (Page 296)

Circumference of circle C $= 2\pi r = 2 \times \pi \times 16$

$= 32\pi$

Perimeter of one curved part $= \dfrac{1}{4} \times 32\pi = 8\pi$

Perimeter of new shape = (4 × Perimeter of curved part) + (2 × radius)

$= (4 \times 8\pi) + (2 \times 16)$

$= 32\pi + 32$ = Circumference + 32

Yes, the perimeter changes.

So, the perimeter of the circle increases by 32 cm.

Quick Check (Page 297)

1. Area of circle $= \pi r^2 = \frac{22}{7} \times 4 \times 4 = 50.28$ sq inches
2. Area of circle $= 154\ \text{cm}^2$
$$\pi r^2 = 154$$
$$r = \sqrt{154} \times \sqrt{\frac{7}{22}} = \sqrt{7 \times 7} = 7\ \text{cm}$$
3. Area of plate $= \pi r^2 = \frac{22}{7} \times 8 \times 8 = 201.14\ \text{cm}^2$

Think and Answer (Page 298)

Area of square $= 26 \times 26 = 676\ \text{cm}^2$

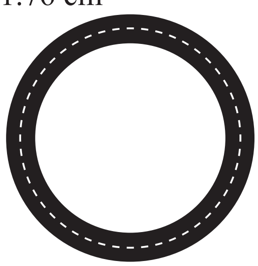
Radius of the circular grazed portion
$$= \frac{1}{2} \times \text{side of square} = \frac{1}{2} \times 26 = 13\ \text{cm}$$

Area of circular grazed portion
$$= \pi r^2 = \frac{22}{7} \times 13 \times 13 = 531.14\ \text{cm}^2$$

Area of field which cannot be grazed
$$= 676 - 531.14 = 144.86\ \text{cm}^2$$

Practice Time 13C

1. (*a*) Diameter $d = 2 \times r = 2 \times 4 = 8$ cm
$$\text{Circumference C} = 2\pi r = 2 \times \frac{22}{7} \times 4$$
$$= 25.14\ \text{cm}$$
$$\text{Area} = \pi r^2 = \frac{22}{7} \times 4 \times 4$$
$$= 50.28\ \text{cm}^2$$
(*b*)–(*d*) Do it yourself (same as above)
2. (*a*) Circumference $\text{C} = 2\pi r = 2 \times \frac{22}{7} \times 7 = 44$ cm
$$\text{Area} = \pi r^2 = \frac{22}{7} \times 7 \times 7$$
$$= 154\ \text{cm}^2$$
(*b*)–(*d*) Do it yourself (same as above)
3. Do it yourself (same as Q2)
4. Circumference $\text{C} = 2\pi r$
$$66 = 2 \times \frac{22}{7} \times r$$
$$r = \frac{66 \times 7}{2 \times 22} = 10.5\ \text{cm}$$
$$\text{Area} = \pi r^2 = \frac{22}{7} \times 10.5 \times 10.5$$
$$= 346.5\ \text{cm}^2$$
5. Circumference $= \frac{1}{2} \times 2\pi r + 2r$
$$= \frac{1}{2} \times 2 \times \ \times 7 + 2 \times 7 = 36\ \text{cm}$$
$$\text{Area} = \frac{1}{2} \times \pi r^2 = \frac{1}{2} \times \frac{22}{7} \times 7 \times 7$$
$$= 77\ \text{cm}^2$$
6. radius $= \frac{63}{2} = 31.5$ cm
Circumference $= 2\pi r = 2 \times \frac{22}{7} \times 31.5 = 198$ cm
Distance = number of revolutions × Circumference of wheel
$$1400000 = n \times 198$$
$$n = \frac{1400000}{198} \approx 7070.70 \text{ revolutions}$$
$$= 7071 \text{ revolutions}$$
7. $\frac{c_1}{c_2} = \frac{2\pi r_1}{2\pi r_2} = \frac{r_1}{r_2} = \frac{7}{9} = 7 : 9$
8. Circumference = Perimeter of rectangle
$$= 2(15.1 + 11.3) = 52.8\ \text{cm}$$
Circumference of circle $= 2\pi r$
$$52.8 = 2 \times \frac{22}{7} \times r$$
$$r = \frac{52.8 \times 7}{2 \times 22} = 8.4\ \text{cm}$$
$$\text{Area of circle} = \pi r^2 = \frac{22}{7} \times 8.4 \times 8.4$$
$$= 221.76\ \text{cm}^2$$
9. Let r be the radius of inner circumference and R be the radius of outer circumference.



Inner circumference $= 2\pi r$
$$= 528$$
$$r = 528 \times \frac{7}{22} \times \frac{1}{2} = 84\ \text{m}$$
Outer circumference $= 2\pi\text{R} = 616$
$$\text{R} = 616 \times \frac{7}{22} \times \frac{1}{2} = 98\ \text{m}$$
Width of the track $= \text{R} - r = 98 - 84$
$$= 14\ \text{m}$$
10. Let $r = 28$ m be the radius of inner circumference and R = 28 + 2.1 = 30.1 m be the radius of outer circumference.

Area of inner circumference $= \pi r^2 = \frac{22}{7} \times 28 \times 28$

$= 2464 \text{ m}^2$

Area of outer circumference $= \pi R^2$

$= \frac{22}{7} \times 30.1 \times 30.1$

$= 2847.46 \text{ m}^2$

Cost of the path = 2847.46 – 2464 = 383.46 m2

Cost of gravelling @ ₹5.50 per sq m

= 383.46 × 5.50 = ₹2109.03

11. Area of circular garden $= 9856 \text{ m}^2$

$\pi r^2 = 9856 \text{ m}^2$

$r = \frac{\sqrt{9856 \times 7}}{22} = \sqrt{3136} = 56 \text{ m}$

Area of circular garden including path

$= 9856 + 2618 = 12474 \text{ m}^2$

$\pi R^2 = 12474 \text{ m}^2$

$R = \sqrt{\frac{12474 \times 7}{22}} = \sqrt{3969} = 63 \text{ m}$

Width of the path $= R - r = 63 - 56 = 7$ m

Maths Connect (Page 301)

(*a*) Area inside shooting circle

$= \pi r^2 = \frac{22}{7} \times 14.63 \times 14.63 = 672.69 \text{ m}^2$

(*b*) Perimeter of hockey ground

= 2(91.6 + 55) = 293.2 m

Brain Sizzlers (Page 301)

Perimeter of square = 4 × 12 = 48 cm

Perimeter (Circumference) of circle

$= 2\pi r = 2 \times \frac{22}{7} \times \frac{12}{2} \times \; = 37.71$ cm

Perimeter of circle is smaller.

Chapter Assessment

A.

1. Area of ||gm = 12 × 24 = base × 18

Base $= \frac{12 \times 24}{18} = 16$ cm

Hence, the correct option is (*a*).

2. Circumference $= 2\pi r = 10\pi$

$r = \frac{10\pi}{2\pi} = 5$ cm

Area $= \pi r^2 = \pi \times 5 \times 5 = 25\pi \text{ cm}^2$

Hence, the correct option is (*c*).

3. $\frac{A_1}{A_2} = \frac{\pi r_1^2}{\pi r_2^2} = \frac{4}{9}$

$\frac{r_1}{r_2} = \frac{2}{3}$

$\frac{C_1}{C_2} = \frac{2\pi r_1}{2\pi r_2} = \frac{2}{3} = 2 : 3$

Hence, the correct option is (*a*).

4. $C = \pi d = 3.14\, d$ = more than three times its diameter

Hence, the correct option is (*a*).

5. Original area $= \pi r^2$

New area $= \pi(3r)^2 = 9\pi r^2 = 9 \times$ Original area

Hence, the correct option is (*a*).

6. Area of semicircle $= \frac{1}{2} \times \pi(4r)^2 = 8\pi r^2$

Hence, the correct option is (*a*).

7. The area of the parallelogram is Base × Height

The option DE × DC does not represent a valid base-height combination.

Hence, the correct option is (*b*).

B.

1. The formula for the circumference of a circle is:

$C = 2\pi r$

Since this is a correct formula, the assertion is true.

Verify the Reason

Substituting $r = 2.8$ m:

$C = 2 \times \frac{22}{7} \times 2.8$

$= \frac{44}{7} \times 2.8 = \frac{44 \times 2.8}{7} = \frac{123.2}{7} = 17.6 \text{ m}$

Clearly, 1760 m is incorrect.

Hence the correct option is (*c*).

2. Using the formula for the area of a circle:

$A = \pi r^2 = \frac{22}{7} \times 12^2$

$= \frac{22}{7} \times 144 = \frac{3168}{7} = 452.57$ sq. m

Since the given area matches exactly, the assertion is true.

Verify the Reason

The formula $A = \pi r^2$ is correct.

Since the reason correctly explains the assertion, Hence the correct option is (*a*).

3. Using the formula:

$$A = \text{base} \times \text{height} = 12 \times 18 = 216 \text{ cm}^2$$

The area given is correct.

Verify the Reason

The formula A = base × height is also correct.

Hence the correct option is (*a*).

4. The ratio of circumference to diameter is:

$$\frac{C}{d} = \frac{2\pi r}{2r} = \pi$$

Since $\pi = \frac{22}{7}$ is a constant, the assertion is true.

Verify the Reason

The formula C=2πr is correct.

Since the reason does not correctly explain why the ratio remains constant,

Hence the correct option is (*b*).

C.

1. Area = base × height

$$30 = 6 \times h \qquad \text{or} \qquad h = \frac{30}{6} = 5 \text{ cm}$$

2. D = 2 × 6 = 12 cm

3. Original Area of $\Delta = \frac{1}{2} \times b \times h$

$$\text{New Area of } \Delta = \frac{1}{2} \times \frac{b}{2} \times 2h = \frac{1}{2} \times b \times h$$

= remains unchanged

4. Original Area = πr^2

New area = $\pi(2r)^2 = 4\pi r^2 = 4 \times$ Original area

5. $C = 2 \times \frac{22}{7} \times 3.5 = 22$ cm

6. Perimeter of a semicircle is $\pi r + 2r$, where r is the radius of the circle.

D.

1. Area = length × breadth

$$17.64 = 3.6 \times b$$

$$b = \frac{17.64}{3.6} = 4.9 \text{ m}$$

Perimeter = $2(l + b) = 2(3.6 + 4.9) = 17$ m

2. (*a*) Area of quadrant $= \frac{1}{4} \times \pi r^2$

$$= \frac{1}{4} \times \frac{22}{7} \times 14 \times 14$$

$$= 154 \text{ m}^2$$

Area of shaded portion = 4 × 154 = 616 cm^2

(*b*) Area of circle $= \pi r^2 = \frac{22}{7} \times 7 \times 7 = 154 \text{ cm}^2$

Area of square $= \frac{1}{2} \times d \times d = \frac{1}{2} \times 14 \times 14$

$$= 98 \text{ cm}^2$$

Area of shaded portion = 154 – 98 = 56 cm^2

(*c*) Area of trapezium AECD

$$= \frac{1}{2} \times (AD + EC) \times AE$$

$$= \frac{1}{2} \times (7 + 4) \times 6 = \times 11 \times 6 = 33 \text{ cm}^2$$

(AD = BC = 7cm)

(*d*) Area of bigger circle $= \pi r^2 = \frac{22}{7} \times 7 \times 7$

$$= 154 \text{ cm}^2$$

Area of two smaller circles = πr^2

$$= 2 \times \frac{22}{7} \times \frac{7}{8} \times \frac{7}{8}$$

$$= 4.81 \text{ cm}^2$$

Area of shaded portion = 154 – 4.81

$$= 149.19 \text{ cm}^2$$

(*e*) Area of rhombus $= \frac{1}{2} \times d_1 \times d_2$

$$= \frac{1}{2} \times 80 \times 60 = 2400 \text{ cm}^2$$

Area of circle = πr^2

$$= \frac{22}{7} \times 10 \times 10 = 314.29 \text{ cm}^2$$

Area of shaded portion = 2400 – 314.29

$$= 2085.71 \text{ cm}^2$$

(*f*) Area of square = 40 × 40 = 1600 cm^2

Area of triangle $= \frac{1}{2} \times b \times h = \frac{1}{2} \times 10 \times 30$

$$= 150 \text{ cm}^2$$

Area of shaded portion = 1600 – 4 × 150

$$= 1000 \text{ cm}^2$$

3. Area of $\Delta = \frac{1}{2} \times b \times h = \frac{1}{2} \times 3x \times 4x$

$$216 = 6x^2$$

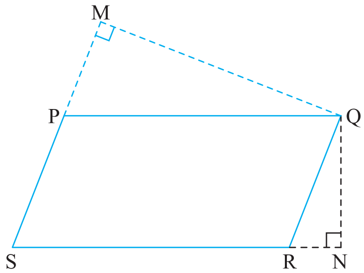
$$x = \sqrt{\frac{216}{6}} = 6 \text{ m}$$

Base = 3 × 6 = 18 m

Height = 4 × 6 = 24 m

4. Do it yourself (same as above)

5. (*a*) Area of PQRS = SR × QN = PS × QM



$24 \times 13 = 16 \times QM$

$$QM = \frac{24 \times 13}{16} = 19.5 \text{ cm}$$

(*b*) Do it yourself (same as above)

6. Area of ||gm = base × height

$= 180 \times 90 = 16200 \text{ m}^2$

Cost of watering the field @ ₹75 per sq m

$= 16200 \times 0.75 = ₹12,150$

7. Circumference of circle = Perimeter of square

$2\pi r = 4 \times 7.7$

$$r = \frac{4 \times 7.7 \times 7}{2 \times 22} = 4.9 \text{ cm}$$

8. Radius (r) = 15 cm

Circumference = $2\pi r = 2 \times 3.14 \times 15 = 94.2$ cm

Therefore, the tip of the minute hand moves 94.2 cm in 1 hour.

9. Area of two circles = $2 \times \pi r^2$

$$= 2 \times \frac{22}{7} \times 3.5 \times 3.5 = 77 \text{ cm}^2$$

Area of rectangle = length × breadth

$= 5 \times 1.5 = 7.5 \text{ cm}^2$

$$\text{Area of bigger circle} = \pi r^2 = \frac{22}{7} \times 28 \times 28$$

$= 2464 \text{ cm}^2$

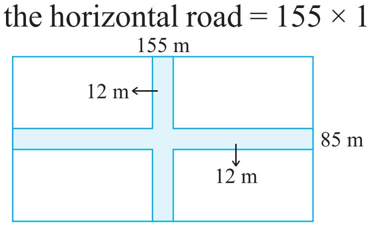
Area of shaded region = $2464 - 77 - 7.5$

$= 2379.5 \text{ cm}^2$

10. Length of the path by moon in one complete revolution = circumference

$= 2\pi r = 2 \times 3.14 \times 384000 = 2411520$ km

11. Area of the horizontal road = $155 \times 12 = 1860 \text{ m}^2$



Area of vertical road = $85 \times 12 = 1020 \text{ m}^2$

Area of intersection of two roads = 12×12

$= 144 \text{ m}^2$

Total area of the roads = $1860 - 1020 - 144$

$= 2736 \text{ m}^2$

Cost of constructing the roads @ ₹150 per sq m

$= 2736 \times 150 = ₹4,10,400$

12. (*a*) Area of square-shaped bread slice = 16×16

$= 256 \text{ cm}^2$

(*b*) Perimeter of each bread slice = $4 \times 16 = 64$ cm

(*c*) Area of each triangle-shaped bread

$$= \frac{256}{2} = 128 \text{ cm}^2$$

CHAPTER 14 : DATA HANDLING

Quick Check (Page 312)

1. Whole number start from 0.

The first 9 whole numbers are:

0, 1, 2, 3, 4, 5, 6, 7, 8,

$$\frac{0+1+2+3+4+5+6+7+8}{9} = \frac{36}{9} = 4$$

3. The first five prime numbers are: 2, 3, 5, 7, 11

$$\frac{2+3+5+7+11}{5} = \frac{28}{5} = 5.6$$

4. The first five negative numbers are: –1, –2, –3, –4, –5

$$\frac{-1-2-3-4-5}{5} = \frac{-15}{5} = -3$$

Quick Check (Page 313)

$$\textbf{2. } \text{Mean} = \frac{31+37+35+38+42+23+17+18+35+25+35+29}{12} = \frac{365}{12}$$

$= 30.42$

Mode = 35, as 35 occurs 3 times in the observation.

Here, mode is greater than mean.

Practice Time 14A

1. (*a*) $$\text{Mean} = \frac{\text{Sum of all observations}}{\text{Number of observations}}$$

$$= \frac{11+9+7+10+12+8+13}{7} = \frac{70}{7} = 10$$

(b) Mean $= \dfrac{14+16+19+25+21+15+17+25}{8}$

$= \dfrac{152}{8} = 19$

(c) Mean $= \dfrac{23+2+0-2+19+11-3+1+17+6}{10}$

$= \dfrac{74}{10} = 7.4$

2. (a) Mode = 3, as 3 occurs 3 times

(b) Mode = 17, as 17 occurs 4 times

(c) Mode = 14, a 14 occurs 5 times

3. (a) 2, 5, 6, 9, 10, 11, 12, 16, 17

Median $= \left(\dfrac{n+1}{2}\right)^{\text{th}} = \dfrac{9+1}{2} = 5^{\text{th}}$ observation

$= 10$

(b) −5, −2, 0, 1, 2, 3, 6, 7, 8, 11

Median $= \dfrac{\frac{10}{2}+\frac{11}{2}}{2} = \dfrac{5^{\text{th}}+6^{\text{th}}}{2} = \dfrac{2+3}{2} = \dfrac{5}{2} = 2.5$

(c) 2, 3, 3, 4, 4, 4, 6, 6, 6, 8, 10

Median $= \dfrac{11+1}{2} = 6^{\text{th}}$ observation $= 4$

4. Mean $= \dfrac{1+3+5+7+9}{5} = \dfrac{25}{5} = 5$

5. Mean $= \dfrac{2+3+5+7+11+13+17+19+23+29}{10}$

$= \dfrac{129}{10} = 12.9$

6. Mean $= \dfrac{1+2+5+10}{4} = \dfrac{18}{4} = 4.5$

7. Mean $= \dfrac{72+70+81+85+80+62}{6} = \dfrac{450}{6} = 75$

8. Mean $= \dfrac{\text{Sum of all observations}}{\text{Number of observations}}$

$x + 1 = \dfrac{(2x-1)+3+4+8}{4}$

$4x + 4 = 2x - 1 + 15$

$4x - 2x = -1 + 15 - 4$

$2x = 10$ or $x = \dfrac{10}{2} = 5$

9. 11, 12, 14, 18, $a + 2$, 20, 22, 25, 61

Median $= \dfrac{9+1}{2} = 5^{\text{th}}$ observation

$21 = a + 2$

$a = 19$

10. Mean $= \dfrac{\text{Sum of numbers}}{\text{Total numbers}}$

$48 = \dfrac{\text{Sum of numbers}}{6}$

Sum of numbers $= 6 \times 48 = 288$

Correct mean $= \dfrac{288+27-17}{6} = \dfrac{298}{6} = 49.67$

11. Total numbers $= 8 \times 108 = 864$

Correct mean $= \dfrac{864+19+21-91-12}{8} = \dfrac{801}{8}$

$= 100.125$

12. Total numbers $= 5 \times 45 = 225$

New mean $= 4 \times 35 = 140$

Excluded number $= 225 - 140 = 85$

13. Total numbers $= 7 \times 98 = 686$

New mean $= 8 \times 88 = 704$

Included number $= 704 - 686 = 18$

14. Mean $= \dfrac{167+145+140+150+155+160+168}{7}$

$= \dfrac{1085}{7} = 155$ cm

Mode = No mode

For median,

140, 145, 150, 155, 160, 167, 168

Median $= \dfrac{7+1}{2} = 4^{\text{th}}$ observation $= 155$

Practice Time 14B

1. (a) By observing the bar graph, 32 people chose apples as their favourite fruit.

(b) Grapes were the most favourite fruit.

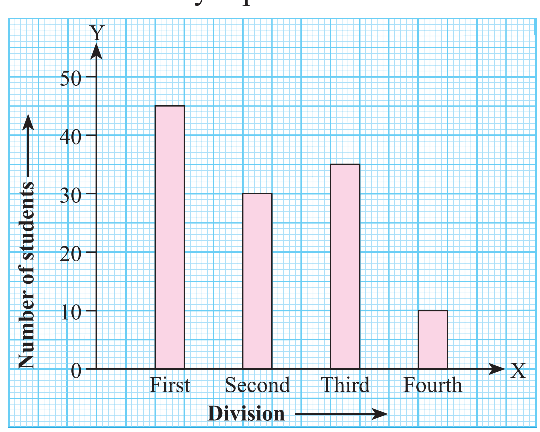
(c) By observing the bar graph, 18 people like papaya.

2. (a) The highest bar corresponds to February, with 56 cars.

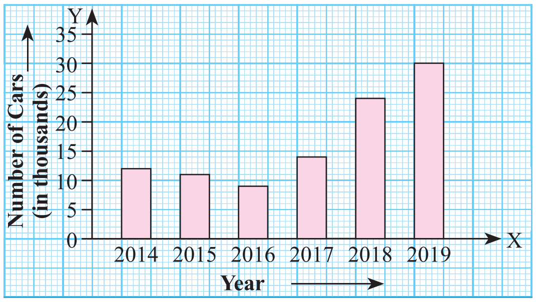
(b) The lowest bar corresponds to March, with 30 cars.

(c) The bar for May represents 36 cars.

3.



4. The bar graph is:

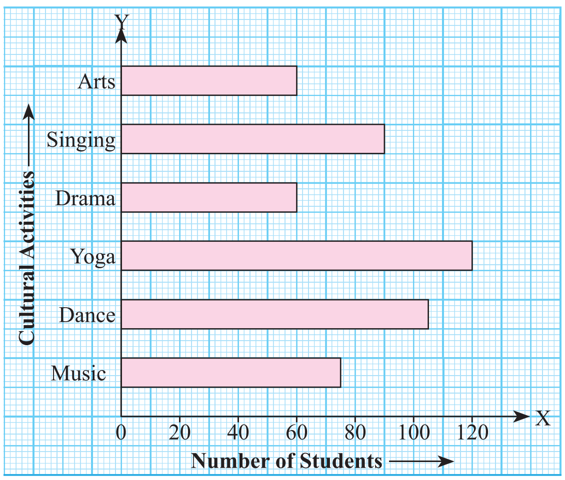


(*a*) The maximum number of cars manufactured in 2019 was 30 thousand cars.

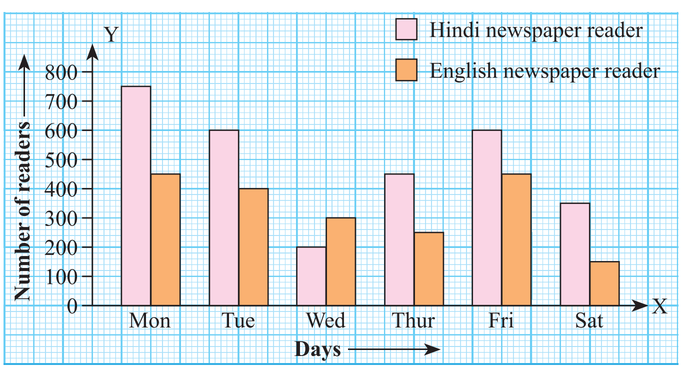
(*b*) The minimum number of cars manufactured in 2016 was 9 thousand cars.

(*c*) The total number of cars manufactured during the six years is 100 thousand.

5.



6. (*a*)



(*b*) On Monday, Total number of readers

$= 750 + 450 = 1200$

(*c*) Mean $= \dfrac{450+400+300+250+450+150}{6}$

$= \dfrac{2000}{6} = 333.33$

Brain Sizzlers (Page 320)

$$AM = \frac{\text{Sum of all observation}}{\text{Number of observation}}$$

$$= \frac{60+75+45+45+45+60+60}{7} = \frac{390}{7}$$

$$= 55.7$$

or 55 min 42 seconds

Practice Time 14C

1. (*a*) A die has 6 faces, numbered 1, 2, 3, 4, 6.

Therefore the total number of possible outcomes is 6.

P (getting a number more than 3)

$$= \frac{P(4,5,6)}{\text{Total no. of throws}} = \frac{3}{6} = \frac{1}{2}$$

(*b*) P (getting a prime number)

$$= \frac{P(2,3,5)}{\text{Total no. of throws}} = \frac{3}{6} = \frac{1}{2}$$

(*c*) P (getting a composite number)

$$= \frac{P(4,6)}{\text{Total no. of throws}} = \frac{2}{6} = \frac{1}{3}$$

(*d*) P (getting a number co-prime with 2)

$$= \frac{P(2,1)(2,3)(2,5)}{\text{Total no. of throws}} = \frac{3}{6} = \frac{1}{2}$$

2. Vowels = (*a*, *e*, *i*, *o*, *u*)

$$P(\text{choosing a vowel}) = \frac{\text{No. of vowels}}{\text{Total no. of letters}}$$

$$= \frac{5}{26}$$

Hence, the correct option is (*b*).

3. P(getting a number 4)

$$= \frac{\text{No. of times 4 obtained}}{\text{Total no. of throws}} = \frac{12}{60} = \frac{1}{5}$$

Hence, the correct option is (*a*).

4. Total number of cards is 52.

(*a*) $P(\text{a king}) = \dfrac{\text{No. of kings in a pack}}{\text{Total no. of cards in a pack}}$

$$= \frac{4}{52} = \frac{1}{13}$$

(*b*) P(a queen) $= \frac{\text{No. of queen in a pack}}{\text{Total no. of cards in a pack}}$

$= \frac{4}{52} = \frac{1}{13}$

(*c*) P(a red card) $= \frac{\text{No. of red cards in a pack}}{\text{Total no. of cards in a pack}}$

$= \frac{26}{52} = \frac{1}{2}$

(*d*) P(a black card) $= \frac{\text{No. of black cards in a pack}}{\text{Total no. of cards in a pack}}$

$= \frac{26}{52} = \frac{1}{2}$

(*e*) P(10 of a club) $= \frac{\text{No. of 10 of clubs in a pack}}{\text{Total no. of cards in a pack}}$

$= \frac{1}{52}$

(*f*) P(a king of spade)

$= \frac{\text{No. of kings of clubs in a pack}}{\text{Total no. of cards in a pack}} = \frac{1}{52}$

5. (*a*) P(choosing multiples of 10)

$= \frac{\text{Multiples are 10 and 20}}{\text{Total no. of chits}} = \frac{2}{20} = \frac{1}{10}$

(*b*) P(choosing an even number)

$= \frac{2,4,6,8,10,12,14,16,18,20}{\text{Total no. of chits}} = \frac{10}{20} = \frac{1}{2}$

(*c*) P(choosing an odd prime number)

$= \frac{3,5,7,11,13,17,19}{\text{Total no. of chits}} = \frac{7}{20}$

(*d*) P (choosing a factor of 18)

$= \frac{3,6,9,12,15,18}{\text{Total no. of chits}} = \frac{6}{20} = \frac{3}{10}$

6. (*a*) P(a silver ball) $= \frac{\text{No. of silver balls}}{\text{Total no. of balls}} = \frac{3}{12} = \frac{1}{4}$

(*b*) P(a ball which is not red)

$= \frac{\text{No. of non-red balls}}{\text{Total no. of balls}} = \frac{10}{12} = \frac{5}{6}$

7. (*a*) P(Science)

$= \frac{\text{No. of students who like science}}{\text{Total no. of students}}$

$= \frac{25}{100} = \frac{1}{4}$

(*b*) P(Maths)

$= \frac{\text{No. of students who like maths}}{\text{Total no. of students}}$

$= \frac{70}{100} = \frac{7}{10}$

(*c*) P(Literature)

$= \frac{\text{No. of students who like literature}}{\text{Total no. of students}}$

$= \frac{5}{100} = \frac{1}{20}$

8. (*a*) P(a number 3)

$= \frac{\text{A number 3 on it}}{\text{Total no. of paper pieces}} = \frac{1}{10}$

(*b*) P(a prime number)

$= \frac{\text{A prime number}}{\text{Total no. of paper pieces}} = \frac{4}{10} = \frac{2}{5}$

(*c*) P(a composite number)

$= \frac{\text{A composite number}}{\text{Total no. of paper pieces}} = \frac{5}{10} = \frac{1}{2}$

(*d*) P(an even number)

$= \frac{\text{An even number}}{\text{Total no. of paper pieces}} = \frac{5}{10} = \frac{1}{2}$

9. (*a*) **Certain:** Since all numbers (1 to 7) are less than 8, it is guaranteed to happen.

(*b*) **Can happen but not certain:** Most children grow taller, but there could be exceptions due to health issues or other factors.

(*c*) **Certain:** Every month has at least 28 days, and since a week has 7 days, every month will have at least 4 Sundays.

(*d*) **Certain:** Everyone becomes a year older on their birthday.

(*e*) **Impossible:** Since there are no yellow marbles in the jar, it is not possible to pick one.

(*f*) **Can happen but not certain:** The teacher may or may not come due to various reasons like illness, leave, or an emergency.

(*g*) **Impossible:** A year has only 12 months, so this can never happen.

Chapter Assessment

A.

1. Range is the difference between the highest and lowest observations in a data.
Hence, the correct option is (*c*).

2. Range = 21 – 4 = 17

Hence, the correct option is (*b*).

3. P (getting a head) = $\frac{32}{80} = \frac{2}{5}$ = 0.4

Hence, the correct option is (*a*).

4. $$\text{Mean} = \frac{-2+0+x+3+7}{5} = x$$

$-2 + x + 10 = 5x$

$4x = 8$ or $x = 2$

Hence, the correct option is (*b*).

5. Numbers = 0, 2, 4, 7, 11

Hence, the correct option is (*c*).

Median = $\frac{5+1}{2}$ observations = 3rd observation = 4

6. Mode = 2

Hence, the correct option is (*b*).

7. • If the extreme values are removed, the sum of observations will change. Therefore, the mean will get affected.

• If the extreme values are removed, the mid value will remain the same. Therefore, the median will not get affected.

• If the extreme values are removed, the frequently occurring data may be removed. Therefore, the mode will get affected.

Hence, the correct option is (*a*).

8. • Mean gives an average value but does not indicate the most frequently chosen brand.

• Mode represents the most frequently occurring value, making it the best choice for identifying the most liked chocolate.

• Median gives the middle value and is not relevant for this case.

• Range only shows the spread of data, not preferences.

Hence, the correct option is (*b*).

B.

1. Range = Highest observation – Lowest observation.

The highest observation = 25, the lowest observation = 10.

Range = 25 – 10 = 15, not 10.

Since Assertion (A) is false, but Reason (R) is true.

Hence the correct option is (*d*).

2. Both statements are true.

Reason (R) correctly explains Assertion (A).

Hence the correct option is (*a*).

3. The given numbers: 1, 1, 2, 2, 2, 2, 3, 4, 4.

Mode is the most frequently occurring number.

2 appears 4 times, which is the highest frequency.

Both statements are true, and the reason correctly explains the assertion.

Hence the correct option is (*a*).

4. Assertion (A) is true: In a bar chart, the width of bars is fixed and uniform.

Reason (R) is not true, bar graphs can also have horizontal bars.

Hence the correct option is (*c*).

C.

1. False. It can be one of the numbers in a data or can be the mean of middlemost observations.

2. False. For any event E, $0 \le P(E) \le 1$.

3. True.

4. False. It may or may not be the observation from given data.

5. True.

D.

1. Median

2. Mean = $\frac{2+3+5+7+11}{5}$ = 5.6

3. Number = 3, 3, 4, 4, 5, 6, 7

Median = $\frac{7+1}{2}$ observations

= 4^{th} observation = 4

4. Central tendency

5. Frequency

6. $$\text{Mean} = \frac{2+4+6+8+10+12+14+16+18+20}{10}$$

= 11

E.

1. $$\text{Mean} = \frac{\text{Sum of all observations}}{\text{Number of observations}}$$

$$= \frac{6+4+2+5+3+4+1+2+6+4+2+2+3+1+5+6+1+2+3}{19}$$

$$= \frac{62}{19} = 3.26$$

For median,

1, 1, 1, 2, 2, 2, 2, 2, 3, 3, 3, 4, 4, 4, 5, 5, 6, 6, 6

$$\text{Median} = \left(\frac{n+1}{2}\right)\text{th observation}$$

$$= \frac{19+1}{2} \text{ observation}$$

$$= \text{10th observation} = 3$$

Mode = 2 (as 2 occurs 5 times)

2. (*a*) $P(\text{a six}) = \dfrac{\text{Number of favourable outcomes}}{\text{Total number of trials}}$

$$= \frac{18}{60} = \frac{3}{10} = 0.3$$

(*b*) $P(\text{not a six}) = \dfrac{42}{60} = \dfrac{7}{10} = 0.7$

3. Mean = a

$30 + x = 55$

$x = 25$

4. $\text{Mean} = \dfrac{810+830+750+910+x}{5} = 816$

$3300 + x = 5 \times 816$

$3300 + x = 4080$

$x = 780$

5. Total number = 6 × 196 = 1176

$\text{Correct mean} = \dfrac{1176+18+34-81-43}{6} = \dfrac{1104}{6}$

$= 184$

6. The mean of four numbers is 36. The sum of these four numbers is:

$$\frac{\text{Sum of four numbers}}{4} = 36$$

Sum of four numbers = 36 × 4 = 144

When an additional number x is included, the new mean becomes 45. Since there are now five numbers, their sum is:

$$\frac{144+x}{5} = 45$$

Multiplying both sides by 5:

$$144 + x = 225$$

$$x = 225 - 144 = 81$$

Thus, the included number is 81.

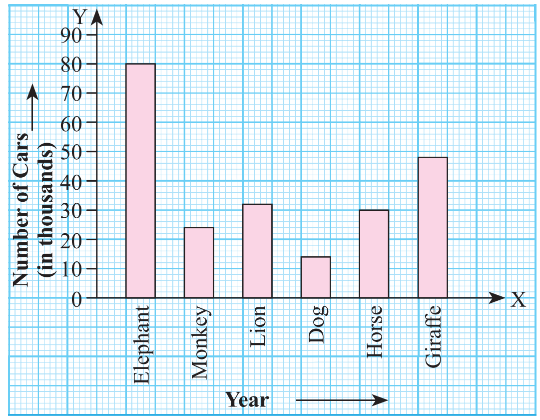
7. $\text{Median} = \dfrac{6^{\text{th}} + 7^{\text{th}}}{2} \text{ observations} = \dfrac{x+x+3}{2}$

$19.5 = \dfrac{2x+3}{2}$

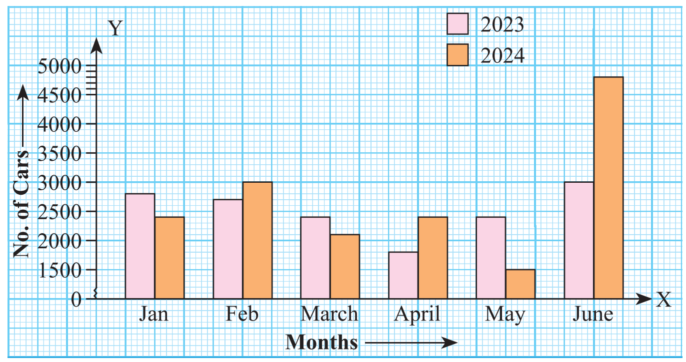
$2x + 3 = 39$

$x = 18$

8.



9.



(*a*) Total Output Calculation:

- **2023:** 2800 + 2700 + 2400 + 1800 + 2400 + 3000 = 15,100
- **2024:** 2400 + 3000 + 2100 + 2400 + 1500 + 4800 = 16,200

The total output was maximum in 2024.

(*b*) Mean Production for 2023:

Mean = 15,100/6=2516.67

(*c*) Finding Maximum Difference:

- **Jan:** 2800 – 2400 = 400
- **Feb:** 3000 – 2700 = 300
- **Mar:** 2400 – 2100 = 300
- **Apr:** 2400 – 1800 = 600
- **May:** 2400 – 1500 = 900
- **June:** 4800 – 3000 = 1800

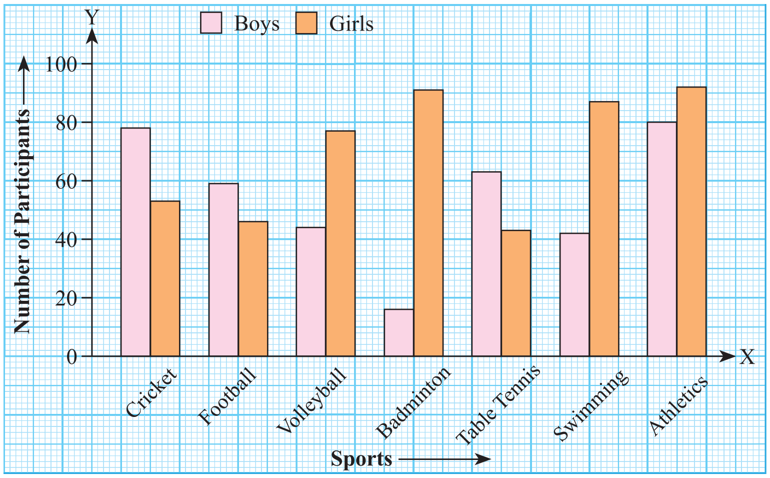
The maximum difference is in June (1800 cars).

(*d*) Maximum Production in 2024:

June (4800 cars).

(*e*) Minimum Production in 2023:

April (1800 cars).

10. 

(*a*) Most Participants in Boys & Girls:
- **Boys:** Athletics (80 participants)
- **Girls:** Athletics (92 participants)

(*b*) Games with More Girls Than Boys:
- **Volleyball:** 77 > 44
- **Badminton:** 91 > 16
- **Swimming:** 87 > 42
- **Athletics:** 92 > 80

(*c*) **Game with Least Participants Overall:** Badminton for boys (16 participants).

(*d*) **More Girls in Swimming Than Boys:** 87 – 42 = 45
45 more girls participate in swimming than boys.

11. Do it yourself.

12. (*a*) Mean = $\frac{5+6+8+4+2+10}{6} = \frac{35}{6} = 5.83$

(*b*) Range = 10 – 2 = 8

(*c*) F has won the most matches (10).

(*d*) Wrester B, Wrester C and Wrestler F

UNIT TEST – 4

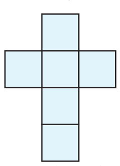
A.

1. Perimeter $= 4 \times \frac{x}{2} = 2x$ cm

Thus, the correct option is (*a*).

2. Range = 94 – 78 = 16

Thus, the correct option is (*d*).

3. 

Net of a cube

Thus, the correct option is (*b*).

4. Area = base × height = 8 × 5 = 40 cm^2

Thus, the correct option is (*c*).

5. $AM = \frac{126+35+55+x+39+57}{6} = 63$

$3123 + x = 63 \times 6$ or $x = 378 - 276 = 66$

Thus, the correct option is (*d*).

6. Number = 2, 3, 4, 4, 4, 7, 9, 10

Median $= \frac{4^{th} + 5^{th}}{2}$ observations $= \frac{4+4}{2} = 4$

Thus, the correct option is (*c*).

7. P (getting a head) $= \frac{15}{60} = \frac{1}{4}$

Thus, the correct option is (*c*).

8. Area of a $\Delta = \frac{1}{2} \times$ base × height

$24 = \frac{1}{2} \times 6$ cm × height

Height $= \frac{24 \times 2}{6} = 8$ cm

Thus, the correct option is (*a*).

9. **Assertion is true:** Using the formula $C = 2\pi r$, we get 2 × 3.14 × 49 = 308 cm.

Reason is true: The given formula is correct and explains the assertion.

Hence the correct option is (*a*).

10. **Assertion is true:** A square pyramid has 1 square base and 4 triangular lateral faces.

Reason is false: A square pyramid has 8 edges, not 9.

Hence the correct option (*c*).

B.

1. A triangular pyramid has 4 vertices.

2. Area of each congruent triangle $= \frac{8 \times 8}{4} = 16$ cm^2

3. Area of ||gm = base × height = 16 × 10 = 160 cm^2

4. Mode = 5 (as 5 occurs 4 times)

5. Primary.

C.

1. **True.**

2. **False.** Side length of a square $= \frac{72}{4} = 18$ cm

Area = 18 × 18 = 324 cm^2

3. True. $P = 2(l + b)$

$$150 = 2(38 + b)$$

$$b = \frac{150-76}{2} = \frac{74}{2} = 37$$

4. False. To find the median, the data need to be arranged either in ascending or descending order.

5. True. Numbers are 1, 2, 3, 4, 5

$$\text{Median} = \frac{5+1}{2} \text{ observations}$$

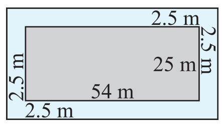
$$= \text{3rd observation} = 3$$

D.

1. Do it yourself.
2. Total number $= 5 \times 37 = 185$

$$\text{Correct mean} = \frac{185-38+33}{5} = \frac{180}{5} = 36$$

3. Area of rectangular garden



$= 54 \times 25 = 1350\ m^2$

Area of rectangular garden including 2.5 m path

$= 59 \times 30 = 1770\ m^2$

Area of path $= 1770 - 1350 = 420\ m^2$

Cost of paving the path $= 420 \times 55 =$ ₹23100.

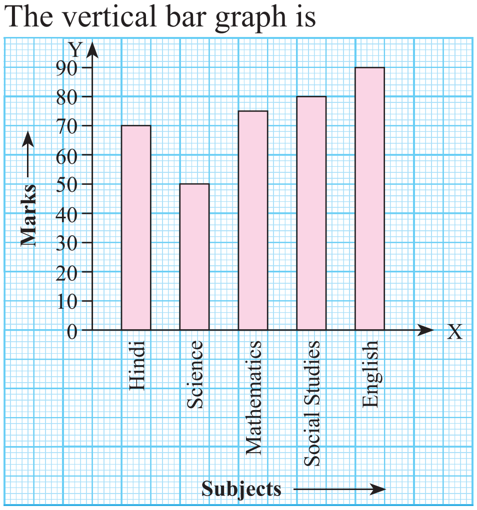
4. Area of shaded trapezium $= \frac{1}{2}(a + b)h$

$$= \frac{1}{2}(2 + 4)8 = 6 \times 4 = 24\ cm^2$$

5. Arrange the numbers in ascending order: 35, 36, 39, 39, 42, 45, 47, 48, 48, 48, 49, 52, 53, 55, 60

Median weight $= \left(\frac{15+1}{2}\right)$th observations = 8th observation = 48 kg

6. Do it yourself.
7. The vertical bar graph is



8. Area of horizontal path $= 40 \times 2 = 80\ m^2$

Area of vertical path $= 50 \times 2 = 100\ m^2$

Area of intersection of two paths $= 2 \times 2 = 4\ m^2$

Sum of area of two paths $= 80 + 100 - 4 = 176\ m^2$

CHAPTER 15 : CONSTRUCTION OF BASIC GEOMETRICAL SHAPES

Let's Recall

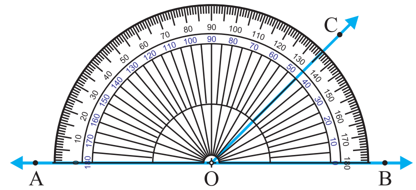
1. (*a*) Steps of construction:

(*i*) Draw a line AB with a point O marked on the line.

(*ii*) Place the protractor on line AB with its base exactly coinciding at point O on the line.

(*iii*) Make a small pencil mark on the line segment that aligns with the 45° mark (after 40°—the fifth mark) on the protractor's inner scale. Label this point as C.

(*iv*) After removing the protractor, draw a line segment joining O and C.



Thus, $\angle$BOC is the required 45° angle.

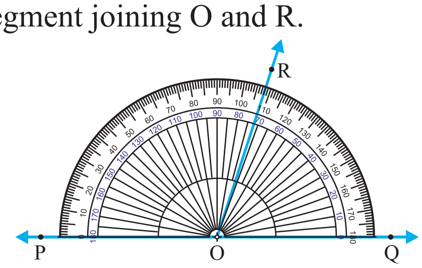
(*b*) Steps of Construction:

(*i*) Draw a line PQ with point O marked on the line.

(*ii*) Place the protractor on line PQ with its base exactly coinciding with point O on the line.

(*iii*) Mark a point at 72° angle (2nd mark after 70°) on the protractor's inner scale. Label this point as R.

(*iv*) After removing the protractor, draw a line segment joining O and R.



Thus, $\angle$QOR is the required 72° angle.

(*c*)–(*e*) Do it yourself (same as above)

2. Do it yourself.

3. Steps of construction:

(*i*) Draw a line segment AB = 4 cm, which is the length of the side.

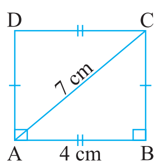
(*ii*) Using compass, construct BX ⊥ AB.

(*iii*) With A as centre, draw an arc of radius 7 cm on the line BX, which cuts at C.

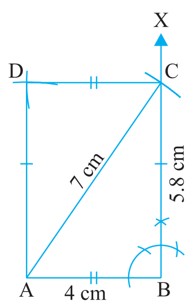
(*iv*) Now with BC as radius and A as centre, draw an arc above AB.

(*v*) With C as centre and radius equal to AB, draw an arc to cut the previous drawn arc at D.

(*vi*) Join AD and CD and measure the lengths of respective line segments.



Rough Diagram



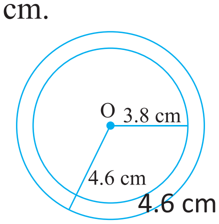
Thus, ABCD is the required rectangle of side length 4 cm and diagonal length 7 cm.

4. Two or more circles which are drawn with the same centre and having different radii are called concentric circles.

Steps of construction:

(*i*) Draw a circle with radius 3.8 cm using a compass, and name the centre as O.

(*ii*) Now with O as centre, draw another circle of radius 4.6 cm.



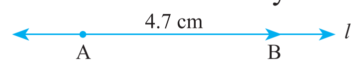
5. Do it yourself.

Maths Talk (Page 336)

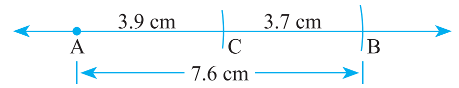
For two creases to be perpendicular, the paper should be rectangular shaped and the creases are exactly made by folding along the middle of the paper.

Practice Time 15A

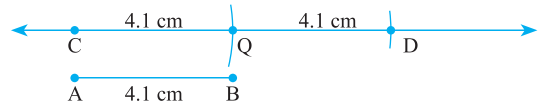
1. **Steps of construction:** Do it yourself.



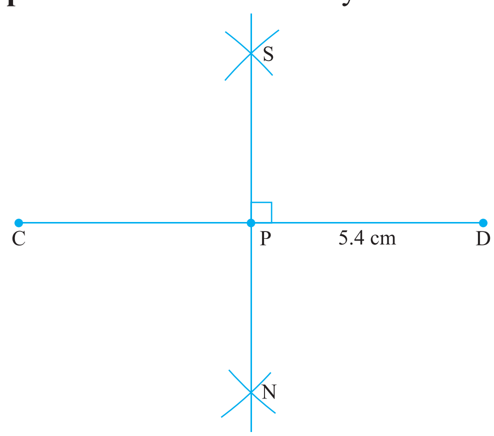
2. **Steps of construction:** Do it yourself.



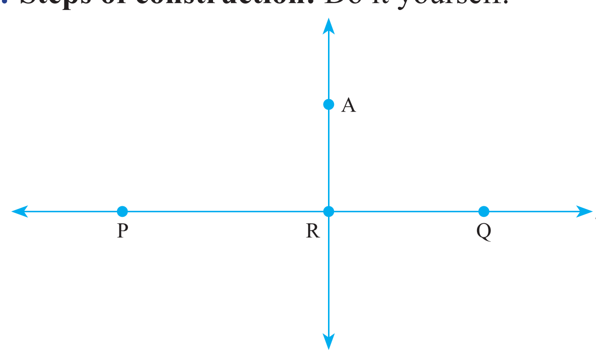
3. **Steps of construction:** Do it yourself.



4. **Steps of construction:** Do it yourself.



5. **Steps of construction:** Do it yourself.



6. Do it yourself.

Quick Check (Page 343)

1. • Draw $\overline{BC}$.

• Place the protractor on the line segment BC such that the mid-point of the protractor is at point B and zero edge along $\overline{BC}$.

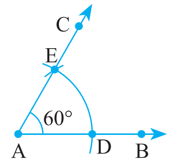
• Starting with 0° near point C, mark point A at 70° on the paper.

• Join BA.

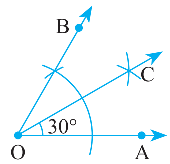
2. Do it yourself.

Practice Time 15B

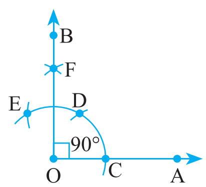
1. (*a*) **Steps of construction:** Do it yourself.



(*b*) **Steps of construction:** Do it yourself.



(*c*) **Steps of construction:** Do it yourself.



2. Do it yourself.

3. (*i*) Draw a ray PQ.

(*ii*) With P as a centre and radius more than half of ray PQ, draw a wide arc to intersect PQ at R. With R as a centre and same radius, draw an arc to intersect the initial arc at S. Draw a line from P passing through S such that $\angle SPR = 60°$.

(*iii*) Again with S as centre and the same radius as before, draw an arc to intersect the initial arc at T. Draw a line from P passing through T such that $\angle TPS = 60°$.

(*iv*) To bisect $\angle TPS$, with T and S as centres and radius greater than TS draw arcs to bisect each other at U. Draw a line from P through C such that

$$\angle UPS = \frac{1}{2}\angle TPS = \frac{1}{2} \times 60° = 30°$$

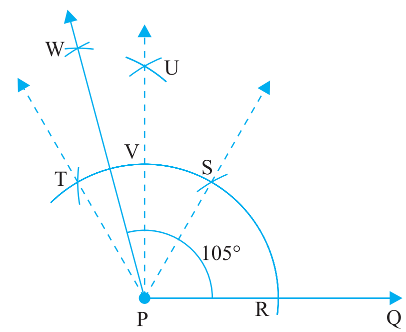
$$\angle UPT = \angle UPS = 30°$$

(*v*) To bisect $\angle UPT$, with T and V as centres and radius greater than half of TV, draw arcs to intersect each other at W. Draw a line through P passing through W such that

$$\angle WPU = \frac{1}{2}\angle UPT = \frac{1}{2} \times 30° = 15°$$

(*v*) $\angle WPR = \angle WPU + \angle UPS + \angle SPR$

$= 15° + 30° + 60° = 105°$



Thus, $\angle WPR$ is the required angle of 105°.

4. Follow the steps given below to complete the construction.

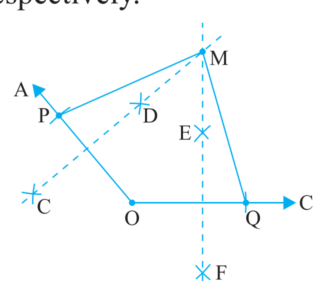
(*i*) Draw angle AOB taking O as the vertex.

(*ii*) Using the same radius and with O as the centre, mark two arcs on both the arms of the angle. Name these points as P and Q respectively such that OP = OQ.

(*iii*) By taking O and P as centres and with a radius, more than half of OP, draw two arcs on both the sides of OP and mark the points as C and D where the arcs intersect each other.

(*iv*) By taking O and Q as centres and with a radius of more than half of OQ, draw two arcs on both sides of OQ and mark the points as E and F where the arcs intersect each other.

(*v*) The perpendicular bisectors CD and EF intersect each other at point M. Join PM and QM respectively.



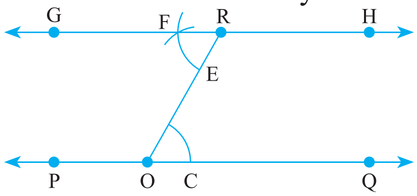
On measuring you will find that PM = QM.

5. Do it yourself.

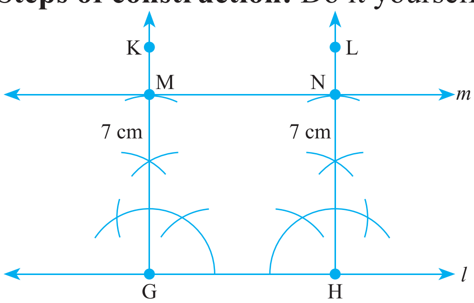
6. Do it yourself.

Practice Time 15C

1. **Steps of construction:** Do it yourself.

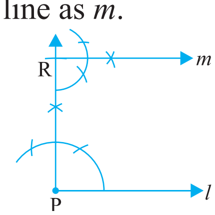


2. (*a*) **Steps of construction:** Do it yourself.



   (*b*) Similarly solve as part (*a*).

3. Steps of construction:
   (*i*) Draw a line *l* using a ruler.
   (*i*) Mark a point P on the line *l* and through P construct a perpendicular using ruler and compass.
   (*iii*) With P as centre and radius 4.2 cm, mark an arc and name the intersecting point as R.
   (*iv*) Now with R as centre and draw a perpendicular to the ray PR.
   (*v*) Name the line as *m*.



   Thus, the required line m is parallel to line l.

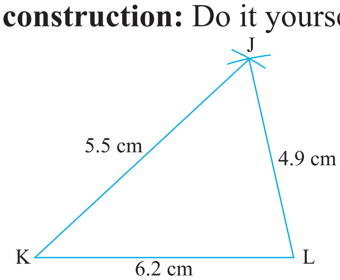
4-5. Do it yourself.

Think and Answer (Page 348)

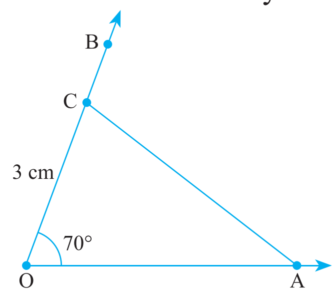
A minimum of two sides are required to construct an isosceles triangle.

Practice Time 15D

1. **Steps of construction:** Do it yourself.

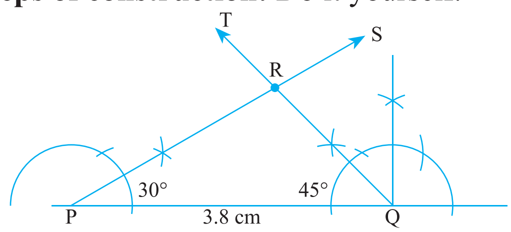


2. Do it yourself.
3. **Steps of construction:** Do it yourself.



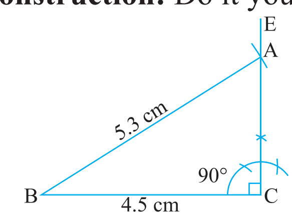
4-5. Do it yourself.

6. **Steps of construction:** Do it yourself.



7-8. Do it yourself.

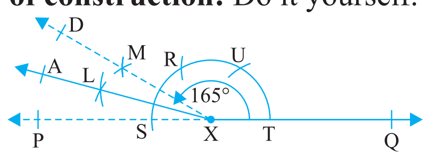
9. **Steps of construction:** Do it yourself.



10. Do it yourself.

Brain Sizzlers (Page 348)

Steps of construction: Do it yourself.



Chapter Assessment

A.

1. Except 85° all other angles are possible to construct using a ruler and a compass.
   Hence, the correct option is (*d*).
2. Using a compass and taking a radius of any particular length measurement you can draw a circle.
   Hence, the correct option is (*d*).
3. The perpendicular line from a given point to a given line is the shortest distance between them and only one shortest distance is possible. Thus,

only one perpendicular line is possible from outside given point to a given line.

Hence, the correct option is (*b*).

4. To construct a triangle, the sum of any two sides must be greater than the third side.

5 cm + 5 cm < 12 cm, which is not possible to construct a triangle.

Hence, the correct option is (*c*).

5. $110° + 40° = 150° < 180°$ is only possible to construct a triangle for having the sum of three angles as 180°.

Hence, the correct option is (*a*).

6. For two angles and the included side, ASA criterion is used.

Hence, the correct option is (*a*).

B.

1. Assertion: When to construct a right-angled triangle, we must know the length of two sides. This statement is true.

Reason: When to construct a right-angled triangle, we must know the lengths of the hypotenuse and a side. So, the statement in Reason (R) is incorrect.

Hence, the correct option is (*c*).

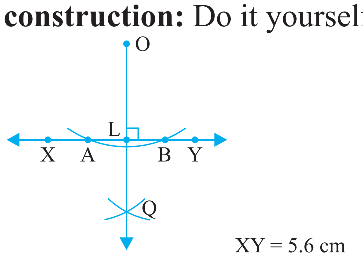
2. Assertion: A triangle can be constructed by taking its base angles 110° and 40°, and base 6 cm. This statement is true.

Reason: If the measure of two base angles and the length of the side included within the angles are given, then the triangle can be constructed by the ASA criterion. So, the statement in Reason (R) is incorrect.

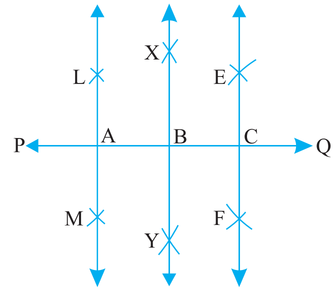
Hence, the correct option is (*c*).

C.

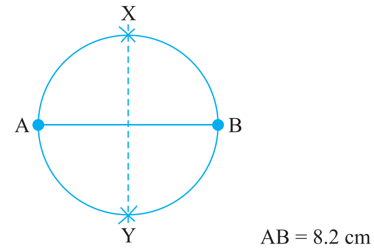
1. Steps of construction: Do it yourself.



2. With P and Q as centres, draw a perpendicular bisector which cuts PQ at B. Now with P and B, and B and Q, draw perpendicular bisectors which cuts PQ at A and C respectively. Verify the parts length using a ruler.



3. Steps of construction: Do it yourself.



4. Do it yourself.

5. Draw an angle measure of 154° using a protractor and draw its angle bisector BX [Fig. (*i*)].

Now with ∠ABX and ∠CBX as equal angles, again draw the angle bisectors of both. BY is the angle bisector of ∠ABX and BZ is the angle bisector of ∠CBX respectively [Fig. (*ii*)].

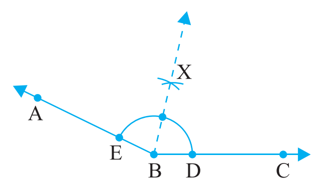


Fig. (*i*)

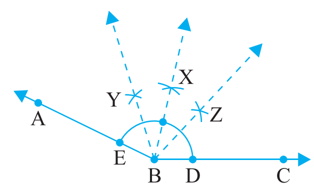
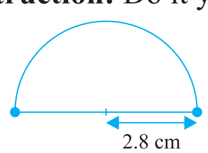


Fig. (*ii*)

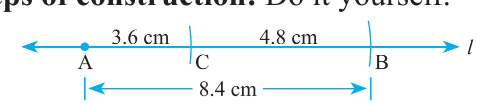
Thus, ∠ABY = ∠YBX = ∠XBZ = ∠ZBC = 38.5°.

6. Do it yourself.

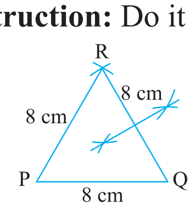
7. Steps of construction: Do it yourself.



8. Steps of construction: Do it yourself.



9. Steps of construction: Do it yourself.



MODEL TEST PAPER – 2

A.

1. (*a*) $[(-3-5)\times(-8-5)] = (-8)\times(-13) = 104$

(*b*) $[2+(-3)]\times[3+(-2)] = [-1]\times 1 = -1$

(*c*) $[(4+5)\times(3+8)] = 9\times 11 = 99$

(*d*) $[(-3)+(-2)]\times(-5)+(-4)] = [-5]\times(-5)+(-4)$
$= 25 - 4 = 21$

Hence, the correct option is (*b*).

2. A unit fraction is a fraction with numerator 1.
Hence, the correct option is (*c*).

3. Ratio $= \dfrac{35}{3\times 60} = \dfrac{7}{3\times 12} = \dfrac{7}{36} = 7:36$

Hence, the correct option is (*d*).

4. $\dfrac{y}{100}\times 3600 = 540$

$$y = \frac{540\times 100}{3600} = 15$$

Hence, the correct option is (*c*).

5. An isosceles trapezium has only 1 line of symmetry.
Hence, the correct option is (*a*).

6. $1007 = 19\times b$

$$b = \frac{1007}{19} = 53 \text{ cm}$$

Hence, the correct option is (*d*).

7. Average runs $= \dfrac{145+186+68+40+0+5}{6} = \dfrac{444}{6}$
$= 74$

Hence, the correct option is (*b*).

8. A square pyramid is made up of a square base and 4 triangular lateral faces.
Hence, the correct option is (*a*).

9. Range = Max – Min = 19 – 4 = 15 (Assertion is correct)
The definition of range is also correct. (Reason is correct and reason explains assertion)
Hence the correct option is (a).

10. Area of circle $= \pi r^2$, given diameter = 14 cm, so $r = 7$ cm.

$A = \dfrac{22}{7}\times 7\times 7 = 154 \text{ cm}^2$ (Assertion is correct)

The formula for area is also correct. (Reason is correct and reason explains assertion)
Hence the correct option is (*a*).

B.

1. If 'n' is an even integer, then $(-1)^n = \underline{1}$.

2. "9 is added to 4 times p". Algebraic expression related to the given statement is $\underline{4p+9}$.

3. The English alphabet B has <u>horizontal/one</u> line of symmetry.

4. $2x + 5x + 11x = 180°$

$$18x = 180° \quad \text{or} \quad x = \frac{180}{18} = 10°$$

The angles are 20°, 50°, 110°.

5. Perimeter = 2.5 + 3.5 + 1.5 = 7.5 cm

C.

1. False. Mode = 8 (as 8 occurs 4 times in the observation)

2. True

3. True

4. False. $\dfrac{2}{5}+\dfrac{6}{7} = \dfrac{2\times 7+6\times 5}{35} = \dfrac{14+30}{35} = \dfrac{44}{35}$

5. If x, y, z and w are in proportion, then $xw = yz$.

D.

1. (*a*) $[3 * (-9)] \# [(-7) * 2] = [3+(-9)] \# [(-7)+2]$
$= (-6) \# (-5)$
$= (-6)\times(-5) = 30$

(*b*) $9 \$ 3 \# 5 * 10 = 9 \div 3\times 5 + 10$
$= 3\times 5 + 10$
$= 15 + 10 = 25$

2. Let the four consecutive even numbers be represented as x, $x+2$, $x+4$, $x+6$

$x + x + 2 + x + 4 + x + 6 = 108$

$4x + 12 = 108$

$$x = \frac{96}{4} = 24$$

The numbers are 24, 24 + 2 = 26, 24 + 4 = 28, 24 + 6 = 30.

3. (*a*) $x + x + 1 + x + 2 = 90°$

$3x + 3 = 90°$

$$x = \frac{87}{3} = 29°$$

So, $x + 1 = 30°$

$x + 2 = 31°$

(*b*) $6x + 9x + 10 + 3x + 8 = 180°$

$18x + 18 = 180°$

$$x = \frac{162}{18} = 9$$

So, $6x = 6 \times 9 = 54°$

$9x + 10 = 9 \times 9 + 10 = 91°$

$3x + 8 = 3 \times 9 + 8 = 35°$

4. (*a*) Percentage $= \dfrac{\text{Part}}{\text{Whole}} \times 100$

Percentage $= \dfrac{240}{800} \times 100 = 0.3 \times 100 = 30\%$

(*b*) Convert 10 m to cm:

$10 \times 100 = 1000$ cm

Percentage $= \dfrac{495}{1000} \times 100 = 0.495 \times 100$

$= 49.5\%$

5. Do it yourself.

6. Do it yourself.

7. Do it yourself.

8. (*a*) Rose plant $= \dfrac{20}{100} \times 7500 = 1500$

(*b*) Difference = Jasmine plants – Rose plants

$\dfrac{32}{100} \times 7500 - \dfrac{20}{100} \times 7500 = 2400 - 1500$

$= 900$

(*c*) Percentage $= \dfrac{1500}{500} \times 100 = 300\%$