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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 Patterns in Mathematics

Learning Objectives

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

- identify the pattern in a number sequence, geometrical pattern formation and predict the next value of a given pattern
- define the rules in a predictable sequence of items
- recognise, create and extend both simple and complex patterns in different settings, including nature

LESSON PLAN

Suggested number of periods: 10

Suggested Teaching Aids: Textbook (Math Genius! 6), teaching board, pen, pencil, chalk/marker, notebooks, paper chits/number cards/flash cards of numbers and shapes, chart papers, some cubes, etc.

Keywords: Patterns, odd numbers, even numbers, triangular numbers, square numbers, cubes or cubic numbers, tetrahedral numbers, pentagonal numbers, hexagonal numbers, centred hexagonal numbers, fibonacci sequence, virahanka numbers, regular polygons, tesselations, stacked triangles and stacked squares, koch snowflakes and sierpinski triangle, etc.

Prerequisite knowledge: Students must be familiar with different types of numbers, such as counting numbers, even, odd, triangular and square numbers, etc. and different types of shapes such as, triangle, square, cube, tetrahedral, pentagon, hexagon, etc.

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: What is a Pattern; Understanding Patterns	NEP Skills: Collaborative Learning, Discussion-Based Learning

TEACHER-PUPIL ACTIVITY

Introduce the topic ‘patterns’ in the classroom by presenting some real-life examples like pictures of a rangoli or butterfly, in mathematical context the patterns of alphabets/numbers/shapes.

Divide the class into groups of 4-5 students each.

Put some number flash cards, geometrical shaped flash cards, matchsticks inside a box.

Ask each group to select one set of items from the box.

Distribute an A4 sheet to each group. Ask each of the groups to prepare a pattern having at least 2 to 3 next numbers/shapes using flash cards.

Other members of the group will identify the pattern and further add 2 or 3 next numbers or shapes to the sequence. All the groups will have to submit their projects to the teacher.

The group who formed the patterns correctly and in lesser time as per the instruction will be the winner.

EXPLANATION

Take reference of pages 7-10 of Math Genius! 6 to recall and explain about patterns on board.

ASSIGNMENTS

Classwork: Let's Recall on page 8, Maths Talk on page 9, and Q.1-3 of Practice Time 1A.

Homework: Remaining questions of Practice Time 1A.

Periods: 3–4	**Topic: Interesting Number Patterns; Geometrical Patterns in Numbers**	**NEP Skills: Experiential Learning, Collaborative Learning**

TEACHER-PUPIL ACTIVITY

Introduce both the topics "Interesting Number Patterns" and "Geometrical Patterns in Numbers" in the classroom and writing some number patterns on board from given examples like odd numbers, even numbers or dot patterns for one by one triangular/square/cubic numbers, etc.

Divide the class into different groups (3-4 students each), and distribute graph paper sheets to each student and ask them to create a geometric shapes like triangle, square, etc. as per the pattern choosen.

For example, one group could build a square shape using square numbers (1, 4, 9, 16), while another might create a triangle using triangular numbers (1, 3, 6, 10) and so on with each member drawing pattern of one number only.

Ask students to connect each number in their pattern to a specific visual element.

For example: For square numbers, paste bindis in square grids that correspond to the number.

$1 \times 1 = 1$ $\quad$ $2 \times 2 = 4$ $\quad$ $3 \times 3 = 9$ $\quad$ $4 \times 4 = 16$

For triangular numbers, bindis should be pasted in the shape of a triangle, showing how each successive row of dots increases.

1 $\quad$ 3 $\quad$ 6 $\quad$ 10

All the groups will present their geometric pattern and number sequence to the class.

The teacher will explain how the numbers and geometric shapes are related.

Discuss what happens to the shape as the numbers increase?

EXPLANATION

Take reference of pages 11-13 of Math Genius! 6 to explain about interesting number patterns and geometrical patterns in numbers on board.

ASSIGNMENTS

Classwork: Discuss Maths Talk on page 11 and Knowledge Desk on page 11; Think and Answer on page 13 and Q.1-3 of Practice Time 1B.

Homework: Remaining questions of Practice Time 1B; and Project given on page 12.

Periods: 5–6	Topic: Relations Among Number Sequences	NEP Skills: Creative Thinking, Collaborative Learning

TEACHER-PUPIL ACTIVITY

Start the class by writing some triangular numbers and square numbers on board, and ask the class how they represent the numbers using dots with example and ask the class to observe the difference in their pattern.

Create a table on the teaching board with columns for triangular numbers, square numbers, and the difference between the triangular number and the nearest square number. For example,

Triangular number	Square number	Difference
1	1	0
3	4	1
6	9	3
10	16	6

Ask the students to extend the table with additional triangular numbers and square numbers they calculated.

Using the above table, encourage the students to establish relationship between square and triangular numbers like,

1　　$4 - 1 = 3$　　$9 - 3 = 6$　　$16 - 6 = 10$

Explain to students that when we subtract consecutive triangular numbers from consecutive square numbers, we get another consecutive triangular numbers.

EXPLANATION

Further using the reference of pages 14-15 of Math Genius! 6 to explain the relations between odd and square numbers, cubic and odd numbers, triangular and tetrahedral numbers.

ASSIGNMENTS

Classwork: Q.1-3; 9-13 of Practice Time 1C.

Homework: Remaining questions of Practice Time 1C.

Periods: 7–8	Topic: Patterns in Shapes	NEP Skills: Discussion-Based Learning, Experiential Learning

TEACHER-PUPIL ACTIVITY

Start the class by asking about one, two or three dimensional shapes and ask questions related to these shapes. Also, ask whether they observe any relationship among the number of sides among different shapes.

Divide the class into 4 teams.

Distribute some colourful straws to them and ask them to make some basic geometric shapes such as triangles, squares, circles, etc. Now, instruct the teams to build a pattern based on these shapes.

The pattern should follow a clear structure, like alternating shapes.

Once the pattern is completed, the team must explain what their pattern represents to the class. For example, "This is an alternating shape pattern with colour repetition."

Add additional challenges, such as creating a pattern with more complex rules like size variations (e.g., small triangle, large circle).

The team that creates the pattern accurately in minimum time and explains it correctly will be the winner.

EXPLANATION

Take reference of pages 18 and 19 of Math Genius! 6 to explain about different patterns and shapes as given in the textbook.

ASSIGNMENTS

Classwork: Discuss 'Create and solve' on page 19, and Q.1-4 of Practice Time 1D.

Homework: Remaining questions of Practice Time 1D.

Periods: 9–10	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.

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

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

ASSIGNMENTS

Classwork: Brain Sizzlers on page 21, few questions of section A-E of Chapter Assessment and Mental Maths on page 21.

Homework: Remaining questions of Chapter Assessment, Maths Connect on page 21 and Maths Fun on page 21.

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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. Which of the following is an example of a number pattern?

(*a*) odd numbers (*b*) square numbers (*c*) natural numbers (*d*) all of these

2. What is the 10th triangular number?

(*a*) 45 (*b*) 55 (*c*) 66 (*d*) 78

3. What is the third centred hexagonal number?

(*a*) 7 (*b*) 19 (*c*) 37 (*d*) 61

4. What is the sum of the first 25 odd numbers?

(*a*) 576 (*b*) 625 (*c*) 650 (*d*) 600

5. Which of the following is a cube number?

(*a*) 81 (*b*) 100 (*c*) 64 (*d*) 1250

6. The 4th tetrahedral number is

(*a*) 10 (*b*) 15 (*c*) 20 (*d*) 24

7. Which of the following numbers is not a power of 2?

(*a*) 128 (*b*) 256 (*c*) 384 (*d*) 512

8. The cube root of the sum of the first 4 centred hexagonal numbers is

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

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 a correct explanation of Assertion (A).

(*b*) Both Assertion (A) and Reason (R) are true but Reason (R) is not a 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:** 20 is a tetrahedral number.

Reason: The tetrahedral numbers are the sum of the triangular numbers beginning from 1.

10. **Assertion:** 19 is a hexagonal number.

Reason: When dots are arranged in such a way that they form a hexagon, then the numbers are termed as hexagonal numbers.

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ASSIGNMENT–2

Marks Obtained: __________

Student's Name: ____ Section: ______

Roll Number: ____________________________________ Date: ______________________

A. Fill in the blanks.

1. The missing term in the sequence 1, 10, ____, 1000, 10000 is ....
2. .... is the smallest number which follows both square and cubic pattern.
3. If a number is subtracted from its square, the remaining number will always be an ....
4. The Koch snowflake is a .... curve that starts with an .... triangle.
5. Virahanka numbers are 1, 2, ..., 5,........, 13, 21, 34, ...

B. Label True or False.

1. The 10th term in the sequence 0, 1, 1, 2, 3, 5, 8, … is 55. ....
2. 8 can be represented as a power of 3. ....
3. The sum of two consecutive triangular numbers makes a square number. ....
4. Hexagonal numbers and centred hexagonal numbers are different. ....
5. Tetrahedral numbers can be represented by the layers of triangles forming a tetrahedron shape ....

C. Match the following.

Column I	Column II
1. Powers of 3	(*a*) 1, 5, 12, 22, 35, ...
2. Consecutive odd numbers	(*b*) 1, 4, 10, 20, ...
3. Hexagonal numbers	(*c*) 1, 3, 5, 7, 9, 11, ...
4. Pentagonal numbers	(*d*) 1, 3, 9, 27, 81, 243, ...
5. Tetrahedral numbers	(*e*) 1, 6, 15, 28, ...

D. Do as directed.

1. A frog wants to reach the top of a well that is 10 steps high. It can climb either 1 step each time or maximum 2 steps at a time. In how many ways can the frog reach the top of the well?
2. How many little squares are there in each shape of the sequence of stacked squares in iterations 1 to 6? Also, name the pattern observed.

2

Lines and Angles

Learning Objectives

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

- identify and name points, lines, rays and line segments
- identify parallel, perpendicular, and intersecting lines
- compare and measure the given line segments
- recognise the presence of angles in their surroundings, name angles and identify their vertex and arms
- compare angles by observation, superimposition and by actual measurement
- measure and draw different types of angles using a protractor
- identify and name acute, obtuse, right angles
- solve problems based on the properties of angles

LESSON PLAN

Suggested number of periods: 16

Suggested Teaching Aids: Textbook (Math Genius! 6), teaching board, pen, pencil, chalk/marker, notebooks, geometry box, clock, some chart papers, some real life pictures and objects, etc.

Keywords: Plane, point, line, line segment, ray, collinear points, non-collinear points, coplanar points, non-coplanar points, concurrent lines, perpendicular lines, perpendicular bisector, angles—acute, obtuse, straight, reflex and complete, angle bisector, complementry angles, supplementry angles, adjacent angles, vertically opposite angles, linear pair.

Prerequisite knowledge: Students must be familiar with points, line, line segment, angle, plane etc.

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: Basic Concepts of Geometry**	**NEP Skills: Collaborative Learning, Discussion-Based Learning**

TEACHER-PUPIL ACTIVITY

Introduce the topic "Concepts of Geometry" and its importance in our lives with the help of chalk, make a dot on the board and ask the students which geometrical shape it represents. Clarify the responses received and introduce other basic geometrical shapes like line, line segment, ray etc. with suitable examples as given in textbook.

Divide the class into small groups of 4-5 students.

Give each group a worksheet having a list of the different shapes they have to find as examples if possible. The list might include:

- ❖ Two plane shapes
- ❖ Four points
- ❖ Objects representing collinear points (points that lie on the same line).
- ❖ Objects representing non-collinear points (points that do not lie on same line).
- ❖ Objects representing coplanar points (points on same plane).
- ❖ Objects representing non-coplanar points (points do not lie on same plane).
- ❖ Examples of intersecting and concurrent lines.
- ❖ Examples of perpendicular and parallel lines.
- ❖ Examples of lines, line segments and rays.

The examples can be parallel edges of book for parallel lines; adjacent edges of a table for perpendicular lines, etc.

Submit the worksheets to the teacher after completing the evaluation.

The group that gives the maximum number of examples as per the given list will get accolades.

Discuss about the different shapes they encountered and how real-world objects can form the different shapes.

EXPLANATION

Take reference of pages 25-30 of Math Genius! 6 and explain the examples 1-4 on board.

ASSIGNMENTS

Classwork: Q.1-5 of Practice Time 2A; Quick Check on page-30

Homework: Remaining questions of Practice Time 2A.

Periods: 3–6	Topic: More About Line Segments	NEP Skills: Experiential Learning, Discussion-Based Learning

TEACHER-PUPIL ACTIVITY

Begin by explaining on board about a line segment and discuss that the length of a line segment is finite and measurable. Also, explain to the class how to compare it using different methods.

Divide students into small groups and give each group a set of line segments such as: line-segments drawn on paper or objects like sticks, string, or pieces of paper of different lengths.

By observation method: Ask students to compare the length of a given line segment by drawing another line segment smaller or bigger than it in their notebook and arrange them in increasing or decreasing order.

By tracing paper method: Given a butter paper to each student of the class and ask them to trace a given line segment and compare by placing on it.

By using the divider: Ask the students to use divider to measure the length of a given line segment.

Observe the work of students and help them to decide which line segment is the longest and which is the shortest.

Help students practice the measurement of line segments using dividers.

Walk around to provide support and check if they are using divider and ruler correctly. After comparison, ask the following questions from the class:

- ❖ How did you determine which line segment is the longest?
- ❖ Which tool helped you compare the lengths of the segments?
- ❖ What challenges did you face while using the divider?
- ❖ What is the difference between measuring a line segment with a ruler and with divider?

EXPLANATION

Take reference of pages 32-34 of Math Genius! 6 to demonstrate comparison of line segments by observation, by tracing paper and using a divider. Also explain measuring of line segment using a divider and ruler with examples given on pages 34-35 on board.

ASSIGNMENTS

Classwork: Q.1-3 of Practice Time 2B; Quick Check on page-34

Homework: Remaining questions of Practice Time 2B; Maths Fun on page-35

Periods: 7–8	Topic: Angles, Comparison of angles	NEP Skills: Experiential Learning, Creative Thinking

TEACHER-PUPIL ACTIVITY

Begin the class by using some real life objects like a book, a pair of scissors, a stapler etc. and demonstrate to show how angles are formed. Ask the students to form pairs.

Distribute them two ice-cream sticks and a rubber band to each of the pairs.

Ask them to bind one end of the ice-cream sticks together with the help of a rubber band and keep the other end open.

Instruct the pairs to move the sticks at the open end apart from each other and observe the shape made.

Explain to the students that the opening between the ice-cream sticks shows an angle between them.

Define the attributes of an angle, i.e., vertex, arms of the angle, interior and exterior of angle, boundary of angle, etc.

Also enable the students to understand that when opening between two ice-cream sticks increases, the angle increases.

Demonstrate using activity that two angles can be compared by observation as well as by the method of superimposition.

EXPLANATION

Further using the reference of pages 36-40 of Math Genius! 6 to explain the concepts of angles. Also explain the interior and exterior of angles using examples given on page 37-38.

ASSIGNMENTS

Classwork: Q.1-2 of Practice Time 2C.

Homework: Remaining questions of Practice Time 2C; Maths Tallk on page-39; Quick Check on page-40.

Periods: 9–11	Topic: Magnitude of an Angle; Comparison of Angles Using a Protractor; Drawing Angles	NEP Skills: Collaborative Learning

TEACHER-PUPIL ACTIVITY

Start the class with revision and discussion about the angles they have learnt earlier. Draw a few angles such as 90° (right angle), 180° (straight angle), 360° (complete angle) and 0° (zero angle) on the board and explain to the class the rotation of arms of angles to get different angle measures.

Discuss the concept of the magnitude (size) of the angle. Explain that the size is measured in degrees (°) and we measure the angles by using the protractor.

Distribute A4 sheets to all students in the classroom.

With the help of protractor, ask the students to measure various angles in the classroom like: corners of books, the angle of a folded piece of paper, angle between set squares etc.

Ask to record their findings.

After 10 minutes, bring the class together and discuss some of the angles they found. Ask them to share the measurements of few angles they measured.

Ensure students are using the protractor correctly: placing the center at the vertex and aligning the baseline with the horizontal edge.

Pair up students to check each other's angles for accuracy, making sure that the angles match the given measurements. They can help each other if needed.

EXPLANATION

Take reference of pages 41-50 of Math Genius! 6 to explain magnitude of an angle, measuring, comparison and drawing angles by using the protractor and explain examples based on it on the board. Also, discuss A Pinch of History, Get it Right, angle bisector in the class.

ASSIGNMENTS

Classwork: Q.1-5 of Practice Time 2D and Q.1-3 of Practice time 2E; Maths Connect on page-44, Quick Check on page-47.

Homework: Remaining questions of Practice Time 2D and 2E.

Periods: 12–14	**Topic: Types of Angles; Perpendicular Lines and Perpendicular Bisector; Real life Application of Angles**	**NEP Skills: Experiential Learning, Discussion-Based Learning**

TEACHER-PUPIL ACTIVITY

Divide the class into small groups of 4-5 students.

Give each group a protractor, a ruler, and a worksheet with a list of the different angles they need to find. The list might include:

- ❖ Find one acute angle.
- ❖ Find one right angle.
- ❖ Find one obtuse angle.
- ❖ Find one straight angle.
- ❖ Find one reflex angle.

Tell the students to explore and find the angles of the corner of a book, the edge of a table, or the angle between folded paper sheet. Ask them to tell there estimated measure.

Encourage them to use their protractors to measure the angles and mark down the objects that represent each type of angle on their worksheet.

Discuss about the different angles they got in forming the angles.

Also discuss the angles of yoga pose shown in "Get Ready" and "Let's Recall" section on page 25 and 26.

EXPLANATION

By taking reference of pages 51-60 of Math Genius! 6 explain the types of angles, perpendicular lines, perpendicular bisector and real life application of angles by explainning the examples given on pages 54-55 on board.

ASSIGNMENTS

Classwork: Q.1-5 and 13 of Practice Time 2F and Q.1-2 of Practice time 2G.

Homework: Remaining questions of Practice Time 2F and 2G, Activity on page-53, Quick Check on page-54

Periods: 15–16	**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.

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

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

Motivate students to play "Labyrinth" in their leisure time on page 68.

ASSIGNMENTS

Classwork: Brain Sizzlers on page 62, few questions of section A-F of Chapter Assessment and Mental Maths on page 62.

Homework: Remaining questions of Chapter Assessment, Maths Fun on page 59.

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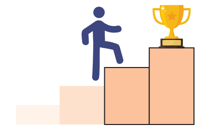
ASSIGNMENT–3



Marks Obtained: __________

Student's Name: ____ Section: ______

Roll Number: ____________________________________ Date: ________________________

A. Multiple Choice Type Questions

Identify the correct answer.

1. Let A, B, C and D be four distinct points in a plane such that no three of them are collinear. How many lines can be drawn using these points?

(*a*) 10 (*b*) 6 (*c*) 8 (*d*) unlimited

2. If A, B and C are three points on a line segment such that AB = 6 cm, BC = 3 cm and AC = 9 cm, which one of them lies between the other two?

(*a*) A (*b*) B (*c*) C (*d*) None of these

3. How many distinct rays are there in the given figure?

(*a*) 5 (*b*) 4 (*c*) 6 (*d*) unlimited

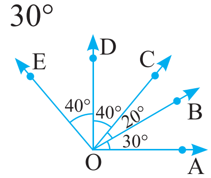
4. Which of the following are two acute angles whose sum is a right angle?

(*a*) 90°, 0° (*b*) 100°, 10° (*c*) 100°, 80° (*d*) 37°, 53°

5. The measures of the two angles between the hour and minute hands of a clock at 7 o'clock are

(*a*) 210°, 150° (*b*) 240°, 120° (*c*) 285°, 75° (*d*) 330°, 30°

6. In the given figure, the number of acute angles is



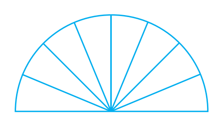
(*a*) 4 (*b*) 6

(*c*) 7 (*d*) 8

7. Two right angles can be

(*a*) Supplementary (*b*) Linear pair (*c*) Adjacent (*d*) All the above

8. A semi-circular piece of a plastic sheet is divided into 8 equal parts as shown. Using this piece which among the following angles can be measured accurately?



(*a*) 11.5° (*b*) 44.5° (*c*) 125° (*d*) 135°

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 a correct explanation of Assertion (A).

(*b*) Both Assertion (A) and Reason (R) are true but Reason (R) is not a 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:** If the arms of an angle are extended, the angle measure will increase.

Reason: The measure of an angle depends only on the amount of rotation between its two arms, not on their length.

10. **Assertion:** Two distinct lines in a plane can either be parallel, intersect at exactly one point or coincide.

Reason: If two lines are not parallel, they must be perpendicular.

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ASSIGNMENT–4

Marks Obtained: __________

Student's Name: ______________________________ Section: _______

Roll Number: ______________________________ Date: ______________________

A. Fill in the blanks.

1. A line extends indefintely in .... directions.
2. Two lines that meet at a common point are called .... lines.
3. A reflex angle is greater than .... degrees but less than .... degrees.
4. The sum of a reflex angle and a straight angle is always .... than a complete angle.
5. An angle formed by two opposite rays is called a .... angle.

B. Label True or False.

1. Two parallel lines can pass through a common point. ....
2. Given two distinct points, only one ray can be drawn starting from one point and passing through the given. ....
3. At 10:15, the angle between the hour and minute hands of a wristwatch is smaller than that of a big clock. ....
4. The sum of two acute angles is greater than a reflex angle. ....
5. Two reflex angles can never form a pair of vertically opposite angles. ....

C. Match the following.

Column I	Column II
1. Sum of an obtuse angle and an acute angle is less than	(*a*) 360°
2. Sum of two right angles	(*b*) 270°
3. Sum of two acute angles	(*c*) 180°
4. Difference between a straight angle and a right angle	(*d*) Less than 180°
5. 1 revolution is equal to	(*e*) 90°

D. Do as directed.

1. Rohan's clock stopped working exactly at 3 o'clock. To reset it, he moves the hour hand forward until it reaches 11 o'clock. What fraction of a complete clockwise revolution does the hour hand turn through during this adjustment?
2. Riya is playing a direction challenge with her friends. She follows these two steps:
   (*i*) She starts facing South and turns clockwise by 135°.
   (*ii*) Then, from her new direction, she turns anti-clockwise by 225°.
   (*a*) In which direction is Riya facing at the end?
   (*b*) What is the total number of right angles she turns after steps (*i*).

3 Number Play

Learning Objectives

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

- understand the importance of numbers in real life
- place large numbers on the number line
- know about different types of numbers – Palindrome, Kaprekar number, etc.
- make a palindromic number from any given number
- know about mathematical constant – Kaprekar constant
- understand the importance of conjecture – Collatz conjecture
- find the sum of numbers from various patterns
- estimate the numbers, time, quantity, etc.

LESSON PLAN

Suggested number of periods: 16

Suggested Teaching Aids: Textbook (Math Genius! 6), teaching board, pen, pencil, chalk/marker, notebooks, some flashcards with numbers (palindromic) etc.

Keywords: Numbers, subcells, supercells, digit sums of numbers, palindromic numbers, collatz conjecture, kaprekar constant, tarsia puzzle, estimation, etc.

Prerequisite knowledge: Students must be familiar with importance of numbers in real life, representation of numbers on the number line, addition and subtraction of large numbers, estimation of numbers, time and quantity, etc.

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: Journey of Numbers; Role of Numbers in Our Life; Large Numbers; Comparing Numbers	NEP Skills: Collaborative Learning, Discussion Based Learning, Logical Thinking

TEACHER-PUPIL ACTIVITY

Start the class by discussing the scene given in “Get Ready” and questions of “Let’s Recall”.

Start with a brief introduction how numbers were used in ancient civilizations (like the Egyptians, Babylonians, and Greeks) and how they’ve evolved into the system, we use today.

- Discuss the activity given on page 74 of the textbook and ask the students to perform the activity based on this. Divide the class into groups of 6 pupils each. Teacher will write a 6-digit number on board by using the digits 0, 1 and 2 for example, 110210. The group leader will distribute number cards to each members of their group. Ask students of the group to stand as per the numbers written on board. Other students of the class will observe the order of standing and match their order with the number written on board. Same activity is repeated with next group with some other 6-digit numbers. The group who will perform their task correctly in less time will be the winner.

- Introduce subcells and supercells concept to the class. Divide the class into 4 different groups. Call one group and ask them to draw 4 × 4 square table and fill at least 10 cells of it with 5-digit numbers using digits 1, 2, 3, 4 and 5, so that the table must have atleast 2 supercells and 2 subcells.

54321	54312		
12345	12354		
13245			35412
45213	41325	42153	31245

Call the second group to identify the supercells (coloured yellow) and subcells (coloured green) of the table.

54321	54312		
12345	12354		
13245			35412
45213	41325	42153	31245

Call the third group, to fill the blanks cells with five digit numbers using digits 1, 2, 3, 4, and 5, so that the previous supercells and subcells remain the same.

54321	54312	35124	34512
12345	12354	53421	34521
13245	51324	24315	35412
45213	41325	42153	31245

Call the fourth group and ask to identify all remaining supercells and subcells in the table.

54321	54312	35124	34512
12345	12354	53421	34521
13245	51324	24315	35412
45213	41325	42153	31245

The group who will perform this task quickly and correctly will be the winner.

EXPLANATION

Take reference of pages 71-78 of Math Genius! 6 to recall and explain the journey of numbers, role of numbers in our life, formation of numbers, large numbers, numbers on the number line, comparing numbers, subcells and supercells, and examples based on it on board.

ASSIGNMENTS

Classwork: Q.1-5 of Practice Time 3A; Quick Check on page 76-77.

Homework: Remaining questions of Practice Time 3A; Maths Connect on page 78, Think & Answer on pages 73, 74, 77.

Periods: 5–6	Topic: Digit Sum of Numbers	NEP Skills: Collaborative Learning, Discussion-Based Learning

TEACHER-PUPIL ACTIVITY

Begin by explaining the sum of the digits of a number. The digit sum of a number is the sum of all its digits, repeated until a single-digit value is obtained. For example, 987 → 9 + 8 + 7 = **24** → 2 + 4 = **6**.

Distribute number cards of numbers 1 to 100 in the classroom.

Instruct students to calculate their digit sum (e.g., 34 → 3 + 4 = 7, 89 →8 + 9 = 17 → 1 + 7 = 8).

Once the students have found the sum of their number card the teacher asks the class to find the other students with the same digit sum (e.g., 79 → 7 + 9 = 16 → 1 + 6 = 7).

Once paired, students compare numbers and discuss any patterns.

Further instruct them, to check if their digit sum of a number is multiple of 3 or 9 or it is the number divisible by 3 or 9.

EXPLANATION

Take reference of pages 80-81 of Math Genius! 6 to demonstrate digit sum of numbers, digit detectives on board. Also discuss example and enrichment given on pages 80-81.

ASSIGNMENTS

Classwork: Q.1-2 of Practice Time 3B; Quick Check on page 80.

Homework: Remaining questions of Practice Time 3B; Maths Talk on page 80.

Periods: 7–8	Topic: Formation of Numbers (By shifting of digits); Palindromic Pattern	NEP Skills: Discussion-Based Learning, Experiential Learning

TEACHER-PUPIL ACTIVITY

Start the class by writing some digits on board and ask students to form different numbers by shifting the digits, the smallest and the greatest numbers using the digits and introducing palindromic numbers.

Distribute different flashcards with numbers 121, 345, 1221, 37, 99, … randomly among some students.

Ask the students to check if their number is a palindrome or not by reading it forward and backward.

Those with non-palindromic numbers may stand in one group and the others join the class.

Now call the students who are with non-palindromic number one by one and ask them to write their number on board. Instruct the class to make the number palindromic, by using the method given in textbook.

Continue till the given numbers are changed to palindromic numbers.

EXPLANATION

Take reference of pages 81-85 of Math Genius! 6 to explain the formation of numbers, palindromic pattern on board with demonstrating and discussing the examples given on pages 82-85 on board.

ASSIGNMENTS

Classwork: Q.1-7 of Practice Time 3C; Activity on page 85.

Homework: Remaining questions of Practice Time 3C; Quick Check on page 83.

Periods: 9–10	Topic: Playing with Number Patterns; Conjecture — Collatz Conjecture and Kaprekar Constant	NEP Skills: Collaborative Learning, Experiential Learning

TEACHER-PUPIL ACTIVITY

Start the class by giving some number patterns and introducing the topic "Collatz Conjecture" and "Kaprekar Constant".

- Let us first discuss about Collatz Conjecture. Write a number on the board and ask the class to observe the change in number when divided by 2 if it is even and multiply by 3 then add 1 if it is odd. For example, start with number 10.

  10 (even) → 5 (odd) → 16 (even) → 8 (even) → 4 (even) → 2 (even) → 1

  (10 ÷ 2) (5 × 3 + 1) (16 ÷ 2) (8 ÷ 2) (4 ÷ 2) (2 ÷ 2)

  Explain: "No matter what number we start with, we always seem to reach 1!" Introduce this as the Collatz Conjecture.

  Allow the students to participate in working out the example.

  Now, assign the students a different starting number one by one (e.g., 7, 12, 19, 25).

  Instruct the students to follow the Collatz steps to reach 1.

- Now, Kaprekar Constant needs to be discussed. Write the number "495" on board and discuss the speciality of this number. Explain that **Kaprekar's Constant** is a special number that almost all 3-digit numbers (excluding digits like 111, 222, etc.) eventually reach 495 by following the method given in the textbook.

  Give the students a 3-digit number (e.g., 123, 456, 789, etc.).

  Ask them to apply the **Kaprekar process** to find 495.

  The first one to reach 495 will get accolades.

  Also, explain to the class how to reach the Kaprekar Constant "6174" for 4-digit numbers given in the textbook.

EXPLANATION

Take reference of pages 86-90 of Math Genius! 6 to discuss playing with number patterns, Collatz Conjecture, Kaprekar constant in detail and the examples given on pages 87 and 90 on board. Also discuss "A Pinch of History" in the classroom if possible.

ASSIGNMENTS

Classwork: Q.1-4 of Practice Time 3D; Think and Answer on page 87.

Homework: Remaining questions of Practice Time 3D; Project given on page 90.

Periods: 11–12	Topic: Breaking up Numbers; Digits and Operations	NEP Skills: Discussion-Based Learning, Collaborative Learning

TEACHER-PUPIL ACTIVITY

Begin the class by recalling the explanation for expanded form of a number and giving examples like: 2950 = 2 × 1000 + 9 × 100 + 5 × 10 + 0 × 1 and then demonstrate that the number 2950 can be broken as: 2950 = 500 × 3 + 200 × 5 + 100 × 4 + 50 or 2950 = 500 × 6 – 50, by using addition and subtraction methods.

Also, discuss the topic Digits and Operations.

Divide the class into different groups. The teacher will write few numbers on the board in tabular form as follows:

25,000	10,000	2,000
58,000	300	12,000
35,000	15,000	10,600
2,000	12,000	5,000

Instruct the students to add or subtract the middle column numbers to get the numbers on the sides. For example,

- ❖ 10,000 × 1 + 15,000 × 1 = 25,000
- ❖ 12,000 – 10,000 = 2,000

Ask the students to find as many as combination of middle numbers so as to get the side numbers.

The group which finds the maximum combination of numbers will get praise.

EXPLANATION

By taking reference of pages 91-94 of Math Genius! 6, explain the concept of breaking up of numbers by addition and subtraction and digits and operations in details with examples given on pages 92-94 on board. Also discuss "Tarsia Puzzle" given on page 94 under the section "Create and Solve".

ASSIGNMENTS

Classwork: Q.1-3 of Practice Time 3E; Quick Check on page 92.

Homework: Remaining questions of Practice Time 3E; Maths Talk on page 93.

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

TEACHER-PUPIL ACTIVITY

Begin the class by using the word "estimation or approximation" by giving some real-life examples, where this word is used often.

Write some numbers up to 5 digits on the board and recall that to round off a number to a certain place, we look at the digit at its immediate right. If it is 5 or more, we add 1 to the digit at the rounding off place and make all the digits to the right of it as 0. If it is less than 5, keep the digit at the rounding off place same and make all the digits to the right of it as 0.

Recapitulate the concept of estimating the sum and difference by rounding off the numbers to the nearest given place. Also, reiterate that to estimate product and quotient, we round off the multiplier and the multiplicand/dividend and divisor to the nearest tens, hundreds or thousands, whichever is more convenient. Then, multiply/divide the rounded off numbers to get the estimated product/quotient.

EXPLANATION

By taking reference of pages 95-97 of Math Genius! 6, explain estimation in detail by demonstrating the examples given on pages 96-97 on board.

ASSIGNMENTS

Classwork: Q.1-5 of Practice Time 3F.

Homework: Remaining questions of Practice Time 3F.

Periods: 15–16	Topic: Revision	NEP Skills: Creative Thinking, Logical Thinking

TEACHER-PUPIL ACTIVITY

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

Start the revision of the exercise, by using Encapsulate, Brain Sizzlers, Chapter Assessment, Maths Fun and Mental Maths.

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

ASSIGNMENTS

Classwork: Few questions of section A-D of Chapter Assessment.

Homework: Remaining questions of Chapter Assessment, Maths Fun on page 101, Mental Maths on page 101, Brain Sizzlers on page 102.

ORANGE

ASSIGNMENT–5

Marks Obtained: __________

Student's Name: ______________________________ Section: _______

Roll Number: ______________________________ Date: ______________________

A. Multiple Choice Type Questions

Identify the correct answer.

1. The sum of a palindromic number and its reverse is 242. The number is:

(*a*) 121 (*b*) 131 (*c*) 202 (*d*) 101

2. Which of the following sequences follows the Collatz Conjecture?

(*a*) 7 → 22 → 11 → 32 → 16 → 8 → 4 → 2 → 1

(*b*) 15 → 46 → 23 → 70 → 35 → 104 → 52 → 26 → 13 → 40 → 20 → 10 → 5 → 16 → 8 → 4 → 2 → 1

(*c*) 50 → 25 → 76 → 38 → 19 → 58 → 29 → 88 → 44 → 22 → 11 → 34 → 17 → 52 → 26 → 13 → 40 → 20 → 10 → 5 → 16 → 8 → 4 → 2 → 1

(*d*) All of these

3. If a number starts at 22 in the Collatz sequence, how many steps does it take to reach 1?

(*a*) 13 (*b*) 14 (*c*) 15 (*d*) 16

4. How many palindromic numbers are there between 100 and 500?

(*a*) 30 (*b*) 40 (*c*) 50 (*d*) 60

5. Take a three-digit number, reverse its digits, and subtract the smaller number from the larger one, the result is always:

(*a*) A multiple of 9 (*b*) A multiple of 99 (*c*) A multiple of 11 (*d*) All of the above

6. What is the number of steps required for 9875 to reach Kaprekar's constant?

(*a*) 3 (*b*) 5 (*c*) 7 (*d*) 9

7. The supercell number in the given series is

2180	3052	7950	9000	8632	2956

(*a*) 3050 (*b*) 7950 (*c*) 9000 (*d*) 2956

8. The difference between two 5-digit numbers is a

(*a*) two-digit number (*b*) three-digit number (*c*) four-digit number (*d*) All of the above

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 a correct explanation of Assertion (A).

(*b*) Both Assertion (A) and Reason (R) are true but Reason (R) is not a 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:** Every four-digit palindromic number is divisible by 11.

Reason: A four-digit palindrome can be expressed in the form ABBA.

10. **Assertion:** 285 rounded off to the nearest tens is 290.

Reason: If the digit to the right of the rounding place is 5 or greater, round up by adding 1 to the digit.

ORANGE

ASSIGNMENT–6

Marks Obtained: __________

Student's Name: ______________________________ Section: ______

Roll Number: ______________________________ Date: ______________________

A. Fill in the blanks.

1. The maximum possible number of digits in the product of any two three-digit numbers is ....
2. The smallest 6-digit palindromic number formed by using each of the digits 3, 7, and 8 exactly twice is ....
3. A number with more digits is .... than a number with fewer digits.
4. A cell is called a .... if its number is smaller than its adjacent cells.

B. Label True or False.

1. The difference between the largest and the smallest 3-digit palindromic numbers is a palindromic number. ....
2. A cell adjacent to a supercell is always a subcell. ....
3. The difference of two 3-digit numbers is always a 1-digit or 2-digit number. ....
4. The smallest palindromic number made with two different digits is 101. ....
5. The estimated value of 6359 to the nearest hundreds is 6300. ....

C. Match the following.

Column I	Column II
1. The largest 5-digit number made by using 4, 5, and 9	(*a*) 45954
2. The smallest palindromic number having digits 4, 5, and 9	(*b*) 50949
3. Kaprekar's constant for 3-digit numbers	(*c*) 2915
4. Product of the successor and predecessor of 54	(*d*) 99954
5. The product of 111 and 459	(*e*) 495

D. Do as directed.

1. Consider two numbers that read the same from forward and backward direction (palindromes). Is the sum of any two palindromic numbers always a palindrome? Provide examples to support your viewpoint, and describe any patterns or exceptions you observe.
2. How many round does the number 3427 take to reach the Kaprekar constant?

4

Data Handling and Presentation

Learning Objectives

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

- ✦ know what the data mean
- ✦ understand how to record, organise and represent data
- ✦ represent data pictorially through a pictograph and a bar graph
- ✦ interpret the given pictograph and bar graph
- ✦ represent data artistically and aesthetically

LESSON PLAN

Suggested number of periods: 16

Suggested Teaching Aids: Textbook (Math Genius! 6), teaching board, pen, pencil, chalk/marker, notebooks, some charts, A4 sheets etc.

Keywords: Data, primary data, secondary data, frequency, pictograph, bar graph, double bar graph, infographics, frequency, tallymarks, key, scale etc.

Prerequisite knowledge: Students must be familiar with data and its collection to gather the information, tabular form of data, pictograph, reading bar graph, etc.

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: What is Data; Need of Data; Types of Data; Recording Data; Organising Data**	**NEP Skills: Discussion-Based Learning, Collaborative Learning, Experiential Learning**

TEACHER-PUPIL ACTIVITY

Start the class by discussing the scene given in "Get ready!" and questions of "Let's recall" given on pages 103-104 of the textbook.

Divide the class in groups of four students each. Ask each group to collect the different kinds of information from the students of the class, like their favourite food items, their favourite storybooks or their favourite fruits, etc. Instruct the groups to record the information they collected in a table with the name of the participated student and then his/her favourite items against his/her name. Reiterate the class that this is the collection of raw data. Also, tell them that collecting or recording data in this way is a time taking process.

Also, tell the class that 'a better and convenient way is to organise data using tally marks, that is, write the name of the information to be collected in a column, put tally marks (|) against it in another column and then in third column write the number of students against the respective tally marks.

Take the reference of the examples 1-2 on pages 107-108. Also, reiterate the class that the number of times a particular observation or value occurs is called the frequency.

EXPLANATION

Take the reference to pages 104-108 of Math Genius! 6 to recall and explain the data, its requirements, types, organisation and recording.

ASSIGNMENTS

Classwork: "Maths connect" on page 105 and Q.1-2 of Practice Time 4A.

Homework: "Activity" given on page 108 and remaining questions of Practice Time 4A.

Periods: 5–7	**Topic: Reading and Interpreting a Pictograph; Drawing a Pictograph; Advantages and Disadvantages of a Pictograph**	**NEP Skills: Creative Thinking, Art Integration, Experiential Learning, Discussion-Based Learning**

TEACHER-PUPIL ACTIVITY

Begin by asking: "How can we represent the data using pictures?"

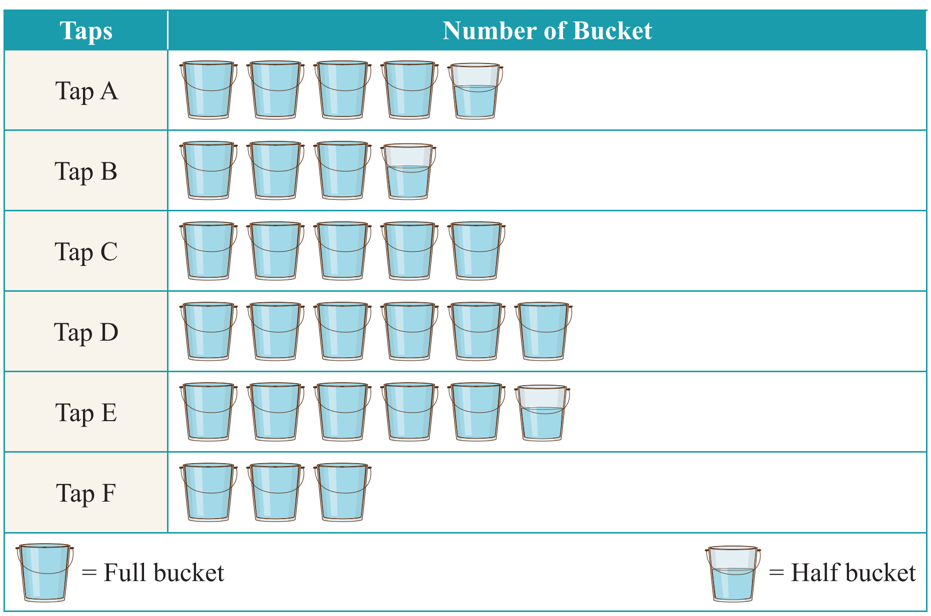
Show a simple example of a pictograph and explain the key elements:

Title, categories, symbols (each symbol represents number), Key, etc.

Discuss how pictographs help in understanding data quickly.

- Display a pictograph on the screen or on the board. Tell the students to observe it and explain what they think about it.

For example, the graph given below shows the number of buckets filled in 30 minutes by different taps as follows:



For interpretation of the above pictograph, ask some questions from the students one-by-one, like

❖ By which tap the water flow is the fastest?

❖ By which tap the water flow is the least?

❖ How many buckets can be filled in 1 hour by the tap A?

❖ How many buckets can be filled by tap B in 2 hours?

- ❖ If a full bucket holds 20 L of water, how much water flows from tap E in 30 minutes?
- ❖ Arrange the taps in order showing slowest to fastest running water.

Discuss the answers of these questions.

- Also, write some data in a tabular form on the board, such as the table given below showing the favourite fruits of the children of a society.

Fruit	Mango	Banana	Guava	Grapes	Orange	Apple
No. of students	10	12	8	10	12	4

Ask the students of the class to observe the table and make a pictograph for the given data by taking a suitable key. Accept the class responses and reiterate to them that they can use any symbol they want when making a pictograph and let each symbol stand for any convenient number of things.

After that discuss with the class about advantages and disadvantages of the pictograph. Take the reference to page 116 to explain this topic.

EXPLANATION

Take reference to pages 109-113 (including examples 3-4) of Math Genius! 6 to explain the topics mentioned.

ASSIGNMENTS

Classwork: Q.1-4 of Practice Time 4B.

Homework: Remaining questions of Practice Time 4B.

Periods: 8–11	**Topic: Bar Graph; Interpretation of Bar Graph; Drawing a Bar Graph (including a Double Bar Graph)**	**NEP Skills: Creative Thinking, Discussion-Based Learning, Experiential Learning**

TEACHER-PUPIL ACTIVITY

Introduce bar graph and its properties. Discuss with the class that representing data by a pictograph is time-consuming and difficult. So, we seek another way of representing data visually. This is a bar graph, in bar graph, bars of uniform width are drawn horizontally or vertically with equal spacing between them. The length of each bar represents the given number (frequency).

Divide the class into groups of 4-5 students. Distribute square grid paper to them.

Instruct each group to collect the data within the class about favourite fruits, favourite sweets or favourite subjects, or favourite indoor activities, etc. of each student. Accept the responses from them and instruct each group to represent the collected data graphically using a bar graph on the square grid paper. Ask the class 'Can they interpret this bar graph?' Also, ask few questions to them such as

- ❖ How many children like (fruit name/sweet name/subject name) the most?
- ❖ Which fruit name/sweet name/subject name do they like the least?

Accept the response. Also, reiterate the class that in double bar graphs, two bars representing two sets of information in different colours so that the comparison becomes easy.

EXPLANATION

Take reference to pages 116-123 of Math Genius! 6 for detail explanation of topics mentioned above. Also, demonstrate the examples 5-10 on the board.

ASSIGNMENTS

Classwork: Discuss "Think and answer" on page 120 in the class room and ask to practice Q. 1-4 of Practice Time 4C.

Homework: Remaining questions of Practice Time 4C.

Periods: 12–14	Topic: Artistic and Aesthetic Consideration	NEP Skills: Art Integration, Experiential Learning

TEACHER-PUPIL ACTIVITY

Start the class by discussing that when data visualisations such as bar graphs are further beautified with more extensive artistic and visual imagery, they are called information graphics, or infographics. Infographics aim to make use of attention-attracting and engaging visuals to communicate information even more clearly and quickly, in a visually pleasing way.

To demonstrate how infographics can be used to communicate data even more suggestively, use the example of tallest mountain in each continent.

Divide the class into groups. Distribute graph paper to each group. Instruct them to create bar graph by using the data given on page 127.

Further instruct them that they can represent the data more visually appealing by using shapes, colours and sizes. For example, we can use triangles instead of rectangles, which look a bit more like mountains. And we can add a splash of colour as well to make the infographic more appealing.

Ask the groups to create infographic of the bar graph they just created. The group who create best infographic will be the winner.

EXPLANATION

Take reference to pages 127-128 to demonstrate the artistic and aesthetic way to represent the data.

ASSIGNMENTS

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

Homework: Remaining questions of Practice Time 4D.

Periods: 15–16	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. Start the revision of the exercise, by using Encapsulate, Brain Sizzlers, Chapter Assessment, Maths Fun and Mental Maths. Divide the students into small groups and guide them to do the activity given in 'Learning by Doing' section.

ASSIGNMENTS

Classwork: Brain Sizzlers on page 130; Few questions of section A-D of Chapter Assessment and Mental Maths on page 129.

Homework: Remaining questions of Chapter Assessment, Maths Fun on page 129.

ORANGE

ASSIGNMENT–7

Marks Obtained: __________

Student's Name: ______________________________ Section: _______

Roll Number: ______________________________ Date: ______________________

Multiple Choice Type Questions

Identify the correct answer.

1. The number of volunteers in a school is shown in the adjoining pictograph. Which class has exactly three times the volunteers as that of class VII?

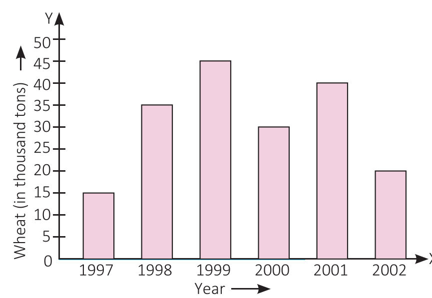
Class	Number of volunteers 🙂 = 10 volunteers
VI	🙂🙂🙂🙂
VII	🙂🙂
VIII	🙂🙂🙂🙂🙂🙂
IX	🙂🙂🙂
X	🙂

(*a*) VI
(*b*) VIII
(*c*) IX
(*d*) X

2. What is the frequency corresponding to the tally marks shown? 卌 卌 |

(*a*) 8 (*b*) 9 (*c*) 10 (*d*) 11

3. The bar graph shows the production of wheat (in thousand tons) by a company over a few years. In which consecutive years was the maximum decline in production recorded?



(*a*) 1997 and 1998
(*b*) 1998 and 1999
(*c*) 1999 and 2000
(*d*) 2001 and 2002

4. The data represented in the form of pictures is called

(*a*) Pictograph (*b*) Bar graph (*c*) Frequency table (*d*) None of these

5. A tally chart records students' preferences for snacks.

Snacks	Tally marks
Biscuit	卌 卌 卌
Popcorn	卌 卌 |
Fruit salad	卌 卌 卌 ||||
Chips	卌 卌 卌 ||

Which snack is the most favourite among the students?

(*a*) Biscuits (*b*) Popcorn (*c*) Fruit salad (*d*) Chips

6. In a pictograph, if * represents 3 balloons, how many symbols should be drawn to depict 54 balloons?

(*a*) 8 (*b*) 18 (*c*) 12 (*d*) 16

7. Data collected directly from the source is called:

(*a*) frequency (*b*) observation (*c*) secondary data (*d*) primary data

8. The marks (out of 10) obtained by 20 students in a Social Studies test are: 3, 5, 7, 9, 6, 8, 4, 7, 7, 10, 5, 6, 8, 7, 9, 2, 7, 8, 7, 10. How many students scored 7 or more marks?

(*a*) 11 (*b*) 12 (*c*) 13 (*d*) 14

ORANGE

ASSIGNMENT–8

Marks Obtained: __________

Student's Name: ____ Section: ______

Roll Number: ____________________________________ Date: ________________________

A. Fill in the blanks.

1. The numerical information collected for analysis is called ....
2. A .... is a way of representing data using symbols or images.
3. In a bar graph, the .... of each bar represents the corresponding value.
4. A tally mark group of five consists of four .... lines and one diagonal line crossing them.
5. Data that is collected from published sources like books and newspapers is called .... data.
6. A .... bar graph is used to compare two sets of data.

B. Label True or False.

1. Representation of data using rectangles of uniform width and equal spacing between them is called pictograph. ....
2. Data collected through a questionnaire or interviewer is considered primary data. ....
3. A bar graph can only be drawn with vertical bars, not horizontal bars. ....
4. Tally marks are useful for recording and counting large numbers quickly. ....
5. Primary data collection is generally more time consuming than secondary data collection. ....

C. Do as directed.

1. The favourite fruit choices of 30 students are as follows:

   Apple, Banana, Orange, Apple, Grapes, Banana, Mango, Apple, Orange, Banana, Mango, Grapes, Apple, Orange, Mango, Banana, Apple, Mango, Grapes, Banana, Orange, Mango, Apple, Grapes, Apple, Orange, Mango, Apple, Banana, Grapes.

   (*a*) Prepare a table to organise the above collected data using tally marks.

   (*b*) Which fruit is the most preferred among the students?

2. The number of books read by the students in two different classes over six months is given below:

Month	Class 6	Class 7
January	15	18
February	20	22
March	18	25
April	25	28
May	22	24
June	30	27

   (*a*) Draw a double bar graph to represent the given data.

   (*b*) In which month did class 6 read more books than class 7?

   (*c*) Which class read the least number of books?

5 Prime Time

Learning Objectives

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

- explain the relationship between factors and multiples
- determine whether a number is a factor or multiple of another number
- solve problems involving factors and multiples
- explore the differences between prime numbers and composite numbers
- use factor tree and prime factorisation to find prime factors of a number
- identify numbers divisible by 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11 without performing division
- find the common factors and HCF of numbers
- find the common multiples and LCM of numbers.

LESSON PLAN

Suggested number of periods: 18

Suggested Teaching Aids: Textbook (Math Genius! 6), teaching board, pen, pencil, chalk/marker, notebook, paper chits/number cards/flash cards of numbers, chart paper, A4 sheets etc.

Keywords: Multiples, factors, common multiples, common factors, even numbers, odd numbers, prime numbers, composite numbers, sieve method, co-prime numbers, twin prime numbers, factorisation, factor tree, perfect numbers, abundant numbers, deficient numbers, amicable numbers, conjecture, goldbach conjecture, prime art, highest common factor (HCF), lowest common multiple (LCM), etc.

Prerequisite knowledge: Students must be familiar with multiples and factors of a number, prime and composite numbers, the divisibility rule of numbers 2, 3, 4, 5, 9 and 10, and finding HCF and LCM of two numbers, etc.

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: Multiples and Factors	NEP Skills: Collaborative Learning, Experiential Learning

TEACHER-PUPIL ACTIVITY

Introduce the topic "Multiples and Factors" in the classroom by asking questions based on it.

For example, 'suppose you and your friend have to buy toys of ₹140 each, and you have notes of denomination ₹10 and your friend have notes of denomination ₹20 only. How many notes will you pay to the shopkeeper?

Accept the response.

Based on the response, divide the class into two teams called factors and multiples.

Draw a table with two columns on the board: one column labelled as factors and the other labelled as multiples.

Distribute some number flash cards up to number 70 to each team, so that each member of the team gets two flash cards.

The teacher will call out a number (say 12).

The students of team factors, who have cards with a number which is a factor of 12 will run to the board and write their numbers in factors column.

Now the students of team multiples, who have flash cards with a number which is a multiple of 12 will run to the board and write their numbers in multiples column.

Next, the teacher will call out a different number (e.g. 11).

Discuss about common factor, common multiples and prime numbers, when the situation arises.

Also, explain that factors of a number are finite, but multiples of a number are infinite.

EXPLANATION

Take reference to pages 137-140 of Math Genius! 6 (including Get Ready!) to recall and explain about multiples and factors on board in detail.

ASSIGNMENTS

Classwork: Quick check on page 139 and Q. 1-2 of Practice Time 5A.

Homework: Remaining questions of Practice Time 5A.

Periods: 4–6	Topic: Common Multiples and Common Factors	NEP Skills: Collaborative Learning, Logical Thinking

TEACHER-PUPIL ACTIVITY

Distribute number cards (1-60) to each student in the class and divide the class into two teams. Call the team one by one. Write a number, for example, 32 on the board. Instruct the team to show its factors through the number cards. Then, the teacher calls out a second number (say 48) and ask the team to show its factors. Further, instruct the team to identify the common factors of both of the numbers. Next, call the second team with another pair of numbers. The fastest team to correctly list all common factors will win.

EXPLANATION

Take reference to pages 142-144 of Math Genius! 6 to explain the topics mentioned above.

ASSIGNMENTS

Classwork: Think and Answer on page 142; Quick Check on page 143; Activity on page 144 and Q. 1, 5, 9 and 12 of Practice Time 5B.

Homework: Remaining questions of Practice Time 5B.

Periods: 7–9	Topic: Prime and Composite Numbers; Co-primes and Twin Primes	NEP Skills: Discussion-Based Learning, Logical Thinking

TEACHER-PUPIL ACTIVITY

- Distribute square grid paper to each student of the class.

  Instruct to write 1 to 200 on it.

  Instruct students to find out all prime and composite numbers by using the method of sieve using the reference given on page 147 of the textbook.

  Appreciate the student who will select all the prime numbers correctly.

- Further, explain to the students that two numbers are said to be **co-prime** to each other if there is no other factor except 1 is common between them. Also, prime number pairs that have a difference of 2 are called **twin primes** and a set of three consecutive prime numbers that have a difference of 2 are called **prime triplets**.

EXPLANATION

By taking reference to pages 146-149 of Math Genius! 6, explain the topic mentioned above in detail.

ASSIGNMENTS

Classwork: Discuss and ask to solve Create and Solve; Quick Check on page 147; Think and Answer on page 148; and Q. 1, 3, 6 and 8 of Practice Time 5C.
Homework: Remaining questions of Practice Time 5C.

Periods: 10–12	Topic: Prime Factorisation; Perfect, Abundant and Deficient Numbers; Amicable Numbers	NEP Skills: Collaborative Learning, Discussion-Based Learning, Experiential Learning

TEACHER-PUPIL ACTIVITY

- Divide the class into pairs. Write some numbers on the blackboard and ask the pairs to write the prime factors of the numbers by using factor tree and division methods. Accept the responses from the class. Take the reference of in-text examples of the textbook, to find the prime factorisation of other numbers.
- Draw a table on the board with the column heading as perfect, abundant, deficient and amicable numbers. Write some numbers like: 6, 12, 15, 18, 28, 30, … on the board. Instruct students to work in pairs to find the sum of the proper divisors of each number. Ask them to sort the numbers and write them on the board into their correct category. Discuss why some numbers are abundant, deficient, perfect or amicable. Take the reference to the pages 152-153 to explain these numbers.

EXPLANATION

Take reference to pages 150-153 of Math Genius! 6 to explain the topics mentioned in details with examples.

ASSIGNMENTS

Classwork: Think and Answer on page 150 and Q. 1-3 of Practice Time 5D.

Homework: Remaining questions of Practice Time 5D.

Periods: 13–14	Topic: Divisibility Rules; Prime Conjectures; Prime Art	NEP Skills: Discussion-Based Learning, Experiential Learning

TEACHER-PUPIL ACTIVITY

- Write some numbers on the blackboard such as 250; 342; 200; 60874 and 3245.

  Ask the students of the class to find the numbers by which the written numbers will be exactly divisible.

  On behalf of this, explain to the class the concept of divisibility rules for different numbers and their properties.
- Discuss that, as per "Goldbach conjecture", every number greater than 2 can be written as the sum of two or more primes.

  Write some numbers like: 9, 13, 15, … on board and ask the class to express these numbers as the sum of 2 or more prime numbers.

  Follow up by the hands-on activity given for prime art on pages 157-159 of the textbook.

EXPLANATION

Take reference to pages 154-159 of Math Genius! 6 to explain the topics mentioned above in details. Also discuss "enrichments" given on pages 154-155.

ASSIGNMENTS

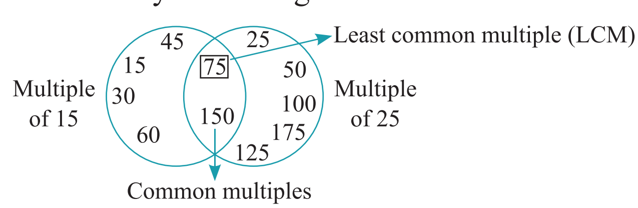
Classwork: Think and Answer given on page 156, Quick Check on page 158, Maths Fun given on page 159 and Q. 1, 3, 5, 9 and 16 of Practice Time 5E.
Homework: Remaining questions of Practice Time 5E.

Periods: 15–17	Topic: Highest Common Factor(HCF); Lowest Common Multiple (LCM); Facts About HCF and LCM	NEP Skills: Collaborative Learning, Experiential Learning

TEACHER-PUPIL ACTIVITY

- Divide students into small groups. Assign each group a pair of numbers. For example, 24 and 36; 15 and 25; 32 and 68, etc. Ask each group to create factor trees for both numbers. Instruct them to identify the common prime factors and multiply them to find the HCF by discussing each other.
- Next, ask them to draw a Venn diagram on A4 sheet or in a notebook.

  Then write the multiples of their numbers. For example, 15 and 25, and the common multiples in the overlapping section.



  The least number in the common multiple section is the LCM of both numbers.

Also, discuss facts about HCF and LCM with examples.

EXPLANATION

Take reference to pages 161-166 of Math Genius! 6 to explain the topics mentioned in details.

ASSIGNMENTS

Classwork: Quick Check on page 163 and 166, Think and Answer on page 165, and Q. 1-5 of Practice Time 5F.

Homework: Remaining questions of Practice Time 5F.

Periods: 18	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. Start the revision of the exercise, by using Encapsulate, Brain Sizzlers, Chapter Assessment, Life skills and Mental Maths. Divide the students into small groups and guide them to do the activity given in the 'Learning by Doing' section.

ASSIGNMENTS

Classwork: Brain Sizzlers, Q. 1, 6 of Part A, Q. 3 of Part B, Q. 1, 4, 7 and 11 of Part E of Chapter Assessment and Mental Maths on page 167.

Homework: Remaining questions of Chapter Assessment and Life Skills on page 167.

ORANGE

ASSIGNMENT–9

Marks Obtained: __________

Student's Name: ____ Section: _______

Roll Number: ____________________________________ Date: ______________________

A. Multiple Choice Type Questions

Identify the correct answer.

1. The number of distinct prime factors of the smallest 4-digit number is

(*a*) 2 (*b*) 3 (*c*) 4 (*d*) 5

2. The largest number which always divides the product of any two consecutive even numbers is

(*a*) 4 (*b*) 8 (*c*) 12 (*d*) 16

3. Which of the following pairs is co-prime?

(*a*) 14 and 21 (*b*) 15 and 20 (*c*) 12 and 25 (*d*) 18 and 27

4. What is the largest 3-digit prime number?

(*a*) 997 (*b*) 991 (*c*) 993 (*d*) 995

5. If the LCM of two numbers is 180, which of the following cannot be their HCF?

(*a*) 45 (*b*) 60 (*c*) 75 (*d*) 90

6. A number divisible by both 3 and 8 must be divisible by

(*a*) 14 (*b*) 24 (*c*) 48 (*d*) 96

7. What is the sum of the number of primes between 20 to 30 and 40 to 50?

(*a*) 5 (*b*) 6 (*c*) 7 (*d*) 8

8. The largest number that always divides the sum of any three consecutive even numbers is:

(*a*) 2 (*b*) 3 (*c*) 6 (*d*) 12

B. Assertion and Reason Type Questions

In the following question, 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:** Two consecutive odd numbers are always co-prime.

Reason: The HCF of two consecutive odd numbers is 1.

10. **Assertion:** All primes greater than 2 are odd.

Reason: There are infinitely many primes.

ORANGE

ASSIGNMENT–10

Marks Obtained: __________

Student's Name: ______________________________ Section: ______

Roll Number: ______________________________ Date: ______________________

A. Fill in the blanks.

1. Two prime numbers that differ by 2 are called .... primes.
2. A number for which the sum of its proper factors is greater than the number itself is called an .... number.
3. A number is divisible by 9 if the sum of its digits is a multiple of ....
4. The number 1 is neither prime nor ....
5. A number is divisible by 4 if the number formed by its last two digits is divisible by ....
6. A number is divisible by 6 if it is divisible by both .... and ....

B. Label True or False.

1. The HCF of an even number and an odd number is always an odd number. ....
2. The square of a prime number is always a prime number. ....
3. The sum of two prime numbers can be a prime number. ....
4. The sum of the first 5 prime numbers is an odd number. ....
5. 469 is a perfect number. ....

C. Match the following.

Column I	Column II
1. The smallest odd prime number	(*a*) 7
2. The only even prime number	(*b*) 6
3. A perfect number	(*c*) 2
4. A factor of 485	(*d*) 3
5. A divisor of 1253	(*e*) 97

D. Do as directed.

1. Ravi has 24 chocolates and 36 toffees. He wants to pack them into identical gift boxes such that each box contains an equal number of chocolates and an equal number of toffees without any leftovers. What is the greatest number of gift boxes he can make, and how many chocolates and toffees will be in each box?

6

Perimeter and Area

Learning Objectives

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

- evaluate the perimeter of closed figures
- derive the formulae for the perimeter and area of a rectangle, triangle and square
- understand the concept of the area of closed figures
- estimate the area of closed figures by using square grid paper
- evaluate the area of closed figures (rectangle, square and triangle)
- identify situations involving the area and perimeter of a rectangle and a square.

LESSON PLAN

Suggested number of periods: 15

Suggested Teaching Aids: Textbook (Math Genius! 6), blackboard or whiteboard, pens, pencils, chalk/ marker, notebook, some cut-outs of 2D shapes like a triangle, a rectangle, a square, a hexagon, some pieces of thread or string, some glue sticks, grid paper, colour pencil, geoboard, grid paper, rubber bands, etc.

Keywords: Perimeter; Regular polygon; Pentagon; Hexagon; Heptagon; Octagon, etc.

Prerequisite knowledge: Students must be familiar with the perimeter and area of a rectangle and a square, regular shapes, irregular shapes, types of regular polygons, etc.

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: Perimeter; Perimeter of a rectangle, square, triangle, equilateral triangle and regular polygon	NEP Skills: Conceptual and experiential learning

TEACHER-PUPIL ACTIVITY

Start the class by recalling the concept of perimeter and area by discussing the situation given in "Get ready" and "Let's recall".

Divide the class into pairs of students.

Distribute the cut-outs, pieces of thread, and glue sticks to the pairs of students.

Instruct them to place the thread/string around the cut-outs of the 2D shapes without overlapping it, cut the thread/string, and measure the length of the thread/string using a ruler that will be equal to the length of the boundary of the 2D shapes.

Based on this activity, explain the concept of the perimeter of 2D shapes, like triangles, rectangles, squares, and other regular polygons, to the class that, 'The perimeter of a figure is the distance around it.

Also, by taking reference to pages 176–178, explain to the students of the class about the formula of the perimeter of different regular geometrical figures, like:

Perimeter of a rectangle = 2(length + breadth)

Perimeter of a square = 4 × side

Perimeter of a triangle = Sum of the lengths of its three sides

Perimeter of an equilateral triangle = 3 × side

Perimeter of a pentagon = 5 × length of a side

Perimeter of a hexagon = 6 × length of a side

Perimeter of a heptagon = 7 × length of a side

Perimeter of an octagon = 8 × length of a side

EXPLANATION

Take reference from pages 176–182 of Math Genius! 6 to recall and explain the perimeter of a rectangle, square, triangle, equilateral triangle, and the perimeter of a regular polygon with detailed examples on the board.

ASSIGNMENTS

Classwork: Discuss "Think and Answer" (page 179, 180), "Maths Fun" (page 179), "Maths Talk" (page 181), and Q.1-2 of Practice Time 6A. Also motivate to do the "Activity" given on page 182 in their leisure period or maths activity period

Homework: Remaining questions of Practice Time 6A.

Periods: 5–8	**Topic: Understanding area; Area on square grid paper; Area of a square and a rectangle**	**NEP Skills: Conceptual and experiential learning**

TEACHER-PUPIL ACTIVITY

Draw a square on the board and ask students how to find its area.

Demonstrate that the area of square = side × side (i.e., side^2).

Introduce the topic "Understanding area" and "Area on square grid paper" by referring to pages 182–188 of the textbook.

- Distribute grid paper to the students.

Ask students to draw squares of different sizes (e.g. 2 cm × 2 cm, 3 cm × 3 cm, 4 cm × 4 cm,…) on their grid paper using a ruler.

Instruct students to count the total number of small squares inside their drawn square.

Ask them to verify if the count matches the formula

Area = side × side

- Instruct students to draw irregular shapes (e.g., a cloud-like shape, a leaf) on grid paper.

Instruct students to count **fully filled** squares inside the figure. Each complete square is counted as 1 sq. unit.

Squares that are more than half-filled in the enclosed region are also taken as 1 sq. unit each.

Exactly half-filled squares are counted as each having an area of $\frac{1}{2}$ sq. unit.

The portions of the area, which are less than half a square, are considered as 0 sq. unit.

Add all the counts (whole, half, and more than half squares) to find the area of the given irregular shape.

Ask students to compare the area they found with their bench partner.

Discuss how this method is used in real-life situations (e.g., land measurements, architecture).

EXPLANATION

Take reference from pages 182–188 of Math Genius! 6 to explain the area of regular and irregular shapes in detail with examples on the board.

ASSIGNMENTS

Classwork: Q.1, 2 of Practice Time 6B and Q.1, 2, 3, 8, 9, 14(*a*) of Practice Time 6C.

Homework: Remaining questions of Practice Time 6B and 6C.

Periods: 9–10	Topic: Area of a triangle; Making different arrangements	NEP Skills: Conceptual, experiential and art integrated learning

TEACHER-PUPIL ACTIVITY

- Distribute the grid paper to each student of the class.

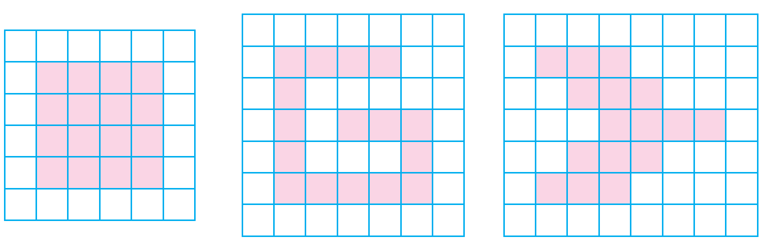
Ask students to construct a rectangle on the grid paper using a coloured pencil. Then, instruct them to cut the rectangle along one of its diagonals to get two triangles.

Instruct to superimpose one triangle on another and check whether the two triangles have the same area.

Then deduce the formula that:

Area of a triangle $= \frac{1}{2} \times$ Area of a rectangle (When the triangle lies on the same base and has the same height as the rectangle).

- Ask each student to colour exactly 16 unit squares as per their choices. Like



Ask them to observe, does each arrangement have the same perimeter and area?

Inform that each one has shaded 16 unit squares. So, their areas are the same. But, their perimeters are not the same.

EXPLANATION

By taking reference to pages 189–194 of Math Genius! 6, explain the area of a triangle, the area and perimeter of different arrangements, and the area and perimeter related to different house plans with detailed examples.

ASSIGNMENTS

Classwork: Discuss and ask students to solve "Quick Check (Page 191)", "Think and Answer (Page 191)", "Create and Solve (Page 194)", and Q1 and Q2 of Practice Time 6D.
Homework: Remaining questions of Practice Time 6D.

Periods: 11–12	Topic: Area using a geoboard	NEP Skills: Collaborative and experimental learning

TEACHER-PUPIL ACTIVITY

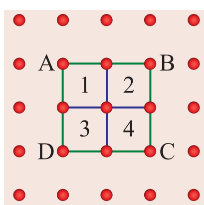
Show a geoboard in the classroom, and introduce it as a mathematical tool used to find the perimeter and area of any polygon by using the following activities:

- Show students how to stretch a rubber band around the peg/nails to form different shapes.
- Explain that each square unit on the geoboard represents **1 square unit of area** (e.g., 1 cm^2 if using a cm-scale board).

Divide the class into 4-5 groups.

Call the groups one by one and instruct them to create a square or a rectangle on the geoboard and show it in the classroom.

Ask the class to count the square units inside each shape, by using the **fill and count method** as follows:

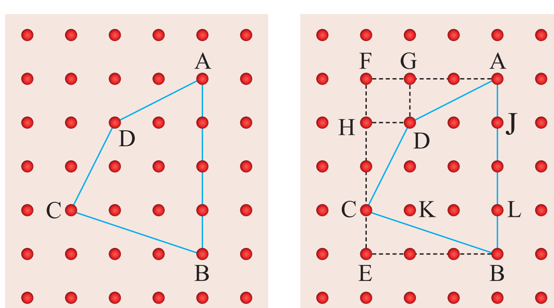


Area of square ABCD = 4 sq. units.

- Ask another group to create irregular shapes by using the rubber bands.

Instruct the student to find the area of the irregular shapes using the surround and uncount method or the chop method.

Instruct them to divide their irregular shape into smaller rectangles, squares, or triangles and find the area of each smaller shape, then add them to find the area of the irregular shape as follows:



Area of quadrilateral ABCD = Area of rectangle ABEF – (Area of triangle AGD + Area of triangle DHC + Area of triangle CEB + Area of square FGDH) =

$$= \left\{12 - \left(1 + 1 + 1 + 1\frac{1}{2}\right)\right\} = 7\frac{1}{2} \text{ sq. units}$$

EXPLANATION

Take reference from pages 195–196 to demonstrate the calculation of area using a geoboard in detail with examples. Also discuss the "Enrichment" and the way to solve it.

ASSIGNMENTS

Classwork: Classwork: Q.1, 2 of Practice Time 6E.

Homework: Remaining questions of Practice Time 6E.

Periods: 13–15	**Topic: Mental Maths; Encapsulate; Brain sizzlers; Chapter Assessment (Revision) and Learning by doing**	**NEP Skills: Coceptual learning' to pupils**

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.

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

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

ASSIGNMENTS

Classwork: Brain Sizzlers, Sections A, B, C and D of Chapter Assessment and Mental Maths.
Homework: Remaining questions of the Chapter Assessment.

ORANGE

ASSIGNMENT–11

Marks Obtained: __________

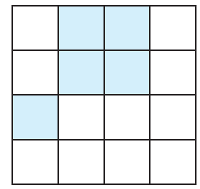
Student's Name: ______________________________ Section: _______

Roll Number: ______________________________ Date: ______________________

Multiple Choice Type Questions

Identify the correct answer.

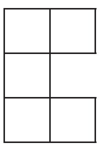
1. If each square is 1 unit long, find the perimeter of the shaded region.

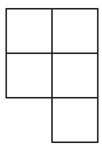


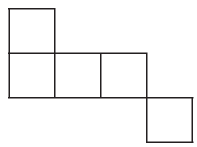
(*a*) 12 units (*b*) 5 units

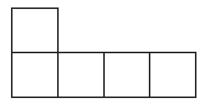
(*c*) 6 units (*d*) 9 units

2. The following figures are formed using 5 unit squares. Which figure has the largest perimeter?

(*a*)


(*b*)


(*c*)


(*d*)


3. A square and a rectangle have the same perimeter of 36 cm. The rectangle has a length of 10 cm. What is the area of the square?

(*a*) 81 cm^2 (*b*) 72 cm^2 (*c*) 64 cm^2 (*d*) 60 cm^2

4. A square is divided into four identical smaller squares. What happens to the total perimeter?

(*a*) It becomes half. (*b*) It doubles. (*c*) It remains the same. (*d*) It quadruples

5. If the length of a rectangle is doubled and its width is halved, what happens to its area and perimeter?

(*a*) Area remains the same; perimeter may change.

(*b*) Area doubles; perimeter remains the same.

(*c*) Area remains the same; perimeter doubles.

(*d*) Area doubles; perimeter doubles.

6. Which pair of shapes has the same area but different perimeters?

(*a*) Square (side 6 cm) and Rectangle (9 cm × 4 cm)

(*b*) Square (side 5 cm) and Rectangle (10 cm × 2.5 cm)

(*c*) Square (side 8 cm) and Rectangle (16 cm × 4 cm)

(*d*) All of these.

7. A farmer fences a rectangular plot with a perimeter of 60 m. If the length is increased by 2 m and the width decreased by 2 m, the new perimeter will:

(*a*) Increase by 4 m (*b*) Decrease by 4 m (*c*) Remain the same (*d*) Decrease by 8 m

8. Which shape has the largest area for a fixed perimeter of 40 cm?

(*a*) Rectangle 15 cm × 5 cm (*b*) Rectangle 12 cm × 8 cm

(*c*) Square with side 10 cm (*d*) All have the same area

ORANGE

ASSIGNMENT–12

Marks Obtained: __________

Student's Name: ____ Section: ______

Roll Number: ______________________________________ Date: ________________________

A. Fill in the blanks

1. The area of a square with a perimeter of 36 m is __________ sq m.
2. If the length of a rectangle is tripled and the width is halved, the new area will be __________ times the original area.
3. A square and a rectangle have the same area. The square has side 8 cm. If the rectangle has length 16 cm, its width is __________ cm.
4. The maximum possible area for a rectangle with a perimeter of 28 cm is __________ cm^2.
5. Two rectangles have the same perimeter. One has dimensions 6 cm × 4 cm, the other 7 cm × 3 cm. The area of the first is __________ cm^2 and the second is __________ cm^2.

B. State true or false

1. If two rectangles have the same perimeter, they must have the same area. __________
2. If two squares have the same perimeter, they must have the same area. __________
3. Changing the shape of a figure by changing its perimeter will always change its area. __________
4. If the area of a square is 289 cm^2, its perimeter is 68 cm. __________
5. If the perimeter of a rectangle is 24 cm, its area can be 35 cm^2. __________

C. Match the following

Column I	Column II
1. Area of a rectangle	(*a*) 4 × length of a side
2. Perimeter of a square	(*b*) side × side
3. Area of a square	(*c*) 3 × length of a side
4. Perimeter of a rectangle	(*d*) length × breadth
5. Perimeter of an equilateral triangle	(*e*) 2(length + breadth)

D. Do as directed

1. A rectangular swimming pool measures 30 m in length and 20 m in width. A pathway of uniform width is constructed all around the pool. If the area of just the pathway is 216 m^2, what is the width of the pathway?
2. A wall measures 3 m in height and 5 m in width. Marble tiles, each measuring 30 cm × 25 cm, are used to cover the wall completely. How many tiles are required to cover the wall?

7

Fractions

Learning Objectives

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

- define fractions
- represent fractions on the number
- identify different types of fractions
- find equivalent fractions
- convert mixed fractions into improper fraction and vice versa
- compare like and unlike fractions
- do addition and subtraction of fractions

LESSON PLAN

Suggested number of periods: 15

Suggested Teaching Aids: Textbook (Math Genius! 6), blackboard or whiteboard, pens, pencils, chalk/marker, notebooks, some chart papers, some real rife objects like: chocolates, etc.

Keywords: Fractions; Numerator; Denominators; Proper fraction; Unit fraction; Improper fraction; Mixed fraction; Like fractions; Unlike fractions; Horus eye fractions; Equivalent fractions; Cross-multiplication; Addition and subtraction of fractions, etc.

Prerequisite knowledge: Students must be familiar with fractions, it types, and its addition and subtraction, etc.

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: Fractions (Fraction as a part of a whole, fraction as a part of collection)	NEP Skills: Conceptual, collaborative and experiential learning

TEACHER-PUPIL ACTIVITY

Introduce the topic with a discussion about their previous knowledge of fractions. For this, ask some questions, such as:

- What is fraction?
- What is numerator and denominator?
- What is the difference between like and unlike fractions?
- What is proper fraction, improper fraction and mixed numbers?
- What are equivalent fractions?

Accept the responses. Also, use the "Let's Recall" sections of the chapter.

Activity:

- Reiterate fraction as a part of a whole by using the following activity:

  Divide the class into pairs and distribute a rectangular paper strip to each pair of students.

  Instruct each pair to make the equal parts of the strips they have using a ruler, a pencil or a pen. Ask the pairs to count the equal parts made on their paper strips and ask them what part of a whole does each part represents?

  On the basis of the outcomes, recall the concept of fractions.

- Further, to reiterate the fraction as a part of a collection by using the following activity:

  Divide the class into 4 to 5 groups.

  Put 3 cartons or bags with 10 cubes, 12 counters, and 20 beads.

  Call a group randomly and ask them to find $\frac{1}{5}$ of 10 cubes or $\frac{2}{3}$ of 12 counters or $\frac{4}{5}$ of 20 beads.

  The group will solve the task with the help of each other. If any student has confusion, the teacher will help them.

  The group that will complete its task correctly will be the winner.

EXPLANATION

Take reference of pages 206–208 of Math Genius! 6 to recall and explain fraction as a part of a whole and as a part of a collection with examples in detail.

ASSIGNMENTS

Classwork: Discuss "Knowledge Desk" and "Quick Check" given on pages 206 and 207. Ask to solve Q. 1, 4 and 5 of 7A.

Homework: Remaining questions of Practice Time 7A.

Periods: 3–5	Topic: Representation of fractions on a number line; Types of fraction	NEP Skills: Conceptual, collaborative and experiential learning

TEACHER-PUPIL ACTIVITY

Start the class by drawing a number line on board with numbers 0, 1, 2, 3, 4 and 5 marked on it.

- Ask from the class "What if I want to show a number between 0 and 1?"

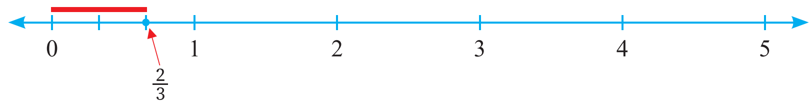
  Recall the concept that fraction represent part of a whole.

  Ask students, "Where does $\frac{1}{2}$ lie?"

  Guide them that it will lies in the middle between 0 and 1.

  Demonstrate how to divide each segment (between whole numbers) into equal parts to represents fractions. For example, to represent $\frac{2}{3}$ on the number line, divide the distance between 0 to 1 into 3 equal parts, as the denominator of the fraction is 3.

  Count 2 parts starting from 0 as the numerator of the fraction is 2. Mark the fraction $\frac{2}{3}$ at that point.



Distribute index card with a fraction to each of students and ask each student to place their fraction on the number line.

Discuss placement and adjust and correct if needed.

Further discuss types of fraction.

Proper fraction: numerator $<$ denominator

Improper fractions: numerator $\leq$ denominator

Mixed fraction: whole number + fraction.

- Distribute flashcards with different fractions.

  Put three basket or carton with label proper fractions, improper fractions and mixed fractions on teacher's table.

  Ask students take turns picking a fraction and placing it in the correct basket/cartoon.

  Teacher will go through sorted fractions and discuss any mistakes.

  Ask student to explain why they placed a fraction in a particular category.

EXPLANATION

Take reference of pages 209–212 of Math Genius! 6 to explain representation of fractions on a number line, types of fractions, conversion of an improper fraction into a mixed fraction and vice-versa.

ASSIGNMENTS

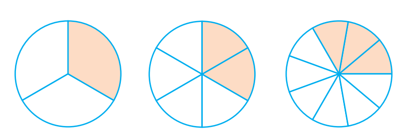
Classwork: Q.1, 2, 3 and 7 of Practice Time 7B.

Homework: Remaining questions of Practice Time 7B. Also write a short note on uses of fractions from ancient India by using "pinch of history" given on page 213 of textbook and internet. **[Tech connect]**

Periods: 6–9	**Topic: Equivalent fractions; Comparing fractions**	**NEP Skills: Conceptual, collaborative and experiential learning**

TEACHER-PUPIL ACTIVITY

- Start the class by reiterating that equivalent fractions are those fractions that have different numerators and denominators but they represent the same value. Like:



$\frac{1}{3}$ $\frac{3}{9}$ $\frac{2}{6}$

  Distribute a bingo card with equivalent fractions randomly placed in a 5 × 5 grid to each student.

  The teacher picks a fraction from the calling cards and announce it.

  Students check if they have an equivalent fraction on their card.

If they have, they put a mark on it.

The first student to complete a row, column, or diagonal shouts "Bingo!"

The student must explain why the fractions they marked are equivalent.

Discuss strategies like multiplying/dividing numerator and denominator by the same number to get an equivalent number.

- Introduce comparison of fractions through an activity.

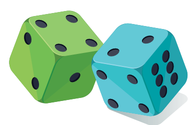
  Draw a table on the board with heading 'Smaller fraction' and 'Greater fraction'.

  Call students in pairs and give each of them a pair of dice. Pairs will roll their dice and make fractions by taking the smaller number as numerator and greater number as the denominator.

  Partners then determine which fraction is larger and write the fractions in respective columns on board.

Student 1

Student 2



Smaller Fraction	Greater Fraction
$\frac{2}{4}$	$\frac{5}{6}$

If any error occurs, the teacher will explain and rectify.

In case of unlike fractions, teacher can hint to use the cross multiplication, i.e., $\frac{a}{b} \times \frac{c}{d}$.

Further reiterate comparison of like fractions and unlike fractions by taking the reference of activity given on pages 216 and 217 of textbook.

EXPLANATION

Also, by taking reference of pages 213–218 of Math Genius! 6, explain equivalent fractions and comparison of fractions in detail with examples.

ASSIGNMENTS

Classwork: Discuss "Activity", ask to solve "Think and Answer" and "Quick Check" given on pages 213, 215 and 216. And Q. 1, 2 and 3 of Practice Time 7C and Q. 1 and 2 of Practice time 7D.

Homework: Remaining questions of Practice Time 7C and 7D.

Periods: 10–12	**Topic: Operations on fractions**	**NEP Skills: Conceptual, collaborative learning**

TEACHER-PUPIL ACTIVITY

The teacher will demonstrate the process of adding and subtracting fractions with like denominators as follows:

- Add or subtract(smaller from the larger) numerators of like fraction.

  Then write this result as the new numerator and keep the denominator same.

  (*a*) $\frac{3}{13} + \frac{5}{13} = \frac{3+5}{13} = \frac{8}{13}$ (*b*) $\frac{9}{47} - \frac{4}{47} = \frac{9-4}{47} = \frac{5}{47}$

The teacher will complete a few problems on the board. To add or subtract unlike fractions, first convert them into like fractions and then proceed as with like fractions.

(*a*) Add the fractions $\frac{3}{8}$ and $\frac{2}{3}$. (*b*) Subtract $\frac{1}{5}$ from $\frac{5}{6}$.

- Instruct students to find the common denominators. Then change the given fractions in equivalent fractions with same denominator. Then add or subtract as like fractions as follows:

(*a*) First convert the fraction into like fractions.

The LCM of the denominators 8 and 3 is 24.

$\therefore$ So, $\frac{3}{8} = \frac{3\times 3}{8\times 3} = \frac{9}{24}$ and $\frac{2}{3} = \frac{2\times 8}{3\times 8} = \frac{16}{24}$

Now, $\frac{3}{8} + \frac{2}{3} = \frac{9}{24} + \frac{16}{24} = \frac{9+16}{24} = \frac{25}{24} = 1\frac{1}{24}$

(*b*) First convert the fraction into like fractions.

The LCM of the denominators 5 and 6 is 30.

$\therefore$ So, $\frac{1}{5} = \frac{1\times 6}{5\times 6} = \frac{6}{30}$ and $\frac{5}{6} = \frac{5\times 5}{6\times 5} = \frac{25}{30}$

Now, $\frac{5}{6} - \frac{1}{5} = \frac{25}{30} - \frac{6}{30} = \frac{25-6}{30} = \frac{19}{30}$

- For, adding and subtracting mixed fractions, instruct them to convert it the mixed fraction to improper fraction and then follow the above rules.
- Also, explain the situation given in "Given ready" and some real-life situations where addition and subtraction of like or unlike fractions are required.

EXPLANATION

Take reference of pages 219-221 to explain addition and subtraction of like, unlike and mixed fraction in details with examples.

ASSIGNMENTS

Classwork: Classwork: "Quick Check" page-220, Q.1, 2 and 3 of Practice Time 7E.

Homework: Remaining questions of Practice Time 7E and "Maths connect".

Periods: 13–15	Topic: Encapsulate; Brain sizzlers; Chapter Assessment (Revision) and Learning by doing	NEP Skills: Conceptual learning, experiential learning

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.

Start the revision of the exercise, by using encapsulate, brain sizzlers and chapter assessment.

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

ASSIGNMENTS

Classwork: Brain Sizzlers, Section A, B and C of Chapter Assessment.

Homework: Remaining questions of Chapter Assessment.

ORANGE

ASSIGNMENT–13

Marks Obtained: __________

Student's Name: ______________________________ Section: _______

Roll Number: ______________________________ Date: ______________________

A. Multiple Choice Type Questions

Identify the correct answer.

1. Which of the following fractions is not in the lowest form?

   (a) $\frac{23}{39}$ (b) $\frac{21}{39}$ (c) $\frac{5}{7}$ (d) $\frac{34}{53}$

2. The fraction which is not equal to $\frac{4}{7}$ is

   (a) $\frac{28}{49}$ (b) $\frac{36}{63}$ (c) $\frac{56}{98}$ (d) $\frac{48}{91}$

3. If $\frac{m}{14} = \frac{48}{56}$, then the value of m is

   (a) 2 (b) 12 (c) 6 (d) 8

4. The two consecutive whole numbers between which the fraction $\frac{3}{4}$ lies are

   (a) 1 and 2 (b) 2 and 3 (c) 3 and 4 (d) 4 and 5

5. Which of the following fractions is the smallest?

   (a) $\frac{3}{5}$ (b) $\frac{5}{7}$ (c) $\frac{7}{9}$ (d) $\frac{9}{11}$

6. When $\frac{8}{13}$ is written with the numerator as 32, its denominator is

   (a) 26 (b) 39 (c) 52 (d) 45

B. Assertion and Reason Type Questions.

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

(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.

1. **Assertion (A):** $\frac{1}{34}$ is a unit fraction.

   Reason (R): A fraction with numerator 1 is called a unit fraction.

2. **Assertion (A):** $\frac{13}{15}$ and $\frac{11}{15}$ are like fractions.

   Reason (R): Fractions having the same numerators are called like fractions.

ORANGE

ASSIGNMENT–14

Marks Obtained: __________

Student's Name: ____ Section: ______

Roll Number: ________________________________ Date: ____________________

A. Fill in the blanks

1. The fraction $\frac{3}{5}$ is called a __________ fraction because its numerator is smaller than the denominator.
2. The fraction $\frac{4}{9}$ is in its __________ form because there are no common factors between the numerator and the denominator.
3. A number representing a __________ of a whole is called a fraction.
4. The fraction $\frac{30}{75}$ in simplest form is __________.
5. A fraction is in its simplest or standard form if the HCF of the numerator and the denominator is ______.

B. State true or false

1. The sum of two improper fractions is always a fraction. __________
2. A fraction can represent a number greater than 1. __________
3. All improper fractions are greater than 1. __________
4. $\frac{2}{3}$ and $\frac{4}{6}$ are equivalent fractions. __________
5. If two fractions have the same denominator, the one with the larger numerator is smaller.

C. Match the following

Column I	Column II
1. $\frac{2}{6}+\frac{2}{3}$	(*a*) $\frac{4}{5}$
2. $\frac{7}{12}-\frac{5}{12}$	(*b*) $\frac{1}{6}$
3. Equivalent fraction of $\frac{5}{6}$	(*c*) 1
4. $\frac{36}{45}$ in standard form	(*d*) $\frac{10}{12}$

D. Do as directed

1. At a Diwali party, Ananya divided one whole fruit cake equally among 8 guests. What fraction of the cake did each guest receive?
2. Arjun rode his scooter $5\frac{2}{3}$ km in the morning to visit his friend and $5\frac{2}{3}$ km in the evening on his way back home. What is the total distance he travelled that day?

8 Playing with Constructions

Learning Objectives

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

- draw different types of curves and their parts
- construct squares and rectangles
- explore diagonals of rectangles and squares
- find points equidistant from two given points.

LESSON PLAN

Suggested number of periods: 15

Suggested Teaching Aids: Textbook (Math Genius! 6), blackboard or whiteboard, pens, pencils, chalk/marker, notebooks, some chart papers, cardboard, strings, colour pen or crayons, some real rife objects, geometry box, etc.

Keywords: Curves; Open curves; Close curves; Circle; Diameter; Radius; Wavy Wave; Squares ; Rectangles; Diagonals; etc.

Prerequisite knowledge: Students must be familiar with squares, rectangles, its properties, and different geometrical shapes, etc.

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: 1–5	Topic: Curves; Circle; Wavy wave; Square and rectangles	NEP Skills: Conceptual, collaborative, experiential and art integrated learning

TEACHER-PUPIL ACTIVITY

Start the class by asking to identify, classify and describe basic geometric shapes. For example, circle, rectangle, square, etc. Also discuss “Get ready”, given on page 229.

Divide students into small groups and instruct them to find a matching object in the classroom.

Once they find their shapes, they will write down real-world examples on their notebook.

Ask to draw different real-life example based on the shape on his/her notebook.

Next, the teacher will demonstrate on board, to construct a circle with the help of ruler, pencil and compass.

Further divide the class into pairs.

Ask each pair to create pair of eyes on an A4 chart paper by taking the reference of the page 231 and 232 of the textbook.

Next, ask the class to exchange their partners and create the next diagram the "Wavy Wave" on A4 chart paper by taking the reference given on page 233 of textbook.

The teacher will help when student will stuck at any step of construction.

EXPLANATION

By taking reference of pages 229–236 of Math Genius! 6 explain curves, circle and construction based on it, wavy wave, squares and rectangles and its construction and properties in detail.

ASSIGNMENTS

Classwork: Q. 1, 4 and 5 of 8A.

Homework: Remaining questions of Practice Time 8A.

Periods: 6–10	Topic: Constructing squares and rectangles	NEP Skills: Conceptual, collaborative and experiential learning

TEACHER-PUPIL ACTIVITY

Start the class by discussing the properties of squares and rectangles as follows:

Square: 4 sides of equal length and 4 right angles.

Rectangle: Opposite sides are equal, 4 right angles.

- Divide the class into group of 3-4 students.

  Give each group a set of sticks and clay.

  Ask students to construct a perfect square and two rectangles of different dimensions.

  Emphasize accurate measurement using rulers.

- Distribute cardboard and strings of different lengths in the classroom.

  Ask to construct different square and rectangles by using the cardboard.

  Ask to use the string to measure the outlines of squares, rectangles, its diagonals, etc.

  Discuss about the properties of diagonals of squares and rectangles by using the thread.

  Also explain breaking rectangles with help of thread.

  Further, demonstrate how to divide a square using thread and shade parts to show patterns or fractions, referring to the book.

EXPLANATION

Take reference of pages 236–242 of Math Genius! 6 to explain about squares, rectangles, breaking rectangles and shading the squares with examples on the board.

ASSIGNMENTS

Classwork: Q.1, 2 of Practice Time 8B and 1, 2, 4 of Practice Time 8C.

Homework: Remaining questions of Practice Time 8B and 8C.

Periods: 11–13	Topic: Exploring Diagonals of Rectangles and Squares; Points Equidistant from Two Given Points; To draw a square inscribed by a given circle.	NEP Skills: Conceptual, collaborative and experiential learning

TEACHER-PUPIL ACTIVITY

Start the class by reiterating the properties of diagonals of squares and rectangles.

Ask the class to submit the rectangles and squares they constructed in the previous topic.

Ask each group to construct diagonals of each shape they construct.

Instruct the class to measure the angles and discuss about their relationships.

Demonstrate on the board or chart paper how to locate points that are equidistant from the two given points.

Instruct the class to draw a house on a chart paper or in their geometry notebooks by following the steps given in the textbook (page 246).

Encourage students to decorate their house drawing using colors.

Challenge students to create their own structures using similar construction methods (e.g., clock tower, tent, etc.).

Measure the angles and distances to verify accuracy.

EXPLANATION

Also, by taking reference of pages 243–247 of Math Genius! 6, explain construction of rectangles, points equidistant from two given points and to draw square inscribed by a given circle in detail with examples.

ASSIGNMENTS

Classwork: Discuss "Maths Talk", ask to the activity of "Create and Solve" and "Knowledge Desk" given on pages 243, 245 and 248. And Q1, 2 and 3 of Practice Time 8D.

Homework: Remaining questions of Practice Time 8D.

Periods: 14–15	Topic: Encapsulate; Chapter Assessment (Revision); Brain sizzlers and Learning by doing	NEP Skills: Conceptual learning, experiential learning

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.

Start the revision of the exercise, by using encapsulate, brain sizzlers and chapter assessment.

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

Classwork: Brain Sizzlers, Section A, B and C of Chapter Assessment.

Homework: Remaining questions of Chapter Assessment.

ORANGE

ASSIGNMENT–15

Marks Obtained: __________

Student's Name: ______________________________ Section: ______

Roll Number: ______________________________ Date: ______________

A. Multiple Choice Type Questions

Identify the correct answer.

1. Which tool is used to measure angles accurately?
   (*a*) Divider (*b*) Compass (*c*) Protractor (*d*) Ruler
2. The diameter of a circle is 14 cm. What is its radius?
   (*a*) 7 cm (*b*) 14 cm (*c*) 3.5 cm (*d*) 28 cm
3. Two circles touch internally. If their radii are 5 cm and 3 cm, what is the distance between their centres?
   (*a*) 8 cm (*b*) 2 cm (*c*) 15 cm (*d*) 4 cm
4. A line segment passing through the centre of a circle and connecting two points on it is called a:
   (*a*) Radius (*b*) Chord (*c*) Diameter (*d*) Arc
5. To verify a square, you must check that all sides are equal and it has:
   (*a*) Two right angles (*b*) Three right angles (*c*) Four right angles (*d*) No right angles
6. What are the common properties of both set-squares in a geometry box?
   (A) They have a right angle and are triangular in shape.
   (B) They have an acute angle and are rectangular in shape.
   (C) They have an obtuse angle and are square in shape.
   (D) They have a straight angle and are parallelogram in shape.

B. Fill in the blanks

1. The instrument in the geometry box having the shape of a triangle is called a __________ . (set square/divider)
2. With a ruler and compasses, we can bisect any given __________ . (line segment/shape)
3. Using only the two set-squares of the geometry box, an angle of __________ can be drawn. (75°/40°)
4. It is possible to draw __________ bisector(s) of a given angle. (only one/two)

9

Symmetry

Learning Objectives

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

- identify symmetrical objects
- define the line of symmetry
- draw the lines of symmetry in given objects, geometrical shapes etc
- correlate reflection with symmetry
- understand rotational symmetry, the centre of rotation, and the angle of rotational symmetry
- understand and identify tessellation and regular tile patterns..

LESSON PLAN

Suggested number of periods: 15

Suggested Teaching Aids: Textbook (Math Genius! 6), teaching board, pens, pencils, chalk/marker, notebooks, some chart papers, graph papers, plane mirrors, cut out of some geometrical shapes, some images of monuments, butterfly, etc.

Keywords: Symmetry, Line of symmetry, Symmetrical, Asymmetrical, Reflection symmetry, Rotational symmetry, Angle of rotation, Order of rotational symmetry, Kolams, Rangoli, Tile pattern, Tessellation, etc.

Prerequisite knowledge: Students must be familiar with symmetry, symmetrical figures, and drawing a line of symmetry to the symmetrical figures, etc.

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: Symmetry	NEP Skills: Conceptual, collaborative, experiential and art integrated learning

TEACHER-PUPIL ACTIVITY

Start the class by defining and explaining the concept of line of symmetry. A line of symmetry divides a shape into two identical halves that can be folded or mirrored onto each other.

- Hang a chart paper containing different images and shapes, such as image of Taj Mahal, Isosceles triangles, heart shape, etc.

  For each shape, draw the line of symmetry and discuss how it divides the shape into two equal halves.

  Encourage students to identify the key features of each shape that make it symmetrical.

Allow students to share their observations and ask questions related to line symmetry.

Further divide the class into groups of two students each. Distribute the cut-outs of symmetrical images to each group.

Instruct the pairs to fold the images in such way that the two halves of the image exactly cover to each other. Now tell them to unfold the cut-outs. Based on the results from the pairs, explain that the crease line formed is called the line of symmetry. When a figure is folded along the line of symmetry the two halves exactly cover (superimpose).

Reiterate to the class that 'A figure may have one line of symmetry, two lines of symmetry, three or more lines of symmetry or no line of symmetry.'

- Divide the class into pairs.

  Distribute the letters of the English alphabet sheets to the pairs and ask them to draw line(s) of symmetry for the letters of the English Alphabet, if they have.

  Reiterate to the class that a few English letters have more than one lines of symmetry, like H, I, O, X.

  Some of the English letters do not have any line of symmetry, like, F, G, J, L, etc.

EXPLANATION

By taking reference of pages 254–259 of Math Genius! 6 explain symmetry, line of symmetry (Horizontal, vertical and diagonal), especially symmetry in geometrical shapes and in English alphabets in detail with examples. Also explained the important fact that a regular polygon has as many lines of symmetry as the number of its sides, i.e., Equilateral triangle – 3, Square – 4, Hexagon – 6, and so on.

ASSIGNMENTS

Classwork: Discuss "Think and Answer" and "Maths Connect" given on page 258 and Q.1, 2 and 3 of 9A.

Homework: Remaining questions of Practice Time 9A.

Periods: 4–6	Topic: Reflection symmetry	NEP Skills: Conceptual, experiential and art integrated learning

TEACHER-PUPIL ACTIVITY

- Divide the class into groups.

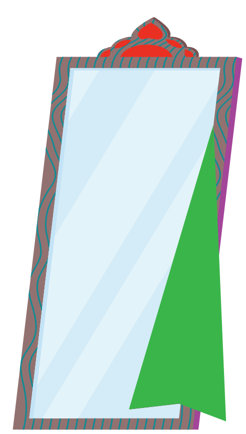
  Distribute different paper cut-outs or geometric shape cut-outs and hand mirrors to each group.

  Ask each group to predict where its line of symmetry might be.

  Instruct them to place the mirror along the predicted line to check if the reflected part creates a complete shapes. Like the given image alongside.

  If it does, ask to mark the line of symmetry on the shape using a pencil or marker.

  Repeat the activity with different shapes, including letters and irregular figures, to explore the line of symmetry.



Further discuss the concept of a mirror line as line of symmetry. When they place any object in front of a mirror, a reversed image is formed. Like:

The refection is of same shape and size and appears at an equal distance from the mirror line. There is no change in the length, only the left and right sides are reversed.

EXPLANATION

Take reference of pages 259-262 of Math Genius! 6 to explain reflection symmetry in details. Also demonstrate symmetrical figures on graph paper with examples.

ASSIGNMENTS

Classwork: Discuss "Think and Answer" given on page 261 and Q.1, 2, 3 and 7 of Practice Time 9B.

Homework: Remaining questions of Practice Time 9B and the activity given on page 260.

Periods: 7–8	**Topic: Rotational symmetry**	**NEP Skills: Conceptual, collaborative and experiential learning**

TEACHER-PUPIL ACTIVITY

Start the class by showing a simple shape and ask "If we rotate this shape, will it look the same at certain points before completing a full turn?" Discuss that if an object rotates around a fixed point, either in a clockwise direction or an anticlockwise direction in a complete turn of 360°, the number of times an object looks exactly the same is called its order of rotational symmetry.

Divide the class into groups.

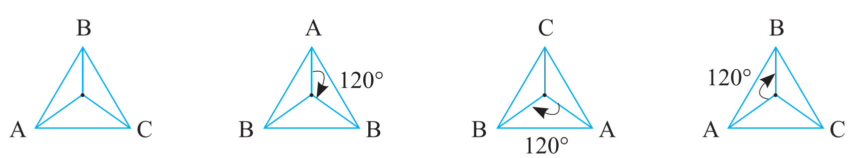
Distribute cut-outs of different shapes and ask the groups to pin them onto a cardboard surface.

Ask students to spin the shapes and count how many times the shape matches its starting position before completing a full 360° rotation.

Ask students to record the number of times the rotated shape match with the original shape.

Reiterate that the number of times an object looks exactly the same during rotation is called its **order of rotational symmetry.**

For example: order of rotational symmetry of an equilateral triangle is 3.



Initial position | After 120° rotation | After 240° rotation | After 360° rotation

EXPLANATION

Also, by taking reference of pages 263-265 of Math Genius! 6, explain rotational symmetry in detail with in text examples. Also, discuss "Knowledge Desk" and "Maths Connect" given on page 265.

ASSIGNMENTS

Classwork: Ask to solve Q.1, 2, 3 and 4 of Practice Time 9C.

Homework: Remaining questions of Practice Time 9C.

Periods: 9–10	Topic: Rangoli pattern	NEP Skills: Creative and innovative learning, conceptual, art integrated and collaborative learning, cultural awareness

TEACHER-PUPIL ACTIVITY

Start the class by discussing the cultural importance of rangoli, highlighting its role in festivals like Diwali and its symbolism in welcoming prosperity. Show some examples of traditional rangoli designs, emphasize on identifying the geometric shapes and use of symmetry. Instruct students to draft their own rangoli designs, incorporating geometric or number patterns and ensuring symmetry.

Divide the students in 4-5 groups.

Instruct each group to create a small rangoli on a chart paper or on floor.

Ask to use colour pencils, crayons, powder or alternative materials.

Ask each group to display their rangoli design to the class and discuss their work.

Appreciate the group whose rangoli is neat and colour coordination is best.

Discuss the history of rangoli in different states. For example, Kolam in Tamil Nadu, Alpana in Bengal, etc.

EXPLANATION

Take reference of pages 267-268 to demonstrate different types of rangoli and the number/dot pattern used to make it details with examples. Also discuss "A Pinch of History" on page-269.

ASSIGNMENTS

Classwork: Q.1 of Practice Time 9D.

Homework: Remaining questions of Practice Time 9D.

Periods: 11–12	Topic: Tile pattern or Tessellation	NEP Skills: Creative and innovative learning, conceptual, art integrated and collaborative learning

TEACHER-PUPIL ACTIVITY

Begin the class by asking: "Have you ever noticed the patterns on your house tiles, floors, or walls?" Show images of tiled floors, honeycombs, and mosaic designs on the board.

Explain that these are called tessellations—patterns that cover a surface without any gaps or overlaps. Arrange a classroom activity to reinforce the concept "tessellation" for the students as follows:

- Distribute cutouts of geometrical shapes like: squares, triangles, hexagon, etc., to the students.
  Ask students to arrange these shapes on a paper sheet to create a pattern.
  Instruct them to trace and colour the pattern.

- Distribute graph paper to the students.
  Ask them to draw and repeat a simple shape like a triangle, square, or hexagon to create a tessellation.
  Ask them to color the pattern creatively.

Students present their designs and explain how they ensured that there were no gaps or overlaps in their design.

Ask the class "Can you identify a shape that cannot tessellate?" Then discuss "Why do some shapes tessellate and other do not?"

EXPLANATION

Take reference of pages 269-270 to explain different types of tessellation patterns with examples.

ASSIGNMENTS

Classwork: Q.1, 2, 3 of Practice Time 9E.

Homework: Remaining questions of Practice Time 9E.

Periods: 13–15	**Topic: Maths fun; Encapsulate; Brain sizzlers; Chapter Assessment (Revision) and Learning by doing**	**NEP Skills: Conceptual learning, experiential learning**

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.

Start the revision of the exercise, by using encapsulate, brain sizzlers and chapter assessment.

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

ASSIGNMENTS

Classwork: Brain Sizzlers, Section A, B, C and D of Chapter Assessment.

Homework: "Maths Fun" and Remaining questions of Chapter Assessment.

ORANGE

ASSIGNMENT–16

Marks Obtained: __________

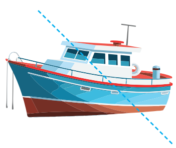
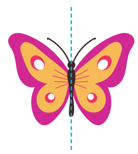
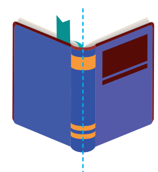
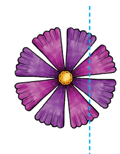
Student's Name: ______________________________ Section: _______

Roll Number: ______________________________ Date: ______________

A. Multiple Choice Type Questions

Identify the correct answer.

1. In which of the following figures is the dotted line a line of symmetry?

(*a*)  (*b*)  (*c*)  (*d*) 

2. Which shape can tessellate a plane without gaps and has rotational symmetry of order 4?
   (*a*) Equilateral Triangle (*b*) Rectangle (*c*) Square (*d*) None of these
3. The number of lines of symmetry in a semicircle is
   (*a*) 0 (*b*) 1 (*c*) 4 (*d*) None of these
4. Which of the following letters does not have the vertical line of symmetry?
   (*a*) A (*b*) T (*c*) F (*d*) U
5. If a figure has rotational symmetry of order 6, what is the smallest angle of rotation?
   (*a*) 30° (*b*) 45° (*c*) 60° (*d*) 90°
6. Select the letter that possesses both horizontal and vertical lines of symmetry.
   (*a*) E (*b*) I (*c*) M (*d*) N
7. Which shape has four lines of symmetry but no rotational symmetry?
   (*a*) Square (*b*) Regular Octagon (*c*) Isosceles Triangle (*d*) None of these
8. In a rectangle and a rhombus, the number of lines of symmetry is:
   (*a*) Equal (*b*) Depends on the side lengths
   (*c*) Unequal (*d*) Always greater for a rhombus

B. Assertion and Reason Type Questions.

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

(*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.

1. **Assertion (A):** A square has more lines of symmetry than a rectangle.
   Reason (R): A square has four lines of symmetry, whereas a rectangle has only two.
2. **Assertion (A):** A circle has an infinite number of lines of symmetry.
   Reason (R): Any line passing through two points on the circumference of a circle is a line of symmetry for the circle.

ORANGE

ASSIGNMENT–17

Marks Obtained: __________

Student's Name: ____ Section: ______

Roll Number: ________________________________ Date: ________________________

A. Fill in the blanks

1. A shape with no lines of symmetry is called __________.
2. The type of symmetry where a shape maps onto itself when reflected over a line is called __________ symmetry.
3. A shape has rotational symmetry of order 4. The smallest angle of rotation is __________ degrees.
4. The letter 'M' has a __________ line of symmetry.
5. The angle through which the object looks exactly the same is called __________ .

B. State true or false

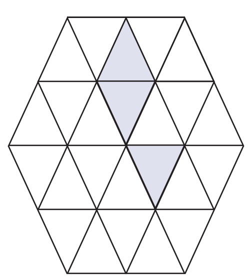
1. A tessellation can be created using only regular pentagons. __________
2. All triangles have at least one line of symmetry. __________
3. A shape with rotational symmetry of order 3 will look the same after every 120° rotation. __________
4. The number of lines of symmetry in a circle is double the number of lines of symmetry in a semicircle. __________
5. Reflection symmetry is the same as rotational symmetry. __________

C. Match the following

Column I Shape	Column II No. of lines of symmetry
1. Parallelogram	(*a*) 6
2. Rhombus	(*b*) 3
3. Regular heptagon	(*c*) 0
4. Equilateral triangle	(*d*) 2
5. Regular hexagon	(*e*) 7

D. Do as directed

1. Shade three more triangles to make a pattern with rotational symmetry of order 3.



10 The other Side of Zero

Learning Objectives

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

- understand what integers are and how they apply in everyday life
- recognize the difference between positive and negative integers
- represent integers on a number line
- arrange integers in ascending and descending orders
- do addition and subtraction with integers.

LESSON PLAN

Suggested number of periods: 20

Suggested Teaching Aids: Textbook (Math Genius! 6), teaching board, pens, pencils, chalk/marker, notebooks, some chart papers, some red and blue tokens, etc.

Keywords: Natural number, Whole number, Integers, Positive integers, Negative integers, Absolute value, Addition of integers, Subtraction of integers, Additive inverse, etc.

Prerequisite knowledge: Students must be familiar with representation of whole numbers on the number line and addition and subtraction of whole number, etc.

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: 1–5	Topic: Need for a new number system; Integers; Negative of a negative integer	NEP Skills: Conceptual, collaborative and experiential learning

TEACHER-PUPIL ACTIVITY

Start the class by demonstrating the need of negative numbers by asking some real–life based questions, such as

- Have you seen temperatures go below 0° C in weather report?
- What happens when you go down an elevator from the ground floor?

Explain that in real life, in all these situations, we need numbers which are similar, like temperature below 0° C, etc.

- Divide the students of the class into pairs, and write some pairs of whole numbers on the blackboard.
  - Instruct one student from each pair to subtract the smaller number from the greater number.
  - Next, call another student from each pair to subtract the greater number from the smaller number.

Ask the entire class, is it possible to subtract greater number from the smaller number?

On the basis of the outcomes that come from the class, explain the need of negative numbers to the class. As, 10 – 7 = 3 but 7 – 10 = ? 9 – 2 = 7 but 2 – 9 = ?

Explain that negative numbers are denoted by placing a '–' sign before a natural number. For example, –1, –2, –3, –4, … are negative numbers.

- Demonstrate the integers on the number line.

Draw a number line on the board.

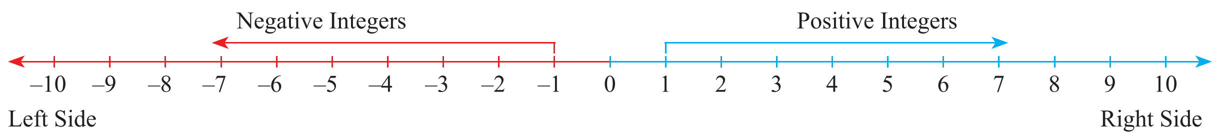
Mark negative numbers, zero and positive numbers on the number line.

Show movement to the **left** for negative numbers and **right** for positive numbers.

Ask students:

➢ If 3 steps right means +3, what does 3 steps left mean? Accepted response (–3).

➢ What is the opposite of +7? Accepted response (–7)



Call students at random and instruct them to mark any number from –10 to + 10 on the matching position of this number line.

If any student makes any mistake, the teacher will rectify it.

Next write some pair of integers such as (–2, 1), (5, 6), etc. on the board. Call a pair of students random, and ask them to place these integers on the number line.

Ask students to compare the integers of the pairs.

On the basis of the outcomes that come from the class, explain that:

➢ Every positive integer is greater than a negative integer.

➢ Zero (0) is less than every positive integer and greater than every negative integer.

➢ The greater the integer, the lesser is its opposite.

Again, write some groups of integers (take up to five integers in a group) on the blackboard and ask the students to arrange the integers in ascending or descending order based on the above properties of the integers.

- Divide the class into pairs.

Call one pair and instruct one student to represent an integer say –5 on the number line and the other to represent integer 5.

Ask the class to observe the distance of both integers from 0.

Repeat this activity with more pairs of students by taking different pair of opposite integers.

Discuss with the class that the image of an integer on the number line is its opposite. Thus, the image of negative integers on the number line is positive integers and vice versa. Since numbers and their opposites are at equally distant from zero, this distance is called the absolute value of the integer.

EXPLANATION

By taking reference of pages 279–284 of Math Genius! 6 explain “Need of a new number system”, “Integers”, Application of integers, Ordering of integers, “Negative of a negative integer “and Absolute value of integers in detail with examples.

ASSIGNMENTS

Classwork: “Discuss Let’s recall” (page 280), “Think and Answer” (page 283), and “Maths Connect” given on page 284 and Q.1, 2, 3, 4 and 5 of 10A.

Homework: Remaining questions of Practice Time 10A.

Periods: 6–10	**Topic: Addition of integers**	**NEP Skills: Conceptual, experiential and cross-curriculum learning**

TEACHER-PUPIL ACTIVITY

Start the class by introducing an elevator analogy.

Ask the class to imagine a building where the floors numbered as follows:

- Basements floors:–1, –2, –3
- Ground floor: 0
- Floors (above): 1, 2, 3, 4, 5, …, 10.

Explain that going up (+) means adding a positive number, and going down (–) means adding a negative number.

- Divide the class into small groups.

  Ask any group randomly, “Which floor do you reach, when you go up 3 floors from the ground floor?” “Which floor do you reach, when you go down 2 floors from the ground floor?” Accepted answers: 0 + 3 = 3rd floor and 0 + (–2) = Basement –2.

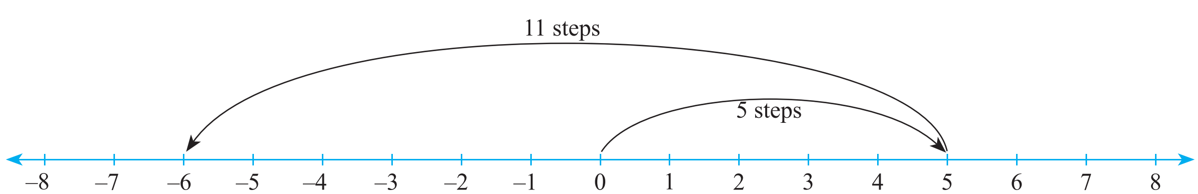
  Ask from other groups questions like: “Start from floor –2, move up 4 floors, on which floor you reach?” “Start from floor 3, move down 5 floors, on which floor you reach?” Accepted answers: –2 + 4 = 2nd floor and 3 + (–5) = –2 i.e., basement –2.

If any student of any group give wrong answer or have any confusion, then the teacher will rectify him/her.

Next, discuss addition of integers using the number line by using the following activity:

- Draw a horizontal number line on the board, ranging from -10 to +10.

Explain: Moving to the right means adding a positive number and moving to the left means adding a negative number. For example, 5 + (–11) → Start from 0 and move 5 steps right, then move 11 steps left, land on –6.



- Ask from students randomly the following questions: 4 + (–6); (–8) + 5 …etc.

Further explain that when we add two integers with the same numerical value but opposite in signs the sum is 0. These numbers are called the additive inverse of each other. Like: 5 + (–5) = 0.

EXPLANATION

Take reference of pages 286-289 of Math Genius! 6 to explain addition of integers using lift analogy, on a number line and additive inverse of any integer in details with examples. Also explain rules and properties of addition of integers with examples and "Knowledge Desk" given on page 289.

ASSIGNMENTS

Classwork: Discuss "Quick Check" given on pages 287 and 289, and Q.1, 2, 3 and 7 of Practice Time 10B.

Homework: Remaining questions of Practice Time 10B.

Periods: 11–13	Topic: Subtraction of integers.	NEP Skills: Conceptual, collaborative and experiential learning

TEACHER-PUPIL ACTIVITY

Engage students with a real-life scenarios that if the temperature in the evening is 5° C and it drop by 8°C during night, what will be the temperature at night? Accept the responses. Rectify and explain if there is any error.

Discuss that:

- When we subtract a positive number, we move left on the number line.
- When we subtract a negative number, it is the same as adding a positive number, so we move to the right on the number line.
- Subtracting an integer means adding its additive inverse.

EXPLANATION

By taking reference of pages 291-292 of Math Genius! 6, explain subtraction of integers with in-text examples. Also discuss "Knowledge Desk" given on page 291 and rules and properties of subtraction of integers with examples.

ASSIGNMENTS

Classwork: Discuss "Life Skills" given on page 292 and Ask to solve Q.1, 2, 3 and 4 of Practice Time 10C.

Homework: Remaining questions of Practice Time 10C.

Periods: 14–17	Topic: Token/Counter models of integers; Explorations with integers	NEP Skills: Creative and innovative learning, conceptual, art integrated and collaborative learning

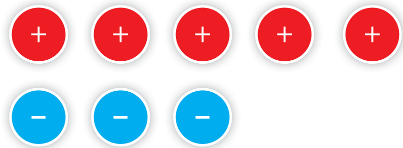
TEACHER-PUPIL ACTIVITY

Start the class by reiterating the addition and subtraction of integers using tokens or counters through the following activity as follows:

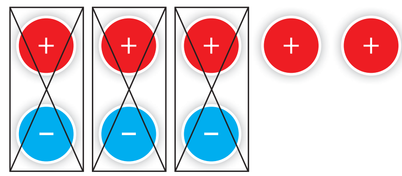
- Divide the class into groups.

  Distribute 10 red tokens and 10 blue tokens to each group, where each red token represents +1 and each blue token represent –1. Also distribute a tray to each group, so that they can demonstrate their addition and subtraction.

Call out integer addition problems: like + (5) + (–3). Ask the students to take 5 red counters and 3 blue counters and arrange them in two rows as shown below:



Further explain that each red counter cancel out a blue counter and give the numerical value '0' and we left with two red counter,



Hence, +5 + (–3) = +2.

Similarly, demonstrate the subtraction of integers by referring to the example given on page 295 of the textbook.

Ask the groups to solve more addition and subtraction problems using token and write their result on the board.

Finally, the teacher will check the results and appreciate the group who done maximum sums correctly.

EXPLANATION

Take reference of pages 294-297 to demonstrate addition and subtraction of integers with examples in detail. Also discuss "Explorations with integers" by motivating the students to solve the given in-text problems on the board.

ASSIGNMENTS

Classwork: Discuss Q.1, 2 of Practice Time 10D.

Homework: Remaining questions of Practice Time 10D.

Periods: 18–20	**Topic: Mental maths; Encapsulate; Chapter Assessment (Revision); Brain Sizzlers; Learning by doing and Labyrinth**	**NEP Skills: Conceptual , experiential, collaborative and art integrated learning**

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.

Start the revision of the exercise, by using encapsulate, brain sizzlers and chapter assessment.

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

Motivate students to solve "Labyrinth", by discussing each other.

ASSIGNMENTS

Classwork: Mental Maths, Brain Sizzlers, Section A, B, C and D of Chapter Assessment.

Homework: Remaining questions of Chapter Assessment.

ORANGE

ASSIGNMENT–18

Marks Obtained: __________

Student's Name: ____________________ Section: ______

Roll Number: ____________________ Date: ____________________

A. Multiple Choice Type Questions

Identify the correct answer.

1. On a number line, which integer is farthest from zero?

   (*a*) –13 (*b*) –7 (*c*) 12 (*d*) 10

2. Which of the following is true?

   (*a*) –5 > –3 (*b*) 0 < –1 (c) –8 < –6 (d) –1 = 1

3. The absolute value of (| –9 + 4 |) is:

   (*a*) –5 (*b*) 5 (*c*) 13 (*d*) –13

4. A diver is at –25 meters. If she ascends 10 meters, her new position is:

   (*a*) –35 m (*b*) –15 m (*c*) 15 m (*d*) 35 m

5. Which integer is 12 units away from –4 on the number line?

   (*a*) 8 (*b*) –16 (*c*) 16 (*d*) Both (*a*) and (*b*)

6. The temperature rose from –5°C to 7°C. What is the temperature change?

   (*a*) 2°C (*b*) 12°C (*c*) –12°C (*d*) 7°C

7. If | A | = 15, then A could be:

   (*a*) 15 only (*b*) –15 only (*c*) 0 (*d*) Both (*a*) and (*b*)

8. Mount Everest is 8,849 m above sea level and the Dead Sea is 430 m below sea level. What is the difference between the two elevations?

   (*a*) 8,419 m (*b*) 9,279 m (*c*) –8,419 m (*d*) –9,279 m

B. Assertion and Reason Type Questions.

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

(*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.

1. **Assertion (A):** The sum of two negative integers is always a negative integer.

   Reason (R): When a negative integer is added to a positive integer, the result is always negative.

2. **Assertion (A):** The predecessor of zero is an integer but not a whole number.

   Reason (R): Every whole number is also an integer.

ORANGE

ASSIGNMENT–19

Marks Obtained: __________

Student's Name: ______________________________ Section: ______

Roll Number: ______________________ Date: ______________

A. Fill in the blanks

1. The sum of –15, 20, and –(–5) is __________ .
2. The absolute value of the sum of –8 and 5 is __________ .
3. The temperature difference between –12°F and 5°F is __________ °F.
4. A debt of ₹200 represented as an integer is __________ .
5. If | P | = 0, then P = __________.

B. State true or false

1. Zero is a positive integer. __________
2. The sum of a fraction and an integer is an integer. __________
3. Subtracting a negative integer is the same as adding its absolute value. __________
4. All integers are whole numbers. __________
5. –10, –3, –2, 0, 3 are in ascending order. __________

C. Match the following

Column I	Column II
1. | 3 | – | –5 | + | – 7 + 2 |	(*a*) 8
2. –3 – (–11)	(*b*) 3
3. –14 + 19	(*c*) 9
4. 0 – (–9)	(*d*) –3
5. –1 + 2 – 3 + 4 – 5	(*e*) 5

D. Do as directed

1. The temperature on a mountain peak is –48°C, while the temperature in a valley below is –15°C. If the temperature in the valley rises by 12°C, how much colder will the mountain peak be compared to the valley?
2. In a math test, 2 marks are awarded for each correct answer and 1 mark is deducted for each incorrect answer. The test consists of 40 questions. A student answered some of the questions while leaving others unanswered. The number of correct answers is twice the number of incorrect answers, and the student's total score is 30 marks.

   How many questions did the student answer correctly, incorrectly, and leave unanswered?

ANSWERS OF THE ASSIGNMENTS

ASSIGNMENT-1

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

ASSIGNMENT-2

A. 1. 100 **2.** One **3.** even number
4. fractal, equilateral **5.** 3, 8, 55
B. 1. False **2.** False **3.** True **4.** True **5.** True
C. 1. (*d*) **2.** (*c*) **3.** (*e*) **4.** (*a*) **5.** (*b*)
D. 1. 89 **2.** 1, 4, 9, 16, 25, 36; Square numbers.

ASSIGNMENT-3

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

ASSIGNMENT-4

A. 1. Both **2.** intersecting
3. 180°, 360° **4.** greater **5.** straight
B. 1. False **2.** True **3.** False **4.** False **5.** True
C. 1. (*b*) **2.** (*c*) **3.** (*d*) **4.** (*e*) **5.** (*a*)
D. 1. $\frac{2}{3}$ **2.** (*a*) East (*b*) 2 right angles.

ASSIGNMENT-5

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

ASSIGNMENT-6

A. 1. 6 **2.** 378873 **3.** greater **4.** subcell
B. 1. True **2.** False **3.** False **4.** True **5.** False
C. 1. (*d*) **2.** (*a*) **3.** (*e*) **4.** (*c*) **5.** (*b*)
D. 1. No **2.** 7 rounds

ASSIGNMENT-7

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

ASSIGNMENT-8

A. 1. data **2.** pictograph **3.** height
4. vertical **5.** secondary **6.** double
B. 1. False **2.** True **3.** False **4.** True **5.** True
C. 1. (*b*) Apple **2.** (*b*) June (*c*) Class 6

ASSIGNMENT-9

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

ASSIGNMENT-10

A. 1. twin **2.** abundant **3.** 9
4. composite **5.** 4 **6.** 2, 3
B. 1. True **2.** False **3.** True **4.** False **5.** False
C. 1. (*d*) **2.** (*c*) **3.** (*b*) **4.** (*e*) **5.** (*a*)
D. 1. gift boxes 12, in each box 2 chocolates and 3 toffees.

ASSIGNMENT-11

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

ASSIGNMENT-12

A. 1. 81 **2.** 1.5 **3.** 4 **4.** 49 **5.** 24, 21
B. 1. False **2.** True **3.** False **4.** True **5.** True
C. 1. (*d*) **2.** (*a*) **3.** (*b*) **4.** (*e*) **5.** (*c*)
D. 1. 2 m **2.** 200 tiles

ASSIGNMENT-13

A. 1. (*b*) **2.** (*d*) **3.** (*b*) **4.** (*a*) **5.** (*a*)
6. (*c*)
B. 1. (*a*) **2.** (*c*)

ASSIGNMENT-14

A. 1. Proper **2.** Standard **3.** Part
4. $\frac{2}{5}$ **5.** 1
B. 1. False **2.** True **3.** False **4.** True **5.** False
C. 1. (*c*) **2.** (*b*) **3.** (*d*) **4.** (*a*)
D. 1. $\frac{1}{8}$ **2.** $11\frac{1}{3}$ km

ASSIGNMENT-15

A. 1. (*c*) **2.** (*a*) **3.** (*b*) **4.** (*c*) **5.** (*c*)
6. (*a*)
B. 1. set-square **2.** line segment **3.** 75°
4. only one

ASSIGNMENT-16

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

B. **1.** (*a*) **2.** (*c*)

ASSIGNMENT-17

A. **1.** asymmetric **2.** reflection **3.** 90 **4.** vertical **5.** angle of rotation

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

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

ASSIGNMENT-18

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

B. **1.** (*c*) **2.** (*b*)

ASSIGNMENT-19

A. **1.** 10 **2.** 3 **3.** 17 **4.** –200 **5.** 0

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

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

D. **1.** 45° **2.** 20 correct, 10 incorrect, 10 unanswered

HINTS AND SOLUTIONS

CHAPTER 1 : PATTERNS IN MATHEMATICS

Let's Recall

1. 1, 1, 1, 1, ...
The number sequence contains only number 1. So, it is a pattern of number 1.

2. 1, 2, 3, 4, ...
The number sequence follows an increasing pattern of counting numbers starting from 1.

3. 3, 5, 7, 9, ...
This is an increasing pattern of odd numbers starting from 3.

4. 4, 7, 10, 13, ...
Every next number is obtained by adding 3 to the previous number starting from 4.

5. 5, 9, 13, 17, ...
Every next number is obtained by adding 4 to the previous number starting from 5.

Practice Time 1A

1. (*a*) Each next number is obtained by adding 4 to the previous number starting from 4.
4, 8, 12, 16, 20, 24, 28

(*b*) Each next number is obtained by adding consecutive counting numbers starting from 1 to the previous number, starting from 1.
1, 2, 4, 7, 11, 16, 22, 29, 37

2. (*a*) 47 43 40 38 37 33 30 28
–4 –3 –2 –1 –4 –3 –2

(*b*) 100 90 81 73 66 60 55
–10 –9 –8 –7 –6 –5

3.

987654321	× 9	=	8	888	888	889
987654321	× 18	=	17	777	777	778
987654321	× 27	=	26	666	666	667
987654321	× 36	=	35	555	555	556
987654321	× 45	=	44	444	444	445
987654321	× 54	=	53	333	333	334
987654321	× 63	=	62	222	222	223
987654321	× 72	=	71	111	111	112
987654321	× 81	=	80	000	000	001

4. 5 = 5, 4 + 1, 1 + 4, 3 + 2, 2 + 3, 3 + 1 + 1, 1 + 3 + 1, 1 + 1 + 3, 2 + 2 + 1, 2 + 1 + 2, 1 + 2 + 2, 2 + 1 + 1 + 1, 1 + 2 + 1 + 1, 1 + 1 + 2 + 1, 1 + 1 + 1 + 2, 1 + 1 + 1 + 1 + 1

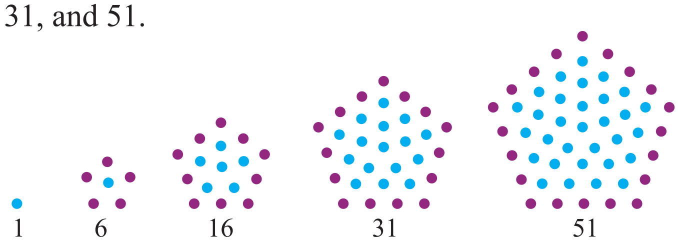
5. 1 staircase = 1 ways
2 staircase = 2 ways
3 staircase = 3 ways
4 staircase = 5 ways
5 staircase = 8 ways
6 staircase = 13 ways
7 staircase = 21 ways
8 staircase = 34 ways
9 staircase = 55 ways
10 staircase = 89 ways

Project (Page 12)

Yes, Third perfect number = 496
Forth perfect number = 8128

Think and Answer (Page 13)

Yes, five centered pentagonal numbers are: 1, 6, 16, 31, and 51.

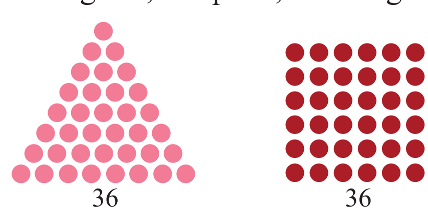


Practice Time 1B

1. (*a*) Even numbers 10, 28, 64, 66, 100
(*b*) Odd numbers 15, 25, 27, 35, 49, 55, 81
(*c*) Triangular numbers 10, 15, 28, 55, 66
(*d*) Square number 25, 49, 64, 81, 100
(*e*) Cubic numbers 27, 64
(*f*) Pentagonal numbers 35
(*g*) Hexagonal numbers 15, 28, 66

3. Triangular, Square, Pentagonal, Hexagonal

4.



Square number that are triangular number
1, 36, 1225, 41616, 1413721

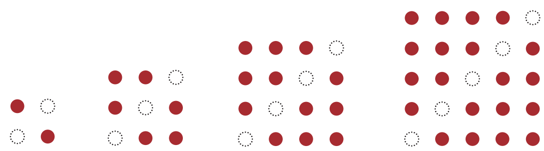
5. Do it yourself.

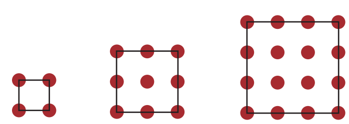
6. $$\begin{aligned} 1 &= 1^3 \\ 1 + 7 = 8 &= 2^3 \\ 1 + 7 + 19 = 27 &= 3^3 \\ 1 + 7 + 19 + 37 = 64 &= 4^3 \end{aligned}$$

Thus, sum of consecutive central hexagonal numbers is a cubic number.

Quick Check (Page 15)

Practice Time 1C

1. First 10 triangular numbers:
   1, 3, 6, 10, 15, 21, 28, 36, 45, 55
   Multiplying triangular numbers by 6 and adding 1
   $$\left.\begin{aligned} 1 \times 6 + 1 &= 7 \\ 3 \times 6 + 1 &= 19 \\ 6 \times 6 + 1 &= 37 \\ 10 \times 6 + 1 &= 61 \end{aligned}\right\} \text{are centered hexagonal numbers}$$
2. $64 = 8 \times 8$ = Square number
   $= 4 \times 4 \times 4$ = Cubic number
3. 

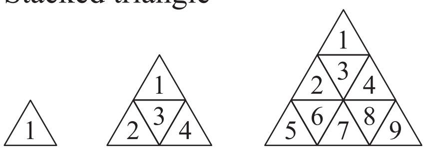
   The upper and lower portion of square number become triangular number when diagonal dots are removed.
4. $$\left.\begin{aligned} 2^2 - 2 &= 2 \\ 3^2 - 3 &= 6 \\ 4^2 - 4 &= 12 \\ 5^2 - 5 &= 20 \end{aligned}\right\} \text{Even numbers}$$
5. 

   All are multiples of 4.
6. A triangular number represents a set of dots arranged in a triangle. The fourth triangular number means arranging dots in a triangular shape with 4 layers starting with 1.
   Given that two copies of the fourth triangular number form a rectangle. The base of the rectangle is made by 4 dots, and the height is 4 +1. So, the fourth triangular number is 1/2 of the number of dots in the area of the rectangle so formed (since two identical triangles are fitted together).
   Fourth triangular number $= \frac{4 \times 5}{2}$.
   By the same pattern we can assemble two 100th triangular numbers to form a rectangle with 100 dots along the base and 101 dots along the height.
   Therefore, 100th triangular number
   $$= \frac{100 \times 101}{2} = 5050$$
   Similarly, 1000th triangular number
   $$= \frac{1000 \times 1001}{2} = 500500$$
   Generalisation:
   Triangular number $= \frac{1}{2}$ (Product of dots along the length and breadth of the rectangle so formed)
7. Do it yourself.
8. $65 = 8^2 + 1^2 = 7^2 + 4^2$
9. Do it yourself.
10. Do it yourself.
11. $99999 \times 2 = 199998$
    $9999999 \times 2 = 19999998$
12. $11111 \times 88888 = 987634568$
    $111111 \times 888888 = 98765234568$
    $1111111 \times 8888888 = 9876541234568$
13. $12345 \times 8 + 5 = 98765$
    $123456 \times 8 + 6 = 987654$
    $1234567 \times 8 + 7 = 9876543$
    $12345678 \times 8 + 8 = 98765432$
14. 65359477124183 × 68 = 4444 4444 4444 4444
    65359477124183 × 85 = 5555 5555 5555 5555
    65359477124183 × 102 = 6666 6666 6666 6666
    65359477124183 × 119 = 7777 7777 7777 7777
    65359477124183 × 153 = 9999 9999 9999 9999

Practice Time 1D

1. 9 sides = Nonagon
   10 sides = Decagon
2. 1, 4, 9, 16, 25, 36; Brick wall
3. Regular polygon
   $$\left.\begin{aligned} &\text{Triangle} && n = 3 \\ &\text{Quadrilateral} && n = 4 \\ &\text{Pentagon} && n = 5 \\ &\text{Hexagon} && n = 6 \end{aligned}\right\} \begin{array}{l} 3, 4, 5, 6, ... \\ \text{Form the sequence of} \\ \text{natural number} \end{array}$$

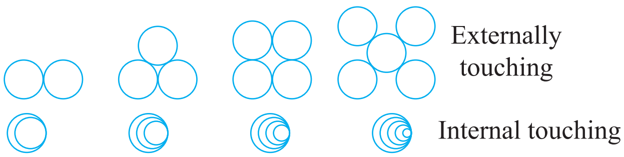
4. Stacked triangle



Total number of triangles: 1, 4, 9, 16, 25, ... This is the sequence of square numbers.

5. Do it yourself.

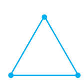
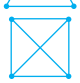
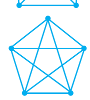
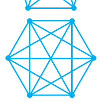
6.



7. Hexagons can gain easily to form a solid figure without any gaps in between having least perimeter and maximum surface area, while other polygon cannot make such figure.

8. Koch snowflake begin with an equilateral triangle and then replaces the middle third of every line segment with a pair of line segments that form an equilateral bumps. 3, 12, 48, ... are the number of line segment. Here each next number is four times the previous.
$12 = 3 \times 4$; $48 = 4 \times 12$; $192 = 4 \times 48$

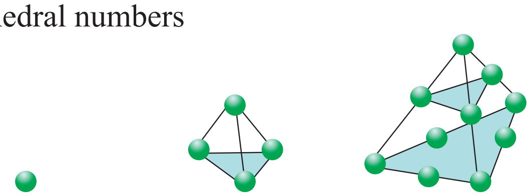
Brain Sizzlers (Page 21)

Line segment		one (1)
Line segment		3
Line segment		6
Line segment		10
Line segment		15

1, 3, 6, 10, ... form a triangular number patterns.

Mental Maths (Page 21)

1. 2, 4, 6, 8, 10, 12, 14, ... Even number sequence
2. The pattern shows the cubic number.
i.e., $1^3, 2^3, 3^3, 4^3, 5^3, 6^3, ...$
Hence, next number $= 7^3 = 343$.
3. 19 is a centered hexagonal number.
4. Tetrahedral numbers



1 4 10

Chapter Assessment

A.

1. Since, $10 = 1 + 2 + 3 + 4$. It is the sum of first four counting numbers. So, 10 is a triangular number. Hence, option (*c*) is correct.
2. $5 \times 5 = 25; 9 \times 9 = 81; 10 \times 10 = 100$. But, 32 can not be written as product of two same numbers. So, 32 is not a square number. Hence, option (*d*) is correct.
3. By adding centred hexagonal numbers, we get 1, 8, 27, 64, ..., which are the cubic numbers. Hence, option (*b*) is correct.
4. We know that
$1 = 1^2$
$1 + 2 + 1 = 4 = 2^2$
$1 + 2 + 3 + 2 + 1 = 9 = 3^2$
$1 + 2 + 3 + 4 + 3 + 2 + 1 = 16 = 4^2$
$1 + 2 + 3 + 4 + 5 + 4 + 3 + 2 + 1 = 25 = 5^2$
Thus, we get the square numbers by adding the counting numbers in above pattern.
So, $1 + 2 + 3 + ... + 49 + 50 + 49 + ... + 3 + 2 + 1 = 50^2 = 2500$
Hence, option (*a*) is correct.
5. Diagonals follow the pattern: 0, 2, 5, 9, ...
So, each next number is obtained by adding the consecutive counting numbers (starting from 2) to the previous number starting from 0.
So, the number of diagonals in the heptagon would be 14. Hence, option (*a*) is correct.

B.

1. Virahanka number.
2. Cubic numbers: 1, 8, 16, ...,
Fibonacci numbers: 1, 1, 2, 3, 5, 8, ...
So, 1 and 8 are both cubic number and fibonacci number. Since, 1 is trivial in many number patterns, we'll consider 8 as the correct answer.
3. Square number as $36 = 6 \times 6$.
4. $25 + 16 + 9 + 4 + 1 = 55$
5. Triangular numbers.

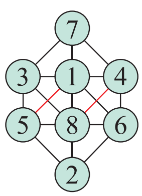
C.

1. Total number of little triangles are 16, which is not a triangular number. False
2. False
3. Koch snowflakes can only be constructed with an equilateral triangle. False
4. True.

D.

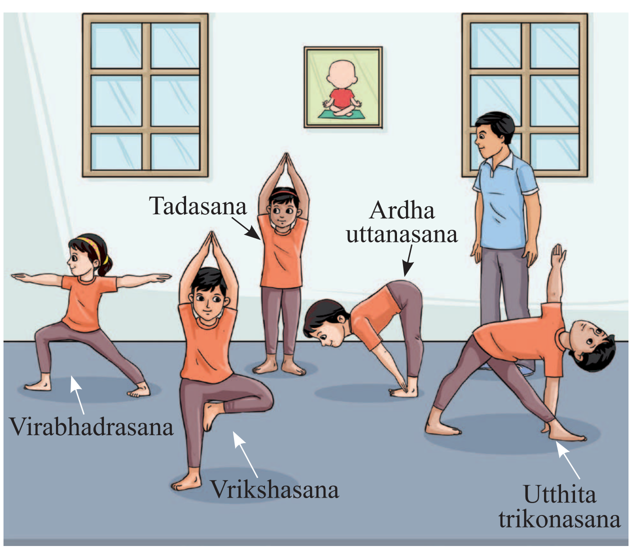
1. Triangular umbers: 1, 3, 6, 10, 15, ...
Fibonacci numbers: 1, 1, 2, 3, 8, 11, ...
Pentagonal number numbers: 1, 5, 12, 22, 35, ...
Tetrahedral number: 1, 4, 10, 20, 35, ...
$1 \to c, 2 \to d, 3 \to a, 4 \to b$

E.

1. 9 × 9 = 81
   99 × 99 = 9801
   999 × 999 = 998001
   By following the above pattern, we get
   9999 × 9999 = 99980001
   99999 × 99999 = 9999800001
2. 11 × 11 = 121
   111 × 111 = 12321
   1111 × 1111 = 1234321
   11111 × 11111 = 123454321
   111111 × 111111 = 12345654321
   1111111 × 1111111 = 1234567654321
   11111111 × 11111111 = 123456787654321
   111111111 × 111111111= 12345678987654321
   These numbers remain same when read from the front or back and they are called palindromic numbers. Mahaviracharya was the first Indian mathematician who first contributed to the study of these special numbers.
3. A truncated icosahedron consists of 12 pentagonal faces and 20 hexagons.
4. 

CHAPTER 2 : LINES AND ANGLES

Let's Recall

1. 

2. 

3. (*a*) Ardha chakrasana
   (*b*) Adho mukha vrikshasana
   (*c*) Anantasana
4. 21 June

Quick Check (Page 30)

1. (*a*) Beam of light from light house ⇒ Ray
   (*b*) A flat face of a box ⇒ Plane
   (*c*) Edge of a postcard ⇒ Line segment
   (*d*) Tip of a needle ⇒ Point
2.

Line	Line segment	Ray
(*a*) no	(*a*) two	(*a*) one
(*b*) infinite	(*b*) finite	(*b*) infinite
(*c*) cannot	(*c*) can	(*c*) cannot
(*d*) $\overleftrightarrow{AB}$	(*d*) $\overline{AB}$	(*d*) $\overrightarrow{AB}$

Practice Time 2A

1. A line segment has two end points. So, option *b* is correct.
2. A ray has only one end point. So, option *b* is correct.
3. In the given image M and N are two end points of MN. So, MN is a line segment, and hence the option *b* is correct.
4. (*a*) A line segment can have infinitely many points. So, the given statement is false.
   (*b*) T (*c*) T
   (*d*) The English alphabet 'X' is an example of intersecting lines. So, the given statement is false.
5. (*a*) $\overleftrightarrow{AE}$, $\overleftrightarrow{EF}$ (*b*) $\overleftrightarrow{AE}$ (*c*) $\overleftrightarrow{CO}$
   (*d*) $\overleftrightarrow{AE}$, $\overleftrightarrow{CO}$ and $\overleftrightarrow{DE}$, $\overleftrightarrow{FE}$

6. (*a*) T (*b*) T (*c*) T (*d*) F
(*e*) F (*f*) F (*g*) T

7. LM, MP, PQ and QR
Point L and point R are on exactly one line segments LM and QR respectively.

8. TA, TB, NB

9. (*a*) Lines GF, NM
(*b*) Line segments EF, ED, DC, BC, AB, DO, CE, MN, GE, GF
(*c*) Rays DC, DO, EF, EG, FG, GF, NM, MN, EC, BA

10. (*a*) Yes, PQ ⊥ CD: as they intersect at 90°.
(*b*) Parallel lines: $\overleftrightarrow{EF} \parallel \overleftrightarrow{CD}, \overleftrightarrow{CD} \parallel \overleftrightarrow{AB}, \overleftrightarrow{AB} \parallel \overleftrightarrow{EF}$.
(*c*) Concurrent lines: $\overleftrightarrow{CD}, \overleftrightarrow{KL}, \overleftrightarrow{PQ}$ and $\overleftrightarrow{MN}$.

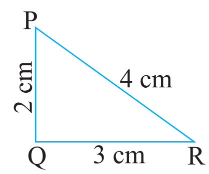
11. Do it yourself.

Practice Time 2B

1. (*a*) Shortest side: LM; Longest side: LN
(*b*) Shortest side: AD; Longest side: BC

2. 

B is the mid point of AC ⇒ AB = BC
C is the mid point of BD ⇒ BC = CD
⇒ AB = BC = CD

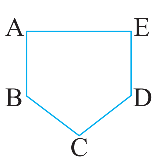
3. (*a*) Since, PQ + QR = 2 + 3 > 4 = PR
QR + PR = 3 + 4 > 2 = PQ
PR + PQ = 4 + 2 = 6 > 3 = QR


(*b*) If can also be verified by actual measurements of sides of the Δ.

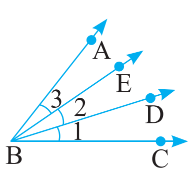
4. Yes, $\overline{AC} = \overline{AB} + \overline{BC}$

5. (*a*) AE + EC = AC (*b*) DC – RC = DR
(*c*) PR – PQ = QR (*d*) BD – (BE + QD) = EQ

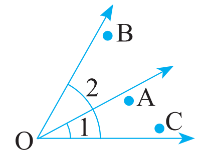
Practice Time 2C

1. (*a*)


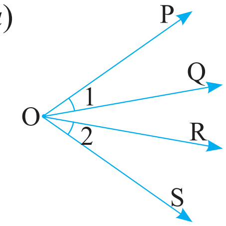
Angles are:
∠BAE, ∠AED, ∠EDC, ∠DCB, ∠CBA

(*b*)


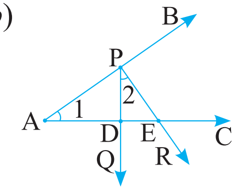
∠DBC, ∠EBD, ∠ABE, ∠ABD, ∠EBC, ∠ABC

2. 

Yes, point C lies in the interior of ∠2 also.

3. (*a*)


Here, ∠POQ, ∠QOR and ∠ROS have one common point O.

(*b*)


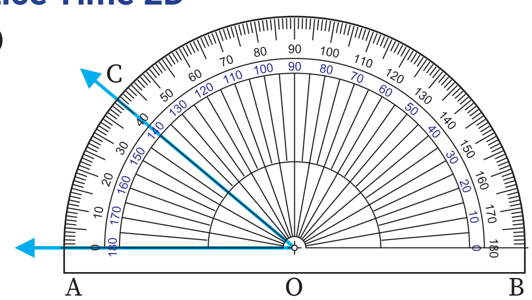
Here, points P, D and E are common in angle, BAC and in angle QPR.

Quick Check (Page 40)

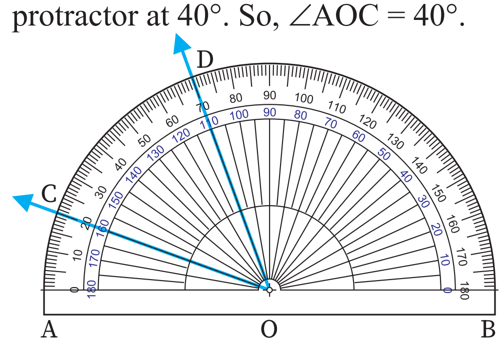
1. (*a*) ∠AOY; ∠XOY is included in ∠AOY
(*b*) ∠AOC; ∠XOY is included in ∠AOC
(*c*) ∠YOB = ∠YOC as B and C lie on the same line.

2. ∠XOY, as ∠XOY is an obtuse angle and ∠AOB is an acute angle.

Practice Time 2D

1. (*a*)


In ∠AOB, base AO is aligned with the horizontal line with point O at the centre of the protractor and the second arm of ∠AOC i.e., CO overlap with the line marking on the protractor at 40°. So, ∠AOC = 40°.

(*b*)


In ∠COD, base CO overlaps with the line marking on the protractor at 20° and the second arm i.e., OD overlaps with the line marking on the protractor at 70°. So, ∠COD = 70° – 20° = 50°.

(*c*) Do it yourself.

2. Do it yourself. 3. Do it yourself.

4. Same as question 1.

(*a*) 35° (*b*) 94° (*c*) 55° (*d*) 125° (*e*) 31°

5. Central angle = 360°

Each angle $= \dfrac{360°}{20} = 18°$

6. **Observation:** Sum of angles of a triangle = 180°

Quick Check (Page 47)

1. Since, ∠SOR = ∠QOR.

So, OR is the angle bisector of ∠QOS.

2. ∠QOT

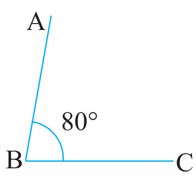
(∵ ∠TOS = ∠SOQ = 30°),

Or

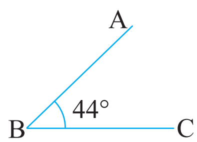
(∵ ∠TOR = ∠POR = 45°)

Practice Time 2E

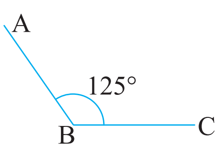
1. (*a*)



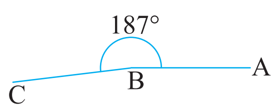
(*b*)



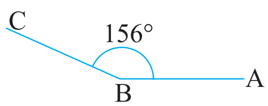
(*c*)



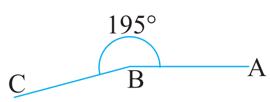
(*d*)



(*e*)

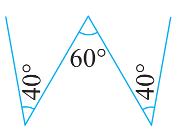


(*f*)



2. Do it yourself.

3.



4. Do it yourself. 5. Do it yourself.

Quick Check (Page 54)

1. (*a*) Acute (*b*) Right (*c*) Obtuse (*d*) Reflex

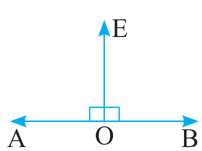
2. Acute angle: ∠EAB

Obtuse angle: ∠ABC, ∠AED

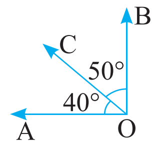
Right angle: ∠DCB

Enrichment (Pages 56-57)

1. No, because a right angle is an angle with measure 90° and sum of two right angle is 180°, which is not complementary angle.



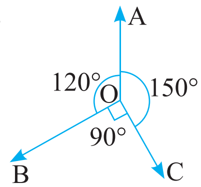
2. Yes,



∠AOC and ∠BOC are adjacent angles, where ∠AOC = 40° and ∠BOC = 50°

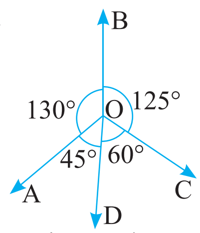
∴ ∠AOC + ∠BOC = 40° + 50° = 90°, complementary angles.

3. Yes,



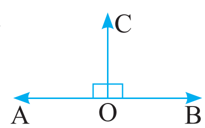
∠AOB and ∠AOC are obtuse as well as adjacent angles.

4. Yes,



∠AOB is an obtuse angle and ∠AOD is an acute angle and both are adjacent.

5. Yes,



∠AOC = 90° = ∠BOC and ∠AOC + ∠BOC = 180°

Practice Time 2F

1. Do it yourself.

2. (*a*) True

(*b*) The measure of an obtuse angle is greater than 90° and less than 180°. So, the given statement is false.

(*c*) True (*d*) False

(*e*) The measure of one complete angle is 360°. So, the given statement is false.

3. (*a*) Obtuse (*b*) Acute (*c*) Right

(*d*) Complete (*e*) Reflex (*f*) Obtuse

(*g*) Straight (*h*) Acute

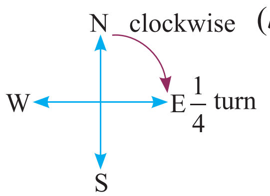
4. (*a*) From 2 to 8, the minute hand moves 6 hour marks (2 → 3 → 4 → 5 → 6 → 7 → 8).

Since a full revolution corresponds to moving through 12 hour marks, the fraction of the revolution completed is: $\dfrac{6}{12} = \dfrac{1}{2}$.

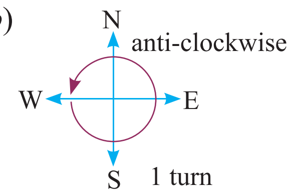
(*b*) From 10 to 1, the minute hand moves 3 hour marks. So, the fraction of the revolution completed is: $\frac{3}{12} = \frac{1}{4}$.

(*c*) From 9 to 6, the minute hand moves 9 hour marks. So, the fraction of the revolution completed is: $\frac{9}{12} = \frac{3}{4}$.

5. (*a*)



(*b*)



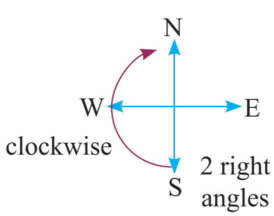
6. (*a*) A full revolution of the hour hand is 360°, which corresponds to moving across 12 hours. Moving from one hour to the next corresponds to turning: 360°/ 12 = 30°.

From 6 to 12 the hour hand moves 6 hour marks. Thus, the hour hand turns through: 6 × 30° = 180° 2 right angles

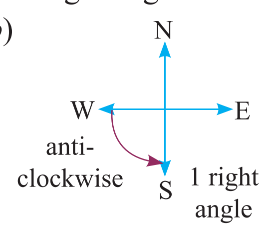
(*b*) 10 → 1 (3 hrs) 1 right angle

(*c*) 8 → 11(3 hrs) 1 right angle

7. (*a*)



(*b*)



8.(*a*) One right angle corresponds to 90°, which covers 3 hour marks. So, in two right angles it will be 6 hour marks. From 8, 6 hour marks in the clockwise direction is 2. Thus the correct answer is 2.

(*b*) Similar to part (*a*)

9. (*a*) A full revolution of the hour hand corresponds to moving across 12 hours. Half a revolution means moving across: $\frac{12}{2} = 6$ hour marks. Starting from 7, six hour marks in the clockwise direction is 1.

(*b*) Similar to part (*a*)

10. (*a*) A full circle in a clock is 360°, and there are 12 hours, so each hour mark represents: 360°/ 12 = 30° per hour.

The difference between 9 and 12 is 3 hour marks.

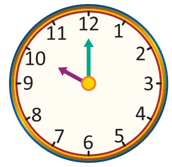
Thus, the angle between the hands:
3 × 30° = 90°

(*b*) 12 → 1 = 1 × 30° = 30°

(*c*) 6 → 12 = 6 × 30° = 180°

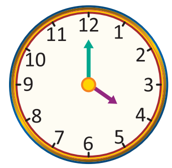
11. Similar to question 10.

(*a*)



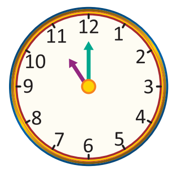
10 → 12 = 2 × 30° = 60°

(*b*)



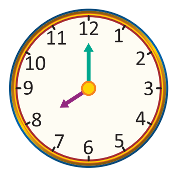
12 → 4 = 4 × 30° = 120°

(*c*)



11 → 12 = 1 × 30° = 30°

(*d*)



8 → 12 = 4 × 30° = 120°

12. (*a*) acute angle

(*b*) straight angle (since 90° + 90° = 180°)

(*c*) acute angle (complementary angles are always acute)

(*d*) obtuse angle (Subtracting an acute angle from 180° always results in a value greater than 90°)

(*e*) straight angle (*f*) acute angle

13. (*a*) X is the mid point of AC
Y is the mid point of BC
Z is the mid point of AB

(*b*) P is the bisector of AC
q is the bisector of BC

(*c*) *p* is the perpendicular bisector of AC

(*d*) *r* is the line which is only perpendicular to AB, but does not bisect it.

(*e*) *q* is the line which only bisects BC, but is not perpendicular to it.

14. (*a*) Yes, the sum of two acute angles can be an acute angle. (*i*) 15° + 45° = 60° (*ii*) 35° + 48° = 83°

(*b*) Yes, the sum of two acute angles can be a right angle. 45° + 45° = 90°

(*c*) Yes, the sum of two acute angles can be an obtuse angle. 50° + 80° = 130°

(*d*) An acute angle is any angle less than 90°. So, the sum of two acute angles is always less than 180°. Thus, it is not possible to have two acute angles whose sum is a straight angle.

(*e*) Reflex angle is more than 180°, but the sum of two acute angles is always less than 180°. Thus, it is not possible to have two acute angles whose sum is a reflex angle.

15. (*a*) Yes, 120° + 130° = 250° < 360°

Sum of two obtuse angles can be a reflex angle.

(*b*) An obtuse angle is any angle greater than 90° but less than 180°. If we add two obtuse angles, their total will always be greater than 180° but less than 360°. Thus, it is not possible to have two obtuse angles whose sum is a complete angle (360°).

Practice Time 2G

3. (*a*) Acute angle: A, K, M, N, V, W, X, Y, Z

(*b*) Obtuse angle: A, X, K, Y

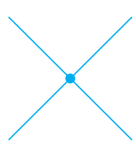
(*c*) Straight angle: I

Mental Maths (Page 62)

1. No, two angles cannot have exactly 5 points in common.

2. Total line segment = 5 × 2 = 10

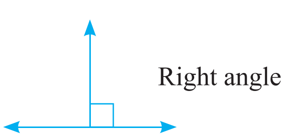
$\overline{AB}$, $\overline{AC}$, $\overline{AD}$, $\overline{AE}$, $\overline{BC}$, $\overline{BD}$, $\overline{BE}$, $\overline{CD}$, $\overline{CE}$, $\overline{DE}$

3. 

Two lines can intersect at one point only. So, it is false.

4. Parallel lines can never meet each other.

5. A **6.** 45° **7.** Infinitely many

8. 

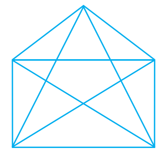
Brain Sizzlers (Page 62)

2. Parallel lines: AB || CS,

Non-parallel lines: AC, PL, RS

Chapter Assessment

A.

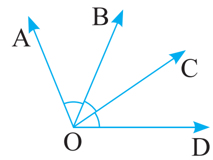
1. 

Thus, the required lines are 10.

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

2. In the figure, ∠XYZ cannot be written as ∠ZXY, since there is no such arm as ZX.

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

3. 

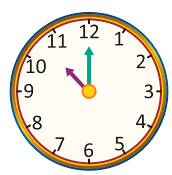
Angles in the given figure are ∠AOB, ∠AOC, ∠AOD, ∠BOC, ∠BOD and ∠COD.

Thus, the total number of angles in the given figure = 6.

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

4. Lines *r* and *s* are perpendicular, intersects each other at a right angle.

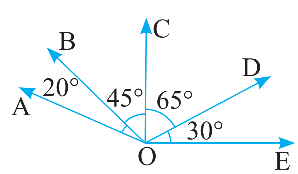
Hence, the correct option is (*c*).

5. 

Angle between the hour and minute hand at 10 o'clock = 2 × 30° = 60°

Other angle = 360° – 60° = 300°

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

6. 

Obtuse angle:

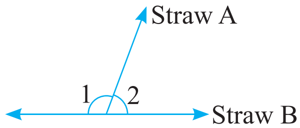
∠EOC, ∠EOB, ∠EOA, ∠DOB, ∠DOA

∴ Total number of obtuse angle = 5

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

7. Since, sum of two right angles is equal to 180°.

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

8. 

When the value of ∠2 triples, the new value of ∠2 is 3(∠2).

So, the increase in the value of ∠2 = 3(∠2) – (∠2)
= 2(∠2).

The same will be the decrease in the value of <1.

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

9. 6 → 360°

1 → 60°

4 → 4 × 60° = 240°

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

10. Semi-circulator angle = 180°, which is divided into 8-equal parts.

So, 8 → 180°

$\Rightarrow 1 \rightarrow \frac{180°}{8} = 22.5°$

$\Rightarrow 2 \rightarrow 2 \times 22.5° = 45°$

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

B.

1. *d* **2.** *a* **3.** *d*

C.

1. one **2.** finite **3.** parallel **4.** acute

5. two **6.** reflex

7. Since, 90° + 90° = 180°, then angle which is equal to its supplement is of 90°.

D.

1. True

2. False, as $\overline{AB}$ is the perpendicular bisector of line segment PQ.

3. False, as a line can be extended infinitely in both directions and cannot be measured.

4. False, as two parallel lines never intersect to each other, they are equidistant from each other.

5. True

6. False, acute angle is greater than 0° but less than 90°.

E.

1. Four rays: — (*b*)

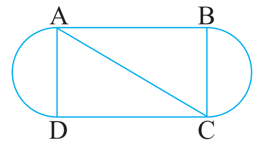
2. Nine line segment — (*a*)

3. Six angles — (*b*), (*c*)

4. Six points on the boundary — (*a*), (*c*)

5. Three collinear points — (*b*)

F.

1. 

Line segment: AB, AC, BC, CD, AD

Number of line segment = 5

2. 65°, $\frac{1}{2} \times 65° = 32.5°$

3. 6; AB, CD, DA, AC, BD, BC

4. Do it yourself.

5. Angles formed at all points A, B, C, D, E, F,G and H.

(*a*) Acute angle: ∠F, ∠C

(*b*) Obtuse angle: ∠A, ∠B

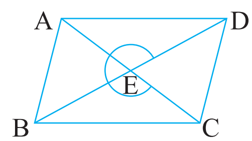
(*c*) right angle: ∠D, ∠E, ∠H, ∠G

6. Do it yourself.

7. (*a*) Acute angle: ∠AEB, ∠DEC, ∠BAE, ∠EDC

(*b*) ∠AED, ∠BEC

(*c*) Reflex ∠CED etc.



(Answer may vary)

8. (*a*) 

6 (Saffron, White, Green, Saffron + White, White + Green, Saffron + White + Green)

(*b*) Total angles = 360°

Since there are 24 spokes, the angle between two consecutive spokes is: $\frac{360°}{24} = 15°$

(*c*) Since there are 24 spokes, each spoke can form a right angle with the one 6 places ahead. Every spoke contributes to one right angle. Thus, there will be 24 right angles.

(*d*) Parallel lines: AB || CD, AB || EF, AB || GH, CD || EF, CD || GH, EF || GH, AG || BH.

∴ Total number of parallel lines = 7.

Unit Test – 1

A.

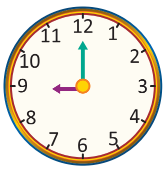
1. (*d*)

2. (*c*) Since $36 = 6 \times 6 = 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8$. So, 36 is both a square as well as a triangular number.

3. (*b*)

4. (*c*) $\frac{3}{5}$ of a right angle $= \frac{3}{5} \times 90° = 54°$

5. (*c*)



$\because$ $1 \rightarrow 30°$

$\therefore$ $12 - 9 = 3 \rightarrow 3 \times 30° = 90°$

6. (*a*) Tetrahedral numbers: 1, 4, 10, 20, 35, ...

7. (*d*) AC and BD are intersecting lines but not perpendicular to each other.

8. (*c*)

9. (*c*) $64 = 8 \times 8 = 4 \times 4 \times 4$

But every square number is not a cubic number as, $4 \times 4 = 16$, which is not a cube of any number.

10. (*a*)

B.

1. 343, cubic number

2. 90°

3. Two

4. Pentagonal number

5. Virahanka

C.

1. True

2. False, because polygon with 8 sides is called octagon.

3. True

4. False, as if sum of two angles is 90°, they are complementary.

5. False, as 1, 4, 10, 20, ... are tetrahedral numbers.

D.

1. Since ∠A is four times ∠B, we can think of ∠B as one part and ∠A as four parts. This means the total parts = 4 parts (for ∠A) + 1 part (for ∠B) = 5 parts. We know that supplementary angles add up to 180°. Therefore, we divide 180° into 5 equal parts: One part = 180° ÷ 5 = 36°

So, ∠B = 36°

∠A = 4 × 36° = 144°.

2. (*a*) 9, 15, 21, 27, 33, 39, 45 (Increase by = 6)

(*b*) 81, 72, 63, 54, 45, 36, 27 (Decrease by = 9)

3. In each hour, the hour hand turn through 30°. And moving from 1 to 10 covers 9 hours.

$\therefore$ Total angle covered by hour hand moving from 1 to 10 = 9 × 30° = 270°.

So, number of right angles $= \frac{270°}{90°} = 3$

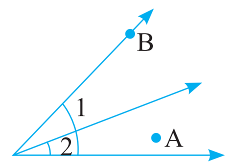
$\therefore$ Hour hand make 3 right angles moving from 1 to 10.

4. Do it yourself.

5. $1 + 3 + 5 + 7 + 9 = 25 = 5 \times 5$

$1 + 3 + 5 + 7 + 9 + 11 = 36 = 6 \times 6$

6.



7. $50 = 7^2 + 1^2 = 5^2 + 5^2$

$65 = 8^2 + 1^2 = 7^2 + 4^2$

8. (*a*) ∠PQR (*b*) ∠MQR and ∠PQN

(*c*) ∠NQM

CHAPTER 3 : NUMBER PLAY

Let's Recall

1. Given number = 27859

TTh	Th	H	T	O
2	7	8	5	9

9 × 1 = 9
5 × 10 = 50
8 × 100 = 800
7 × 1000 = 7000
2 × 10000 = 20000

Expanded form of 27859

= 20000 + 7000 + 800 + 50 + 9

2. The numbers are: 5,30,003; 5,29,999; 5,30,456; 5,29,896 and 5,29,870. Each of these numbers, when rounded to the nearest 10,000, becomes 5,30,000. (Answer may vary)

3. Total score of team India = 176

Runs scored by Kohli = 76

Extra runs = 7

So, the runs scored by other players

= Total team score – Kohli's score – Extra runs

= 176 – 76 – 7 = 93

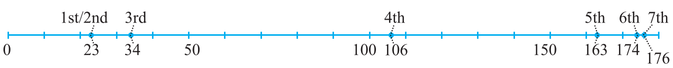
$\therefore$ Total contribution of runs by other players is 93 runs.

4. Number of balls in one over of an inning = 6

∴ Total number of balls in 20 overs of an inning = 20 × 6 = 120

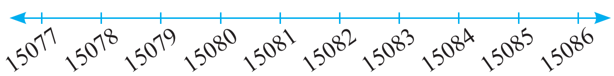
5. When reading the given number from forward or backword direction, it remains same. So, the given number is a palindromic number. The other numbers similar to 151 are 11, 121 and 99.

6. Fall of the next wickets at 106/4, 163/5, 174/6 and 176/7 on the number line is as follows:

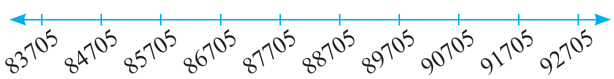


Quick Check (Page 76)

1. The numbers marked on the first number line are the consecutive numbers starting from 15077 till the number 15086.

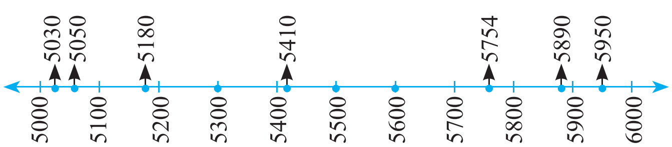


The numbers marked on the second number line are counting numbers starting from 83,705 and each next number is obtained by adding 1000 to previous number.

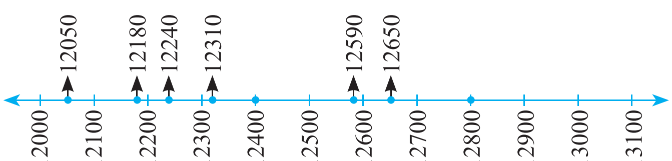


2. The positions of the given numbers on the given number lines are as follows:

(*a*)



(*b*)



Quick Check (Page 77)

Since, 22,429 > 22,327

Therefore, the area of Meghalaya is greater than the area of Manipur.

Think and Answer (Page 77)

1. A cell is called a supercell if the numbers in its adjacent cells are smaller than that cell.

The table with 4-digit numbers such that the supercells are the coloured cells is as follows:

4352	4452	3500	3683	3452	3600	6300	6071	1200	1251

Here, 4452 is greater than 4352 and 3500. similarly, 3683 is greater than 3500 and 3452 and so on. Thus, 4452, 3683, 6300 and 1251 are the supercells. (Answer may vary)

2. Yes, the cell having the largest number in a table always be a supercell because if it is a corner cell, then the number adjacent to it will be smaller than it. If it is in between the two cells then both of its adjacent numbers would be smaller than it.

No, the cell having the smallest number in a table cannot be a supercell because the number adjacent to it will always be larger than it.

Maths Connect (Page 78)

1. The largest planet in our solar system is Jupiter whose diameter is 88,846 miles and the smallest planet is Mercury with diameter 3032 miles.

2. All the planets according to their diameters in ascending order are as follows:

Mercury (3032 miles) < Mars (4221 miles)
< Venus (7521 miles) < Earth (7926 miles)
< Neptune (30775 miles) < Uranus (31763 miles)
< Saturn (74898 miles) < Jupiter (88846 miles)

3.

3032	7521	7926	4221	88846	74898	31763	30775

The diameters of planets have been arranged according to their distances from the sun in the above table.

Since, 3032, 4221 and 30775 are smaller numbers than their respective adjacent numbers in the above table.

Therefore, 3032, 4221 and 30775 are subcells.

And 7926 and 88846 are greater numbers than their respective adjacent numbers in the above table. So, these are supercells. Thus, there are 3 subcells and 2 supercells.

Practice Time 3A

1.

200	577	626	345	694	109	198

Here, 198, 626 and 694 are greater numbers than the numbers in their adjacent cells. So, they are supercells.

2.

6828	670	**9435**	3780	3708	7308	**8000**	5583	52

Here, 6828, 8000 and 9435 are greater numbers than the numbers in their adjacent cells. So, they are supercells.

3.

43	76	67	**28**	69	109	**18**

The numbers 18, 28 and 43 are smaller than the numbers in their adjacent cells. So, they are subcells.

4.

11	12	13	14	15	16	17	18	19	**20**

In the above table, only 11 is smaller than its adjacent cell and 20 is greater than its adjacent cell.

∴ There is only 1 supercell (coloured blue) and 1 subcell (coloured red). (Answer may vary)

5.

40,007	**77,400**	70,400	40,700
47,700	40,070	47,000	**74,000**
74,400	74,004	70,740	70,004
47,070	47,770	**70,744**	40,777

(Answer may vary)

6.

(12)	11	13	14	15	16	17	18	(19)	20

Second smallest number (a supercell) — Second largest number (not a subcell)

In the above table, second largest number is 19, but it is not a subcell as it is greater than its adjacent cell. Also, second smallest number is 12, which is a supercell as it is greater than its adjacent cell.

(Answer may vary)

7. No, it is not possible because the cell having the largest number in a table always be a supercell.

8.

Supercell

2	**16**	13	3
11	5	8	**10**
7	9	**12**	6
14	4	1	**15**

Subcell

2	16	13	**3**
11	**5**	8	10
7	9	12	**6**
14	4	**1**	15

9.

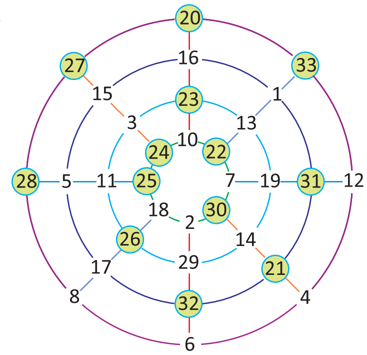
Supercell

11	**24**	7	**20**	3
4	12	**25**	8	**16**
17	5	13	**21**	9
10	**18**	1	14	**22**
23	6	**19**	2	15

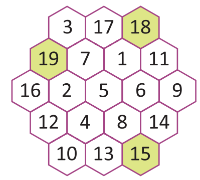
Subcell

11	24	**7**	20	**3**
4	12	25	**8**	16
17	**5**	13	21	**9**
10	18	**1**	14	22
23	**6**	19	**2**	15

10. Yes,



11.



Quick Check (Page 80)

1. Since, 1 + 2 + 4 + 5 = 12

So, 1245 is a 4-digit numbers whose digits add up to 12. Other such numbers are as follows: 1236, 3333, 7050, etc.

2. Smallest 5-digit number is 10,000. To make it smallest 5-digit number whose digits sum is 12, we will add to it the smallest number whose digits sum is 11. Since, 2 + 9 = 11

∴ 10,000 + 29 = 10029.

3. To find such number we need to maximize each digit from left to right of the largest 6-digit number so that the total sum remains 12.

So, the left most digit in the largest 6-digit number is 9, but since the sum of digits should be 12.

So, the sum of the remaining digits will be 12 – 9 = 3.

∴ The largest 6-digit number whose digits sum is 12 is 9,30,000.

Practice Time 3B

1. (*a*) There are total 10 times when digit 6 appears as unit digit and 10 times when digit 6 appears as tens digit from 1 to 100.

i.e., 06, 16, 26, ..., 56, ..., 96 and 60, ..., 65, ... 69.

∴ Total 20 times digit 6 appears among 1 to 100.

(*b*) From 501 to 599, numbers which have 6 as a digit are: 506, 516, 526, 536, 546, 556, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 576, 586, 596. Here, digit 6 occurs 20 times.

Similarly, from 701 to 999 number of times digit 6 occurs = 3 × 20 times = 60 times

And, the number of times digit 6 occurs from 600 to 699: 100 times + 20 times = 120 times

∴ Total number of times digit 6 occurs from 501-1000: (120 + 60 + 20) times = 200 times

2. (*a*) All the two digit numbers whose tens and units places add up to 15 are:

96 : 9 + 6 = 15, 87 : 8 + 7 = 15

78 : 7 + 8 = 15, 69 : 6 + 9 = 15

So, all the 2-digit numbers with digit sum 15 are 69, 78, 87 and 96.

(*b*) For any 3-digit number whose digits sum is 15, the sum of digits at hundred, tens and unit places should be 15. Five such numbers are,

159 : 1 + 5 + 9 = 15; 168 : 1 + 6 + 8 = 15;

258 = 2 + 5 + 8 = 15; 348 : 3 + 4 + 8 = 15;

555 : 5 + 5 + 5 = 15.

(*c*) For any 4-digit number whose digits sum is 15, the sum of digits at thousand, hundred, tens and units places should be 15.

So, the three such numbers are as follows:

1086 : 1 + 0 + 8 + 6 = 15

1239 : 1 + 2 + 3 + 9 = 15

2436 : 2 + 4 + 3 + 6 = 15

(*d*) For any 5-digit number whose digits sum is 15, the sum of digits at ten thousand, thousand, hundred, tens and units places should be 15 and the left digit should be smaller than or equal to the right digit in the number to make the digits in ascending order.

So, the four 5-digit numbers with the digits sum 15 in which digits are in ascending order are as follows: 12345, 22245, 13335, 22335

(*e*) Smallest 6-digit number is 100000. To make it smallest 6-digit odd number whose digits sum is 15, we will add to it the smallest number whose digits sum is 14 and it should be odd.

Since, 5 + 9 = 14 and 59 is an odd number.

∴ 100000 + 59 = 100059 is the smallest 6-digit odd number with the digits sum 15.

3. (*a*) 3-digit numbers whose any two digits are same are 232, 252, 335, 998, ….

Now 2 + 3 + 2 = 7; 2 + 5 + 2 = 9;

3 + 3 + 5 = 11; 9 + 9 + 8 = 26, ….

So, the digit sum of the 3-digit numbers whose any two digits are same can be any counting number less than 27.

(*b*) 3-digit numbers whose all three digits are same are 111, 222, 333, 444, 555, 666, 777, 888, 999.

The sum of the digits is as follows:

1 + 1 + 1 = 3; 2 + 2 + 2 = 6; 3 + 3 + 3 = 9;

4 + 4 + 4 = 12; 5 + 5 + 5 = 15, …

Thus, the digit sum of the 3-digit numbers whose all three digits are same is 3 times to any digit of that number.

(*c*) 3-digit numbers whose all three digits are consecutive are: 123, 234, 345, 456, 567, 678, 789. The sum of the digits are as follows:

1 + 2 + 3 = 6; 2 + 3 + 4 = 9; 3 + 4 + 5 = 12;

4 + 5 + 6 = 15; 5 + 6 + 7 = 18, ….

Thus, the digit sum of the 3-digit numbers whose all three digits are consecutive are multiples of 3.

(*d*) 3-digit numbers in which difference between two consecutive digits is 4 are: 404, 515, 595, ….

The sum of the digits are as follows:

4 + 0 + 4 = 8; 5 + 1 + 5 = 11; 5 + 9 + 5 = 19

4. To find the largest 5-digit number we need to maximize each digit of a 5-digit number from left to right while making sure that the digit sum remains 14.

The largest leftmost digit in a 5-digit number is 9, but since the digit sum is 14, so the second leftmost digit will be 14 – 9 = 5.

∴ The largest 5-digit number whose digit sum is 14 is 95000.

5. The numbers from 31 to 79 are 31, 32, 33, …, 79.

So, their digit sum is 3 + 1 = 4, 3 + 2 = 5, 3 + 3 = 6, ..., 7 + 9 = 16.

Thus, the digit sum of all numbers from 31 to 79 is the counting numbers from 4 to 16.

Quick Check (Page 83)

1. Given digits are 2, 5, 9, 1.

To find the largest 4-digit number using the given digits, arrange the digits in ascending order, i.e., 9521.

And to find the smallest 4-digit number using the given digits, arrange the digits in descending order, i.e., 1259.

Sum = 9521 + 1259 = 10780, which is a 5-digit number. Difference = 9521 – 1259 = 8262, which is a 4-digit number.

∴ Difference is a 4-digit number but sum is not.

2. Since 82,675 is the largest number in the given table so if we swap the first two digits of this number, then it will become a smaller number then we get the 4 supercells.

36,200	39,344	20,765
63,609	28,675	54,306
49,381	50,319	37,084

Practice Time 3C

1. Given number = 2345

All possible 4-digit numbers using the digits of number 2345 are:

2345, 2354, 2435, 2453, 2534, 2543, 3254, 3245, 3452, 3425, 3524, 3542, 4325, 4352, 4235, 4253, 4523, 4532, 5324, 5342, 5234, 5243, 5432, 5423.

2345	2354	2435	2453	2534	2543
3254	3245	3452	3425	3524	3542
4325	4352	4235	4253	4523	4532
5324	5342	5234	5243	5432	5423

From the above table, subcell = 2345 and supercell = 5342 and 5432.

But if we change the place of numbers in the above table, then the supercells and subcells may change.

2. Since the number is a 4-digit palindromic number, its thousands and unit digits will be the same, also the hundreds and tens digit will be the same. We are given that the tens digit is 3 more than thousands digit. Therefore, we will start with the smallest such numbers and will check their digits sum if it is 22.

1441, 2552, 3663, 4774, 5885, 6996

In these numbers the sum of the digits of 4774 is 22. Thus, the required number is 4774.

3. To find a palindromic number, first take a number and reverse it. Add the original number with the reversed number obtained. Check you get a palindromic number or not. If not, repeat the same process. Therefore, the examples of numbers that gives 2-step palindromes are as follows:

19 + 91 = 110

⇒ 110 + 011 = 121;

And 91 + 19 = 110

⇒ 110 + 011 = 121

Here, 121 is a palindromic number.

The examples of numbers that gives 3-step palindromes are as follows:

95 + 59 = 154

⇒ 154 + 451 = 605

⇒ 605 + 506 = 1111;

And 59 + 95 = 154

⇒ 154 + 451 = 605

⇒ 605 + 506 = 1111

Here, 1111 is a palindromic number.

The examples of numbers that gives 4-step palindromes are as follows:

96 + 69 = 165

⇒ 165 + 561 = 726

⇒ 726 + 627 = 1353

⇒ 1353 + 3531 = 4884;

And 69 + 96 = 165

⇒ 165 + 561 = 726

⇒ 726 + 627 = 1353

⇒ 1353 + 3531 = 4884.

Here, 4884 is a palindromic number.

4. The dates which are palindromic numbers are:

12/02/2021, 22/02/2022, 13/03/3031, 23/03/3032, 14/04/4041, 24/04/4042, 15/05/5051, 25/05/5052, 16/06/6061, 26/06/6062 (Answer may vary)

5. 3.52 +25.3 = 28.82

Since, 28.82 is palindromic number, so only one step is required to produce a palindromic number starting with 3.52.

6. Since, 69 + 96 = 165

165 + 561 = 726

726 + 627 = 1353

1353 + 3531 = 4884

Here, after four steps starting with 69, we get a palindrome.

Also, 78 + 87 = 165

165 + 561 = 726

726 + 627 = 1353

1353 + 3531 = 4884

Here, after four steps starting with 78, we get a palindrome.

Also, 79 + 97 = 176

176 + 671 = 847

847 + 748 = 1595

1595 + 5951 = 7546
7546 + 6457 = 14003
14003 + 30041 = 44044

Here, after six steps starting with 79, we get a palindromic number 440044.

Thus, there are many numbers less than 100 that requires at least four steps to become a palindrome.

7. Some palindromic squares are 676, 10201, 12321, 14641, 44944 and so on as they remain the same when its digits are reversed.

8. 11 × 10 = 110, which is a multiple of 11 but not a palindromic number. So, the smallest multiple of 11 which is not a palindromic number is 110.

9.
11 × 11 = 121
111 × 111 = 12321
1111 × 1111 = 1234321
11111 × 11111 = 123454321
111111 × 111111 = 12345654321
1111111 × 1111111 = 1234567654321
11111111 × 11111111 = 123456787654321
111111111 × 111111111 = 12345678987654321

10. 99 and 101 are palindromes and their difference is 2. Similarly, 999 and 1001 are palindromes with difference 2. So there are many palindromes less than 1000 with difference 2.

11. 1001 is a palindromic number which is larger than 1000.

12. 1 + 3 + 1 = 5; 2 + 1 + 2 = 5

So, 131 and 212 are palindromic numbers which has a digit sum 5.

13. If 56665 is the first palindrome in a series then the next palindromes to 56665 are 56765, 56865, 56965, 57075, 57175, 57275, 57375. Thus, the 8th palindrome in this series is 57375.

14. 90909 is a palindromic number which has digit sum 9 + 0 + 9 + 0 + 9 = 27 and product of its digit is zero that is, 9 × 0 × 9 × 0 × 9 = 0

15. Lets start with some 3 digit palindromic numbers whose some of the digits is 7, and then check their product of digits.

Number	Sum of digits	Product of Digits
151	7	5
232	7	12
313	7	9

Here, for 232 the sum of the digits is 7 and product of the digits is 12. So, the required number is 232.

16. The largest 5-digit number is 99999, which is a palindromic number and the smallest five-digit number is 10000. So, its next number is 10001, which is the smallest 5-digit palindromic number. Their sum = 10001 + 99999 = 110000 and difference = 99999 – 10001 = 89998

17. The dates whose digits read the same from left to right and from right to left are 31/01/1013, 21/02/2012, 11/02/2011; 01/02/2010 and so on.

18. Timings with patterns 5:55, 10:01 and 12:21 are palindromes because they read the same from left to right and from right to left. Some more possible times on a 12- hour clock of each of these types are 1:11, 2:22, 11:11 and 4:44 etc.

19. Some examples of product of two palindromes that gives a palindrome are: 121 × 11 = 1331; 33 × 11 = 363;

But this statement is not always true as 44 × 55 = 2420, which is not a palindrome.

Practice Time 3D

1. (*a*) In the given figure, the number written in blue and yellow box is 8, the number written in red box is 4, and the numbers written in green and maroon boxes are 2 and 16 respectively.

There are 5 blue box, 5 yellow box, 10 red box, 10 green box and 1 maroon box. Thus, the sum of the numbers given in the figure = 5 × 8 + 5 × 8 + 10 × 4 + 10 × 2 + 1 × 16 = 156

(*b*) The given figure represents a palindromic numbers in each line horizontally or vertically that are 1413141, 4254524, 1536351, 3461643, 1536351, 4254524 and 1413141. The sum of their digits are 15, 26, 24, 27, 24, 26, 15.

Thus, the total sum of numbers written in each box = 15 + 26 + 24 + 27 + 24 + 26 + 15 = 157

2. Make a square of 5 × 5, and put the numbers as follows:

80	80	80	80	80
80	40	40	40	80
80	40	20	40	80
80	40	40	40	80
80	80	80	80	80

Here, 16 yellow outer boxes contain number 80, internal 8 green boxes contain number 40 and 1 inner red colour box contains 20.

Thus, the sum of patterns = 16 × 80 + 8 × 40 + 1 × 20
= 1280 + 320 + 20 = 1620

Another pattern is

80	40	20	40	20	80
80	40	20	40	20	80
80	40	20	40	20	80
80	40	20	40	20	80
80	40	20	40	20	80
80	40	20	40	20	80

The number in first and last columns is 80, in second and fourth columns is 20 and in third and fifth columns is 40.

Thus, their sum = 12 × 80 + 12 × 40 + 12 × 20
= 1680

There are many pattern using the numbers 20, 40 and 80 whose sum lies between 1600 and 2000.

(Answer may vary)

3. Collatz conjecture for number 12 is 12, 6, 3, 10, 5, 16, 8, 4, 2, 1.

Collatz conjecture for number 19 is 19, 58, 29, 88, 44, 22, 11, 34, 17, 52, 26, 13, 40, 20, 10, 5, 16, 8, 4, 2, 1. Collatz conjecture for number 23 is 23, 70, 35, 106, 53, 160, 80, 40, 20, 10, 5, 16, 8, 4, 2, 1.

Number 12 takes minimum steps while number 19 takes maximum steps to satisfy the conjecture.

4. To find the Kaprekar constant, we follow these steps:

- First arrange the digits in ascending order
- Then arrange the digits in descending order.
- Subtract the smaller number from the larger number.
- Repeat the process till we get the Kaprekar constant 6174.

(*a*) Let us proceed with number 1738 to reach the Kaprekar constant.

Step 1: 8731 – 1378 = 7353

Step 2: 7533 – 3357 = 4176

Step 3: 7641 – 1467 = 6174 (Kaprekar constant)

Thus, it takes 3 steps to reach the constant.

(*b*) Let us proceed with number 2964 to reach the Kaprekar constant.

Step 1: 9642 – 2469 = 7173

Step 2: 7731 – 1377 = 6354

Step 3: 6543 – 3456 = 3087

Step 4: 8730 – 0378 = 8352

Step 5: 8532 – 2358 = 6174 (Kaprekar constant)

Thus, it takes 5 steps to reach the constant.

(*c*) Let us proceed with the number 3214 to reach the Kaprekar constant.

Step 1: 4321 – 1234 = 3087

Step 2: 8730 – 0378 = 8352

Step 3: 8532 – 2358 = 6174 (Kaprekar constant)

Thus, it takes 3 steps to reach the constant.

(*d*) Let us proceed with the number 4075 to reach the Kaprekar constant.

Step 1: 7540 – 0457 = 7083

Step 2: 8730 – 0378 = 8352

Step 3: 8532 – 2358 = 6174 (Kaprekar constant)

Thus, it takes 3 steps to reach the constant.

5. Let us proceed with the 3-digit number 346 to reach the Kaprekar constant.

Step 1: 643 – 346 = 297

Step 2: 972 – 279 = 693

Step 3: 963 – 369 = 594

Step 4: 954 – 459 = 495 (Kaprekar constant)

It takes 4-steps to reach the constant.

6. The matchstick used in first figure = 7

The matchstick used in second figure = 12

The matchstick used in third figure = 17

Therefore, the number of matchstick is increasing by 5 in each figure.

Thus, the table shows the pattern as follows:

Pattern numbers	Number of matchsticks
1	7
2	12
3	17
4	22
5	27
6	32
7	37
8	42
9	47
10	52

7. A 4-digit palindromic number is 1221

Now, let us proceed with the number 1221 to reach the Kaprekar constant.

Step 1: 2211 – 1122 = 1089

Step 2: 9810 – 0189 = 9621

Step 3: 9621 – 1269 = 8352

Step 4: 8532 – 2358 = 6174 (Kaprekar constant)

Thus, it takes 4 steps to reach Kaprekar constant.

Practice Time 3E

1. (*a*) Since, 99,999 + 99,998 = 1,99,997 > 95,000

Thus, the given scenario is possible.

(*b*) Since, 99899 + 9999 = 109898, which is a 6-digit number.

∴ The given scenario is possible.

(*c*) Since, 100009 – 99 = 99910, which is a 5-digit number.

∴ The given scenario is possible.

(*d*) Since, 1001 – 999 = 2 < 100

∴ The given scenario is possible.

(*e*) Since, 65,500 – 1000 = 64,500

∴ The given scenario is possible.

2. (*a*) The number 2000 can be obtained by adding the given numbers as:

2000 = 1400 + 200 + 200 + 200

= 1400 + 3 × 200

or we can write it as:

2000 = 500 + 500 + 500 + 500

= 4 × 500

(*b*) The number 4800 can be obtained using the given numbers as:

4800 = 1400 + 1400 + 1400 + 200 + 200 + 200

= 3 × 1400 + 3 × 200

(*c*) The number 75,000 can be obtained using the given numbers as:

75000 = 25000 + 25000 + 25000 = 3 × 25000

Or 75000 = 40000 + 25000 + 7000 + 6 × 500

(*d*) The number 36,800 can be obtained using the given numbers as:

36800 = 25000 + 3 × 1400 + 3 × 200 + 7000

(*e*) The number 51,500 can be obtained using the given numbers as:

51500 = 25000 + 25000 + 500 + 500 + 500

= 2 × 25000 + 3 × 500

Or 51500 = 40000 + 7000 + 3 × 500 + 2 × 1400 + 200

Above written numbers can also be obtained by adding other given numbers.

3. (*a*) The number 12000 can be obtained by adding the given numbers as:

12000 = 8000 + 2 × 1500 + 700 + 300

(*b*) The number 9600 can be obtained by adding and subtracting the given numbers as:

9600 = 8000 + 2 × 1500 – 2 × 700

(*c*) The number 5000 can be obtained by subtracting the given numbers as:

5000 = 8000 – 1500 – 1500 = 8000 – 2 × 1500

(*d*) The number 68500 can be obtained by adding and subtracting the given numbers as:

68500 = 50,000 + 8000 + 1500 + 700 + 300 + 8000

or 68500 = 50,000 + 21,000 – 1500 – 700 – 300

(*e*) The number 92500 can be obtained by adding and subtracting the given numbers as:

92500 = 50,000 + 21000 × 2 + 1500 – 700 – 300

Above written numbers can also be obtained by adding and subtracting other given numbers.

4. Let us take a date of birth 19 Jan 2016, i.e. 19012016, then the smallest 8-digit number using these digits is 10011269 and the largest 8-digit number is 96211100.

Therefore, the sum and difference of these smallest 8-digit and largest 8-digit is as follows:

Sum = 10011269 + 96211100 = 106222369

Difference = 96211100 – 10011269 = 86199831

5. (*a*) Let us take the largest 5-digit number 99999.

Now, we add the largest 5-digit number with itself as: 99999 + 99999 = 199998, which is not a 10-digit number.

Thus, the sum of two 5-digit numbers can never be a 10-digit number.

(*b*) Let us take smallest 4-digit number i.e., 1000 and one 1-digit number i.e., 9 then after subtracting them, we get 1000 – 9 = 991, which is a 3-digit number.

Thus, the difference of 4-digit number and 1-digit number is a 3-digit number.

(*c*) Let us take the largest 3-digit number, i.e. 999 and largest 4-digit number, i.e. 9999, then their sum is 999 + 9999 = 10998, which is a 5-digit number.

Thus, the sum of a 3-digit number and a 4-digit number is a 5-digit number.

(*d*) Let us take the smallest 6-digit number 100000 and the largest 4-digit number 9999, then their difference is 100000 – 9999 = 90001, which is not a 2-digit number.
Thus, the difference of a 6-digit number and a 4-digit number can never be a 2-digit number.

Practice Time 3F

1. (*a*)

898

Rounding place | 8 > 5

In the number 898, the digit at ones place is 8 (> 5). The next digit is 9 (at the tens place). So to round off the given number to the nearest tens place, we round up the tens digit by 1, i.e. 9 + 1 = 10 and the last digit becomes 0.
Therefore, 898 ≈ 900

(*b*)

1235

Rounding place | 5 = 5

In the number 1235, the digit at ones place is 5. The next digit is 3 (at the tens place).
So to round off the given number to the nearest tens place, we round up the tens digit by 1, i.e. 3 + 1 = 4, and the last digit becomes 0.
Therefore, 1235 ≈ 1240.

(*c*) Similar to part (*b*).

2. (*a*)

876

Rounding place | 7 > 5

In the number 876, the digit at the tens place is 7 (> 5). The next digit is 8 (at hundreds place). Thus to round off the given number to the nearest hundred place, we round up the hundreds digit by 1 and the digits at tens and units place become 0.
Therefore, 876 ≈ 900

(*b*)

2345

Rounding place | 4 < 5

In the number 2345, the digit at the tens place is 4 (< 5). The next digit is 3 (at hundreds place). Thus to round off the given number to the nearest hundred place, we leave the hundreds digit as it is and the digits at tens and units place become 0.
Therefore, 2345 ≈ 2300

(*c*) Similar to part (*b*).

3. (*a*)

56743

Rounding place | 7 > 5

In the number 56743, the digit at the hundreds place is 7 (> 5). The next digit is 6 (at thousands place). Thus to round off the given number to the nearest thousands place, we round up the thousands digit by 1 and the digits at hundreds, tens and units place become 0.
Therefore, 56743 ≈ 57000.

(*b*) Similar to part (*a*)   (*c*) Similar to part (*a*)

4. In the number 2345, the digit at the units place is 5(= 5). The next digit is 4 (at tens place). Thus to find the estimated value of the given number in 10s, we round up the tens digit by 1 and the digit at units place becomes 0.
Therefore, 2345 ≈ 2350.
Also, the digit at the tens place is 4 (< 5). The next digit is 3 (at hundred place). Thus to find the estimated value of the given number in 100s, we leave the hundreds digit as it is and the digits at tens and units place become 0.
Therefore, 2345 ≈ 2300.
Also, the digit at the hundreds place is 3 (< 5). The next digit is 2 (at thousand place).
Thus to find the estimated value of the given number in 1000s, we leave the thousands digit as it is and the digits at hundreds, tens and units place become 0.
Therefore, 2345 ≈ 2000.
Thus, the table for estimated values is as follows:

Number	2345	6458	6174
Estimated Value in 10s	2350	6460	6170
Estimated Value in 100s	2300	6500	6200
Estimated Value in 1000s	2000	6000	6000

5. (*a*) On an average, a person blinks their eyes 15-20 times per minute.
(*b*) On an average, a person blinks their eyes 900 to 1200 times in every hour.
(*c*) On an average, a person blinks their eyes 14,400 – 19,200 times a day.

(*d*) On an average, a person blinks their eyes 100,800 to 134,400 times a week.

(*e*) On an average, a person blinks their eyes 432,000 to 576,000 times a month.

(*f*) On an average, a person blinks their eyes 5.25 million to 7.1 million times a year.

6. Do it yourself.

7. Do it yourself

8. Do it yourself

9. Do it yourself

10. Distance travelled by Seema from Delhi to Patna = 861 km

Distance travelled by Seema from Patna to Kolkata = 462 km

In the number 861, the digit in the tens place is 6 (> 5) and the next digit is 8 (at hundred place).

Thus to round off the given number in 100 km, we round up the hundred digit by 1 and the digits at tens and units place become 0 and similarly in the number 462.

Therefore, 861 km ≈ 900 km and 462 km ≈ 500 km.

And, estimated distance from Delhi to Patna to nearest 100 km = 900 km

So, estimated distance from Patna to Kolkata to nearest 100 km = 500 km

∴ Estimated distance travelled by Seema from Kolkata to Delhi = estimated distance travelled from Delhi to Patna + estimated distance travelled from Patna to Kolkata = 900 km + 500 km = 1400 km

Chapter Assessment

A.

1. Option (*a*) is not a palindromic number, option (*d*) is 3-digit palindromic number made with two different digits.

Option (*b*) and (*c*) are the palindromic number using there different digits.

But option (*b*) is the smallest among the given option. Hence, the correct answer is option (*b*).

2. The smallest and largest 2-digit palindromes are 11 and 99 respectively.

∴ Sum = 11 + 99 = 110.

Thus, option (*d*) is correct.

3.

Given number	Step 1	Step 2	Step 3	Step 4	Step 5
4716	7641 – 1467 = 6174 (kaprekar constant)				
3214	4321 – 1234 = 3087	8730 – 0378 = 8352	8532 – 2358 = 6174 (kaprekar constant)		
9874	9874 – 4789 = 5085	8550 – 0558 = 7992	9972 – 2799 = 7173	7731 – 1377 = 6354	6543 – 3456 = 3087 And so on.
8067	8760 – 0678 = 8082	8820 – 0288 = 8532	8532 – 2358 = 6174 (kaprekar constant)		

Thus, using the number 4716, we get the Kaprekar constant in 1 step only.

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

4.

5	15	20	410	85
458	357	612	111	65
54	6	99	750	478
715	745	100	951	10
854	147	555	66	521

There are 8 supercells in the above table.

Thus, the correct answer is option (*d*).

5. The number obtained by interchanging the digits at the tens and thousands place of the number 64891 is 69841. Difference = 69841 – 64891 = 4950

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

6. In Collatz conjecture, if a number is odd we multiply it by 3 and add 1 to it and if a number is even we divide it by 2, so in option (*a*) after 11 there should be 34 and in option (*b*) after 5 there should be 16. So the correct option is (*c*).

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

B.

1. If we add two smallest five digit numbers, i.e. 10000, we get 20000, a 5-digit number. But if we add two largest 5-digit numbers, i.e. 99999, we get 199998, a 6-digit number. Therefore, the sum of two 5-digit numbers can be a 5-digit number or 6-digit number.

2. Using the digits 2, 4, 5, 5-digit palindrome can be 25452 or 42524 or 52425 and so on. Thus, using the digits 2,4 and 5, there are many 5-digit palindromes possible.

3. Since 2 × 40000 + 3 × 2000 = 86000
   Therefore, 86000 – 85400 = 600
   So, 85400 = 2 × 40000 + 3 × 2000 – 600
4. From 101 to 900 there are total 800 3-digit numbers and from 901 to 999 there are 99 3-digit numbers and 100 is also a 3-digit number. Thus there are total 800 + 99 + 1 = 900 3-digit numbers.
5. When we subtract 1 from 10,00,000 we get 10,00,000 – 1 = 999999, which is the 6-digit largest number. Thus, by adding 1 to the greatest 6-digit number, we get ten lakhs.

C.

1. 7 × 100000 + 3 × 10000 + 2 × 1000 + 2 × 100 + 3 × 10 + 4 = 700000 + 30000 + 2000 + 200 + 30 + 4 = 732234

∴ 1 – (*d*)

2. Greatest 5-digit number is 99,999, which we get by subtracting 1 from 1,00,000. So 99,999 is the predecessor of 1,00,000.

∴ 2 – (*a*)

3. A 4-digit Kaprekar constant is 6174. So, 3 – (*e*)
4. An average person takes 17000 to 22000 breaths in a day.

∴ 4 – (*b*)

5. The greatest 4-digit number formed with the digits 1,4,7, and 6 is 7641.

∴ 5 – (*c*)

D.

1.

2340	3421	7344	6174
4981	3115	9124	9876
2465	1944	5000	6027
3165	4777	6413	8888

The numbers which are neither in supercells nor in subcells are 3421, 7344, 3115, 9124, 2465, 5000, 6027, 3165, 4777, 6413.

These numbers in ascending order are as follows:
2465 < 3115 < 3165 < 3421< 4777 < 5000 < 6027 < 6413 < 7344 < 9124.

2. To make a palindrome, take a number and reverse it. Add the original number with the reverse number obtained. Check if you get a palindromic number. If not, repeat the process. Let us find the palindromes using the given numbers.

(*a*) 43 + 34 = 77, which is a palindromic number.
(*b*) 29 + 92= 121, which is a palindromic number.
(*c*) 78 + 87 = 165
165 + 561 = 726
726 + 627 = 1353
1353 + 3531 = 4884, which is a palindromic number.
(*d*) 67 + 76 = 143
143 + 341 = 484, which is a palindromic number.
(*e*) 89 + 98 = 187
187 + 781 = 968
968 + 869 = 1837
1837 + 7381 = 9218
9218 + 8129 = 17347
17347 + 74371 = 91718
91718 + 81719 = 173437
173437 + 734371 = 907808
907808 + 808709 = 1716517
1716517 + 7156171 = 8872688
8872688 + 8862788 = 17735476
17735476 + 67453771 = 85189247
85189247 + 74298158 = 159487405
159487405 + 504784951 = 664272356
664272356 + 653272466 = 1317544822
1317544822 + 2284457131 = 3602001953
3602001953 + 3591002063 = 7193004016
7193004016 + 6104003917 = 13297007933
13297007933 + 33970079231= 47267087164
47267087164 + 46178076274 = 93445163438
93445163438 + 83436154439 = 176881317877
176881317877 + 778713188671
= 955594506548
955594506548 + 845605495559
= 1801200002107
1801200002107 + 7012000021,081
= 8813200023188, which is a palindromic number

3. The magic constant or magic sum is the sum of numbers in any row, column, or diagonal of the magic square.

∴ 363 + 424 + 646 + 747 + 757 + 767 + 787 + 393 = 4884

The sum of rows, columns and diagonals = 4884 (since it is a magic square with magic constant 4884). Also, 4884 is a palindromic number.

So, the magical constant is a palindromic number.

4. Since, 111113 × 111113 = 12346098769 and 311111 × 311111 = 96790054321

Thus, the given pattern fails here.

And we cannot find a series of squares in which the given pattern continues, because the pattern discontinues after some steps. Let us take another similar series which continue the pattern for some steps and then fails.

12 × 12 = 144

112 × 112 = 12544

1112 × 1112 = 1236544

11112 ×11112 = 123476544

.

.

.

111111112 × 111111112 = 12345679209876544

And 21 × 21 = 441

211 × 211 = 44521

2111 × 2111 = 4456321

21111 × 21111 = 445674321

.

.

.

211111111 × 211111111

= 44,56,79,01,18,76,54,321

5. In the given pattern, each number is a palindrome. Also, the sum of any three palindromic number is same as sum of any another three palindromic number. Some other such patterns are:

(*i*) 1001 + 5665 + 4774 = 3443 + 2002 + 5995

(*ii*) 181 + 727 + 757 = 353 + 383 + 929

6. Let us proceed to reach the Kaprekar constant taking the given number 3444 as follows:

Step 1: 4443 – 3444 = 0999

Step 2: 9990 – 0999 = 8991

Step 3: 9981 – 1899 = 8082

Step 4: 8820 – 0288 = 8532

Step 5: 8532 – 2358 = 6174 (Kaprekar constant)

Thus, we can find a Kaprekar constant for 4-digit number 3444 and it takes 5 steps to reach the constant.

But we cannot find the Kaprekar constant for the number 2222 because all digits are same and after subtracting the lowest number 2222 from the highest number 2222, we get 0.

7. In Collatz conjecture, choose a number. If number is odd, multiply it by 3 and add 1 to it and if number is even divide it by 2, repeat the process till you get the resultant 4 - 2 - 1.

Let us find the Collatz conjecture for the number 29:

29 → 88 → 44 → 22 → 11 → 34 → 17 → 52 → 26 → 13 → 40 → 20 → 10 → 5 → 16 → 8 → 4 → 2 → 1.

Mental Maths (Page 101)

1. The smallest 3-digit number for digit sum 14 = 149

The greatest 3-digit number for digit sum 14 = 950

2. A four numbers in a table is as follows:

3333	2222	4445	4500

In the above table, second smallest number is 3333, its adjacent cell number is smaller than 3333. So, the cell 3333 becomes the supercell.

3. The 2-digit palindromic numbers are 11, 22, 33, 44, 55, 66, 77, 88, 99. So, the total 2-digit palindromic numbers are 9.

4. Yes, let us take two 4-digit number 4005 and 3950. Then, the difference is 4005 – 3950 = 55, which is a 2-digit palindromic number.

5. Yes, we can write 86400 as an addition using the numbers 30000, 3000 and 300 as follows:

86400 = 30000 + 30000 + 3000 + 3000 + 3000 + 3000 + 3000 + 3000 + 3000 + 3000 + 300 + 300 + 300 + 300 + 300 + 300 + 300 + 300

= 2 × 30000 + 8 × 3000 + 8 × 300

Brain Sizzlers (Page 102)

1. In the given diagram, we can see that every digit end at 1 which seems like a collatz conjecture. So let us check one of the series whether it is Collatz conjecture or not.

Let's start with 21, then we get

21 → 64 → 32 → 16 → 8 → 4 → 2 → 1

Thus, we get a Collatz conjecture.

2. The number of steps to reach 1 for the number 3 using Collatz conjecture is as follows:

$3 \rightarrow 10 \rightarrow 5 \rightarrow 16 \rightarrow 8 \rightarrow 4 \rightarrow 2 \rightarrow 1$

Thus, it takes 7 actual steps to reach 1.

3. The number of steps to reach 1 for the number 18 using Collatz conjecture is as follows:

$18 \rightarrow 9 \rightarrow 28 \rightarrow 14 \rightarrow 7 \rightarrow 22 \rightarrow 11 \rightarrow 34 \rightarrow 17 \rightarrow 52 \rightarrow 26 \rightarrow 13 \rightarrow 40 \rightarrow 20 \rightarrow 10 \rightarrow 5 \rightarrow 16 \rightarrow 8 \rightarrow 4 \rightarrow 2 \rightarrow 1.$

Thus, Nikhil takes 20 actual steps to reach 1.

4. Let Sunita starts with number 13 (i.e. between 10 and 20) and Lalita starts with number 21 (i.e. between 20 and 30), the steps to reach 1 using Collatz conjecture are as follows:

$13 \rightarrow 40 \rightarrow 20 \rightarrow 10 \rightarrow 5 \rightarrow 16 \rightarrow 8 \rightarrow 4 \rightarrow 2 \rightarrow 1$

And $21 \rightarrow 64 \rightarrow 32 \rightarrow 16 \rightarrow 8 \rightarrow 4 \rightarrow 2 \rightarrow 1$

So, Lalita takes less number of steps to reach 1.

Now, if Sunita takes the number 17 and Lalita takes the number 23, then the Collatz conjecture is as follows.

$23 \rightarrow 70 \rightarrow 35 \rightarrow 106 \rightarrow 53 \rightarrow 160 \rightarrow 80 \rightarrow 40 \rightarrow 20 \rightarrow 10 \rightarrow 5 \rightarrow 16 \rightarrow 8 \rightarrow 4 \rightarrow 2 \rightarrow 1$

And $17 \rightarrow 52 \rightarrow 26 \rightarrow 13 \rightarrow 40 \rightarrow 20 \rightarrow 10 \rightarrow 5 \rightarrow 16 \rightarrow 8 \rightarrow 4 \rightarrow 2 \rightarrow 1.$

So, Sunita takes 12 steps, while Lalita takes 15 steps to reach 1.

Thus, Sunita takes less number of steps to reach one.

∴ It will depend on the number they choose that who will take less steps to reach 1.

CHAPTER 4 : DATA HANDLING AND PRESENTATION

Let's Recall

The data of the given blood groups is given in the following table:

Blood Group	O^+	O^-	A^+	A^-	B^+	B^-	AB^+	AB^-
Number of Students	11	8	10	10	7	8	1	5

1. The maximum number of students have blood group O^+.
2. The minimum number of students have blood group AB^+.
3. From the table, we can see that 8 students have blood group B^-.

Maths Connect (Page 105)

The Complete table which shows the performance of top five countries in Paris Olympics is as follows:

Countries	Medals			To
	Gold	Silver	Bronze	
United States of America	40	44	42	126
People's Republic of China	40	27	24	91
Japan	20	12	13	45
Australia	18	19	16	53
France	16	26	22	64

1. Japan and Australia won less than 20 bronze medals, i.e. 13 and 16 respectively.
2. The least number of silver medal was won by Japan i.e., 12.
3. France won the total 64 medals which is the third highest medals.
4. Gold medal won by USA = 40

Gold medal won by China = 40

Gold medal won by Japan = 20

∴ Total gold medals of top 3 countries = 40 + 40 + 20

= 100

Practice Time 4A

1. (*a*) The table for the given collected data using tally marks is as follows:

Ice cream flavours	Tally marks	Number of children (frequency)
Vanilla	𝍸 |	6
Chocolate	𝍸 ||||	9
Strawberry	||||	4
Mango	𝍸 |	6
Total		**25**

(*b*) Most number of children prefer Chocolate flavored ice cream.

2. The frequency distribution table for the given data is as follows:

Observations (Shoe size)	Tally marks	Number of children (frequency)
4	卌 ||	7
5	卌 |||	8
6	||||	4
7	卌 ||	7
8	||||	4
Total		**30**

From the above table, the most frequent shoe size is 5.

3. The frequency distribution table using tally marks for the given data is as follows:

Family size	Tally marks	Number of families (frequency)
1	卌 |	6
2	卌 ||||	9
3	卌	5
4	|||	3
6	||	2
Total		**25**

(*a*) The smallest family size is 1.

(*b*) 6 families have only 1 member in their family. Thus, the families of smallest size are 6.

(*c*) Since, 9 families have family size 2. So, the most common family size is 2.

4. The frequency table of the marks of Mathematics test for the given data is as follows:

Marks	Tally marks	Number of students (frequency)
60	卌	5
65	|||	3
70	卌 |	6
80	卌	5
85	||	2
90	|||	3
100	|	1
Total		**25**

(*a*) The maximum marks obtained by the students is 100.

(*b*) 5 students scored 60 marks, 3 students scored 65 marks and 6 students scored 70 marks. Thus, total number of students scored less than 75 marks = Number of students scored 60 marks + Number of students scored 65 marks + Number of students scored 70 marks = (5 + 3 + 6) students = 14 students

(*c*) 5 students scored 80 marks, 2 students scored 85 marks, 3 students scored 90 marks and 1 student scored 100 marks.

∴ Total number of students scored 80 marks and above = Students scored (80 marks + 85 marks + 90 marks + 100 marks) = (5 + 2 + 3 + 1) students = 11 students

(*d*) Total number of students = (5 + 3 + 6 + 5 + 2 + 3 + 1) students = 25 students

Practice Time 4B

1. (*a*) Since, 1  = 20 stamps and Shahid has total 5  .

∴ Total number of stamps of Shahid = 5 × 20 stamps = 100 stamps

(*b*) From the pictograph, we can see that Jaya has maximum number of stamps as she has maximum  .

(*c*) Total number of  collected by 5 friends = 32

∴ Total number of stamps collected by 5 friends = 32 × 20 stamps = 640 stamps.

2. (*a*) From the pictograph, we can see that the least number of cars were produced in 2021, because there are only 2  and 1  .

Also since, 1  = 4000 cars and 1  = 2000 cars.

Therefore, total cars in 2021 = 2 × 4000 cars + 1 × 2000 cars = 10,000 cars (*b*) In 2023, the number of  is maximum, so the most cars produced in 2023.

(*c*) In 2024, there are total 6  and since, 1  = 4000 cars.

∴ Total cars produced in 2024 = 6 × 4000 cars = 24000 cars

(*d*) From 2021 to 2024, total number of cars produced = 22  + 2 

= 22 × 4000 cars + 2 × 2000 cars = 92000 cars.

3. (*a*) From the pictograph, Joseph has maximum number of baskets as he has 9  and 1 

(*b*) Namita sold 4  and 1 .

Since, 1  = 100 fruit baskets and 1  = 50 fruit baskets.

∴ Total baskets sold by Namita = 4 × 100 fruit baskets + 1 × 50 fruit baskets = 450 fruit baskets.

(*c*) Fruit baskets sold by Ranjit = 7 

= 7 × 100 fruit baskets = 700 fruit baskets

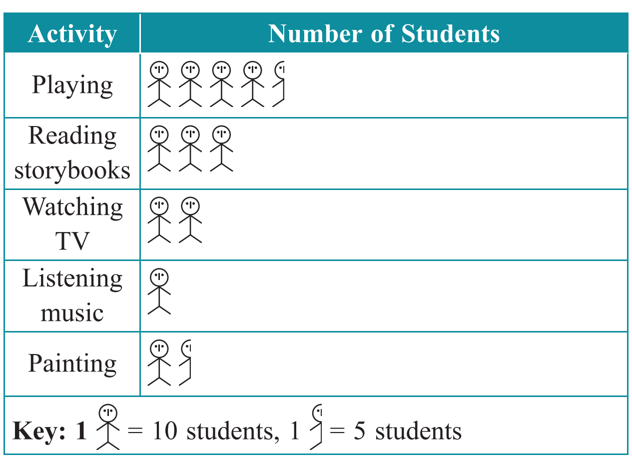
Fruit baskets sold by Joseph = 9  + 1 

= 9 × 100 fruit baskets + 1 × 50 fruit baskets = 950 fruit baskets.

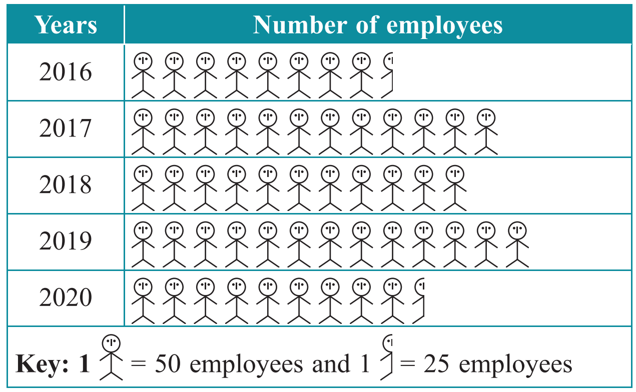
Fruit basket sold by Rahim = 8  = 8 × 100 fruit baskets = 800 fruit baskets.

Thus, Ranjit, Joseph and Rahim sold 600 or more fruit baskets in the particular session.

4. The pictograph for the given students in a school is as follows:



5. The pictograph to represent the given employee data is as follows:



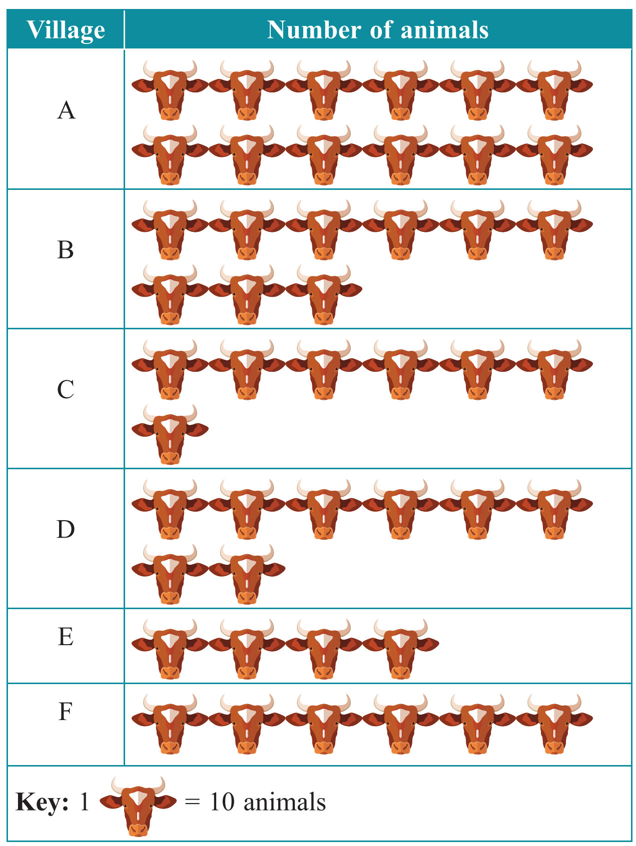
(*a*) From the given data, we can see that 2019 has the maximum number of employees i.e., 650.and to represent this number, we used 13 symbols of .

(*b*) Total symbols used to represent the total number of employees from 2016 to 2020

= Symbol in 2016 + Symbol in 2017 + Symbol in 2018 + Symbol in 2019 + Symbol in 2020

= 53 full symbols + 2 half symbols

6. The pictograph represents the total number of animals of six villages where 1  = 10 animals is as follows:



(*a*) Since village C has 70 animals and 1  = 10 animals .

So, total symbols used to represent animals in village $C = \frac{70}{10} = 7$.

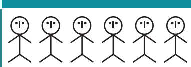
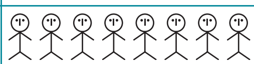
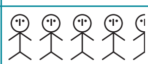
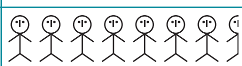
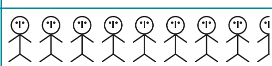
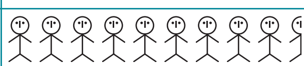
(*b*) Village B has 90 animals while village C has 70 animals.

Thus, Village B has more animals than village C.

7. The pictograph about the colours of scooties riding in a street on a particular day is as follows:

Colour of scooty	Number of employees
Black	
White	
Red	
Pink	
Green	
Key: 1  = 4 scooties	

8. (*a*) The pictograph that represents the number of students in a school with one symbol = 100 students is as follows:

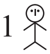
Years	Number of students
2014	
2016	
2018	
2020	
2022	
2024	
Key: 1  = 100 students and 1  = 50 students	

(*i*) Total number of students in the year 2022 = 850

Since, 1  = 100 students,

Therefore, total symbols that represent the number of students in the year $2022 = \frac{850}{100} = 8\frac{1}{2}$

(*ii*) Total number of students in the year 2016 = 800

Since, 1  = 100 students,

Therefore, total symbols that represent the number of students in the year $2016 = \frac{800}{100} = 8$

(*b*)

Years	Number of students
2014	
2016	
2018	
2020	
2022	
2024	
Key: 1  = 50 students	

The second pictograph seems more informative as it is more precise to the actual number of students.

Think and Answer (Page 120)

1. Since, LPG used in 40 houses. Thus, the maximum houses used LPG as a fuel.
2. Since, Kerosene used in 5 houses only. Thus, the minimum houses used Kerosene as a fuel.
3. The coal is used by 10 houses as a fuel given in a bar graph.
4. If the total number of houses in the town is 1 lakh, then 100 houses = 1 lakh

$\Rightarrow$ 1 houses = 1000

Now in the given bar graph, the number of houses using electricity as a fuel = 25

Then, the number of houses using electricity as a fuel = 25 × 1000 = 25000.

Practice Time 4C

1. (*a*) From the bar graph, the maximum number of tickets sold = 100, which is sold for Delhi.

(*b*) The minimum number of tickets sold for Chennai i.e., 30.

(*c*) From the bar graph, Tickets sold for Patna = 70,

Tickets sold for Jaipur = 50,

Tickets sold for Delhi = 100,

Tickets sold for Guwahati = 40

Thus, for Patna, Jaipur, Delhi and Guwahati the number of tickets sold is more than 30 tickets.

(*d*) Total number of tickets sold for Delhi = 100,
Total number of tickets sold for Jaipur = 50
Total number of tickets sold for Patna = 70,
Total number of tickets sold for Chennai = 30
∴ Total number of tickets sold for Delhi and Jaipur = 100 + 50 = 150
∴ Total number of tickets sold for Patna and Chennai = 70 + 30 = 100
So, Difference = 150 – 100 = 50
Thus, number of tickets sold for Delhi and Jaipur together exceeds the total number of tickets sold for Patna and Chennai by 50.

(*e*) Total number of tickets sold = Ticket sold for Delhi + Ticket sold for Jaipur + Ticket sold for Patna + Ticket sold for Chennai + Ticket sold for Guwahati = 100 + 50 + 70 + 30 + 40 = 290

2. (*a*) From the bar graph, total number of students with favourite free-time dancing = 175,
Total number of students with favourite free-time drawing = 150,
Total number of students with favourite free-time playing sports = 125,
Total number of students with favourite free-time watching TV = 125
Total number of students with favourite free-time playing indoor games = 75
Total number of students with favourite free-time reading books = 50
Thus, Total students who were surveyed = 175 + 150 + 125 + 125 + 75 + 50 = 700

(*b*) From the bar graph, total number of students preferred playing indoor games = 75

(*c*) Only 50 students prefer reading books, so the least number of students prefer reading book.

(*d*) Total students surveyed = 700
Number of students like to play games = playing sports + playing indoor games = 125 + 75 = 200
∴ Number of students who do not like to play any games = 700 – 200 = 500

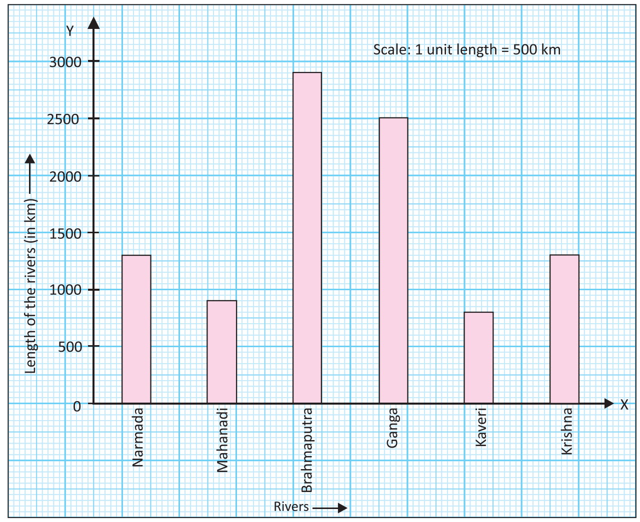
3. (*a*) From the bargraph the longest length of National highway = 1500 km, which is the length of NH2.
Thus, the longest National Highway is NH2.

(*b*) The shortest length of National highway = 400 km, which is the length of NH10.
Thus, the shortest National Highway is NH10.

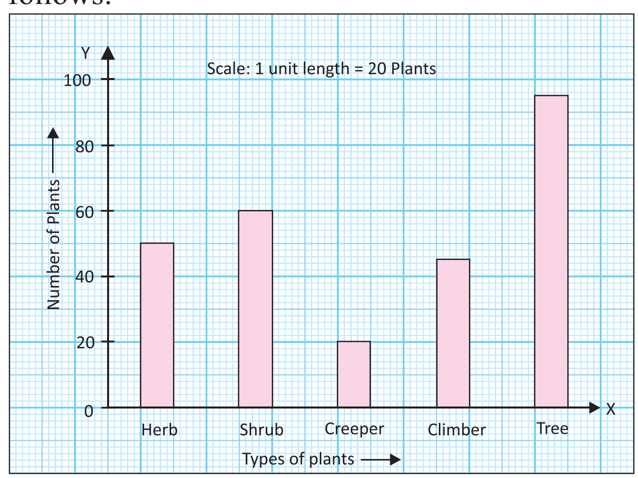
(*c*) From the bar graph, the length of National highway 9 is 1400 km.

(*d*) The length of National highway 10 = 400 km and the length of National highway 3 = 1200 km.
Since, 1200 = 3 × 400. Thus, the length of NH 3 is three time the length of NH10.

4. The bar graph that represents the length of some major rivers of India is as follows:



5. The bar graph that represents the number of different types of plants using the given data is as follows:



(*a*) From the graph, the maximum number of plants is 95, which are trees.
Thus, trees are maximum in number in the garden.

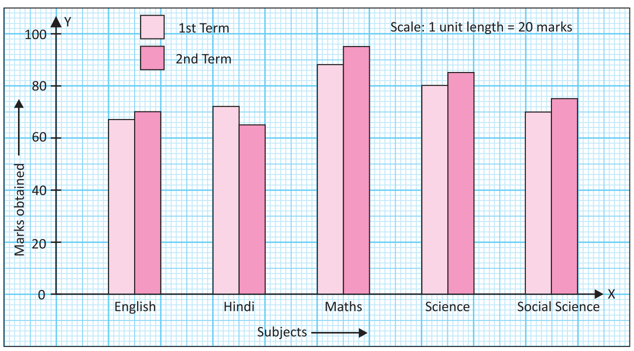
(*b*) The minimum number of plants is 20, which is creeper. Thus, creepers are minimum in number in the garden.

6. (*a*) In double bar graph, the *x*-axis represents the students of the class and the *y*-axis represents the marks of quarterly test and half yearly test. Thus, the data of the double bar graph in table form is as follows:

Students	Marks obtained in quarterly test	Marks obtained in half yearly test
Ashish	10	15
Arun	15	18
Kavish	13	16
Maya	20	22
Rita	8	15

(*b*) Yes, the new teaching technique should be continued because the performance of all the listed students are improving.

7. The double bar graph for the given data with scale: 1 unit = 20 marks is as follows:



(*a*) In English, improved marks of student = 2nd term – 1st term = 70 – 67 = 3

In Maths, improved marks of student = 2nd term – 1st term = 95 – 88 = 7

In Science, improved marks of student = 2nd term – 1st term = 85 – 80 = 5

In Social Science, improved marks of student = 2nd term – 1st term = 75 – 70 = 5. Thus, in Maths, the student has improved the most.

(*b*) From the above bar graph, the improvement of marks in English is 3, which is the least. Thus, the student has improved the least in English.

(*c*) Yes. In Hindi, the marks of 2nd term is less than the 1st term. Thus, the performance has deteriorated in Hindi.

Mental Maths (Page 129)

1. From the bar graph, the number of ants = 80. Thus, Reena saw 80 ants in the park.
2. Total number of butterflies = 10, which is the least in the given bar graph. Thus, the least seen insects were butterflies.
3. From the bar graph, the grasshoppers were seen by Reena = 14
4. Total number of insects in the park = Number of (Butterflies + Grasshoppers + Ladybugs + Dragonflies + Ants + Bees) = 10 + 14 + 30 + 40 + 80 + 38 = 212

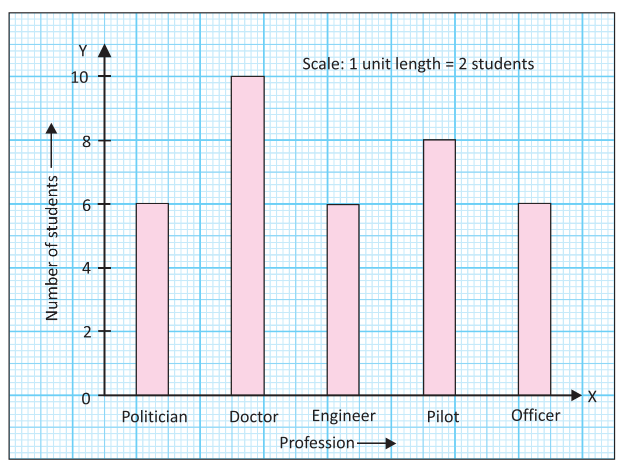
Brain Sizzlers (Page 130)

The representation of the given data using tally marks is as follows:

Profession	Tally marks	Frequency (Number of students)
Politician	~~||||~~ |	6
Doctor	~~||||~~ ~~||||~~	10
Engineer	~~||||~~ |	6
Pilot	~~||||~~ |||	8
Officer	~~||||~~ |	6
Total		**36**

Now the pictograph and bar graph for the above frequency table is as follows:

Profession	Number of students
Politician	☺☺☺☺☺☺
Doctor	☺☺☺☺☺☺☺☺☺☺
Engineer	☺☺☺☺☺☺
Pilot	☺☺☺☺☺☺☺☺
Officer	☺☺☺☺☺☺
Keys: 1 ☺ = 1 student	



Chapter Assessment

A.

1. Using tally marks, number 8 can be written as 𝍸 |||. Hence, the correct answer is option (*d*).
2. The marks more than or equal to 5 are 5, 6, 7, 8, 9 and 10 and the number of students who got more than or equal to 5 marks are 17.
   Hence, the correct answer is option (*d*).
3. The number of students who scored marks less than 4 are 10.
   Hence, the correct answer is option (*d*).
4. Since, 1  = 20 flowers
   Therefore,  = 3 × 20 flowers = 60 flowers.
   Hence, the correct answer is option (*c*).
5. Since, 1  = 30 shells
   Then, 3.5 × 1  = 3.5 × 30 shells = 105 shells
   That is,  = 105 shells.
   Hence, the correct answer is option (*d*).

B.

1. Data obtained in its original form is called **raw** data.
2. The number of times a particular observation occurs in a data is called **frequency** of the observation.
3. An observation occurring 9 times in a data is represented as 𝍸 |||| using tally marks.
4. Arranging the data in the form of table using tally marks is called **frequency distribution table**.
5. A representation of data using pictures or symbols of objects is called a **pictograph**.

C.

1. Since, Pictographs and bar graphs are pictorial representations of the numerical data.
   Thus, the given statement is **true**.
2. There are two types of bar graph, one is drawn horizontally and one is drawn vertically. So, we can draw the bars of uniform width vertically or horizontally. Thus, this statement is **false**.
3. Using tally marks, observation which occurs five times in a data is represented as 𝍸. Thus, this statement is **false**.
4. In a bar graph, each bar represents only one value of its corresponding frequency. Thus, this statement is true.
5. Using a bar graph, a more practical approach might be to use a larger scale.
   For instance, 1unit length could represent 100, 1000, or even 10000 people, depending on the range of the populations, this method would make the graph more manageable and easier to interpret, especially if the populations are large.
   But if we take 1 unit length to represent one person then for the large data, the graph become so large and critical and difficult to draw.
   So, this statement is false.

D.

1. The tabular form of the given data using tally marks is as follows:

Marks obtained	Tally marks	Number of students
10	|	1
15	||	2
19	𝍸	5
20	||||	4
24	𝍸 |	6
25	𝍸 |	6
30	𝍸 |	6
Total		**30**

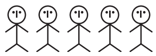
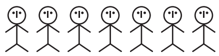
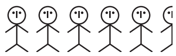
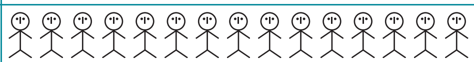
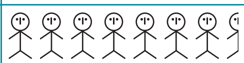
(*a*) From the above table, the number of students who scored more marks than 25 is 6.

(*b*) Since passing marks is 20. Thus, the students who got equal or more marks than 20 will pass the exam.

∴ Number of students who passed the test = students who scored 20 marks + students who scored 24 marks + students who scored 25 marks + students who scored 30 marks = (4 + 6 + 6 + 6) students = 22 students

(*c*) The marks scored by students between 15 and 30 are 19, 20, 24 and 25.
Thus, the total number of students who scored marks between 15 and 30 = (5 + 4 + 6 + 6) students = 21 students

2. Pictograph to represent the given data is as follows:

Modes of transport	Number of students
Car	
Cycle	
Private Van	
School Bus	
Walking	
Key: 1 = 50 students and 1 = 25 students	

3. (*a*) From the given pictograph, area of Koria district = 6 , and 1 = 1000 sq. km

Thus, the area of Koria district = 6 × 1000 sq. km = 6000 sq. km

(*b*) From the pictograph, the area of both Raigarh and Jashpur = 6 and 1 .

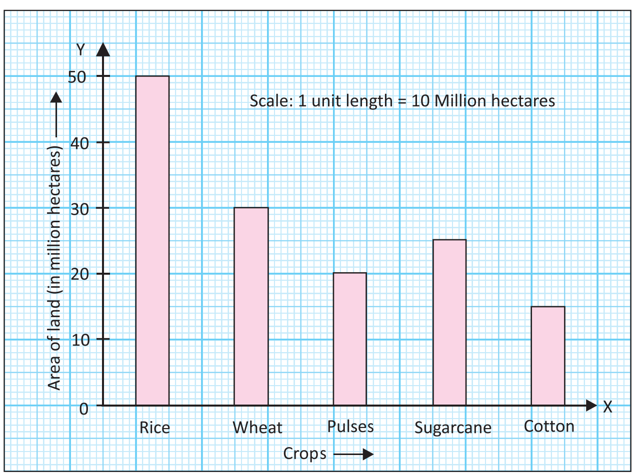
Thus, both Raigarh and Jashpur district have same area.

(*c*) Since, 1 = 1000 sq. km

Then, 5 = 5 × 1000 sq. km = 5000 sq. km

So, if any district have more than 5 , then that district have an area more than 5000 sq. km. From the pictograph, we can see that the district which have an area more than 5000 sq. km are Raigarh, Rajnandgaon, Koria and Jashpur. Thus, 4 district have an area more than 5000 sq. km

4. To draw the bar graph of the given area of land at the particular region, let us choose the scale: 1unit length = 10 million hectares, the bar graph is as follows:



5. From the bar graph, the number of motorcycle sold by dealer I in first 6 months = 8 + 12 + 6 + 3 + 6 + 18 = 53.

And the number of motorcycle sold by dealer II in first 6 months = 9 + 16 + 10 + 5 + 12 + 4 = 56

Difference between the number of motorcycle sold by dealer I and dealer II in first 6 months = 56 – 53 = 3. Thus dealer II sold 3 more bikes than dealer I.

Also, Cost of 1 motorcycle = ₹55,000

Thus, Cost of 3 motorcycle = 3 × ₹55,000 = ₹1,65,000

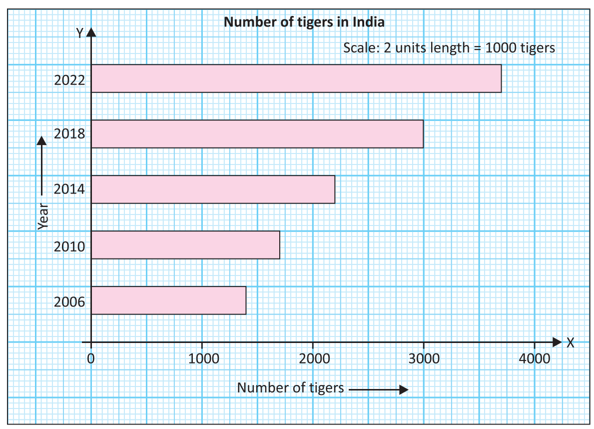
Hence, Dealer II get ₹1,65,000 more than dealer I.

6. (*a*) In the year 2006, the number of tigers in the table is 1411, and its estimated value is 1400, but the given bar graph shows the number of tigers in 2006 is 700.

Similarly, other mistakes are listed in the table below:

Years	Estimated value of tigers to the nearest hundred	Number of tigers given in bar graph
2006	1400	700
2010	1700	1500
2014	2200	2750
2018	3000	2250
2022	3700	3700

So, we will draw the correct bar graph using the estimated value of tigers.



(*b*) Growth from 2006 to 2010 = 1706 – 1411 = 295

Growth from 2010 to 2014 = 2226 – 1706 = 520

Growth from 2014 to 2018 = 2967 – 2226 = 741

Growth from 2018 to 2022 = 3682 – 2967 = 715

Thus, the maximum growth in the number of tigers is in 2014-2018.

(*c*) Population of tigers in 2006 = 1411

Population of tigers in 2022 = 3682

Since, the population of tigers in 2022 is approximately more than 2 and half times the population of tigers in 2006. Thus, the population is increased by approximately 2 and half times from 2006 to 2022.

7. Base price of October month = 7195 (i.e. on 15 October 2024)

Difference between the price of 15 October and 11 October = 7195 – 7195 = 0

Difference between the price of 15 October and 14 October = 7220 – 7195 = 25

Difference between the price of 15 October and 16 October = 7240 – 7195 = 45

Difference between the price of 15 October and 17 October = 7260 – 7195 = 65

Difference between the price of 15 October and 19 October = 7380 – 7195 = 185

So, the maximum and the minimum difference in prices are 185 and 0 respectively.

Thus, on 19 October 2024, the variation from the base price is maximum and on 11 October 2024, the variation from the base price is minimum.

Unit Test – 2

A.

1. Using the tally marks, number nine is represented as 卌 ||||.

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

2. Marks more than or equal to 16 are 16, 17, 18, 19 and 20. Thus, the number of students who obtained marks from 16 to 20 is 10.

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

3. A palindromic number remains same when we read it from backward or forward direction.

Since, number 828, 727 and 121 are same from backward and forward direction, but 984 is not same. Thus, 984 is not a palindromic number.

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

4. The smallest number using the digits 4,9,3,2 and 1 is 12349, which is a 5-digit number. To make it smallest 8-digit number, we write the smallest digit i.e., 1 three times to the left side of the number 12349, we get 11112349.

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

5. The greatest 6-digit number is 999999.

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

6. The graphical representation of a given data using rectangular bars of equal width and varying heights is called bar graph.

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

7. Since, weather reports for different cities telecast on television contain information arranged and organized on the basis of some definite plan. Thus, it is an example of secondary data.

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

8. Since 3 + 4 + 6 + 2 = 15, so 3462 is the number whose digits add up to 15.

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

9. In the number 548, the unit digit is 8 (> 5). So to round off the given number to the nearest tens place, we round up the tens place by 1, i.e., 4 become 5 and the digit at unit place becomes 0.

∴ 548 ≈ 550

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

10. First we round off the numbers 968 and 377 to nearest hundred. In number 968, the tens digit is 6 (> 5) and in number 377, the tens digit is 7 (> 5), thus to round off the digits to nearest hundred, round up each number by 1, i.e., 9 become 10 and 3 become 4 and the digits at tens and ones place become 0.

∴ 968 ≈ 1000 and 377 ≈ 400.

Now, 968 × 377 ≈ 1000 × 400 = 400000

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

B.

1. Since 99, 99,999 + 1 = 1,00,00,000.

Thus, by adding 1 to the greatest **seven**-digit number, we get 1 crore.

2. If we interchange the digits at the tens and hundreds place of the number 72984, we get 72894.

∴ Difference = 72984 – 72894 = **90**.

3. The number of times a particular observation occurs in a data is called the **frequency** of that observation.

4. A pictograph is the **pictorial** representation of data.

5. Since, the date collected from the survey is unmodified, so it is called **primary** data.

C.

1. Since, a palindromic number remains same when it reads from backward or forward direction. So, the number 629 is not a palindromic number. Thus, the given statement is **true**.
2. In the number 3726, the digit at tens place is 2 (< 5). So, to round off it to the nearest hundreds place, we leave the hundreds place digit as it is and the digits at tens and units place become 0.

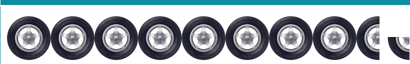
∴ 3726 ≈ 3700. Thus, the given statement is **true**.

3. As the frequency increases, the height of the bar increases and vice-versa. So, the height of each bar cannot be same. Thus, the given statement is **false**.
4. In a bar graph, bars of uniform width can be drawn horizontally or vertically. Thus, the given statement is **false**.
5. The smallest 7-digit number = 10,00,000

So, 10,00,000 – 1 = 9,99,999, which is the largest 6-digit number. Thus, the given statement is **true**.

D.

1. The pictograph that represents the various mode of transport used by 1000 students is as follows:

Models of transport	Number of students
Cycle	
Private van	
School Bus	
Car	
Key: 1  = 40 students, 1  = 20 students and 1  = 10 students	

2. Let us take two 5-digit numbers 99999 and 87653.

∴ Difference = 99999 – 87653 = 12346, which is not a 3-digit number.

Thus, we do not always get a 3-digt number when a 5-digit number is subtracted from another 5-digit number.

3. (*a*) In the number 75, the unit digit is 5 (=5). Thus, to round off the given number to nearest 10, we round up the tens digit by 1 and the digit at ones place becomes 0.

∴ 75 ≈ 80

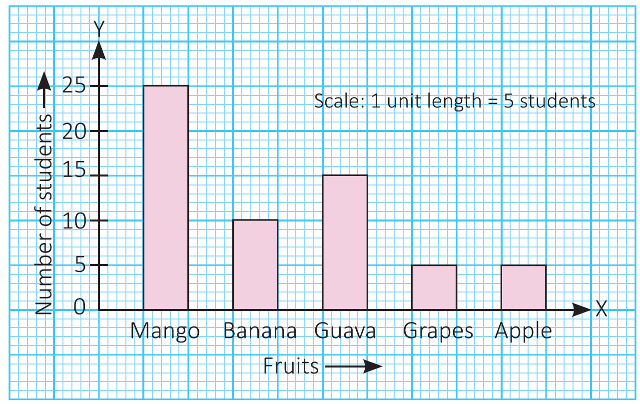
(*b*) In the number 194, the tens digit is 9 (> 5). Thus, to round off the given number to nearest 100, we round up the hundred digit by 1. So the digit at hundred place becomes 2 and the digits at tens and ones place become 0.

∴ 194 ≈ 200

(*c*) In the number 64289, the hundreds digit is 2 (< 5). Thus, to round off the given number to nearest 1000, we leave the thousand digit as it is and the digits at hundreds, tens and ones place become 0.

∴ 64289 ≈ 64000

4. The bar graph which shows the favourite fruit of students in a class is as follows:



5. (*a*) From the bar graph, total students who were surveyed = Students watching movies + students playing sports + students reading books + students listening music + students party with friends = 30 + 70 + 50 + 60 + 60 = 270

Thus, total 270 students were surveyed in all.

(*b*) From the bar graph, the number of students preferred reading books = 50

(*c*) Only 30 students prefer to watch movies. Thus, the least preferred activity is watching movies.

6. The data of marks obtained by 40 students in a unit test using tally marks is as follows:

Marks	Tally marks	Number of students
10	|	1
16	|	1
17	|	1
18	||	2
21	|	1
24	||	2

<table>
<tr><td>25</td><td>|</td><td>1</td></tr>
<tr><td>26</td><td>|||</td><td>3</td></tr>
<tr><td>28</td><td>|</td><td>1</td></tr>
<tr><td>29</td><td>||</td><td>2</td></tr>
<tr><td>32</td><td>|</td><td>1</td></tr>
<tr><td>35</td><td>|</td><td>1</td></tr>
<tr><td>36</td><td>|</td><td>1</td></tr>
<tr><td>37</td><td>|</td><td>1</td></tr>
<tr><td>38</td><td>||</td><td>2</td></tr>
<tr><td>39</td><td>|</td><td>1</td></tr>
<tr><td>40</td><td>卌 |</td><td>6</td></tr>
<tr><td>41</td><td>|</td><td>1</td></tr>
<tr><td>42</td><td>|</td><td>1</td></tr>
<tr><td>44</td><td>|</td><td>1</td></tr>
<tr><td>45</td><td>|||</td><td>3</td></tr>
<tr><td>46</td><td>|</td><td>1</td></tr>
<tr><td>48</td><td>|||</td><td>3</td></tr>
<tr><td>50</td><td>|</td><td>1</td></tr>
<tr><td>52</td><td>|</td><td>1</td></tr>
<tr><td>Total</td><td></td><td>40</td></tr>
</table>

(*a*) The marks scored by students more than 45 marks are 46, 48, 50 and 52.
Thus, the number of students who scored more than 45 marks = 1 + 3 + 1 + 1 = 6

(*b*) The marks scored by students between 20 and 50 are 21, 24, 25, 26, 28, 29, 32, 35, 36, 37, 38, 39, 40, 41, 42, 44, 45, 46 and 48.
Thus, the number of students who scored marks between 20 and 50 = 1 + 2 + 1 + 3 + 1 + 2 + 1 + 1 + 1 + 1 + 2 + 1 + 6 + 1 + 1 + 1 + 3 + 1 + 3 = 33.

7. Distance travelled by Ravi by walking from his home to take a bus to his office = 695 m
Distance travelled by bus = 3 km 125 m = 3000 m + 125 m = 3125 m
Distance travelled by walk from bus stand to reach office = 100 m

∴ Total distance travelled by Ravi from his home to office = 695 m + 3125 m + 100 m.
= 700 m + 3100 m + 100 m
= 3900 m ≈ 4 km [Rounding off the given number]
Thus, the estimated distanced from his home to office is approximately 4 km.

8. The smallest 8-digit number using the digits 1, 2, 5, 9, and 4 is 11112459.
And the largest 8-digit number using the digits 1, 2, 5, 9, and 4 is 99995421.
∴ Sum = 99995421 + 11112459 = 111107880
And difference = 99995421 – 11112459
= 88882962.

CHAPTER 5 : PRIME TIME

Let's Recall

1. 2, 4, 6, 8, 10, … is the series in which each element is the succeeding multiple of 2.
Since, the total number of pairs of shoes = 9
Thus, total number of shoes = 9 × 2 = 18
And, the total number of pairs of shocks = 14
Thus, total number of socks = 14 × 2 = 28

2. A spider has 8 legs and a deer has 4 legs.
Thus, the complete table is as follows:

No. of spiders	Legs	No. of deer	Legs
2	2 × 8 = 16	3	3 × 4 = 12
3	3 × 8 = 24	4	4 × 4 = 16
4	4 × 8 = 32	5	5 × 4 = 20
6	6 × 8 = 48	8	8 × 4 = 32
9	9 × 8 = 72	10	10 × 4 = 40

3.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

Quick Check (Page 139)

1. 8 × **4** = 32 **2.** 5 × **8** = 40
3. **4** × 6 = 24 **4.** **12** × 5 = 60

Practice Time 5A

1. (*a*) We know that 1 × 18 = 18, 2 × 9 = 18, 3 × 6 = 18.
Thus, 1, 2, 3, 6, 9 and 18 are the factors of 18.

(*b*) - (*c*) Same as part (*a*)

(*d*) Since, 1 × 135 = 135,
3 × 45 = 135,
5 × 27 = 135,
9 × 15 = 135.

Thus, 1, 3, 5, 9, 15, 27, 45 and 135 are the factors of 135.

2. (*a*) To find first five multiples of any number, we multiply that number by natural numbers 1, 2, 3, 4 and 5.

∴ 10 × 1 = 10,
10 × 2 = 20,
10 × 3 = 30,
10 × 4 = 40,
10 × 5 = 50

Thus, the first five multiples of 10 are 10, 20, 30, 40 and 50.

(*b*) - (*d*) Same as part (*a*)

3. (*a*) Since, 18 × 1 = 18
18 × 2 = 36,
18 × 3 = 54,
18 × 4 = 72,
18 × 5 = 90, …

Thus, multiples of 18 are 18, 36, 54, 72, 90, ...

(*a*) → (*ii*)

(*b*) Since 7 × 6 = 42. Thus, 7 is the factor of 42.
(*b*) → (*iv*)

(*c*) We know that 1 × 46 = 46, 2 × 23 = 46. So, 1, 2, 23 and 46 are all the factors of 46.
(*c*) → (*v*)

(*d*) Since, any number is the greatest factor of itself. So 30 is the greatest factor of 30.
(*d*) → (*iii*)

(*e*) Since, any number is the smallest multiple of itself. So, 24 is the smallest multiple of 24.
(*e*) → (*i*)

4. To find the multiples of 4 between 32 and 60, we multiply it by counting numbers 9, 10, ..., 14.

∴ 4 × 9 = 36, 4 × 10 = 40, 4 ×11 = 44,
4 × 12 = 48, 4 × 13 = 52, 4 × 14 = 56.

Thus, the multiples of 4 between 32 and 60 are 36, 40, 44, 48, 52 and 56.

5. (*a*) We know that 12 × 5 = 60 = 20 × 3
And 12 + 5 =17 and 20 – 3 = 17.

(*b*) We know that 4 × 6 = 24 = 12 × 2
and 4 + 6 = 10 = 12 – 3

Think and Answer (Page 142)

1. First time *Chole-Bhature* is said on number 6, then on number 12 and next on number 18. Thus, it follows the series 6, 12, 18, …. i.e., the multiples of 6.

So, the number at which *Chole-Bhature* is said for the 8th time = 8 × 6 = 48.

2. (*a*) Since, we say *Chole* at number 4 and *Bhature* at number 5. Thus to say *Chole-Bhature* together, we find the common multiple of 4 and 5.

Now, we know that 4 × 5 = 20 and 5 × 4 =20.

Thus, 20 is the common multiple of 4 and 5 at which we say *Chole-Bhature* together.

(*b*) - (*c*)Same as part (*a*)

3. Multiples of 6 are 6, 12, 18, **24**, 30, 36, 42, **48**, 54, 60, 66, **72**, 78, 84, 90, **96**, …

Multiples of 8 are 8, 16, **24**, 32, 40, **48**, 56, 64, **72**, 80, 88, **96**, …

Multiples of 12 are 12, **24**, 36, **48**, 60, **72**, 84, **96**, …

From these lists, we find that the common multiples of 6, 8 and 12 are 24, 48, 72, 96, ...

Thus, among the four options only (*a*) 96 is the common multiple of 6, 8 and 12.

Quick Check (Page 143)

Factors of 63 are 1, 3, 7, 9, 21, 63.

Factors of 112 are 1, 2, 4, 7, 8, 14, 16, 28, 56, and 112.

So, the common factors of 63 and 112 are 1 and 7.

Hence, the total number of common factors of 63 and 112 is two.

Practice Time 5B

1. (*a*) The numbers less than 40 which have the sum of digits 8 are 17, 26, 35. But 7 is not the factor of 17 and 26. Thus, the required number is 35.

(*b*) All multiples of 5, which are greater than 5 are 10, 15, 20, 25, 30, ...

From all these factors, the odd number and the factor of 30 is 15. Thus, the required number is 15.

(*c*) 90 is the only number less than 100 whose one digit is 9 more than the other and two of its factors are 3 and 5.

Thus, the required number is 90.

(*d*) Factors of 120 are 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 20, 24, 30, 40, 60, and 120. Out of them, multiples of 2 and 3 are 6, 12, 24, 30, 60 and 120.

Also, the multiples of 5 are 5, 10, 15, 20, 25, 30, ...

Thus, out of the numbers 6, 12, 24, 30, 60 and 120. 6 is the only number which is 1 away from the multiples of 5.

Thus, 6 is the required number.

2. To find the first five even multiples of 17, we multiply 17 by the first five even numbers.

That are, $17 \times 2 = 34$,

$17 \times 4 = 68$,

$17 \times 6 = 102$,

$17 \times 8 = 136$,

$17 \times 10 = 170$.

Thus, the first five even multiples of 17 are 34, 68, 102, 136 and 170.

3. (*a*) Multiples of 7 are 7, 14, 21, 28, 35, 42, 49, 56, 63, 70, 77, 84, …

Thus, the multiples of 7 from the given list are 7, 21, 63, 70 and 77.

(*b*) Similarly, the multiples of 12 are 12 and 36.

(*c*) Similarly, the multiples of 4 are 12, 36 and 80.

4. (*a*) Factors of 12 are 1, 2, 3, 4, 6 and 12.

∴ From the given list of numbers, the factor of 12 is 3.

(*b*) Same as part (*a*)

(*c*) Factors of 12 are 1, 2, 3, 4, 6 and 12 and factors of 15 are 1,3, 5, 15.

∴ The common factors of 12 and 15 are 1 and 3.

Thus, the common factor of 12 and 15 from the given list of numbers is 3.

(*d*) Even multiples of 3 are 6, 12, 18, 24, 30, ...

Thus, from the given list of numbers, even multiples of 3 are 24 and 30.

5.

1, 2, 3, 6, 8, 11, 12, 15, 18, 24, 30, 32, 35, 39

Even | Odd

6,12,18,24,30	2, 8, 32	15, 35	1, 3, 11,39
Multiples of 3	Not a multiples of 3	Multiples of 5	Not a multiples of 5

6. Both lights will flash together at the time which are common multiples of 8 and 12.

∵ Multiples of 8 are 8, 16, 24, 32, 40, 48 …. and multiples of 12 are 12, 24, 36, 48 …

∴ Common multiples of 8 and 12 are 24, 48, …

Thus, after 24 seconds both lights will flash together.

7. To buy the same number of breads and eggs, Namita has to find the common multiple of 20 and 12.

∵ Multiples of 12 are 12, 24, 36, 48, 60, … and multiples of 20 are 20, 40, 60, 80, …

∴ Common multiples of 12 and 20 are 60, 120, …

So, the same number of breads and eggs that were bought by Namita is 60.

Now since, $20 \times 3 = 60$ and $12 \times 5 = 60$

Thus, Namita bought 3 bread packs and 5 eggs tray.

8. (*a*) Smallest odd number is **1**.

(*b*) First 3 multiples of 12 are **12**, **24** and **36**.

(*c*) 12, 15, 21, 27 are the multiple of **3**.

(*d*) **2** is a factor of every even number.

(*e*) A number is a factor of another number if on dividing, the **remainder** is zero.

9. The complete multiplication grid is as follows:

×	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

(*a*) Multiples of 3 (colour yellow): 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 36, 42, 45, 48, 54, 60, 63, 72, 81, 90.

(*b*) Even numbers greater than 60 but less than 80 are 64, 70, 72 (mark circle).

(*c*) First 10 multiples of 7 are 7,14, 21, 28, 35, 42, 49, 56, 63, 70 (colour red).

(*d*) From the above table, we can see that 11 is not a factor of 54.

(*e*) Since $7 \times 5 = 35$, thus 7 is a factor of 35.

(*f*) Since $9 \times 3 = 27$, thus 9 is a factor of 27 but not multiple.

(*g*) First 8 multiples of 5 are 5, 10, 15, 20, 25, 30, 35, 40 (colour green).

(*h*) From the above table, we can see that common factor of 2 and 5 is only 1.

(*i*) From the above table, we can see that the common multiple of 7 and 8 is 56.

(*j*) Odd numbers more than 25 but less than 60 are 27, 35, 45, 49.

10. (*a*) Factors of 4 are 1, 2 and 4.

Factors of 8 are 1, 2, 4 and 8.

Factors of 12 are 1, 2, 3, 4, 6 and 12.

Thus, common factors of 4, 8 and 12 are 1, 2, and 4.

(*b*) Factors of 35 are 1, 5, 7 and 35.

Factors of 50 are 1, 2, 5, 10, 25 and 50.

Thus, the common factors of 35 and 50 are 1 and 5.

(*c*) Factors of 5 are 1 and 5.

Factors of 15 are 1, 3, 5 and 15.

Factors of 25 are 1, 5 and 25.

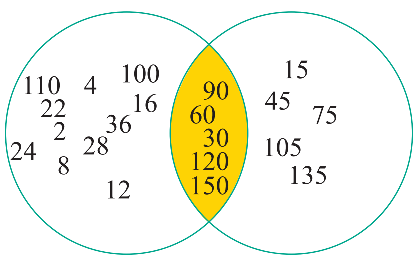
Thus, the common factors of 5, 15 and 25 are 1 and 5.

(*d*) Same as part (*b*)

11. (*a*) Even numbers are 2, 4, 6, 8, ….,16,…, 24, 26, 28, 30, ….60, …100,…

Multiples of 15 are 15, 30, 45, 60, ….

Thus, the numbers that are common in both are 30, 60, 90, ….



(*b*) Same as part (*a*)

12. Let us take two numbers 7 and 8. Their least common multiple (LCM) is 56, the first instance of '*Chole-Bhature*' after 50. Both numbers are under 10, satisfying the game's criteria. We can also take some other numbers such as 7 and 9; 8 and 9.

Quick Check (Page 147)

Prime numbers are 2, 3, 5, 7, 11, ….

Multiples of 5 are 5, 10, 15, 20, …

Since, 3 + 2 = 5, which is multiple of 5.

Also, 3 + 7 = 10, which is multiple of 5.

Thus, (2, 3), (3, 7), (7, 13) are few pairs whose sum is a multiple of 5.

Think and Answer (Page 148)

1. The smallest prime number is 2, which is an even number.

2. The smallest composite number is 4 as the factors of 4 are 1, 2 and 4, i.e., more than two factors and it is an even number.

3. The prime numbers which are less than 50 are 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43 and 47. Thus, there are total 15 prime numbers which are less than 50.

4. Let us take two numbers 6 and 9. Factors of 6 are 1, 2, 3 and 6 and factors of 9 are 1, 3 and 9.

So, number 6 has four factors while number 9 has three factors but 6 is less than 9. Thus, the given statement is not true.

Create and Solve (Page 148)

(*i*) Using prime numbers, we can complete it as:

2	3	7	42
7	11	2	154
13	3	5	195
182	99	70	

(*ii*) Using composite numbers, we can complete it as:

4	6	10	240
9	4	8	288
12	6	15	1080
432	144	1200	

Practice Time 5C

1. (*a*) If we divide any even number say 4 by 2, we get $\frac{4}{2} = 2$, which is an even number. Thus, given statement is false.

(*b*) Since 2 is the only prime number which is even. Thus, the given statement is true.

(*c*) True.

(*d*) 2 is an even number but the factors of 2 are 1 and 2. So, 2 is not a composite number but an even number. Thus, given statement is false.

(*e*) Let us take two prime numbers say 2 and 3. Their sum is 2 + 3 = 5, which is a prime number. Thus, given statement is false.

(*f*) Since all prime numbers are odd except 2, thus any prime number can never be end with 4. Thus, the given statement is true.

(*g*) The product of two primes can't be a prime because it violates the definition of the prime number as it will be divisible by the prime numbers which are multiplied rather than 1 and the number itself. So, the given statement is false.

(*h*) There are 1229 prime numbers between 1 and 10,000, which are finite. Thus, the given statement is false.

2. Prime numbers between 50 and 100 are 53, 59, 61, 67, 71, 73, 79, 83, 89, 97. So, there are total 10 prime numbers between 50 and 100.

3. (*a*) Factors of 9 are 1, 3 and 9 and factors of 16 are 1, 2, 4, 8 and 16. So, the only common factor of 9 and 16 is 1. Thus, 9 and 16 is a pair of co-primes.

(*b*) Same as part (*a*)

(*c*) Factors of 10 are 1, 2 and 5 and factors of 25 are 1, 5 and 25. So, the common factors of 10 and 25 are 1 and 5. Thus, 10 and 25 are not pairs of co-primes.

(*d*) Same as part (*a*)

4. We know that the pairs of primes with a difference of 2 are called twin primes. So, the pairs of twin primes from 1 to 100 are (3, 5), (5, 7), (11, 13), (17, 19), (29, 31), (41, 43), (59, 61), (71, 73).

5. We know that 2, 3, 5, 7, 11, 13, 17 and 19 are prime numbers less than 20.

Now, difference of 3 and 7 = 7 – 3 = 4, which is a multiple of 4.

Difference of 3 and 11 = 11 – 3 = 8, which is a multiple of 4.

Difference of 13 and 17 = 17 – 13 = 4, which is a multiple of 4. Thus, the required pairs are (3, 7), (3, 11), (13, 17). There can be some more pairs (5, 13), (5, 17), (7, 19), (11, 19), etc.

(Answer may vary)

6. (*a*) Since 3 + 3 + 7 = 13, which is a prime number. Also, 5 + 7 + 11= 23, which is also a prime number. Thus, we can express prime numbers as the sum of odd primes.

(*b*) The product of two primes can never be a prime because it violates the definition of the prime number as it will be divisible by the prime numbers which are multiplied rather than 1 and the number itself. So, prime numbers cannot be expressed as the product of two primes.

7. Using the technique of Sieve of Eratosthenes, we can find the prime numbers between 101 and 200 as: 103, 107, 109, 113, 127, 131, 137, 139, 149, 151, 157, 163, 167, 173, 179, 181, 191, 193, 197, 199.

8. 3-digit numbers formed by using each of the digits 2, 3 and 5 once are 235, 253, 352, 325, 523, 532. Out of them, there is only one prime number i.e., 523 as all others have a factor other than 1 and the number itself.t

Think and Answer (Page 150)

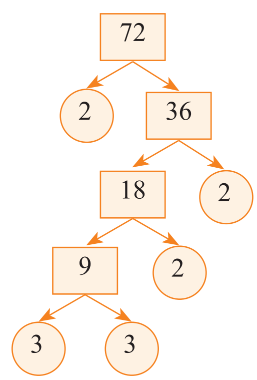
The first four different prime numbers are 2, 3, 5, and 7. On multiplying them, we get

$2 \times 3 \times 5 \times 7 = 210$. Thus, the smallest number having four different prime factors is 210.

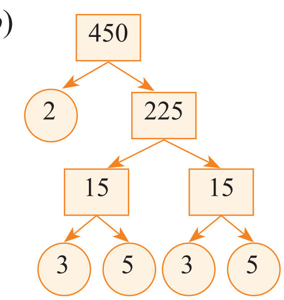
Practice Time 5D

1. The factor trees are as follows:

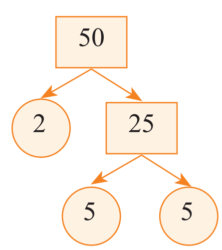
(*a*)



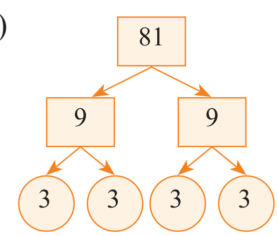
(*b*)



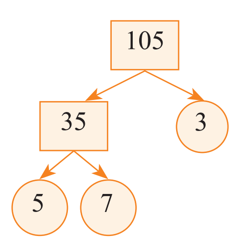
(*c*)



(*d*)

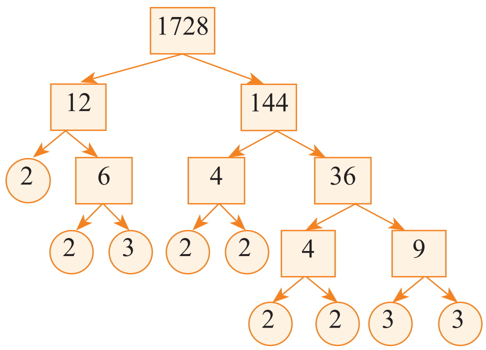


2. (*a*)



Thus, $105 = 3 \times 5 \times 7$.

(*b*)



Thus, $1728 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3$

(*c*) - (*d*) Same as part (*b*)

3. (*a*)

3	141
	47

$\therefore 141 = 3 \times 47$

(*b*)

2	1000
2	500
2	250
5	125
5	25
	5

$\therefore 1000 = 2 \times 2 \times 2 \times 5 \times 5 \times 5$

(*c*) - (*d*) Same as part (*b*)

4. (*a*) Since, the first three prime numbers are 2, 3, and 5.

$\therefore 2 \times 3 \times 5 = 30$

Thus, 30 is the smallest number which has three different prime factors.

(*b*) Since, the first five prime numbers are 2, 3, 5, 7 and 11.

$\therefore 2 \times 3 \times 5 \times 7 \times 11 = 2310.$

Thus, 2310 is the smallest number which has five different prime factors.

5. (*a*) Prime factorisation of $25 = 5 \times 5$.

Prime factorisation of $56 = 2 \times 2 \times 2 \times 7$

Since, the numbers 25 and 56 have no common prime factor, so only common factor is 1.

Hence, 25 and 56 are co-prime.

(*b*) Prime factorisation of $231 = 3 \times 7 \times 11$

Prime factorisation of $242 = 2 \times 11 \times 11$

Since, the numbers 231 and 242 have a common factor 11.

Hence, 231 and 242 are not co-prime.

(*c*) - (*d*) Same as part (*a*)

6. Let us take an example for each type of number.

Factors of 496 = 1, 2, 4, 8, 16, 31, 62, 124, 248, 496

Sum of all proper factors of $496 = 1 + 2 + 4 + 8 + 16 + 31 + 62 + 124 + 248 = 496$

Since, sum of all proper factors of 496 is equal to the number itself. So, 496 is a perfect number.

Now, factors of 18 = 1, 2, 3, 6, 9, 18

Sum of all proper factors of $18 = 1 + 2 + 3 + 6 + 9 = 21$

Since, sum of all proper factors of 18 is greater than itself. So, 18 is an abundant number.

Now, factors of 15 = 1, 3, 5, 15

Sum of all proper factors of $15 = 1 + 3 + 5 = 9$

Since, sum of all proper factors of 15 is less than the number itself. So, 15 is a deficient number.

7. Let us take a pair (1184, 1210).

Proper divisors of 1184 = 1, 2, 4, 8, 16, 32, 37, 74, 148, 296, 592.

Proper divisors of 1210 are 1, 2, 5, 10, 11, 22, 55, 110, 121, 242, 605.

Now, sum of proper divisors of $1184 = 1 + 2 + 4 + 8 + 16 + 32 + 37 + 74 + 148 + 296 + 592 = 1210$.

And sum of proper divisors of $1210 = 1 + 2 + 5 + 10 + 11 + 22 + 55 + 110 + 121 + 242 + 605 = 1184$.

Therefore, 1184 and 1210 is a pair of amicable numbers.

Think and Answer (Page 156)

Any number would be divisible by 4 if the number formed by its last two digits is divisible by 4. Using the given digits 1, 2, 3 and 4, a 4-digit number which is divisible by 4 can have 12, 24 or 32 at the last two digits.

Thus, the possible 4-digit numbers using the given digits are 3412, 4312, 1324, 3124, 1432 and 4132.

So, the smallest 4-digit number using the digits 1, 2, 3 and 4, divisible by 4 is 1324.

Practice Time 5E

1. (*a*) A number is divisible by 10 if its unit digit is 0. In the number 7345, unit digit is 5, so 7345 is not divisible by 10.

(*b*) In the number 8760, unit digit is 0, so it is divisible by 10.

(*c*) Same as part (*a*) (*d*) Same as part (*b*)

2. A number is divisible by 8 if the number formed by the last 3 digits is divisible by 8.

(*a*) In the number 7248882, the number form by the last 3 digits is 882, which is not divisible by 8. So, the number 7248882 is not divisible by 8.

(*b*) Same as part (*a*)

(*c*) In the number 92304, the number formed by the last 3 digits is 304, which is divisible by 8. So, the number 92304 is divisible by 8.

(*d*) Same as part (*c*).

3. Refer to the answer given in the book.

4. A number is divisible by 9 if the sum of its digits is divisible by 9.

(*a*) In the number 345672, the sum of digits = 3 + 4 + 5 + 6 + 7 + 2 = 27, which is divisible by 9. So, the number 345672 is divisible by 9.

(*b*) In the number 278901, the sum of digits = 2 + 7 + 8 + 9 + 0 + 1 = 27, which is divisible by 9. So, the number 278901 is divisible by 9.

(*c*) In the number 46938, the sum of digits = 4 + 6 + 9 + 3 + 8 = 30, which is not divisible by 9. So, the number 46938 is not divisible by 9.

(*d*) In the number 96435, the sum of digits = 9 + 6 + 4 + 3 + 5 = 27, which is divisible by 9. So, the number 96435 is divisible by 9.

5. (*a*) We know that if a number is divisible by both 2 and 3, then it is divisible by 6 also.
In the number 3409122, the unit digit is 2.
So, it is divisible by 2.
Now, the sum of the digits of 3409122 = 3 + 4 + 0 + 9 + 1 + 2 + 2 = 21, which is divisible by 3. So, the number 3409122 is divisible by 3.
Since, the number 3409122 is divisible by both 2 and 3. So, it is divisible by 6.

(*b*) In the number 17218, the unit digit is 8, so it is divisible by 2.
Now, the sum of the digits of 17218 = 1 + 7 + 2 + 1 + 8 = 19, which is not divisible by 3.
So, the number 17218 is not divisible by 3.
Since, the number 17218 is divisible by 2 but not by 3. So, it is not divisible by 6.

(*c*) We know that a number is divisible by 8 if the number formed by the last 3 digits is divisible by 8. In the number 11309634, the number formed by last 3 digits is 634, which is not divisible by 8, so the given number is not divisible by 8.

(*d*) In the number 515712, the number formed by the last 3 digits is 712, which is divisible by 8. So, the given number is divisible by 8.

(*e*) We know that a number is divisible by 4 if the number formed by the last 2 digits is divisible by 4. In the number 3501804, the number formed by last 2 digits is 04, which is divisible by 4, so the number 3501804 is divisible by 4.

(*f*) A number is divisible by 9 if the sum of its digits is divisible by 9. In the number 23456780, the sum of digits = 2 + 3 + 4 + 5 + 6 + 7 + 8 + 0 = 35, which is not divisible by 9. Thus, the number 23456780 is not divisible by 9.

6. We know that if a number is divisible by both 2 and 3, then it is divisible by 6 also.

(*a*) In the number 59730, the unit digit is 0.
So, it is divisible by 2.
Now, the sum of the digits of 59730 is 5 + 9 + 7 + 3 + 0 = 24, which is divisible by 3.
So, the number 59730 is divisible by 3.
Since, the number 59730 is divisible by both 2 and 3. So, it is divisible by 6.

(*b*) 18620 is divisible by 2 but not by 3, so it not divisible by 6.

(*c*) - (*d*) Same as part (*a*)

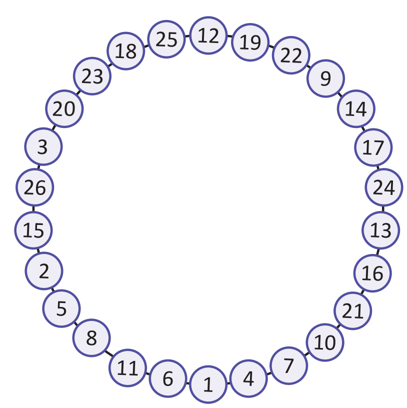
7. (*a*) 48 = 7 + 41 (*b*) 64 = 3 + 61
(*c*) 96 = 7 + 89 (Answer may vary)

8. (*a*) 27 = 3 + 5 + 19 (*b*) 41 = 3 + 7 + 31
(*c*) 63 = 3 + 7 + 53 (Answer may vary)

9. (*a*) 36 = 17 + 19, where 17 and 19 are twin primes.
(*b*) 84 = 41 + 43, where 41 and 43 are twin primes.

10. Let us take three 2-digit numbers that are 25, 26 and 31. Now, 25 = 2 + 23; 26 = 3 + 23; 31 = 7 + 11 + 13. Since, each number is written as the sum of two or more primes, thus they satisfy the Goldbach conjecture.

11. The required circle is as follows:



12. (*a*) Since, 202 – 2 × 3 = 196 and 19 – 2 × 6 = 7, which is divisible by 7, so the number 2023 is divisible by 7. (*a*) → (*iv*)

(*b*) In the number 24804, sum of digits = 2 + 4 + 8 + 4 = 18, which is divisible by 3. So, the number 24804 is divisible by 3. (*b*) → (*i*)

(*c*) In the number 12892, sum of digits at odd places – sum of digits at even places = (1 + 8 + 2) – (2 + 9) = 11 – 11 = 0. So, 12892 is divisible by 11. (*c*) → (*ii*)

(*d*) In the number 6016, the number formed by last three digits i.e., 016 is divisible by 8. So, the number is divisible by 8. (*d*) → (*iii*)

13. (*a*) 127 = 1 × 127. So, it is a prime number.

(*b*) 361 = 19 × 19. So, it has a factor other than 1 and itself. So, it is a composite number.

(*c*) 299 = 13 × 23. So, it has a factor other than 1 and itself. So, it is a composite number.

(*d*) 343 = 7 × 7 × 7. So, it has a factor other than 1 and itself. So, it is a composite number.

14. A number is divisible by 9 if the sum of its digits is divisible by 9. Now, sum of digits = 1 + 7 + 5 + 6 + * + 2 = 21 + *.

A number divisible by 9 and greater than 21 is 27, so, 21 + * = 27. Thus, * = 6

So, the number 175662 is divisible by 9.

15. Among any three consecutive number, there will always be atleast one even number, which is divisible by 2. Also, there will always be at atleast one number that is divisible by 3.

So, the product of three consecutive numbers is always divisible by both 2 and 3, then it is always divisible by 6. Let us take three consecutive number 21, 22 and 23 .

Product of 21, 22 and 23 = 21 × 22 × 23 = 10626, which is divisible by 6.

Thus, the given statement is true.

16. (*a*) Sum of digits at odd places – sum of digits at even places = (9 + * + 8) – (2 + 3 + 9)

= 17 + * – 14

= 3 + *

Since, the given number is divisible by 11, so 3 + * should be either 0 or multiple of 11.

Thus, if * = 8, then the number 928389 is divisible by 11.

(*b*) Sum of digit at odd places – sum of digits at even places

= (8 + 9 + 8) – (* + 4 + 9)

= 25 – * – 13 = 12 – *

Since, the given number is divisible by 11, so 12 – * should be either 0 or multiple of 11.

Thus, * = 1, then the number 819489 is divisible by 11.

Quick Check (Page 163)

1. (*a*) Factors of 16 are 1, 2, 4, 8 and 16.

Factors of 64 are 1, 2, 4, 8, 16, 32 and 64.

Factors of 88 are 1, 2, 4, 8, 11, 22, 44, and 88.

Common factors are 1, 2, 4 and 8 but 8 is the greatest among these common factors.

Hence, the HCF of 16, 64 and 88 is 8.

(*b*) Same as part (*a*)

2. (*a*) Two consecutive numbers: 4 and 5 (we can take some other numbers also)

Factors of 4 are 1, 2 and 4 and factors of 5 are 1 and 5. Common factor of 4 and 5 is 1.

So, the HCF is 1.

(*b*) Two consecutive even numbers: 8 and 10

Factors of 8 are 1, 2, 4 and 8 and factors of 10 are 1, 2, 5 and 10.

Common factors of 8 and 10 are 1 and 2.

So, the HCF is 2.

(*c*) Two consecutive odd numbers: 13 and 15

Factors of 13 are 1 and 13 and factors of 15 are 1, 3, 5 and 15.

Common factor of 13 and 15 is 1.

So, the HCF is 1.

Think and Answer (Page 165)

We know that the smallest 4-digit number is 1000. But it is not exactly divisible by 18, 24 and 32.

The least number exactly divisible by 18, 24 and 32 is their LCM.

By division method,

2	18, 24, 32
2	9, 12, 16
2	9, 6, 8
3	9, 3, 4
	3, 1, 4

Here, LCM of 18, 24 and 32 = 2 × 2 × 2 × 4 × 3 × 3

= 288.

Since it's not a 4-digit number, we need to find the multiple of 288, close to 1000.

Now,
```
          3
    288) 1000
         -864
         ----
          136
```
∴ Smallest 4-digit number exactly divisible by 288 is 1000 – 136 + 288 = 1152

Quick Check (Page 166)

1. Since 5 is a factor of 35, so the HCF of 5 and 35 is 5.

2. We know that the LCM of two co-primes is equal to their product. Since the number 6 and 25 are co-prime. Therefore, LCM of 6 and 25 is 150.

Practice Time 5F

1. (*a*)

2	18
3	9
	3

18 = 2 × 3 × 3

2	26
	13

26 = 2 × 13

2	72
2	36
2	18
3	9
	3

72 = 2 × 2 × 2 × 3 × 3

The common prime factor of 18, 26 and 72 is 2.
Thus, the HCF of 18, 26 and 72 is 2

(*b*)

2	118
	59

118 = 2 × 59

2	460
3	230
5	115
	23

460 = 2 × 2 × 5 × 23

Thus, HCF of 118 and 460 = 2

(*c*) Same as part (*a*)

2. (*a*) By long division method,
```
44) 144 (3
   -132
   ----
    12) 44 (3
       -36
       ---
        8) 12 (1
           -8
           --
           4) 8 (2
             -8
             --
              0
```
Since, 4 is the last divisor.
Thus, the HCF of 44 and 144 is 4.

(*b*) Same as part (*a*)

(*c*) First find the HCF of 40 and 56 by long division method,
```
40) 56 (1
   -40
   ---
   16) 40 (2
      -32
      ---
       8) 16 (2
         -16
         ---
           0
```
Here, the last divisor is 8.
So, next find the HCF of 8 and 17.
```
8) 17 (2
  -16
  ---
   1) 8 (8
     -8
     --
      0
```
Since the last divisor is 1.
So the HCF of 40, 56 and 17 is 1.

(*d*) Same as part (*c*).

3. (*a*)

2	28
2	14
	7

28 = 2 × 2 × 7

2	42
3	21
	7

42 = 2 × 3 × 7

Here, the factors 2, 3 and 7 occur maximum 2, 1 and 1 times respectively.
So, the LCM of 28 and 42 = 2 × 2 × 3 × 7 = 84

(*b*) - (*c*) Same as part (*a*)

4. (*a*) By division method,

3	30, 48, 120
2	10, 16, 40
5	5, 8, 20
2	1, 8, 4
2	1 4 2
	1, 2, 1

Now, find the product of all the divisors and the quotients (except 1) in the last row.
Thus, the LCM of 30, 48 and 120
= 3 × 2 × 5 × 2 × 2 × 2 = 240.

(*b*) - (*c*) Same as part (*a*)

5. To find the time when the traffic light will change again, we find the LCM of 48 seconds, 60 seconds and 72 seconds. By division method,

4	48, 60, 72
3	12, 15, 18
2	4, 5, 6
	2, 5, 3

Now, find the product of all the divisors and the quotients in the last row.

Thus, the LCM of 48, 60 and 72 = 4 × 3 × 2 × 2 × 5 × 3 = 720 seconds = 12 minutes

Thus, the traffic light will change again after 12 minutes i.e., on 9:12 a.m.

6. Length of the room = 4 m 96 cm = 400 cm + 96 cm = 496 cm

Breadth of the room = 4 m 3 cm = 400 cm + 3 cm = 403 cm

Now, we find the LCM of length and breadth by long division method,

```
403) 496 (1
    –403
    ----
     93) 403 (4
        –372
        ----
         31) 93 (3
            –93
            ---
              0
```

Since, the last divisor is 31.

So, the HCF of 496 and 403 is 31.

Therefore, the largest possible square brick that can be paved on the floor of the room has a side of length 31 cm.

7. First, find the LCM of 15, 25 and 30 by division method, we get

5	15, 25, 30
3	3, 5, 6
	1, 5, 2

Now, find the product of all the divisors and the quotients (except 1) in the last row.

Thus, the LCM of 15, 25 and 30 = 5 × 3 × 5 × 2 = 150.

So, the required number is 150 + 8 = 158.

8. We know that the product of HCF × LCM = Product of two numbers.

Thus, 55 × 7700 = 275 × other number

Other number = $\frac{55 \times 7700}{275} = 1540$

Thus, the other number is 1540.

9. First find the LCM of 36, 40 and 48 seconds.

By division method,

4	36, 40, 48
3	9, 10, 12
2	3, 10, 4
	3, 5, 2

Now, find the product of all the divisors and the quotients (except 1) in the last row.

Thus, the LCM of 36, 40 and 48 = 4 × 3 × 2 × 3 × 5 × 2 = 720 seconds

So, Raman, Veena, and Harish will meet again after 720 seconds or 12 minutes at the starting point.

Mental Maths (Page 167)

1. Since, factors of 9 are 1, 3 and 9. Also every odd number less than 9 is prime number. Thus, 9 is the smallest odd composite number.
2. The greatest prime number less than 100 is 97 as it is divisible by 1 and itself only.
3. Even numbers between 58 and 80 are 60, 62, 64, 66, 68, 70, 72, 74, 76 and 78.
   Thus, the total even numbers between 58 and 80 is 10.
4. Composite number between 10 and 50 having digit 3 are 30, 32, 33, 34, 35, 36, 38 and 39.
   Thus, there are 8 composite numbers between 10 and 50 that have digit 3.
5. The greatest 2-digit number = 99
   Prime factorisation of 99 = 3 × 3 × 11.
   Thus, the greatest 2-digit number have total 2 prime factors i.e., 3 and 11.
6. The smallest pair of consecutive odd number is 1 and 3. Their sum = 1 + 3 = 4
   Thus, 4 is the largest number that divides the sum of any pair of consecutive odd numbers.

Brain Sizzlers (Page 167)

1. Five such palindromes which are obtained by multiplying prime numbers are as follows:
   3 × 11 = 33
   3 × 7 × 11 × 13 = 3003
   2 × 7 × 11 × 13 = 2002
   2 × 17 × 19 = 646
   3 × 17 × 19 = 969 (Answer may vary)
2. Fibonacci sequence is 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, ...
   Thus, the next two Fibonacci prime numbers after 2, 3, 5, 13 are 89 and 233, ...
3. Since a number is divisible by 12, so it must be divisible by 4 and 3.
   Clearly, 4864 is divisible by 4 but not by 3.
   So, 9 ★ 2 must be divisible by 3.
   So, (9 + ★ + 2) must be divisible by 3.

∴ ★ = 1

4. Smallest perfect number is 6 and the smallest odd composite number is 9.
Prime factorisation of 6 = 2 × 3
Prime factorisation of 9 = 3 × 3
Since, the highest common factor is 3.
So, the HCF of 6 and 9 is 3.
Also, the product of all the prime factors (common factors count only once) of 6 and 9 is the LCM.
So, LCM of 6 and 9 = 2 × 3 × 3 = 18
5. Since 169 and 630 are two co-prime numbers. Thus, the HCF of 169 and 630 is 1.
So, the HCF of 169, 221 and 630 is 1, which is not a prime number.

Life Skills (Page 167)

1. Factors of 35 = 1, 5, 7 and 35.
But since in each row, number of people should be same and minimum and maximum people in a row can be 3 and 8, respectively.
Thus, the possible arrangements are 7 × 5 (i.e.,7 people in 5 rows) or 5 × 7 (i.e., 5 people in 7 rows).
2. Total people to arrange = 28 + 4 = 32
(*a*) Since, the maximum number of people in a row can be only 8, so this arrangement is not possible.
(*b*) Maximum number of people in a row = 8
And 4 × 8 = 32
So, this arrangement is possible for all the 32 people as it satisfies all the conditions.
(*c*) It does not satisfy the condition that an equal number of people should be in each row. So, this arrangement is not possible.
(*d*) If we arrange 4 students in 6 rows and 1 row for teachers then only 24 + 4 = 28 people can be arranged but still 4 students remain left.
So, this arrangement is not possible.
3. Larges-size photographs = 140 – 70 – 40 = 30
Total cost of small-size photographs = 70 × ₹60
= ₹4200
Total cost of medium-size photographs = 40 × ₹80
= ₹3200
Total cost of large-size photographs = 30 × ₹120
= ₹3600
∴ Total cost of all photographs
= ₹4200 + ₹3200 + ₹3600 = ₹11000
But, total money collected = ₹10500 < ₹11000
So, the collected money is not sufficient for 140 photographs.

Chapter Assessment

A.

1. Prime numbers between 16 and 80 = 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79
So, total prime numbers between 16 and 80 are 16.
Prime numbers between 90 and 100 is 97, i.e., only 1.
Thus, prime numbers between 16 and 80 are 15 more than those between 90 and 100.
Hence, the correct answer is option (*c*).
2. Since, the HCF of an even and an odd number is 1. So this is not true.
Hence, the correct answer is option (*d*).
3. Largest 4-digit number is 9999.
Prime factors of 9999 = 3 × 3 × 11 × 101.
Thus, the number of distinct prime factors of the largest 4-digit number is 3.
Hence, the correct answer is option (*b*).
4. Smallest 5-digit number is 10000.
Prime factors of 10000 = 2 × 2 × 2 × 2 × 5 × 5 × 5 × 5
Thus, the number of distinct prime factors of the smallest 5-digit number is 2.
Hence, the correct answer is option (*a*).
5. Let's take an odd natural number 3, its predecessor and successor are 2 and 4 respectively.
Product = 2 × 4 = 8 (divisible by 2, 4 and 8)
So, the greatest number which always divides the product of the predecessor and successor of an odd natural number is 8.
Hence, the correct answer is option (*d*).
6. By divisibility rule of 11, 22222222 is divisible by 11.
Hence, the correct answer is option (*c*).
7. LCM of two number = 180, its factors are 1, 2, 3, 4, 5, 6, 9, 10, 12, 15, 18, 20, 30, 36, 45, 60, 90 and 180
HCF is always a factor of LCM for the given numbers.
From the given options, 75 is not a factor of 180.
Therefore, 75 is not the HCF of the numbers.
Hence, the correct option is (*c*).

B.

1. Factors of 16 are 1, 2, 4, 8 and 16. And each factor is an exact divisor of the number.

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

2. Since, $4 + 8 + 0 + 9 = 21$, which is divisible by 3. So, by divisibility rule, 4089 is divisible by 3. Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
Hence, the correct answer is option (*b*).

3. Prime factorisation of $20 = 2 \times 2 \times 5$;
Prime factorisation of $24 = 2 \times 2 \times 2 \times 3$;
Prime factorisation of $32 = 2 \times 2 \times 2 \times 2 \times 2$.
So, the highest common factors $= 2 \times 2 = 4$.
So, the HCF of 20, 24 and 32 is 4.
$\therefore$ Assertion (A) is false but.
Reason (R) is true.
Thus, the correct answer is option (*d*).

C.

1. Prime factors of $1729 = 7 \times 13 \times 19$
$\therefore$ Sum $= 7 + 13 + 19 =$ **39**

2. Prime factorisation of $75 = 5 \times 5 \times 3$;
Prime factorisation of $60 = 2 \times 2 \times 3 \times 5$;
Prime factorisation of $105 = 3 \times 5 \times 7$
So, the common prime factors are 3 and 5. Thus, the number of common prime factors of 75, 60, and 105 is **2**.

3. The LCM of the two co-prime is equal to **product** of the numbers.

4. Prime factorisation of $10 = 2 \times 5$;
Prime factorisation of $15 = 3 \times 5$;
Prime factorisation of $20 = 2 \times 2 \times 5$.
Thus, the HCF of 10, 15 and 20 is **5**.

5. Number 11 and 13 are prime numbers and 10, 12 and 14 numbers are even numbers.
Also, $15 = 3 \times 5$. So, the smallest odd composite number having two digits is **15**.

D.

1. Since $81 = 9 \times 9$.
So, 81 is not prime.
Hence, this statement is false.

2. Yes, every number is a multiple of itself.
So, this statement is true.

3. Smallest factor of each number is 1.
So, this statement is false.

4. Yes, every composite number has more than two factors. So, this statement is true.

5. Two prime numbers that differs by 2 are called twin primes.
So, this statement is false.

E.

1. Prime numbers between 40 and 100 are 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89 and 97.

2. (*a*) $44 = 3 + 41$ or $7 + 37$
(*b*) $50 = 19 + 31$ or $3 + 47$
(*c*) $64 = 3 + 61$ or $5 + 59$
(*d*) $88 = 5 + 83$ or $17 + 71$ (Answer may vary)

3. (*a*) $63 = 3 + 29 + 31$ (*b*) $79 = 3 + 5 + 71$
(*c*) $15 = 3 + 5 + 7$ (*d*) $31 = 7 + 11 + 13$
(Answer may vary)

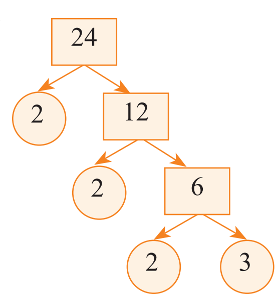
4. (*a*) Factors of 60 are 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30 and 60.
Factors of 75 are 1, 3, 5, 15, 25 and 75.
Factors of 120 are 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 20, 24, 30, 40, 60 and 120.
$\therefore$ Common factors = 1, 3, 5 and 15.
(*b*) - (*c*) Similar to part (*a*)

5. (*a*) First five common multiples of 2, 3 and 5 are the first five multiples of their LCM.
Since, 2, 3 and 5 are co-primes.
So, their LCM is $2 \times 3 \times 5 = 30$.
First five multiples of 30 are 30, 60, 90, 120 and 150.
(*b*) - (*c*) Same as part (*a*)
(*d*) By division method,

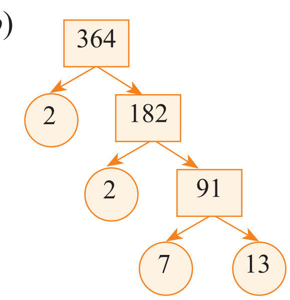
2	8, 12, 15
2	4, 6, 15
3	2, 3, 15
	2, 1, 5

LCM of 8, 12, $15 = 2 \times 2 \times 2 \times 3 \times 5 = 120$
$\therefore$ First five common multiples of 8, 12, 15 are 120, 240, 360, 480 and 600.

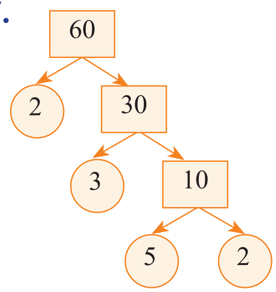
6. (*a*)



(*b*)



(*c*) - (*d*) Same as part (*b*)

7. 

Sum of factors of missing place = 2 + 30 + 5 = 37

8. (13, 31), (17, 71), (37, 73) and (79, 97)

9. We know that the the 8th prime number is 19 and 11th prime number is 31, i.e.,

$* = 19, \# = 31$. Thus, $\# - * = 31 - 19 = 12$

10. Sum of digits at odd places – Sum of digits at even places = $(5 + * + 7) - (6 + 3 + 4)$

$= 12 + * - 13$

$= * - 1$

Since, it is divisible by 11, So, $* - 1 = 0$ or $* = 1$.

11. (*a*) Prime factors of 72 = $2 \times 2 \times 2 \times 3 \times 3$

Prime factors of 144 = $2 \times 2 \times 2 \times 2 \times 3 \times 3$

Prime factors of 234 = $2 \times 3 \times 3 \times 13$

Since, the common factors of 72, 144 and 234 are 2, 3 and 3. Thus, the HCF of 72, 144 and 234 is $2 \times 3 \times 3 = 18$.

Thus, the greatest number of chairs in each row is 18.

(*b*) Total number of coloured chairs = 72 + 144 + 234 = 450

Since, the greatest number of chairs in each row = 18

∴ The minimum number of rows of chairs in the auditorium = $\frac{450}{18} = 25$

12. The given number is divisible by 80, so it must be divisible by 8 and 10.
By divisibility rule of 10, ones digir, i.e., # = 0
Now, the number 653 * 0 must be divisible by 8. So, by divisibility rule of 8, 3 * 0 should be divisible by 8.
Therefore, by trial and error, we find * = 6
Thus, the minimum value of * + # = 6 + 0 = 6.

Model Test Paper – 1

A.

1. Since $6 \times 12 = 72$, $24 \times 3 = 72$.

So, 6, 12, and 24 are factors of 72 but 48 is not a factor of 72.

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

2. From the given figure, $t \| z$.

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

3. The largest 5-digit number is 99999, But its digit sum = 9 + 9 + 9 + 9 + 9 = 45.

Subtract 2 from 45, we get 45 – 2 = 43, i.e., we need to subtract 2 from 99999.

So, 99999 – 2 = 99997, which is a largest 5-digit numbers whose digit sum is 43

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

4. A collection of numbers gathered to give some information is called data.

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

5. A polygon with 9 sides is called a nonagon.

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

6. Common multiples of 3, 5 and 10 are the multiple of their LCM. By division method,

3	3, 5, 10
5	1, 5, 10
	1, 1, 2

LCM = $3 \times 5 \times 2$

= 30

So, multiples of 30 are 30, 60, 90, 120, ….

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

7. Since 8 is the factor of the number and number is less than 50. So the possible numbers can be 8, 16, 24, 32, 40, 48.

Also, since the sum of digit is 5.

Thus, the required number is 32 (as 3 + 2 = 5).

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

8. The degree measure of a complete angle is 360°.

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

9. Factors of a number 24 are 1, 2, 3, 4, 6, 8, 12, 24 and each factor of a number divides the number exactly.

∴ Both Assertion (A) and Reason (R) are true and Reason (R) is a correct explanation of Assertion (A).
Hence, the correct answer is option (*a*).

10. Three or more points are said to be collinear if they lie in a straight line. In the given figure, points A, B and C lie on the straight line.
So, Assertion (A) is true but Reason (R) is false.
Hence, the correct answer is option (*c*).

B.

1. **36** is a triangular number as well as a square number other than 1.

2. Points that lie in the same plane are called **coplanar** points.

3. 636 is same for reading backwards and forwards. So, 636 is a **palindromic** number.

4. Tally mark is recorded in bunches of **five**.

5. The smallest 2-digit prime number, sum of whose digits is 10, is **19**.

C.

1. 2 is an even prime number, so this statement is false.

2. Each number smallest multiple of is itself. So, the given statement is true.

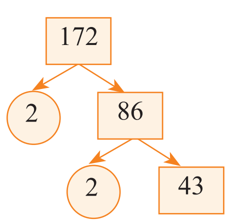
3. Each bar represents only one value of the numerical data. So, this statement is true.

4. Two parallel lines never intersects at one point. They are equidistant from each other.
So, this statement is false.

5. Since difference of 17 and 19 is 2 and they are prime. So 17 and 19 are twin primes.
Thus, this statement is true.

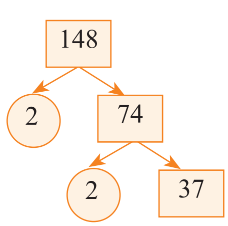
D.

1. (*a*)



Prime factor of 172 = 2 × 2 × 43

(*b*)



Prime factor of 148 = 2 × 2 × 37

2. To determine the maximum capacity of a container that can measure the diesel of the three containers an exact number of times, we need to calculate the HCF of 891, 1215 and 1377.
So, prime factorisation of 891, 1215 and 1377 are as follows,

$891 = 3 \times 3 \times 3 \times 3 \times 11$
$1215 = 3 \times 3 \times 3 \times 3 \times 3 \times 5$
$1377 = 3 \times 3 \times 3 \times 3 \times 17$

Here, we observe that $3 \times 3 \times 3 \times 3 = 81$ is the highest common factor of 891, 1215 and 1377. Therefore, the maximum capacity of the required container that can measure the diesel of the three containers an exact number of times will be 81 litres.

3. (*a*)

Corresponding sides	Midpoints
SP	T
PQ	L
QR	N

(*b*) *l* is the perpendicular bisector of line PQ.
m is the perpendicular bisector of line QR.
n is the perpendicular bisector of line PS.

4. The digit at 'T' and 'H' place is same and it is the second smallest positive odd number i.e., 3.
Also the digit at 'O' and 'Th' place is same and it is double that of 'T' digit i.e., $2 \times 3 = 6$
So, the required number is 6336.

5. (*a*) By divisibility rule of 3, the sum of digits of the number 52*664 is divisible by 3.
That is 5 + 2 + * + 6 + 6 + 4 = 23 + *
Check for possible values:
23 + 0 = 23 (not possible by 3)
23 + 1 = 24 (divisible by 3)
Since 5 + 2 + * + 6 + 6 + 4 = 23 + *
∴ * = 1

(*b*) By divisibility rule of 11, difference of sum of digits at even place and sum of digits at odd place is either 0 or multiple of 11.
That is, (8 + 8 + 9) – (2 + 4 + *) = 25 – 6 – * = 19 – * is divisible by 11.
So, 19 – * = 0 or 19 – * = 11
⇒ * = 19 (not possible) or * = 8
∴ * = 8.

6.

Years	Number of Employees
2018	◇ ◇ ◇ ◇ ◁
2019	◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇
2020	◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◁
2021	◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇
2022	◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇
2023	◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇
2024	◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇ ◇
Key: 1 ◇ = 50 employees, ◁ = 25 employees	

(*a*) From the pictograph, we can see that the maximum number of employees is in year 2024 and the total number of symbols used to represent this number is 16.

(*b*) The symbols used to represent the total number of employees from 2022 to 2024 are 45.

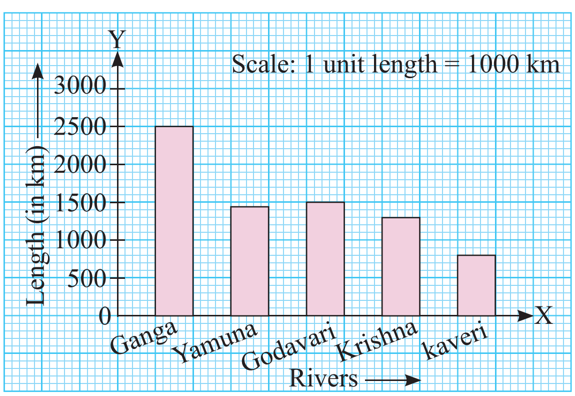
7. We know that LCM × HCF = Product of two numbers

$\Rightarrow$ 72 × HCF = 36 × 24

$\Rightarrow$ HCF = $\dfrac{36 \times 24}{72} = 12$

Thus, the HCF of the given numbers is 12.

8. (*a*)



(*b*) The length of the longest river = 2500 km

The length of the shortest river = 800 km

Difference = 2500 km – 800 km = 1700 km

∴ The difference between the longest and the shortest rivers is 1700 km.

(*c*) The length or river kaveri = 800 km

Thus, the palindromic numbers greater than 800 and less than 830 are 808, 818, 828.

CHAPTER 6 : PERIMETER AND AREA

Let's Recall

1. (*a*) Perimeter (*b*) Perimeter (*c*) Area
(*d*) Area (*e*) Perimeter (*f*) Area

2. (*a*) Side of each small square = 1 units

Area of each small square = 1unit × 1 unit = 1 sq. unit

Area of the figure = 12 × area of each small square = 12 × 1 sq. unit = 12 sq. units

Perimeter of the figure = sum of lengths of all sides of the boundary = 16 × 1 unit = 16 units

(*b*) Same as part (*a*) (*c*) Same as part (*a*)

(*d*) Same as part (*a*)

(*e*) Side of each small square = 1 unit

Area of each small square = 1unit × 1 unit = 1 sq. unit

Area of the figure = 14 × area of each small square = 14 × 1 sq. unit = 14 sq. units

Perimeter of figure = sum of lengths of all sides of the boundary = 30 × 1 unit = 30 units.

Quick Check (Page 177)

1. Perimeter of the figure = sum of lengths of all its side = 30 m + 60 m + 35 m + 40 m + 15 m + 25 m = 205 m

2. Perimeter of the figure = sum of lengths of all its side = 5 m + 2 m + 1 m + 2 m + 1 m + 2 m + 1 m + 6 m + 8 m + 12 m = 40 m.

Think and Answer (Page 179)

Perimeter of a regular hexagon = sum of length of all its sides

$\Rightarrow$ 6 × length of each side of hexagon = 24 cm

($\because$ regular hexagon has six equal side)

$\Rightarrow$ Length of each side of hexagon = $\dfrac{24 \text{ cm}}{6}$ = 4 cm

Now, perimeter of new figure formed = sum of length of all its sides = 4 cm + 4 cm + 4 cm + 4 cm + 4 cm + 4 cm + 4 cm + 4 cm + 4 cm + 4 cm = 10 × 4 cm = 40 cm

Think and Answer (Page 180)

1. To find the distance travelled by Mukulika and Shreya, we find the length (perimeter) of the track run by Mukulika and Shreya.

∵ Perimeter of rectangle = 2 (length + breadth)

∴ Length of the track run by Mukulika in 1 round = 2 (80 m + 50 m) = 2 × 130 m = 260 m

Length of the track run by Mukulika in 4 round = 4 × 260 m = 1040 m

Length of the track run by Shreya in 1 round = 2 (70 m + 40 m) = 2 × 110 m = 220 m

Length of the track run by Shreya in 6 round = 6 × 220 m = 1320 m

∴ Difference = 1320 m – 1040 m = 280 m

Thus, Shreya runs longer distance than Mukulika by 280 m.

2. (*a*) In 1 round, Mukulika runs 260 m.

So, 260 m + 40 m = 300 m

Thus, point P will be marked when Mukulika covers 1 complete round and next 40 m from starting point, see in figure (A) below.

(*b*) In 1 round, Shreya runs 220 m.

So, 2 × 220 m + 60 m = 500 m

Thus, point Q will be marked when Shreya covers 2 complete rounds, and next 60 m from starting point, see in figure (A) below.

(*c*) In 1 round, Mukulika runs 260 m.

So, 3 × 260 m = 780 m.

In 1 round, Shreya runs 220 m.

So, 4 × 220 m = 880 m.

Thus, to run 1000 m, Mukulika runs 3 complete rounds and Shreya runs 4 complete rounds.

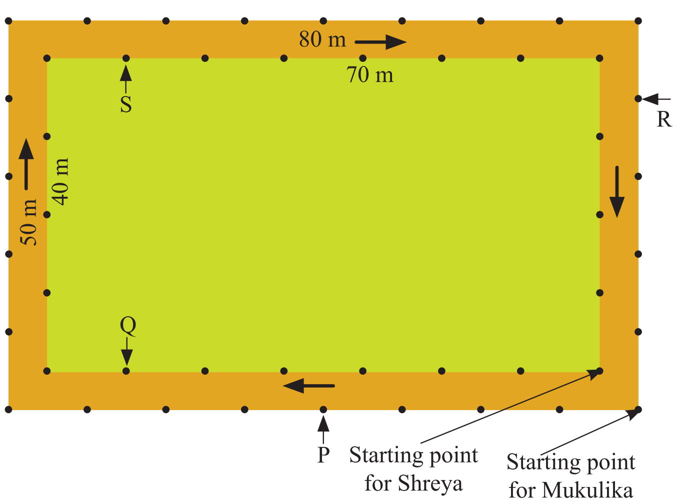


Figure (A)

Also, 780 m + 80 m + 50 m + 80 m + 10 m = 1000 m, i.e., point R

And 880 m + 70 m + 40 m + 10 m = 1000 m, i.e., point Q.

So, points R and S is marked on the figure (A) above.

Practice Time 6A

1. (*a*) We know that the perimeter of the rectangle = 2(length + breadth) = 2 (16 cm + 10 cm) = 2 × 26 cm = 52 cm

(*b*) Same as part (*a*)

2. (*a*) We know that the perimeter of a square = 4 × side of square = 4 × 15 cm = 60 cm

(*b*) Same as part (*a*)

3. (*a*) Side of an equilateral triangle = 10 cm

∴ Perimeter of an equilateral triangle = sum of lengths of its three sides = 10 cm + 10 cm + 10 cm = 30 cm

(*b*) Lengths of sides of the triangle are 16 cm, 8 cm and 12 cm.

∴ Perimeter of a triangle = sum of lengths of its three sides = 16 cm + 8 cm + 12 cm = 36 cm

(*c*) Length of two equal sides of an isosceles triangle = 8 cm and length of the third side = 10 cm

∴ Perimeter of an isosceles triangle = 2 × length of equal sides + length of the third side = 2 × 8 cm + 10 cm = 26 cm

(*d*) Length of the side of regular hexagon = 17 cm

∴ Perimeter of a regular hexagon = 6 × length of each side of regular hexagon = 6 × 17 cm = 102 cm

4. (*a*) Length of the side of an equilateral triangle = 18 cm

∴ Perimeter of an equilateral triangle = 3 × length of each side of equilateral triangle = 3 × 18 cm = 54 cm

(*b*) Length of the side of a square = 15 cm

∴ Perimeter of a square = 4 × length of each side of a square = 4 × 15 cm = 60 cm

(*c*) Length of the side of a regular pentagon = 9 cm

∴ Perimeter of a the regular pentagon = 5 × length of a each side of regular pentagon = 5 × 9 cm = 45 cm (*d*) Length of the side of a regular hexagon = 8 cm

∴ Perimeter of a regular hexagon = 6 × length of each side of regular hexagon = 6 × 8 cm = 48 cm

Thus, the square with a side 15 cm has the largest perimeter.

5. Length of the lid = 2 m 15 cm = 200 cm + 15 cm = 215 cm (∵ 1 m = 100 cm)

Breadth of the lid = 2 m 25 cm = 200 cm + 25 cm = 225 cm

Thus, the length of the required tape = perimeter of the lid of rectangular box = 2 (length + breadth) = 2(215 cm + 225 cm) = 2 × 440 cm = 880 cm = 8 m 80 cm

6. Length of the table = 3 m and breadth of the table = 1 m

So, the length of the required steel frame = perimeter of the top of the table = 2 (length+ breadth) = 2(3 m + 1 m) = 2 × 4 m = 8 m

7. Length of the rectangular field = 38 m and breadth of the rectangular field = 20 m

∴ Perimeter of the rectangular field = 2(length + breadth) = 2 (38 m + 20 m) = 2 × 58 m = 116 m

So, the cost of fencing the rectangular field = ₹25 × 116 m = ₹2900

Now, the side of the square field = 30 m.

∴ Perimeter of the square field = 4 × side = 4 × 30 m = 120 m

So, the cost of fencing the square field = ₹25 ×120 = ₹3000

∴ The difference of cost of fencing the rectangular field and the square field = ₹3000 – ₹2900 = ₹100

Thus, the cost of fencing a square field is more than the rectangular field by ₹100.

8. Length of a rectangular park = 155 m and breadth of a rectangular field = 145 m

So, perimeter of a rectangular park = 2(length + breadth) = 2(155 m + 145 m) = 2 × 300 m = 600 m

Thus, the cost of fencing a rectangular park = ₹12 × 600 = ₹7200

9. (*a*) Total length of a piece of string = perimeter of an equilateral triangle = 42 cm

∵ Perimeter of an equilateral triangle = 3 × length of each side

∴ 42 cm = 3 × length of each side

$\Rightarrow$ Length of each side = $\frac{42 \text{ cm}}{3}$ = 14 cm

(*b*) Total length of a piece of string = perimeter of a regular heptagon = 42 cm

∵ Perimeter of a regular heptagon = 7 × length of each side (∵ regular heptagon has 7 equal sides)

∴ 42 cm = 7 × length of each side

$\Rightarrow$ Length of each side = $\frac{42 \text{ cm}}{7}$ = 6 cm

10. Side of the heptagon = 8 m and length of the rectangle = 15 m

Let the breadth of the rectangle be *b* m.

Since, perimeter of a regular heptagon = perimeter of rectangle

∴ 7 × length of each side of heptagon = 2(length+ breadth)

$$\Rightarrow 7 \times 8 \text{ m} = 2(15 \text{ m} + b)$$

$$\Rightarrow 56 \text{ m} = 2(15 \text{ m} + b)$$

$$\Rightarrow 15 \text{ m} + b = \frac{56 \text{ m}}{2} = 28 \text{ m}$$

$$\Rightarrow b = 28 \text{ m} - 15 \text{ m} = 13 \text{ m}$$

Thus, the breadth of the rectangle is 13 m.

11. Length of the land = 18 m and the breadth of the land = 9 m

So, Length of the land = perimeter of the land = 2(length + breadth) = 2(18 m + 9 m) = 2 × 27 m = 54 m

Thus, the required length of the wire = 6 × length of the land = 6 × 54 m = 324 m

Practice Time 6B

1. (*a*) Area of each small square box = 1 sq. cm

∴ Area of figure = 16 × area of each small square box = 16 × 1 sq. cm = 16 sq. cm

(*b*) Area of each small square box = 1 sq. cm

Area of portion less than half a square = 0 sq. cm

Area of portion more than half-filled squares = 1 sq. cm

Area of portion Exactly half-filled squares $= \frac{1}{2}$ sq. cm

∴ Area of figure = 12 × area of each small square box + 8 × area of portion more than half-filled squares + 4 × area of portion less than half a square = 12 × 1 sq.cm + 8 × 1 sq. cm + 4 × 0 sq.cm = 20 sq. cm

(*c*) Same as part (*b*)

(*d*) Area of each small square box = 1 sq. cm; Area of portion exactly half-filled squares $= \frac{1}{2}$ sq. cm

∴ Area of figure = 6 × area of each small square box + 4 × area of portion exactly half-filled squares = 6 × 1 sq. cm + 4 × $\frac{1}{2}$ sq. cm = 8 sq. cm

(*e*) Area of each small square box = 1 sq. cm;

Area of portion exactly half-filled squares = $\frac{1}{2}$ sq. cm; Area of portion more than half-filled squares = 1 sq. cm; Area of portion less than half a square = 0 sq. cm

∴ Area of figure = 7 × area of each small square box + 3 × area of portion more than half-filled squares + 3 × area of portion exactly half-filled square + 2 × area of portion less than half-filled square = 7 × 1 sq. cm + 3 × 1 sq. cm + 3 × $\frac{1}{2}$ sq. cm + 2 × 0 sq. cm = $11\frac{1}{2}$ sq. cm

(*f*) same as part (*e*) (*g*) Same as part (*e*)

(*h*) Same as part (*e*)

2. (*a*) Area of each small square box = 1 sq. cm

∴ Area of the figure = 12 × area of each small square box = 12 × 1 sq.cm = 12 sq. cm

Length of side of each small square box = 1 cm

∴ Perimeter of the figure = Sum of length of all sides = 22 × 1 cm = 22 cm

(*b*) Same as part (*a*)

3. Area of each small square = 1 sq. cm;

Area of portion less than half a square = 0 sq. cm;

Area of portion more than half-filled squares = 1 sq. cm;

Area of portion exactly half-filled squares = $\frac{1}{2}$ sq. cm

∴ Area of the figure = 9 × Area of each small square + 18 × area of portion more than half-filled squares + 2 × area of portion exactly half-filled squares + 18 × area of portion less than half a square = $(9 \times 1 + 18 \times 1 + 2 \times \frac{1}{2} + 18 \times 0)$ sq. cm = 28 sq. cm

Quick Check (Page 185)

1. Length of rectangle = 15 cm

Breadth of rectangle = 8 cm

∴ Area or rectangle = length × breadth = 15 cm × 8 cm = 120 sq. cm

2. Side of square = 12 cm

∴ Area of square = side × side = 12 cm × 12 cm = 144 sq. cm

Practice Time 6C

1. Length of rectangle = 18 cm

Breadth of rectangle = 5 cm

So, area of rectangle = length × breadth = 18 cm × 5 cm = 90 sq. cm

2. Side of square park = 60 m

∴ Area of square park = side × side = 60 m × 60 m = 3600 sq. m

3. Area of hall = length × breadth = 30m × 12 m = 360 sq. m

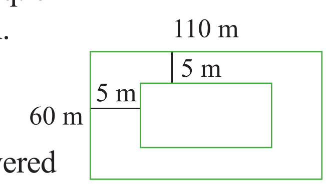
Area of carpet = length × breadth = 3 m × 2 m = 6 sq. m

Number of required carpet

$$= \frac{\text{Area of hall}}{\text{Area of carpet}} = \frac{360 \text{ sq. cm}}{6 \text{ sq. cm}} = 60$$

4. Same as above question.

5. Length of plot = 110 m



Breadth of plot = 60 m

Length of plot which covered with grass

= 110 m – 5 m – 5 m

= 100 m

Breadth of plot which covered with grass

= 60 m – 5 m – 5 m = 50 m

∴ Area of plot laid with grass = Length × breadth = 100 m × 50 m = 5000 sq. m

6. Area of piece of land = length × breadth = 7 m × 5 m = 35 sq. m

Area of each flower bed = side × side = 2 m × 2 m = 4sq. m

So, the area of the remaining part of the land = Area of piece of land – 4 × Area of each flower bed = 35 sq. m – 4 × 4 sq. m = 35 sq. m – 16 sq. m = 19 sq. m

7. Area of room = length × breadth = 12 m × 10 m = 120 sq. m = 1200000 sq. cm

Area of brick = length × breadth = 20 cm × 6 cm = 120 sq. cm

∴ Required number of bricks

$$= \frac{\text{Area of room}}{\text{Area of brick}} = \frac{1200000 \text{ sq.cm}}{120 \text{ sq.cm}} = 10000$$

Now, cost of 100 bricks = ₹220

∴ Cost of 10000 bricks = ₹220 × 100 = ₹22000

8. Length of piece of cloth = 4 m = 400 cm

(∴ 1 m = 100 cm)

Breadth of piece of cloth = 1 m 50 cm = 150 cm

Area of a piece of cloth = Length × breadth = 400 cm × 150 cm = 60000 sq. cm = 6 sq. m

9. Let the length of the rectangle be l cm.

Now, Area of the rectangle = length × breadth

⇒ 750 sq. m = l × 25 m

$$\Rightarrow l = \frac{750 \text{ sq.m}}{25 \text{ m}} = 30 \text{ m}$$

So, perimeter of rectangle = 2(length + breadth) = 2(30 m + 25 m) = 2 × 55 m = 110 m

10. Area of room = length × breadth = 24 m × 14 m = 336 sq. m

Since, a border with square tiles of 1m are laid on all along its sides.

So, length of room excluding tiles = (24 – 1 – 1) m = 22 m and breadth of room excluding tiles = (14 – 1 –1) m = 12 m

∴ Area of floor excluding tile = 22 m × 12 m = 264 sq. m

Thus, area of border = 336 sq. m – 264 sq. m = 72 sq. m

Since, area of a tile = 1 sq. m

Thus, the number of such tiles required

$$= \frac{72 \text{ sq.m}}{1 \text{ sq.m}} = 72$$

11. Let the breadth of rectangle is b cm.

Now, area of rectangle = area of square

⇒ length × breadth = side ×side

⇒ 25 cm × b = 20 cm × 20 cm

$$\Rightarrow \quad b = \frac{400 \text{ sq.cm}}{25 \text{ cm}} = 16 \text{ cm}$$

⇒ Thus, the required breadth of the rectangle is 16 cm.

12. Let the side of square be a unit

Area of square = side ×side = a unit × a unit = a^2 sq. units

New length of side of square = $2a$ unit

So, new area of square = $2a$ × $2a$ sq. units = $4a^2$ sq. units

So, new area of square = 4 × area of square

Thus, when the side of a square is doubled, the area becomes quadrupled (4 times).

13. Area of tiles = length × breadth = 12 cm × 5 cm = 60 sq. cm

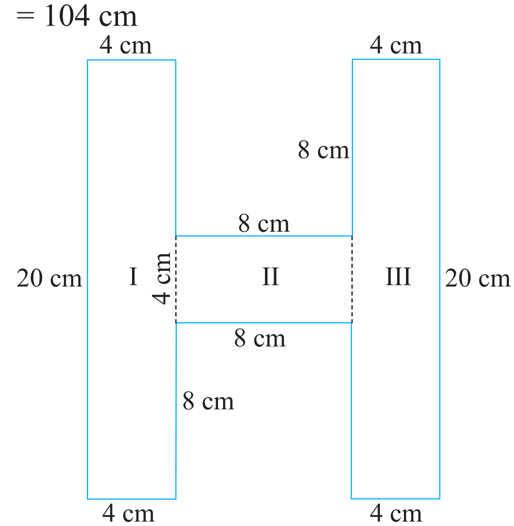
(*a*) Area of rectangular region = length × breadth = 200 cm × 144 cm = 28800 sq. cm

∴ Required number of tiles =

$$\frac{\text{Area of rectangular region}}{\text{Area of tiles}} = \frac{28800 \text{ sq.cm}}{60 \text{ sq.cm}} = 480$$

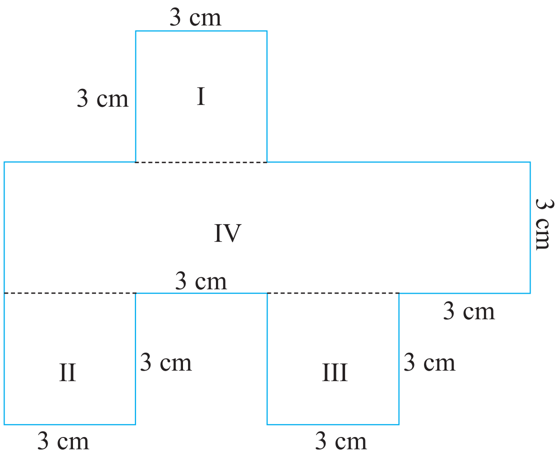
(*b*) Same as part (*a*)

14. (*a*) Perimeter of the figure = Sum of all its side = 20 cm + 4 cm + 8 cm + 8 cm + 8 cm + 4 cm + 20 cm + 4 cm + 8 cm + 8 cm + 8 cm + 4 cm = 104 cm



Area of the figure = Area of region I + area of region II + area of region III = 20 cm × 4 cm + 8 cm × 4 cm + 20 cm × 4 cm = 80 sq. cm + 32 sq. cm + 80 sq. cm = 192 sq. cm

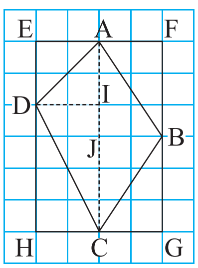
(*b*) Perimeter of the figure = Sum of all its side = 6 cm + 3 cm + 3 cm + 3 cm + 3 cm + 6 cm + 3 cm + 3 cm + 3 cm + 3 cm + 3 cm + 3 cm + 3 cm + 3 cm = 48 cm



Area of the figure = Area of region I + area of region II + area of region III + area of region IV = 3 cm × 3 cm + 3 cm × 3 cm + 3 cm × 3 cm + 12 cm × 3 cm = 9 sq. cm + 9 sq. cm + 9 sq. cm + 36 sq. cm = 63 sq. cm

Quick Check (Page 191)

1.



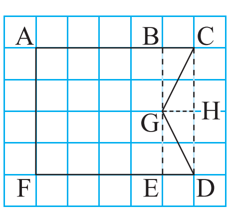
Area of figure ABCD = area of triangle ADI + area of triangle DIC + area of triangle ABC

$= \frac{1}{2}$ area of rectangle AEDI + $\frac{1}{2}$ area of rectangle DICH + $\frac{1}{2}$ area of rectangle AFGC

$= \frac{1}{2} \times (2 \times 2)$ sq units + $\frac{1}{2} \times (4 \times 2)$ sq units + $\frac{1}{2} \times (6 \times 2)$ sq units

= 2 sq. units + 4 sq. units + 6 sq. units = 12 sq. units

2.



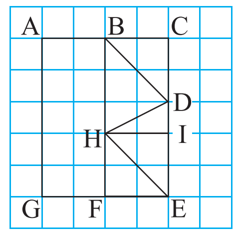
Area of figure ACGDF = area of square ABEF + area of triangle BCD + area of triangle GED

= (4 ×4) sq. units + $\frac{1}{2}$ area of rectangle BCHG + $\frac{1}{2}$ area of rectangle GHDE

= 16 sq. units + $\frac{1}{2} \times (2 \times 1)$ sq. units + $\frac{1}{2}$ (2×1) sq. units

= 18 sq. units.

3.



Area of figure ABDHEG = area of rectangle ABFG + area of triangle BDH + area of triangle HEF

= (5 × 2) sq. units + $\frac{1}{2}$ area of rectangle BCIH + $\frac{1}{2}$ area of rectangle HDEF

= 10 sq. units + $\frac{1}{2} \times (3 \times 2)$ sq. units + $\frac{1}{2} \times (2 \times 2)$ sq. units

= 10 sq. units + 3 sq. units + 2 sq. units

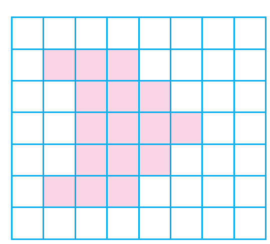
= 15 sq. units

In actual calculations, figure 2 has the greatest area.

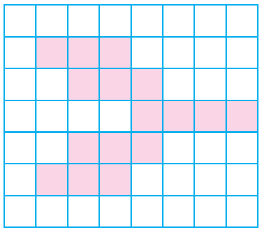
Think and Answer (Page 191)

1. Perimeter of Rahul's shading = sum of all sides = 26 units

   Let us shift a unit square in two different places, then perimeter is as follows:



Perimeter of the figure = Sum of all side = 22 units

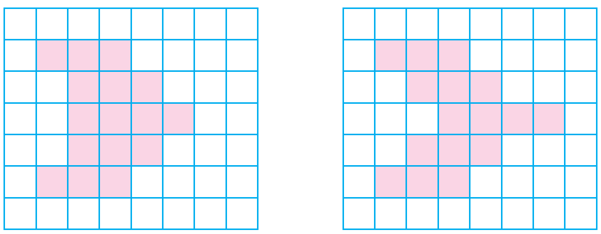


Perimeter of the figure = Sum of all side = 30 units

Thus, in first figure perimeter decreases and in second figure perimeter increases.

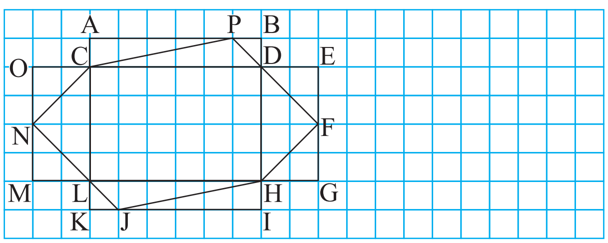
So, the perimeter of the figure is depending on its shape.

2. The figures with 16 sq. units which have different perimeter are as follows:



Practice Time 6D

1.



Area of the figure = Area of triangle PCD + area of triangle DFH + Area of triangle HJL + Area of triangle CNL + Area of rectangle CDHL = $\frac{1}{2}$ area of rectangle ABDC + $\frac{1}{2}$ area of rectangle DEGH + $\frac{1}{2}$ area of rectangle LHIK + area of rectangle OCLM + Area of rectangle CDHL

$= \frac{1}{2} \times (6 \times 1)$ sq. units + $\frac{1}{2} \times (4 \times 2)$ sq. units + $\frac{1}{2} \times (6 \times 1)$ sq. units + $\frac{1}{2} \times (4 \times 2)$ sq. units + (6×4) sq. units

= 3 sq. units + 4 sq. units + 3 sq. units + 4 sq. units + 24 sq. units

= 38 sq. units

2. Given that area of rectangle = 6 cm × 8 cm + 5 cm × 10 cm = 48 sq. cm + 50 sq. cm = 98 sq. cm

So, the possible dimension of the rectangle with area 98 sq. cm are 1 cm × 98 cm; 2 cm × 49 cm; 7 cm × 14 cm.

3. Perimeter of square = Sum of perimeter of two rectangles = 2(10 cm + 9 cm) + 2(6 cm + 7 cm)

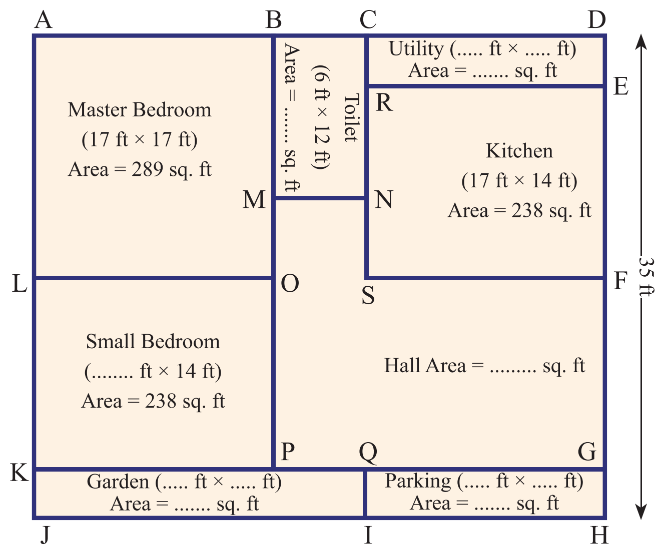
= 38 cm + 26 cm = 64 cm

We know that perimeter of square = 4 × side

⇒ 64 cm = 4 × side

⇒ Side $= \frac{64 \text{ cm}}{4} = 16$ cm

5. (*a*)



Toilet measurement = BC × BM = 6 ft × 12 ft; Area = 6 ft × 12 ft = 72 sq. ft

Master bedroom measurement = AB × AL = 17 ft × 17 ft = 289 sq. ft

So, AB = LO = 17 ft = AL = BO

∴ Small bedroom measurement = LO × Lk = 17 ft × 14 ft = 238 sq. ft

Now, BC = 6 ft = PQ and KP = LO = 17 ft

So, KQ = KP + PQ = 17 ft + 6 ft = 23 ft

Since, in kitchen measurement, RE = 17 ft = SF = CD, RS = EF = 14 ft

And AL = BO = CS = DF = 17 ft,

So, DE = DF – EF = 17 ft – 14 ft = 3 ft

So, utility measurement = CD × DE = 17 ft × 3 ft = 51 sq. ft

Now, LK = OP = FG = SQ = 14 ft and DH = 35 ft

So, GH = DH – DE – EF – FG = 35 ft – 3 ft – 14 ft – 14 ft = 4 ft and GH = QI = KJ = 4 ft

So, garden measurement = KQ × KJ = 23 ft × 4 ft = 92 sq. ft

Parking measurement = QG × GH = 17 ft × 4 ft = 68 sq. ft (∵ QG = RE)

Now, MO = NS = BO – BM = 17 ft – 12 ft = 5 ft; MN = BC = 6 ft

And PG = OF = PQ + QG = BC + CD = 6 ft + 17 ft = 23 ft

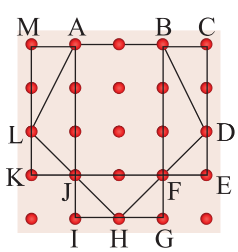
Hall area = area of POFG + area of MNSO = OP × PG + MN × MO = 14 ft × 23 ft + 6 ft, × 5 ft = 322 sq. ft + 30 sq. ft = 352 sq. ft

(*b*) Since, AD = AB + BC + CD = (17 + 6 + 17) ft = 40 ft and DH = 35 ft

∴ Area of rectangular plot = AD × DH = 40 ft× 35 ft = 1400 sq. ft

Practice Time 6E

1. (*a*)



By chop method, Area of the given figure = Area of triangle ALJ + Area of triangle BDF + Area of triangle JHF + Area of rectangle ABFJ

$= \frac{1}{2}$ area of rectangle AJKM + $\frac{1}{2}$ area of rectangle BCEF + $\frac{1}{2}$ area of rectangle JFGI + $\frac{1}{2}$ area of rectangle ABFJ

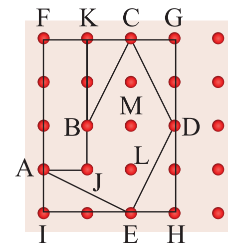
$= \frac{1}{2} \times (3 \times 1)$ sq. units + $\frac{1}{2} \times (3 \times 1)$ sq. units + $\frac{1}{2} \times (2 \times 1)$ sq. units + (3×2) sq. units

$= \frac{3}{2}$ sq. units + $\frac{3}{2}$ sq. units + 1 sq. units + 6 sq. units = 10 sq. units

(*b*) Same as part (*a*) (*c*) Same as part (*a*)

(*d*) Same as part (*a*) (*e*) Same as part (*a*)

2. (*a*) Build a rectangle completely around the shape and count the number of unit squares to find the area of the complete figure.



Area of rectangle FGHI = (4 × 3) sq. units = 12 sq. units

Now, chop the figure to get the area of the figure AJBCDE.

Area of the figure ABCDE = Area of rectangle FGHI – Area of rectangle AFKJ – Area of triangle BKC – Area of triangle CGD – Area of triangle DHE – Area of triangle AIE

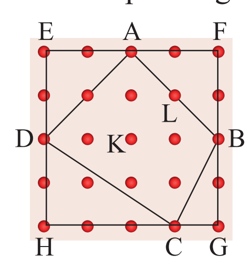
= Area of rectangle FGHI – Area of rectangle AFKJ – $\frac{1}{2}$ Area of rectangle BKCM – $\frac{1}{2}$ Area of rectangle CGDM – $\frac{1}{2}$ Area of rectangle DHEM – $\frac{1}{2}$ Area of rectangle ALEI

$= (12 - (3 \times 1) - \frac{1}{2} \times (2 \times 1) - \frac{1}{2} \times (2 \times 1) - \frac{1}{2} \times (2 \times 1) - \frac{1}{2} \times (2 \times 1))$ sq. units

= 5 sq. units

(*b*) Same as part (*a*) (*c*) Same as part (*a*)

3. (*a*) Build a rectangle completely around the shape and count the number of unit squares to find the area of the complete figure.



Now, chop the figure to get the area of the quadrilateral ABCD.

Area of quadrilateral ABCD = Area of square EFGH – Area of triangle AED – Area of triangle AFB – Area of triangle BGC – Area of triangle DHC

$= \text{Area of square EFGH} - \frac{1}{2}\text{ Area of rectangle AEDK} - \frac{1}{2}\text{ Area of rectangle AFBK}$

$-\frac{1}{2}\text{ Area of rectangle BLCG} - \frac{1}{2}\text{ Area of rectangle DLCH}$

$= (4 \times 4)\text{ sq. units} - \frac{1}{2} \times (2 \times 2)\text{ sq. units}$

$- \frac{1}{2} \times (2 \times 2)\text{ sq. units} - \frac{1}{2} \times (2 \times 1)\text{ sq. units}$

$- \frac{1}{2} \times (3 \times 2)\text{ sq. units}$

= 8 sq. units

(*b*) Same as part (*a*) (*c*) Same as part (*a*)

4. (*a*) Area of P = 2 unit square + 4 half square = $2 \times 1\text{ sq. units} + 4 \times \frac{1}{2}\text{ sq. units} = 4\text{ sq. units}$

Area of R = 6 unit square + 4 half square $= 6 \times 1\text{ sq. units} + 4 \times \frac{1}{2}\text{ sq. units} = 8\text{ sq. units}$

Area of Q = 4 unit square + 8 half square = $4 \times 1\text{ sq. units} + 8 \times \frac{1}{2}\text{ sq. units} = 8\text{ sq. units}$

Area of S = 2 unit square + 4 half square = $2 \times 1\text{ sq. units} + 4 \times \frac{1}{2}\text{ sq. units} = 4\text{ sq. units}$

Area of T = 6 unit square + 4 half square = $6 \times 1\text{ sq. units} + 4 \times \frac{1}{2}\text{ sq. units} = 8\text{ sq. units}$

Area of U = 12 unit square + 8 half square = $12 \times 1\text{ sq. units} + 8 \times \frac{1}{2}\text{ sq. units} = 16\text{ sq. units}$

Area of V = 12 unit square + 8 half square = $12 \times 1\text{ sq. units} + 8 \times \frac{1}{2}\text{ sq. units} = 16\text{ sq. units}$

(*b*) P and S have the same area; U and V have the same area. Q, R and T are three different shapes but they have the same area.

(*c*) Perimeter of shape P = 4 straight units (s) + 4 diagonal units (*d*) = 4s + 4d units

Perimeter of shape R = 8 straight units (s) + 4 diagonal units (*d*) = 8s + 4d units

Perimeter of shape Q = 8 diagonal units (*d*) = 8d units

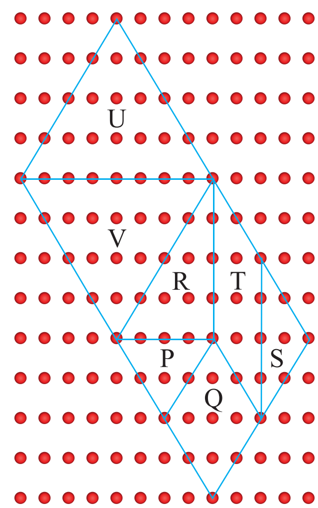
Perimeter of shape S = 4 straight units (s) + 4 diagonal units (*d*) = 4s + 4d units

Perimeter of shape T = 8 straight units (s) + 4 diagonal units (*d*) = 8s + 4d units

Perimeter of shape U = 8 straight units (s) + 8 diagonal units (*d*) = 8s + 8d units

Perimeter of shape V = 8 straight units (s) + 8 diagonal units (*d*) = 8s + 8d units

(*d*) Yes we are rearrange the seven pieces to form a rectangle.



Mental Maths (Page 199)

1. Area of rectangle = Length × breadth = 125 cm × 1m = 125 cm × 100 cm = 12500 sq. cm

($\because$ 1 m = 100 cm)

2. Perimeter of a square park = 4 × side = 4 × 250 m = 1000 m

So, cost of fencing a square park = ₹20 × 1000 = ₹20000

3. Perimeter of rectangular shape string = 2(length + breadth) = 2(20 cm + 10 cm) = 60 cm

Since, Perimeter of rectangular shape string = Perimeter of square shape

$\Rightarrow$ $60 \text{ cm} = 4 \times \text{side}$

$\Rightarrow$ $\text{Side} = \dfrac{60 \text{ cm}}{4} = 15 \text{ cm}$

$\therefore$ Length of each side of a square is 15 cm.

4. Distance travelled by a person in one round of a square park = perimeter of square park

$= 4 \times \text{side}$

$= 4 \times 80 \text{ m}$

$= 320 \text{ m}$

$\therefore$ Total distance travelled by a person in six rounds of a square park = $6 \times 320 \text{ m} = 1920 \text{ m}$

5. Let length of the rectangular field is l cm

Now, perimeter of rectangular field = 2(length + breadth)

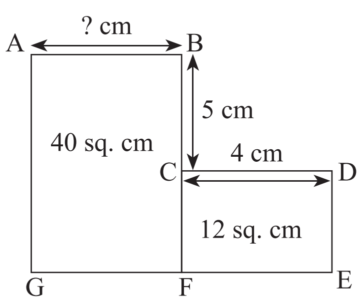
$\Rightarrow$ $320 \text{ m} = 2(l + 60 \text{ cm})$

$\Rightarrow$ $l + 60 \text{ cm} = 160 \text{ cm}$

$\Rightarrow$ $l = 160 \text{ cm} - 60 \text{ cm} = 100 \text{ cm}$

So, area of rectangular field = length × breadth = 100 cm × 60 cm = 6000 sq. cm

6. (*a*)



Area of rectangle CDEF = CD × CF

$\Rightarrow$ 12 sq. cm = 4cm × CF

$\Rightarrow$ $\text{CF} = \dfrac{12 \text{ sq.cm}}{4 \text{ cm}} = 3 \text{ cm}$

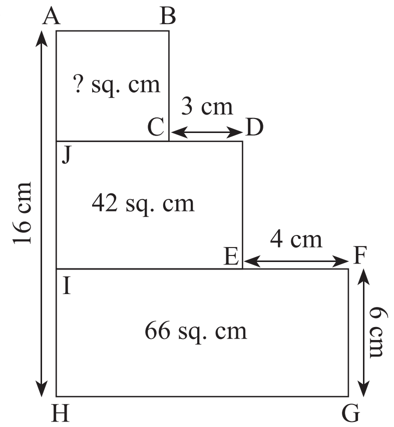
So, BF = BC + CF = 5 cm + 3 cm = 8 cm

Now, Area of rectangle ABFG = AB × BF

$\Rightarrow$ 40 sq. cm = AB × 8cm

$\Rightarrow$ $\text{AB} = \dfrac{40 \text{ sq.cm}}{8 \text{ cm}} = 5 \text{ cm}$

(*b*)



Area of HIFG = IF × FG

$\Rightarrow$ 66 sq. cm = IF × 6 cm

$\Rightarrow$ $\text{IF} = \dfrac{66 \text{ sq.cm}}{6 \text{ cm}} = 11 \text{ cm}$

Now IE = JD = IF – EF = 11 cm – 4 cm = 7 cm

Also, JC = JD – CD = 7 cm – 3 cm = 4 cm = AB

Now, area of rectangle JDEI = JD × JI

$\Rightarrow$ 42 sq. cm = 7 cm × JI

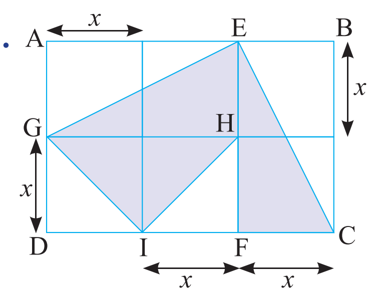
$\Rightarrow$ $\text{JI} = \dfrac{42 \text{ sq.cm}}{7 \text{ cm}} = 6 \text{ cm}$

So, AJ = AH – JI – HI = 16 cm – 6 cm – 6 cm = 4 cm

$\therefore$ Area of ABCJ = AB × AJ = 4 cm × 4 cm = 16 sq. cm

Brain Sizzlers (Page 200)

1.



Let the length of each side of square is x as the given figure contains the 6 identical squares.

So AB = $3x$ and AD = $2x$

Now, Perimeter of the rectangular land = 2(AB + AD) = $2(3x + 2x) = 10x$

$\Rightarrow$ $40 \text{ m} = 10x$

$\Rightarrow$ $x = \dfrac{40 \text{ m}}{10} = 4 \text{ m}$

Now area of the land used to grow vegetables = Area of triangle GEH + Area of triangle CEF + Area of triangle GIH

$= \frac{1}{2} \times$ area of rectangle AEHG + $\frac{1}{2} \times$ area of rectangle BCFE + $\frac{1}{2} \times$ area of rectangle DGHF

$= \frac{1}{2} \times (\text{AE} \times \text{HE}) + \frac{1}{2} \times (\text{BE} \times \text{EF}) + \frac{1}{2} \times (\text{HG} \times \text{GD})$

$= \frac{1}{2} \times (8 \text{ m} \times 4 \text{ m}) + \frac{1}{2} \times (4 \text{ m} \times 8 \text{ m}) + \frac{1}{2} \times (8 \text{ m} \times 4 \text{ m})$

= 48 sq. m

Chapter Assessment

A.

1. In regular decagon, all sides are equal.

∴ Perimeter of regular decagon = sum of all sides = 10 × side = 10 × 8 cm = 80 cm

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

2. Two plane figures A and B coincide with each other if they should completely overlap each other which is only possible when they have same shape and same size. Thus, they have equal areas and perimeters.

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

3. Let the square of side $2x$ units cut into two identical rectangles.

Then, length of rectangle = $2x$ units and breadth of rectangle = x units

So, Perimeter of square = 4 × side = 4 × $2x$ units = $8x$ units

And perimeter of 2 identical rectangles = 2 × 2(length + breadth) = $4(2x + x)$ units = $12x$ units

∴ $12x = 1\frac{1}{2} \times 8x$

Also, area of square = side × side = $(2x \times 2x)$ sq. units = $4x^2$ sq. units

And area of 2 identical rectangles = 2(length × breadth) = $2(2x \times x)$ sq. units = $4x^2$ sq. units

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

4. Number of required tiles

$$= \frac{\text{Area of floor}}{\text{Area of each tile}} = \frac{8100 \text{ sq.m}}{0.9 \text{ m} \times 0.9 \text{ m}} = 10000$$

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

5. Let the new side of square = 3 × side of square = 3 × 12 cm = 36 cm

Perimeter of given square = 4 × side = 4 × 12 cm = 48 cm

And perimeter of new square = 4 × side = 4 × 36 cm = 144 cm = 3 times the perimeter of given square.

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

B.

1. (*a*) Area of square = side × side

⇒ 64 sq. m = side × side ⇒ side = 8 m

So, perimeter of a square = 4 × side = 4 × 8 m = 32 m

∴ Both Assertion (A) and Reason (R) are true and Reason is the correct explanation of Assertion. Thus, the correct answer is options (*a*).

2. (*c*) Since the length of the wire is same, so the perimeter will be same no matter it is square rectangle or triangle.

But, side of square, rectangle and triangle are not always same.

So, Assertion (A) is true but Reason (R) is false.

∴ The correct answer is option (*c*).

C.

1. Area of a rectangular ground = 30 m × 24 m = 720 sq. m

So, the cost of levelling a rectangular ground = ₹1.25 × 720 = ₹900

Thus, the given statement is true.

2. Perimeter of a square = 4 × side = 16 cm

⇒ side = $\frac{16 \text{ cm}}{4}$ = 4 cm

Then the area of the square = side × side = 4 cm × 4 cm = 16 sq. cm

Thus, the given statement is true.

3. Let the side of square = x unit, so the length of rectangle formed by joining identical squares = $2x$ unit and the breadth of rectangle formed by joining identical squares = x unit.

So, perimeter of square = $4x$ unit

And perimeter of rectangle = $2(2x \text{ unit} + x \text{ unit})$ = $6x$ unit

Thus, the given statement is false.

4. Length of rectangle = l, then new length = $\frac{l}{2}$;

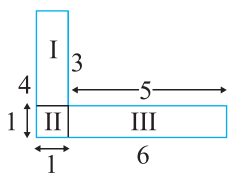
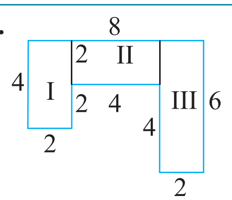
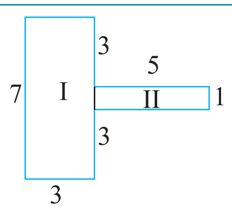
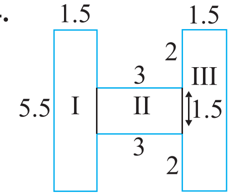
Breadth of rectangle = b, then new breadth = $3b$

So, area of rectangle = length × breadth = $l \times b$;

And, new area of rectangle = $\frac{l}{2} \times 3b = \frac{3}{2} lb$

Thus, the given statement is false.

D.

Figure	Perimeter	Area
1. 	Perimeter = Sum of all sides = (4 + 1 + 3 + 5 + 1 + 6) units = 20 units	Area = Area of (region I + region II + region III) = (3 × 1 + 1 × 1 + 5 × 1) sq. units = 9 sq. units 1 → (*d*) → (*ii*)
2. 	Perimeter = Sum of all sides = 4 + 8 + 6 + 2 + 4 + 4 + 2 + 2) units = 32 units	Area = Area of (region I + region II + region III) = [(4 × 2) + (2 × 4) +(6 × 2)] sq. units = (8 + 8 + 12) sq. units = 28 sq. units 2 → (*c*) → (*i*)
3. 	Perimeter = Sum of all sides = (7 + 3 + 3 + 5 + 1 + 5 + 3 + 3) units = 30 units	Area = Area of (region I + region II) = [(7 × 3) + (5 × 1)] sq. units = (21 + 5) sq. units = 26 sq. units 3 → (*b*) → (*iv*)
4. 	Perimeter = Sum of all sides = (5.5 + 1.5 + 2 + 3 + 2 + 1.5 + 5.5 + 1.5 + 2 + 3 + 2 + 1.5) units = 31 units	Area = Area of (region I + region II + region III) = [(5.5 × 1.5) + (3 × 1.5) + (5.5 × 1.5)] sq. units = (16.5 + 4.5) sq. units = 21 sq. units 4 → (*a*) → (*iii*)

E.

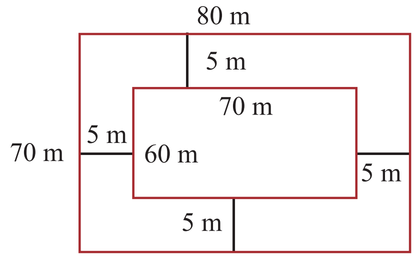
1. Number of marble slabs required

$$= \frac{\text{Area of square shape floor}}{\text{Area of each marble slab}}$$

$$= \frac{3 \text{ m} \times 3 \text{ m}}{30 \text{ cm} \times 30 \text{ cm}}$$

$$= \frac{300 \text{ cm} \times 300 \text{ cm}}{30 \text{ cm} \times 30 \text{ cm}} = 100 \quad (\because \ 1 \text{ m} = 100 \text{ cm})$$

2.



Length of the inner rectangular plot = 70 m

Breadth of the inner rectangular plot = 60 m

∴ Length of the outer rectangular plot = (70 + 5 + 5) m = 80 m;

Breadth of the outer rectangular plot = (60 + 5 + 5) m = 70 m

So, Area of the inner rectangular plot = length × breadth = 60 m × 70 m = 4200 sq. m

Area of the outer rectangular plot = length × breadth = 70 m × 80 m = 5600 sq. m

Thus, the area of the lawn = Area of Outer rectangular plot – Area of inner rectangular plot

= 5600 sq. m – 4200 sq. m

= 1400 sq. m

3. Length of Garden with road = 20 m + 1 m + 1 m

= 22 m

Breadth of Garden with road = 5 m + 1 m + 1 m

= 7 m

Area of rectangular garden = length × breadth = 20 m × 5 m = 100 sq. m

Area of rectangular garden with road = length × breadth = 22 m × 7 m = 154 sq. m

So, the area of the road = Area of rectangular garden with road – Area of rectangular garden

= 154 sq. m – 100 sq. m = 54 sq. m

Thus, the cost of metalling the road at 200 per sq. m = ₹200 × 54 = ₹10800

4. Number of required square shaped tin sheets

$$= \frac{\text{Area of lagrer square tin sheet}}{\text{Area of smaller square tin sheet}}$$

$$= \frac{1\text{ m} \times 1\text{ m}}{20\text{ cm} \times 20\text{ cm}}$$

$$= \frac{100\text{ cm} \times 100\text{ cm}}{20\text{ cm} \times 20\text{ cm}} = 25 \quad [\because \quad 1\text{ m} = 100\text{ cm}]$$

5. Perimeter of rectangular field = 2(length + breadth)

$\Rightarrow$ 200 m = 2(length + 40 m)

$\Rightarrow$ length + 40 m = $\frac{200\text{ m}}{2} = 100$ m

$\Rightarrow$ length = 100 m – 40 m = 60 m

So, the area rectangular field = length × breadth = 60 m × 40 m = 2400 sq. m

6. Number of required marble tiles

$$= \frac{\text{Area of wall}}{\text{Area of each tile}} = \frac{4\text{ m} \times 3\text{ m}}{30\text{ cm} \times 25\text{ cm}}$$

$$= \frac{400\text{ cm} \times 300\text{ cm}}{30\text{ cm} \times 25\text{ cm}} = 160$$

7. Area of floor of bathroom = length × breadth = 5 m × 3 m 50 cm = 500 cm × 350 cm = 175000 sq. cm

Area of square tiles = side × side = 25 cm × 25 cm = 625 sq. cm

Required number of tiles

$$= \frac{\text{Areaof floor of bathroom}}{\text{Area of square tile}}$$

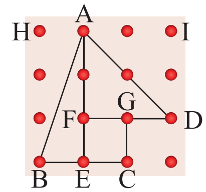
$$= \frac{175000\text{ sq.cm}}{625\text{ sq.cm}} = 280$$

Thus, the cost of tiles at the rate of ₹60 per tile

= ₹60 × 280

= ₹16800

8.



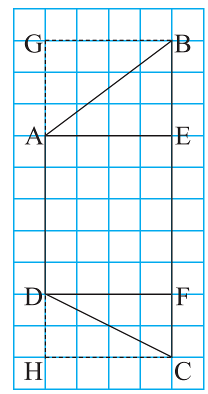
Area of the figure ABCGD = Area of triangle ABE + Area of triangle AFD + Area of rectangle FECG

$= \frac{1}{2}$ × area of rectangle AEBH + $\frac{1}{2}$ × area of rectangle AIDF + area of rectangle FECG

$= \frac{1}{2} \times (3 \times 1)$ sq. units + $\frac{1}{2} \times (2 \times 2)$ sq. units + (1×1) sq. units

$= \frac{3}{2}$ sq. units + 2 sq. units + 1 sq. units = $4\frac{1}{2}$ sq. units

9. (*a*) Area of the quadrilateral ABCD = Area of triangle ABE + Area of triangle DFC + Area of rectangle AEFD



$= \frac{1}{2}$ area of rectangle AEBG

$+ \frac{1}{2}$ area of rectangle DFCH

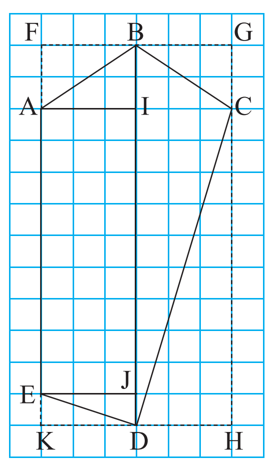
+ area of rectangle AEFD

$= \frac{1}{2} \times (4 \times 3)$ sq. units + $\frac{1}{2}$ × (4 × 2) sq. units + (5 × 4) sq. units

= 6 sq. units + 4 sq. units + 20 sq. units

= 30 sq. units

(*b*)



Area of the figure ABCDE = area of triangle ABI + area of triangle EJD + area of triangle BCI + area of triangle CID + area of rectangle AIJE

$= \frac{1}{2} \times$ area of rectangle AIBF $+ \frac{1}{2} \times$ area of rectangle EJDK $+ \frac{1}{2} \times$ area of rectangle BGCI $+ \frac{1}{2} \times$ area of rectangle CHDI $+ \frac{1}{2} \times$ area of rectangle AIJE

$= \frac{1}{2} \times (3 \times 2)$ sq. units $+ \frac{1}{2} \times (3 \times 1)$ sq. units $+ \frac{1}{2} \times (3 \times 2)$ sq. units $+ \frac{1}{2} \times (10 \times 3)$ sq. units $+ (9 \times 3)$ sq. units

$= 3$ sq. units $+ \frac{3}{2}$ sq. units $+ 3$ sq. units $+ 15$ sq. units $+ 27$ sq. units

$= 49\frac{1}{2}$ sq. units

10. (*a*) Total area of a badminton court = 44 ft × 20 ft = 880 sq. ft

(*b*) Length of badminton court including clearance area = 44 ft + 2 ft + 2 ft = 48 ft

Breadth of badminton court including clearance area = 20 ft + 2 ft + 2 ft = 24 ft

∴ Perimeter of badminton court including clearance area = 2(length + breadth) = 2(48 ft + 24 ft) = 144 ft = 43.89 m

(*c*) Length of the net = 6.1 m;

Height/Breadth of the net

= 1.55 m – 0.76 m = 0.76 m

(*d*) Perimeter of the net = 2(length + breadth)

= 2(6.1 m + 0.79 m)

= 13.78 m

Area of the net = length × breadth

= 6.1 m × 0.79 m

= 4.819 sq. m

CHAPTER 7 : FRACTIONS

Let's Recall

1. An Improper fraction has the numerator greater than or equal to the denominator. So, option (*b*) is correct.

2. Fraction for shaded parts

$= \frac{\text{Number of shaded parts}}{\text{Total number of parts}}$

(*a*) $\frac{5}{8}$ (*b*) $\frac{2}{4}$ (*c*) $\frac{4}{8}$ (*d*) $\frac{2}{3}$

3. (*a*) $\frac{5}{8}$ (*b*) $\frac{7}{8}$ (*c*) $\frac{3}{8}$ (*d*) $\frac{1}{8}$

Hence the correct option is (*c*).

4. (*a*) $\frac{5}{17}$ (*b*) $\frac{4}{9}$ (*c*) $\frac{3}{8}$

Quick Check (Page 207)

A week has 7 days.

Hence, fraction of a week with Sunday $= \frac{1}{7}$

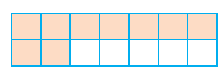
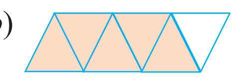
Practice Time 7A

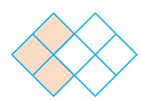
1. (*a*) $\frac{3}{4}$, out of 4 triangles, 3 are shaded.

(*b*) $\frac{3}{5}$, out of 5 triangles, 3 are shaded.

(*c*) $\frac{8}{16}$, out of 16 small squares, 8 are shaded.

(*d*) $\frac{7}{8}$, out of 8 sectors, 7 are shaded.

2. (*a*)  (*b*) 

(*c*) 

3. (*a*) Numerator = 5, Denominator = 9

(*b*) Numerator = 19, Denominator = 71

(*c*) Numerator = 99, Denominator = 101

(*d*) Numerator = 131, Denominator = 1000

4. (*a*) $\frac{1}{6}$ of 12 notebook $= \frac{1}{6} \times 12 = 2$ notebooks.

(*b*) $\frac{1}{6}$ of 24 mangoes $= \frac{1}{6} \times 24 = 4$ mangoes.

(*c*) $\frac{1}{6}$ of 30 toffees $= \frac{1}{6} \times 30 = 5$ toffees.

5. (*a*) 11 hours out of 24 hours in a day $= \frac{11}{24}$

(*b*) 3 Kiwis taken from a total of 8 Kiwis $= \frac{3}{8}$

(*c*) 15 days out of 31 days in December $= \frac{15}{31}$

(*d*) ₹71 out of a total of ₹100 = $\frac{71}{100}$

6. Total balls = 12 + 17 = 29 balls

Fraction of black balls = $\frac{\text{Black ball}}{\text{Total balls}} = \frac{17}{29}$

Practice Time 7B

1. (*i*) A unit fraction has 1 as its numerator.

Here $\frac{1}{5}$ and $\frac{1}{9}$ are unit fraction.

Hence, the correct option (*d*).

(*ii*) In proper fraction,

numerator < denominator.

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

(*iii*) 1 unit has been divided into 5 subunits. Here the segment starts at 0 and end at the third small division after 1. So, the total length $= 1 + \frac{3}{5} = \frac{8}{5}$

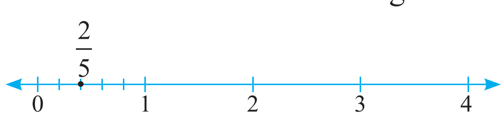
Hence, the correct option is (*c*).

(*iv*) $\frac{93}{15} = 6\frac{3}{15}$

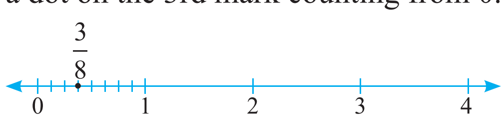
$$15\overline{)93}(6$$
$$\underline{-90}$$
$$\underline{3}$$

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

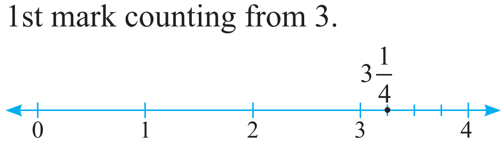
2. (*a*) As $\frac{2}{5}$ is a proper fraction, divide the distance between 0 and 1 into 5 equal parts and insert a dot on the 2nd mark counting from 0.



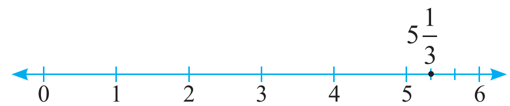
(*b*) As $\frac{3}{8}$ is a proper fraction, divide the distance between 0 and 1 into 8 equal parts and insert a dot on the 3rd mark counting from 0.



(*c*) As $3\frac{1}{4} = 3 + \frac{1}{4}$; divide the distance between 3 and 4 into 4 equal parts and insert a dot on the 1st mark counting from 3.



(*d*) As $5\frac{1}{3} = 5 + \frac{1}{3}$; divide the distance between 5 and 6 into3 equal parts and insert a dot on the 1st mark counting from 5.



3. In like fractions, denominator has to be the same.

$\therefore$ $\frac{2}{9}, \frac{15}{29}, \frac{17}{29}, \frac{19}{29}$ and $\frac{23}{29}$... are five like fractions.

(Answer may vary)

4. (*a*) $1\frac{3}{5} = \frac{5+3}{5} = \frac{8}{5}$

(*b*) $2\frac{3}{8} = \frac{2\times8+3}{8} = \frac{19}{8}$

(*c*) $5\frac{12}{19} = \frac{5\times19+12}{19} = \frac{107}{19}$

(*d*) $5\frac{6}{13} = \frac{5\times13+6}{13} = \frac{71}{13}$

5. (*a*) $\frac{15}{8} = 1\frac{7}{8}$ (*b*) $\frac{43}{7} = 6\frac{1}{7}$

(*c*) $\frac{119}{13} = 9\frac{2}{13}$ (*d*) $\frac{136}{9} = 15\frac{1}{9}$

6. 1 rupee = 100 paise

2009 paisa = $\frac{2009}{100} = 20\frac{9}{100}$

7. Total volunteers = 120

Clean up services = 72

Local food bank = 75

(*a*) Clean up services = $\frac{72}{120}$

(*b*) Local food bank = $\frac{75}{120}$

(*c*) In both services = $\frac{75+72-120}{120}$

$= \frac{147-120}{120} = \frac{27}{120}$

Think and Answer (Page 215)

1. Let the fraction be $\frac{x}{y}$.

Now, $\frac{x}{y} = \frac{35}{9}$

i.e., $x = 35t, y = 9t$

Also, $x + y = 88$

$\Rightarrow$ $35t + 9t = 88$

$\Rightarrow$ $44t = 88$

$\Rightarrow$ $t = 2$

So, $x = 35 \times 2 = 70$, $y = 9 \times 2 = 18$ and required fraction $= \frac{x}{y} = \frac{70}{18}$.

Practice Time 7C

1. (*a*) $\frac{1}{3}$ (one portion out of 3 is shaded)

(*b*) $\frac{2}{6}$ (two portions out of 6 are shaded)

(*c*) $\frac{3}{9}$ (three portions out of 9 are shaded)

$\because \frac{1}{3} = \frac{2}{6} = \frac{3}{9}$

Hence, they are equivalent fraction.

2. (*a*) $\frac{5}{6} = \frac{5 \times 2}{6 \times 2} = \frac{5 \times 3}{6 \times 3} = \frac{5 \times 4}{6 \times 4} = \frac{5 \times 5}{6 \times 5}$

$\frac{5}{6} = \frac{10}{12} = \frac{15}{18} = \frac{20}{24} = \frac{25}{30}$

So, the four fractions equivalent to $\frac{5}{6}$ are $\frac{10}{12}, \frac{15}{18}, \frac{20}{24}$ and $\frac{25}{30}$.

(*b*) $\frac{3}{8} = \frac{3}{8} \times \frac{2}{2} = \frac{3}{8} \times \frac{3}{3} = \frac{3}{8} \times \frac{4}{4} = \frac{3}{8} \times \frac{5}{5}$

So, the four fractions equivalent to $\frac{3}{4}$ are $\frac{6}{10}, \frac{9}{24}, \frac{12}{32}$ and $\frac{15}{40}$.

(*c*) $\frac{9}{13} = \frac{9}{13} \times \frac{2}{2} = \frac{9}{13} \times \frac{3}{3} = \frac{9}{13} \times \frac{4}{4} = \frac{9}{13} \times \frac{5}{5}$

$\frac{9}{13} = \frac{18}{24} = \frac{27}{34} = \frac{36}{52} = \frac{45}{65}$

So, the four fractions equivalent to $\frac{9}{13}$ are $\frac{18}{26}$, $\frac{27}{39} = \frac{36}{52} = \frac{45}{65}$.

(*d*) $\frac{30}{90} = \frac{30 \div 2}{90 \div 2} = \frac{30 \div 3}{90 \div 3} = \frac{30 \div 5}{90 \div 5}$

$= \frac{30 \div 10}{90 \div 10}$

$\frac{30}{90} = \frac{15}{45} = \frac{10}{30} = \frac{6}{18} = \frac{3}{9}$

So, the four fractions equivalent to fractions $\frac{30}{90}$ are $\frac{15}{45}, \frac{10}{30}, \frac{6}{18}$ and $\frac{3}{9}$

(Answer may vary)

3. (*a*) $\frac{30}{72} = \frac{30}{72} \times \frac{2}{2} = \frac{60}{144}$

(*b*) $\frac{30}{72} = \frac{30 \div 6}{72 \div 6} = \frac{5}{12}$

(*c*) $\frac{30}{72} = \frac{30}{72} \times \frac{4}{4} = \frac{120}{288}$

(*d*) $\frac{30}{72} = \frac{30 \div 3}{72 \div 3} = \frac{10}{24}$

4. (*a*) $\frac{5}{7} = \frac{5}{7} \times \frac{5}{5} = \frac{25}{35}$

Hence, $\frac{5}{7}$ and $\frac{25}{35}$ are equivalent fractions.

(*b*) $\frac{11}{17} = \frac{11}{17} \times \frac{4}{4} = \frac{44}{68}$

Hence, $\frac{11}{17}$ and $\frac{44}{68}$ are equivalent fractions.

(*c*) $\frac{23}{77} = \frac{23}{77} \times \frac{2}{2} = \frac{46}{154}$

$\therefore \frac{23}{77} = \frac{46}{154} \neq \frac{46}{164}$

Hence, $\frac{23}{77}$ and $\frac{46}{164}$ are not equivalent fractions.

5. (*a*) $\frac{13}{169} = \frac{13 \div 13}{169 \div 13} = \frac{1}{13}$

(*b*) $\frac{102}{119} = \frac{102 \div 17}{119 \div 17} = \frac{6}{7}$

(*c*) $\frac{175}{275} = \frac{175 \div 25}{275 \div 25} = \frac{7}{11}$

(*d*) $\frac{840}{1700} = \frac{840 \div 20}{1700 \div 20} = \frac{42}{85}$

6. (*a*) $\frac{3}{8} = \frac{\boxed{}}{72}$

$$\frac{3}{8} = \frac{3\times 9}{8\times 9} = \frac{\boxed{27}}{72}$$

(*b*) $\frac{136}{144} = \frac{136 \div 8}{144 \div 8} = \frac{17}{\boxed{18}}$

(*c*) $\frac{4}{\boxed{}} = \frac{60}{75} = \frac{64}{\boxed{}}$

Since, 60 ÷ 4 = 15

$$\frac{60}{75} = \frac{60 \div 15}{75 \div 15} = \frac{4}{5}$$

$$\frac{4}{5} = \frac{4\times 16}{5\times 16} = \frac{64}{80}$$

$$\frac{4}{\boxed{5}} = \frac{60}{75} = \frac{64}{\boxed{80}}$$

7. (*i*) HCF of 42 and 147 is 21.

$$\frac{42}{147} = \frac{42 \div 21}{147 \div 21} = \frac{2}{7}$$

Hence, the correct options (*b*).

(*ii*) $\frac{25 \text{ cm}}{1 \text{ m}} = \frac{25 \text{ cm}}{100 \text{ cm}} = \frac{25 \div 25}{100 \div 25} = \frac{1}{4}$

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

Quick Check (Page 216)

When denominator are same, the fraction with greater numerator is greater:

$$\frac{3}{11} < \frac{4}{11} < \frac{7}{11} < \frac{9}{11}$$

Practice Time 7D

1. (*a*) Since both fractions have the same denominator, the fraction with the greater numerator is greater.

$$9 < 19$$

$$\therefore \quad \frac{9}{29} \boxed{<} \frac{19}{29}$$

(*b*) Since both fractions have the same numerator, the fraction with the smaller denominator is greater.

$$\therefore \quad \frac{1}{4} \boxed{>} \frac{1}{9}$$

(*c*) LCM of 3 and 5 = 15

Convert both to like fractions:

$$\frac{2}{3} = \frac{2\times 5}{3\times 5} = \frac{10}{15}, \frac{4}{5} = \frac{4\times 3}{5\times 3} = \frac{12}{15}$$

Now, 10 < 12 $\Rightarrow \frac{2}{3} < \frac{4}{5}$

Alternate method:

$$\frac{2}{3} \boxed{<} \frac{4}{5} \Rightarrow 2\times 5 \boxed{} 3\times 4 \Rightarrow 10 \boxed{<} 12$$

(*d*) LCM of 4 and 19 = 76

Convert both to like fractions:

$$\frac{3}{8} = \frac{3\times 19}{4\times 19} = \frac{57}{76}, \frac{18}{19} = \frac{18\times 4}{19\times 4} = \frac{72}{76}$$

Now 57 < 72 $\Rightarrow \frac{3}{4} < \frac{18}{19}$

Alternate method:

$$3\times 19 \boxed{} 4\times 18 \Rightarrow 57 \boxed{<} 72$$

(*e*) LCM of 4 and 13 = 52

Convert both to like fractions:

$$\frac{13}{4} = \frac{13\times 13}{4\times 13} = \frac{169}{52}, \frac{4}{13} = \frac{4\times 4}{13\times 4} = \frac{16}{52}$$

Now 169 < 16 $\Rightarrow \frac{13}{4} > \frac{4}{13}$

Alternate method:

$$\frac{13}{4} \boxed{} \frac{4}{13} \Rightarrow 13\times 13 \boxed{>} 4\times 4 \Rightarrow 169 \boxed{>} 16$$

(*f*) LCM of 42 and 30 = 210

Convert both to like fractions:

$$\frac{5}{42} = \frac{5\times 5}{42\times 5} = \frac{25}{210}, \frac{7}{30} = \frac{7\times 7}{30\times 7} = \frac{49}{210}$$

Now, 25 < 49 $\Rightarrow \frac{5}{42} < \frac{7}{30}$

Alternate method:

$$\frac{5}{42} \boxed{} \frac{7}{30} \Rightarrow 5\times 30 \boxed{} 7\times 42 \Rightarrow 150 \boxed{<} 294$$

2. (*a*) LCM of 9 and 7 = 63

Convert both to like fractions:

$$\frac{5}{9} = \frac{5\times 7}{9\times 7} = \frac{35}{63}, \frac{2}{7} = \frac{2\times 9}{7\times 9} = \frac{18}{63}$$

Since 35 > 18, $\frac{5}{9}$ is larger.

(*b*) LCM of 8 and 3 = 24

Convert both to like fractions:

$$\frac{3}{8} = \frac{3\times3}{8\times3} = \frac{9}{24}, \frac{5}{3} = \frac{5\times8}{3\times8} = \frac{40}{24}$$

Since 9 < 40, $\frac{5}{3}$ is larger.

(*c*) Convert to improper fractions:

$$2\frac{5}{6} = \frac{17}{6},\ 3\frac{3}{4} = \frac{15}{3}$$

LCM of 6 and 4 = 12

Convert both to like fractions:

$$\frac{17}{6} = \frac{17\times2}{6\times2} = \frac{34}{12}, \frac{15}{4} = \frac{15\times3}{4\times3} = \frac{45}{12}$$

Since 34 < 45, $3\frac{3}{4}$ is larger.

3. (*a*) Since, denominators are same, the numerator value have to be arranged in ascending order:

$$\frac{3}{8} < \frac{5}{8} < \frac{7}{8} < \frac{13}{8}.$$

(*b*) Since, numerator are same, the least value of denominator in this case will give maximum value. Hence, the denominator has to be arranged in descending order: $\frac{9}{17} < \frac{9}{7} < \frac{9}{5} < \frac{9}{4}$.

(*c*) LCM of denominator

7	8, 7, 23, 63
	8, 1, 23 9

LCM = 7 × 8 × 23 × 9 = 11592

$$\frac{3}{8}\times\frac{1449}{1449} = \frac{4347}{11592}$$

$$\frac{1}{7}\times\frac{1656}{1656} = \frac{1656}{11592}$$

$$\frac{13}{23}\times\frac{504}{504} = \frac{6552}{11592}$$

$$\frac{12}{63}\times\frac{184}{184} = \frac{2208}{11592}$$

Therefore, $\frac{1656}{11592} < \frac{2208}{11592} < \frac{4347}{11592} < \frac{6552}{11592}$

Hence, $\frac{1}{7} < \frac{12}{63} < \frac{3}{8} < \frac{13}{23}$.

4. (*a*) LCM of 7, 30, 15, 9

3	7, 30, 15, 9
5	7, 10, 5, 3
	7, 2, 1, 3

LCM = 3 × 5 × 7 × 2 × 3 = 630

$$\frac{2}{7}\times\frac{90}{90} = \frac{180}{630}$$

$$\frac{2}{30}\times\frac{21}{21} = \frac{42}{630}$$

$$\frac{2}{15}\times\frac{42}{42} = \frac{84}{630}$$

$$\frac{2}{9}\times\frac{70}{70} = \frac{140}{630}$$

Therefore, $\frac{180}{630} > \frac{140}{630} > \frac{84}{630} > \frac{42}{630}$

Hence, $\frac{2}{7} > \frac{2}{9} > \frac{2}{15} > \frac{2}{30}$.

(*b*) LCM of 7, 21, 49, 42

7	7, 21, 49, 42
3	1, 3, 7, 6
	1, 1, 7 2

LCM = 7 × 3 × 7 × 2 = 294

$$\frac{2}{7}\times\frac{42}{42} = \frac{84}{294}$$

$$\frac{5}{21}\times\frac{14}{14} = \frac{70}{294}$$

$$\frac{8}{49}\times\frac{6}{6} = \frac{48}{294}$$

$$\frac{3}{42}\times\frac{7}{7} = \frac{21}{294}$$

Therefore, $\frac{84}{294} > \frac{70}{294} > \frac{48}{294} > \frac{21}{294}$

Hence, $\frac{2}{7} > \frac{5}{21} > \frac{8}{49} > \frac{3}{42}$.

(*c*) LCM of 7, 8, 5, 4

2	7, 8, 5, 4
2	7, 4, 5, 2
	7, 2, 5, 1

LCM = 2 × 2 × 7 × 2 × 5 = 280

$$\frac{6}{7}\times\frac{40}{40}=\frac{240}{280}$$

$$\frac{7}{8}\times\frac{35}{35}=\frac{245}{280}$$

$$\frac{4}{5}\times\frac{56}{56}=\frac{224}{280}$$

$$\frac{3}{4}\times\frac{70}{70}=\frac{210}{280}$$

Therefore, $\frac{245}{280}>\frac{240}{280}>\frac{224}{280}>\frac{210}{280}$

Hence, $\frac{7}{8}>\frac{6}{7}>\frac{4}{5}>\frac{3}{4}$.

5. Soumya delivered a lecture on the first day $=\frac{3}{5}$

and that on the second day $=\frac{7}{8}$

LCM of 5, 8 = 40

$\frac{3}{5}\times\frac{8}{8}=\frac{24}{40}$ and $\frac{7}{8}\times\frac{5}{5}=\frac{35}{40}$

Since, $24<35$.

Hence, $\frac{7}{8}>\frac{3}{5}$ i.e., she delivered longer lecture on the second day.

Quick Check (Page 220)

$$\frac{9}{14}+\frac{8}{16}=\frac{72+56}{112}=\frac{128}{112}=\frac{8}{7}$$

$$\frac{1}{4}+\frac{2}{5}=\frac{5+8}{20}=\frac{13}{20}$$

$$\frac{9}{14}-\frac{1}{4}=\frac{18-7}{28}=\frac{11}{28}$$

$$\frac{8}{16}-\frac{2}{5}=\frac{1}{2}-\frac{2}{5}=\frac{5-4}{10}=\frac{1}{10}$$

$$\frac{8}{7}-\frac{13}{20}=\frac{160-91}{140}=\frac{69}{140}$$

$$\frac{11}{28}+\frac{1}{10}=\frac{55+14}{140}=\frac{69}{140}$$

	+ →		
− ↓	$\frac{9}{14}$	$\frac{8}{16}$	$\frac{8}{7}$
	$\frac{1}{4}$	$\frac{2}{5}$	$\frac{13}{20}$
	$\frac{11}{28}$	$\frac{1}{10}$	$\frac{69}{140}$

Practice Time 7E

1. (*a*) LCM of 5, 9 = 45

$$\frac{2}{5}+\frac{2}{9}=\frac{2\times9}{5\times9}+\frac{2\times5}{9\times5}=\frac{18}{45}+\frac{10}{45}=\frac{28}{45}$$

(*b*) $2\frac{3}{7}+1\frac{4}{7}=\frac{17}{7}+\frac{11}{7}=\frac{17+11}{7}=\frac{28}{7}=4$

(*c*) $2\frac{3}{5}+1\frac{4}{10}+\frac{7}{15}$

$=\frac{13}{5}+\frac{14}{10}+\frac{7}{15}$ [∵ LCM of 5, 10, 15 = 30]

$=\frac{13}{5}\times\frac{6}{6}+\frac{14}{10}\times\frac{3}{3}+\frac{7}{15}\times\frac{2}{2}$

$=\frac{78}{30}+\frac{42}{30}+\frac{14}{30}$

$=\frac{78+42+14}{30}=\frac{134}{30}=\frac{67}{15}=4\frac{7}{15}$

2. (*a*) $\frac{6}{48}-\frac{2}{48}=\frac{6-2}{48}=\frac{4}{48}$

(*b*) $4\frac{13}{14}-\frac{6}{7}=\frac{69}{14}-\frac{6}{7}=\frac{69-12}{14}=\frac{57}{14}=4\frac{1}{14}$

(*c*) $7\frac{1}{8}-3\frac{1}{4}-2\frac{1}{12}=\frac{57}{8}-\frac{13}{4}-\frac{25}{12}$

$\frac{57}{8}-\frac{13}{4}-\frac{25}{12}$ [∵ LCM of 8, 4, 12 = 24]

$=\frac{171-78-50}{24}=\frac{43}{24}=1\frac{19}{24}$

3. (*a*) $3\frac{3}{4}+2\frac{1}{3}-5\frac{1}{6}$

$=\frac{15}{4}+\frac{7}{3}-\frac{31}{6}$ [∵ LCM of 4, 3, 6 = 12]

$=\frac{45+28-62}{12}$

$=\frac{73-62}{12}=\frac{11}{12}$

(*b*) $1+\frac{13}{15}-\frac{4}{9}$ [∵ LCM of 1, 9, 15 = 45]

$=\frac{45+39-20}{45}=\frac{64}{45}=1\frac{19}{45}$

(*c*) $6\frac{1}{3}-2\frac{1}{3}+1\frac{2}{7}$ [∵ LCM of 4, 3, 7 = 21]

$$= \frac{19}{3} - \frac{7}{3} + \frac{9}{7} = \frac{133 - 49 + 27}{21} = \frac{111}{21} = \frac{37}{7}$$

$$= 5\frac{2}{7}$$

4. $14\frac{3}{5} + ? = 20$

Therefore, $? = 20 - 14\frac{3}{5}$

$$= 20 - \frac{73}{5} = \frac{100 - 73}{5} = \frac{27}{5} = 5\frac{2}{5}.$$

5. Lace left = Total – Used lace

$$= 3\frac{1}{2} - 1\frac{3}{4}$$

$$= \frac{7}{2} - \frac{7}{4}$$

$$= \frac{14 - 7}{4} = \frac{7}{4} = 1\frac{3}{4}\text{ m}$$

6. Money spent on Math = $\frac{2}{5}$

Comic book = $\frac{1}{6}$

Horror book = $\frac{4}{15}$

Total money spent $= \frac{2}{5} + \frac{1}{6} + \frac{4}{15}$

$$= \frac{12 + 5 + 8}{30} = \frac{25}{30}$$

Money left $= 1 - \frac{25}{30} = \frac{5}{30} = \frac{1}{6}$

7. Weight of wheat bag = $4\frac{3}{4} = \frac{19}{4}$ kg

Weight of rice bag = $2\frac{1}{10} = \frac{21}{10}$ kg

$\frac{19}{4}\,\square\,\frac{21}{10}$

On cross multiplication 19 × 10 $\square$ 21 × 4

190 > 84

Hence, $\frac{19}{4} > \frac{21}{10}$

Wheat bag is heavier.

Maths Connect (Page 221)

1. Length of the playing area of the court

$$= 28\frac{1}{3}\text{ m} - \frac{5}{3}\text{ m} - \frac{5}{3}\text{ m} = \frac{75}{3}\text{ m} = 25\text{ m}$$

Breadth of the playing area

$$= 14\frac{2}{3}\text{ m} - \frac{4}{3}\text{ m} - \frac{4}{3}\text{ m} = \frac{36}{3}\text{ m} = 12\text{ m}$$

∴ Perimeter of the playing area = 2(length + breadth)

= 2(25 m + 12 m)

= 2 × 37 m

= 74 m

Brain Sizzlers (Page 222)

(*a*) $\frac{1}{6} + \frac{1}{3} + \frac{1}{2} = \frac{1 + 2 + 3}{6} = \frac{6}{6} = 1$

Therefore, the three different unit fractions that add up to 1 are $\frac{1}{2}, \frac{1}{3}, \frac{1}{6}$.

(*b*) $\frac{1}{28} + \frac{1}{14} + \frac{1}{7} + \frac{1}{4} + \frac{1}{2} = \frac{1 + 2 + 4 + 7 + 14}{28}$

$$= \frac{28}{28} = 1$$

Therefore, the three different unit fractions that add up to 1 are $\frac{1}{2}, \frac{1}{4}, \frac{1}{7}, \frac{1}{14}, \frac{1}{28}$.

Chapter Assessment

A.

1. All fractions have the same numerator (17). The larger the denominator, the smaller the value of the fraction.

∴ 15 > 11 > 9 > 6

So, the correct option is (*c*) $\frac{17}{15}$.

2. (*a*) $\frac{1}{4} = \frac{\square}{12}$

$$\frac{1}{4} = \frac{1 \times 3}{4 \times 3} = \frac{3}{12}$$

So, the correct option is (*a*).

3. (*a*) $\frac{8}{10} = \frac{4}{5}$

(c) $\frac{12}{15} = \frac{4}{5}$

(d) $\frac{24}{30} = \frac{4}{5}$

$\therefore \frac{8}{10} = \frac{12}{15} = \frac{24}{30}$ are equal.

So, the correct options (b).

4. $\frac{19}{9} - \frac{5}{9} = \frac{19-5}{9} = \frac{14}{9}$

So, the correct options (b).

5. $\frac{7}{9} = \frac{42}{\square}$

$\frac{7 \times 6}{9 \times 6} = \frac{42}{54}$

So, the correct option is (d)

6. $\frac{17}{2} + 3\frac{1}{2} = \frac{17}{2} + \frac{7}{2} = \frac{24}{2} = 12$

So, the correct options (d).

7. $\frac{17}{34} = \frac{17 \div 17}{34 \div 17} = \frac{1}{2}$

So, the correct options (a).

8. (c) $\frac{11}{7} = 1\frac{4}{7}$

So, the correct options (c).

B.

1. In proper fraction $N^r < D^r$. Hence Assertion is true. Also, Reason is the correct explanation of Assertion.

Hence, option (a) is correct.

2. (d) $\frac{6}{7} = \frac{18}{21} = \frac{6 \times 3}{7 \times 3}$

$\frac{6}{7} = \frac{6 \times 6}{7 \times 6} = \frac{36}{42}$

$\frac{6}{7} = \frac{6 \times 12}{7 \times 12} = \frac{72}{84}$

Hence, $\frac{6}{7} = \frac{18}{21} = \frac{36}{42} = \frac{72}{84}$ are equivalent fraction.

So, Assertion is true.

Reason is true but reason is not the correct explanation of Assertion.

Hence, option (b) is correct.

3. There are infinite number of fractions that are equivalent to $\frac{3}{8}$.

So, Assertion is false but Reason is true.

Hence, option (d) is correct.

4. $\frac{9}{4} = 2\frac{1}{4}$ Assertion is true. Also, Reason is the correct explanation of Assertion.

Hence, option (a) is correct.

C.

1. False; the unshaded portion represents $\frac{1}{6}$, not $\frac{5}{6}$.

2. True

3. False $\frac{21}{48} = \frac{7}{16}$ is the lowest form.

4. True $\frac{1}{2} + \frac{1}{2} = 1$

D.

1. Box I: $\frac{12}{13}, \frac{5}{29}$

Box II: $\frac{5}{5}$

Box III: $\frac{13}{12}, \frac{41}{40}, \frac{25}{11}, \frac{100}{11}$

2. A square has been divided into 4 triangle

Total Δ = 60

Unshaded = $4 \times 4 = 16$

Unshaded fraction = $\frac{16}{60} = \frac{4}{15}$

3. Paakhi ate : $\frac{3}{7}$

Ishaani ate : $\frac{2}{5}$

$\frac{3}{7} \square \frac{2}{5}$

$3 \times 5 > 2 \times 7$

Hence, $\frac{3}{7} > \frac{2}{5}$

So, Paakhi ate more.

Now, find difference: $\frac{3}{7} - \frac{2}{5} = \frac{15-14}{35} = \frac{1}{35}$ of the donut.

4. House left for painting $= 1 - \frac{3}{5} = \frac{2}{5}$

5. Distance between A and B $= 2\frac{2}{5} = \frac{12}{5}$

Distance between B and C $= \frac{3}{5}$

Distance between A and C $= \frac{12}{5} + \frac{3}{5} = \frac{15}{5} = 3$ km

6. Walking $= \frac{1}{2}$ km

Bus $= 4\frac{1}{4} = \frac{17}{4}$ km

Battery rickshaw $= \frac{1}{4}$ km

Total distance covered $= \frac{1}{2} + \frac{17}{4} + \frac{1}{4}$

$= \frac{2+17+1}{4} = 5$ km

Yes it is less than 6 km.

7. For trouser $= 2\frac{2}{3} = \frac{8}{3}$ m

For top $= 1\frac{1}{4} = \frac{5}{4}$ m

Total cloth $= \frac{8}{3} + \frac{5}{4} = \frac{32+15}{12} = \frac{47}{12}$

$= 3\frac{11}{12}$ m

8. Weight on Wednesday $= 51\frac{2}{5} + 1\frac{1}{3}$

$= \frac{257}{5} + \frac{4}{3}$

$= \frac{771+20}{15}$

$= \frac{791}{15} = 52\frac{11}{15}$ kg

9. 16 parts represent the fraction $\frac{1}{4}$ of the rectangle.

Hence, the rectangle has been divided into $16 \times 4 =$ **64** parts

10. Total time spent $= 1\frac{2}{5} + 1\frac{1}{5} + \frac{1}{6}$

$= \frac{7}{5} + \frac{6}{5} + \frac{1}{6}$

$= \frac{42+36+5}{30}$

$= \frac{83}{30} = 2\frac{23}{30}$ hours

11. Probability has 11 letters and O, A, I, I are 4 vowels.

(*a*) Fraction $= \frac{4}{11}$

(*b*) Consonant $= \frac{7}{11}$

(*c*) Fraction of all letters $= \frac{11}{11}$

(*d*) $\frac{4}{11} + \frac{7}{11} = \frac{11}{11}$ yes.

Unit Test – 3

A.

1. (*b*) Perimeter of the rectangle

= 2(length + breadth)

= 2(30 cm + 25 cm)

= 110 cm

2. (*d*) Length of the string

= perimeter of square formed

= 4 × side

⇒ 60 cm = 4 × side

⇒ side $= \frac{60 \text{ cm}}{4} = 15$ cm

3. (*c*) Total months in a year = 12

So, fraction of a year in 8 months $= \frac{8}{12} = \frac{2}{3}$

4. (*b*) Numerator = 98; Denominator = 407

So, Sum = Numerator + Denominator

= 98 + 407 = 505

5. (*c*) Since $\frac{3}{7} = \frac{(3\times9)}{(7\times9)} = \frac{27}{63}, \frac{3}{7} = \frac{(3\times12)}{(7\times12)} = \frac{36}{84}$,

$\frac{3}{7} = \frac{(3\times19)}{(7\times19)} = \frac{57}{133}$

and $\frac{3}{7} = \frac{(3\times17)}{(7\times17)} = \frac{51}{119}$

So, $\frac{51}{109}$ is not equivalent to $\frac{3}{7}$.

6. (*a*) Perimeter of triangle = sum of all sides

$\Rightarrow$ 63 cm = 19 cm + 23 cm + Length of third side

$\Rightarrow$ Length of third side = 63 cm – 19 cm – 23 cm

= 21 cm

7. (*c*) Area of rectangular park = length × width

$\Rightarrow$ 975 sq. m = 65 m × width

$\Rightarrow$ Width = $\frac{(975 \text{ sq.m})}{65 \text{ m}}$ = 15 m

8. (*d*) Total part in the given figure = 8, Shaded part = 5

So, fraction represent the shaded part

$= \frac{(\text{Shaded part})}{(\text{Total part})} = \frac{5}{8}$

9. (*a*) Since the denominator is same of all fractions. So, they are like fractions.

10. (*c*) Perimeter of regular hexagon = 6× side = 6 × 15 cm = 90 cm

Reason is not always true.

B.

1. Perimeter of a regular decagon is **10** times its side length.

2. Area of square = side × side = 3 cm × 3 cm = 9 sq. cm

So, Area of square of side 3 cm is **9 sq. cm.**

3. Fraction is called **bhinna** in Sanskrit.

4. Since $\frac{(21 \div 7)}{(28 \div 7)} = \frac{3}{4}$. Thus, the simplest form of $\frac{21}{28}$ is $\frac{3}{4}$.

5. Since $\frac{15 \text{ cm}}{2\text{m}} = \frac{15 \text{ cm}}{200 \text{ cm}} = \frac{3}{40}$. So, equivalent fraction of $\frac{15 \text{ cm}}{2 \text{ m}}$ is $\mathbf{\frac{3}{40}}$.

C.

1. $\frac{3}{5} - \frac{1}{9} = \frac{(3\times9)-(1\times5)}{45} = \frac{(27-5)}{45} = \frac{22}{45}$

[∵ LCM of 5 and 9 is 45]

So, the given statement is false.

2. Since Perimeter of any closed figure = Sum of all its side.

So, the given statement is true.

3. Given statement is true.

4. In $\frac{195}{17}$, numerator is less than denominator. So, it is not a proper fraction. Given statement is false.

5. In improper fractions, numerator is greater than denominator. So, they always lie on the right side of 1 on the number line. So, the given statement is false.

D.

1. Perimeter of rectangle = Perimeter of square

$\Rightarrow$ 2(length + breadth) = 4 × side

$\Rightarrow$ 2(19 cm + breadth) = 4 × 20 cm

$\Rightarrow$ 19 cm + breadth = $\frac{80 \text{ cm}}{2}$

= 40 cm

$\Rightarrow$ breadth = 40 cm – 19 cm

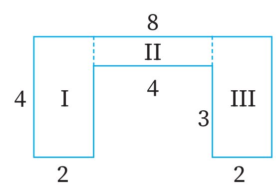
= 21 cm

So, area of rectangle = length × breadth

= 19 cm × 21cm

= 399 sq. cm

2.



Area of the figure = Area of region I + Area of region II + Area of region III

= (4 × 2) sq. units + (4 × 1) sq. units + (4 ×2) sq. units

= 8 sq. units + 4 sq. units + 8 sq. units

= 20 sq. units

3. LCM of 9, 5, 4 and 6 is 180.

So, $= \frac{4}{9} = \frac{(4\times20)}{(9\times20)} = \frac{80}{180}$,

$\frac{2}{5} = \frac{(2\times36)}{(5\times36)} = \frac{72}{180}$, $\frac{3}{4} = \frac{(3\times45)}{(4\times45)} = \frac{135}{180}$,

$\frac{1}{6} = \frac{(1\times30)}{(6\times30)} = \frac{30}{180}$

We know that if denominator is same, then number with greater numerator is greater.

So, the numbers in ascending order are as follows;

$\frac{30}{180}, \frac{72}{180}, \frac{80}{180}, \frac{135}{180}$

$\Rightarrow \frac{1}{6}, \frac{2}{5}, \frac{4}{9}, \frac{3}{4}$

4. Time spend in playing = $2\frac{3}{5}$; Time spend in watching movies = $1\frac{3}{4}$; Time spend in studying = $3\frac{2}{7}$

Total time spend in all activities = Time spent in (playing + watching movies + studying)

$= 2\frac{3}{5} + 1\frac{3}{4} + 3\frac{2}{7}$

$= \frac{13}{5} + \frac{7}{4} + \frac{23}{7} = \frac{(13 \times 28 + 7 \times 35 + 23 \times 20)}{140}$

($\because$ LCM of 5,4 and 7 is 140)

$= \frac{(364 + 245 + 460)}{140} = \frac{1069}{140} = 7\frac{89}{140}$ hours

Thus, total time spend in all activities is $7\frac{89}{140}$ hours.

5. Side of the square = 15 cm; Perimeter of square = 4 × side = 4 × 15 cm = 60 cm

New side of the square = 4 × 15 cm = 60 cm; Perimeter of new square = 4 × 60 cm = 240 cm

Since, 240 = 4 × 60.

So, the perimeter of the square becomes 4 times if the side of the square becomes four times.

6. Area of the rectangular ground

$= \frac{\text{Total cost}}{\text{Cost of per sq.cm}} = \frac{900}{2} = 450$ sq.m

Now, area of rectangular ground = length × width

$\Rightarrow$ 450 sq.m = 25 m × width

$\Rightarrow$ width $= \frac{(450 \text{ sq.m})}{25 \text{ m}} = 18$ m

7. $3\frac{1}{5} + 4\frac{1}{10} - 5\frac{1}{15} + 9 + \frac{1}{3} = \frac{16}{5} + \frac{41}{10} - \frac{76}{15} + 9 + \frac{1}{3}$

LCM of 5, 10, 15, and 3 is 30.

Now,

$\frac{16}{5} = \frac{(16 \times 6)}{(5 \times 6)} = \frac{96}{30}, \frac{41}{10} = \frac{(41 \times 3)}{(10 \times 3)} = \frac{123}{30},$

$\frac{76}{15} = \frac{(76 \times 2)}{(15 \times 2)} = \frac{152}{30}, \frac{1}{3} = \frac{(1 \times 10)}{(3 \times 10)} = \frac{10}{30},$

$\frac{9}{1} = \frac{(9 \times 30)}{(1 \times 30)} = \frac{270}{30}$

So, $3\frac{1}{5} + 4\frac{1}{10} - 5\frac{1}{15} + 9 + \frac{1}{3}$

$= \frac{16}{5} + \frac{41}{10} - \frac{76}{15} + 9 + \frac{1}{3}$

$= \frac{96}{30} + \frac{123}{30} - \frac{152}{30} + \frac{270}{30} + \frac{10}{30}$

$= \frac{347}{30} = 11\frac{17}{30}$

8. Letters in word MATHEMATICS are M, A, T, H, E, M, A, T, I, C, S.

Vowels are A, A, E, I and consonants are M, T, H, M, T, C, S.

So, total number of letters in word = 11; Number of vowels = 4; Number of consonants = 7

(*a*) Fraction of vowel $= \frac{\text{Number of vowel}}{\text{Total number of letters}} = \frac{4}{11}$

(*b*) Fraction of consonants $= \frac{\text{Number of consonant}}{\text{Total number of letters}} = \frac{7}{11}$

CHAPTER 8 : PLAYING WITH CONSTRUCTION

Practice Time 8A

1. (*a*) Since an open curve does not enclose any area within itself and has two endpoints. So, it is a open curve.

(*b*) Since a closed curve has no endpoints and encloses an area (or a region). So, it is a closed curve.

(*c*) Same as part (*a*)

(*d*) Same as part (*b*)

(*e*) Same as part (*b*)

5. (*d*) This is a square as all its side are equal and all angles are 90°

Chapter Assessment

A.

1. (*d*) The instrument used to draw a circle is compass.
2. (*d*) The distance between the center of the circle and any point on the circle = radius of circle = 7 cm
3. (*d*) More than half i.e., 5 cm
4. (*b*) No, it stays the same
5. (*a*) Diameter of larger circle = diameter of both inner circle = $2 \times 4 + 2 \times 6 = 8 + 12 = 20$

   So, radius of larger circle = $\frac{d}{2} = \frac{20}{2} = 10$ cm
6. (*c*) Circle is a closed curve all of whose points are at the same distance from a fixed point.
7. (*d*) A rectangle has four right angle.
8. (*b*) Circles

B.

1. (*a*) Assertion is true and the Reason correctly cuplains why the assertion is true.
2. (*d*) A compass can draw only circle and arcs but not straight lines. Hence, the Assertion is false, but the reason is true.
3. (*d*) A compass can draw only circle and arcs but not straight lines. Hence, the Assertion is false, but the reason is true.

C.

1. True
2. True
3. False as the diagonals of a square are of equal length.
4. True

D.

3. Since, figure A, D, F and G have equal opposite sides with each angle is 90°. So, they form rectangle.

   Also in figure B and C, all sides are of equal length and each angle is 90°. So they form square.

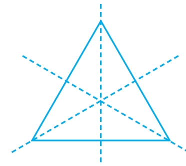
CHAPTER 9 : SYMMETRY

Refer to the book answer key

Unit Test – 4

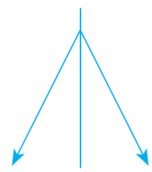
A.

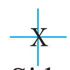
1. (*c*) An equilateral triangle has 3 lines of symmetry.



2. (*c*) Diameter = 16 cm

   Radius = $\frac{16}{2} = 8$ cm
3. (*b*) Divider has one line of symmetry.



4. (*c*) 5. (*d*) 6. (*b*)
7. Alphabet H, has both reflection and rotational symmetry.
8. (*b*) 
9. (*d*) Side of square = 8 cm

   Length of rectangle = 18 cm

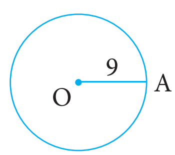
   Breadth of rectangle = 6 cm

   Here, $6 < 8$ and $18 < 3 \times 8$

   Hence, Assertion is false but Reason is true.
10. (*a*) A regular pentagon has 5 lines of symmetry because it has 5 equal sides and angles.

    Hence, both statements are true and R correctly explains A.

B.

1. 

2. A Circle consists of a set of points on a plane that are all at a fixed distance from a single point.
3. The letter H has a rotational symmetry of order 2.
4. In regular tiling pattern, the equilateral triangle can be duplicated infinitely to fill a plane without gaps.
5. The line that divides an object into two identical parts is called the line of symmetry.

C.

1. False, it has four line of symmetry.

2. True
3. True, if the right triangle is an isosceles right triangle.
4. False, a rectangle has a rotational symmetry of order 2.
5. True

D.

1. (*a*) ⅃ƎWOT (*b*) ⅃AИOITAИ
2. (*a*) $\frac{360°}{3} = 120°$

   Angle of rotation that map it onto itself:

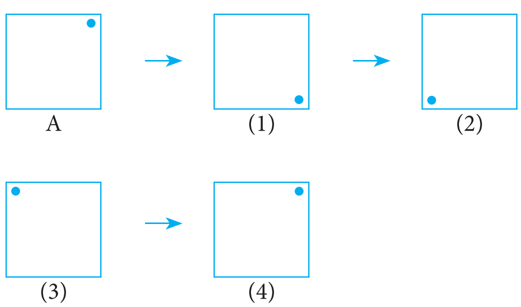
   120°, 240° and 360°.

   (*b*) $\frac{360°}{6} = 60°$

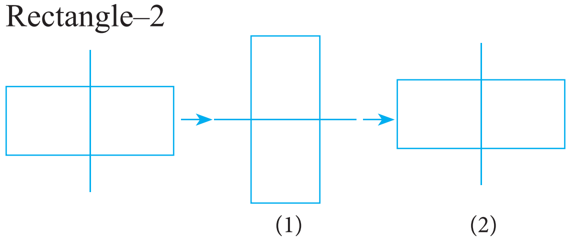
   Angle of rotation that map it onto itself:

   60°, 120°, 180°, 240°, 300° and 360°.
3. A, P, Q, L, G and J have rotational symmetry of order 1. (Answer may vary)
5. Rotational symmetry for

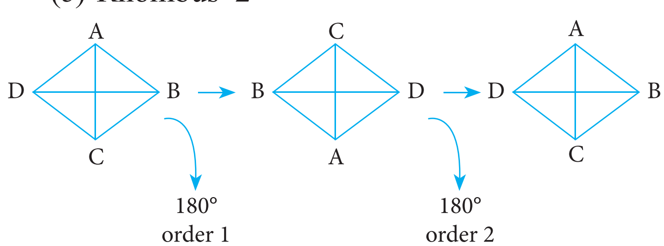
   (*a*) Square–4



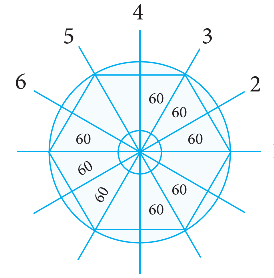
   (*b*) Rectangle–2



   (*c*) Rhombus–2



   (*d*) Hexagon–6



Hexagon

6. No. 360° cannot be divided by 19.

CHAPTER 10 : THE OTHER SIDE OF ZERO

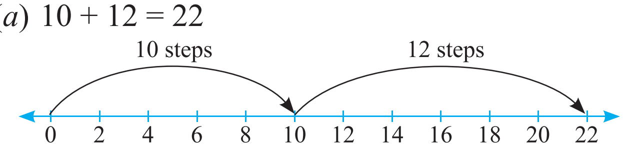
Let's Recall

1. (*a*) Successor number of 6745 is the next number i.e., 6746 and precedesor of 2024 is the previous number i.e., 2023.

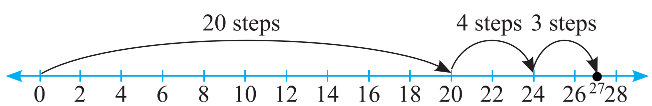
   (*b*) 1 and 0

   (*c*) Below
2. (*a*) True, because the smallest natural number is 1,

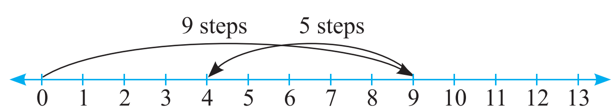
   (*b*) True
3. (*a*) 10 + 12 = 22



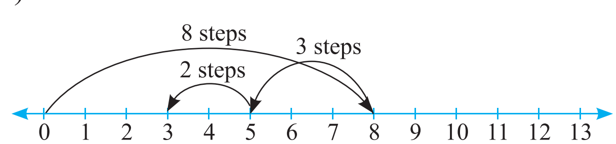
   (*b*) 20 + 4 + 3 = 27



   (*c*) 9 – 5 = 4



   (*d*) 8 – 3 – 2 = 3



4. (*a*) Below (*b*) Loss

   (*c*) Decrease (*d*) Smita

   (*e*) Negative

Think and Answer (Page 283)

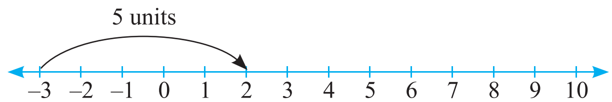
1. Maximum marks = 17 → Vaishali
   Minimum marks = –15 → Smita
2. Smita scored less than Shailza.

Maths connect (Page 284)

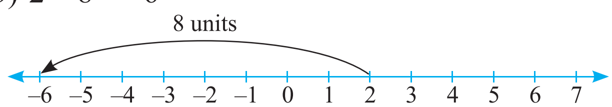
1. Since, iron image will be an inverted image. So, design will look like option 2 when printed on a T-shirt.

Practice Time 10A

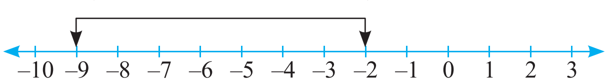
1. Integers are neither decimal nor fraction.
   Hence, –142, 254, –7, 0, 547 are integers.
2. (*a*) 50 m rise in water level
   (*b*) 9°C above 0°C
   (*c*) Increase in marks
   (*d*) 1899 BCE
3. (*a*) +12 cm (*b*) –₹700
   (*c*) +6 kg (*d*) –₹5100
4. (*a*) –3 + 5 = 2



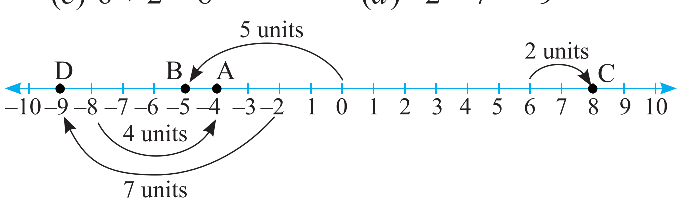
   (*b*) 2 – 8 = –6



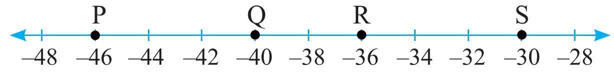
5. (*a*) False, because the smallest whole number is 0.
   (*b*) True (*c*) True
   (*d*) True
   (*e*) False, because absolute value of an integer is always its numerical value irrespective of its sign.
   (*f*) True
   (*g*) False, because whole numbers are 0, 1, 2, … .
6. 6 i.e., (–8, –7, –6, –5, –4, –3)



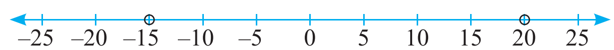
7. (*a*) –8 + 4 = –4 (*b*) 0 – 5 = –5
   (*c*) 6 + 2 = 8 (*d*) –2 – 7 = –9



8.

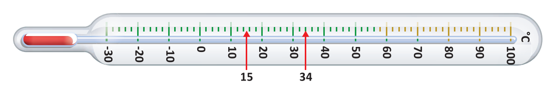


9. (*a*) 2 < 9 (*b*) 0 < 7 (*c*) –9 < –1 (*d*) 28 > –12
10. (*a*) –39 < –33 < 0 < 10 < 33
    (*b*) –31 < –21 < –17 < 8 < 15
    (*c*) –10 < – 7 < –6 < 8 < 9
11. (*a*) 3 > 0 > –1 > –3 > –4 > –6
    (*b*) 110 > 58 > 7 > –230 > –330
    (*c*) 25 > 24 > –7 > –24 > –25
12. (*a*) Integers less than –23 are –24, –25, –26, –30, –100 etc.
    (*b*) Integers greater than –3 are –2, – 1, 0, 1, 2 etc.
    (Answer may vary)
13. (*a*) | –233 | = 233
    (*b*) –| –23 | = –(23) = –23
    (*c*) 89 – | 7 | = 89 – 7 = 82
14.



    Missing positive integer is 20.

15. 15°C

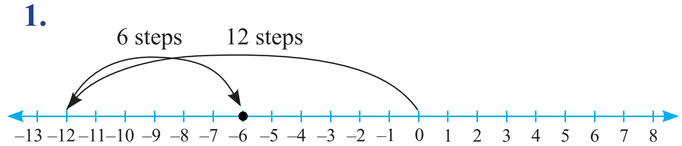


16. Temperatures from coldest to warmest means arrange temperatures in increasing order: –10°C, –6°C, 0°C, 15°C, 38°C, 45°C, 70°C
17. Each gap is represented by $\frac{1000}{5} = 200$.

P = 2000 + 4 × 200 = 2800 m
Q = –1000 m
R = 200 × 3 = 600 m
S = –2000 + 2 × –200 = –2400 m
T = 2000 + 2 × 200 = 2400 m
U = –200 × 2 = –400 m
V = 200 × 1 = +200 m

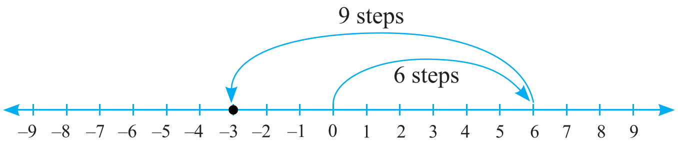
Quick Check (Page 287)

1.



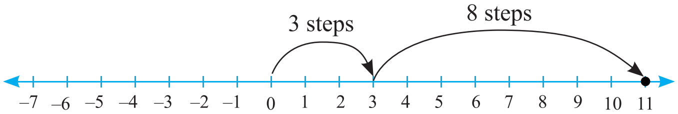
∴ –12 + 6 = –6

2.



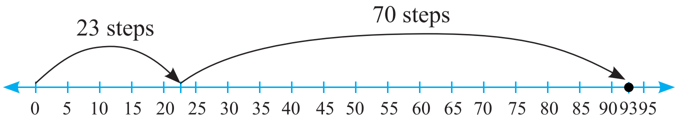
∴ 6 + (–9) = –3

3.



∴ 3 + 8 = 11

4.



∴ 23 + 70 = 93

Quick Check (Page 289)

1. $(a + b) + c = a + (b + c)$ (Associative law for addition).

Hence, [12 + (–19)] + (–34) = 12 + [(–19) + (–34)]

2. $a + b = b + a$ (Commutative law for addition)

∴ (–123) + 341 = 341 + (–123)

3. $a + 0 = a = 0 + a$ (Additive identity)

(–123) + 0 = (–123)

4. $(–a) + a = 0 = a + (–a)$ (Additive inverse)

∴ (–2) + 2 = 0 = 2 + (–2)

Practice Time 10B

1.

+	–6	–4	–2	0	2	4	6
6	0	2	4	6	8	10	12
4	–2	0	2	4	6	8	10
2	–4	–2	0	2	4	6	8
0	–6	–4	–2	0	2	4	6
–2	–8	–6	–4	–2	0	2	4
–4	–10	–8	6	–4	–2	0	2
–6	–12	–10	–8	–6	–4	–2	0

From the table

(*a*) 6 + (–6) = 0

4 + (–4) = 0

2 + (–2) = 0

0 + 0 = 0

–2 + 2 = 0

–4 + 4 = 0

–6 + 6 = 0

∴ the pairs of integers are 6, – 6; 4, –4; 2, – 2; 0, 0; –2, 2; –4, 4; –6, 6.

(*b*) Yes, –4 – 2 = –6

2. (*a*) |5| + |–5| + 4 = 5 + 5 + 4 = 14

(*b*) 7 + |5| – 7 = 7 + 5 – 7 = 5

(*c*) 27 – |–10| + 6 = 27 – 10 + 6 = 23

3. (*a*) |–12 + (–15)| = |–12 – 15| = |–27| = 27

(*b*) |25 – (–45 + 15)| = |25 – (–30)| = |25 + 30| = 55

(*c*) |(–3) + (–4) + (–5)| = |–3 –4 –5| = |–12| = 12

4. (*a*) (–71) + (–302) + 36 = –71 – 302 + 36

= –373 + 36 = – 337

(*b*) 147 + (–254) + (–136) = 147 – 254 – 136

= 147 – 390 = –243

(*c*) (–379) + (–546) = –379 – 546

= –925

5. (*a*) 30 + (–23) + (–63) + (+55) = 30 – 23 – 63 + 55

= 85 – 86 = –1

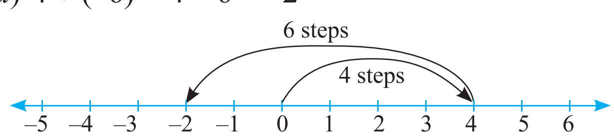
(*b*) (27) + (–6) + (–56) + (–4) = 27 – 6 – 56 – 4

= 27 – 66 = –39

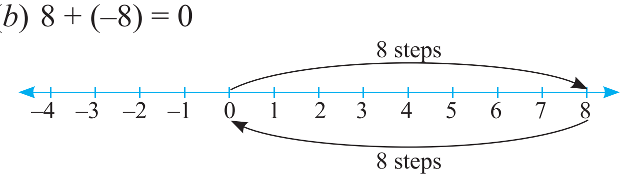
(*c*) (–12) + 19 + (–16) + (–35) = –12 + 19 – 16 – 35

= 7 – 51 = –44

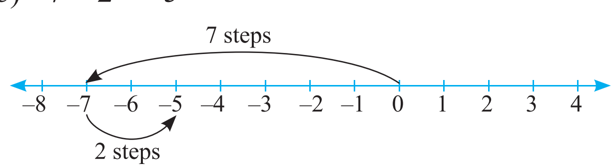
6. (*a*) 4 + (–6) = 4 – 6 = –2



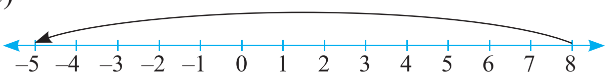
(*b*) 8 + (–8) = 0



(*c*) –7 + 2 = –5

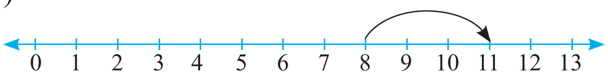


7. (a)



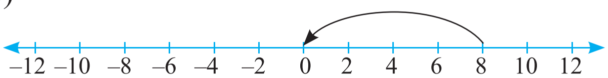
Left direction

(b)



Right direction

(c)



Left direction

8. (a) Additive inverse of 17 = –17
   (b) Additive inverse of (–357) = 357
   (c) Additive inverse of 0 = 0
9. (a) True
   (b) False as (–1) + 4 = 3, which is a positive integer
   (c) True
   (d) False as (–3) + 2 + 1 = –3 + 3 = 0

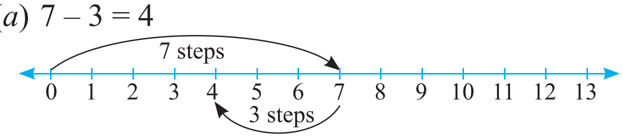
Life Skills (Page 292)

Withdrawal amount means Radhika spends some amount from the existing balance, while deposit amount means she add some amount.

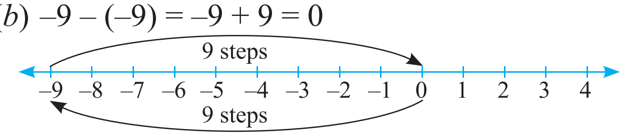
∴ Radhika's balance amount at the end of the month = ₹89,000 + ₹8,000 – ₹9,500 + ₹2,000 – ₹950 – ₹1,050 + ₹1,500 = ₹89,000

Practice Time 10C

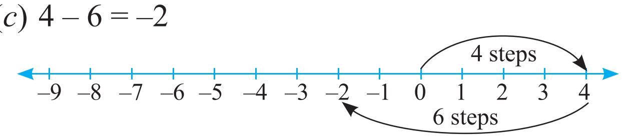
1. (a) (–19) + (–11) = (–11) + (–19)
   (b) (–235) + 0 = –235
   (c) 2367 + (–1234) = (–1234) + 2367
   (d) 675 + {–345 + (–888)}
   = {675 + (–345)} + (–888)
2. (a) 7 – 3 = 4



   (b) –9 – (–9) = –9 + 9 = 0



   (c) 4 – 6 = –2



3. (a) 9 – (–18) = 9 + 18 = 27
   (b) –3 – (–12) = –3 + 12 = 9
   (c) –7 – (–9) = –7 + 9 = 2
   (d) –13 – (–5) = –13 + 5 = –8
   (e) 1695 – 134 = 1561
   (f) –54 – (89) = –54 – 89 = –143
4. (a) LHS = (–15) + (–23)
   = –15 – 23 = –38
   RHS = (–12) + (–32)
   = –12 – 32 = –44
   Hence, –38 > – 44
   (b) LHS = (–12) + 23 – (–43)
   = –12 + 23 + 43
   = –12 + 66
   = 54
   RHS = 92 + (–34) – (–23)
   = 92 – 34 + 23
   = 115 – 34 = 81
   Hence, 54 < 81
   (c) LHS = (–20) – (–20) + 30
   = –20 + 20 + 30 = 30
   RHS = 20 + (–650) + (–12)
   = 20 – 662 = –642
   Hence, 30 > –642
   (d) LHS = 123 – (–233) = 123 + 233 = 356
   RHS = 234 – (0 – 14 + 17)
   = 234 – 3 = 231
   Hence, 356 > 231
5. (a) [58 – (–8)] + [12 – (–6)]
   = (58 + 8) + (12 + 6)
   = 66 + 18 = 84
   (b) [–24 – (–32)] + [–52 – (–36)]
   = (–24 + 32) + (–52 + 36)
   = 8 – 16 = –8
6. (a) –45 + 242 – 32 + 67 – 777 – 23 + 721 – 34
   = (–45 – 32 – 777 – 23 – 34) + (242 + 67 + 721)
   = –911 + 1030 = 119
   (b) –23 + 34 – 45 + 56 – 67 + 78 – 89 + 98 – 100
   = (–23 – 45 – 67 – 89 – 100) + (34 + 56 + 78 + 98)
   = –324 + 266 = –58
   (c) 12 – 23 + 33 – 445 – 566 + 66 – 888 + 34
   = (12 + 33 + 66 + 34) – (23 + 445 + 566 + 888)
   = 145 – 1922 = – 1777

(*d*) 5 – 55 + 555 – 5555 + 654

= (5 + 555 + 654) – (55 + 5555)

= 1214 – 5610 = –4396

7. (*a*) Sum of –160 + 175 = 15

Sum of 115 – 315 = –200

Hence, (115 – 315) – (–160 + 175)

= –200 – 15 = –215

(*b*) [–2100 + (–2001)] – (–5308)

= (–2100 – 2001) + 5308

= –4101 + 5308

= 1207

8. Other integer = 85 – (–17) = 85 + 17 = 102

9. Utkarsha final score = 12 – 9 + 4 + 6 – 3

= 3 + 4 + 6 – 3 = 10

10. Initial temperature = +8°C

Temperature in 1st hour = (8 + 5)°C

= 13°C

Temperature in 2nd hour = (13 – 3)°C

= 10°C

11. Score of Nilabh = –10 + 20 – 5 – 20 + 50

= (–10 – 5 – 20) + (20 + 50)

= –35 + 70

= 35

Score of Nishtha = 0 – 30 + 10 + 50 – 20

= –50 + 60

= 10

Hence, Nilabh scored more than by Nishtha.

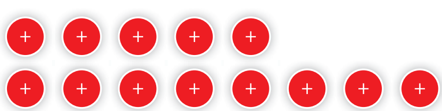
12. Net calories = Calories burned – Calories gained

380 – 207 = 173.

∴ Aakriti lose 173 calories on that particular day.

Quick Check (Page 296)

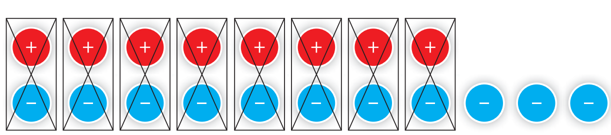
1. 5 + 8



Total number of token = 13

∴ 5 + 8 = 13

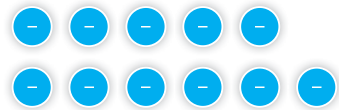
2. 8 – 11



∴ 8 + 11 = –3

3. Same as part (2)

4. –5 – 6



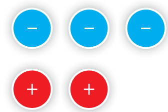
Total number of token = 11

∴ –5 – 6 = –11

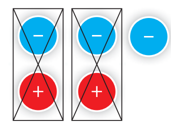
5. Same as part (2)

6. Same as part (2)

7. (–3) – (–2)



But, we have to subtract (–2), so below 2 tokens have to be inverted, we get



∴ –3 – (–2) = –3 + 2 = –1

8. Same as part (2)

Think and Answer (Page 296)

–6	–4	–2
–5		–7
–1	–8	–3

Practice Time 10D

1. (*a*) –6, –5, –4, –3, –2, –1

(*b*) –29, –28, –27, –26, –25, –24

(*c*) –14, –13, –12, –11, –10, –9

(*d*) –249, –248, –247, –246, –245, –244 –243, –242, –241, –240, –239, –238, –237, –236

(*e*) –2, –1, 0, 1, 2

(*f*) 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

2. (*a*)

–10	–2	16
5		–5
9	2	–7

(*b*)

6	8	–16
11		–5
–19	–2	19

(c)

7	–7	–8
–10		–5
–1	–8	5

3. (a)

–6	–1	–8
–7	–5	–3
–2	–9	–4

(b)

–5	0	–7
–6	–4	–2
–1	–8	–3

4. Number an both dice = –1, 2, –3, 4, –5 and 6

Minimum sum = –5 + (–5) = –10

Maximum sum = 6 + 6 = 12

Numbers that can't be obtained = –9, –7, –5, 0, 2, 7, 9 and 11.

5. (a)

3	–2	1	–7
4	–1	2	–6
0	–5	–2	–10
9	–4	7	–1

Sum = 3 + 2 – 5 – 1 = –1

(b)

7	–2	–11	–20
10	1	–8	–7
13	4	–5	–14
16	7	–2	–11

Sum = –11 + 10 – 14 + 7
= –1 – 7
= –8

(c)

–11	–7	–3	1
–10	–6	–2	2
–9	–5	–1	3
–8	–4	0	4

Sum = –11 – 6 – 1 + 4
= –14

Mental Maths (Page 298)

1. In a magic square, sum of all elements in a row, column or in diagonal is same.

(a)

0	5	–2
–1	1	3
4	–3	2

(b)

–4	1	0
3	–1	–5
–2	–3	2

(c)

–2	3	–4
–3	–1	1
2	–5	0

(d)

–2	3	2
5	1	–3
0	–1	4

2. (–5) – (–9) – (+18) – (+7) = –5 + 9 – 18 – 7
= 4 – 18 – 7 = –21

3. Solve it with example,

(a) 4 – (–5) = 4 + 5 = 9 Positive
or 4 – (–1) = 4 + 1 = 5 Positive

(b) 5 + (–3) = 5 – 3 = 2 Positive
5 + (–8) = 5 – 8 = –3 Negative

(c) (–5) + (–8) = –5 – 8 = –13 Negative

(d) (–5) – (–8) = –5 + 8 = 3 Positive
(–8) – (–5) = –8 + 5 = –3 Negative

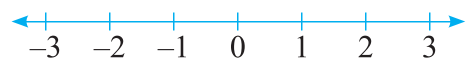
(e) (–5) – (8) = –5 – 8 = –13 Negative

(f) (–5) + (8) = –5 + 8 = +3 Positive
(–15) + (8) = –15 + 8 = –7 Negative

Chapter Assessment

A.

1. (c) The number line is as follows:



So, the integers lying between –2 and 2 are –1, 0 and 1.

That is total 3.

2. (b) The whole number are 0, 1, 2, 3, …

So, the whole numbers lying between –6 and 6 are 0, 1, 2, 3, 4, 5

Thus, the number of whole numbers lying between –6 and 6 are 6.

3. (b) 11 – 0 = 11, 9 – (–3) = 12, –7–(–14) = 7, 0 – (–6) = 6

Thus the maximum temperature rise from –3ºC to 9ºC.

4. (d) [–58 – 18 = –76]

5. (b) [| –10 | + | 11 | = 21]

6. (c) –6464 – 2446 = –8910

7. (d) Since –4°C < –1°C. And difference
= –1ºC – (–4ºC) = 3ºC

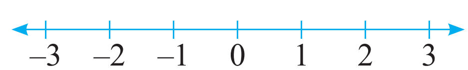
∴ A is cooler than B.

8. (d) [–25 + 4 – 75 – 12 + 6 = –102]

9. (b) other number = –20 + 6 = –14.

B.

1. (a)



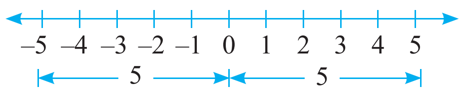
Assertion: Yes, –1 is the largest integer which is negative.

Reason: The closest integer to –1 is 0. Hence A and R both are correct.

2. (*d*) **A:** –5 – (–10) = –5 + 10 = 5 ≠ –15

Here, A is false but R is true. correct option is (*d*)

3. (*a*)



A: Yes the distance is the same

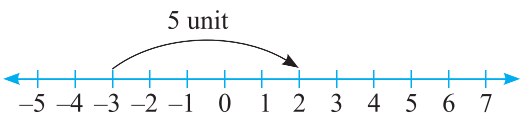
R: Absolute value is always positive. Hence, A and R both are true. Correct option is (*a*).

C.

1. Since, – 7 + 7 = 0. So, the additive inverse of –7 is 7

∴ Option (*d*) is correct. So, 1 → (*d*)

2.



So, –3 + 5 = 2

∴ Option (*a*) is correct. So, 2 → (*a*)

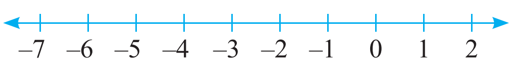
3. –1 is the largest negative integer and 0 > –1. So, 0 is the smallest integer greater than every negative integer.

∴ Option (*e*) is correct. So, 3 → (*e*)

4. 77 + (–15) + (–35) = 77 + (–50) = 27

∴ Option (*b*) is correct. So, 4 → (*b*)

5.



So, the number lies one the lift side of –6 is –7.

∴ Option (*c*) is correct. So, 5 → (*c*)

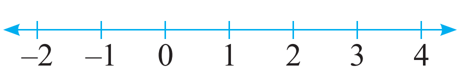
D.

1. Since 6 > 4 = – 6 < –4. So, the given statement is False.

2. (–1) + (–2) = –3, which is also a negtive integer. So, the given statement is false.

3. (–3) – (–13) = –3 + 13 = 10 > –16. So, the given statement is false.

4.



So, the given statement is true.

5. Addtive inverse of 2 is –2. so 2 – (–2) = 2 + 2 = 4, even number and additive inverse of 3 is –3. So 3 – (–3) = 3 + 3 = 6, even number

∴ The given statement is true.

6. Successor of 2 is 3 and predecessor is 1.

∴ Sum = 3 + 1 = 4, even integer.

So, given statement is false.

7. Let –3 be integer. So –3 + (–3) = –3 – 3 = –6

But, –6 < –3

So, the given statement is false.

E.

1. Consider 49 – (–40) – (–3) + 69

= 49 + 40 + 3 + 69 = 161

2. (*a*) Since opposite of down is up. So, the opposite of 15 floors down is 15 floors up.

(*b*) Since, opposite of above is below.

So, the opposite of 20 m above the danger mark of river Ganga is 20 m below the danger mark.

(*c*) Opposite of gain is loss.

So, opposite of a gain of ₹450 is a loss of ₹450.

(*d*) Since, opposite of winning is losing.

So, the opposite of winning by a margin of 1500 votes is losing by a margin of 1500 votes.

3. In each jump, kitten moves 4 steps forward and 3 steps backward.

So, net movement per jump

= 4 – 3 = 1 step forward

Now, the points in sequence are:

A → B → C → D → E → F → G

Since each jump the kitten moves 1step forward, So, the kitten will need 6 jumps to reach point G.

4. At the end of 5th round, Kartik score

= 60 – 90 + 55 – 30 + 25

= 140 – 120 = 20

5. (*a*) [245 + (–518)] – 51 = –324

(*b*) [3321 + (–4312)] + (–2043)

= –991 – 2043 = –3034

6. Current solution = 21 – 9 –13

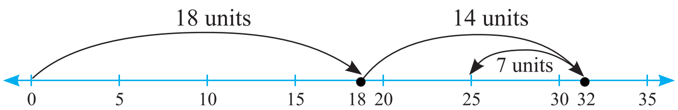
= 21 – 22 = –1

instead of subtracting 22, she added 22. The reason being she learnt that two negative numbers when added will get the sign of larger number but failed to apply.

7. Priyanshi parked her car in the third basement, i.e., –3, and took elevator to the next sixth floor, i.e., 6. So, –3 + 6 = 3 i.e. 3rd floor above the ground level. So, she ended up on 3rd floor.

8. $18 + 14 - 7$

$= 25$ ice cream



9. Score of team A $= -10 + 12 + 19 = 21$

Score of team B $= 21 + 10 - 17 = 14$

Score of team C $= 25 + 18 - 20 = 23$

Score of team D $= 20 + 5 - 10 = 15$

Thus, team C had the highest score.

10. $-2 - 3 + 2 + 3 + 5 = 5;$

$-1 - 2 + 2 + 1 + 5 = 5$

11. (*a*) Point A = + 8 km, since, it is 8 km above sea level.

Point B = – 12 km, since it is 12 km below sea level

Point C = + 11 km, since it is 11 km below sea level

Point D = – 9 km, since it is 9 km below sea level.

(*b*) Point C

(*c*) Distance between points B and C = 12 + 11 = 23 km

(*d*) Point B = 12 km below sea level = –12 km

So, elevation of point E = –12 km – 5 km

= –17 km

∴ The elevation of point E is 17 km below sea level.

Brain Sizzlers (Page 303)

Niharika's Movement:

$+ 24 + (-27) + 24 + (-27) + 24 + (-27) + 24 + (-27) + 24 = 120 + (-108) = 12$

Nidhi's Movement:

$+ 37 + (-32) + 37 + (-32) + 37 + (-32) + 37 + (-32) + 37 = 185 + (-128) = 57$

So, Nidhi is at higher level by 57 – 12 = 45 units.

Model Test Paper – 2

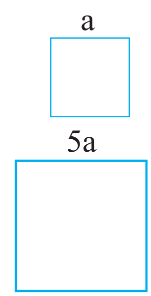
A.

1. (*d*) 1, 6, 15, 28, …, are hexagonal numbers as they form hexagonal dots.

2. (*c*) $\frac{5}{9} = \frac{5 \times 12}{9 \times 12} = \frac{60}{108}$

3. (*c*) Two sets of data on the same graph is shown by double bar graph.

4. (*c*) Let the side of a square = *a*



∴ Perimeter = 4*a*

If the new side = 5*a*

∴ New Perimeter = 4 × 5*a*

= 20*a*

= 5(4*a*)

= 5 × Perimeter

Hence, perimeter becomes five times (*c*)

5. (*c*) no line of symmetry

6. (*c*) A complete turn = 360º

So, three-quarter turn $= \frac{3}{4} \times 360°$

$= 270°$

7. (*b*) 2394 – (–4128)

= 2394 + 4128

= 6522

8. (*d*) Since 24 × 1 = 24,

24 × 3 = 72,

24 × 6 = 144

But 218 is not divisible by 24. So 218 is not a multiple of 24.

9. (*b*) Perimeter = 24 cm

Side $= \frac{24}{4} = 6$ cm.

(∵ Perimeter of a square = 4 × side)

So, Area $= (6)^2 = 36$ sq. cm.

Assertion is true so as Reason but reason is not the correct explanations. hence (*b*).

10. (*a*) A and R are both true and A is correct explanation of R.

B

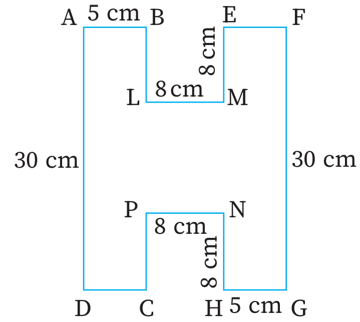
1. properties
2. perimeter = 6 × 6 cm = 36 cm.
3. 1
4. diagonal
5. twin

C.

1. Successor of –9058 is – 9058 + 1 = –9057
   So, this statement is false.
2. 19 + 38 + 57 + 76 + 95
   = 19(1 + 2 + 3 + 4 + 5)
   = 19 × 15 = 285. So, this statement is true.
3. Both are required as P = 2(*l* + *b*). So, this statement is false.
4. True
5. True

D.

1. (*a*) –459 + 301 + (–50) + 109
   = –459 + 301 – 50 +109 = –99
   Therefore, the additive inverse of –99 = 99 as –99 + 99 = 0.
   (*b*) 30 + (–48) + (–15) – 80
   = 30 – 48 – 15 – 80 = –113
   Therefore, the additive inverse of –113 is 113 as – 113 + 113 = 0
2. (*a*) AD||CB, DC||AB, LT||AB, AD||MN, DC||LT, MN||CB.
   (*b*) MN⊥AB, LT⊥BC, NN⊥DC, LT⊥ AD
   (*c*) AC and BD, MN and LT.
3. HCF × LCM = Product of two numbers.
   32 × 480 = 160 × other number
   $$\text{Other number} = \frac{32 \times \cancel{480}^{\,3}}{\cancel{160}} = 32 \times 3 = 96$$
4. BL = EM = 8 cm
   LP = 30 – 8 – 8 = 14 cm
   or (LMPN) = 8 cm × 14 cm = 112 sq. cm.
   or (EFGH) = 30 cm × 5 cm = 150 sq. cm
   or (ABCD) = 30 cm × 5 cm = 150 sq. cm



Total area = (112 + 150 + 150) sq. cm
= 412 sq. cm

5. Word H and S have rotational symmetry of order2 as it looks same when rotated about180 degrees.
6. Distance covered by walking = $\frac{1}{3}$ km
   Distance covered by bus = $3\frac{1}{5}$ km = $\frac{16}{5}$ km
   Distance covered by Battery rickshaw = $\frac{1}{4}$ km
   Total distance covered = $\left(\frac{1}{3} + \frac{16}{5} + \frac{1}{4}\right)$ km
   $= \frac{20 + 192 + 15}{60}$ km $= \frac{227}{60}$ km $= 3\frac{47}{60}$ km
   $= 3\frac{47}{60}$ km < 4 km
8. Total number of people = 155
   Number of people who do regular meditation = 45
   Number of people who do Regular exercise = 95
   Number of people who do Yoga = 155 – 45 –95 = 15
   (*a*) Fraction of total number of people who do yoga
   $= \frac{15}{155} = \frac{3}{31}$
   (*b*) Yes as the numerator is smaller than denominator.
   (*c*) Meditation = $\frac{\cancel{45}^{\,9}}{\cancel{155}_{\,31}} = \frac{9}{31}$
   Exercise = $\frac{\cancel{95}^{\,19}}{\cancel{155}_{\,31}} = \frac{19}{31}$
   Yoga = $\frac{15}{155} = \mathbf{\frac{3}{31}}$