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MATH GENIUS

Think Smart, Solve Fast

Ver. 2.0

Lesson Plan

Experience the Joy of Learning Mathematical Skills

ORANGE

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PREFACE

The Teacher's Resource Manual is specially developed for teachers using **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 two segments—Chapter-wise detailed **Lesson Plans based on 6E model** and **Practice Materials** in the form of **Worksheets**.

Features of the Teacher's Resource Manual:

Detailed Lesson Plan: It contains Topics to be covered in the chapter, Suggested Allocation of Periods, Teaching Objectives, Learning Objectives and Suggested Teaching Aids.

- **Each lesson plan is based on 6E's:** The 6E lesson plan is based on an instructional model that consists of six phases or steps: Engage, Explore, Explain, Elaborate, Evaluate and Enhance.
- **Engage:** It enhances students' curiosity, interest, and engagement and help them access prior knowledge.
- **Explore:** It provides students with opportunities to construct learning experience through activities.
- **Explain:** students acquire opportunities to explain their learning experiences with the current learning and to conceptualise the topic's main ideas.
- **Elaborate:** Students apply their knowledge to real-world applications.
- **Evaluate:** it allows teachers and students to recognize the learning effect and review and assess what they have learned and how they have learned it.
- **Enhance:** Provides students time to think, plan, investigate, and organize collected 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.

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 by the teachers' community will be gratefully acknowledged by us.

—Publisher

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1 Large Numbers

Learning Objectives

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

- read and write large numbers up to 8 digits in Indian place value system
- find the face value and the place value of the digits in a number
- compare and order large numbers
- form numbers by using given digits without and with repetition of digits
- read and write large numbers in international place value system
- round off the numbers to the nearest tens, hundreds and thousands
- read and write numbers in Roman numerals

LESSON PLAN

Suggested number of periods: 12

Suggested Teaching Aids: Textbook (Math Genius 5), blackboard or whiteboard, pens, pencils, chalks/marker, notebook, paper chits/number cards/flash cards, newspaper, an empty box, etc.

Keywords: Crores, Millions, Predecessor, Successor, Roman numerals, etc.

Pre-requisite knowledge: Students must be familiar with numbers up to lakhs, their number names, the smallest and greatest 6-digit numbers, etc.

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

Periods: 1–3	**Topics: Knowing large numbers; Place value system; Face value and Place value; Expanded form; Predecessor and successor**	**Suggested extra teaching aids: Blackboard or whiteboard, chalks/marker, dice/number cards/flash cards, an empty box, etc.** **Math Genius 5 pages: 8–14**

ENGAGE

Choose a student in the class and ask him 'What is the pin code of your area?'. Accept the response and instruct another student to come on the board and read aloud the number and write its number name on the board. E.g., if the area pin code is 243601, then the other student will read and write 'Two lakh forty-three thousand six hundred one'. Repeat the same activity with other students.

Revise the learners' previous knowledge by using Let's Recall section given in the book.

Now, instruct the students to write their date of birth in the DDMMYY format in their notebook and read aloud the number formed. Also, ask them to write the number name. Accept the responses.

Ask 'How many digits are in the number formed by writing the date of birth in DDMMYY format?', 'Are these numbers 6-digit numbers?', 'What are the smallest and the greatest 6-digit numbers?', What will you get after adding 1 to the greatest 6-digit number?', etc. Accept the responses and then introduce 7-digit numbers to the class. **[Experiential Learning]**

EXPLORE

Divide the class into groups of 7 students. Give a dice and instruct them to make a 7-digit number by throwing the dice (a student can throw dice and note down the number come on the top face of the dice to build a 7-digit number). Instruct one student of that group to come on the board and write the number built. Choose any student randomly from other group to write the number name of that one. If he/she writes the correct number name of that number, then the related group will get one point. If he/she is unable to write the correct name, give the chance to other group. Repeat this activity till time permits. **[Collaborative Learning]**

EXPLAIN

Explain to the class that if we add 1 to the largest 6-digit number, we will get the smallest 7-digit number.

	9	9	9	9	9	9	← Largest 6-digit number
						1	
+	1	0	0	0	0	0	← Smallest 7-digit number

Take the reference to the textbook pages 8 to 10 for explaining more about 7-digit numbers and then extend their learning to the 8-digit numbers. Hence explain them how to read and write 7- and 8-digit numbers in Indian place value system.

Also, take the reference of the Examples 1 and 2 given on page 10 for more explanation about the numbers up to 8 digits.

ELABORATE

Divide the class into pairs and make a place value table up to crores places on the board. Spread some flash cards on the table having 7- or 8-digit numbers written on them. Instruct the pairs to choose any card from them and represent the number written on it in the place value table on the board. Ask the questions related to place value or face value to them as, 'Which digit is at Hundreds/lakhs/ten lakhs/crores place?'; 'What is the place value and the face value of the digits at tens/thousands/ten lakhs/..., places?', etc.

Repeat this activity with other pairs till time permits.

Also, take the reference of the Examples 1 to 3 on pages 11, 12 for more explanation about the place value and the face value of a numbers.

Again ask the class how can we express the numbers in their expanded form? Accept the responses. Take the reference of pages 13 to 14 to elaborate expanded form of a number as well as successor and predecessor of a number. **[Experiential Learning]**

EVALUATE

Classwork: Ask to solve Q3 and 4 of Practice Time 1A and Q2, 4 and 6 of Practice Time 1B.

Homework: Ask to solve the remaining questions of Practice Time 1A and 1B.

ENHANCE

- Encourage the students to solve the question(s) given in 'Think Tank' section on page 11.
- Ask students to watch the following videos related to the topics taught in the periods:

https://www.youtube.com/watch?v=ziVMro-BbnU

https://www.youtube.com/watch?v=2ocKY_TUXFM **[Tech Connect]**

Periods: 4–6	Topics: Comparing and ordering numbers, Forming numbers (without and with repetition of digits)	Suggested extra teaching aids: Blackboard or whiteboard, pens, pencils, chalks/marker, cutouts of newspaper ads of home, pamphlet, number cards etc. Math Genius 5 pages 15–18

ENGAGE

Show different newspaper ads or pamphlet of buy homes on board and ask students to compare and order prices of houses to decide which is better to buy. Then move to comparing and ordering of large numbers.

EXPLORE

Divide the class into 4 or 5 groups. Give each student of groups a number card. Instruct each group, to make different numbers on board by using the digits written on number cards, like: largest 5-digit number with smallest digit at tens place, smallest 6-digit number with largest digit at thousand place, etc. The group who forms the number correctly as per instruction will be appreciated. **[Experiential Learning]**

EXPLAIN

Explain on board that:

- If two numbers have different number of digits, the number with less digits is smaller than the number with more digits.
- If two numbers have the same number of digits, then compare the corresponding digits starting from the left most digit of numbers. Continue till get different digits at the corresponding places. The number with greater digit at such place will be greater.

Next, explain forming of numbers without repetition and repetition of digits. To form the smallest number without repeating the digits, write the smallest digit other than zero (0) at the leftmost place and then write zero (0) if given, otherwise write other digits in their ascending order. To form the largest number using the given digits, write the greatest digit at the left-most place and then write other digits in their descending order. When repetition of digits is allowed, then to form the smallest number, repeat the smallest digit and to form the greatest number, repeat the greatest digit at higher places.

ELABORATE

Demonstrate the steps of comparing and ordering of numbers on board by taking the reference of Examples 1, 2, 3, 4 and 5 given on pages 15, 16.

Further, demonstrate formation of numbers without repetition of digits by taking the reference of Examples 1 and 2 and with repetition of digits using the Examples 3 and 4 given on page 17.

[Conceptual Understanding]

EVALUATE

Classwork: Ask to solve Q2, 4 and 6 of Practice Time 1C.

Homework: Ask to solve Q1, 3 and 5 of Practice Time 1C.

ENHANCE

Encourage the students of the class to solve the 'Think Tank' section given on page 16. Also, ask students to watch the following videos related to the topics taught in the periods on "www.orangewebsupport.co.in"

Periods: 7–8	Topics: International place value system, Rounding off numbers	Suggested extra teaching aids: Blackboard or whiteboard, pens, pencils, chalks/marker, medicine box with small compartments, 7 to 10 dice, etc. Math Genius 5 pages 18–22

ENGAGE

After introduction, write some eight-digit numbers on the board, and ask the students to write the numbers in place value chart. Also ask to write the numbers to their nearest tens or hundreds. Accept the answers. If any students have any confusion, rectify it. Next introduce International place value system.

[Conceptual Learning]

EXPLORE

Divide the class into groups. Draw a table on the board with a column for each group. Take some medicine boxes with small compartments and put a die in every compartment of boxes. Distribute these boxes to each group. Ask to shake the box to reveal the numbers on the dice. Ask to read the number on the dice accordingly and write the numbers on the board in their column as per in Indian place value system. Help them to write the same number in International place value system. The group who makes the highest number by rolling the dice will be the winner of the game.

[Experiential Learning]

EXPLAIN

Explain to the class that as Indian place value system, the International place value system is also used to read and write numbers. This place value system is used globally. In this system, every period has three places: ones, tens and hundreds. In this number system, we put commas after every third digit from the right of the number to separate the periods. Also explain the difference between the periods of Indian and International systems.

Next, revise the rounding off the numbers to nearest 10, nearest 100 by writing some numbers on board and telling their rounded off. Explain the rule of rounding off to the nearest 1000. **[Conceptual Learning]**

ELABORATE

Demonstrate International place value chart on board by writing a number 65423198 in this chart and by taking the reference given on page 18 in the book. Also, demonstrate that each period of International system has three places, Demonstrate the example given on page 19 in detail on board. Also show the relationship between the places of Indian as well as International place value system by using the reference given on page 19.

Further, discuss the rounding off to the nearest 1000, by using the steps given on page 21. Also talk about the examples: 1, 2 and 3 as explained on page 21. **[Conceptual Learning]**

EVALUATE

Classwork: Ask to solve Q1 and 4 of Practice Time 1D and Q4 of Practice Time 1E.
Homework: Ask to solve the remaining questions of Practice Time 1D and 1E.

ENHANCE

- Discuss ‘Think Tank’ given on page 19.
- Ask to watch the video: https://www.youtube.com/watch?v=PryGQXOwRsI.

[Tech Connect]

Periods: 9–10	Topic: Roman Numerals	Suggested extra teaching aids: Flash cards for Roman numerals and Hindu-Arabic numerals, etc. Math Genius 5 pages 22–23

ENGAGE

Talk about Roman Numerals what they have already learnt in previous class. After the introduction, write some Hindu-Arabic numerals on the board and ask the students randomly to write their corresponding Roman numerals on the board. Accept their responses. Introduce the reading and writing the higher Roman numerals. **[Conceptual Learning]**

EXPLORE

Distribute flash cards of Roman numerals and their corresponding Hindu-Arabic numerals in the class. Ask the class to read the Roman numerals and find the partner who have their corresponding Hindu-Arabic number. When they find their partner, students should seat together. Ask each pair to write first 10 multiples of their Hindu-Arabic number and their corresponding Roman numeral on a sheet of paper and submit to teacher. Teacher will appreciate the pairs who form the Roman numerals correctly. **[Collaborative Learning]**

EXPLAIN

Recall the Roman numeral symbols and their corresponding Hindu-Arabic values. Explain the rules for writing the Roman numerals.

ELABORATE

Demonstrate on board in detail, the rules for writing the Roman numerals by taking the reference given on pages 22–23. **[Conceptual Learning]**

EVALUATE

Classwork: Instruct to solve Q3 and 5 of Practice Time 1F.
Homework: Ask to solve rest of the questions of Practice Time 1F.

ENHANCE

- Discuss and motivate to solve the 'Maths Fun' given on page 25. **[Logical thinking]**
- Ask the students to prepare a beautiful chart on Roman numerals up to 100 by using matchsticks. **[Art Integration]**

Periods: 11–12	Topic: (Revision) Chapter Assessment	Suggested extra teaching aids: Math Genius 5 pages 24–27

ENGAGE

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.

EXPLORE

Divide the students into small groups and guide them to do the activity given in 'Gamified Learning' section on page 27.

EXPLAIN

Start the revision of the exercise, by using Mind Map, Mental Maths, Maths Connect and Chapter Assessment.

ELABORATE

Discuss questions 1 to 5 of the 'Chapter Assessment' and accept students' answer. If they have any confusion or do any error then explain and correct it. Motivate students to solve 'Mental Maths'.

EVALUATE

Classwork: Discuss the questions 1 to 5 of 'Chapter Assessment' in classroom.
Homework: Ask to solve Q6 to 10 of 'Chapter Assessment' given on page 26.

ENHANCE

Motivate the class to solve 'Maths Connect' given on page 25.

Operations on Large Numbers

Learning Objectives

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

- perform all four mathematical operations (addition, subtraction, multiplication and division) on large numbers
- estimate the sum, difference, product and quotient
- learn about simplification of numerical expressions
- learn BODMAS and DMAS rule

LESSON PLAN

Suggested number of periods: 15

Suggested Teaching Aids: Textbook (Math Genius 5), blackboard or whiteboard, pens, pencils, chalks/ marker, notebook, paper chits /number cards/flash cards, newspaper, an empty box, etc.

Keywords: Addition, Addend, Successor, Predecessor, Difference, Subtrahend, Minuend, Multiplicand, Multiplier, Product, Quotient, Divisor, Dividend, Remainder, Estimation, Round up, Round down, DMAS, ODMAS, BODMAS.

Pre-requisite knowledge: Students must be familiar with addition, subtraction, multiplication, division and rounding off a number up to desired place values.

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

Periods: 1–3	**Topics: Making sums equal, Addition of large numbers, Properties of addition**	**Suggested extra teaching aids: Blackboard or whiteboard, pens, pencils, chalks/ marker, notebook, paper chits** **Math Genius 5 pages 29–33**

ENGAGE

Introduce the topic in the classroom with some interesting activities, like asking questions on previously learned topics and then link to addition. Like: What is the sum of the largest 7-digit number and the smallest 8-digit number? Use the "Get Ready" and "Let's Recall" given on pages 28 and 29 of the book for this purpose. Next, introduce the topics "Making Sums Equal" and "Addition of Large Numbers".

EXPLORE

Divide the class into groups of 2-3 students. Put some number chits, on which 5, 6 or 7-digit numbers are written, on a box. Invite the groups to choose 2-3 number chits.

First member will write down the numbers in his/her notebook. Then he/she will shuffle the chits and give it to the second member. He/she will also note down the numbers and pass them to the third member. The third one also note down the numbers in the notebook. Now, all the members will add the numbers individually without looking the others calculation. After completing the task they will tally their answers and find whether it is same or not.

If any student makes any error, then the teacher will help and correct it. Repeat this activity till time permits.

[Collaborative Learning]

EXPLAIN

Explain that sometimes two groups of numbers have unequal sum. By interchanging numbers between the groups, we make the sums equal. Further, explain that addition of larger numbers is same as addition of smaller number. First, we write the addends as per their place values. Then add the numbers of each column. Use regrouping if required. Also explain the real-life situations, where the application of addition is required.

Further, explain the order property, zero property and grouping property of addition.

ELABORATE

Demonstrate on board by taking the reference given on page 29 to make two sums equal and the addition of larger numbers of 6, 7 and 8 digits by taking the references given on page 30. Also demonstrate the use of addition in the real-life situations by discussing the example 2 given on page 30.

Further, discuss properties of addition by using the references given on page 31. **[Conceptual Learning]**

EVALUATE

Classwork: Ask to solve Q1, 3 and 5(*a*), (*b*) of Practice Time 2A and 'Think Tank' given on pg 30.

Homework: Ask to solve Q2, 4, 5(*c*), (*d*) and 6 of Practice Time 2A.

ENHANCE

Visit the web portal to download assignments from www.orangewebsupport.co.in and provide them to students to solve.

Periods: 4–5	Topics: Subtraction of large numbers, Properties of subtraction, Addition and subtraction together	Suggested extra teaching aids: Blackboard or whiteboard, pens, pencils, chalks/marker, deck of cards, paper sheet etc. Math Genius 5 pages 33–37

ENGAGE

Introduce the topic in the classroom with some interesting activities, like asking the question:

(*a*) Which is the greatest 6-digit number?

(*b*) Which is the smallest 7-digit number?

(*c*) What is the difference between the greatest 6-digit and smallest 7-digit numbers?

Accept the answers, if any queries or any wrong answers then solve them on board.

EXPLORE

Digit-sum method: Using this activity, students will learn to check their answer quickly.

Divide the class into 4 or 5 groups, each group has 5 or 6 students. Distribute a paper sheet to each group. Ask each student of the group to pull 2 cards, flip them and make two numbers by using numbers of the cards and write them on their paper sheet. Instruct them to subtract the smaller number from the bigger number.

Now, the teacher will explain the "digit-sum method" to the class, so that each group will check the accuracy of their answer.

For example: If 9872541 – 143256 = 9729285

- Add the digits of the minuend: 9 + 8 + 7 + 2 + 5 + 4 + 1 $\Rightarrow$ 36 = 3 + 6 = 9
- Add the digits of the subtrahend: 1 + 4 + 3 + 2 + 5 + 6 $\Rightarrow$ 21 = 2 + 1 = 3
- Add the digits of the difference: 9 + 7 + 2 + 9 + 2 + 8 + 5 $\Rightarrow$ 42 = 4 + 2 = 6

Here, 9 – 3 = 6

Thus, the calculation is correct.

Now, each group will check their calculation. It the students have any confusion, help them.

[Collaborative Learning]

EXPLAIN

Explain to the class that subtraction of larger numbers is same as subtraction of smaller numbers. First write the minuend and subtrahend in columns as per their place values. Start subtraction from ones column. Regroup the digits if needed, then move to the tens column, and so on. Also explain the real-life situations, where the application of subtraction is required.

Further, explain the properties of subtraction and method of simplification where addition and subtraction both are required.

ELABORATE

Demonstrate on board the subtraction of larger numbers by taking the references and examples given on pages 33 and 34.

Further, discuss properties of subtraction by using the references given on page 34. Demonstrate how to do addition and subtraction operations together.

Next, discuss the real-life situations where we use addition and subtraction together. Refer pages 34 and 35 for examples and explanation. Encourage students to solve questions given in 'Think Tank' sections on pages 34 and 35.

EVALUATE

Classwork: Ask to solve Q1(a) – (e), 3(a) – (c), 5 and 6(a) – (c) of Practice Time 2B.

Homework: Ask to solve the remaining questions of Practice Time 2B.

ENHANCE

Ask students to think any five real-life situations where they need to add or subtract the larger numbers for getting the solution.

Periods: 6–7	Topics: Multiplication of numbers, Properties of multiplication	Suggested extra teaching aids: Blackboard or whiteboard, pens, pencils, chalks/marker, etc. Math Genius 5 pages 37–41

ENGAGE

After introduction, write 1 or 2-digit numbers on the board, and instruct students to multiply the numbers by 10 one by one. Ask to observe the patterns in their products. Next introduce multiplication by 100 and 1000 and multiplication of large numbers.

EXPLORE

The teacher will describe a method called base method of multiplication from Vedic math to help in certain cases where traditional multiplication takes a long time to calculate the product.

Find the product of 99994 by 885 by using the following steps:

Step 1: Find the base, if the numbers have different base make them equal as follows:

Since 99994 is closer to 100000 and 885 is closer to 1000.

Multiply 885 by 100 to make it closer to 100000

So, 885 × 100 = 88500

Step 2: Find the difference of both numbers with base.

The difference of 99994 and 100000 is 6.

And, 88500 and 100000 is 11500.

Step 3: Separate the product in two parts LHS and RHS with a straight line as follows:

99994	– 6
88500	– 11500
LHS	RHS

Step 4: Multiply the difference and write it in RHS of product.

99994	– 6
88500	– 11500
LHS	69000

Step 5: Subtract 6 from the second number *i.e.*, 88500 and put it in the LHS of product.

99994	– 6
88500	– 11500
88494	69000

Step 6: Now the complete product is 8849469000.

Step 7: Divide the product 8849469000 by 100 as we have multiplied 885 by 100.

So, the final product is 88494690. **[Vedic Math Learning]**

EXPLAIN

Explain in the classroom, the short method of multiplication by 10, 100 or 1000, …, and multiplication of large numbers. Further explain properties of multiplication and 'Doubling and Halving' method of multiplication.

ELABORATE

Demonstrate on board when we multiply any number with 10, 100, 1000, or any number whose first digit is 1 and others are 0, then the product is the number itself with number of zeros in the multiplier. Take the reference of examples of multiplication by 10, 100, or 1000, … given on pages 37 and 38.

Further, demonstrate multiplication of large numbers by using the examples and explanation given on pages 38 and 39 in detail on board.

Next, discuss properties of multiplication:

- Numbers can be multiplied in any order.
- When a number is multiplied by 1, the product is the number itself.

- When a number is multiplied by 0, the product is always 0.
- The product of three numbers does not change when the grouping of numbers is changed.
- If a sum or a difference of two numbers is multiplied by another number, they can be multiplied separately and then added or subtracted.

Explain these properties with examples by taking the references given on page 39. **[Conceptual Learning]**

Further, demonstrate the method of 'Doubling and Halving' and 'Nearest Multiple' method of multiplication on board.

EVALUATE

Classwork: Ask to solve Q1(a) – (d), 4, 6(a) – (d) of Practice Time 2C.

Homework: Ask to solve the remaining questions of Practice Time 2C.

ENHANCE

Download the worksheet of multiplication from the site and practise it:

https://math-drills.com/multiplication2/multiplication_long_no_tseparator_0805_001.php **[Tech Connect]**

Periods: 8–9	Topics: Division of numbers, Properties of division	Suggested extra teaching aids: Blackboard or whiteboard, pens, pencils, chalks/marker, packets of pencils, etc. Math Genius 5 pages 41–46

ENGAGE

Invite six students who got rank 1 to 6 in class test in the front of the classroom, and announce that I have a packet of 30 pencils which I want to distribute equally among these students. Tell me what I have to do and how many pencils each of them will get. Accept the response. Recall that, for this, we need the process of division. Motivate the class towards lesson on division.

EXPLORE

We can also divide the numbers by using "Paravartya Method of division". The Vedic sutra 'Paravartya Yojayet' means transpose and apply. In this method we divide the dividend into two parts. The RHS will contain as many digits as the number of zeros in the base. The final answer obtained on the LHS is the quotient and on RHS is the remainder.

Base

Divisor

Difference

Dividend

Quotient | Remainder

For example, Divide 3955 by 125.

In this method, we divide by using the following steps:

LHS		RHS	
3	9	5	5

Step 1: The divisor is related to the base 100 and therefore we split the dividend in such a way that the RHS has two digits.

Step 2: Find the difference of base and the divisor. The base is 100 and the difference is –25 (negative).

Step 3: Write down the first digit 3 of the dividend as it is.

- Multiply 3 with the difference –25 and write the product as –7 and –5 below the second and third digits of the dividend.

100
–125
–25

Step 4: Go to the second column of the dividend. Bring down 9 minus 7 is 2.

- Multiply –25 with 2 and write the answer as –5 and –0 below the last two digits of the dividend. Add or subtract the digits of RHS.

Step 5: In the LHS, we have 32 and in the RHS we have –55.

- We cannot have a negative remainder in the final answer. Hence, we reduce the quotient by 1 and subtract the remainder from the divisor.
- Expand –55 as per their place values as –50 + 5 = –45
- Subtract –45 from divisor 125: 125 – 45 = 80
- Thus, final quotient is 32 – 1 = 31 and final remainder is 80.

100
–125
–25

3	9	5	5
	–7	–5	
		–5	–0
3	2	–5	+5

[Vedic Maths Learning/India Connects]

EXPLAIN

Explain the short method of division by 10, 100 or 1000, …, and division of large numbers. Further explain the properties of division.

ELABORATE

Demonstrate on board that when we divide any number by 10, 100, 1000, then the remainders are ones; ones and tens; ones, tens and hundreds digits respectively of the dividend.

Further, demonstrate in detail the division of large numbers on board by taking the references and examples given on pages 42 to 44.

Next, discuss properties of division:

- When a number is divided by itself, the quotient is 1.
- When a number is divided by 1, the quotient is the number itself.
- When 0 is divided by a non-zero number, the quotient is zero.
- Division by 0 is meaningless. **[Conceptual Learning]**

EVALUATE

Classwork: Ask to solve Q1(*c*) – (*f*), 4 and 5(*c*), (*d*) of Practice Time 2D.

Homework: Ask to solve the remaining questions of Practice Time 2D.

ENHANCE

- Ask to solve the 'Think Tank' given on pages 44 and 45. **[Critical Thinking]**
- Ask students to search the method of "Lattice Division" on internet and discuss it with classmates and teacher. **[Tech Connect]**

Periods: 10-12	Topics: Estimation in operations, Simplification of numerical expressions, BODMAS rule	Suggested extra teaching aids: Blackboard or whiteboard, pens, pencils, chalks/marker, etc. Math Genius 5 pages 46–51

ENGAGE

After the introduction, write some addition, subtraction, multiplication and division problems of numbers up to 4-digits on board. Ask students to solve it. Accept the answers. Introduce estimation in operations by using the same sum.

EXPLORE

Write the expression "10 ÷ 2 × 5" on board. Ask the value of the expression from the class. Introduce the rules of simplification on board.

EXPLAIN

Recall the rounding off a number to its highest place. Then introduce estimation of addition, subtraction, multiplication and division.

Next, explain simplification of numerical expressions by using the rule of DMAS, ODMAS and BODMAS.

ELABORATE

Demonstrate on board to find the estimated sum, difference, product, or quotient by rounding off the numbers to the nearest tens, hundreds and thousands using the explanation given on page 46.

Next demonstrate that when we have to solve an expression which contains more than one operation, it is very important that we should follow a certain order of operation to solve such a problem correctly.

There are three rules for the order of operation to solve a mathematical expression;

- DMAS
- ODMAS
- BODMAS

Explain the DMAS, ODMAS and BODMAS rule with examples on board by taking reference from pages 48–51.

EVALUATE

Classwork: Ask to solve Q1 and 4 of Practice Time 2E, Q9–12 of Practice Time 2F, Q1–5 of Practice Time 2G.

Homework: Ask to solve the remaining questions of Practice Time 2E, 2F and 2G.

ENHANCE

- Motivate the class to solve 'Think Tank' given on pages 47 and 51.
- Ask to watch the video on simplification on "www.orangewebsupport.co.in".

Periods: 13–15	Topic: (Revision) Chapter Assessment	Suggested extra teaching aids: Math Genius 5 pages 52–55

ENGAGE

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.

EXPLORE

Guide the students to do the activity given in 'Gamified Learning' section on page 55.

EXPLAIN

Start the revision of the exercise, by using 'Mind Map' and 'Chapter Assessment'.

ELABORATE

Discuss questions 1 to 5, 11 and 14 of the 'Chapter Assessment' and accept students' answer. If they have any confusion or do any error then explain and correct it. Discuss 'Challenge Question' and motivate students to solve Mental Maths.

EVALUATE

Classwork: Discuss the questions 1 to 5, 11 and 14 of 'Chapter Assessment' in classroom.

Homework: Ask to practise rest of the questions of Chapter Assessment.

ENHANCE

Motivate the class to solve 'Maths Connect', 'Challenge Question' and 'Maths Fun'.

Factors and Multiples

Learning Objectives

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

- find the factors and multiples of numbers
- identify the numbers divisible by 2, 3, 4, 5, 6, 8, 9, 10, and 11 without dividing them
- identify prime and composite numbers
- find the prime factors of a number using factor tree and prime factorisation method
- find the common factors and HCF of numbers
- find the common multiples and LCM of numbers
- understand the properties of HCF and LCM

LESSON PLAN

Suggested number of periods: 10

Suggested Teaching Aids: Textbook (Math Genius 5), blackboard or whiteboard, pens, pencils, chalks/marker, notebook, paper chits /number cards/flash cards.

Keywords: Factors, Multiples, Divisibility rule, Prime number, Composite number, Co-primes, Twin primes, Factor tree, Highest common factor, Lowest common multiple.

Pre-requisite knowledge: Students must be familiar with factors and multiples of numbers, process of division, divisibility rule of 2, 3, 4, 5, 6, 9 and 10, prime and composite numbers.

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

Periods: 1–3	Topics: Factors, Multiples, Test of divisibility	Suggested extra teaching aids: Blackboard or whiteboard, pens, pencils, chalks/marker, notebook, dice, 4 charts with number grids from 1 to 50. Math Genius 5 pages 56–62

ENGAGE

Introduce the topic in the classroom with some interesting activities, like asking questions based on factors and multiples. 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 responses. Introduce factors and multiples.

Use the 'Get Ready' and 'Let's Recall' sections to revise the previous knowledge.

EXPLORE

Divide the class into pairs and distribute each group a dice and the number chart with numbers up to 50. Ask one player of each group to choose a number less than 50, and note down it as his/her score. The second player will circle all its factors on the chart by red colour and note down them as his/her score. Now the second player will choose the number and the first one encircle the factors and both of them will note down their scores.

Next, each player will find his/her 1st number by rolling the dice and mark all its multiples on the chart paper using any colour pencil. The sum of the multiples will be their scores.

The player that scores more will be the winner. **[Collaborative Learning]**

EXPLAIN

Explain that as ₹140 = 14 × ₹10 and 7 × ₹20; So, 7, 10, 14 and 20 are factors of 140. Inversely, 140 is a multiple of numbers 7, 10, 14 and 20. Also, explain that 140 = 1 × 140, 2 × 70, 4 × 35, 5 × 25; so 1, 4, 5, 28, 35, 70 and 140 are also the factors of 140.

To calculate the factors of large numbers, divide the numbers with the least prime number, i.e., 2. If the number is not divisible by 2, move to the next prime numbers, i.e., 3 and so on. If the number is divisible by any of the prime number, then also check the divisibility by the multiple of that prime number until factors are repeated.

Similarly, multiple of a number is obtained by multiplying it with a natural number (except zero).

Further explain the properties of factors and multiples.

ELABORATE

Demonstrate on board, the method of finding the factors of any number using the explanation and examples given on page 57, and properties of factors given on page 58.

Further, explain multiples by demonstrating the examples 1, 2 and 3 on board by referring page 59 and properties of multiples given on pages 59–60.

Further, recall the rules of divisibility of a number by 2, 3, 4, 5 and 10 and extend the divisibility of numbers by 6, 8, 9 and 11 by using the explanation and examples given on page 61. Also, demonstrate rule of divisibility by 7 by using the example given in subject enrichment on page 61. **[Conceptual Learning]**

EVALUATE

Classwork: Ask to solve Q1, 4 of Practice Time 3A, Q1 and 4 of Practice Time 3B, and Q1 of Practice Time 3C.

Homework: Ask to solve the remaining questions of Practice Time 3A, 3B and 3C.

ENHANCE

Discuss ‘Think Tank’ and ‘Fast Check’ given on pages 58–61. If the students get stuck at any point, help them.

Periods: 4–5	Topics: Prime and composite numbers, Co-prime numbers, Twin prime numbers; Prime factorisation	Suggested extra teaching aids: Blackboard or whiteboard, pens, pencils, chalks/marker, multiple index cards with prime number 2 to 19, index cards with composite numbers Math Genius 5 pages 62–66

ENGAGE

Start the class with some interesting activities. Call out one number at a time. If it is prime, students stand. If it is a composite number, they sit. Give a few seconds each time for students to figure it out. If any student make any error in recognizing a number, teacher will correct it.

EXPLORE

Teach the prime factorisation of a number, using the following activity.

- Divide the class into groups of five or six.
- Distribute the prime number cards (2 to 19) on the teacher's table.
- Ask 1st group to stand behind the teacher's table facing the class.
- Distribute a composite number card to each student of the group.
- After instruction to start, group will send one member to collect all cards that are prime factors of his/her composite number, and show it to the class. If any error in selecting the prime factor, other group member can correct it.
- The next member of the group starts, when the previous member has finished.

The group whose all members select their prime factors correctly will be appreciated. **[Collaborative Learning]**

EXPLAIN

Explain to the class that the number of factors of a number decides whether it is a prime or composite.

Numbers which have only two factors, 1 and the number itself are called prime numbers, and the numbers which have more than two factors are called composite numbers. Use the references given on pages 62 and 63.

Discuss 'Think Tank' given on page 63.

ELABORATE

After demonstrating the prime and composite numbers and its factors, explain co-prime numbers and twin prime numbers by using the explanation given on page 64.

Further, explain that the process of expressing a number as a product of its prime factors only is called the prime factorisation.

Demonstrate the two methods of prime factorisation on board:

(*a*) Factor tree method

(*b*) Division method by using the examples and explanation given on page 65 of the book.

EVALUATE

Classwork: Ask to solve Q1 and 4(*a*) – (*f*) of Practice Time 3D.

Homework: Ask to solve remaining questions of Practice Time 3D.

ENHANCE

- Discuss the activity of finding the prime numbers from 1 to 100 given on page 63.
- Further, ask to take a chart paper and draw a grid of 1 to 200, and find all the prime numbers lying between 1 and 200, by taking help of Internet. **[Tech Connect]**

Periods: 6–8	Topics: Highest common factor(HCF), Lowest common multiple (LCM), Relationship between HCF and LCM	Suggested extra teaching aids: Blackboard or whiteboard, pens, pencils, chalks/marker, A4 paper sheets, two colour beads/ two types of pulses/ rajma up to 50 Math Genius 5 pages 66–74

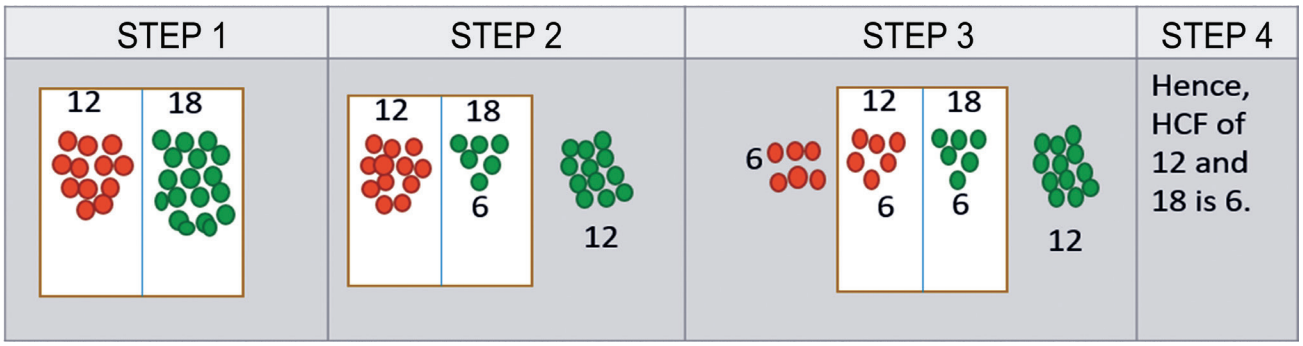
ENGAGE

After the introduction, write two numbers on board, and ask about its factors from the class one by one. Then motivate the class towards HCF and LCM.

EXPLORE

The teacher will teach the class to find the HCF of two numbers by using the following activity:

- Instruct to divide paper sheet into 2 parts using ruler and pencil. And write two numbers on board whose HCF is to be found.
- Ask to arrange colour beads/ pulses/ rajma on the top of sheet as per the numbers.
- Ask to eliminate the smaller number from the larger number.
- Continue the process till both sides have same number.
- The same number of beads on both sides is the HCF of two numbers.



[Art Integration]

EXPLAIN

Explain that the highest common factor(HCF) of two or more numbers is the greatest number that divides each given number exactly. HCF can be found by any of the three methods:

(*i*) Common factors method

(*ii*) Prime factorisation method

(*iii*) Long division method

In further periods, explain the methods of finding the LCM by using the three above mentioned methods.

Also explain the relationship between HCF and LCM.

ELABORATE

Using example 1, first demonstrate on board to find the HCF of two numbers by common factor method. Further explain and demonstrate to find the HCF of two or more numbers using prime factorisation method by taking the example 2 given on pages 67 and 68.

Then demonstrate the method of finding the HCF by long division method using the reference and examples given on page 68 of the textbook.

Also demonstrate example 4 to understand the real-life application of HCF.

In next period, discuss lowest common multiple (LCM) and the three different methods: common multiples method, prime factorisation method and division method to calculate it, by taking the references and examples given on pages 70 to 72.

Further, demonstrate the relationship between HCF and LCM by taking references and examples given on page 73. **[Conceptual Learning]**

EVALUATE

Classwork: Ask to solve Q1, 5 and 6 of Practice Time 3E, Q1, 5 and 7 of Practice Time 3F, Q1 of Practice Time 3G.

Homework: Ask to solve remaining questions of Practice Time 3E, 3F and 3G.

ENHANCE

Watch the video given on link https://www.youtube.com/watch?v=Gc4CblnY5zE to enhance the knowledge of LCM and HCF. **[Tech Connect]**

Periods: 9–10	Topic: (Revision) Chapter Assessment	Suggested extra teaching aids: Blackboard or whiteboard, pens, pencils, chalks/marker, etc. Math Genius 5 pages 75–78

ENGAGE

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.

EXPLORE

Involve the students to do the activity given in 'Gamified Learning' section on page 78.

EXPLAIN

Start the revision of the exercise, by using 'Mind Map', 'Mental Maths' and 'Chapter Assessment'.

ELABORATE

Discuss questions 1, 2, 11 and 12 of the 'Chapter Assessment' and accept students' answer. If they have any confusion or do any error then explain and correct it. Discuss 'Challenge Question' given on page 77 and ask students to solve 'Mental Maths' given on page 74.

EVALUATE

Classwork: Ask to solve Q1 to 5, 11 and 12 of 'Chapter Assessment'.

Homework: Ask to solve rest of the questions of 'Chapter Assessment'.

ENHANCE

Motivate the class to solve 'Challenge Question'.

Fractions

Learning Objectives

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

- explain fractions and differentiate between different kinds of fractions
- convert mixed fractions into improper fractions and its converse
- find the equivalent fractions of a given fraction
- reduce the given fractions into their lowest term
- compare and order the given fractions
- add and subtract like and unlike fractions
- multiply and divide fractions

LESSON PLAN

Suggested number of periods: 14

Suggested Teaching Aids: Textbook (Math Genius 5), blackboard or whiteboard, pens, pencils, chalks/marker, notebook, etc.

Keywords: Fraction, Equivalent fractions, Like fractions, Unlike fractions, Proper fractions, Improper fractions, Mixed fraction, Multiplicative inverse, Reciprocal, etc.

Pre-requisite knowledge: Students must be familiar with fractions, comparison of fractions, ordering of fractions, addition and subtraction of like fractions.

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

Periods: 1–3	Topics: Fractions, Equivalent fractions, Reducing fraction to its lowest terms	Suggested extra teaching aids: Blackboard or whiteboard, pens, pencils, chalks/marker, notebook, equivalent fraction cards, etc. Math Genius 5 pages 79–84

ENGAGE

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 are equivalent fractions?

Accept the responses.

Also, use the "Let's Recall" and ''Get Ready'' sections to introduce the chapter.

EXPLORE

Teacher can revise the concept of equivalent fractions using the following activity.

- Distribute fraction cards to each student of the class.
- Ask 4–5 students of the class to come in front of class and show their fraction cards to the class.
- Next, teacher will instruct the class, to check their own fraction cards and come forward to stand with the student who has equivalent fraction card. For example, the boy standing in front having fraction card of $\frac{1}{4}$, then the students who have $\frac{3}{12}$, $\frac{2}{8}$, $\frac{4}{16}$, $\frac{5}{20}$ stands with that student and form a group.
- If any student has any confusion, teacher will rectify and explain. **[Collaborative Learning]**

EXPLAIN

Revise in the classroom that a fraction represents a part of a whole such as $\frac{1}{5}$, $\frac{3}{4}$, $\frac{7}{9}$, etc. The number above the bar is called numerator and the number below the bar is called the denominator.

Also explain that, when numerator is less than denominator, it is proper fraction, when numerator is greater than or equal to the denominator, it is improper fraction. Fractions having numerator as 1 are called unit fractions. If the fractions having same denominator, they are called like fractions and if they have different denominators, they are unlike fractions.

And the fractions with a combination of a whole number and a proper fraction are called mixed fractions.

ELABORATE

Demonstrate the process of converting an improper fraction to mixed fraction and vice versa by using the concepts given on pages 81–82. Further, discuss the equivalent fractions and methods of finding the equivalent fractions by taking the examples 1 and 2 given on pages 82–83. Next, discuss how to reduce a fraction to its lowest term using the example given on page 83. **[Conceptual Learning]**

EVALUATE

Classwork: Ask to solve Q1, 6, 8 and 10 of Practice Time 4A.
Homework: Ask to solve Q2–5, 7 and 9 of Practice Time 4A.

ENHANCE

Discuss and ask to solve 'Think Tank' given on page 83. If the students get stuck at any point, help them.

Periods: 4–6	Topic: Comparing and ordering fractions	Suggested extra teaching aids: Blackboard or whiteboard, pens, pencils, chalks/marker, dice, etc. Math Genius 5 pages 85–88

ENGAGE

Start the class with an interaction based on revision of some previous learnt topics.

Write some fractions on board: $\frac{1}{5}$, $\frac{3}{15}$, $\frac{11}{7}$, $2\frac{1}{5}$, etc., and ask to identify:

- Unit fraction
- Proper fraction
- Mixed fraction
- Improper fraction
- Like fractions
- Unlike fractions

Also, tell them to give an example of each of these fractions. Accept the responses.

EXPLORE

Introduce comparison of fractions through an activity: Draw a line on board with heading smaller fraction and greater fraction. Call students in pair and give each of them a pair of dice. Pair 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. If any error occurs, the teacher will explain and rectify. In case of unlike fractions, teacher can hint to use the cross multiplication: $\frac{a}{b} \times \frac{c}{d}$

Student 1 Student 2

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

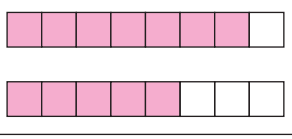
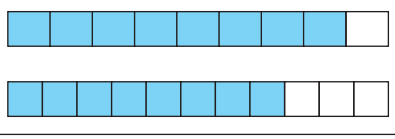
[Collaborative Learning]

EXPLAIN

Explain that in case of like fractions, the fraction with greater numerator is greater. And in case of unlike fractions with same numerator the fractions with smaller denominator is greater. For fractions having different numerators and denominators, first change the fractions into their respective equivalent fractions with the same denominator by finding the LCM of the denominators of the given fractions, then compare them as like fractions. Also, explain the method of cross-multiplication.

ELABORATE

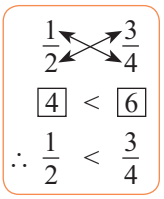
Demonstrate the comparison of like fractions and unlike fractions on board by making the bar model as follows:

Like Fractions	Unlike Fractions
 $\frac{7}{8}$ $\frac{5}{8}$	 $\frac{8}{9}$ $\frac{8}{11}$
$\frac{7}{8} > \frac{5}{8}$	$\frac{8}{9} > \frac{8}{11}$

Refer textbook pages 85–87 for explanation and examples.

Further, explain the method of arranging the given fractions in ascending and descending order by using the examples 4 and 5 given on page 87.

Also, discuss the comparison of fractions by using the method of cross multiplication. In this method cross-multiply the numerator of 1st fraction to denominator of 2nd fraction and denominator of 1st fraction to numerator of 2nd fraction as shown alongside.



EVALUATE

Classwork: Ask to solve Q1 and 3 of Practice Time 4B.

Homework: Ask to solve Q2 and 4 of Practice Time 4B.

ENHANCE

- Discuss 'Think Tank' given on page 86.
- Ask to watch the video on fractions on "www.orangewebsupport.co.in".

Periods: 7–9	Topic: Addition and subtraction of fractions	Suggested extra teaching aids: Blackboard or whiteboard, pens, pencils, chalks/marker, etc. Math Genius 5 pages 88–91

ENGAGE

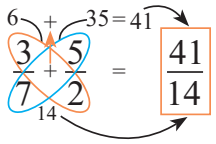
Start the class by discussing a real-life situation. Suppose Riya has 10 candies and she gives 2 candies to each of her two friends Soha and Rohan. Now, answer the following questions:

- What fraction of candies is with Riya in starting?

- What fraction of candies does Riya give to Soha?
- What fraction of candies does Riya give to Rohan?
- What fraction of candies has she distributed?
- What fraction of candies are left with her?

EXPLORE

The teacher will demonstrate a very interesting and useful method to quickly add and subtract fractions known as butterfly method on board and the students will copy the steps in their notebook.



- Draw the butterfly wings to imply which two numbers are to be multiplied together.
- Write the result in the respective antenna.
- The denominators are multiplied and the result is written below the abdomen.
- At the end add/subtract the antenna and write it over the number written in abdomen to get the result.

Note: in case of subtraction write the larger fraction on the left side and instead of adding the product of antenna, subtract them. **[Art Integration]**

EXPLAIN

Explain that to add or subtract like fractions, add the numerators of given fractions and write this numerator in the place of numerator of the resultant fraction and keep the denominator same. And to add or subtract unlike fractions, first convert them into like fractions and then add or subtract as like fractions. Also explain some real-life situations where addition and subtraction of like or unlike fractions are required.

ELABORATE

First revise on board addition and subtraction of like fractions by considering example 1 given on page 88 and then demonstrate the examples 2 and 3 based on real-life situation given on pages 88–89.

Further, explain the problem based on addition and subtraction of unlike fractions.

Add: $\frac{1}{2}+\frac{1}{8}$

LCM of denominator 2 and 8 is 8,

So, $\frac{1\times4}{2\times4}=\frac{4}{8}$ and $\frac{1\times1}{8\times1}=\frac{1}{8}$

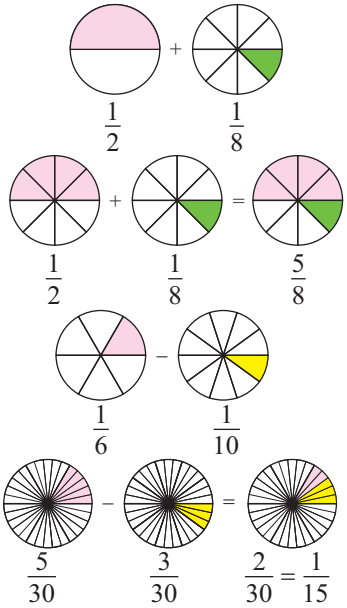
So, $\frac{4}{8}+\frac{1}{8}=\frac{4+1}{8}=\frac{5}{8}$

Subtract: $\frac{1}{6}-\frac{1}{10}$

LCM of 6 and 10 is 30

So, $\frac{1\times5}{6\times5}=\frac{5}{30}$ and $\frac{1\times3}{10\times3}=\frac{3}{30}$

So, $\frac{5}{30}-\frac{3}{30}=\frac{2}{30}=\frac{1}{15}$



Refer pages 88–90 for more explanation and examples.

[Conceptual Learning]

EVALUATE

Classwork: Ask to solve Q1(*a*) – (*f*), 2(*a*) – (*d*), 6 of Practice Time 4C.

Homework: Ask to solve the remaining questions of Practice Time 4C.

ENHANCE

Watch the video given on link https://www.youtube.com/watch?v=sVGlyjl71vg and prepare a working model to represent the addition of mixed fractions. **[Tech Connect]**

Periods: 10–12	Topics: Multiplication of fractions, Use of operator 'OF' in fractions, Multiplicative Inverse (Reciprocal), Division of fractions	Suggested extra teaching aids: Blackboard or whiteboard, pens, pencils, chalks/marker, square grid paper, colour pencils, etc. Math Genius 5 pages 91–96

ENGAGE

Start the class with an interaction based on multiplication and division of fractions.

Ask: If you have to prepare 4 glasses of lemonade for your parents and grandparents, and you have the recipe for 1 glass of lemonade as follows:

Water: 1 glass

Lemon juice: $\frac{1}{2}$ tablespoon

Sugar: $1\frac{1}{2}$ tablespoon

Then, how much lemon and sugar would you require for 4 glasses?

Accept the answers. Solve if any query raised. Introduce multiplication of fraction in detail.

EXPLORE

The teacher will motivate the class to do the activity given in "Gamified Learning" section on page 99 of textbook. **[Experimental Learning]**

EXPLAIN

First explain that to multiply a fraction by a whole number, multiply the numerator of the fraction by the whole number and keep the denominator same. To multiply two or more fractions, multiply their numerators and the and denominators separately, to get the numerator and denominator of the product. Show that the "OF" operator is same as multiplication.

The multiplicative inverse of a fraction is the reciprocal of the fraction.

Further, to divide a fraction by a whole number, multiply the fraction by the reciprocal of the whole number.

And to divide a whole number by a fraction, multiply the whole number by the reciprocal of the fraction.

Next, to divide a fraction by another fraction, multiply the first fraction with the reciprocal of the second fraction.

ELABORATE

Demonstrate some examples of multiplication on board, by solving questions from exercise/examples given on pages 91–92.

Further, demonstrate use of operator "OF" in fractions by taking the reference and example given on page 93.

Next, demonstrate that the multiplicative inverse or the reciprocal of any fraction say $\frac{2}{5}$ is $\frac{5}{2}$, *i.e.*, the numerator of the fraction is the denominator in its reciprocal and the denominator is the numerator in its reciprocal.

At last demonstrate and explain the division of fractions on board:

- Division of a fraction by a whole number as $\frac{2}{5} \div 5 = \frac{2}{5} \times \frac{1}{5} = \frac{2}{25}$

- Division of a whole number by a fraction as $5 \div \frac{2}{5} = 5 \times \frac{5}{2} = \frac{25}{2} = 12\frac{1}{2}$
- Division of a fraction by another fraction as $\frac{1}{5} \div \frac{2}{5} = \frac{1}{\cancel{5}} \times \frac{\cancel{5}}{2} = \frac{1}{2}$

Also, discuss the examples 1–5 based on division of fractions and its real-life applications given on pages 94 to 96 of textbook on board.

EVALUATE

Classwork: Ask to solve Q2, 3 and 7 of Practice Time 4D and Q2, 4 and 5 of Practice Time 4E.

Homework: Ask to solve the remaining questions of Practice Time 4D and 4E.

ENHANCE

- Ask to watch the video on fractions on "www.orangewebsupport.co.in".

Periods: 13–14	Topic: (Revision) Chapter Assessment	Suggested extra teaching aids: Blackboard or whiteboard, pens, pencils, chalks/marker, etc. Math Genius 5 pages 96–99

ENGAGE

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.

EXPLAIN

Start the revision of the exercise by using Mind Map, Mental Maths and Chapter Assessment.

ELABORATE

Ask to solve 'Mental Maths' given on page 96 and questions 1, 2, 7, 12 and 13 of the 'Chapter Assessment'. If they have any confusion or do any error then explain and correct it.

EVALUATE

Classwork: Discuss the questions 1, 2, 7, 12 and 13 of 'Chapter Assessment' and 'Challenge Question' given on page 97.

Homework: Ask to solve rest of questions of 'Chapter Assessment'.

ENHANCE

Ask to solve "Maths Fun" given on page 99 of the textbook.

Ask to prepare a working model on fractions to represent addition, subtraction, multiplication and division by using internet. **[Tech Connect]**

Introduction to Decimals

Learning Objectives

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

- understand decimals
- explore tenths and hundredths
- represent decimal numbers in the place value chart
- represent decimal numbers in expanded form
- convert fractions to decimals and vice versa

LESSON PLAN

Suggested number of periods: 8

Suggested Teaching Aids: Textbook (Math Genius 5), notebook, chalk, blackboard or whiteboard, projector, smartboard, some real-life objects like eraser, pen, pencil, number/flash cards, number and place chits, A-4 size sheet, etc.

Keywords: Decimals, Tenths and Hundredths, Decimal Place Value and Expanded Form, Decimal Fractions

Pre-requisite knowledge: Students must be familiar with a fractions.

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

Periods: 1–2	Topics: Understanding Decimals; Tenths and Hundredths; Decimals greater than 1	Suggested extra teaching aids: Math Genius 5 pages 100–103

ENGAGE

Ask the students to recall the real life situations when they could see any number written using a dot. If they are unable to say, talk about the amount of money/price of an item, height or length of an object, weight of a fruit/vegetable, temperature of a patient, etc. Also, write some numbers on the board and tell them to read the numbers. Accept the responses.

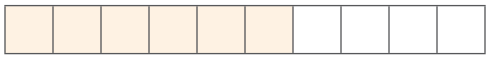
Then introduce the term 'decimal' with the help of "Get Ready" section given in the book.

[Holistic Learning]

EXPLORE

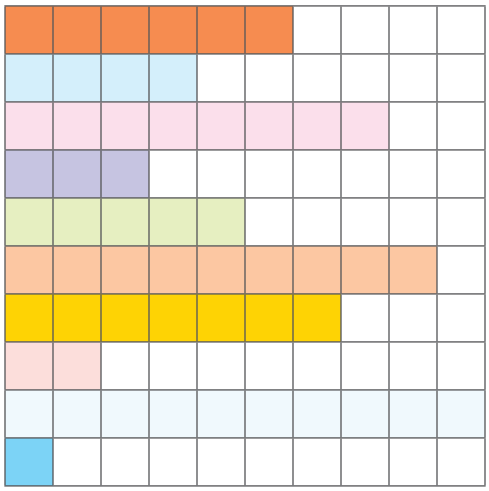
Divide the class into 10 students. Distribute paper strips to each group and tell the group members to divide the strip into 10 equal parts. Then ask them to shade few parts as per their choice and write the fraction for the shaded parts.

Instruct them to observe the numerators and denominators of the fractions. Have them know how to express such kind of fractions as decimals. For example, shade 6 out of 10.



$\frac{6}{10}$ is same as 0.6. It is read as six-tenths. We can also read 0.6 as zero point six.

Further, tell the group to put ten strips together on a sheet and count all the shaded parts. Hence, write the fraction for the shaded portions. Note that the ten strips each divided into 10 equal parts contain 100 equal divisions. So, write denominator as 100. For instance,

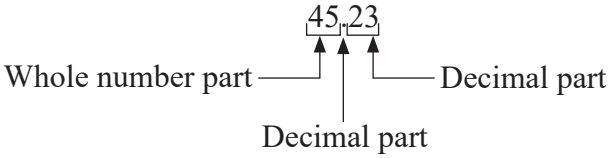


$\frac{55}{100}$ is same as 0.55. It is read as fifty-five-hundredths. We can also read 0.55 as zero point five five.

Monitor students' participation and engagement during the activities. **[Experiential Learning]**

EXPLAIN

Refer textbook page 101 and first, introduce the concept of decimals. Explain that the decimal point split a number into two parts – Whole number part (left side of the point) and decimal part (right side of the point). For example, a farmer buys a bundle of fencing wire which is 45 m 23 cm long. It can be also written as 45.23 m using decimal number 45.23. In this number, we see:

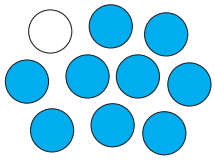


After understanding what a decimal is, deal the decimal fractions with denominators 10 and 100, *i.e.*, tenths and hundredths. **[Conceptual Understanding]**

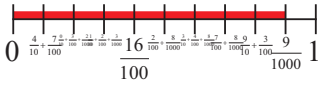
ELABORATE

Demonstrate some visuals and show how to represent them using decimal numbers. For example,

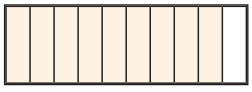
Parts of a Group



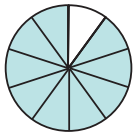
Number Line



Fraction Bar



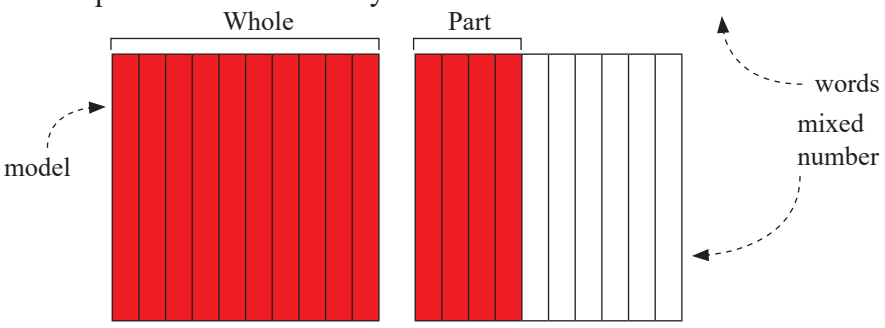
Fraction Circle



Each figure represents the fraction $\frac{9}{10}$ or 0.9 (nine-tenths)

Next, show a decimal greater than 1.

Each square is one whole. Jay has colored 1 whole and four-tenths red.



Write this as a mixed number. = $1\frac{4}{10}$

decimal

→ Write the decimal shown by the model.

Hint: Use a place value table to help you.

Ones	•	Tenths
1	•	4

= 1.4

Hence, motivate students to solve questions.

[Conceptual Understanding]

EVALUATE

Classwork: Ask to practice Q1 of Practice Time 5A.

Homework: Ask to practice Q2 and 3 of Practice Time 5A.

ENHANCE

Divide the class into 4–5 teams. Ask each team to do Activity given in 'Gamified Learning' section on page 111.

Periods: 3–4	Topics: Representation of decimal Numbers on place value chart; Decimal Place Value and Expanded Form	Suggested extra teaching aids: Math Genius 5 pages 104–106

ENGAGE

Start the class with an interaction. Ask the students about their height and weight. Express height in m and weight in 'kg'. Write any decimal number on the board and ask the students to identify the places of digits. For example,

1. Which digit is in the hundredths place for the number 213.05?
2. Which digit is in the tenths place for the number 819.25?

   Further, tell them to identify the place of a digit and write its place value.
3. Identify the place value for each digit in the number 83.72.

Digit	Place Value
8	
3	
7	
2	

Accept their responses and reiterate about the places and place values. **[Critical Thinking]**

EXPLORE

Divide the class into pairs. Make a place value chart on the board and instruct the students to copy it. Then, ask them to fill the digits in all the places and find place value of each digit.

Places	Tens	Ones	Decimal point	Tenths	Hundredths
Value of the Place	10	1	.	$\frac{1}{10}$	$\frac{1}{100}$
Number 1					
Number 2					

Hence, explore the pattern in place values and discuss about their findings. **[Collaborative Learning]**

EXPLAIN

Make a place value chart on the board and fill the same digit in all the places. Write the place value of each digit and explain the pattern in place values and then discuss as given below.

Places	Thousands	Hundreds	Tens	Ones
Number	4	4	4	4
Place value of each digit	4000	400	40	4
Observation		$\frac{1}{10}$ of $4000 = 400$	$\frac{1}{10}$ of $400 = 40$	$\frac{1}{10}$ of $40 = 4$

We see that when we move from right to left in the place value chart, the value of the places increases by 10 times.

Inversely, when we move from left to right in the place value chart, the value of the successive places decreases by 10 times. That is, the place value of the right place just after a place is one-tenth $\left(\frac{1}{10}\right)$ the place value of it. Hence, introduce what happens when we move to the right of ones place.

The place value of first right place after the ones place is tenths $\left(\frac{1}{10}\right)$ and again moving towards right of tenths place the place value will be hundredths $\left(\frac{1}{100}\right)$ and so on.

Places →	**Tens**	**Ones**	**•**	**Tenths**	**Hundredths**
Values of Places →	**(10)**	**(1)**	•	$\left(\frac{1}{10}\right)$	$\left(\frac{1}{100}\right)$

Write some numbers and demonstrate how to read and write number name using table. Next, explain about the place values and expanded forms of decimal numbers. Refer textbook pages 104–106 for more explanation and examples. **[Conceptual Understanding]**

ELABORATE

Consider few decimal numbers and demonstrate how to find its place value and express it in expanded form.

Places	Tens	Ones	Decimal point	Tenths	Hundredths
Value of the Place	**10**	**1**	**.**	$\frac{1}{10}$	$\frac{1}{100}$
Number 1	3	8	.	9	
Place value of each digit	3 tens $= 3 \times 10 = 30$	8 ones $= 8 \times 1 = 8$		9 tenths $= \frac{9}{10} = 0.9$	
Expanded form	$38.9 = 3 \text{ tens} + 8 \text{ ones} + 9 \text{ tenths}$ $= 3 \times 10 + 8 \times 1 + \frac{9}{10}$ $= 30 + 8 + 0.9$				
Number 2	1	5	.	7	4
Place value of each digit	1 ten $= 1 \times 10 = 10$	5 ones $= 5 \times 1 = 5$		7 tenths $= \frac{7}{10} = 0.7$	4 hundredths $= \frac{4}{100} = 0.04$
Expanded form	$15.74 = 1 \text{ ten} + 5 \text{ ones} + 7 \text{ tenths} + 4 \text{ hundredths}$ $= 1 \times 10 + 5 \times 1 + \frac{7}{10} + \frac{4}{100}$ $= 10 + 5 + 0.7 + 0.04$				

Hence, encourage students to attempt questions given under 'Challenge Question' on page 106.

[Experiential Learning]

EVALUATE

Classwork: Ask to solve Q3 and 5 of Practice Time 5B.

Homework: Ask to solve remaining questions of Practice Time 5B.

ENHANCE

Ask students to complete the project work given on page 106.

Periods: 5–6	Topic: Conversion of Fractions and Decimals	Suggested extra teaching aids: Math Genius 5 pages 107–108

ENGAGE

Divide the class into small groups. Ask them to take a ruler and a measuring tape and find the length of some small objects like a pencil, a matchstick, an eraser, etc. and some long/tall object like table, chair, door, stick, etc. Express the measurement using decimals and convert it into fractions too. **[Collaborative Learning]**

EXPLORE

Write some decimal fractions on the paper pieces. Put them in a bowl on the table. Ask the students to pick up a slip, write it on the board and express it in decimal form. After taking the turn of all the students, ring those which are incorrect and rectify them with a brief discussion. **[Discussion-based Learning]**

EXPLAIN

Refer textbook page 107 and explain how to convert fractions into decimals and vice versa. Demonstrate some examples on the board.

(*a*) $\frac{3}{10} = 0.3$ (*b*) $\frac{6}{100} = 0.06$ (*c*) $\frac{52}{100} = 0.52$

(*d*) $2\frac{6}{10} = 2.6$ (*d*) $35\frac{24}{100} = 35.24$ (*f*) $1\frac{7}{100} = 1.07$

A zero has been added before 6 in part (*b*) before 7 in part (*f*) to make two decimal places.

Further, explain that:

To convert a decimal into a decimal fraction, write the given decimal number as the numerator without the decimal point and in the denominator, write 1 followed by as many zeros as there are digits after the decimal point.

(*a*)	$0.7 = \frac{7}{10}$	(*b*)	$2.9 = \frac{29}{10} = 2\frac{9}{10}$	(*c*)	$30.2 = \frac{302}{10} = 30\frac{2}{10}$
(*d*)	$0.39 = \frac{39}{100}$	(*e*)	$0.05 = \frac{5}{100}$	(*f*)	$1.12 = \frac{12}{100} = 1\frac{12}{100}$

[Conceptual Understanding]

EVALUATE

Classwork: Ask to solve Q1(*a*), (*c*), (*h*), (*j*) and 2(*a*), (*b*), (*c*), (*f*) of Practice Time 5C.

Homework: Ask to solve remaining questions of Practice Time 5C.

ENHANCE

Ask students to complete the 'Maths Connect' given on page 110.

Periods: 7–8	Topic: (Revision) Chapter assessment	Suggested extra teaching aids: Math Genius 5 pages 108–111

ENGAGE

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.

EXPLAIN

Start the revision of the exercise by using Mind Map, Chapter Assessment, Mental Maths and Challenge Question.

ELABORATE

Discuss questions 1 to 4 of the 'Chapter Assessment' and accept students' answer. If they have any confusion or do any error then explain and correct it. Motivate students to solve 'Mental Maths' given on page 110.

EVALUATE

Classwork: Ask to solve Q1 to 4 of 'Chapter Assessment' and 'Challenge Question' given on page 111.

Homework: Ask to solve Q5 to 8 of Chapter Assessment.

Geometry

Learning Objectives

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

- understand the basic geometric shapes (Plane, Point, Line segment, Ray)
- differentiate between intersecting, parallel and perpendicular lines
- explore more about the angles and differentiate between different types of angles
- measure and draw angles using a protractor
- understand types and term of angles
- know about polygons
- learn about tangrams
- describe a circle and its parts

LESSON PLAN

Suggested number of periods: 20

Suggested Teaching Aids: Textbook (Math Genius 5), blackboard or whiteboard, some real-life objects like: coin, bangles, CD, etc.

Keywords: Point, Line, Ray, Horizontal line, Vertical line, Slanting line, Line segment, Triangle, Rectangle, Square, Quadrilateral, Pentagon, Hexagon, Heptagon, Octagon, Nonagon, Decagon, Circle, Centre, Side, Vertex, Chord, Circumference, etc.

Pre-requisite knowledge: Students must be familiar with plane shapes rectangle, square, triangle, circle, oval, straight line, curved line, drawing a straight line, circle, etc.

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

Periods: 1–3	Topic: Basic geometrical shapes	Suggested extra teaching aids: Ruler, pencil, some A4 chart paper, dot paper, crayons or colour pencils etc. Math Genius 5 pages 113–117

ENGAGE

Take a sharpened lead pencil and mark a dot on a sheet of paper. Ask the class, "Which geometrical shape does it represent?". Accept their responses. Next, instruct the students to mark any two dots on a paper and join them with the help of a ruler. Then ask them to recognise the shape so formed. Accept their responses. Introduce simple geometrical shapes, such as point, line, line segment, ray, etc. Discuss the concepts given in 'Get Ready' and 'Let's Recall' sections on pages 112 and 113.

EXPLORE

Divide the class into four/five groups. Distribute dot paper to each group. Ask groups to construct the following figures with help of each other.

- A kite using straight (slanting, vertical and horizontal lines) and curved lines and colour it sky blue.
- A leaf using slanting, vertical and curved lines and colour it green.
- A flower using curves and colour it red.
- A boat using slanting, vertical and horizontal lines and colour it brown.

The group who will construct all the shapes correctly will be appreciated.

[Art Integration and Collaborative Learning]

EXPLAIN

A smooth flat surface which extends endlessly in all the directions is called a plane. A plane has no boundary. The surface of a wall, top of a table are some examples of part of planes.

A point is represented by a tiny dot (.). To distinguish points, we give them names using capitals letters, such as A, B, C, ... these points are read as point A, point B, point C and so on.

The straight line which joins the two points is called line segment. The line segment has two end points (say, A and B). The line segment is the shortest distance between the two points.

If a line segment goes endlessly in one direction, it is called a ray.

If a line segment is extended endlessly in both directions, it is called a line.

If two lines meet at a point or tend to meet if extended, they are called intersecting lines.

The lines which lie in the same plane and never intersect are called parallel lines.

The lines which intersect each other making a right angle at the point of intersection are called perpendicular lines.

ELABORATE

Demonstrate a plane paper and ask what they are observing, explain that it is a part of a plane, in which they can draw figures like, triangle, rectangle, circle, etc.

Show that the board is also an example of a plane.

Demonstrate that a point shows an exact position and it is said to have no length, width or thickness.

Draw five or six points on the board. Name these points using capital letters.

Draw a straight line which joins the two points called line segment. The line segment has two end points (say, A and B).

Further demonstrate the ‘ray’, ‘line’, ‘intersecting lines’, ‘parallel lines’ and ‘perpendicular lines’ on board by taking references and examples given on pages 114 and 115 of the textbook. **[Conceptual Learning]**

EVALUATE

Classwork: Discuss Q1, 2, 4 and 6 of Practice Time 6A in the classroom.

Homework: Ask to solve the remaining questions of Practice Time 6A.

ENHANCE

- Ask to solve ‘Think Tank’ given on page 115 of the textbook.
- Ask to write 5 real-life examples where we observe parallel lines and intersecting lines.

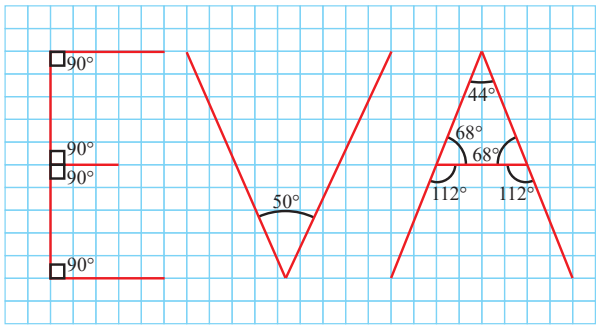
Periods: 4–9	Topics: Angle, Measuring an angle, Drawing an angle with protractor, Types of Angles, Turn the angle, Turn in a direction	Suggested extra teaching aids: Ruler, pencils, marker or chalk, protractor, square grid paper, some origami paper, ice-cream sticks, wall clock or table clock, etc. Math Genius 5 pages 117–128

ENGAGE

Start the class by calling one student and tell him to write his/her name on the board in capital letter and in big size. Ask the class to find angles within the letters in the name one by one. Accept the responses. Introduce the topic 'Angles'.

EXPLORE

Distribute square grid paper in the classroom. Instruct students to write their name with pencil and ruler on the grid paper in capital letters and in big size. Instruct and help them to write each letter squared without any curved edges. Demonstrate by writing his/her own name on board, and measure the angles using a protractor within the letters. Instruct students to follow the teacher to mark angles within the letters of their name. As an extension, teacher can also discuss about the type of angles, turn of angles and turn in a direction.



[Collaborative Learning]

EXPLAIN

Explain that two rays having a common end point form an angle, and the rays are called the arms of the angle and the common end point is the vertex of the angle. Further, explain the method of naming an angle, interior and exterior of an angle.

Extend the concept of measuring the angles by protractor using the references given on pages 119–121 of the textbook.

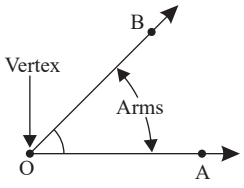
Further, explain the method of drawing an angle with protractor and then discuss about the types of angles.

Also, explain different types of angles by taking the reference of page 123.

Describe different turns of angles and turn in a direction by taking the reference of pages 124–126.

ELABORATE

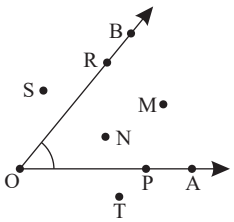
Draw the adjoining figure and demonstrate that the rays $\overrightarrow{OA}$ and $\overrightarrow{OB}$ form an angle at point O. $\overrightarrow{OA}$ and $\overrightarrow{OB}$ are the arms and O is the vertex of this angle.



Further, demonstrate that three letters are used to show an angle, the letter showing the vertex is always written in the middle like ∠AOB.

The points lying inside the angle form the interior of the angle, like points M and N.

And the points lying outside the angle form an exterior of the angle, like points S and T. Also use the references and examples given on page 118.



Demonstrate the protactor and the method of measuring an angle by using it.

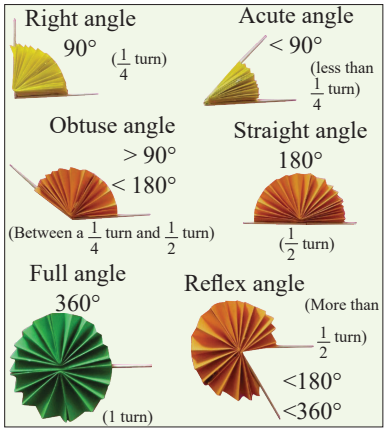
Further, show drawing an angle with protractor by using the methods given on page 121 of the textbook.

Also, demonstrate and explain the types of angle and turns of angles by using an activity as follows:

- Take two colour origami paper and fold them as a paper fan. Paste two ice-cream sticks to the fan.
- Then show different types of angles by turning the angle using this.

The teacher will also take the reference of 'types of angles' and 'turn the angle' given on pages 123 and 124 of textbook.

Also demonstrate the turn in a direction by taking the reference of pages 125 and 126 of the textbook. **[Conceptual and Art Integrated Learning]**



EVALUATE

Classwork: Discuss Q1, 2, 3 of Practice Time 6B, Q1 and 2 of Practice Time 6C and Q1 and 3 of Practice Time 6D in the classroom. If students make any error, teacher will correct them and explain.

Homework: Ask to solve the remaining questions of Practice Time 6B, 6C and 6D.

ENHANCE

- Discuss 'Think Tank', 'Be Aware' and 'Fast Check' given at some places on pages 117–126.

[Creative and Logical Thinking]

Periods: 10–12	Topics: Polygon, Tangram	Suggested extra teaching aids: Papers, pens, pencils, chalk or marker, duster, geoboard, some rubber bands or threads. Math Genius 5 pages 128–132

ENGAGE

Start the class by calling any one student of the class and ask him/her to draw a close shape using only the straight lines with the chalk/marker without lifting it. Appreciate him/her for their effort and introduce the topic 'Polygon'.

EXPLORE

Divide the class into four groups. Distribute a geoboard, some rubber bands or threads to each group. Ask groups to construct these shapes with help of each other

- A square joining only 16 nails.
- A rectangle joining only 20 nails.
- A triangle joining only 18 nails.
- A quadrilateral using 16 nails.
- A pentagon using 15 nails.

The group who constructs all the shapes correctly on the geoboard will be appreciated.

[Experimental Learning]

EXPLAIN

Explain that a closed figure made up of 3 or more line segments that do not cross each other is called a polygon. Polygons are given special names depending on the number of sides they have. Further explain the types of triangles on the basis of sides and angles. Further explain making of various shapes using tangrams.

ELABORATE

Draw some closed figure on board by using 3 or more line segments without crossing over.

And let them know that the name of polygons is based on the number of sides by taking the reference given on page 129 of textbook.

Further, demonstrate the triangles and its types:

Based on sides:

- A triangle whose all three sides are of equal length is called an equilateral triangle.
- A triangle whose two sides are of equal length is called an isosceles triangle.
- A triangle whose all three sides are of different lengths is called a scalene triangle.

Based on angles:

- A triangle is called an acute-angled triangle, if all its angles are acute angles, *i.e.*, less than 90°.
- A triangle is called an obtuse-angled triangle, if it has one obtuse angle, i.e., greater than 90°.
- A triangle is called a right-angled triangle, if it has one right angle, i.e., 90°.

Also discuss the properties of a triangle, such that:

- The sum of all three angles of a triangle is 180°.
- The sum of measures of any two sides of a triangle is always greater than the measure of the third side.

For detailed elaboration also use the references given on pages 129, 130 of the textbook.

Next demonstrate to create various shapes using tangrams. **[Conceptual Learning]**

EVALUATE

Classwork: Encourage students to solve Q1, 2 of Practice Time 6E. If any student makes any error, the teacher will correct and explain.

Homework: Ask to solve remaining questions as a homework assignment.

ENHANCE

- Discuss 'Math Insight' given on page 129, ask to solve 'Think Tank' given on page 131.

[Logical Thinking]

Periods: 13–17	Topic: Circle	Suggested extra teaching aids: Pen, pencils, chalk/ marker, duster, some real-life circular objects, geometry box, some paper sheets, etc. Math Genius 5 pages 132–134

ENGAGE

Recall the concept of polygons by asking some questions, such as:

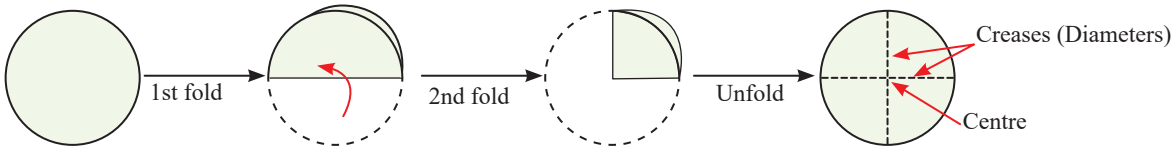
- I am a closed plane figure. I have 3 sides only. Who am I?
- I am a closed plane figure. I have 4 equal sides. Who am I?
- I am a closed plane figure. I have 5 equal sides. Who am I?
- I am a closed plane figure. I have 7 equal sides. Who am I?
- I am a closed plane figure. I have 10 equal sides. Who am I?

Accept their responses, and acknowledge the correct answers. Introduce circle. **[Critical Thinking]**

EXPLORE

Students are aware about circular objects. They can trace the circle on a sheet of paper using any circular objects such as bangle, bottle top, plate, can etc. and cut the circle using a pair of scissors.

Tell the students in advance to bring cut-outs of circles. Instruct the students to take a circle and fold it into halves. Fold it once more into halves and press to make creases. Now unfold the paper and mark the point where two creases intersect as centre 'O'. Introduce the crease passing through the centre as the diameter of the circle, and the distance from the centre of the circle to the boundary of the circle, i.e., half of the crease as a radius of the circle. Refer activity discussed in 'Gamified Learning' section on page 137.



[Experiential Learning]

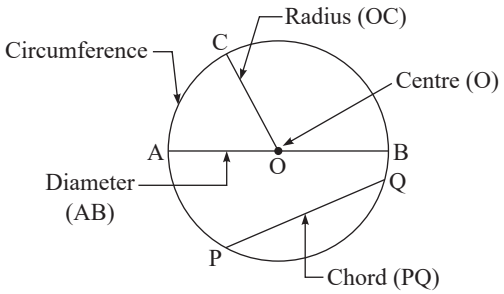
EXPLAIN

Show some circular objects like: coin, bangle or CD and with their help, make a sketch on the board, then explain the circle and its parts. Discuss the relation between a diameter and a radius of a circle.

ELABORATE

Demonstrate on board that a circle is a simple closed figure made up of a curved line, whose each point is equidistant from a fixed point in it.

Alternatively, a circle is the collection of all those points in a plane which are at an equal distance from a fixed point called centre. Also represents its part in detail using the references given on pages 132–133 of the textbook.



Further, discuss that diameter of a circle is twice of its radius or radius is half the diameter.

EVALUATE

Classwork: Discuss Q1 and 2 of Practice Time 6F in the classroom. If any student makes any error, the teacher will correct and explain.

Homework: Ask to do Q. 3 and 4 of Practice Time 6F as homework assignment.

ENHANCE

- Ask to draw different polygons, inside a circle on a chart paper by taking help of internet.

[Tech Connect]

Periods: 18–20	Topic: (Revision) Chapter Assessment	Suggested extra teaching aids: Math Genius 5 pages 135–137

ENGAGE

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

EXPLAIN

Start the revision of the exercise by using, 'Maths Connect', 'Mind Map', 'Mental Maths', 'Challenge Question' and 'Chapter Assessment'.

ELABORATE

Discuss questions 1, 2 and 6 of the Chapter Assessment and accept students' answers. If they have any confusion or they make any error then explain and correct them. Motivate students to solve 'Mental Maths' given on page 135 and Maths Fun given on pages 133 and 137.

EVALUATE

Classwork: Ask to solve Q1, 2 and 6 of the 'Chapter Assessment' in the classroom.

Homework: Ask to do the rest of the questions of the 'Chapter Assessment' as homework assignment.

ENHANCE

Ask students to solve the 'Challenge Question' given on page 135.

Symmetry and Patterns

Learning Objectives

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

- recognise the line(s) of symmetry in the objects around us and in various geometrical figures
- understand the concept of reflection symmetry and recognise the mirror image of objects
- recognise the slide, flip, turns of an object and rotational symmetry of geometric shapes
- understand the concept of tessellation
- make patterns by moving shapes
- make different number patterns (square and triangular numbers)

LESSON PLAN

Suggested number of periods: 8

Suggested Teaching Aids: Textbook (Math Genius 5), blackboard or whiteboard, some pictures of real-life objects or cut-outs like: monuments, human faces, etc.

Keywords: Symmetry, Line of symmetry, Slide, Flip, Turn, Rotational Symmetry, Patterns, Triangular Number, Square Number, Tessellation, etc.

Pre-requisite knowledge: Students must be familiar with symmetry, line of symmetry, patterns in shapes, numbers, and letters.

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

Periods: 1–3	**Topics: Symmetry around us, Line of symmetry**	**Suggested extra teaching aids: Ruler, pencil, chalk/ marker, duster, some cut-outs of monuments, human faces, etc. some A4 chart paper, crayon or colour pencils, a plane mirror, etc.** **Math Genius 5 pages 140–144**

ENGAGE

Distribute some cut-outs of monuments, human faces, or other objects. Instruct: Fold the cut-outs into two identical equal halves and open them. Ask: Does the crease formed on the cut-out divide the shape into two identical equal halves? Accept the responses. Explain which shape is symmetrical and which is asymmetrical. Use the section of 'Get Ready' and 'Let's Recall' for recalling the concept of symmetry and patterns.

EXPLORE

Distribute A4 chart paper in the class and instruct to make some closed shapes on it. Ask to draw a crease line on the shapes wherever they want to divide the shape into two identical equal halves and ask to observe the shapes about its symmetry.

Ask: Which shapes are divided into two identical equal halves by the crease line? If the crease line divides the shapes into two identical equal halves, then what is the line called? If the shape cannot be divided into two identical halves, then what is it called? Accept the responses.

[Art Integration and Collaborative Learning]

EXPLAIN

When a figure or shape can be divided into two equal halves by drawing a line, then they are called symmetrical figures or shapes. The line which divides the figure into two equal halves is called the line of symmetry.

Further, explain that some figures have more than one line of symmetry.
Also, discuss about mirror image and reflection symmetry. Teacher can also use the activity given on page 142.

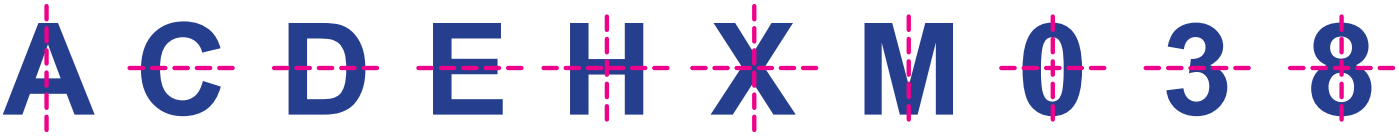
[Experiential Learning]

ELABORATE

Draw some shapes on board and ask to identify which may have more than one creased line or line of symmetry. Accept the class responses.

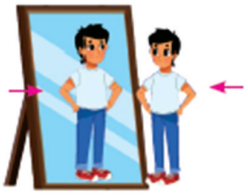
Again, draw some letters of English Alphabet or some numbers on the board and draw lines of symmetry on them.

Ask: Which letters or numbers have one line of symmetry? Which letters or numbers have more than one line of symmetry?



Also, refer textbook pages 141–142 for more explanation and examples of line of symmetry.

Further, demonstrate the formation of mirror image by bringing a plane mirror or any plane surface that reflect the image. Call the students randomly in front of the mirror, tell them to observe the difference in their images. Further, draw only half of a figure and show how it looks complete by placing the mirror alongside.



Next, demonstrate the reflection symmetry by using the mirror. Take the references and examples given on pages 142 and 143 of the textbook.

[Experimental and Conceptual Learning]

EVALUATE

Classwork: Discuss Q1 and 2 of Practice Time 7A in the classroom.

Homework: Ask to solve the remaining questions of Practice Time 7A as their homework assignment.

ENHANCE

- Ask to solve 'Think Tank' given on page 142 of the textbook.

Periods: 4–5	Topic: Slides, Flips and Turns	Suggested extra teaching aids: Ruler, pencils, marker or chalk, any real life object, etc. Math Genius 5 pages 144–148

ENGAGE

Start the class by taking any object and show its movement by sliding, flipping and turning the object in front of class. Ask the students to observe the differences.

EXPLORE

Divide the class into groups and give each student a pattern blocks or alphabet magnets.

Ask each student to select a shape or letter and trace it on a piece of paper.

Instruct them to trace a slide, turn, and flip for their objects and label each one.

Ask other group members to compare their drawings.

Ask one student from each group to choose an object and ask the other group members to draw a corresponding slide, turn, or flip.

Afterward, the first student or the teacher can move the object and trace it to show the correct answer and check the group's work.

Encourage students to help each other. **[Collaborative Learning]**

EXPLAIN

Discuss that a shape or a figure can move in various ways: sliding, flipping and turning.

When a shape simply moves from one place to another in one direction, it slides.

When a shape is turned over a straight line to form a mirror image, we call it has flipped. It can be horizontally or vertically.

When a shape is rotated clockwise or anti-clockwise through an angle, it turns.

A turn can be a quarter turn, a half turn, a three-quarter turn and a full turn.

Rotational symmetry of a figure occurs if it appears the same two or more times during a complete rotation of 360° about a fixed point.

ELABORATE

Ask the students to collect in the ground or the teacher can use the physical education period to teach the topic 'slides, flips and turns' of maths.

Divide students into groups.

Ask students to sit or stand in a circle and one group to lay down at the centre.

Ask them to slide left or right. If there is any confusion, teacher will help them.

Ask another group to flip on the ground, i.e., the students move from their back to their stomach, their stomach to their back, or feet to head. Suggest that they flip on their left side, flip on their right side or both.

Next discuss about the turns, help the student to turn quarter $\left(\frac{1}{4} \text{ or } 90°\right)$, half $\left(\frac{1}{2} \text{ or } 180°\right)$, three-quarters - $\left(\frac{3}{4} \text{ or } 270°\right)$ and a full turn (360°).

The teacher can also take help of references and examples given on pages 144–146 of the textbook.

Further demonstrate the rotational symmetry of an object or a shape by taking the references and example given on page 146 of the textbook.

Also demonstrate the shapes that possess rotational symmetry but no line symmetry. **[Holistic Learning]**

EVALUATE

Classwork: Discuss Q1, 2, 3 and 8 of Practice Time 7B in the classroom and encourage students to solve them. If students make any error, teacher will correct them and explain.

Homework: Ask to solve the remaining questions of Practice Time 7B as homework assignment.

ENHANCE

- Discuss 'Think Tank' given on page 146 of the textbook.
- Ask to explore two or more figures or shapes that have rotational symmetry but no line symmetry.

[Creative and Logical Thinking]

Periods: 6–7	Topics: Patterns, Tessellations	Suggested extra teaching aids: Papers, pens, pencils, chalk or marker, duster, A4 paper sheets. Math Genius 5 pages 148–152

ENGAGE

Start the class by instructing to pay attention. Draw some object patterns on the board with some blank spaces. Ask: Tell the name of next two shapes or objects to complete the pattern drawn on the board. Accept the responses. Introduce the concept of different kinds of pattern.

EXPLORE

Divide the class into 4–5 groups. Distribute each of them an A4 sheet. Tell them to choose any shape/design and colour as per their choices. Draw their figures in order to make a pattern. Create at least three different patterns. Walk around the class and interact with students during activity.

The teacher can also write some number pattern on board and ask students to complete the pattern.

10, 20, 30, 40, ..., ..., ..., ...,

3, 5, 8, 12, 17, ..., ..., ..., ...,

10, 20, 35, 55, 80, ..., ..., ..., ...,

2, 2, 3, 3, 3, 4, 4, 4, 4, ..., ..., ..., ...,

1, 3, 6, 8, 11, 13, 16, ..., ..., ..., ..., **[Creative Thinking and Art integration]**

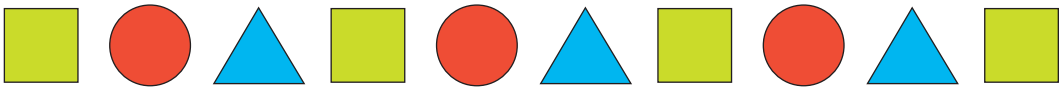
EXPLAIN

The pattern is formed when different shapes are drawn repeatedly. Different colours can be used to create different patterns with the same shapes. Patterns can also create by moving shapes. Discuss the pattern in numbers like triangular numbers, square numbers, Pascal triangles.

Also discuss about the tiling pattern, tessellations.

ELABORATE

Demonstrate the shape pattern on board or in prepared chart paper.

Shape patterns: 

Number patterns: 4 8 16 32 64 128 256 512

Letter patterns: A Z C Y E X G W

Demonstrate that pattern can also be made by moving shapes as follows:

Further, demonstrate the triangular numbers that can be arranged using dots in the shape of a triangle, square numbers can be arranged using dots in the shape of a square, the Pascal's triangle where the numbers are arranged in the shape of a triangle and some more number patterns by taking the references and examples given on pages 148–150.

To explain tessellations, show some different pictures of tiling or rangoli patterns to the class. And ask them to draw similar patterns in their notebooks such that repeating arrangement of a particular shape to cover a plane without leaving any gaps or overlapping. **[Conceptual Learning]**

EVALUATE

Classwork: Discuss Q1, 2 and 4 of Practice Time 7C and encourage students to solve them. If any student makes any error, the teacher will correct and explain.

Homework: Ask to solve remaining questions of Practice Time 7C as a homework assignment.

ENHANCE

- Ask to find the next numbers in 'Fast Check' given on page 149.
- Discuss the activity given on page 148 of the book and tell them to perform it in the classroom.
- Discuss 'Think Tank' given on page 150 of the book. **[Critical and Logical Thinking]**

Period: 8	Topic: (Revision) Chapter Assessment	Suggested extra teaching aids: Pen, pencils, chalk /marker, duster, etc. Math Genius 5 pages 153–156

ENGAGE

Make students comfortable, so they can ask any question on any previously learnt topics in which they are confused. Clarify their doubts or queries and start the revision of the exercise.

EXPLORE

Guide the students to do the activity as suggested in 'Gamified Learning' section given on page 156.

EXPLAIN

Start the revision of the exercise by using, 'Mind Map', 'Mental Maths' and 'Chapter Assessment'.

ELABORATE

Discuss questions 1, 2 and 6 of the 'Chapter Assessment' and accept students' answers, if they have any confusion or they make any error then explain and correct them. Discuss and motivate students to solve 'Mental Maths' and 'Maths Fun'.

EVALUATE

Classwork: Discuss questions 1, 2 and 6 of the 'Chapter Assessment' in the classroom. Ask to do the 'Project Work' given on page 152 and 'Challenge Question' given on page 156.

Homework: Ask to do the rest of the questions of 'Chapter Assessment' as homework assignment.

ENHANCE

Teacher can enhance the skills of students using the following activity.

Step 1: Think of any number

Step 2: If the number is odd, triple it and add 1, if the number is even, halve it.

Step 3: Continue step 2, based on the resulting number in step 2 and continue the steps.

Step 4: Write the pattern generated.

Example: Let's explore a pattern starting with the number 20.

- Since 20 is an even number, divide it by 2, $\frac{20}{2} = 10$
- Again, 10 is an even number, divide it by 2, $\frac{10}{2} = 5$
- 5 is an odd number. Multiple by 3 and add 1, $3 \times 5 + 1 = 16$
- $\frac{16}{2} = 8$
- $\frac{8}{2} = 4$
- $\frac{4}{2} = 2$
- $\frac{2}{2} = 1$
- $1 \times 3 + 1 = 4$
- $\frac{4}{2} = 2$
- $\frac{2}{2} = 1$ …….

Resulting pattern is 20, 10, 5, 16, 8, 4, 2, 1, 4, 2, 1, 4, 2, 1, …….

Ask the students to play it in pairs. Let one child give the number, the other one develops the pattern and vice versa.

Discuss all the patterns they develop and ask them to find out the reason for the pattern which is named as hailstone numbers.

8 Measurement

Learning Objectives

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

- convert bigger units to smaller units of metric measures.
- convert smaller units to bigger units of metric measures.
- convert measuring units using a double number line
- add and subtract metric measures (length, weight and capacity).

LESSON PLAN

Suggested number of periods: 16

Suggested Teaching Aids: Textbook (Math Genius 5), blackboard or whiteboard, some chits in which different measurements are written, bowl, etc.

Keywords: Kilometre, Hectometre, Decametre, Metre, Decimetre, Centimetre, Millimetre, Kilogram, Hectogram, Decagram, Gram, Decigram, Centigram, Milligram, Kilolitre, Hectolitre, Decalitre, Litre, Decilitre, Centilitre, Millilitre, etc.

Pre-requisite knowledge: Students must be familiar with units of measurement, conversion, addition, subtraction, multiplication and division of numbers.

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

Periods: 1–7	**Topics: Metric Measures (conversion), conversion of measuring units using a double number line**	**Suggested extra teaching aids: Some paper chits, glass bowl, etc.** **Math Genius 5 pages 157–164**

ENGAGE

Write two metric measurements for length, weight or capacity in two different metric units on the board.

Instruct: Convert both measurements in same metric units. Accept the responses. Introduce: Conversion of metric units. The teacher can use "Get Ready" and "Let's Recall" sections to revise the previous concepts.

EXPLORE

Write some measurements in cm, m, and km on the board such as: 200 cm, 5 m, 3 km, 5000 m, etc. Take a bowl and put some chits having units metres, centimetres, or kilometres written on them. Invite a pair of students randomly.

Instruct: Read aloud the measurement written on the board, pick out a chit, and convert the measurement into the units written on the chit. Accept the responses. Repeat this activity with more pair of students till time permits. **[Experimental Learning]**

EXPLAIN

There are some standard units of metric measures (metre, gram and litre) used to measure smaller lengths, masses and capacities as well as larger lengths, weights and capacities.

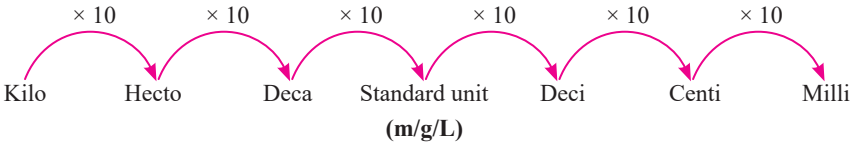
We add different prefixes 'deca', 'kilo' and 'hecto' for higher units and 'deci', 'centi' and 'milli' for lower units with standard units of metric measures. There is a relationship among the various units of metric measures. For converting the bigger units to smaller units multiply by 10 for every step as we move towards the right. Also explain the method of writing the combination of units in decimals. Similarly, for converting the smaller units to bigger units divide by 10 for every step as we move towards the left.

Further, explain the method of conversion of measuring units using a double number line.

ELABORATE

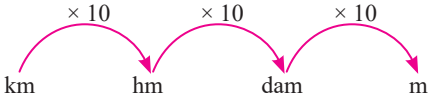
Demonstrate the relationship among the various units of metric measures by showing the table given on page 159 of the book.

Further, demonstrate that we have to multiply by 10 at each step for the conversion of bigger metric units to smaller units on the board.



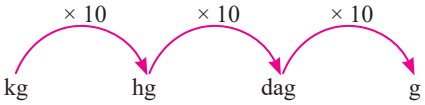
For length: 28 km to m

$$28 \text{ km} = 28 \times 1000 \text{ m}$$
$$= 28000 \text{ m}$$



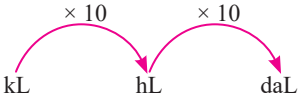
For weight: 37 kg into g

$$37 \text{ kg} = 37 \times 1000 \text{ g}$$
$$= 37000 \text{ g}$$



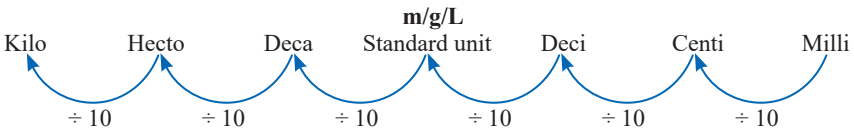
For Capacity: 7 kL into daL

$$7 \text{ kL} = 7 \times 100 \text{ daL}$$
$$= 700 \text{ daL}$$



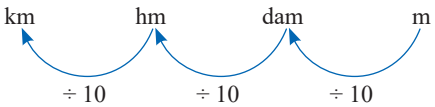
Also use the references and examples given on pages 160 and 161 of book.

Similarly, demonstrate that for the conversion of smaller units to bigger units we have to divide by 10 at each step as follows:



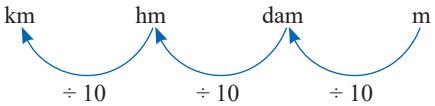
For length: 5432 m into km and m

$$5432 \text{ m} = (5432 \div 1000) \text{ km} = \frac{5432}{1000} \text{ km}$$
$$= 5 \text{ km } 432 \text{ m}$$



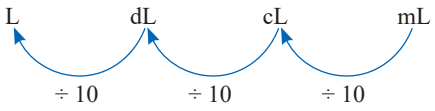
For weight: 2323 mg to g and mg

$$2323 \text{ mg} = (2323 \div 1000) \text{ g} = \frac{2323}{1000} \text{ g}$$
$$= 2 \text{ g } 323 \text{ mg}$$



For capacity: 2456 mL into L and mL

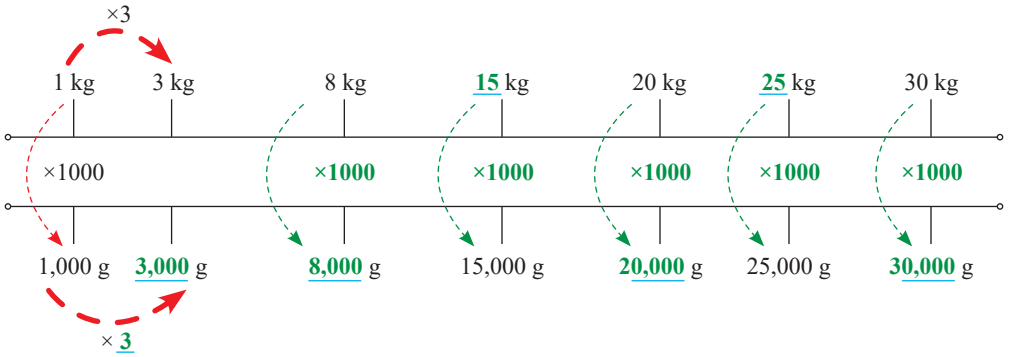
$$2456 \text{ mL} = (2456 \div 1000) \text{ L} = \frac{2456}{1000} \text{ L}$$
$$= 2 \text{ L } 456 \text{ mL}$$



Also use the references and examples given on pages 161 and 162. **[Conceptual Learning]**

Further, demonstrate on board conversion of measuring units using a double number line.

For example, conversion of weight as follows:



Also use the examples given on pages 162-163 of text-book.

EVALUATE

Classwork: Ask to solve Q1 and 2 of Practice Time 8A. If any student makes any error, the teacher will correct it and explain.

Homework: Ask to solve Q3 of Practice Time 8A as their homework assignment.

ENHANCE

- Discuss the 'Knowledge Desk' given on page 158.
- Ask to note and learn the 'Facts' given on page 161.
- Ask to do the task assigned in 'Think Tank' section given on page 162.

Periods: 8–10	Topic: Addition and Subtraction of metric measures	Suggested extra teaching aids: Chalk/marker, duster, etc. Math Genius 5 pages 164–166

ENGAGE

Write some measurements in different standard units on the board.

Instruct: Convert them into m and cm, km and m, g and kg, L and mL.

Ask to add any two measurements written on the board. Accept the responses.

EXPLORE

Divide the class into pairs. Write few metric measurements for length, weight or capacity on a board. Put some well-shuffled number chits up to 25 in a bowl.

Call one pair and instruct: pick out any number chit from the bowl, read aloud the numbers and multiply and divide the metric measures written on the board by the number written on the chit.

Ask: What is product and quotient? Accept the response. Repeat this activity with other pairs till time permits.

[Experimental Learning]

EXPLAIN

Explain that we can perform fundamental operations, addition, subtraction, multiplication and division on metric measures of the same units. Before performing any operation first convert given metric measures into the same units. Units of measurement are added or subtracted in the same way as we add or subtract whole or decimal numbers. Similarly, for multiplication and division we use the same method as multiplication and division of decimal numbers.

ELABORATE

Demonstrate on board the different operations, using the examples given in book.

For addition: 24 m 24 cm and 7 m 1 cm 2 mm

Step 1: Write the measurements in columns.

Step 2: Add them as per their places.

	m	cm	mm
	①		
	24	24	0
+	7	01	2
	31	25	2

Thus, the sum is 31 m 25 cm 2 mm or 3 dam 1 m 2 dm 5 cm 2 mm.

Similarly, for subtraction use the same method by taking the reference and example given on page 165.

EVALUATE

Classwork: Ask to solve Q1 – 2 of Practice Time 8B

Homework: Ask to solve Q3, 4 and 5 of Practice Time 8B.

ENHANCE

- Watch the video on the measurement on "www.orangehousewebsupport.co.in". **[Tech Connect]**

Periods: 11–13	Topic: Speed, distance and time	Suggested extra teaching aids: Chalk/marker, duster, etc. Math Genius 5 page 166

ENGAGE

After introduction, ask some questions in the classroom. For example,

- Where do the students live?
- Where do their grandparents live?
- If they go to their grandparents' house by bicycle or car, or any other means of transport, by which vehicle will they reach earlier? What is the reason behind it? Accept the answer. Introduce the topic speed, distance and time.

EXPLORE

Take the students of the class to the playground, and divide them into groups. Mark two points as starting and finishing position. Assign one student the role of captain and give him/her a stopwatch. Ask one group to reach from starting point to finishing point by hopping and ask the captain to record the time taken by the group to touch the finishing point.

Again instruct the 2nd group and 3rd group to reach from starting point to finishing point by walking and running respectively and the captain to record the timings.

Further, show the three times on the board and ask why the times taken are different.

Introduce the relation between speed and the time.

EXPLAIN

Speed tells us how fast an object or a person travels. It is the rate of covering a distance in one unit of time. Speed is calculated by dividing the distance travelled by the total time taken to travel that distance.

Thus, Speed = Distance ÷ Time.

Or, Distance = Speed × Time

Or, $\text{Time} = \frac{\text{Distance}}{\text{Speed}}$

Further, explain the unit of speed as km/h.

ELABORATE

Demonstrate on board that a speed of 50 km per hour means that a distance of 50 km will be covered in one hour. If a man walks 4 km in 1 hour, his walking speed is 4 km per hour.

EVALUATE

Ask to solve the questions given in section 'Think Tank' on page 166 in classwork or homework.

ENHANCE

- Discuss about the information given in 'Knowledge Desk' on pages 165 and 166.

Periods: 14–16	Topic: (Revision) Chapter Assessment	Suggested extra teaching aids: Math Genius 5 pages 167–169

ENGAGE

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

EXPLORE

- Guide the students to perform the activity given in 'Gamified Learning' on page 169.

[Experimental Learning]

EXPLAIN

Start the revision of the exercise by using 'Mind Map', 'Mental Maths' and 'Chapter Assessment'.

ELABORATE

Discuss 'Mental Maths', Q1 to 4 of the 'Chapter Assessment' and accept students' answers. If they have any confusion or they make any error, then explain and correct them.

EVALUATE

Classwork: Discuss questions 1 to 4 of the 'Chapter Assessment' in the classroom.

Homework: Ask to solve Q5 to 6 of the 'Chapter Assessment' as homework assignment.

9 Time

Learning Objectives

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

- explain the 24-hour clock and convert the 24-hour clock time to 12-hour clock time and vice versa
- convert higher units of time to lower units and vice versa
- perform operations (addition, subtraction, multiplication and division) on time units.

LESSON PLAN

Suggested number of periods: 10

Suggested Teaching Aids: Textbook (Math Genius 5), blackboard or whiteboard, wall clock/table clock, thermometers, etc.

Keywords: A.M., P.M., 24-hours clock, Minutes, Seconds, Conversion, Degree-Celsius, Degree-Fahrenheit, etc.

Pre-requisite knowledge: Students must be familiar with a.m., p.m., reading time when minute hand is at half past the hour, quarter the hour, days of the week, days in the year, etc.

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

Periods: 1–3	Topics: The 24-hour clock, Conversion of time	Suggested extra teaching aids: Wall clock or table clock and a 24 hours digital clock, etc. Math Genius 5 pages 170–177

ENGAGE

Ask the class to pay attention. Show a 12-hour clock and a 24-hour digital clock in the classroom.

Instruct: Observe and read aloud the displayed time in both of the clock. Ask: Why there is difference in the timing of the clock. Accept the responses. Explain the reason behind it. Discuss the concepts given on "Get Ready" and "Let's Recall" sections on pages 170 and 171.

EXPLORE

Divide the class into 4 teams, and name them as 12-hours, 24 hours, minutes and seconds team.

Instruct one student from each team to tell the time as per their choice, and the other team will convert the time as per their team name and report the answer.

For example: 12-hours team select the time 7:55 p.m.

Then the 24-hours team convert it to 1955 hours with help of their team member and answer.

Similarly, minutes team will answer 475 minutes.

And seconds team will answer 28500 seconds.

In the same way, seconds team can select 35678 second and the other team convert into the time unit as per their name. Quick and correct responses from any team will get rewarded with the score.

[Collaborative Learning]

EXPLAIN

We normally use the 12-hour clock to measure the time. But some organization like the railways, the airlines, etc. use 24-hours clock. In 24-hours clock, we use 4 digits to show the time. The first two digits from the left show the hours and the last two digits from the left show the minutes.

A day starts at 12 mid-nights and is written as 0000 hours or 2400 hours.

12 O'clock at noon is expressed as 1200 hours.

Further, explain the conversion of 24-hour clock to 12-hours clock time and vice versa by taking the references and examples given on pages 171, 172.

Next, explain that the conversion of higher units of time to lower units, we use the multiplication and the relationship between different units of time as follows:

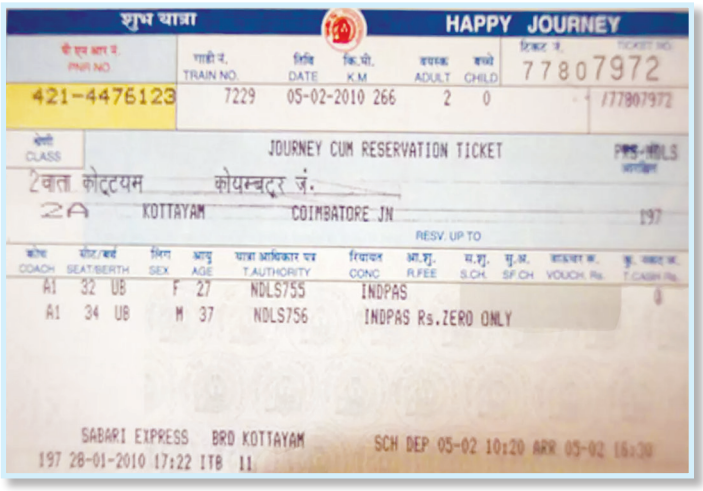
1 minute	=	60 seconds	1 fortnight	=	2 weeks = 14 days
1 hour	=	60 minutes	1 year	=	12 months
1 day	=	24 hours	1 year	=	365 days
1 week	=	7 days	1 leap year	=	366 days

Use the examples given on page 174, 175 and 176 for detailed explanation.

Similarly, to convert the lower units to higher units, we divide by using the above mentioned relationships. Demonstrate this concept on board by using the examples given on page 176. Also demonstrate the conversion using double number line.

ELABORATE

Bring any train/air ticket in the class to demonstrate the conversion of 12-hour clock time and 24-hour clock time. For example, have a look at the ticket shown here.



It has mentioned: The departure time on 05-02-2010 from Kottayam is 10:20, which means 10:20 am.

Here the first two digits show hour 10. It is less than 12, so no need to subtract 12 from 10. The last two digits show 20 minutes, so keep it as it is and suffix am to indicate the time between midnight to noon.

Hence, 10:20 = 10:20 am, which indicates morning time.

The arrival time on 05-02-2010 to Coimbatore Junction is 16:30, which means 4:30 pm.

Here the first two digits show hour 16. It is more than 12, so subtract 12 from 16. 16 – 12 = 4. The last two digits show 30 minutes, so keep it as it is and suffix pm to indicate the time between noon to midnight. Hence, 16:30 = 4:30 pm, which indicates evening time.

Also discuss the Railway time-table given on page 173 and motivate and help the students to solve the questions. **[Experimental Learning]**

EVALUATE

Classwork: Ask to solve Q1–2 of Practice Time 9A and Q1 of Practice Time 9B.

Homework: Ask to solve Q3 of Practice Time 9A, 'Life Skills' given on page 173, Q2–5 of Practice Time 9B.

ENHANCE

- Discuss the 'Knowledge desk' section given on page 173 of the book.
- Further the teacher will give task to prepare a short article on the difference of GMT and IST with help of internet. **[Tech Connect]**

Periods: 4–7	Topics: Addition and Subtraction of Measures of time, Multiplication and Division of units of Time	Suggested extra teaching aids: Wall clock or table clock, etc. Math Genius 5 pages 177–182

ENGAGE

Start the class, by asking some questions like:

- When do you reach home after school?
- At what time do you start the studying?
- If you start your homework at 4 pm and it takes 1 hour and 30 minutes to complete, then at what time do you complete it?

Accept the responses. Introduce operations on time units.

EXPLORE

Divide the class into pairs.

Assign one student the role of supervisor and provide him a stopwatch.

Call each pair one by one, and ask them to do different activities one by one, like standing on one leg.

The supervisor will record and note the timing of each one on board.

Ask the class to calculate the timing of standing on one leg by each pair by adding the times.

Also, who stands longer and how much by subtracting the times. **[Collaborative Learning]**

EXPLAIN

We can perform operations on time units as we did for length, weight and capacity.

To perform addition or subtraction of time, we arrange the same units of time in same columns and then add or subtract. Also, explain the method of calculating the elapsed time.

Further, explain the method of multiplication and division of units of time.

ELABORATE

Demonstrate on board "Add 11 hours 15 minutes and 49 seconds and 6 hours, 46 minutes and 33 seconds".

Step 1: Add seconds: 49 + 33 = 82 seconds, as it is more than 60 seconds, so we regroup it as 60 s (1 min) + 22 s.

Step 2: Add minutes: 1 + 15 + 46 = 62 mins. Regroup it as 60 min (1 h) + 2 min.

Step 3: Finally, add the hours: 1 + 11 + 6 = 18 hours.

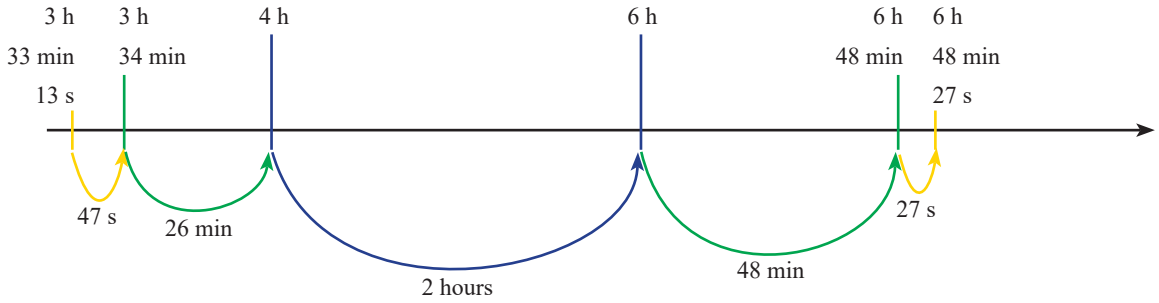
	h	min	s
	①	①	
	11	15	49
+	6	46	33
	18	02	22

Further, demonstrate the difference between two times measured in hours, minutes and seconds. Find the difference between 6 hours, 48 minutes, and 27 seconds and 3 hours, 33 minutes, and 13 seconds.

To find the difference between the two given times, we can place them on a time line.

Step 1: Take the next minute after the smaller time, that is, 3 hours and 34 minutes and 13 seconds and take the next hour: 4 hours.

Step 2: Place the last minute before the larger time: 6 hours, 48 minutes and 27 sec and take the previous hour: 6 hours.



Step 3: Count the number of seconds between 3 hours 33 minutes 13 seconds and 3 hours 34 minutes, i.e., the number of seconds required 13 s to get 60 s, i.e., 47 s. Then, count the time difference between 3 hours 34 minutes and 4 hours i.e., 26 minutes. Check that time between 4 hours and 6 hours is 2 hours, that between 6 hours and 6 hours 48 minutes is 48 minutes, and, finally, that between 6 hours 48 minutes and 6 hours 48 minutes 27 seconds is 27 seconds.

Step 4: Add all the in-between times,

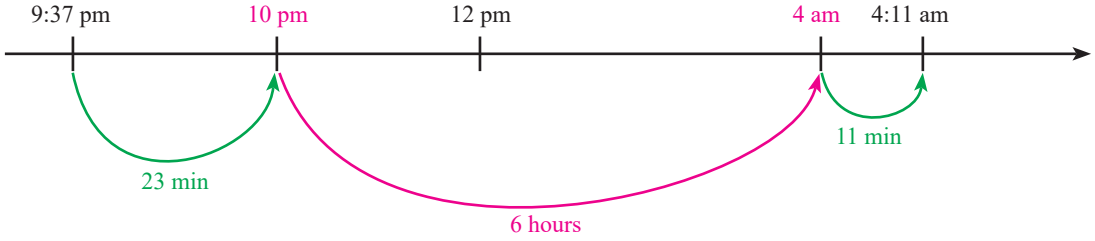
47 s + 26 min + 2 h + 48 min + 27 s = 2 h + 74 min + 74 s = 3 h + 15 min + 14 s (after regrouping)

Next, explain that we can also find the time duration by using the time line as follow:

To find the elapsed time from 9:37 p.m. to 4:11 a.m.

Step 1: On the time line mark the earlier time 9:37 p.m., then mark 10 p.m. next mark then complete hour before the later time 4:11 a.m., i.e., 4 a.m.

Step 2: Mark the difference between 9:37 and 10 p.m. that is 23 min 10 p.m. and 4 a.m. that is 6 hours and 4 a.m. and 4:11 a.m. that is 11 min.



Step 3: Add the in-between time together.

23 min + 6 hours + 11 min = 6 hours 34 min.

Also, discuss the references and examples given on pages 177 – 179.

Further demonstrate, the multiplication and division of units of time by using the references and examples given on pages 181 – 182 of the textbook. **[Conceptual Learning]**

EVALUATE

Classwork: Ask to solve Q1, 4, 5 of Practice Time 9C, Q1(*a*)-(*c*), 2 (*a*)-(*c*) of Practice Time 9D.

Homework: Ask to solve the remaining questions of Practice Time 9C and 9D.

ENHANCE

- Discuss 'Knowledge Desk' given on page 183 in the classroom. **[Logical and Critical Thinking]**
- Watch the video on time on "www.orangewebsupport.co.in". **[Tech Connect]**

Period: 8–10	Topic: (Revision) Chapter Assessment	Suggested extra teaching aids: Math Genius 5 pages 183–186

ENGAGE

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

EXPLORE

Help them to do the activity given in 'Gamified Learning' section on page 186. **[Cross curricular Learning]**

EXPLAIN

Start the revision of the exercise by using Mind Map, Mental Maths, Chapter Assessment and Challenge Question.

ELABORATE

Discuss questions 1 to 4 of the 'Chapter Assessment' and accept students' answer. If they have any confusion or they make any error then explain and correct them. Discuss and motivate students to solve 'Mental Maths'.

EVALUATE

Classwork: Discuss questions 1 to 4 of the 'chapter assessment' in the classroom. Ask to solve 'Mental Maths' given on page 183.

Homework: Ask to solve Q5 to 7 of 'Chapter Assessment' as homework assignment.

ENHANCE

- Discuss and motivate to solve 'Challenge Question' given on page 183.

Money

Learning Objectives

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

- apply unitary method to find the values of articles or items
- calculate the profit, loss, cost price and selling price of an item

LESSON PLAN

Suggested number of periods: 7

Suggested Teaching Aids: Textbook (Math Genius 5), blackboard or whiteboard, some dummy notes and coins of different denominations.

Keywords: Unit Price, Cost Price, Selling Price, Profit and Loss, etc.

Pre-requisite knowledge: Students must be familiar with addition and subtraction of money, multiplication and division of money, etc.

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

Periods: 1–3	Topic: Unitary method	Suggested extra teaching aids: Some real-life objects, Math Genius 5 pages 187–189

ENGAGE

After the introduction, ask from the class, if cost of 1 pencil is ₹5, then what is the cost of such 10 pencils. Accept the answers. Discuss 'Get Ready' and ask to solve questions given in 'Let's Recall' section. Introduce the topic unitary method.

EXPLORE

Write a situation on the board.

"I bought 20 bananas and paid ₹100 to the shopper. When I reached home, my mother asked me to bring 10 more bananas. I return to the market to bring 10 more bananas. How much more money do I have to pay the shopkeeper for 10 bananas?"

And write some questions based it on board. Like:

How much bananas I bought? ……

How much I paid for this?.....

To pay for 10 more bananas what do I need to know?.....

How would I know the rate of bananas?.....

And ask students to answer those questions, with help of each other in their notebook.

At the end teacher will explain the answers and students will match with their own. The student who solve all or the maximum will be appreciated. **[Conceptual Learning]**

EXPLAIN

The method of finding the value of one article, when the value of some articles is given, is called the unitary method. The price of 1 item is called the unit price.

ELABORATE

Demonstrate on board the unitary method and its requirement in real-life by using the examples 1, 2 and 3 given on pages 188 and 189 of the textbook. **[Conceptual Learning]**

EVALUATE

Classwork: Ask to solve Q1, 2 and 3 of Practice Time 10A in the classwork notebook.

Homework: Ask to solve the remaining questions of Practice Time 10A as their homework assignment.

ENHANCE

- Ask to download some worksheets based on unitary method from the internet and solve them.

Periods: 4–6	Topic: Profit and Loss	Suggested extra teaching aids: Some objects for selling, dummy currency notes, etc. Math Genius 5 pages 190–194

ENGAGE

Start the class by discussing like: Everyone in this world has to earn his or her living. Some are in service, while others do independent business. Ask question like:

- How do shopkeepers earn their living?
- Do they sell articles at the same price at which they buy?
- What do we call the additional amount they got by selling the product?

Accept the students' answers.

Also tell them that sometimes they are compelled to sell at a lower price depending on circumstances, it is known as selling at loss.

EXPLORE

- Arrange the tables for selling the products.
- Ask students to select the products they want to sell.
- Now, ask them to decide the cost price and selling price for each product.
- Distribute dummy currency notes to all students.
- Now, give shopping time to students in batches. Encourage them to negotiate the pricing and get a better deal for themselves.
- After this, each student should calculate how many products they have sold and what is their profit or loss.
- Encourage and help them to find the profit by applying the formula of subtracting the cost price from the selling price to get the profit amount. Discuss their experience too.

[Experiential and Collaborative Learning]

EXPLAIN

The price at which an article (item) is bought is called the cost price (CP).
The price at which an article or item is sold is called the selling price (SP).
When the selling price (SP) is greater than the cost price (CP), that is, SP > CP, then there will be a profit.
Profit = SP – CP.
When the selling price (SP) is less than the cost price (CP), that is, SP < CP, then there will be a loss.
Loss = CP – SP.
When the selling price (SP) is equal to the cost price (CP), that is, SP = CP, then there will be neither a profit nor a loss.
In case of profit, the Cost price is Selling price – Profit.
In case of loss, Cost price is Selling price + Loss.
Further, in case of profit, the Selling price is Cost price + Profit.
In case of loss, the Selling price is Cost price – Loss.

ELABORATE

Demonstrate on board examples based on 'Profit and Loss', finding the cost price, selling price, profit and loss by taking references given on pages 190 – 193. **[Conceptual Learning]**

EVALUATE

Classwork: Ask to solve Q1 and 5 of Practice Time 10B in the classroom.

Homework: Ask to solve Q2, 3, 4, 6 and 7 of Practice Time 10B as homework assignment.

ENHANCE

- Discuss and motivate to solve 'Fast Check' given on page 190. **[Logical Thinking]**
- Ask to solve 'Think Tank' given on page 193.

Period: 7	Topic: (Revision) Chapter Assessment	Suggested extra teaching aids: Math Genius 5 pages 195–197

ENGAGE

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

EXPLAIN

Start the revision of the exercise by using, Mind Map, Chapter Assessment, Life Skills, Mental Maths and Challenge Question.

ELABORATE

Ask to solve questions 1 to 5 of the 'chapter assessment'. If they have any confusion or do error, then explain and correct it. Discuss and motivate students to solve 'Mental Maths'. Guide them to solve Challenge Question given on page 195.

EVALUATE

Classwork: Ask to solve Q1 to 5 of the 'Chapter Assessment' in the classroom.

Homework: Ask to solve Q6 to 11 of 'Chapter Assessment' and 'Mental Maths' as homework assignment.

EXPLORE

Guide students to do activity as suggested in 'Gamified Learning' given on page 197.

[Experiential and Collaborative Learning]

Perimeter and Area

Learning Objectives

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

- find the perimeter of geometrical shapes
- find the area of geometrical shapes
- find the area of composite figures
- find the area of irregular shapes

LESSON PLAN

Suggested number of periods: 12

Suggested Teaching Aids: Textbook (Math Genius 5), blackboard or whiteboard, measuring tape, some cubical and cuboidal boxes, etc.

Keywords: Boundary, Perimeter, Region, Area, Length, Breadth, Height, Space, etc.

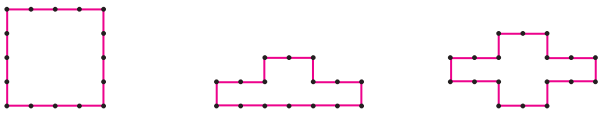
Pre-requisite knowledge: Students must be familiar with finding the area and perimeter of 2D regular shape and irregular shapes, etc.

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

Periods: 1–4	Topic: Perimeter	Suggested extra teaching aids: Chalk, marker, duster, measuring tape, etc. Math Genius 5 pages 198–203

ENGAGE

Ask the students to construct the following figures using ear buds/ matchsticks and observe the total length of their boundary. The students may be asked to calculate the length of the boundary of these shapes. They may check if the lengths are the same.



Students may be encouraged to construct more shapes, such as triangles, with the same boundary length. This will give them an idea that different shapes can have the same boundary length or perimeter.

Introduce: The concept of perimeter of a rectangle. Discuss the concepts given on "Get Ready" and motivate to solve "Let's Recall" given on pages 198 and 199, respectively.

EXPLORE

Take the class into the playground. Make a rectangular shape on the playground by standing any four students at four different points of the playground. Instruct: Another student to make lines using sand/ chalk by walking in a line between the two students who stand at two different points.

Again, instruct another student to measure the length of the sides of the rectangular shape formed on the playground by using the measuring tape.

Ask: What is the perimeter of the rectangular shape formed? Accept the responses.

Further, make another shape like square/ triangle and repeat the process till the time permits.

[Collaborative and Experiential Learning]

EXPLAIN

The perimeter is the sum of the lengths of the sides of any rectilinear figure. So the perimeter of a rectangle is the sum of the lengths of all four sides. Explain the method of deriving the formula 2 (Length + Breadth) as the opposite sides of a rectangle are of same length.

Further, we know that a square is a 4-sided polygon whose all four sides are of equal length.

Hence, perimeter of a square = 4 × side.

Similarly, perimeter of a triangle = sum of its three sides.

ELABORATE

Demonstrate on board how to find the perimeter of different rectilinear figures like: rectangle, square and types of triangles.

The perimeter of a rectangle with measurements 9 cm and 4 cm = 2 × (length + breadth) = 2 × (9 + 4) cm
= 2 × 13 cm = 26 cm.

The perimeter of a square with side 8 cm = 4 × side = 4 × 8 cm = 32 cm.

The perimeter of a scalene triangle ABC, with measurement AB = 5 cm, BC = 8 cm and AC = 11 cm,
= AB + BC + CA = 5 cm + 8 cm + 11 cm = 24 cm.

The perimeter of an equilateral triangle of side 5 cm = 3 × sides = 3 × 5 cm = 15 cm.

The perimeter of an isosceles triangle in which each of the equal sides is 6 cm and the third side is 5 cm.
= 6 cm + 6 cm + 5 cm = 17 cm.

Also demonstrate on board the solved examples and examples based on real-life situations where we use the concept of perimeter given on pages 199–202 of the book. **[Conceptual Learning]**

EVALUATE

Classwork: Ask to solve Q5–9 of Practice Time 11A.

Homework: Ask to solve Q1–4 and 10–12 of Practice Time 11A.

ENHANCE

- Discuss the 'Math Insight' on page 202 and ask to do the question of 'Think Tank' section given on page 201 of the book.

Periods: 5–10	Topics: Area, Area of a Composite Figure, Area of a Triangle, Area of irregular shapes	Suggested extra teaching aids: Chalk, duster, square paper having images, crayons or colour pencils, etc. Math Genius 5 pages 204–211

ENGAGE

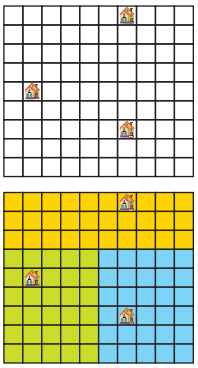
Refer some real-life objects and ask questions based on area.

- Which of the following has a larger area of a carom board or a chess board?

- If you have to clean a door or a window pan, for which one will you take less time?
- On which sheet can you draw a bigger smiley – on a chart paper or on a notebook page?

Accept their responses and talk about their logic behind concept. Introduce the topic Area.

EXPLORE



Divide the class into groups. Distribute the shown grid paper with image of three houses in each group.

Now, ask the group to divide the area equally among three parts, by colouring it in three colours, such that each part include one image of the house. The group who did it correctly in minimum time will be the winner. If students have any confusion, teacher will help them and ask them to distribute the area in three equal parts by counting the square and colour them as shown in given figure. **[Experiential and Collaborative Learning]**

EXPLAIN

Area is the amount of surface that a plane-closed figure covers. Area of an object which takes more space is larger than an object which takes less space. To measure the area of a closed figure, we count the squares with convenient unit of area. For example, a square whose side is 1 cm, square centimetre or sq. cm is a unit of area.

Explain that, area of a rectangle can also be calculated by using the formula "(Length × Breadth) sq. units". And if area is given, length and breadth can be calculated by using the formula,

$$\text{Length} = \frac{\text{Area of rectangle}}{\text{Breadth}} \quad \text{and} \quad \text{Breadth} = \frac{\text{Area of rectangle}}{\text{Length}}$$

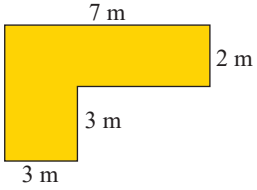
Explain, area of a square = (side × side) sq. units.

Further, to explain area of a triangle, a diagonal divides a square or a rectangle into two halves. Each half is a triangle. Thus, the area of a triangle is half the area of the square or rectangle.

Next, explain how to find the area of irregular shapes, using the squared paper counting the squares by using the formula given below:

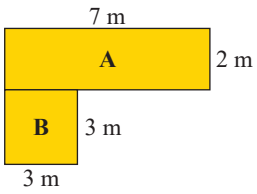
Area of the irregular closed figure = Number of complete squares (m) + Number of squares having more than half parts enclosed (n) + $\frac{1}{2}$ × Number of squares having half parts enclosed (p).

ELABORATE



Demonstrate on board the method of finding the area of a rectangle and square, by taking the reference and examples given on pages 204–206.

Further, demonstrate the area of composite figure as shown.



Show that the figure can be divided into one rectangle A and one square B, where the length and breadth of rectangle A are 7 m and 2 m respectively.

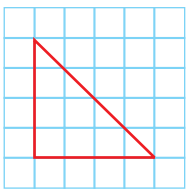
And each side of square B is 3 m.

So, area of rectangle A = $2 \times 7 = 14$ sq. m

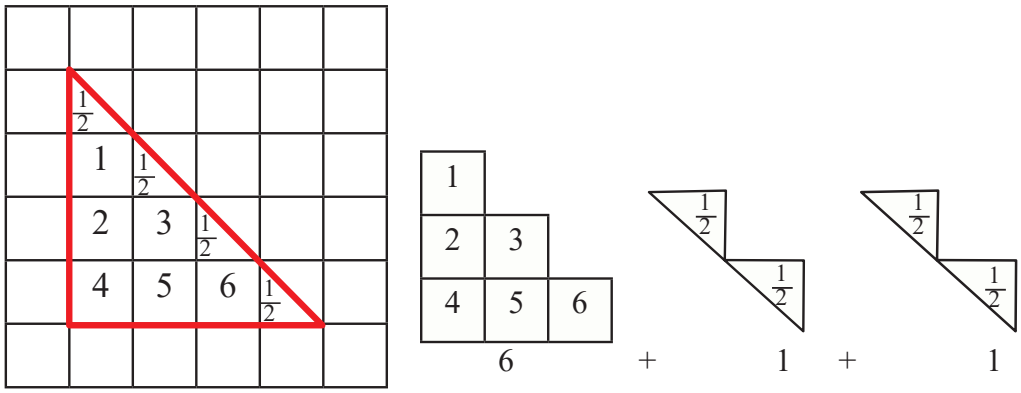
And area of square B = $3 \times 3 = 9$ sq. m

So, area of composite figure = 14 sq. m + 9 sq. m = 23 sq. m

Also, demonstrate the examples 1, 2 of area of composite figures given on pages 206–207 of the textbook. For area of triangles, show the triangle on a square grid paper as given alongside:



Here, the triangle does not contain all complete squares. It has 6 complete squares and 4 half squares.

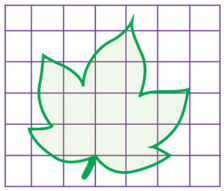


Number of complete squares = 6 + 2

So, the area of the triangle is 8 square units.

Also, demonstrate area of triangle by taking the references and examples given on pages 207–208.

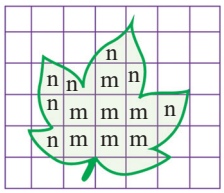
To demonstrate area of irregular shapes, count the squares that are completely covered, half covered and so on as shown:



Number of complete squares (m) + Number of squares having more than half parts enclosed (n) + Number of squares having half parts enclosed (p).

$m = 7; p = 0; n = 7$

So, area of the given shape = $\left(m + n + \frac{1}{2}p\right) = 7 + 7 = 14$ sq. units



For detailed explanation of area of irregular shapes, use the references given on page 210.

[Conceptual Learning]

EVALUATE

Classwork: Ask to solve Q1, 2, 4, 10 of Practice Time 11B and Q1–3 of Practice Time 11C.

Homework: Ask to solve the remaining questions of Practice Time 11B and 11C.

ENHANCE

- Discuss 'Think Tank' given on page 206 of the textbook.
- Ask to solve 'Maths Fun' given on page 210 in the classroom. **[Logical and Critical Thinking]**

Periods: 11–12	Topic: (Revision) Chapter Assessment	Suggested extra teaching aids: Math Genius 5 pages 211–214

ENGAGE

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

EXPLORE

Help them to do the activity given in 'Gamified Learning' on page 214 of book in the classroom.

[Collaborative Learning]

EXPLAIN

Start the revision of the exercise by using Mind Map, Mental Maths, Maths Connect and Chapter Assessment.

ELABORATE

Discuss questions 1, 5 and 6 of the 'Chapter Assessment' and accept students' answers. If they have any confusion or do any error then explain and correct it. Discuss and motivate students to solve 'Mental Maths'.

EVALUATE

Classwork: Ask to do questions 1, 5 and 6 of the 'Chapter Assessment' in the classroom.

Homework: Ask to solve the remaining questions of 'Chapter Assessment' as homework assignment.

ENHANCE

- Ask to solve 'Maths Connect' given on page 212.
- Ask to solve 'Challenge Question' given on page 211.

Visualisation of 3D Objects and Maps

Learning Objectives

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

- draw nets of 3D shapes
- know about icosahedron and dodecahedron
- understand and draw route maps
- draw a 2D Floor Map and 3D Deep Drawings
- learn and do the positioning of objects in a plane

LESSON PLAN

Suggested number of periods: 10

Suggested Teaching Aids: Textbook (Math Genius 5), blackboard or whiteboard, chalk, duster, compass, isometric paper, etc.

Keywords: Net, Icosahedron, Dodecahedron, Map, Scale, Directions, Ordered pair, etc.

Pre-requisite knowledge: Students must be familiar with difference in 2D and 3D objects, drawing nets of solid shapes, different view of a shape and map of a location, etc.

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

Periods: 1–2	Topics: Solid shapes, Icosahedron and Dodecahedron	Suggested extra teaching aids: Chart based on solid shapes and its nets, Isometric dot paper, etc. Math Genius 5 pages 215–219

ENGAGE

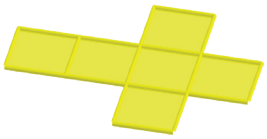
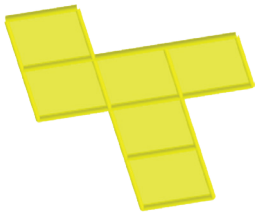
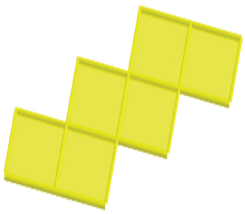
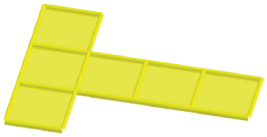
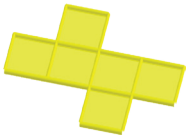
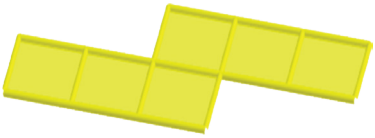
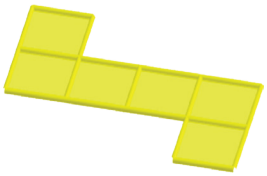
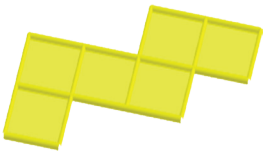
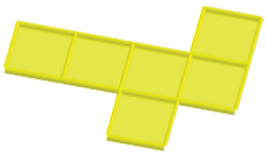
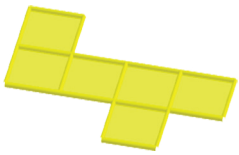
Start the class by asking few questions like:

- Why solids are called 3-dimensional figures/shapes?
- When we add two cube what shape do we get?

Discuss the concepts given in 'Get Ready' section and ask to do the questions of Let's Recall section given on page 216.

EXPLORE

Take the class to the computer lab. Divide the class into pairs. Ask each pair to open Geogebra in their system. Instruct: Start exploring nets of solids, like: net of a cube.

Cube	Net with maximum 4 squares in a row	Net with maximum 3 squares in a row	Net with maximum 2 squares in a row
			
			
			
			
			
			

And note the shapes in their notebook.

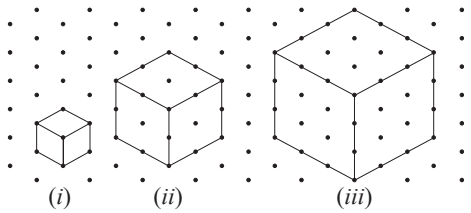
At last the students will discuss and present their observation in the classroom. **[Tech Connect]**

EXPLAIN

By opening the hollow 3D shape/object, we get its 2D net. A cube is a 3D shape whose all faces are squares. It has six faces, eight corners and twelve edges. Cuboid also has six faces, eight corners and twelve edges, but its faces are in rectangular shape. Further, a cylinder has two identical circular bases joined by a curved surface. And a cone is a 3D solid shape with a flat and curved surface pointed towards the top. Teacher can take the references and images given on pages 216 and 217 for the detailed explanation. Next explain about the shapes Icosahedron and Dodecahedron.

ELABORATE

Distribute isometric dot paper in the class and instruct to observe how this paper is different from the square dot paper. Demonstrate that on isometric dot paper, the dots form an equilateral triangle. Further demonstrate on board how to draw cubes of sides 1 cm, 2 cm and 3 cm.



Also show the construction of cuboids of different dimensions. **[Experiential Learning]**

Further, demonstrate the shapes Icosahedron and Dodecahedron in the classroom.

EVALUATE

Classwork: Discuss Q1, 2 and 3 of Practice Time 12A in the classroom.

Homework: Ask to solve Q4 and 5 of Practice Time 12A as the homework assignment.

ENHANCE

- Ask to draw at least 5 cuboids of dimension 2 × 3 × 4 on an isometric dot paper.

Periods: 3–5	Topic: Map	Suggested extra teaching aids: Chart showing maps or route between two locations, etc. Math Genius 5 pages 219–221

ENGAGE

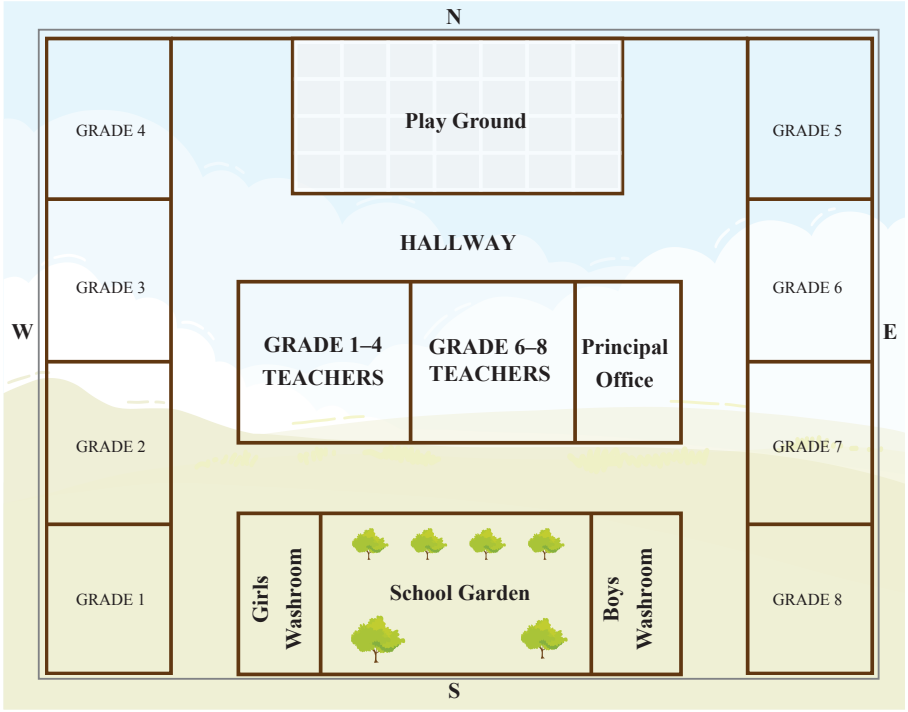
Exploring Directions on a Map

In this activity students will explore different places using a map and understand the value of directions mentioned in it. Ask them to get a Map of their school. They may be asked to look for a compass rose on the map. It's usually a small star or flower-like symbol with arrows pointing in different directions.

This handy tool will guide them as they explore directions. They may be familiarised with the four main directions:

1. North is at the top of the map.
2. South is at the bottom.
3. East is on the right side.
4. West is on the left side.

They may be asked to face a certain direction. They may then use the compass rose to figure out which direction they are facing. It's like using a compass to find their way. Now, allow them to try to locate different places on the map using the directions they have learned. For example, they might find their classroom to the north of the playground. You may call out a direction, and the student should point to that direction on the map. Introduce the topic maps.



EXPLORE

Divide the class into groups. Distribute plain paper to each group. Ask to draw route map from the classroom to principal room or they can draw the route from their home to the school, showing important landmarks on the way using keys. The teacher will help if any group wants it. The group whose route map is the best and accurate is the winner.

[Experiential Learning]

EXPLAIN

A map is simply a drawing or picture or a landscape of a location. It shows the landscape as it would be seen from above (top view). It is also used for guiding directions and to find out distances in a locality.

ELABORATE

Take reference of map given on pages 219 to 221 to explain the map. Discuss the example given on page 220 on board. Also demonstrate the components of a map: title, scale, keys.

Demonstrate the directions in detail by using the compass, and taking the references given on pages 220–221.

EVALUATE

Classwork: Ask to solve Q1 of Practice Time 12B in the classroom. If any student makes any error, the teacher will correct and explain.

Homework: Ask to solve Q2 of Practice Time 12B as homework assignment.

ENHANCE

- Ask to do the 'Project' given on page 222 of the textbook. **[Experiential Learning]**

Periods: 6–8	**Topics: 2D floor maps and 3D deep drawings, Positioning of objects**	**Suggested extra teaching aids: Some real life objects like Flower pot, tea cup, drawing sheets, sample of some floor map and 3D deep drawing, etc. Math Genius 5 pages 222–223**

ENGAGE

Start the class by showing a floor map of any building and ask some question like:

- What information you get from the map?
- Can you find the number of windows and door in a single flat of building.

Accept the response. Introduce the topic 2D floor maps and 3D deep drawings.

EXPLORE

Further the teacher will demonstrate how to represent objects' positions using grid coordinates. And to explore how grid-based maps are used in real-world scenarios like locating objects in a zoo, city map, or even game levels.

- Start by showing a basic grid, similar to the one in the image given in textbook page 223, and explain how the grid works with horizontal lines (rows) and vertical lines (columns).
- Explain the concept of an "ordered pair" (x, y), where x represents the horizontal position (column) and y represents the vertical position (row). For example, the position of the panda is (1, 1), as it is at the intersection of the first column and first row.

- Ask students to create their own grid on a piece of graph paper.
- Ask students to choose 5 animals (or objects) to place on their grid. These could be zoo animals, sea creatures, or any other theme they enjoy.

For each animal, students should decide on its location on the grid by picking an ordered pair (x, y). For example:

- Tiger at (2, 7)
- Elephant at (7, 4)
- Ask them to draw or place stickers of their chosen animals at the correct coordinates.
- Discuss, if a zookeeper needs to locate a specific animal, how would they navigate the zoo map? Would it be easier or harder if the zoo used a 10 × 10 grid instead of 12 × 12? Why?
- Let students share their grids with the class and describe the position of each animal. Encourage them to explain how they chose each animal's position using coordinates.

Also take the reference given on page 223 of the textbook.

EXPLAIN

Explain 3D objects on 2D surfaces showing the impression of length, width, depth, distance, etc. Explain about the important terms, vanishing point, eye point and eye level or horizon line that help us to understand how perspective (one point) drawings give smaller appearance of objects from farther distance and how 3D objects look realistic when drawn on 2D shape.

ELABORATE

Show a sample of floor map and its 3D deep drawing in the classroom and explain 2D floor plans show the basic outline of a building including walls, doorways, windows and entrances. Before construction, the building is described by the floor map. A floor map illustrate how the available space should be used. Deep drawing is a 3D drawing show the length, width and the height of a house or a building. It is drawn on the basis of the floor map.

The deep drawing matches the specifications of the floor map. **[Experiential Learning]**

EVALUATE

Classwork: Discuss Q3 and 4 of Practice Time 12B in the classroom. If students make any error, teacher will correct it and explain.

Homework: Ask to do the Project given on page 226 of the textbook.

ENHANCE

- Ask to do the 'Challenge Question' given on page 226 of the textbook. **[Experiential learning]**

Periods: 9–10	Topic: (Revision) Chapter Assessment	Suggested extra teaching aids: Math Genius 5 pages 227–230

ENGAGE

Make students comfortable, so they can ask any question on any previously taught topics in which they are confused. Clarify their doubts/queries and start the revision of the exercise.

EXPLORE

Help the students to perform the activity given in 'Gamified Learning' on page 230. **[Art Integration]**

EXPLAIN

Start the revision of the exercise by using Mind Map and Chapter Assessment.

ELABORATE

Discuss questions 1, 2 and 5 of the Chapter Assessment and accept students' answers. If they have any confusion or do any error, then explain and correct it.

EVALUATE

Classwork: Discuss questions 1, 2 and 5 of the Chapter Assessment in the classroom.

Homework: Ask to solve Q3 and 4 of Chapter Assessment as homework assignment.

Data Handling

Learning Objectives

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

- collect data related to various daily life situations
- represent and organise the data in tabular form using tally marks
- interpret and draw bar graphs for the given data
- interpret and draw circle graphs (pie graph) for the given data

LESSON PLAN

Suggested number of periods: 8

Suggested Teaching Aids: Textbook (Math Genius 5), blackboard or whiteboard, some charts, etc.

Keywords: Data, Collection, Tally marks, Tally chart, Pictograph, Key, Bar graph, Circle graph, Pie chart etc.

Pre-requisite 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: The way of teaching provides experiential learning opportunities to the students and allows them to work with the support of each other which helps in their holistic development.

Periods: 1–2	Topics: Data, Organising the data in tabular form or tally chart	Suggested extra teaching aids: Chalk, marker, duster, etc. Math Genius 5 pages 231–236

ENGAGE

After introduction, ask some questions based on data handling that they are already learnt in their previous classes. Like:

- What is data?
- How can we represent data?
- Why do we organise it?
- Suppose teacher wants to compare the performance of the students of Class V in various subjects, what will he/she do?

Accept the responses. Discuss 'Get Ready' and 'Let's Recall' sections given on pages 231 and 232, respectively. Introduce the topic organising the data in tabular form or tally chart.

EXPLORE

Write name of 4 favourite ice-cream flavour on board in a tabular form as follows:

Favourite ice-cream flavour	Tally marks	Number of students
Vanilla		
Chocolate		
Blueberry		
Mango		

Ask students one-by-one to come on board and mark a vertical line (|) in front of their favourite flavour. The teacher will introduce the rules for tally marks. Ask: How many of them like mango ice cream? Which flavour is liked by the most? Which flavour is liked by the least? Accept the responses. **[Experiential Learning]**

EXPLAIN

When the data is represented in a tabular form with tally marks, that table is known as a tally mark chart. The general way of writing tally marks is as a group or set of five lines. The first four lines are drawn vertically and each of the fifth line runs diagonally over the previous four vertical lines, *i.e.* from the top of the first line to the bottom of the fourth line.

Tally marks are the representation of numbers in bars as follows:

1 as |, 2 as ||, 3 as |||, 4 as ||||, 5 as 𝍸, 6 as 𝍸|, , 7 as 𝍸||, and so on.

A tally chart is a quick and easy way to count how many data or items are there in each category.

ELABORATE

Demonstrate organizing the data using the tally marks or tally chart by elaborating the examples on board by using the references given on pages 233–235 of the book. **[Conceptual Learning]**

EVALUATE

Classwork: Ask to solve questions 1 and 2 of Practice Time 13A in their classwork notebook. If any student makes any error, the teacher will correct and explain it.

Homework: Ask to do Q3 and 4 of Practice Time 13A in homework assignment.

ENHANCE

- Discuss 'Knowledge Desk' given on page 232.
- Ask to solve 'Think Tank' given on page 234.

Periods: 3–4	Topics: Reading bar graphs, Drawing a bar graph	Suggested extra teaching aids: Chalk, duster, square grid paper, colour pencils/ crayons, etc. Math Genius 5 pages 236–239

ENGAGE

Call two students from the class and ask them to collect the data within the class about favourite fruits of all students. Accept the responses. Introduce how can we represent this data using bar graph.

EXPLORE

Distribute square grid paper in the classroom. Instruct each group to collect the data within the class about favourite fruits, favourite sweets or favourite subjects, etc. of each student. Accept the responses and instruct each group to represent the collected data in tally mark chart/ bar graph on a paper sheet/board.

Ask: Which fruit name/sweet name/subject is liked by the most? Which fruit name/sweet name/subject is liked by the least number of students? Accept the responses. **[Experimental and Collaborative Learning]**

EXPLAIN

When the numeric data is represented using rectangular bars of different heights, it is called a bar graph. It is a very effective way of representing data graphically. A bar graph also helps us to compare information. In bar graph we represent data using rectangular bars of equal width. On a bar graph, the bars have equal spaces between them.

Further explain the method of drawing a bar graph to represent the data. Explain that a bar graph has: (*i*) a title (*ii*) horizontal and vertical axes (*iii*) labels on both the axes (*iv*) a suitable scale.

ELABORATE

Demonstrate how to represent data through a bar graph and how to read the information from a given bar graph. Every bar graph has:

(*a*) a title explaining the information given in the graph.
(*b*) the horizontal and the vertical axes.
(*c*) the labels explaining the meaning of each bar.
(*d*) the scale that is chosen for given data.

Focus on these terms and finding the solution by reading the bar graph through example given on page 237 of the textbook.

Further, demonstrate drawing a bar graph for the given data by using the reference given on page 238 of the textbook. **[Conceptual Learning]**

EVALUATE

Classwork: Ask to solve Q1 and 3 of Practice Time 13B.
Homework: Ask to solve Q2, 4 and 5 of Practice Time 13B.

ENHANCE

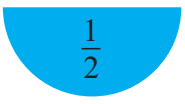
- Ask to focus on points given in 'Be Aware' section given on page 238 of the textbook.
- Motivate the class to collect more information on various things within the class. By using those data, draw more bar graphs on the board. Demonstrate the interpretation of those bar graphs.

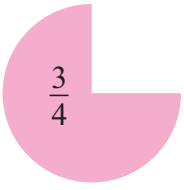
[Collaborative Learning]

Periods: 5–6	Topic: Circle graph	Suggested extra teaching aids: Cut-out/drawing of Circular parts, etc. Math Genius 5 pages 240–241

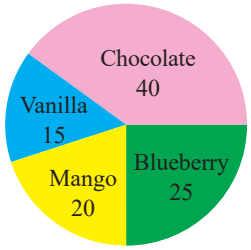
ENGAGE

Recall the fraction by showing parts of the whole as follows:





And show that if we collect data of 100 students for their favourite flavour of ice-cream as we did earlier, we can also represent this data as shown here, known as circle graph or pie chart.



EXPLORE

Ask to do the activity given in 'Gamified Learning' section on page 244 of the textbook. After finding the fractions for each of the given fruit in their notebook, ask students to try to divide a circle as per these fractions with the help of each other.

[Experimental and Collaborative Learning]

EXPLAIN

Circle graph or pie chart is another way to represent data graphically. Circle graphs show different parts of an information put together in the form of a whole. In a circle graph (pie chart), a circle is divided into sectors (slices). Each sector represents a different part of the data as a fraction or percentage of the complete circle. The size of each sector shows what part of the whole it is.

For constructing a circle graph for given data, first find the fractional part for each in the whole, and then construct the circle graph accordingly.

ELABORATE

Demonstrate on board, the method of constructing the circle graph in detail by using the methods and examples given on pages 240–241. **[Conceptual Learning]**

EVALUATE

Classwork: Discuss Q1 of Practice Time 13C in the classroom.

Homework: Ask to do Q2 and 3 Practice Time 13C as homework assignment.

ENHANCE

- Ask to solve 'Challenge Question' given on page 242. **[Critical Thinking]**

Periods: 7–8	Topic: (Revision) Chapter Assessment	Suggested extra teaching aids: Math Genius 5 pages 242–244

ENGAGE

Make students comfortable, so they can ask any question on any previously taught topics in which they are confused. Clarify their doubts/queries and start the revision of the exercise.

EXPLAIN

Start the revision of the exercise by using 'Mind Map' and 'Chapter Assessment'.

ELABORATE

Discuss questions 1 and 2 of the 'Chapter Assessment' and accept students' answers. If they have any confusion or do any error, then explain and correct it.

EVALUATE

Classwork: Ask to do Q1 and 2 of the 'Chapter Assessment' in the classroom.

Homework: Ask to do Q3 to 6 of 'Chapter Assessment' as homework assignment.

ENHANCE

- Ask to do the 'Project' given on page 242 of the textbook. **[Experiential Learning]**