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MATH GENIUS

Think Smart, Solve Fast

Ver. 2.0 >



Lesson Plan

Experience the Joy of Learning Mathematical Skills



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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.



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Large Numbers

Learning Objectives

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

- ◆ read and write numbers up to 6 digits
- ◆ find the face value and the place value of the digits in a number
- ◆ compare and order the large numbers up to 6 digits
- ◆ form numbers using given digits without and with repetition of digits
- ◆ round off the numbers to the nearest tens, hundreds and thousands
- ◆ read and write large Roman numerals

LESSON PLAN

Suggested number of periods: 15

Suggested Teaching Aids: Book: Math Genius 4, Textbook, notebook, chalk, blackboard or whiteboard, projector, smartboard, some real-life objects like clock, pen, pencils, number/Flash Cards, Spike abacus, number and place value chits, A-4 size sheet, newspaper/magazines.

Keywords: Periods, Places, Thousands, Ten thousands, Lakhs, Place value, Face value, Expanded form, Short form, Smallest and greatest numbers, Successor, Predecessor, Rounding up, Rounding down, Roman numerals, Hindu-Arabic numerals.

Pre-requisite knowledge: Students must be familiar with numbers up to 4 digits, their number names, the smallest and greatest 4-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 – 4 | Topics: Recap; 5- and 6-digit numbers; Reading and writing numbers; Numbers on the Abacus | Suggested extra teaching aids: Abacus, Newspaper Math Genius 4 pages 8–13 |
|----------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|

ENGAGE

The teacher can start the topic in the classroom using an interactive method. For this, she can ask some questions related to the students' real life. For example,

- How many members are there in your family?
- Who is/are earning members in your family? What are their works?

- Can you guess your family’s monthly income/expenses?
- How much school fee do you pay every month? and so on.

After the students’ responses, she can introduce the chapter Large numbers.

EXPLORE

Divide the class into groups of 3–4 students. Provide a newspaper to each group and instruct them to search any three numbers made up of 3 to 6 digits. They will underline the information and note down the numbers in their notebook. After 5–10 minutes, tell the students to read the noted numbers aloud and write it on the black/whiteboard. In case of 5- and 6-digit numbers, the teacher should assist them in reading.

[Experiential Learning]

EXPLAIN

- The teacher will revise the learners’ previous knowledge of 4-digit numbers with the help of the “Get Ready” and “Let’s Recall” sections of the book for this purpose.

Next, ask some questions related to the topic to build the concept, like:

- Which is the smallest 4-digit number?
- Which is the greatest 4-digit number?

Write on the board $9999 \rightarrow$ Greatest 4-digit number.

When we add 1 to 9999, we get 10000, it is the smallest 5-digit number. It is read as ‘ten thousand’. Counting ahead, we get 10001, 10002, 10003, ..., 10009, 10010, 10011, ..., 10099, ..., 99999. These all are 5-digit numbers. 99999 is the greatest 5-digit number.

Refer Math Genius 4, pages 8–11 for more explanation.

[Conceptual Understanding]

ELABORATE

Draw a Place Value chart on the black/whiteboard and demonstrate how to present 5-digit numbers in the table and using it read the numbers as well as write the number name.

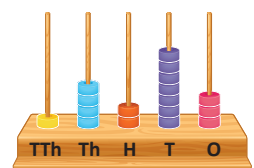
| Periods \rightarrow | Thousands | | Ones | | |
|--------------------------------|------------------------|-------------------|-----------------|-------------|-------------|
| Places \rightarrow | Ten Thousands (TTh) | Thousands (Th) | Hundreds (H) | Tens (T) | Ones (O) |
| Values of Places \rightarrow | (10000) | (1000) | (100) | (10) | (1) |
| (a) | 2 | 3 | 7 | 5 | 2 |
| (b) | 3 | 8 | 9 | 0 | 5 |

To write the numbers without using a place value chart, we separate the periods by a comma (,). Thus, we can write and read these numbers as:

- 23,752— Twenty-three thousand seven hundred fifty-two
- 38,905 — Thirty-eight thousand nine hundred five

Next, take a 5-spiked abacus and demonstrate how to visualise 5-digit numbers on it using different coloured beads.

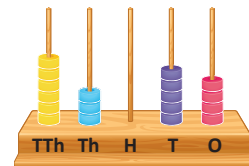
For example, 14,273 can be shown by putting 1 bead in TTh spike, 4 beads in Th spike, 2 beads in H spike, 7 beads in T spike and 3 beads in O spike.



Note: We do not put beads in any spike if there is 0 at the corresponding place in the number. For example, 63,054 is shown as

Furthermore, refer pages 11–13 and explain about the 6-digit numbers along with presentation and demonstration.

[Conceptual Understanding]



EVALUATE

Classwork: Ask to solve Q.1, 4 and 7 of Practice Time 1A.

Homework: Ask to solve Q. 2, 3, 5 and 6 of Practice Time 1A.

ENHANCE

- Ask students to write the address of any two friends/relatives including the pin/area code.

| | | |
|--------------|---------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| Periods: 5–6 | Topics: Face value and Place value; Expanded form and Short form; Predecessor and Successor | Suggested extra teaching aids: Number cards, Place value paper strips Math Genius 4 pages 14–17 |
|--------------|---------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|

ENGAGE

Write the last 5/6 digits of a mobile number on the board, e.g., 23654.

Instruct the students to identify the places for each digit and note down in their notebook.

Ask about face value and place value of each digit. Accept their responses.

Tell them to arrange the digits in ascending/descending order.

Ask: If the place value of any digit is changed, does the face value of the digit also change?

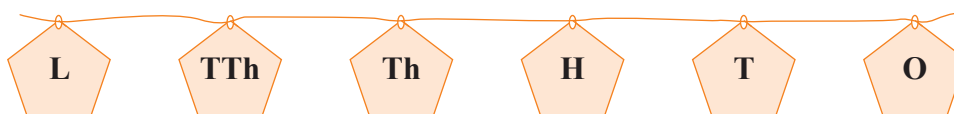
Tell them to discuss about the answers among the classmates.

[Discussion-based Learning]

EXPLORE

Card Game

- Write the places L, TTh, Th, H, T, O on the board. Or, string the place value cards and fix it on the wall in front of the class.



- Divide the class into groups of five/six students.
- Give each group a deck of cards from 0 to 9.
- Then ask the students to shuffle the cards and take five/six cards at random and stand in a row under the places fixed.
- Ask the rest students to say the number shown by group and tell the place values of each one.
- Instruct them to write an addition expression using the place values of all the digits.

Then, introduce the expanded form of numbers.

[Experiential Learning]

EXPLAIN

Refer Math Genius 4, page 14 for explanation. Draw a place value table on the board and write a number in it. Hence describe the term face value and place value considering each digit of the number written. For example, In 3,41,975, we can find the face value and place value of each digit as shown on the next page.

Large Numbers



| L | TTh | Th | H | T | O | Face value | × | Value of the place | = | Place value |
|---|-----|----|---|---|---|------------|---|--------------------|---|-------------|
| 3 | 4 | 1 | 9 | 7 | 5 | 5 | × | 1 | = | 5 |
| | | | | | | 7 | × | 10 | = | 70 |
| | | | | | | 9 | × | 100 | = | 900 |
| | | | | | | 1 | × | 1000 | = | 1000 |
| | | | | | | 4 | × | 10000 | = | 40000 |
| | | | | | | 3 | × | 100000 | = | 300000 |

Next explain about the short form and expanded form of the number.

$$\begin{aligned}
 3,41,975 &= 3 \text{ lakhs} + 4 \text{ ten thousands} + 1 \text{ thousand} + 9 \text{ hundreds} + 7 \text{ tens} + 5 \text{ ones} \\
 &= 3 \times 100000 + 4 \times 10000 + 1 \times 1000 + 9 \times 100 + 7 \times 10 + 5 \times 1 \\
 &= 300000 + 40000 + 1000 + 900 + 70 + 5
 \end{aligned}$$

} Expanded form

The number 3,41,975 is in its standard (short) form. For more examples, go through page 15 and tell the students to attempt 'Fast Check' given here. **[Conceptual Understanding]**

ELABORATE

Use paper snake strips to create a reusable math manipulative that reinforces place value concepts and expanded form.

| TTh | Th | H | T | O |
|-----|----|---|---|---|
| 2 | 7 | 9 | 3 | 8 |



Predecessor and Successor

Repeat the card game and ask the students to tell the number that comes just before/after the number formed.

| Predecessor (Number - 1) | Number | | | | | Successor (Number + 1) |
|-----------------------------|--------|----|---|---|---|---------------------------|
| | TTh | Th | H | T | O | |
| 58908 | 5 | 8 | 9 | 0 | 9 | 58910 |

Furthermore, refer page 16 and explain about the 'Predecessor and Successor' of a number.

[Experiential Learning]

EVALUATE

Classwork: Ask to solve Q.1 of Practice Time 1B, Think Tank given on page 16.

Homework: Ask to solve Q. 2, 3, 4 and 5 of Practice Time 1B.

ENHANCE

Ask students to write any five 3 or 4 letter words. Hence, replace the letter with their positional value in the English alphabet and write a number. For example, PEN

Positional value of: P → 16, E → 5, N → 14

So, the number → 16514

Then, write the number name, expanded form, predecessor and successor of the number formed.

[Cross-curricular Learning]



Periods: 7 – 9

Topics: Comparing and Ordering of Numbers; Formation of numbers using given digits without and with repetition of digits

**Suggested extra teaching aids: Number cards, place value chart
Math Genius 4 pages 17–21**

ENGAGE

Divide the class into pairs. Tell each student to write any number using 4–6 digits in their notebook. Instruct the pairs to compare their numbers. The student with greater number will get a point. Repeat the activity for 5 to 6 rounds.

Next, one student will write a number on the paper. His/her partner has to write any three numbers smaller/greater than that number in sequence. Now they will change their turn and do similar steps.

The teacher will walk around in the class and guide if the students are unable to perform the activity.

[Discussion-based Learning]

EXPLORE

Refer the ‘Gamified Learning’ given at the end of the chapter and involve the class in a card game. Instruct them to form the greatest/smallest number using the number cards picked up. Discuss how the digits appear in such number formation.

[Experiential Learning]

EXPLAIN

Refer Math Genius 4, page 17 for explanation about the comparison of numbers having different number of digits/same number of digits. After understanding the concept of comparing numbers, move on to the next page and explain how to arrange the given numbers in ascending/descending order using a place value table.

Forming greatest and smallest Numbers

Going through pages 19–21, explain why digits are arranged in descending/ascending order to form the greatest/smallest number. Emphasise on the place of 0 in case of the formation of the smallest number. Focus on the digit that has to be repeated at higher places when repetition of digits is allowed.

[Conceptual Understanding]

ELABORATE

Draw a place value chart on the board. Divide the class into 4–5 teams and invite one student from each team near the board. Instruct each one to write a number in the table.

| Team | Numbers | | | | | Order of numbers from smallest to greatest |
|------|---------|----|---|---|---|--------------------------------------------|
| | TTh | Th | H | T | O | |
| A | 5 | 8 | 9 | 0 | 9 | iv |
| B | 2 | 7 | 9 | 1 | 4 | iii |
| C | 6 | 0 | 3 | 9 | 4 | v |
| D | 1 | 8 | 7 | 6 | 8 | ii |
| E | | 9 | 9 | 9 | 2 | i |

Now ask the class to arrange the numbers written on the table in the ascending order. For this, first of all we need to identify the number having least number of digits. Here, it is 9992 with 4 digits. So it is the smallest number. Others have 5 digits, so compare the digits at the highest place, *i.e.*, TTh place.

These are 5, 2, 6 and 1; and $1 < 2 < 5 < 6$. So the numbers are $18,768 < 27,914 < 58,909 < 60,394$.



Hence, the numbers in ascending order are: $9,992 < 18,768 < 27,914 < 58,909 < 60,394$.

Further invite other students and demonstrate how they can arrange the numbers in descending order.

| Team | Numbers | | | | | | Order of numbers from greatest to smallest |
|------|---------|-----|----|---|---|---|--------------------------------------------|
| | L | TTh | Th | H | T | O | |
| A | | | 8 | 9 | 0 | 9 | v |
| B | 7 | 2 | 7 | 9 | 1 | 4 | ii |
| C | | 4 | 0 | 3 | 9 | 4 | iv |
| D | | 4 | 8 | 7 | 6 | 8 | iii |
| E | 9 | 0 | 9 | 9 | 9 | 2 | i |

727914 and 909992 have 6 digits. Comparing the left most digits, we have $9,09,992 > 7,27,914$.

40394 and 48768 have 5 digits and their left most digits are same. So, comparing the digits at next higher place, we have $48768 > 40394$. 8909 has only 4 digits so it is the smallest number.

Hence, the numbers in descending order are: $9,09,992 > 7,27,914 > 48,768 > 40,394 > 8,909$.

[Conceptual Learning]

EVALUATE

Classwork: Ask to solve Q.1 of Practice Time 1C; ‘Maths Connect’ on page 19 and ‘Think Tank’ given on page 20.

Homework: Ask to solve Q. 2, 3, 4 of Practice Time 1C, and Q. 1–3 of Practice Time 1D.

ENHANCE

- Ask students to search the internet and list the 5 batsmen who scored more than 10000 ODI runs/Test match runs.

[Cross-curricular Learning]

| | | |
|-----------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Periods: 10–11 | Topic: Rounding off the numbers to the nearest tens, hundreds and thousands | Suggested extra teaching aids: Newspaper/Old magazines Math Genius 4 pages 21–24 |
|-----------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|

ENGAGE

Divide the class into 4–5 groups. Provide Newspaper/Old magazines to each group and tell them to underline headings that have numbers written along with the words near, about, around, approximately, etc. For example,



After finding out some numbers, ask what they think about such numbers. Are they showing the exact number of items?

[Discussion-based Learning]



EXPLORE

Invite 5 students in front of the class. Take five A4 sheets and write a number on each sheet such that two of them are consecutive tens and others are lying between them. Tell the students to pick a sheet and stand in a row showing their numbers to the class. Instruct them to arrange themselves in order and keep the gaps in between according to their numbers.

For example,



Next, instruct the three students who are standing between two tens to move to the nearer tens. Ask the class to say whether they have moved to the right side or not. Repeat the similar steps for two consecutive hundreds by inviting other groups of students.

Ask: Discuss what you observe.

[Experiential Learning]

EXPLAIN

Refer Math Genius 4, pages 21–23 for explanation about the rounding off numbers. First, discuss the use of Rounded/estimated numbers by talking about some real life situations.

Then explain how numbers can be rounded off to the nearest tens, hundreds and thousands by considering the digits at ones, tens and hundreds places respectively.

Reinforce the concept of rounding up and rounding down through examples. Using place value chart and number line is helpful.

ELABORATE

Draw a place value chart on the board. Demonstrate some example to explain the rounding off numbers to the nearest tens, hundreds and thousands.

| To be rounded off to the | Numbers | | | | | Rule | Round up or Round down | Rounded numbers |
|--------------------------|---------|----|---|---|---|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----------------|
| | TTh | Th | H | T | O | | | |
| nearest tens | | | 2 | 7 | 3 | • If the digit at the ones place is 1, 2, 3, or 4, keep the tens place digit as it is and replace the ones place digit with 0. ← Round down | Ones digit is 3, round down | 270 |
| | | 1 | 9 | 5 | 8 | • If the digit at the ones place is 5, 6, 7, 8, or 9, increase the tens place digit by 1 and replace the ones place digit with 0. ← Round up | Ones digit is 8, round up | 1960 |

| | | | | | | | |
|-------------------|---|---|---|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| nearest hundreds | 7 | 9 | 1 | 4 | • If the digit at the tens place is 1, 2, 3, or 4, keep the hundreds place digit as it is and replace the tens and ones place digits with 0. ← Round down | Tens digit is 1, round down | 7900 |
| | 2 | 2 | 6 | 5 | 7 | • If the digit at the tens place is 5, 6, 7, 8, or 9, increase the hundreds place digit by 1 and replace the tens and ones place digits with 0. ← Round up | Tens digit is 5, round up |
| nearest thousands | 5 | 4 | 8 | 4 | • If the digit at the hundreds place is 1, 2, 3, or 4, keep the thousands place digit as it is and replace the hundreds, tens and ones place digits with 0. ← Round down | Hundreds digit is 4, round down | 5000 |
| | 7 | 9 | 6 | 5 | 7 | • If the digit at the hundreds place is 5, 6, 7, 8, or 9, increase the thousands place digit by 1 and replace the hundreds, tens and ones place digits with 0. ← Round up | Hundreds digit is 6, round up |

[Conceptual Understanding]

EVALUATE

Classwork: Ask to solve ‘Fast Check’ given on page 23.

Homework: Ask to solve Q1–3 of Practice Time 1E.

ENHANCE

- Ask students to estimate monthly expenses of their family on different heads by talking to their parents.

| | | |
|----------------|-----------------------|----------------------------------------------------------------------------------------|
| Periods: 12–13 | Topic: Roman Numerals | Suggested extra teaching aids: Newspaper/Old magazines Math Genius 4 pages 24–26 |
|----------------|-----------------------|----------------------------------------------------------------------------------------|

ENGAGE

Tell students, today we will learn how to read and convert the Roman Numerals to Hindu-Arabic numbers and vice versa through the use of a visual Roman Numeral Converter. Share with students that you’re going to give them the secret tricks on how to read the Roman numerals easily.

Ask:

What Symbols are used for Roman Numerals?

Where do you see Roman numerals written in your surroundings?

EXPLORE

Divide the class into small groups and provide them ice-cream sticks or matchsticks, glue and chart paper. Tell them to make first 10 numerals by arranging and pasting the sticks on the chart paper.



[Art Integration]

Now divide class into two teams. One team show any Roman numeral using their fingers and another team has to identify it. For example,



For every correct response, the team will get a point.

[Experiential Learning]

EXPLAIN

Refer Math Genius 4, pages 24–25 for explanation about the Roman Numerals. First, recall the value of seven basic symbols.

| | | | | | | | |
|-----------------------|---|---|----|----|-----|-----|------|
| Roman Numerals | I | V | X | L | C | D | M |
| Hindu-Arabic Numerals | 1 | 5 | 10 | 50 | 100 | 500 | 1000 |

Then explain how to read and write Roman Numerals using these symbols. Remember these 3 steps on how to read the Roman Numerals:

- Memorize the basic Roman numeral symbols and their values.
- Start reading the symbols from left to right, adding the value of the current symbol to the total.
- If the value of the current symbol is less than the next one, subtract the current symbol's value from the next symbol's value and add the result to the total.

Write some examples on the board and explain the rules.

ELABORATE

Focus on the notes given with each rule.

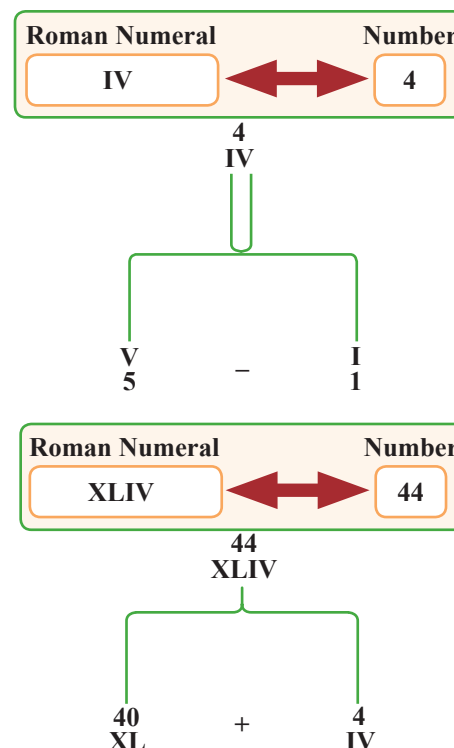
Note:

1. The symbols I, X, C and M can be repeated up to three times only.
2. V, L and D are not repeated.
3. Roman numeral 'I' can only be subtracted from V and X. X can be subtracted from L and C only. C can be subtracted from D and M only.
4. V, L and D are never subtracted.

Demonstrate the formation of some special numbers where students may get confused. For example, Number 4.

- Input the number “4” in the number box of the converter.
- Tell the class to look at the example showing how roman numeral 4 (IV) is broken down by the Roman Numeral converter.
- What the converter is showing is how the number 4 (IV) is expressed in Roman numerals as 5 minus 1. The value of the 'I' preceding the 'V' is what triggers that last rule, where when you read the symbols from left-to-right, if you encounter a symbol with a larger value you need to subtract.
- Input the number “44” in the number box of the converter.

Here's another example of the Roman Numeral converter's visual representation of the number 44.



Large Numbers

- The number 44 (XLIV) is expressed in Roman numerals as 40 plus 4, where 40 is expressed as 50 minus 10 and 4 is expressed as 5 minus 1.

Similarly, discuss about the formation of numbers 9, 49, 90, 99 and so on. **[Conceptual Understanding]**

EVALUATE

Classwork: Ask to solve ‘Think Tank’ given on page 25 and Q3 of Practice Time 1F.

Homework: Ask to solve Q1, 2 and 4 of Practice Time 1F.

ENHANCE

- Ask students to find how numbers are written in different regional languages in India, and try to learn at least 2 of them.

Periods: 14–15

**Topic: (Revision)
Chapter assessment**

**Suggested extra teaching aids:
Math Genius 4 pages 26–30**

ENGAGE

Make students comfortable, so that they can ask any question on any previously taught topics. And start the revision of the exercise.

EXPLAIN

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

ELABORATE

Discuss questions 1 to 5 of the ‘chapter assessment’ and accept students’ answer, if there is any confusion or error then explain and correct it. Discuss ‘Challenge Question’ and motivate students to solve ‘Mental Maths’.

EVALUATE

Classwork: Ask to solve Q1 to 5 of ‘Chapter Assessment’ and ‘Maths Connect’ given on page 29.

Homework: Ask to solve Q6 to 12 of ‘Chapter Assessment’ given on page 29.

ENHANCE

Involve students to perform the activity as discussed in ‘Gamified Learning’ section on page 30.



Addition and Subtraction

Learning Objectives

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

- ◆ add 5 and 6-digit numbers without and with regrouping
- ◆ understand the properties of addition
- ◆ subtract 5 and 6-digit numbers without and with regrouping
- ◆ understand the properties of subtraction
- ◆ estimate sum and difference
- ◆ apply the concept to solve real-life problems

LESSON PLAN

Suggested number of periods: 12

Suggested Teaching Aids: Book: Math Genius 4, notebook, chalk, blackboard or whiteboard, projector, smartboard, some real-life objects like clock, pen, pencils, number/flash cards, spike abacus, number chits, A-4 size sheet, newspaper/magazines.

Keywords: Addition, Addends, Sum, Subtraction, Minuend, Subtrahend, Difference, Estimation.

Pre-requisite knowledge: Students must be familiar with addition and subtraction up to 4-digit numbers, solving simple word problems

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: Recap; Addition of 5 and 6-digit numbers without and with regrouping

Suggested extra teaching aids:
Abacus
Math Genius 4 pages 32–36

ENGAGE

The teacher can start the topic in the classroom through an interactive method. For this, she can ask some questions related to the students' real life. For example,

- Can you guess how many men, women and children are there in your colony/village? Find the total population of the village.
- Do you know how much your parents spent on admission, dresses and book/stationery when you were enrolled in this class? If yes, find the total expenses.



By asking the questions she can introduce the addition of large numbers.

- The teacher will revise the learners’ previous knowledge of addition up to 4-digit numbers with the help of the “Get Ready” and “Let’s Recall” sections given in the book.

EXPLORE

Divide the class into pairs. Instruct each student to write a 4/5/6-digit number in his/her notebook. Next, he/she will ask and note down the number that his/her partner has written. He/she will write it below the first number, and then find their sum. For example,

Student A writes: 25640 and Student B writes: 63125

Then, they will add the two numbers as shown here.

Student A finds: Student B finds:

| | |
|----------------------------|----------------------------|
| 25640 | 63125 |
| + 63125 | + 25640 |
| <hr style="width: 100%;"/> | <hr style="width: 100%;"/> |
| 88765 | 88765 |

Hence, they will compare their sum and rectify the errors, if any. Repeat the activity for 3–4 rounds.

Monitor students’ participation and engagement during the activities.

[Collaborative Learning]

EXPLAIN

Write the terms associated with “addition” on the board and briefly define each term.

Explain that addition is the process of combining two or more numbers to find the total. Tell them that addition of 5- and 6-digit numbers can be done same as addition of 4-digit numbers.

$$81,000 + 47,000 = 1,28,000$$



Refer Math Genius 4, pages 32–35 and explain addition without regrouping as well as with regrouping with examples solving on the board.

[Conceptual Understanding]

ELABORATE

Take an abacus and demonstrate how to add 5- and 6-digit numbers. Suppose, we have to find $521456 + 125412$.

| | | |
|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|------------------------------------------------------------------------|
| For this, take a 6-spiked abacus and show the first addend on it using different coloured beads. | Next, put more beads in spikes at different places for the second addend. | Now count all the beads in each spike and write the number as its sum. |
| | | |

Furthermore, demonstrate addition with regrouping. For this, we put a bead to the next higher place if a spike has 10 or more beads. For example, if there are 14 beads in ones spike, we keep only 4 beads at this place and put a bead at the tens place.

[Conceptual Understanding]

EVALUATE

Classwork: Ask to solve ‘Think Tank’ given on page 35, and Q.1 of Practice Time 2A.

Homework: Ask to solve Q. 2 of Practice Time 2A.

ENHANCE

Ask students to find a palindromic number using continued addition. For example,

Consider a number, say 7325

Reverse the digits and add the new number to the original one.

$$7325 \text{ (original number)} + 5237 \text{ (Reverse of original number)} = 12562$$

Repeat it until you get a palindrome.

$$12562 + 26521 = 39083$$

$$39083 + 38093 = 77176$$

$$77176 + 67177 = 144353$$

$$144353 + 353441 = 497794 \text{ (Palindrome)}$$

Periods: 3–4

Topics: Properties of addition; Addition word problems

Suggested extra teaching aids:
Math Genius 4 pages 36–39

ENGAGE

Recall the properties of addition learnt in previous classes by asking some questions.

- Which number is to be added to the greatest 4-digit number to get the smallest 5-digit number?
- There are 1234 girls and 2568 boys in School A and 2568 girls and 1234 boys in School B. Which school has more students?
- When a number is added to 258963, the result is 258963. Which number is added?

Tell the students to discuss about the answers with their bench partners.

[Discussion-based Learning]

EXPLORE

Divide the class into groups of 3 students each. Instruct each student to write a 4/5-digit number in his/her notebook. Next, he/she will ask and note down the numbers that his/her partners have written. He/she will write them below the first number, and then find their sum. For example,

Student A writes: 52640, Student B writes: 25406, and Student C writes: 63125

Then, they can add the three numbers as shown here.

Student A finds:

| | | | | | |
|---|----------|----------|----------|----------|----------|
| | 5 | 2 | 6 | 4 | 0 |
| | 2 | 5 | 4 | 0 | 6 |
| + | 6 | 3 | 1 | 2 | 5 |
| | 1 | 4 | 1 | 1 | 7 |

Student B finds:

| | | | | | |
|---|----------|----------|----------|----------|----------|
| | 2 | 5 | 4 | 0 | 6 |
| | 6 | 3 | 1 | 2 | 5 |
| + | 5 | 2 | 6 | 4 | 0 |
| | 1 | 4 | 1 | 1 | 7 |

Student C finds:

| | | | | | |
|---|----------|----------|----------|----------|----------|
| | 6 | 3 | 1 | 2 | 5 |
| | 5 | 2 | 6 | 4 | 0 |
| + | 2 | 5 | 4 | 0 | 6 |
| | 1 | 4 | 1 | 1 | 7 |

Hence, they will compare their sum and rectify the errors, if any. Repeat the activity for 2–3 rounds.

Monitor students’ participation and engagement during the activities.

[Collaborative Learning]



EXPLAIN

Refer textbook pages 36–37 for explanation. Write any simple addition problem on the board and tell the students to find the sum using different strategies. Ask whether they get the same result by following different ways.

Solve few questions of Practice Time 2B on the board and explain the concept. Next, tell the students to attempt Think Tank given on page 37. **[Experiential Learning]**

ELABORATE

Consider any real life situations based on addition. Encourage students to read and understand what information is given in the problem and what is being asked to find out.

For example,

The cost of a bicycle is ₹7945, the cost of a tricycle is ₹1680 more than that of a bicycle. What is the cost of the tricycle?

Given: The cost of a bicycle = ₹7945

To find: The cost of the tricycle

Think: What to do?

Also, we have: The cost of a tricycle is ₹1680 **more than** that of a bicycle.

Here, **more than** means **addition**. Therefore,

$$\begin{aligned}\text{The cost of a tricycle} &= \text{The cost of a bicycle} + ₹1680 \\ &= ₹7945 + ₹1680 = ₹9625\end{aligned}$$

Thus, the cost of a tricycle is ₹9625.

Next, refer example given on page 38. **[Conceptual Understanding]**

EVALUATE

Classwork: Ask to solve Q.1–2 of Practice Time 2B, Q.2, 5 of Practice Time 2C.

Homework: Ask to solve Q. 3–5 of Practice Time 2B. Q.1, 3, 4, 6 of Practice Time 2C.

ENHANCE

- Ask students to list 2–3 gadgets/furniture/other items that they see at home. They have to enquire about their costs from their parents/elders and calculate the total cost of those articles.
- Visit web portal for worksheets/assignments and download from the link “orangewebsupport.co.in”.

[Holistic Learning]

Periods: 5–6

Topic: Subtraction of 5- and 6-digit numbers without and with regrouping

Suggested extra teaching aids: Math Genius 4 pages 39–43

ENGAGE

Recall the concept of addition-subtraction facts with an example. Write an addition fact on the board and ask the students to write the two corresponding subtraction facts.

For example,

$$2100 + 35000 = 37100$$

← Addition fact

$$37100 - 2100 = 35000 \text{ and } 37100 - 35000 = 2100$$

← Subtraction facts



Then, tell them to identify the minuend, subtrahend and difference in the subtraction facts written.

Also ask the students to write one more example of addition-subtraction facts themselves and identify the terms. Hence, introduce subtraction of large numbers. **[Experiential Learning]**

EXPLORE

Write some hobbies that class 4 students would like to do in free time on the board. Also, write their first four letters as codes. For example,

| | | | | | |
|----------------|---------|---------|---------|---------|----------|
| Hobbies | Reading | Drawing | Dancing | Playing | Chatting |
| Code | READ | DRAW | DANC | PLAY | CHAT |

Tell the students to write the code of his/her hobby and transform it into a numeral by putting the order value of each letter in English alphabet. Suppose a student like Drawing, then he/she will write DRAW and transform it as 418123. Next, he/she will have to rearrange the digits to form the greatest/smallest number and find how much less/more his/her hobby code than that number.

Here, the greatest number = 843211, so difference = $843211 - 418123 = 425088$

And the smallest number = 112348, so difference = $418123 - 112348 = 305775$

Further, instruct them to group together who have same hobbies and compare their findings. Discuss if they do not find the same result. **[Discussion-based Learning]**

EXPLAIN

Refer textbook pages 39–41, and explain the subtraction of 5- and 6-digit numbers without and with regrouping on the board. Focus on such example when the minuend has zeros. After understanding the concept of subtraction, move on to the next page and explain how to check it using addition.

[Conceptual Understanding]

ELABORATE

Write 2–3 questions as given below on the board.

- What must be added to 67,284 to get 80,000?
- What must be subtracted from 85,214 to get 45,663?

And discuss which operation would be performed to find the answer. For this, express the problem as an equation and ask them to think about.

1. $\underline{\quad} ? \underline{\quad} + 67,284 = 80,000$

By writing the corresponding subtraction fact, we have $\underline{\quad} ? \underline{\quad} = 80,000 - 67,284$

2. $85,214 - \underline{\quad} ? \underline{\quad} = 45,663$

By using the fact Minuend – Subtrahend = Difference, we have

$$\text{Minuend} = \text{Subtrahend} + \text{Difference}$$

$$\text{Or, Minuend} - \text{Difference} = \text{Subtrahend}$$

So, $\underline{\quad} ? \underline{\quad} = 85,214 - 45,663$

Solve few questions on the board and encourage students to practise more questions themselves.

[Conceptual learning]

EVALUATE

Classwork: Ask to solve Q.1 and 6 of Practice Time 2D.

Homework: Ask to solve Q.2, 3, 4, 5 of Practice Time 2D.

ENHANCE

- Ask students to search internet and list the top 5 batsmen. Find the difference between their ODI runs and Test match runs.

[Cross-curricular Learning]

Periods: 7–8

Topics: Properties of subtraction;
Subtraction word problems

Suggested extra teaching aids: pictures
related to real life
Math Genius 4 pages 44–45

ENGAGE

Recall the properties of subtraction learnt in previous classes by asking some questions.

- Which number is to be subtracted from the smallest 6-digit number to get the greatest 5-digit number?
- When a number is subtracted from 28963, the result is 28963. Which number is subtracted?
- What happens when a number is subtracted from itself?

Tell the students to discuss about the answers with their bench partners.

[Discussion-based Learning]

EXPLORE

Divide the class into pairs. One student will write a 4/5-digit number and another student will try to express it as a sum of 4 to 5 different numbers. For example, if student A writes 20156, then student B can express it as $20000 + 100 + 50 + 6$ or $10000 + 10000 + 100 + 50 + 6$ or any other way.

Further, the second student will write a number and the first one has to express it as a difference of two numbers. For example, if student B writes 65410, then student A can express it as $65411 - 1$; $65500 - 90$; $66000 - 590$; $70000 - 4590$; and so on.

The teacher should walk around and assist the pairs who need help.

[Experiential Learning]

EXPLAIN

Refer textbook page 44, and explain the properties of subtraction. Next, discuss the strategies of subtraction as explained on the same page and encourage students to use it wherever they can apply.

Further, talk about some real life problems based on subtraction and demonstrate how to solve it. Reinforce the keywords (more/less than, left, remain, increase/decrease, etc.) used in the problems so that the learners can understand which operation they should perform.

ELABORATE

Consider any real life situations based on addition. Encourage students to read and understand what the information is given in the problem and what is being asked to find out.

For example,

The award money for the best feature film was given ₹2,50,000 and that for the best children's film was given ₹1,50,000. How much more money was given to the feature film than the children's film?

Given: The award money for the best feature film = ₹2,50,000

The award money for the best children's film = ₹1,50,000



To find: The difference between two amounts

Think: What to do?

Subtraction

$$\begin{aligned}\text{Difference} &= \text{The award money for the best feature film} - \text{The award money for the best children's film} \\ &= ₹2,50,000 - ₹1,50,000 \\ &= ₹1,00,000\end{aligned}$$

Thus, the feature film got ₹1,00,000 more than the children's film.

Next, refer example given on page 45.

[Conceptual Understanding]

EVALUATE

Classwork: Ask to solve Q.1 of Practice Time 2E and Q.1, 2 of Practice Time 2F.

Homework: Ask to solve Q.2 of Practice Time 2E, and Q.3–6 of Practice Time 2F.

ENHANCE

Show any picture and ask students to write any word problem based on it.



Then they will exchange the sheet/notebook with his/her bench partner and solve the problem. Hence, they will return the sheet/notebook and check the solution. Discuss the answers if any error. [Holistic Learning]

Period: 9

Topic: Addition and subtraction together

Suggested extra teaching aids:
Math Genius 4 pages 45–46

ENGAGE

Tell students to think of two numbers that represent the number males and females who live in their village or locality. Now, assume the number of people who can vote in the next Panchayat Election.

Hence, ask them to compute the number of people who are not voters. Discuss which operations will they perform for solving such problems.

EXPLORE

Divide the class into small groups and tell them to write at least 3 situations where they need to do both addition and subtraction together. Now divide the class into two teams. One team reads the problem written and another team has to identify whether the problem involves the operations of + and – or not. For each correct response the team will score 1 point. At the end the team scoring more points will be declared the winner.

[Critical Thinking]

EXPLAIN

Refer textbook pages 45–46, and explain how to solve the problem involving + and – together. For this, let them know the steps to be followed.

- Add the numbers having +ve sign.
- Add the numbers having –ve sign.
- Subtract the sum obtained in the 2nd step from the sum obtained in 1st step.

Write some examples on the board and demonstrate for better understanding.

ELABORATE

Consider a problem, such as:

A factory produced 7339 bulbs on Monday and 8751 bulbs on Tuesday. Out of these, 9945 bulbs were supplied to the distributors. How many bulbs are left now?

Solve it on the board following the steps involved.

- Express the problem as number sentence. $7339 + 8751 - 9945$
- Add the numbers having +ve sign. $7339 + 8751 = 16090$
- Subtract 9945 from the sum obtained in the previous step. $16090 - 9945 = 6145$

Thus, 6145 bulbs are left in the factory.

Alternative way:

Production of bulbs on Monday = 7339

Production of bulbs on Tuesday = + 8751

Total production in two days = 16090

Number of bulbs supplied to the distributors = 9945

Number of bulbs left in factory = $16090 - 9945 = 6145$.

[Conceptual Understanding]

EVALUATE

Classwork: Ask to solve Q1 (d), (e) and 2 of Practice Time 2G and Challenge Question given on page 46.

Homework: Ask to solve Q1 (a)-(c) and 3 of Practice Time 2G.

ENHANCE

- Ask students to talk about monthly income and expenses of their family at home and try to calculate savings.

[Holistic Learning]

Period: 10

Topic: Estimating Sum and Difference

Suggested extra teaching aids:
Math Genius 4 pages 47–48

ENGAGE

Recall the concept of rounding off the numbers. For this, write few questions on the board and tell the students to solve them.

- Choose any number between 130 and 150 and round it to the nearest ten.
- Write any five numbers which when rounded off to the nearest hundred, give 4600.
- Round off 98765 to the nearest tens, hundreds and thousands.
- Write the greatest 5-digit number using three different digits. Round it to the nearest hundreds.

[Critical Thinking]

EXPLORE

Divide the class into groups of 3–4 students and tell them to plan about a picnic. Hence, estimate the expenses on different heads such as conveyance, food, rides, etc. and share it with other groups. Discuss about the budget estimated.



EXPLAIN

Start the class with interaction about any real life situations. For example, a person wants to buy a geyser and a washing machine. Guess what amount he should carry when he goes for shopping.

Let us assume that a geyser will be for ₹7000 and a washing machine for ₹13000. So, he should have about ₹7000 + ₹13000 = ₹20000. This is just an estimation. The exact value may be little more or less.

Refer textbook pages 47–48, and explain how to estimate sum and difference. Write some examples on the board and demonstrate for better understanding. Explain that rounding up or down the numbers help in estimation of sum and difference.

ELABORATE

On the board, write a sum like $7339 + 8751$ and estimate its value to the nearest thousands.

$$7339 \text{ rounded down to the nearest thousand} = 7000 \quad (\text{As hundreds digit } 3 < 5)$$

$$8751 \text{ rounded up to the nearest thousand} = +9000 \quad (\text{As hundreds digit } 7 > 5)$$

$$\text{Estimated sum} = \underline{\underline{16000}}$$

Similarly, take another problem like $45671 - 2584$ and estimate the difference to the nearest hundreds.

$$45671 \text{ rounded up to the nearest hundred} = 45700 \quad (\text{As tens digit } 7 > 5)$$

$$2584 \text{ rounded up to the nearest hundred} = -2600 \quad (\text{As tens digit } 8 > 5)$$

$$\text{Estimated difference} = \underline{\underline{43100}} \quad \text{[Conceptual Understanding]}$$

EVALUATE

Classwork: Ask to solve Q1 (c) – (f) and 2 (c) – (f) of Practice Time 2H.

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

ENHANCE

Divide the class into small groups and let them perform the activity given under ‘Gamified Learning’ section on page 52.

| | | |
|-----------------------|-------------------------------------------------|---------------------------------------------------------------------|
| Periods: 11–12 | Topic: (Revision) Chapter Assessment | Suggested extra teaching aids: Math Genius 4 pages 49–52 |
|-----------------------|-------------------------------------------------|---------------------------------------------------------------------|

ENGAGE

Make students comfortable, so that they can ask any question on any previously taught topics. And start the revision of the exercise.

EXPLAIN

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

ELABORATE

Discuss questions 1 to 4 of the ‘chapter assessment’ and accept students’ answer, if there is any confusion or error then explain and correct it. Motivate students to solve mental maths.

EVALUATE

Classwork: Ask to solve Q1 to 4 of ‘Chapter Assessment’ and ‘Mental Maths’ given on page 51.

Homework: Ask to solve Q5 to 9 of page no.50–51.

ENHANCE

Ask students to do the task as discussed in ‘Maths Fun’ on Page 51.



Multiplication

Learning Objectives

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

- ◆ multiply 4-digit numbers by 1-digit number
- ◆ multiply 3- and 4-digit numbers by 2-digit numbers
- ◆ understand the properties of multiplication
- ◆ multiply the numbers using Lattice multiplication
- ◆ solve real life problems based on multiplication
- ◆ multiply two 3-digit numbers together
- ◆ estimate the product

LESSON PLAN

Suggested number of periods: 10

Suggested Teaching Aids: Book: Math Genius 4, notebook, chalk, blackboard or whiteboard, projector, smartboard, some real-life objects like eraser, pen, pencil, number/Flash Cards, Spike abacus, number chits, A-4 size sheet, newspapers/magazines.

Keywords: Multiplicand, Multiplier, Product, Estimation.

Pre-requisite knowledge: Students must be familiar with multiplication up to 3-digit numbers, solving simple word problems

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: Recap; Multiplication by a 1-digit Number

Suggested extra teaching aids: Math Genius 4 pages 54–56

ENGAGE

The teacher can start the topic in the classroom through an interactive method. For this, she can ask some questions based on real life situations. For example,

- How many members are there in your family?
- Assume your family is planning to go to movie, hometown, or somewhere else. Let a considerable ticket price and find how much you need to pay. Compare the calculated amount with your friend's amount.

By asking the questions she can introduce the multiplication of bigger numbers.

- The teacher will revise the learners' previous knowledge of multiplication up to 3-digit numbers with the help of "Get Ready" and "Let's Recall" sections given in the book.

EXPLORE

Divide the class into pairs. Instruct each pair to choose any 4–5 digits and form two numbers using them. Hence find the product of two numbers. Rearrange the digits and form another pair of numbers and find their product. How many different products can you get? Explore when you obtain the greatest product and when the least one.

Monitor students' participation and engagement during the activities.

[Collaborative Learning]

EXPLAIN

Start the discussion with real life situation and explain how to multiply a 4/5/6-digit number by a 1-digit number using vertical as well as horizontal method.

Refer textbook pages 54–55 for more explanation and examples.

[Conceptual Understanding]

ELABORATE

Take an example from current scenario, demonstrate the process of multiplication on the board using standard algorithm. Suppose a movie based on the national patriotism is released on the occasion of Republic Day. This movie has run in 5 shows on the first day and every show is houseful. How many people could watch the movie if the theatre has the capacity of 1236 seats?

$$\begin{aligned}\text{Capacity of the theatre} &= 1236 \\ \text{Number of shows run} &= 5 \\ \text{So, number of total viewers} &= 1236 \times 5 \\ &= 6180\end{aligned}$$

$$\begin{array}{r} 1236 \\ \times 5 \\ \hline 6180 \end{array}$$

[Conceptual Understanding]

EVALUATE

Classwork: Ask to solve Q1 of Practice Time 3A.

Homework: Ask to solve Q2 of Practice Time 3A.

ENHANCE

Ask students to consider any one-digit number and double it mentally. Double the number obtained. Continue it until they get a number greater than 1000. Ask: In how many times have they crossed the number 1000? They can also try to get thrice the number and go beyond 10000. They can use paper and pen if unable to do it mentally.

Periods: 3–4

Topics: Multiplication by a 2-digit Number; Multiplication by a 3-digit Number

Suggested extra teaching aids: Math Genius 4 pages 56–58

ENGAGE

Divide the class into groups of 3 students each. Provide a sheet having a multiplication problem of 3/4-digit number by a 2-digit number to each group. Tell the first student to multiply the multiplicand by the ones digit of the multiplier. The second student will multiply it by the tens digit of the multiplier and the third student will add up the partial products. Then, they will discuss the answer with their group members.

[Discussion-based Learning]



EXPLORE

Divide the class into two teams. Write a multiplication problem with its incorrect calculation on the board. Ask the students to find the errors. For every error finding, they will score a point for the team. Repeat it with at least 5 problems. The team who scores more points will be winner. **[Critical Thinking]**

EXPLAIN

Refer textbook pages 56–58 and explain how to multiply a 3/4-digit number by a 2/3-digit number using standard algorithm. Discuss why we put zero(s) at ones and tens places in the partial products while multiplying the number by tens/hundreds digits of the multiplier.

Solve few questions of Practice Time 3B and 3C on the board and explain the concept.

[Experiential Learning]

ELABORATE

Consider an example when multiplier has zero and demonstrate how the students can skip the row of partial product for the multiplication by the 0 ones or tens. Refer examples 1 and 2 discussed on page 58.

[Conceptual Understanding]

EVALUATE

Classwork: Ask to solve Q1–3 of Practice Time 3B, Q1, 2 and 5 of Practice Time 3C.

Homework: Ask to solve Q4–7 of Practice Time 3B. Q3, 4, and 6–8 of Practice Time 3C.

ENHANCE

Ask students to enjoy ‘Maths Fun’ given on page 58.

[Collaborative Learning]

| | | |
|------------------|------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| Period: 5 | Topics: Multiplication by a Number ending with Zero; Properties of Multiplication | Suggested extra teaching aids: Math Genius 4 pages 58–61 |
|------------------|------------------------------------------------------------------------------------------|-----------------------------------------------------------------|

ENGAGE

Tell the students to write their roll numbers in their notebook. Then ask them to multiply it by the tens between which their roll numbers lie. Suppose a student has roll number 14. Then he/she will multiply it by 10 and 20 as $14 \times 10 = 140$ and $14 \times 20 = 280$. Also, ask them to multiply the roll number with corresponding hundreds/thousands. Discuss the result with bench partner. **[Experiential Learning]**

EXPLORE

Divide the class into small groups and ask them to perform the Activity given under ‘Gamified Learning’ section on page 69. Explore the idea to verify the other properties by hands-on activity.

[Collaborative Learning]

EXPLAIN

Refer textbook pages 58–60, and explain the multiplication of a number by a number ending with zeros such as 10, 20, 30, ..., 90; 100, 200, 300, ..., 900; 1000, 2000, 3000, ..., 9000 citing counter examples. After understanding the concept, discuss the properties of multiplication. To verify the order/commutative property of multiplication, tell the students to work in pairs. They have to take two numbers but arrange them in different order. Hence multiply and compare their result. For example, they take the numbers 23 and 54.

Student A
multiplies as

$$\begin{array}{r} 2 3 \\ \times 5 4 \\ \hline 9 2 \\ + 1 1 5 0 \\ \hline 1 2 4 2 \end{array}$$

Student B
multiplies as

$$\begin{array}{r} 5 4 \\ \times 2 3 \\ \hline 1 6 2 \\ + 1 0 8 0 \\ \hline 1 2 4 2 \end{array}$$

Next they will compare their result and conclude.

[Conceptual Understanding]

ELABORATE

Make three columns on the board as given below for multiplying with tens, hundreds and thousands.

| Multiplying by tens | Multiplying by hundreds | Multiplying by thousands |
|---------------------|-------------------------|--------------------------|
| $\times 10$ | $\times 100$ | $\times 1000$ |
| $\times 20$ | $\times 200$ | $\times 2000$ |
| $\times 30$ | $\times 300$ | $\times 3000$ |
| $\times 40$ | $\times 400$ | $\times 4000$ |
| $\times 50$ | $\times 500$ | $\times 5000$ |
| $\times 60$ | $\times 600$ | $\times 6000$ |
| $\times 70$ | $\times 700$ | $\times 7000$ |
| $\times 80$ | $\times 800$ | $\times 8000$ |
| $\times 90$ | $\times 900$ | $\times 9000$ |

Ask the birth date of any student and strengthen the concept of multiplication. Suppose, one says 12. Then complete the table as follows.

| Multiplying by tens | Multiplying by hundreds | Multiplying by thousands |
|--------------------------------------------------------------------------|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| $12 \times 10 = 12 \times 1 \text{ ten}$ $= 12 \text{ tens} = 120$ | $12 \times 100 = 12 \times 1 \text{ hundred}$ $= 12 \text{ hundreds} = 1200$ | $12 \times 1000 = 12 \times 1 \text{ thousand}$ $= 12 \text{ thousands} = 12000$ |
| $12 \times 20 = 12 \times 2 \text{ tens}$ $= 24 \text{ tens} = 240$ | $12 \times 200 = 12 \times 2 \text{ hundreds}$ $= 24 \text{ hundreds} = 2400$ | $12 \times 2000 = 12 \times 2 \text{ thousands}$ $= 24 \text{ thousands} = 24000$ |
| $12 \times 30 = 12 \times 3 \text{ tens}$ $= 36 \text{ tens} = 360$ | $12 \times 300 = 12 \times 3 \text{ hundreds}$ $= 36 \text{ hundreds} = 3600$ | Similarly, $12 \times 3000 = 36000$ |
| $12 \times 40 = 12 \times 4 \text{ tens}$ $= 48 \text{ tens} = 480$ | Similarly, $12 \times 400 = 4800$ | $12 \times 4000 = 48000$ |
| $12 \times 50 = 12 \times 5 \text{ tens}$ $= 60 \text{ tens} = 600$ | $12 \times 500 = 6000$ | $12 \times 5000 = 60000$ |
| $12 \times 60 = 12 \times 6 \text{ tens}$ $= 72 \text{ tens} = 720$ | $12 \times 600 = 7200$ | $12 \times 6000 = 72000$ |
| $12 \times 70 = 12 \times 7 \text{ tens}$ $= 84 \text{ tens} = 840$ | $12 \times 700 = 8400$ | $12 \times 7000 = 84000$ |
| $12 \times 80 = 12 \times 8 \text{ tens}$ $= 96 \text{ tens} = 960$ | $12 \times 800 = 9600$ | $12 \times 8000 = 96000$ |
| $12 \times 90 = 12 \times 9 \text{ tens}$ $= 108 \text{ tens} = 1080$ | $12 \times 900 = 10800$ | $12 \times 9000 = 108000$ |

Hence, motivate the students to prepare a similar table for their own birth date.

[Conceptual learning]

EVALUATE

Classwork: Ask to solve Q1 of Practice Time 3D and 3E; Think Tank given on pages 59, 60.

Homework: Ask to solve Q2 of Practice Time 3D and 3E.

ENHANCE

- The teacher can organise a quiz for the Q1 of Practice Time 3D and 3E by dividing the class into two teams.

Periods: 6–7

Topics: Estimating product; Word Problems

Suggested extra teaching aids:
Math Genius 4 pages 61–62

ENGAGE

Write 4–5 digits on the board. Tell the students to use these digits only once and make any two numbers. Hence find their estimated product as well as actual product. Allow a reliable time and ask about their findings. Note down how many different products have they obtained.

Then discuss the answers.

[Experiential Learning]

EXPLORE

Divide the class into pairs. Tell them to plan a birthday party. Think about the menu and number of invitees. Hence, guess how much amount you would require for it.

Suppose, you want to invite 18 friends or relatives, and decide to give a cupcake for ₹21, a samosa for ₹12, a fry for ₹10 to each one. Then, you need the amount of money = $18 \times (\text{₹}21 + \text{₹}12 + \text{₹}10)$

Actual amount = $\text{₹}18 \times 43 = \text{₹}774$

By rounding of each number to the nearest tens, we get

Estimated amount = $\text{₹}20 \times 40 = \text{₹}800$, which is close to the actual amount.

The teacher should walk around and assist the pairs who need help.

[Holistic Learning]

EXPLAIN

Refer textbook page 61, and explain how to estimate the product by rounding of the numbers to the nearest tens/hundreds. Next, encourage students to use it wherever they can apply.

Further, talk about some real life problems based on multiplication and demonstrate how to solve it. For example, ask the price of maths book they have. Then tell the number of students present in the class and ask to find the total cost of all the maths books.

[Conceptual Understanding]

ELABORATE

Discuss that the numbers should be rounded off to their highest place while estimating product. Write few examples on the board and interact with the students to keep them attentive.

- 27×14 ; here both are two-digit numbers, so they can be rounded off to the nearest tens as 30×10 and estimated product = 300.
- 182×321 ; here both are three-digit numbers, so they can be rounded off to the nearest hundreds as 200×300 and estimated product = 60000.

- 517×86 ; here the first number has 3 digits and the second number has 2 digits, so they can be rounded off to the nearest hundreds and tens respectively as 500×90 and estimated product = 45000.

Furthermore, consider any real life situations based on multiplication. Encourage students to read and understand what the information is given in the problem and what is being asked to find out. Hence, deal few examples in the class and motivate the students to practise themselves. **[Conceptual Understanding]**

Next, refer example given on page 62.

EVALUATE

Classwork: Ask to solve Q1 of Practice Time 3F and Q3–5 of Practice Time 3G.

Homework: Ask to solve Q2 of Practice Time 3F, and Q1–2, 6–9 of Practice Time 3G.

ENHANCE

This game is simple and reinforces multiplication tables. Students can play in pairs.

Shuffle three sets of digit cards and deal them between the two players.

Each player turns over one of their cards at the same time and puts it in the middle.

Race your partner to shout out the answer that you get when you multiply both the numbers together. For example, if you turned over an 8 and your partner turned over a 9, you would have to shout out 72, because $8 \times 9 = 72$.

The player who shouts out the correct answer first gets to keep both cards.

Keep playing until one player runs out of cards.

The player who collects more cards will be the winner!

[Critical Thinking]

Period: 8

Topic: Lattice Multiplication

**Suggested extra teaching aids:
Math Genius 4 pages 63–65**

ENGAGE

Write two numbers on the board and tell students to think any other strategy to multiply these numbers. Let them share their strategies and accept the responses.

EXPLORE

Divide the class into pairs. Instruct them to open their book randomly and look at the page numbers. Both of them will write their page numbers on a sheet. They will exchange one number and multiply it with another number by using any convenient way. For example, Student A opens pages 46–47 and Student B opens pages 124–125. If they exchange 46 with 124, then Student A will find 124×47 and Student B will find 125×46 .

Instruct them to compare their answers and discuss.

[Discussion-based Learning]

EXPLAIN

Refer textbook pages 63–65, and explain how to multiply two numbers using Lattice multiplication method. For this, let them know the steps to be followed.

- Draw the squares in rows and columns as per the number of digits in the two numbers to be multiplied. Then divide each square diagonally into two triangles.
- Write the two numbers on top and right side of the table so formed.

- Multiply each digit of the number written on the top by each digit of the number written on the right side. Write the product in corresponding triangles such that ones digit is in lower triangle and tens digit is in upper triangle.
- Add the numbers diagonally. Carry over to next place, if any.
- Hence, read the answers from left to right.

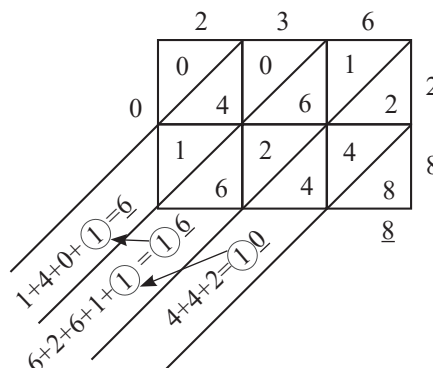
Write some examples on the board and demonstrate for better understanding.

Use the lattice multiplication method to find 236×28 .

Since, we have to multiply a 3-digit number by a 2-digit number, so, we draw a lattice of 3×2 . Proceed as discussed in the previous example. The product is 6608

Thus, $236 \times 28 = 6608$.

[Conceptual Understanding]



ELABORATE

Teacher can consider the ‘Lattice Multiplication method’ as an activity. Students will enjoy it like a hands-on learning. Instruct the class to take an A4 size sheet and follow the procedure as you demonstrate on the board. It can be started with smaller numbers and extend gradually as dealt in the textbook. Assist the students who feel difficulty.

[Experiential Learning]

EVALUATE

Classwork: Ask to solve Q1, 4 and 6 of Practice Time 3H.

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

ENHANCE

- Ask students to recite multiplication tables up to 20.
- Download worksheets from ‘orangewebsupport.co.in’ and provide students for practice.

Periods: 9–10

Topic: (Revision)
Chapter assessment

Suggested extra teaching aids:
Math Genius 4 pages 65–69

ENGAGE

Make students comfortable, so that they can ask any question on any previously taught topics.

EXPLAIN

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

ELABORATE

Discuss questions 1 to 5 of the ‘Chapter Assessment’ and accept students’ answer, if there is any confusion or error then explain and correct it. Motivate students to solve ‘Mental Maths’.

EVALUATE

Classwork: Ask to solve Q. 1 to 5 of ‘Chapter Assessment’ and ‘Challenge Question’ given on page 66.

Homework: Ask to solve Q.6 to 14 of page 68.





Division

Learning Objectives

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

- ◆ divide 4- and 5-digit numbers by a 1-digit number
- ◆ divide 4- and 5-digit numbers by a 2-digit number
- ◆ use the properties of division
- ◆ estimate the quotient
- ◆ solve the problems based on four fundamental operations together

LESSON PLAN

Suggested number of periods: 10

Suggested Teaching Aids: Book: Math Genius 4, notebook, chalk, blackboard or whiteboard, projector, smartboard, some real-life objects like eraser, pen, pencil, number/Flash Cards, number chits, A-4 size sheet, newspapers/magazines.

Keywords: Dividend, Divisor, Quotient, Remainder, Estimation.

Pre-requisite knowledge: Students must be familiar with division up to 3-digit numbers by a 1-digit number, solving simple word problems

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.

Period: 1

Topics: Recap; Division – Associated Terms; Properties of Division

Suggested extra teaching aids: Math Genius 4 pages 71–72

ENGAGE

The teacher can start the topic in the classroom using an interactive method. For this, she can ask some questions based on real life situations. For example,

- How many members are there in your family? If you have to share a packet of 25 cookies among them equally, how many will you give to each member? Will there be any cookie left over?
- A packet of 10 pencils is for ₹60. Can you buy a pencil for ₹5? Why or why not? **[Critical Thinking]**

Then teacher will revise the learners' previous knowledge of division up to 3-digit numbers with the help of "Get Ready" and "Let's Recall" sections given in the book.

EXPLORE

Divide the class into groups of 3 students each. Instruct each group to choose any 3-digit number and pick up a number card (from the well-shuffled four sets of 1–10 number cards). Then, one student of each group will divide the number chosen by the number appeared on the number card.

Suppose, he/she has chosen number 458 and card bearing number 7. Then, divide 458 by 7 and find quotient and remainder. Another student will check and verify the result.

Further, second student will change the order of digits in the number chosen as 845 and divide by 7. His/her answer will be checked or verified by the third student.

Now, the third student will change the order of digits in the number chosen as 584 and divide by 7. And, this will be verified by the first student.

Monitor students' participation and engagement during the activities.

[Collaborative Learning]

EXPLAIN

Start the discussion with real life situation where we write process of division. Recall the terms associated with division. Then, explain the properties of division by citing examples on the board.

Refer textbook pages 71–72 for more explanation and examples.

[Conceptual Understanding]

ELABORATE

As students have learnt the properties of multiplication. Ask the students about it and write some examples on the board. Let them remember that division is the inverse process of multiplication and for every multiplication fact, they write two corresponding division facts.

| Multiplication fact | Division facts | Conclusion as a properties of division. |
|--------------------------------------|------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| $12 \times 1 = 12; 34 \times 1 = 34$ | $12 \div 1 = 12; 34 \div 1 = 34$ | <ul style="list-style-type: none">When a number is divided by 1, the quotient is the number itself. |
| | $12 \div 12 = 1; 34 \div 34 = 1$ | <ul style="list-style-type: none">When a number (other than 0) is divided by itself, the quotient is 1. |
| $14 \times 0 = 0; 23 \times 0 = 0$ | $0 \div 14 = 0; 0 \div 23 = 0$ | <ul style="list-style-type: none">Zero divided by any non-zero number gives the quotient zero. |
| | $14 \div 0 = \text{---}; 23 \div 0 = \text{---};$ $0 \div 0 = \text{---}$ | <ul style="list-style-type: none">The division of any number by zero is not defined. |

[Conceptual Understanding]

EVALUATE

Classwork: Ask to solve Q1, 3 and 6 of Practice Time 4A.

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

ENHANCE

Ask students to consider any three-digit number and find its half mentally. Leave the remainder, if any. Halve the quotient again and ignore the remainder, if any. Continue it until they get the quotient 1. Repeat this activity to get one-third and quarter. They can use paper and pen if unable to do it mentally. Now, look at the remainders and discuss what they observe.

Conclusion: Remainder < Divisor



ENGAGE

Divide the class into pairs. Write few division problems of 4/5-digit number by a 1-digit number on the board and ask the students to check whether they need regrouping in the very first step or not.

For example, $5\overline{)8745}$; $3\overline{)12589}$; $8\overline{)1246}$; $7\overline{)20691}$

Tell the students to perform the division as they have learnt for 3-digit numbers. Then, they will discuss about the answer with their partners. [Critical Thinking]

EXPLORE

Divide the class into two teams. Write a division problem with its incorrect calculation on the board. Ask the students to find the errors. For every error finding, they will score point for the team. Repeat it with at least 5 problem. The team who scores more points will be the winner.

EXPLAIN

Refer textbook pages 72–75 and explain how to divide a 4/5-digit number by a 1-digit number using standard algorithm. Discuss why we put zero(s) in the quotient when we are unable to divide the partial dividend after bringing down the digit at any step(s).

Solve few questions on the board and explain the concept.

[Conceptual Understanding]

ELABORATE

Talk about the importance of short division method and discuss few examples in the class. Refer page 74 and encourage students to attempt questions given under ‘Fast Check’.

Also, consider an example when dividend has zero(s) and demonstrate how the students can skip the step by putting zero in the quotient for the division. Refer example 2 on page 73 and example 4 discussed on page 74.

In addition, focus on the common mistakes committed by students as shown on page 75.

[Experiential Learning]

EVALUATE

Classwork: Ask to solve Q1(a)–(d) and 2(a) of Practice Time 4B.

Homework: Ask to solve Q1(e)–(h) and 2(b)–(c) of Practice Time 4B.

ENHANCE

Divide the class into small groups and ask them to perform the Activity given in ‘Gamified Learning’ on page 85. Explore the idea to verify the result. [Discussion-based Learning, Collaborative Learning]



ENGAGE

Division Race is a fast-paced activity that helps students practise division while also competing against their peers. To play, divide the class into pairs and give each pair a set of division problems. The first player in each pair solves a problem and passes it to their partner, who then solves the next problem. The first pair to correctly solve all their problems wins the race. **[Discussion-based Learning]**

EXPLORE

Division Bingo is another fun activity to help students practise division. To play, create Bingo cards with division problems on them. Students then solve the division problems and mark the answer on their Bingo card. The first player to get five answers in a row (either vertically, horizontally, or diagonally) shouts “Bingo!” and wins the game. **[Critical Thinking]**

EXPLAIN

Dividing by a two-digit number is a lot like single-digit division, but it does take a little longer and some practice. Since most of us haven’t memorized the times tables of bigger numbers, this can take a little guesswork, but there’s a handy trick you can learn to make it faster.

Refer textbook pages 75–76 and explain how to divide a 4/5-digit number by a 2-digit number using standard algorithm.

ELABORATE

Take an example from current scenario, demonstrate the process of division on the board using standard algorithm. For example, there are 1035 soldiers in an army camp. They have to go to the border and a van can accommodate only 45 soldiers. How many vans are required to take all of them?

Capacity of a van = 45

Number of soldiers = 1035

So, number of vans required = $1035 \div 45 = 23$

$$\begin{array}{r} 45 \overline{)1035} \text{ (23)} \\ \underline{- 90} \\ 135 \\ \underline{- 135} \\ 0 \end{array}$$

[Conceptual learning]**EVALUATE**

Classwork: Ask to solve Q.1 of Practice Time 4C.

Homework: Ask to solve Q.2 and 3 of Practice Time 4C.

ENHANCE

‘Division War’ is a fun and interactive way to help students practise division. To play, divide the class into two teams and give each team a set of cards with numbers on them. One player from each team draws a card and races to divide the number on their card by a 2-digit number written on the board. The first player to correctly solve the division problem wins a point for their team. The game continues until all the cards have been played, and the team with the most points at the end wins. **[Collaborative Learning]**

ENGAGE

Tell the students to check how many pages are there in textbooks of main subjects such as Maths, EVS, English, Hindi, etc. and note down in their notebooks. Then ask them to divide it by 10 and 100. Observe the quotient and remainder. Discuss about the result with bench partner.

Next, write few 4/5-digit numbers on the board and ask the students to divide it by 1000. Then talk about their findings.

[Experiential Learning]**EXPLORE**

Divide the class into two teams. Put some slips, on which a division problem is written, upside down on the table. For example, $243 \div 10$; $4238 \div 100$; $4263 \div 100$; $852 \div 10$; $9514 \div 1000$; $75394 \div 100$; $465 \div 10$; $78 \div 10$; $75141 \div 100$, etc. Invite one player from each team and ask them to pick a slip and speak aloud the answer. The player who speaks the correct answer will score a point for his/her team. Repeat the process with another pairs of players. After the participation of all players, the team with more points will be declared as the winner!

[Collaborative Learning]**EXPLAIN**

Refer textbook pages 77–78, and explain the division of a number by 10, 100 and 1000 along with counter examples. After understanding this concept, discuss how to estimate the quotient.

Round to the nearest ten. It's not always easy to see how many times a two-digit number goes into a larger one. One useful trick is to round to the nearest multiple of 10 to make guessing easier. This comes in handy for smaller division problems, or for parts of a long division problem.

For example, let's say we're solving $146 \div 27$, but we don't have a good guess at how many times 27 goes into 146.

$$\begin{array}{r} 30 \overline{) 150} \quad (5 \\ - 150 \\ \hline 0 \end{array}$$

Let's pretend we're solving $150 \div 30$ instead.

For more explanation, refer textbook page 79.

[Conceptual Understanding]**ELABORATE**

Obtaining a result near the accurate or actual outcome is referred to as estimation. It means coming to certain conclusions or rounding a figure to the closest ones, tens, hundreds, and so on.

Estimation may be necessary for a variety of reasons. It is useful when there is insufficient information to determine a precise number. When calculating transaction amounts, accountants make estimations. We round the payout to the closest tens, hundreds, or thousands to calculate the quotient.

There are different ways to calculate the quotient. The teacher can demonstrate these ways.

Estimating Quotient Using a Compatible Number

Compatible numbers are easily divided. Such numbers are closer to the equal value of the actual numbers, making estimation and problem-solving easier. We can round the complex number to the nearest tens, hundreds, thousands, ten thousands, and so on to make them compatible. For example, 48 can be rounded off as 50, and 887 can be rounded off as 890 to make them compatible.

$$\begin{array}{l} \text{Estimated Quotient} \\ 55304 \div 875 \\ \downarrow \\ 56000 \div 800 \\ \downarrow \\ 560 \div 8 \\ = 70 \end{array}$$



Estimating Quotient Using Rounding Off to the highest places

Refer textbook page 79

Hence, motivate the students to practise the given problems.

EVALUATE

Classwork: Ask to solve Q.2, 3, 6, 7 of Practice Time 4D and Q.1 of Practice Time 4E; ‘Think Tank’ given on page 78.

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

ENHANCE

The teacher can tell the students to write their height in cm. Then, express it in m and cm if $100\text{ cm} = 1\text{ m}$.

Period: 8

Topics: Word Problems; The Four Operations Together

Suggested extra teaching aids: Math Genius 4 pages 80–81

ENGAGE

Tell the students to think about any five real life situations where they need to divide something. Next write few problems on the board ask them to identify the operation needed to solve them. For example,

1. In a school, there are 12 classes and 30 teachers.
 - (a) In each class, there are 35 students. How many students are there in total?
 - (b) If the students are distributed equally among the teachers, what is the number of the students each teacher is responsible for?
 - (c) On Friday, 5 classes went on a field trip. How many students were left at the school?
2. 6 printing machines together can print 222 pages in a minute. How many pages can each machine print per hour? **[Critical Thinking]**

EXPLORE

Ask students to write at least three word problems based on any operation, *i.e.*, addition, subtraction, multiplication or division on a sheet of paper. Collect the sheets and shuffle them.

Then distribute among the students and tell them to identify the operation that they will use to solve the problem. Accept their responses and discuss their logic. **[Holistic Learning]**

EXPLAIN

Refer textbook pages 80–81, and explain how to solve the given word problems based on division.

Further, talk about some real life problems based on any operation and tell them to focus on the key words used so that they can identify the operation required to solve it. Solve some questions from outside or from textbook Exercise to clear the concept. Teacher can encourage the students to attempt some questions in the class for better understanding. **[Conceptual Understanding]**



ELABORATE

Explain the problems considered above.

1. (a) There are 35 students in each class. So, to find the total students in 12 classes, we need to multiply.
Clearly, $35 \times 12 = 420$

Thus, there are 420 students in total.

- (b) Now, 420 students are distributed among 30 teachers. So, we need to divide to know the number of students for whom each teacher is responsible. Clearly, $420 \div 30 = 14$

Thus, each teacher is responsible for 14 students.

- (c) 5 out of 12 classes went on a field trip. So, we must subtract to know the remaining number of classes. Clearly, $12 - 5 = 7$ classes left.

Now, the number students in these classes can be found using multiplication, *i.e.*, $7 \times 35 = 245$

Thus, 245 students are left in the school.

2. Given 6 printing machines together print 222 pages. To know the number of pages printed by each machine, we must divide. Clearly, $222 \div 6 = 37$ pages per minute

Now, 37 pages are printed by a machine in 1 minute. So, to know the number of pages printed in one hour, *i.e.*, 60 minutes, we need to multiply. Clearly, $37 \times 60 = 2220$ pages.

Thus, each machine will print 2220 pages per hour.

[Conceptual Understanding]

EVALUATE

Classwork: Ask to solve Q1, 3, 5 and 10 of Practice Time 4F; Think Tank given on page 81.

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

ENHANCE

This is a challenge that triggers the concept of multiplication and division. Students can work in pairs.

In these multiplication facts each digit has been replaced by a letter and the order of the multiplication facts has been jumbled up! Can you work out which digit each letter stands for?

There are two sets of multiplication facts for you to complete. Try to spot patterns in the digits so you can rule out certain numbers and rule in others.

Can you work out which multiplication fact is the 11 multiplication fact or the 1 multiplication fact? Does the number of single-digit answers help you work out which multiplication fact it could be?

Solve the puzzle and record which digit each letter stands for on the challenge sheet.

$$M = \square \quad N = \square \quad P = \square \quad Q = \square \quad R = \square$$

$$S = \square \quad T = \square \quad U = \square \quad Y = \square \quad Z = \square$$

$$Y \times Z = Z$$

$$Z \times Z = S$$

$$T \times Z = YP$$

$$M \times Z = YQ$$

$$N \times Z = PY$$

$$YY \times Z = ZZ$$

$$Q \times Z = PT$$

$$YP \times Z = ZM$$

$$S \times Z = PN$$

$$U \times Z = YU$$

$$P \times Z = M$$

$$YR \times Z = ZR$$

[Critical Thinking]

Periods: 9–10

Topic: (Revision)
Chapter assessment

Suggested extra teaching aids:
Math Genius 4 pages 82–84

ENGAGE

Make students comfortable, so that they can ask any question on any previously taught topics. Clarify their concept before starting the revision.

EXPLAIN

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

ELABORATE

Discuss questions 1 to 5 of the ‘Chapter Assessment’ and accept students’ answer, if there is any confusion or error then explain and correct it. Motivate students to solve ‘Mental Maths’.

EVALUATE

Classwork: Ask to solve Q1 to 5 of ‘Chapter Assessment’ and ‘Challenge Question’ given on page 84.

Homework: Ask to solve Q6 to 10 of ‘Chapter Assessment’ and ‘Life Skills’ on page 84.



Factors and Multiples

Learning Objectives

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

- ◆ find factors and common factors of given numbers
- ◆ find multiples and common multiples of given numbers
- ◆ identify the numbers divisible by 2, 3, 4, 5, 6, 9, and 10 without dividing them
- ◆ identify prime and composite numbers
- ◆ do prime factorisation of a number

LESSON PLAN

Suggested number of periods: 10

Suggested Teaching Aids: Book: Math Genius 4, notebook, chalk, blackboard or whiteboard, projector, smartboard, some real-life objects like eraser, pen, pencil, number/Flash Cards, number chart, multiplication table, A-4 size sheet, square grid paper.

Keywords: Factors, common factors, Multiples, Common multiples, Test of divisibility, Prime Numbers and composite numbers, Factorisation, Prime factorisation, Factor tree method, Division method

Pre-requisite knowledge: Students must be familiar with multiplication and division facts.

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: Recap; Factors; Properties of Factors; Common Factors

Suggested extra teaching aids: Concrete items, multiplication table
Math Genius 4 pages 86–91

ENGAGE

The teacher can start the topic in the classroom through active participation of students. For this, she can call a group of students and ask them to stand in rows and columns. Ask rest of the students to write a multiplication/division fact for the arrangement. Hence, introduce the number of rows and columns as the factors of the number representing total students. Next, invite same number of students and tell them to stand in different way compared to the previous one. Again, the students will tell the factors of that number.

Then teacher will revise the learners' previous knowledge of multiplication/division facts with the help of the "Get Ready" and "Let's Recall" sections given in the book. [Collaborative Learning]

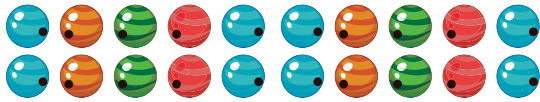
EXPLORE

Divide the class into groups of 3 students each. Provide each group some beads, seeds, squared paper, etc. and ask them to make rectangles to show a particular number, say 20.

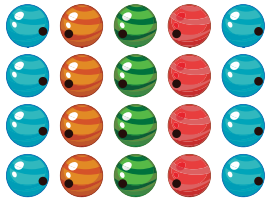




$$1 \times 20 = 20$$



$$2 \times 10 = 20$$



$$4 \times 5 = 20$$

Let them know that when we multiply two numbers to get a product, the numbers being multiplied are called factors.

Thus, 1, 2, 4, 5, 10 and 20 are the factors of 20.

Then, ask how many factors have they explored for that number. Also, discuss why 3, 6, 7, etc. are not factors of 20. For this, let them arrange the items in these numbers of rows and check whether each row has same number of items.

Monitor students' participation and engagement during the activities.

[Critical Thinking]

EXPLAIN

Start the discussion with an interaction based on any real life situations. For example,

Suppose you invite 36 guests on your next birthday. You want to arrange some items for them.

Let a packet contain 12 cookies, or carton holds 6 fruity packs, or tray has 9 cupcakes. How many sets of each item you take so that each person can get 1 item of each kind?

Accept the responses and explain the term factors. Then discuss how to find factors of a number using multiplication and division. Also, explain how to check whether a number is a factor of the given number.

Next, talk about properties of factors.

Refer textbook pages 87–90 for more explanation and examples.

[Conceptual Understanding]

ELABORATE

Bring a multiplication table in the class or display soft copy on projector.

| × | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 2 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 |
| 3 | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 | 27 | 30 | 33 | 36 | 39 | 42 | 45 | 48 | 51 | 54 | 57 | 60 |
| 4 | 4 | 8 | 12 | 16 | 20 | 24 | 28 | 32 | 36 | 40 | 44 | 48 | 52 | 56 | 60 | 64 | 68 | 72 | 76 | 80 |
| 5 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 |
| 6 | 6 | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 54 | 60 | 66 | 72 | 78 | 84 | 90 | 96 | 102 | 108 | 114 | 120 |
| 7 | 7 | 14 | 21 | 28 | 35 | 42 | 49 | 56 | 63 | 70 | 77 | 84 | 91 | 98 | 105 | 112 | 119 | 126 | 133 | 140 |
| 8 | 8 | 16 | 24 | 32 | 40 | 48 | 56 | 64 | 72 | 80 | 88 | 96 | 104 | 112 | 120 | 128 | 136 | 144 | 152 | 160 |
| 9 | 9 | 18 | 27 | 36 | 45 | 54 | 63 | 72 | 81 | 90 | 99 | 108 | 117 | 126 | 135 | 144 | 153 | 162 | 171 | 180 |
| 10 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 |
| 11 | 11 | 22 | 33 | 44 | 55 | 66 | 77 | 88 | 99 | 110 | 111 | 132 | 143 | 154 | 165 | 176 | 187 | 198 | 209 | 220 |
| 12 | 12 | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 | 132 | 144 | 156 | 168 | 180 | 192 | 204 | 216 | 228 | 240 |
| 13 | 13 | 26 | 39 | 52 | 65 | 78 | 91 | 104 | 117 | 130 | 143 | 156 | 169 | 182 | 195 | 208 | 221 | 234 | 247 | 260 |
| 14 | 14 | 28 | 42 | 56 | 70 | 84 | 98 | 112 | 126 | 140 | 154 | 168 | 182 | 196 | 210 | 224 | 238 | 252 | 266 | 280 |
| 15 | 15 | 30 | 45 | 60 | 75 | 90 | 105 | 120 | 135 | 150 | 165 | 180 | 195 | 210 | 225 | 240 | 255 | 270 | 285 | 300 |
| 16 | 16 | 32 | 48 | 64 | 80 | 96 | 112 | 128 | 144 | 160 | 176 | 192 | 208 | 224 | 240 | 256 | 272 | 288 | 304 | 320 |
| 17 | 17 | 34 | 51 | 68 | 85 | 102 | 119 | 136 | 153 | 170 | 187 | 204 | 221 | 238 | 255 | 272 | 289 | 306 | 323 | 340 |
| 18 | 18 | 36 | 54 | 72 | 90 | 108 | 126 | 144 | 162 | 180 | 198 | 216 | 234 | 252 | 270 | 288 | 306 | 324 | 342 | 360 |
| 19 | 19 | 38 | 57 | 76 | 95 | 114 | 133 | 152 | 171 | 190 | 209 | 228 | 247 | 266 | 285 | 304 | 323 | 342 | 361 | 380 |
| 20 | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 | 220 | 240 | 260 | 280 | 300 | 320 | 340 | 360 | 380 | 400 |

With the help of this table, find out the factors of two or more numbers. First talk about factor properties and then demonstrate what factors are common to them. Discuss about common factors referring textbook page 91. Hence, write few numbers on the board and give the opportunity to find out their common factors.

[Conceptual Understanding]

EVALUATE

Classwork: Ask to solve Q.1 and 4 of Practice Time 5A; Think Tank given on page 90.

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

ENHANCE

Students can play this game in pairs.

For this, they will take a 1–100 number chart and two coloured pencils.

Procedure

Player A will choose any number on the grid and note it as his/her score. Player B will cross out all its proper factors, except the number itself, list them on his/her notebook and add them. The sum of the proper factors will be the score of player B.

Now, player B will choose any number and add it to his/her score. Player A will list the proper factors and get the sum as his/her score. Note that the selected number must have at least one proper factor on the board.

Repeat the procedure for up to 10–15 rounds. The player with more points will be winner.

Periods: 3–4

Topics: Multiples; Properties of Multiples; Common Multiples

Suggested extra teaching aids: Number Charts, Square grid paper
Math Genius 4 pages 92–95

ENGAGE

Divide the class into pairs.

On the board make a 3×3 grid and write the numbers 21, 24, 40, 60, 288 and 378 as shown below.

Then, ask the students to write the numbers 1–9 in the squares such that numbers in each row when multiplied together they will give the product written next to that row.

Also, keep in mind that the numbers in each column multiplied together will give the product under that column.

Tell the students to recall the multiplication tables and try to fill in the numbers. After giving sufficient time, discuss about the answers by completing the grid as shown here.

| | | | |
|----|----|-----|-----|
| | | | 24 |
| | | | 40 |
| | | | 378 |
| 60 | 21 | 288 | |

| | | | |
|----|----|-----|-----|
| 2 | 3 | 4 | 24 |
| 5 | 1 | 8 | 40 |
| 6 | 7 | 9 | 378 |
| 60 | 21 | 288 | |

Hence, introduce the term multiple as the product of two or more numbers. For example, 24 is the product of 2, 3 and 4 so 24 is a multiple of each one, *i.e.*, 2, 3 and 4. Similarly, 40 is a multiple of 1, 5 and 8.

[Critical Thinking]

EXPLORE

Students will work in pairs. Each pair will take a 100-number chart and two coloured pencils.

| | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|-----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 |
| 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 |
| 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |

Student A will choose any number less than 10 on the grid and ring all those numbers which come in the multiplication table of that number. Then he/she will list them in his/her notebook.

Similarly, Student B will choose any number less than 10 and ring all those numbers which come in the multiplication table of that number. Also, he/she will list them in his/her notebook.

Instruct them to find the numbers which are present in both the lists. Have them introduce these numbers as the common multiples of the numbers chosen.

Tell them to repeat the procedure and find the common multiples of other numbers. **[Experiential Learning]**

EXPLAIN

Start the discussion with an interaction based on any real life situations. Refer textbook pages 92–94 for explanation and examples. Explain the term multiples with examples. Then discuss how to find multiples of a number by multiplying it with counting numbers. Also, explain how to check whether a number is a multiple of the given number.

Next, talk about properties of multiples and common multiples. Solve few questions on the board and explain the concept. **[Conceptual Understanding]**

ELABORATE

After understanding the concept of multiples well, ask students to write the multiplication table of any number. Then ask few questions like:

- Which is the first multiple of that number?
- Is there any multiple smaller than that number?
- Up to which number can they write the multiples of that number?
- How many multiples can any number have?
- Is 1 a factor or multiple of every number?
- Is every number a factor or multiple of 1?

Accept the responses and discuss about the properties of multiples. Hence, encourage students to attempt questions given under ‘Think Tank’ on page 94. **[Experiential Learning]**

EVALUATE

Classwork: Ask to solve Q.3(a)-(d) and 4 (a) of Practice Time 5B.

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

ENHANCE

Divide the class into small groups and ask them to perform the Activity given in ‘Gamified Learning’ section on page 105. **[Discussion-based Learning, Collaborative Learning]**

Period: 5

Topic: Test of Divisibility

**Suggested extra teaching aids: Concrete items, paper, pencil
Math Genius 4 pages 95–97**

ENGAGE

Divide the class into groups of different sizes, such as 2, 3, 4, 5 or 6 students. Give a certain number of things, say 24 chalks to each group and tell them to share among themselves equally. Let them explain their observation. Discuss about the number of chalks left over in distribution and introduce the term divisible. The group of 2, 3, 4 and 6 students can share the 24 chalks equally but the group of 5 students cannot, so, 24 is divisible by 2, 3, 4 and 6 but not by 5. **[Experiential Learning]**

EXPLORE

Write some 2/3/4-digit numbers on the board and tell the students to select numbers to complete the table and then answer the following questions. They can use the numbers at more than one places.

| | |
|------------------------------------------------------|--|
| 35, 40, 88, 105, 350, 432, 117, 2000, 1256, 60, 2169 | |
| Even numbers | |
| Multiples of 3 | |
| Multiples of 5 | |
| Multiples of 4 | |
| Multiples of 10 | |

[Critical Thinking]

Does any even number have ones digit 1, 3, 5, 7, or 9?

- Is the sum of digits of a multiple of 3 in the multiplication table of 3?
- What are the digits at ones place in the multiples of 5?
- Is every even number a multiple of 4?
- Which is the digit at ones place in the multiples of 10?

After getting their responses, have them introduce rules of divisibility.

[Critical Thinking]

EXPLAIN

Refer textbook pages 95–96 and explain which number is divisible by a given number. Also, explain the divisibility rules for some numbers and have them understand its use. Solve few questions on the board and explain the concept. **[Conceptual Understanding]**



ELABORATE

Interact with students and strengthen their concept through a game.

Divide the class into two teams.

Ask any member from first team to tell any two digits.

Then ask the other team members to make the greatest 3-digit number (divisible by any number say, 2, 3, 4, 5, 6, 9 or 10) using the two given digits and one digit of their own choice.

For each correct response, the team will score a point.

Suppose Team A gives the numbers 8 and 1. Teacher tell to make the greatest 3-digit number divisible by 3. And if Team B answers 981, then they will be rewarded 1 point. For any other answers, they will not score any point.

Now, Team B will give the two digits and Team A will have to form the number as per teacher's instruction.

Similar procedure will be continued till time permits. The team scoring more points will be winner!

[Logical Thinking]

EVALUATE

Classwork: Ask to solve Q.1 of Practice Time 5C.

Homework: Ask to solve Q.2 of Practice Time 5C.

ENHANCE

Ask students to read the 'Maths Fun' section given on page 97 and do as directed. Hence answer the questions.

[Art integration]

Periods: 6–8

Topics: Prime Numbers and composite numbers; Factorisation

Suggested extra teaching aids:
Math Genius 4 pages 97–101

ENGAGE

Tell the students to write their birth dates and roll numbers in their notebooks. Then each student will write all the factors of those numbers. For example, a student writes

Birth Date: 8 March and Roll Number: 12

Then he/she will list the factors as:

Factors of 8 are: 1, 2, 4 and 8

Factors of 12 are: 1, 2, 3, 4, 6 and 12

After listing the factors, teacher will ask how many factors the numbers 1, 2, 3, 4, ..., 31 have and classify the numbers into prime (numbers having only two factors) and composite (numbers having more than two factors) numbers.

Teacher can ask the students to raise their left hands if their roll numbers or birth dates are prime, *i.e.*, 2, 3, 5, 7, 11, 13, etc. and to raise their right hands if their roll numbers or birth dates are composite, *i.e.*, 4, 6, 8, 9, 10, 12, etc.

[Experiential Learning]

Instruct the students to stand up whose roll number or birth dates are 1, *i.e.*, neither prime nor composite.



EXPLORE

Divide the class into small groups. Ask each group to write any three 2-digit numbers on a sheet. Hence try to express the numbers as the product of two or more numbers. Teacher can walk around during the activity to watch the participation of the students. After allowing the reliable time, ask them to check whether their factors are prime or not. Invite the group one by one in front of the class and encourage them to tell about their workings.

Hence, reiterate the factorisation as well as prime factorisation.

[Collaborative Learning]

EXPLAIN

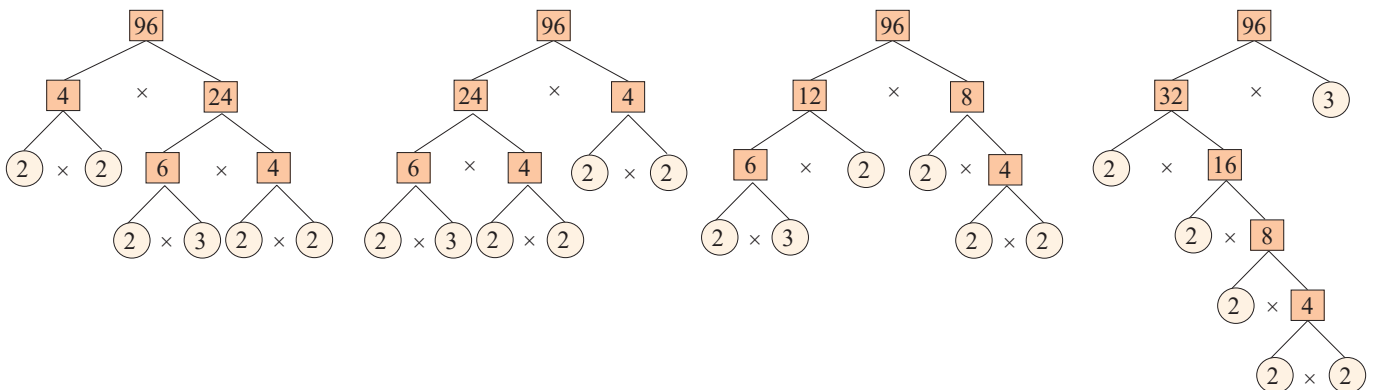
Refer textbook pages 97–99, and explain about prime and composite numbers. Demonstrate how to check whether a given number is prime or composite by dividing the numbers with known prime numbers starting from 2, 3, 5, 7 and so on. Encourage the students to attempt ‘Think Tank’ given on page 99.

Next, write any composite number on the board and explain how to factorise it. Also, have them understand prime factorisation. For more explanation, refer textbook page 99.

[Conceptual Understanding]

ELABORATE

After understanding the concept of prime factorisation, discuss the methods – factor tree method and division method which are often used to get the prime factorisation of a composite number. Reinforce that more than one factor tree may be possible for the same number. For example, factor tree of 96.



Refer textbook page 99 to focus on the fundamental property of prime factorisation. Also, demonstrate the process of division method for the same number and let the students know that they will get the same result if they use any method.

| | | |
|---------------------------|---|----|
| Prime Factorisation of 96 | 2 | 96 |
| | 2 | 48 |
| | 2 | 24 |
| | 2 | 12 |
| | 2 | 6 |
| | 3 | 3 |
| | | 1 |

$96 = 2 \times 2 \times 2 \times 2 \times 2 \times 3$

Hence, motivate the students to practise the given problems.

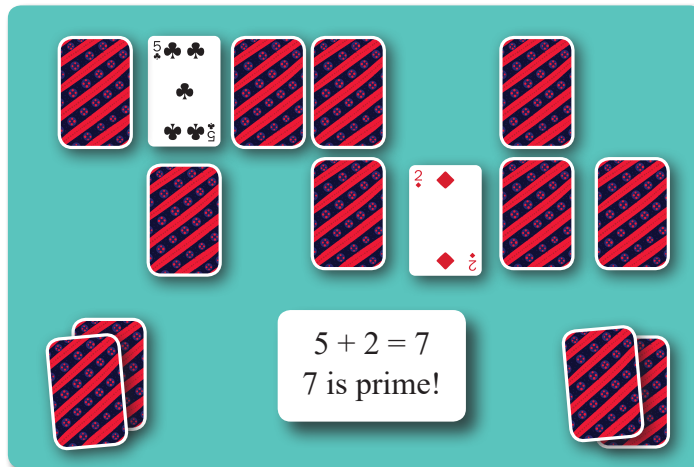
EVALUATE

Classwork: Ask to solve Q.1 and 6 of Practice Time 5D; ‘Think Tank’ given on page 99.

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

ENHANCE

Card Game



Take a pack of playing cards and play a fun mystery game to help students get the hang of prime numbers and composite numbers.

Shuffle a deck of playing cards, and remove the jokers. You may also choose to remove aces, jacks, queens, and kings, or you can assign them number values. For example, tell your students aces are 1, jacks are 11, queens are 12, and kings are 13. To keep it simple, you could also say all face cards are 11. Then lay 10 to 20 cards face-down in rows on a table or desk.

Students will take turns flipping over two playing cards at a time. The student will add the numbers together. If the resulting number is a prime number, he or she gets to keep the cards. If not, he or she will flip the cards back over, and the next student will take a turn.

Play will continue for as many rounds as you choose or until no other prime numbers can be formed from the card combinations. The player with the most cards at the end of the game wins.

Periods: 9–10

Topic: (Revision)
Chapter assessment

Suggested extra teaching aids:
Math Genius 4 pages 102–105

ENGAGE

Make students comfortable, so that they can ask any question on any previously taught topics. Clarify their doubts or queries before starting the revision.

EXPLAIN

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

ELABORATE

Discuss questions 1 to 3 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 105.

EVALUATE

Classwork: Ask to solve Q. 1 to 3 of 'Chapter Assessment' and 'Challenge Question' given on page 102.

Homework: Ask to solve Q.4 to 8 of 'Chapter Assessment' and 'Life Skills' given on page 104.



Fractions

Learning Objectives

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

- ◆ understand the concept of fractions
- ◆ find the fraction of a collection of objects or numbers
- ◆ write the equivalent fractions of a given fraction
- ◆ reduce a fraction to its simplest form
- ◆ identify different types of fractions (unit fractions, like and unlike fractions, proper, improper and mixed fractions)
- ◆ convert improper fractions to mixed fractions and vice versa
- ◆ compare and order the given fractions
- ◆ add and subtract like fractions

LESSON PLAN

Suggested number of periods: 10

Suggested Teaching Aids: Book: Math Genius 4, notebook, chalk, blackboard or whiteboard, projector, smartboard, some real-life objects like eraser, pen, pencil, number/Flash Cards, paper strips, circular/rectangular/square paper cutouts, crayons/colour pencils.

Keywords: Fractions, Numerator, Denominator, Like and Unlike fractions, Equivalent fractions, Simplest form (Lowest terms), Proper, Improper, Unit and Mixed Fractions

Pre-requisite knowledge: Students must be familiar with parts of a whole or a collection as a fraction.

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: Recap; Fractions; Like and Unlike Fractions; Equivalent Fractions; Simplest Form (Lowest Terms) of a Fraction

Suggested extra teaching aids: Math Genius 4 pages 107–113

ENGAGE

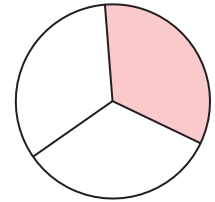
Draw a few shapes, like a rectangle, a square, a circle, etc. on the board and divide them equally into different number of parts. Shade a few parts using chalk and instruct students to write the fractions for the shaded parts with respect to the total number of equal parts. Also, tell them to identify the numerator and the denominator in the fraction they have written. Accept the responses.

Recall the numerator and the denominator of a fraction. For example,

In the given figure, total number of parts = 3

Number of shaded part = 1

Hence, we represent it in fraction as $\frac{1}{3}$, where numerator = 1 and denominator = 3



[Experiential Learning]

Then teacher will revise the learners' previous knowledge of fractions with the help of "Let's Recall" section given in the book.

EXPLORE

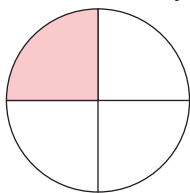
Divide the class into 3–4 students. Distribute paper strips to each group and tell the group members to divide the strip into 6, 7 or 8 equal parts, but each member of a group should have equal divisions. Then ask them to shade few parts as per their choice but same as shaded by other group members. Now they will note down the fraction for the shaded parts and observe the numerators and denominators of the fractions. Their fractions will have same denominator but different numerators. Let them know that such kind of fractions are called like fractions. Further, provide another set of strips and let them divide and shade as per their choice. Hence, write the fractions for the shaded portions. These are unlike fractions as their denominators are different.

Monitor students' participation and engagement during the activities.

[Experiential Learning]

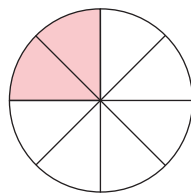
EXPLAIN

After dealing the concept about fractions and understanding the like/unlike fractions, talk about any real life situation connecting with equivalent fractions. For example, parts of a pie/pizza. Consider the circular cut-outs of a pizza and divide it into different parts. Then, highlight a particular section in each one and write the fractions representing them. Ask what they observe. Clearly, they show same amount of the pizza, their values are equal. We also say the fractions are equivalent.



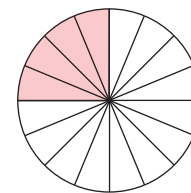
$$\frac{1}{4}$$

=



$$\frac{2}{8}$$

=



$$\frac{4}{16}$$

You can also use maths activity given under 'Gamified Learning' section on page 126.

Next, explain how to find the fractions equivalent to a given fraction using multiplication/division. Also, demonstrate how to check whether the two given fractions are equivalent or not. Refer textbook pages 107–110 for more explanation and examples.

[Conceptual Understanding]

ELABORATE

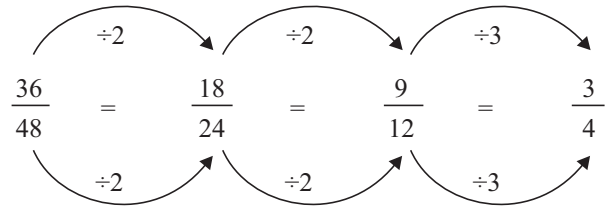
Write a few sets of equivalent fractions on the board. Ask the students to identify what kind of fractions these are. Try if they can write them into their lowest form. After the students' responses, demonstrate how to get the simplest form of a fraction.

Explain that fractions are said to be in the simplest form or lowest term if the numerator and denominator have only 1 as the common factor. Also, reiterate that a fraction is simplified to its lowest term by dividing the numerator and denominator with common factors until only 1 is left as a common factor.

For example, reduce the fraction $\frac{36}{48}$ to its lowest term.

$$\frac{36}{48} = \frac{36 \div 2}{48 \div 2} = \frac{18}{24} = \frac{18 \div 2}{24 \div 2} = \frac{9}{12} = \frac{9 \div 3}{12 \div 3} = \frac{3}{4}$$

Thus, $\frac{3}{4}$ is the lowest term of $\frac{36}{48}$.



Refer textbook pages 111–112 for more explanation and examples.

Hence, motivate students to solve questions.

[Conceptual Understanding]

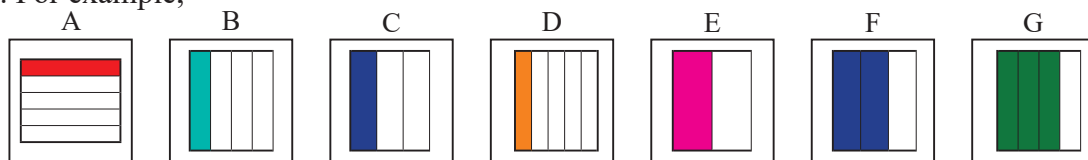
EVALUATE

Classwork: Ask to solve Q5, 7 of Practice Time 6A and Q1 of Practice Time 6B; ‘Fast Check’ given on page 108.

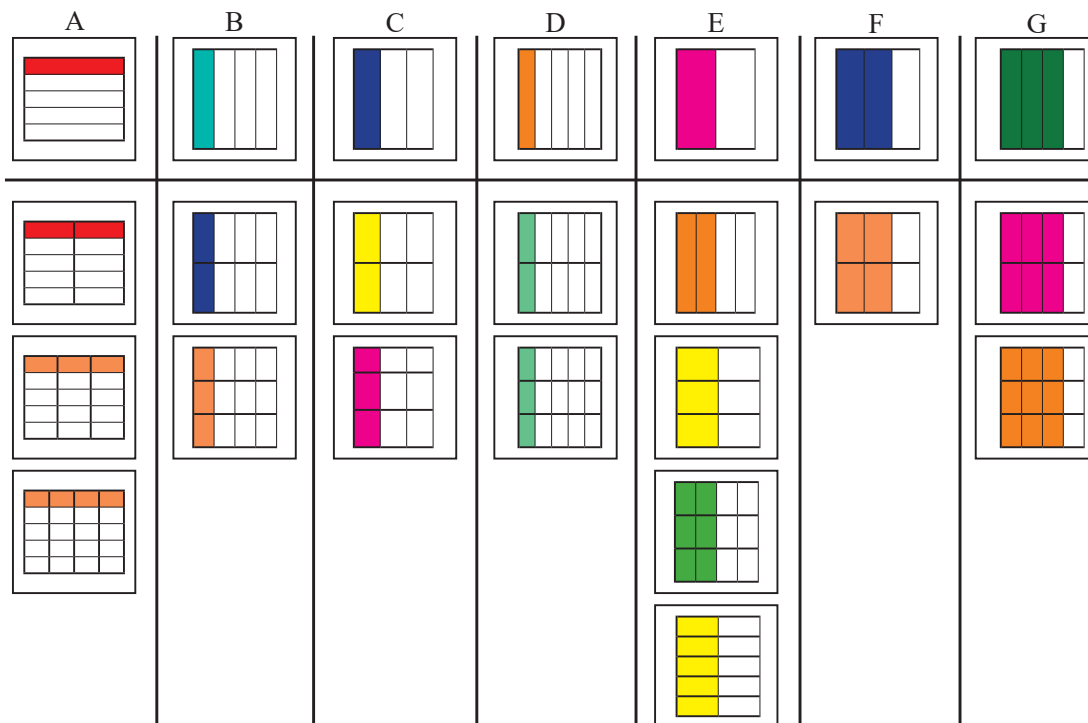
Homework: Ask to solve remaining questions of Practice Time 6A and 6B.

ENHANCE

Divide the class into 4–5 teams. Ask each team to choose their team leader. Call the team leaders and provide each of them a paper piece. Ask them to make any shape, divide it as per their choice and shade some parts. Note that they should show different fractions. Then instruct them to fix their chits on the display board on the top row. For example,



Now provide a paper piece to each of the remaining students and instruct them to make similar design showing the fractions equivalent to their team leader. They all will fix their chits under their leader’s chit.



The team showing maximum number of equivalent fractions will be the winner.

ENGAGE

Start the class by story telling. You can consider a story similar to the story given below.

Story

Ram and Gopal, two friends, contributed some amount and bought a box of apples. After bringing the box at home, they decided to share them equally.

Ask: Can you say what part of it will each of them get?

They opened the box and counted the apples. They found 45 apples in all, so each one took $\frac{45}{2}$ apples.

Ask: Can you think how many apples this fraction represents?

They used the trick of repeated subtraction, picked up pair of apples 22 times and both of them took one-one every time. At last, they had 1 apple which was cut into halves and 1 piece was taken by each friend. Thus, each one got $22\frac{1}{2}$ apples, *i.e.*, 22 whole and $\frac{1}{2}$ (one-half) apples.

Having an interaction, introduce: $\frac{1}{2}$ as a proper fraction, where numerator $1 <$ denominator 2

$\frac{45}{2}$ as an improper fraction, where numerator $45 >$ denominator 2; and

$22\frac{1}{2}$ (22 whole and a half apples) as a mixed fraction, which is a combination of a whole and a proper fraction.

[Holistic Learning]

EXPLORE

Divide the class into pairs. Distribute some flash cards having different types of fractional numbers written on them. Tell the students to identify their numerators and denominators, and compare them. On the basis of their observations, tell what are the types of these fractions. Can you categorise them as proper, improper, or mixed fractions? Accept the responses.

Also, introduce them unit fraction as the fraction with numerator 1.

[Experiential Learning]

EXPLAIN

Start the discussion with an interaction based on any real life situations. Ask students to look around and find the things for which they can use a fraction. Explain the types of fractions such as proper, improper, unit and mixed fractions along with their examples. Then discuss how to convert an improper fraction into a mixed fraction and vice versa. Refer textbook pages 113–115 for more explanation and examples.

[Conceptual Understanding]

ELABORATE

Fractions which have greater denominator are called proper fractions, while the fractions which have greater numerator are called improper fractions.

Fractions having a whole number and a fraction along with it are called mixed fractions or mixed numbers.

Demonstrate the different types of fractions using visuals and citing the examples from daily life. Refer conversation given in “Get Ready” section. Next deal the concept of converting an improper fraction to a mixed fraction as

$$\text{Improper fraction} = \text{Quotient} \frac{\text{Remainder}}{\text{Divisor}} = \text{Mixed fraction}$$

Example:

$$\text{Improper fraction} \left\{ \begin{array}{l} 15 - \text{Numerator} \\ 7 - \text{Denominator} \end{array} \right.$$

Step 1: Divide the numerator with the denominator.

$$15 \div 7 = 2 \text{ R } 1$$

Step 2: Assemble the mixed fraction.

$$\frac{15}{7} = 2 \frac{1}{7}$$

$$\boxed{\frac{15}{7} = 2 \frac{1}{7}} \leftarrow \text{Mixed fraction}$$

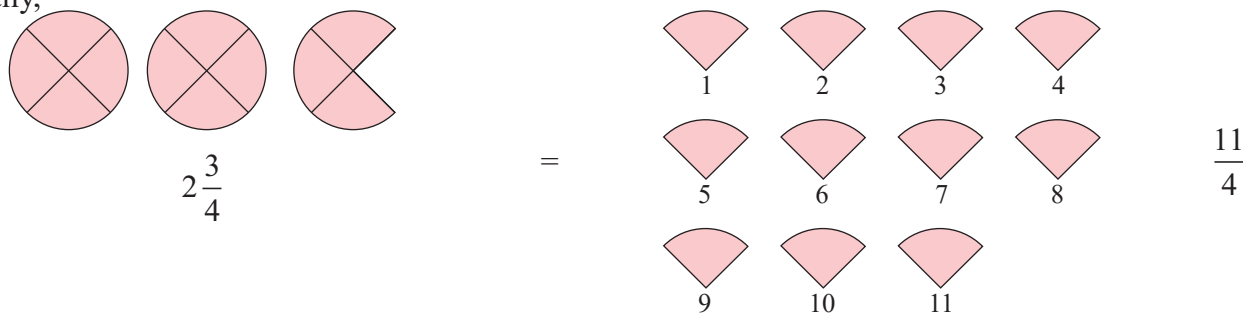
Further, show converting a mixed fraction to an improper fraction as

$$\text{Mixed fraction} = \frac{\text{Denominator} \times \text{Whole} + \text{Numerator}}{\text{Denominator}} = \text{Improper fraction}$$

Example:

$$\text{Mixed fraction} \rightarrow 2 \frac{3}{4} = \frac{(4 \times 2) + 3}{4} = \frac{8 + 3}{4} = \frac{11}{4} \leftarrow \text{Improper fraction}$$

Pictorially,



Hence, encourage students to attempt questions given under Fast Check on page 114.

[Experiential Learning]

EVALUATE

Classwork: Ask to solve Q3 and 6 of Practice Time 6C.

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

ENHANCE

Divide the class into groups of 4–5 students. Put some flash cards of having mixed fractions written on them in one bowl and their corresponding improper fractions in another bowl. Invite two teams at a time and tell one team to pick up the flash cards having mixed fractions and another team to take out the cards having improper fractions. Then they have to show their cards to another team and make the pairs showing same fractions. Read aloud the fractions and stand in a row to display in the class. Repeat the activity with other groups.

ENGAGE

Divide the class into groups of 5–6 students.

- Understanding the concept of like fractions

Invite any group in front of the class and tell them to express what fraction of the group is boys and girls. Write the fractions on the board and ask the class to identify which one is greater/smaller. Suppose there are 2 boys and 4 girls in Group A. Then,

$$\text{Fraction of boys} = \frac{2}{6} \text{ and Fraction of girls} = \frac{4}{6}; \text{ Clearly, } \frac{2}{6} < \frac{4}{6} \text{ or } \frac{4}{6} > \frac{2}{6}$$

Further call another group and instruct them to do the same work. Now compare the fractions of boys or girls in the two groups. Suppose there are 3 boys and 3 girls in Group B. Then,

$$\text{Fraction of boys} = \frac{3}{6} \text{ and Fraction of girls} = \frac{3}{6};$$

Now, comparing the fraction of boys in two groups, we see $\frac{2}{6} < \frac{3}{6}$

And comparing the fraction of girls in two groups, we see $\frac{4}{6} > \frac{3}{6}$

With the extension, they can observe $\frac{4}{6} > \frac{3}{6} > \frac{2}{6}$

- Understanding the concept of unlike fractions

Instruct one of the girls from the Group A to go back on her seat. Then, ask the group to express the number of remaining girls as a fraction. Certainly, it will be $\frac{3}{5}$.

Now compare it with the fraction of girls present in the Group B, *i.e.*, $\frac{3}{6}$.

Clearly, $\frac{3}{5} > \frac{3}{6}$. If the students couldn't understand (how?), you can ask them to let both groups share 30 candies among themselves. Then which group member will get more candies? **[Holistic Learning]**

EXPLORE

Divide the class into pairs. Ask them to count the number of books and notebooks kept in their bags. Express them as fractions and compare the two fractions. Further, they can count the number of pencils, crayons, erasers, etc. and compare their fractions. If they get unlike fractions, instruct them to compare only the fractions with the same numerator. For this, they have to keep same number of a particular item in the groups but the total numbers will be different. **[Discussion-based and Collaborative Learning]**

EXPLAIN

Refer textbook pages 116–117 and explain how to compare like and unlike fractions with same numerator.

When the fractions are like then compare their numerators. The like fraction with greater numerator will be greater, and the fraction with smaller numerator will be smaller, and if both the numerators of like fractions are same then those fractions will be equal fractions.

When the fractions are unlike but their numerators are same then compare their denominators. The fraction with greater denominator will be smaller, and the fraction with smaller denominator will be greater. Also, explain the ordering of fractions having same numerator/denominator. Demonstrate some examples on the board. **[Conceptual Understanding]**

ELABORATE

Interact with students and strengthen their concept connecting with other subjects. Write any word related to moral value or a quotation on the board. For example,

OBEY YOUR PARENTS! BE OBEDIENT!

Ask any two students randomly to stand up and tell the fractions for the consonants and vowels present in the word/quote. Hence, compare the two fractions.

Also, ask one student to write a word/quote and another to write the fractions and compare.

Suppose student A writes RESPECT. Then, student B will observe 5 consonants, viz. R, S, P, C, T and its fraction = $\frac{5}{7}$; and 2 vowels, viz. E, E and its fraction = $\frac{2}{7}$. Clearly, $\frac{5}{7} > \frac{2}{7}$.

[Cross-curricular Learning]

EVALUATE

Classwork: Ask to solve Q1 and 3 of Practice Time 6D. ‘Think Tank’ given on page 117.

Homework: Ask to solve Q2 and 4 of Practice Time 6D.

ENHANCE

Ask students to complete the project work given on page 121.

Periods: 7–8

Topic: Addition and Subtraction of Like Fractions, Word problems

Suggested extra teaching aids: Math Genius 4 pages 118–121

ENGAGE

Start the discussion by connecting the students with real life. For this, ask some questions such as:

About how much water in litres can your bottle hold? What part of the water is left in the bottle? Think what part of water you have consumed.

Suman got a chocolate bar in the morning. It had 10 slabs. She gave 4 slabs to her friend Ria and 3 slabs to her brother Parth. Can you say what part of chocolate did she give in all? What part of chocolate is left with her?

Accept their responses, and introduce the concept of addition and subtraction. **[Experiential Learning]**

EXPLORE

Divide the class into pairs. Give two paper strips to each of the pairs. Instruct them to mark equal number of divisions on the strips, shade the divisions as much as they can and then keep both the strips together. Ask them to count the total number of shaded parts in both strips together out to total divisions. Now, write the fractions for the shaded parts and find the sum of the fractions. Also, find the difference of the fractions. Accept the responses. **[Collaborative Learning]**

EXPLAIN

Write some real-life problems based on addition and subtraction of fractions on the board. For example, Alisa drank $\frac{4}{8}$ of a cup of milk at breakfast and $\frac{6}{8}$ of a cup of milk at lunch. How much more milk did she drink at lunch than at breakfast?

Instruct the students to read aloud the problem and think how to solve it.

Let them understand the problem. Then workout the solution and explain the concept. At last check the solution.

Refer textbook pages 118–120 for more explanation and examples.

[Conceptual Understanding]



ELABORATE

Write some like fractions in pairs on the board but pairs should not be together. For example, have a look at the fractions given below.

| | | | | |
|----------------|-----------------|----------------|----------------|----------------|
| $\frac{5}{10}$ | $\frac{4}{11}$ | $\frac{1}{8}$ | $1\frac{2}{3}$ | $\frac{8}{12}$ |
| | $\frac{5}{8}$ | $\frac{9}{15}$ | $\frac{7}{11}$ | $\frac{1}{4}$ |
| $\frac{3}{4}$ | $\frac{11}{12}$ | $\frac{5}{15}$ | $\frac{2}{10}$ | $\frac{1}{3}$ |

Ask students to find the pairs of like fractions and add and subtract in their notebooks. After allowing sufficient time, show the working on the board and let them make corrections if they have not done correctly.

To add fractions with the same denominators:

$$\frac{5}{10} + \frac{2}{10} = \frac{\boxed{}}{\boxed{}}$$

← Add the numerators
← Use the same denominator

To subtract fractions with the same denominators:

$$\frac{11}{12} - \frac{8}{12} = \frac{\boxed{}}{\boxed{}}$$

← Subtract the numerators
← Use the same denominator

Hence, motivate the students to practise the problems given in the book.

EVALUATE

Classwork: Ask to solve Q1(a), (d), (h); 2 (b), (f), (g) and 3(a), (c) of Practice Time 6E.

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

ENHANCE

Ask students to explore the use of fractions in daily life and list at least five situations. Apply the operation they use to solve them. Refer to the interactive exercise given on the portal orangewebsupport.co.in.

| | | |
|----------------------|-------------------------------------------------------|-----------------------------------------------------------------------------|
| Periods: 9–10 | Topic: (Revision) Chapter assessment | Suggested extra teaching aids: Math Genius 4 pages 122–126 |
|----------------------|-------------------------------------------------------|-----------------------------------------------------------------------------|

ENGAGE

Make students comfortable, so that they can ask any question on any previously taught topics. Clarify the doubts and rectify the errors.

EXPLAIN

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

ELABORATE

Discuss questions 1 to 3 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’ and ‘Maths Fun’ given on page 122.

EVALUATE

Classwork: Ask to solve Q1 to 3 and 10 of ‘Chapter Assessment’ and ‘Challenge Question’ given on page 125.

Homework: Ask to solve Q4 to 9 of ‘Chapter Assessment’.



Geometry

Learning Objectives

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

- ◆ recall basic geometrical shapes
- ◆ measure and draw the line segment
- ◆ understand angle, open and closed figures
- ◆ identify and draw a circle and its parts
- ◆ know more about solids, make cube and cuboids using nets
- ◆ learn to build different shapes with cubes
- ◆ learn different types of lines
- ◆ describe polygons and their types

LESSON PLAN

Suggested number of periods: 17

Suggested Teaching Aids: Book: Math Genius 4, notebook, chalk, blackboard or whiteboard, projector, smartboard, some real-life objects like eraser, pen, pencil, flash cards, geometry box, paper cut-outs of different shapes, solid objects, tangram pieces.

Keywords: Geometry, Point, Line, Ray, Line Segment, Horizontal line, Vertical line, Slanting line, Angle, Open and Closed Figures, Polygons, Triangle, Quadrilateral, Square, Rectangle, Pentagon, Tangram, Circles, Solid Shapes, Cube and Cuboid, Nets of Solids.

Pre-requisite knowledge: Students must be familiar with plane and solid shapes.

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: Recap; Basics of Geometry; Measuring and Drawing a Line Segment

Suggested extra teaching aids: Math Genius 4 pages 129–133

ENGAGE

Divide the class into pairs. Distribute the paper sheets to the pairs. Ask each student to make a dot using her/his sharpened pencil and identify what it represents. Let them understand it as a point. Next, ask how they will distinguish the two points marked by pair of students. Accept the responses and have them understand that we name them using capital letters, such as A, B, C, ... to distinguish between them.


Then teacher will revise the learners' previous knowledge of Shapes and their properties with the help of "Get Ready" and "Let's Recall" sections given in the book.

[Experiential Learning]




EXPLORE


Divide the class into pairs. Instruct them to take a paper sheet and fold it to get a crease on it. Then, open the sheet and draw a line over the crease so formed. Mark arrowheads at both ends to show its extension in both directions. Tell them to identify the figure and name it by putting any two points on it. For example,

 It is a line AB, denoted as \overleftrightarrow{AB} .

Make another crease and put arrowhead at only one end to show its extension in one direction only. Identify this figure also and name it by putting any two points on it as shown here.

 It is a ray AB, denoted as \overrightarrow{AB} .

Similarly, make third crease and label its both ends without showing its extension in any direction. Identify this figure as shown here.

 It is a line segment AB, denoted as \overline{AB} .


Monitor students' participation and engagement during the activities.


[Experiential Learning]

EXPLAIN

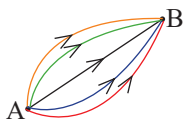
Explain the straight line from a point extended in one direction is called a ray and the straight line extended on both sides is called a line. Demonstrate the diagrams of a ray and a line along with their names on the board.

Have them understand well that a ray AB is different from a ray BA as they have different initial points.

 \overrightarrow{AB} means the ray starts from A and goes towards B.

 \overrightarrow{BA} means the ray starts from B and goes towards A.

Next, mark Point A and Point B on the board. Sketch different paths from A to B. Discuss that the shortest way from A to B is known as a line segment. Hence, ask the students to identify it in the figure.



Further discuss how to measure and draw a line segment using a ruler. Refer textbook pages 130–132 for more explanation and examples.

[Conceptual Understanding]

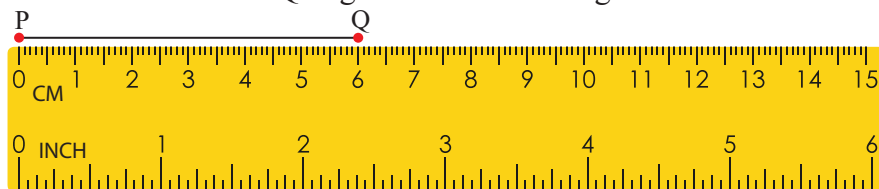
ELABORATE

A line segment is a part of a line that goes from one point to another. Invite the students in small groups and demonstrate the procedure of measuring and drawing a line segment.

- Measuring the length of a line segment using a ruler

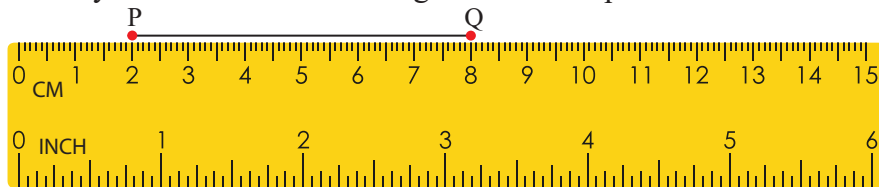


When measuring the length of a line segment, say PQ, place the end point P of the segment on the zero mark on the ruler, then see where its other end Q aligns with the markings on the ruler.



Here, Q aligns with marking 6, the length of PQ = 6 cm.

Also, demonstrate how they can measure the line segment if some part of ruler from zero end is damaged.



We can see here point P aligns with 2 cm and Q aligns with 8 cm. In this case, the length of PQ = 8 – 2 = 6 cm, which is same as above.

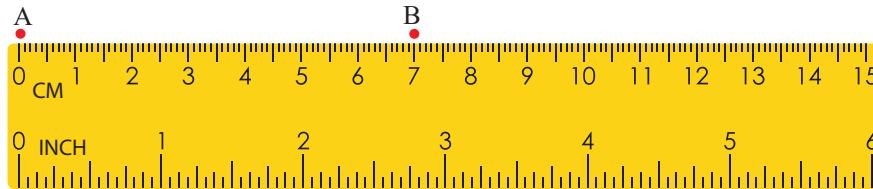
- Drawing a line segment of length 7 cm using a ruler

We are going to draw a line segment of length 7 cm using a ruler with the following steps:

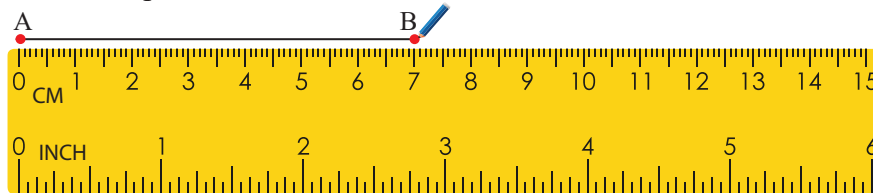
Step 1: Mark a point A on a plain paper.

Step 2: Place the '0' point of the ruler at point A.

Step 3: Now, mark a point B on the paper at 7 cm of the ruler.



Step 4: Now draw a line from point A to B.



Here, AB is the required line segment.



Hence, motivate students to solve questions given in 'Think Tank' on page 131.

[Conceptual Understanding]

EVALUATE

Classwork: Ask to solve Q.1, 2 and 5 of Practice Time 7A.

Homework: Ask to solve remaining questions of Practice Time 7A.

ENHANCE

Ask students to write the similarity and difference among a line, a ray and a line segment.

Periods: 4–5

Topics: Types of Lines– Horizontal line, Vertical line, Slanting line; Angle

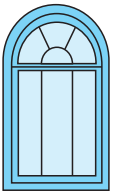
Suggested extra teaching aids:
Math Genius 4 pages 133–135

ENGAGE

Show a picture on projector or fix a large print out/poster on bulletin board and ask the students to identify different types of lines in the picture. For example, have a look at the window grill.

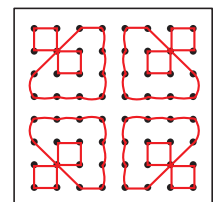
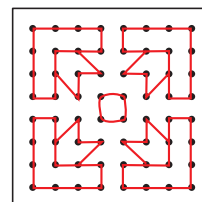
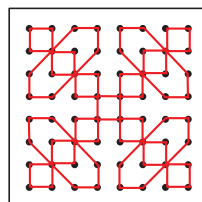
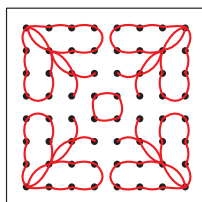
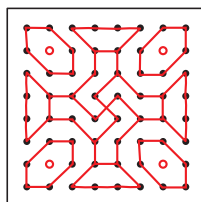
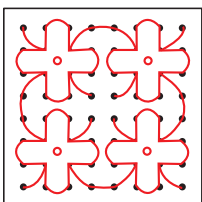
Accept their responses.

[Experiential Learning]



EXPLORE

Divide the class into pairs. Distribute some dotted paper among the groups and instruct them to make any design as per their choices. After allowing a reliable time, take few sheets and introduce the types of lines, such as curved and straight lines – horizontal, vertical and slanting. Also, visualise them pair of parallel, intersecting and perpendicular lines and the angle if present in the picture.



Further, tell the students to mark these types of lines and angles in their designs.

[Discussion-based Learning and Art Integration]

EXPLAIN

Start the discussion with an interaction based on any real life situations. Refer textbook pages 133–135, explain about different types of lines, such as curved and straight lines – horizontal, vertical and slanting; pair of parallel, intersecting and perpendicular lines.

After understanding the concept, deal the angle and its parts along with their examples. For checking their understanding, tell them to solve the questions embedded under ‘Think Tank’ sections on these pages.

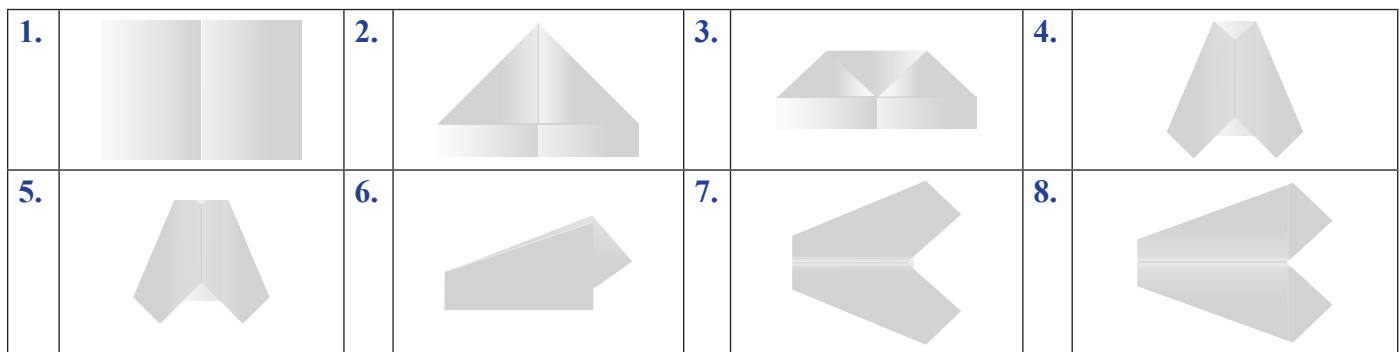
[Conceptual Understanding]

ELABORATE

For having fun, involve the students in a paper folding activity to make a paper boat, aeroplane, dog face, etc. During the procedure, interact and let them recognise the types of lines and the angle formed.

The Bumble

Built correctly, this bee-like beauty stays in the air for a long time.



1. Fold the paper in half horizontally.
2. Unfold the paper and fold each of the top corners into the centre line.
3. Fold the peak down to meet the edge of the previous fold.
4. Fold the upper sides into the centre line.
5. Fold the top edge $\frac{1}{2}$ " (inch) away from you.
6. Fold the plane in half towards you.
7. Fold the wings down $\frac{1}{2}$ " (inch) from the bottom of the plane.
8. Add double stick tape to the inside of the body. The finished plane should look like this.

[Art Integration]

EVALUATE

Classwork: Ask to solve Q.1 of Practice Time 7B.

Homework: Ask to solve Q2 of Practice Time 7B.

ENHANCE

Ask students to look around and find the things in which they observe different types of lines, such as curved and straight lines – horizontal, vertical and slanting; pair of parallel, intersecting and perpendicular lines and the angle.

Periods: 6–8

Topics: Open and Closed Figures;
Polygons

Suggested extra teaching aids: Geo-
board and rubber boards
Math Genius 4 pages 135–137

ENGAGE

Divide the class into groups of 3–4 students. Tell each group to take a plane sheet and draw some figures without lifting the pencil from the paper. Then, ask them to

- Cross the figure which have different starting and end points.
- Tick the figure which have same starting and end points.
- Identify the figures which are made up of straight lines only.
- Shade the figures made with line segments only and without crossing themselves.

[Critical Thinking]

Look at their sheets and then introduce the term open and closed figures, simple closed figures and polygons with the help of some drawings on the board.

EXPLORE

Divide the class into small groups. Provide each group a geoboard and some rubber bands. Ask them to perform the Maths activity given in ‘Gamified Learning’ section on page 147.

[Experiential and Collaborative Learning]

EXPLAIN

Refer textbook pages 135–136 and explain what open and closed figures, simple closed figures and polygons are. Draw any polygon on the board and visualise its vertices, sides, angles, and diagonals. Motivate the students to draw any polygon in their notebook, label and write their vertices, sides, angles, and diagonals.

[Conceptual Understanding]

ELABORATE

Take a square sheet and cut it into 7 pieces (tangram) as marked in Activity given on page 136. You may take readymade plastic/cardboard pieces if it is available in Maths Lab. Show the pieces to the class and name the shape. Then, demonstrate how to arrange these pieces to make other polygons/objects. [Art Integration]

EVALUATE

Classwork: Ask to solve Q.1, 2 and 5 of Practice Time 7C.

Homework: Ask to solve Q.3 and 4 of Practice Time 7C.

ENHANCE

Ask students to make different types of polygons using matchsticks/toothpicks/broomsticks and recognise its sides and angles.

Periods: 9–10

Topic: Circles

Suggested extra teaching aids:
Math Genius 4 pages 137–139

ENGAGE

Recall the concept of 2D shapes by asking some questions, such as:

- I am a plane shape. I have 4 sides and my opposite sides are equal in length. Who am I?
- I am a plane shape. I have 3 sides and 3 corners. Who am I?



- I am a plane shape. I have no sides and corners. Who am I?
- I am a plane shape. I have 4 sides which are equal in length. Who am I?

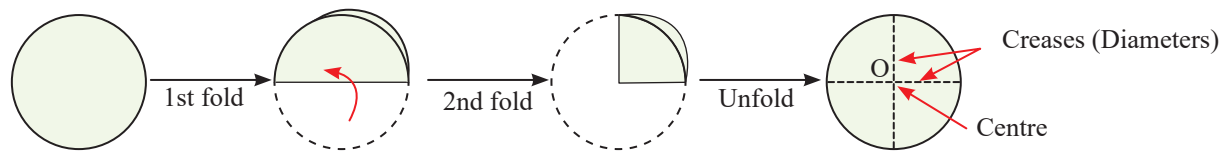
Accept their responses, and acknowledge the correct answers.

[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.



[Experiential Learning]

EXPLAIN

With the help of circular cut-out or making a sketch on the board, explain the circle and its parts. Demonstrate how to draw a circle of given radius/diameters using a ruler and a compass. Also, discuss the relation between a diameter and a radius of a circle.

Refer textbook pages 137–138 for more explanation and examples.

[Conceptual Understanding]

ELABORATE

Discuss about the compass, a tool that can be used to draw a circle of exact radius.

What is Meant by a Compass?

The word compass literally means “encircle” which in other words is also called “to go around”. A compass is an instrument that is usually a metal or plastic V-shaped drawing tool. It majorly consists of two movable arms, which are hinged together. It is used to draw circles or the parts of circles called arcs. A compass is also called a pair of compass.

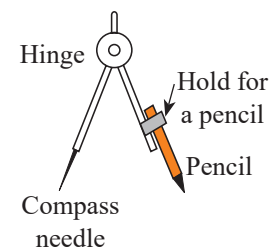
Parts of a Compass

As a compass has two arms, one arm holds a pencil while the other arm has a pointed end. A compass is designed for the users to grip it between their thumb and pointer finger. Keeping the same in mind, the handle length of the drawing compass is about 1.25 cm.

Arms: The space between the compass arms is adjustable. If we keep the arms of the compass apart, it is easier to construct a circle or arc with a greater radius. There is a clamp on one end to hold a pencil whereas, on the other end, there is a sharp point that keeps the tool steady on the drawing surface while the pencil moves.

Hinge: It is the handle of a compass. We hold it between our forefinger and thumb. Normally only one hand is used to draw a circle. The compass is turned by twisting between the forefinger and thumb.

Compass Needle: It is the point that is placed at the centre of the circle. The pencil tip is turned around this point. The gap between the compass needle and the pencil tip is the radius of the circle. It is set using a ruler. The gap can be changed by changing the angle between the arms of the compass.



Hold for a Pencil: A sharp pencil is clamped tightly at this place. The tip of the pencil is aligned to the compass needle by bringing the tip of the pencil and compass needle closer. Once, their tips have matched, the compass can be used to construct circles.

Drawing with a Compass

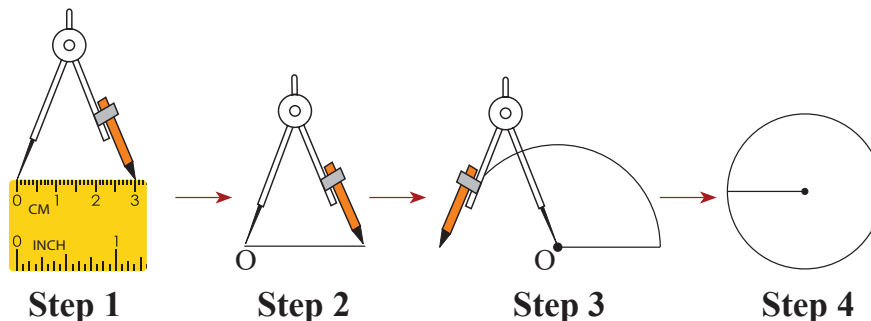
It is possible to construct circles, arcs, bisect lines, angles and determine mid-points using a compass. The steps to draw a circle using a compass are:

Step 1: Open the arms as per the measurement of radius for the circle to be drawn.

Step 2: We place the sharp point of the compass at the centre of the intended circle.

Step 3: Press down the needle, turn the knob at the top of the compass to draw a circle, and drag the pencil around the centre to draw the curve.

Step 4: A circle is drawn. You can mark its centre point, radius, or diameter if required.



Tips to Remember

- Just make sure that the hinge at the top of the compass is tightened so that it does not slip.
 - Do not apply any pressure to the pencil but tighten the hold for the pencil else the width of the circle will get changed.
 - It should be taken care that the pencil lead is aligned with the compass's needle.
 - A drawing compass can draw circles on any specific material (wood, metal, plastic, etc.). All you have to do is, put the needle on the surface/ page, on which the circle has to be drawn, fix it and rotate the other arm around while keeping the same angle on the hinge.
- Hence, motivate the students to practise themselves.

EVALUATE

Classwork: Ask to solve Q1, 4 and 6 of Practice Time 7D.

Homework: Ask to solve remaining questions of Practice Time 7D.

ENHANCE

Ask students to explore the paths followed by planets to go around the Sun in solar system.

[Cross-curricular Learning]

| | | |
|-----------------------|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| Periods: 11–14 | Topics: Solid Shapes; Nets of Solid; Build with Cubes | Suggested extra teaching aids: Some plastic or cardboard cubes; Math Genius 4 pages 139–143 |
|-----------------------|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|

ENGAGE

Students are familiar with the solid shapes, such as cube, cuboid, sphere, cylinder, cone. Write few questions on the board and ask them to write their answers in their notebooks.

- Give two examples of each solid shape.
- Why solids are called 3-dimensional (3D) shapes?
- Draw the sketch of five basic 3D shape and write their names.

Accept their responses, and reinforce the concept by writing the answers on the board.

[Experiential Learning]

EXPLORE

Divide the class into small groups. Provide them the wooden/plastic blocks of basic solid shapes. Instruct them to explore about the nature of surfaces each solid has. Then count the number of faces, edges and vertices and list them in a table. Hence, compare the table made by other group and discuss if any differences occur.

[Collaborative Learning]

EXPLAIN

Bring some objects in the class and explain about their shapes. Introduce the term, face, edge and vertex visualising it in any object. Talk about the number of faces, edges and vertices of different types of 3d shapes. Hence, deal the term 'net of a solid' by opening a shoebox or any carton. Further, show them how to make solid shape by folding the net of a cube and cuboid. Motivate them to build different shapes using blocks of cubes.

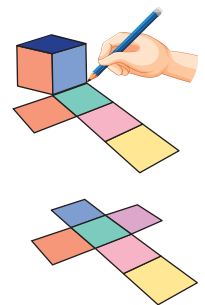
Refer textbook pages 139–142 for more explanation and examples.

[Conceptual Understanding]

ELABORATE

Take a cubical block or a big die, trace its all faces on a paper. Note that you turn the face and keep it adjacent to the previous outline so that you can get its net.

Hence, demonstrate to fold the net obtained and make a cube. Next, remove its one face and show formation of an open cube and then a hollow cube by removing one more face.



EVALUATE

Classwork: Ask to solve Q2 and 4 of Practice Time 7E.

Homework: Ask to solve remaining questions of Practice Time 7E.

ENHANCE

Ask students to explore the nets of cubes and cuboids. They can bring the nets of small boxes used to pack sweets, cake, etc. and practise to make the box by properly folding and fixing its flaps.

Periods: 15–17

Topic: (Revision)
Chapter assessment

Suggested extra teaching aids:
Math Genius 4 pages 143–147

ENGAGE

Make students comfortable, so that they can ask any question on any previously taught topics. Clarify the doubts or queries, if any.

EXPLAIN

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

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 'Challenge Question' and 'Mental Maths' of the chapter.

EVALUATE

Classwork: Ask to solve Q1 to 4 of 'Chapter Assessment' and 'Challenge Question' given on page 146.

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

ENHANCE

Ask students to enjoy the activity as suggested in the section of Maths Fun on page 143.



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
- ◆ recognise the mirror image or reflection
- ◆ learn and create patterns of figures and numbers
- ◆ make patterns based on multiples of 9 and know about casting out 9
- ◆ understand the concept of tessellation
- ◆ understand the coding and decoding of messages

LESSON PLAN

Suggested number of periods: 14

Suggested Teaching Aids: Book: Math Genius 4, notebook, chalk, blackboard or whiteboard, projector, smartboard, some real-life objects like eraser, pen, pencil, some symmetrical/asymmetrical cut-outs, square/isometric dotted paper, mirror, colours, scissors, A-4 size sheet, glue.

Keywords: Symmetry, asymmetry, line of symmetry, Mirror Image (reflection), Patterns, Tessellations (tiling), Coding and Decoding

Pre-requisite knowledge: Students must be familiar with symmetry and patterns of shapes and colours.

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

Topics: Recap; Symmetry; Mirror Image (reflection)

Suggested extra teaching aids:
Pictures of monuments
Math Genius 4 pages 148–152

ENGAGE

Start the class with discussion about the beauty of some monuments. Talk about their constructions. Ask some questions, such as:

Why do they look so beautiful?

Would you like to be an architect in future?

What will an architect do? and so on.



Accept the responses and introduce the term ‘Symmetry’.

Then teacher will revise the learners’ previous knowledge of Symmetry and Patterns with the help of “Get Ready” and “Let’s Recall” sections given in the book. **[Cross-curricular Learning]**

EXPLORE

Divide the class into pairs. Distribute each group a sheet of paper. Tell one member to draw the figure of any item that he/she can divide into halves for sharing it equally with his/her partner. Instruct another member to draw an item which cannot be shared equally between the two members.

Monitor students’ participation and engagement during the activities. After some time, invite the groups one by one to show their drawings and explain about it to the whole class.

[Holistic Learning]

EXPLAIN

Start the class with an interaction regarding presence of symmetry in nature and surrounding. Explain the symmetry and asymmetry with respect to the sketches made by students in above activity. Then, draw some symmetrical shapes/figures/letters on the board and show their line or axis of symmetry. Also discuss if any figure has more than one line of symmetry.

You can conduct an activity as explained on the page 150. Hence, motivate students to solve questions given in Think Tank.

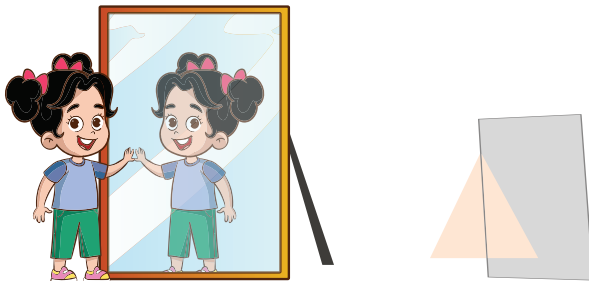
Further discuss about mirror image or reflection. Refer textbook page 151 for more explanation and examples.

[Conceptual Understanding]

ELABORATE

Bring a plane mirror in the class, demonstrate the image formation of an object. Invite the students randomly in front of the mirror, tell them to do any movement of their hands and observe the difference in their images. Hence explain about the lateral inversion in image formation.

Further, draw only half of a figure and show how it looks complete by placing the mirror alongside.



[Experiential Learning]

EVALUATE

Classwork: Ask to solve Q1, 2 of Practice Time 8A and Q2 of Practice Time 8B.

Homework: Ask to solve remaining questions of Practice Time 8A and 8B.

ENHANCE

Discuss the context given in Knowledge Desk on page 151. Ask students to write a message using reflection of letters, then show it to your friend and ask him/her to read the message. If unable, ask him/her to use a mirror for reading it correctly.

ENGAGE

Show some pictures having different kind of patterns on the projector or fix a large poster on bulletin board and ask the students to differentiate between two or identify each one. For example, feathers of a peacock, body of a zebra/dear/snake, fabrics, etc. Also, ask them to look around and find if any pattern is there on window grill, gate, boundary, fencing of garden, etc. Accept their responses. **[Experiential Learning]**

EXPLORE

Divide the class into groups of 3–4 students. Tell them to open a drawing sheet and 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.

You can also tell them to write few steps of any number/letter pattern on a sheet and exchange with other member. Hence, other one will try to write next steps to continue it.

10, 20, 30, 40,,,,

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

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

2, 2, 3, 3, 4, 4, 5, 5,,,,

1, 3, 6, 8, 11, 13, 16,,,,

[Creative Thinking and Art Integration]**EXPLAIN**

Start the discussion with an interaction based on any real life situations. Refer textbook pages 152–155, explain different types of patterns, such as shape pattern, colour pattern, number pattern, patterns based on mathematical operations, *i.e.*, addition, subtraction, multiplication and division.

$$9 + 1 = 10$$

$$111 \div 3 = 37$$

$$5 \times 5 = 25$$

$$90 + 10 = 100$$

$$222 \div 6 = 37$$

$$55 \times 5 = 275$$

$$900 + 100 = 1000$$

$$333 \div 9 = 37$$

$$555 \times 5 = 2775$$

$$9000 + 1000 = \underline{\hspace{2cm}}$$

$$444 \div 12 = 37$$

$$5555 \times 5 = 27775$$

$$90000 + 10000 = \underline{\hspace{2cm}}$$

$$555 \div 15 = \underline{\hspace{2cm}}$$

$$90000 + 100000 = \underline{\hspace{2cm}}$$

$$666 \div 18 = \underline{\hspace{2cm}}$$

After dealing the concept, check their understanding by instructing them to solve the questions embedded under ‘Fast Check’ and ‘Think Tank’ sections on these pages. **[Conceptual Understanding]**

ELABORATE

For having fun, involve the students in a paper folding, cutting and pasting activity as suggested in the ‘Gamified Learning’ section on page 164. During the procedure, interact and help the students/groups who face difficulty. They can also take some objects like leaves, flowers, etc. to make patterns and decorate the classroom.

[Art Integration]**EVALUATE**

Classwork: Ask to solve Q.1 and 4 of Practice Time 8C.

Homework: Ask to solve Q.2, 3 of Practice Time 8C.



ENHANCE

Ask students to make a rangoli pattern at home, click it using their parents' mobile phone and share with friends/media groups on social sites.

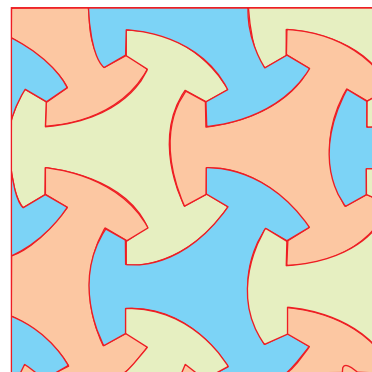
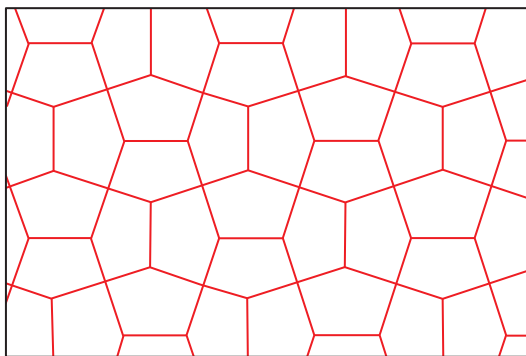
Periods: 9–11

Topics: Tessellations; Coding and Decoding

Suggested extra teaching aids: Printouts of tiling pattern, dotted paper
Math Genius 4 pages 156–159

ENGAGE

Interact with the students about the tiling pattern they have seen at their home on walls, floors, or on footpaths on the way coming to school, etc. Show some patterns in the class and tell to draw the figure/shape of tiles which are repeating there.

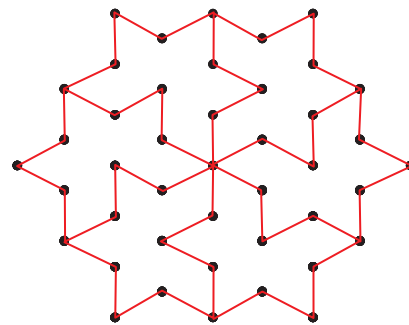
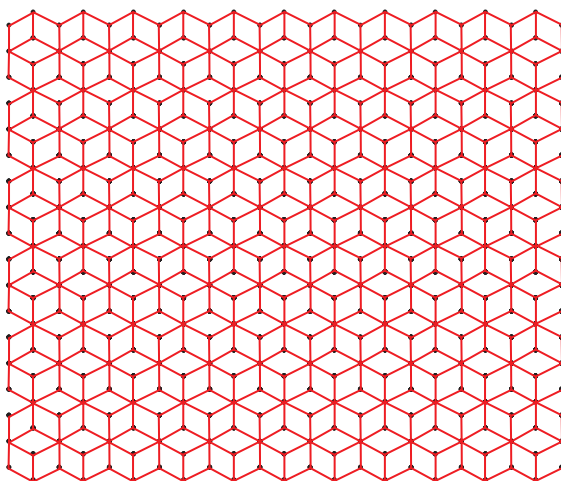


[Critical Thinking]

Look at their sheets and then draw the correct tile on the board. Also you can draw some shapes and ask them to tell whether the shape can tessellate or not. Accept their responses and justify logically.

EXPLORE

Divide the class into small groups. Provide each group a dotted sheet. Ask them to make a tiling pattern by choosing the design of tile(s) which they would like to use in their dream house. For example,



[Experiential and Collaborative Learning]

EXPLAIN

Refer textbook pages 156–158 and explain the term tiling or tessellation. Use some simple polygons to make a tiling pattern on the board. Have the students understand which tile can tessellate and which will leave a gap between them if they try to use it. Further, encourage them to make the tiling patterns on square or isometric dotted paper.

After understanding this concept, move on to the next topic and explain how to code and decode a message. For example, let us use the order number of letters in English alphabet to code the message.

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |

WE LOVE OUR INDIA! → 23 5 12 15 22 5 15 21 18 9 14 4 9 1!

[Conceptual Understanding]

ELABORATE

To strengthen the concept of coding and decoding, write some symbols as codes corresponding to few letters on the board. For example,

| | | | | | | | | | | | |
|---|---|---|----|---|---|---|---|---|---|---|---|
| A | E | P | I | K | T | L | O | B | R | V | S |
| £ | @ | # | \$ | % | ^ | & | Ω | π | © | € | ¥ |

Then, write something using codes and tell the students to decode the message.

π £ ¥ % @ ^ π £ & & → B A S K E T B A L L

\$ & Ω € @ ¥ # Ω © ^ ¥ → _____

Encourage them to solve the questions given in ‘Think Tank’ sections on pages 157 and 159.

[Critical Thinking]

EVALUATE

Classwork: Ask to solve Q1, 2 of Practice Time 8D and Q2 of Practice Time 8E.

Homework: Ask to solve Q3, 4 of Practice Time 8D and Q.1 of Practice Time 8E.

ENHANCE

Ask students to think their own codes, write a message and ask their friend or siblings to decode it.

Periods: 12–14

Topic: (Revision)
Chapter assessment

Suggested extra teaching aids:
Math Genius 4 pages 160–164

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, Challenge Question 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’ on page 159.

EVALUATE

Classwork: Ask to solve Q1 to 5 of ‘Chapter Assessment’ and ‘Challenge Question’ given on page 160.

Homework: Ask to solve Q6 to 11 of ‘Chapter Assessment’.



Measurement

Learning Objectives

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

- ◆ know about metric system and different units of metric measures
- ◆ convert measuring units of lengths in bigger to smaller units and its vice versa
- ◆ add and subtract measuring units of length
- ◆ convert measuring units of weight in bigger to smaller units and its vice versa
- ◆ add and subtract measuring units of weight
- ◆ convert measuring units of capacity in bigger to smaller units and its vice versa
- ◆ add and subtract measuring units of capacity

LESSON PLAN

Suggested number of periods: 16

Suggested Teaching Aids: Book: Math Genius 4, notebook, chalk, blackboard or whiteboard, projector, smartboard, some real-life objects like eraser, pen, pencil, ruler/meter rod/ measuring tape, weighing machine, weights and balance, measuring jars/cylinders, etc.

Keywords: Metric System, Length, Weight (mass), Capacity, Volume, Units of Measurement–Metre, Centimetre, Kilometre, Kilogram, Gram, Litre, Millilitre, Conversion.

Pre-requisite knowledge: Students must be familiar with standard units of measuring length, weight (mass) and capacity; conversion of units; addition and subtraction of simple measurements.

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: Recap; Metric System; Measuring Length

Suggested extra teaching aids: Math Genius 4 pages 165–170

ENGAGE

Start the topic with ‘why do we need to measure something?’. Before explaining it, ask some questions, such as:

What are the sizes of your shoes, shirt, pants, and so on? Can your elders or parents wear it?

Can you bring your lunch in a cooking pot or in a spoon? Why?

Why do you not bring drinking water in a bucket or a tub?

Acknowledge to them that without measurement we cannot imagine our life. Suppose you are ill and doctor advises to take medicine. Think what will happen if you drink a whole bottle of medicine at a time. After having the students understand the importance of measurement, introduce metric system. **[Holistic Learning]**

Then teacher will revise the learners’ previous knowledge of measurement with the help of “Get Ready” and “Let’s Recall” sections given in the book.

EXPLORE

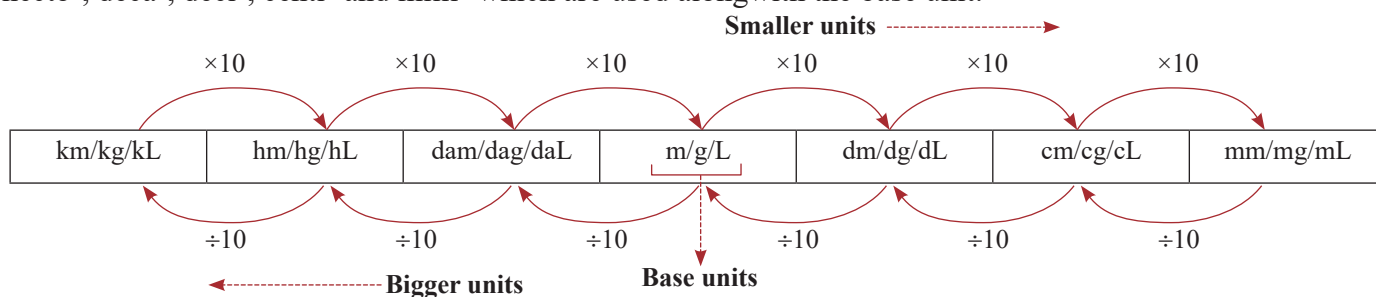
Divide the class into pairs. Tell them to look around in the class or think of the articles available at their homes and make a list of things that can be measured in cm and those in m. Also, instruct them to guess their sizes and write it. After sometime, call a group, give a tailor’s tape or measuring rod and ask them to verify the measurement of the things present in the classroom. Similarly, invite other groups and give the chance one by one.

Monitor students’ participation and engagement during the activities.

[Experiential Learning]

EXPLAIN

Start the class with a recall of base (standard) units m, g and L used for measuring length, weight (mass) and capacity (volume) respectively. Then explain about the derived units by putting the prefixes, such as kilo-, hecto-, deca-, deci-, centi- and milli- which are used alongwith the base unit.



Thereafter, refer textbook pages 167–168 to have them learn more about the measurement of length. Further, discuss about the inter-conversion of different units of length dealing with some examples on the board. Let them understand that:

- To convert a bigger unit into a smaller unit, we need to multiply the bigger unit.

For example, $7 \text{ m} = 7 \times 100 \text{ cm} = 700 \text{ cm}$ (since $1 \text{ m} = 100 \text{ cm}$)

$14 \text{ km } 185 \text{ m} = 14 \text{ km} + 185 \text{ m} = (14 \times 1000) \text{ m} + 185 \text{ m}$ (since $1 \text{ km} = 1000 \text{ m}$)
 $= 14000 \text{ m} + 185 \text{ m} = 14185 \text{ m}$

- To convert a smaller unit into a bigger unit, we need to divide the smaller unit.

For example, $3000 \text{ m} = (3000 \div 1000) \text{ km} = 3 \text{ km}$ (since $1000 \text{ m} = 1 \text{ km}$)

$65 \text{ mm} = 60 \text{ mm} + 5 \text{ mm} = (60 \div 10) \text{ cm} + 5 \text{ mm} = 6 \text{ cm } 5 \text{ mm}$ (since $10 \text{ mm} = 1 \text{ cm}$)

[Conceptual Understanding]

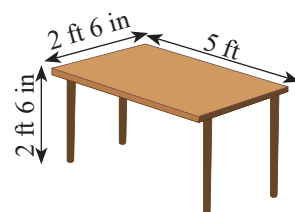
ELABORATE

After understanding about the metric units of length, ask the students if they have heard the terms inch, foot, yard, mile, etc. Reiterate that these are other units commonly used for measuring length. You can show a picture of carpenter measuring the size of door and window in feet and inches.

Give some more real life examples and then demonstrate how to convert the units of given measurement. Take a 15 cm or 30 cm ruler and show the marking of inches on opposite edge. Further, explain how to measure the dimensions of a table or desk using it. Hence, convert the units.

Hence, motivate students to solve questions given in ‘Fast Check’, ‘Think Tank’ and ‘Challenge Question’ on page 169.

[Experiential Learning]



EVALUATE

Classwork: Ask to solve Q5, 6 and 8 of Practice Time 9A.

Homework: Ask to solve remaining questions of Practice Time 9A.

ENHANCE

Ask students to grow a plant in a pot or kitchen garden. Take care of it regularly and keep the record of its growth after 1 week, 2 weeks, 1 month, 2 months, etc. Also, visit your neighbour's or friend's garden and compare your plant's growth to theirs. [Holistic Learning]

Periods: 4–5

Topic: Addition and
Subtraction of Lengths

Suggested extra teaching aids:
Math Genius 4 pages 170–172

ENGAGE

Go to the playground along with the class and have them realise how long a m, dam, hm, km, dm, cm and mm, is by actually measuring the distance between two places/length of an object. You can take the help of physical teacher. Instruct some students to stand at the corner of basketball/tennis/badminton court, or at the boundary of football/hockey/cricket field or somewhere else and ask other students to guess the distance between any two students. Hence, verify it by measuring. Find the difference between actual and estimated length. Accept their responses. You can also organise a 100-m race among them, or throwing a ball as far as possible, and so on. [Cross-curricular and Holistic Learning]

EXPLORE

Tell the students in advance to bring ribbons of vibrant colours and varying lengths. Divide the class in small groups, ask them to arrange their ribbons from the shortest to the longest. Once arranged, they will use a ruler or tape to measure and determine the exact length of each ribbon. Hence instruct them to calculate the total length of their ribbons, and then compare it with other groups and find how much longer or shorter their total length is. Accept their responses. [Collaborative and Experiential Learning]

EXPLAIN

Start the class with an interaction based on a real life situation, such as a journey or travel. Ask where they have gone and which modes of transport they have used. Assume the distances they travelled and explain how to add or subtract them. Refer textbook pages 170–171 for more explanation and examples. [Conceptual Understanding]

ELABORATE

Write some questions on the board and demonstrate how to add or subtract the measurements of length. For example,

(a)

| | km | m | | | cm | | |
|---|----|---|---|---|----|---|---|
| | 1 | 1 | 1 | | | | |
| | 1 | 3 | 9 | 7 | 5 | 3 | 2 |
| + | 1 | 5 | 6 | 8 | 8 | 5 | 5 |
| | 1 | 9 | 6 | 6 | 3 | 8 | 7 |

Thus, 13 km 975 m 32 cm + 5 km 688 m 55 cm
= 19 km 663 m 87 cm

(b)

| | m | cm | | mm |
|---|--------------|--------------|--------------|----|
| | 17 | 11 | | |
| | 7 | 7 | 15 | |
| | 9 | 7 | 6 | 9 |
| - | 9 | 7 | 6 | 4 |
| | 8 | 4 | 9 | 5 |

Thus, 18 m 25 cm 9 mm – 9 m 76 cm 4 mm
= 8 m 49 cm 5 mm



EVALUATE

Classwork: Ask to solve Q3 and 6 of Practice Time 9B.

Homework: Ask to solve Q1, 2, 4, 5 and 7 of Practice Time 9B.

ENHANCE

Ask students to check the measurement of length marked on the pack when they buy a cello-tape, wrapping foil, or string/thread. What length of it is left after its use first time. Also, it can be asked to the students to find how long a string they use to fly a kite or what length is left with them if their kite is cut by someone.

Periods: 6–7

Topic: Measuring weight
(Mass)

Suggested extra teaching aids:
Math Genius 4 pages 172–174

ENGAGE

Students are aware with the units, such as gram (g) and kilogram (kg) which are used to measure the weight (mass) of objects. Ask the students to look around and list some objects which can be measured in g and kg. Write some questions on the board and instruct the students to write their answers.

Guess how heavy your bag is.

What is your weight? Can you write the answer in grams?

Who is the heaviest in your family?

Name the heaviest animal found on land, and on earth.

[Logical Thinking]

EXPLORE

Is bigger thing always heavier than the smaller thing? To explore the answer of this question, students can be given an opportunity to do an experiment.

Divide the class into small groups. Put a digital weighing machine, string, measuring tape and objects of different kind and sizes. In this activity, groups are given strings to wrap around various objects, such as an apple, a ball, a balloon, an eraser, a water bottle, etc. Once wrapped, they can compare and measure the lengths of these strings. Next, they will measure their weights and compare. It's a tactile way of understanding how different objects have different sizes and weights.



Monitor students' participation and engagement during the activities. Guide them if they need help.

[Experiential Learning]

EXPLAIN

Refer textbook pages 172–174, explain about the derived units of weight by putting the prefixes, kilo-, hecto-, deca-, deci-, centi- and milli- alongwith the base unit gram (g).

Further, discuss about the inter-conversion of different units of weight dealing with some examples on the board. Let them understand that:

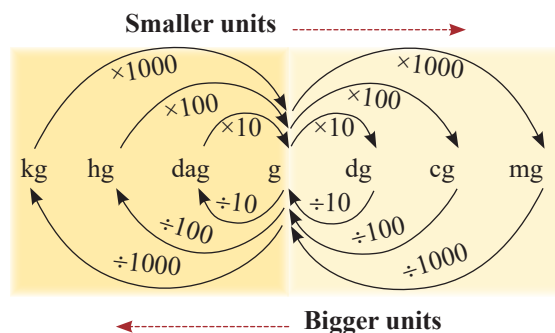
- To convert a bigger unit into a smaller unit, we need to multiply the bigger unit.

For example, Let us convert 9 kg 8 dg 7 cg 6 mg into mg.

$$9 \text{ kg } 8 \text{ dg } 7 \text{ cg } 6 \text{ mg} = (9 \times 1000) \text{ g} + (8 \times 100) \text{ dg} + (7 \times 10) \text{ cg} + 6 \text{ mg}$$

$$\text{(since } 1 \text{ g} = 1000 \text{ mg, } 1 \text{ dg} = 100 \text{ mg and } 1 \text{ cg} = 10 \text{ mg)}$$

$$= 9000 \text{ mg} + 800 \text{ mg} + 70 \text{ mg} + 6 \text{ mg} = 9876 \text{ mg}$$



- To convert a smaller unit into a bigger unit, we need to divide the smaller unit.

For example, $8238 \text{ g} = 8000 \text{ g} + 238 \text{ g} = (8000 \div 1000) \text{ kg} + 238 \text{ g} = 8 \text{ kg } 238 \text{ g}$ (since $1000 \text{ g} = 1 \text{ kg}$)

[Conceptual Understanding]

ELABORATE

After understanding about the metric units of weight, ask the students if they have heard the terms quintal, ton, *mann*, etc.. Reiterate that quintals and tons are other units commonly used for measuring heavy weights. You can show a picture of a truck, tractor, freight train loaded with goods and commodities.



Give some more real life examples and then demonstrate how to convert the units of given measurement.

Hence, motivate students to solve questions given in the book.

[Experiential Learning]

EVALUATE

Classwork: Ask to solve Q1 and 4 of Practice Time 9C and ‘Think Tank’ on page 173.

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

ENHANCE

Ask students to go for shopping with their elders or parents. Look how seller weighs fruits, vegetables and other household items. Help their parents/elders in carrying the things.

[Holistic Learning]

Periods: 8–9

Topic: Addition and Subtraction of Weights

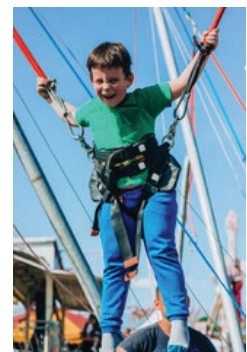
Suggested extra teaching aids:
Math Genius 4 pages 175–176

ENGAGE

Talk about any real life situation where the persons having a particular range of weight are allowed. For example, this bungee trampoline allows the children only when they have their weights above 30 kg but not more than 40 kg.

Ask who are eligible to enjoy on it. Check their weights on a weighing machine and categorise in three groups—Students who are less than 30 kg, between 30 kg and 40 kg and above 40 kg. Further, ask the students of first and third groups to find how much lighter/heavier they are from the given range.

[Collaborative and Experiential Learning]



EXPLORE

Write the name of some sports on the board and ask the students to choose the one which they like most. Then, write the weight/mass of the sports items which are used to play. For example,

Cricket ball: 160–163 g

Cricket bat: 1 kg 200 g–1 kg 400 g

Tennis ball: 56–60 g

Tennis racket: 280–310 g

Hockey ball: 156–163 g

Hockey stick: less than 735 g

Next tell them to find total weight of any two–three items, or difference between the weights of two items. Accept their responses.

[Cross-curricular and Holistic Learning]

EXPLAIN

Start the class with an interaction based on a real life situation, such as a home-made recipe. Ask which item their mother bakes that is delicious and crispy. Talk about the ingredients used in it and explain how to add or subtract their weights. Refer textbook pages 175–176 for more explanation and examples.

[Conceptual Understanding]

ELABORATE

Write some questions on the board and demonstrate how to add or subtract the measures of weight. For example,

(a)

| kg | | g | | | |
|----|---|---|---|---|---|
| 1 | 1 | 1 | 1 | | |
| 3 | 8 | 2 | 7 | 8 | |
| + | 5 | 6 | 7 | 8 | 3 |
| | 9 | 5 | 0 | 6 | 1 |

Thus, 38 kg 278 g + 56 kg 783 g = 95 kg 61 g

(b)

| kg | | g | | | mg | | |
|--------------|--------------|--------------|---------------|---------------|---------------|--------------|--------------|
| | | 9 | 9 | 9 | 11 | | |
| | 15 | 5 | 10 | 10 | 10 | 1 | 10 |
| 1 | 5 | 5 | 0 | 0 | 0 | 1 | 0 |
| | 6 | 4 | 8 | 6 | 8 | 6 | 5 |
| | 9 | 1 | 1 | 3 | 1 | 5 | 5 |

Thus, 15 kg 600 g 20 mg – 6 kg 486 g 865 mg = 9 kg 113 g 155 mg

EVALUATE

Classwork: Ask to solve Q1 of Practice Time 9D.

Homework: Ask to solve Q2 and 3 of Practice Time 9D.

ENHANCE

Ask students to check the weight marked on the pack of biscuits, cheese, chips, etc. when they buy it. Weigh them on a weighing machine and assure the product has right weight.

Periods: 10–11

Topic: Measuring Capacity (Volume)

Suggested extra teaching aids:
Math Genius 4 pages 177–178

ENGAGE

Students are aware of the units, such as Litre (L) and Millilitre (mL) which are used to measure the Capacity (Volume) of a container. Ask the students to make a list of some containers whose capacity can be measured in L and mL. Write some questions on the board and instruct the students to write their answers.

What is the capacity of your water bottle?

Guess how much water you have drunk today from your bottle.

What amount of water did you use for having bath this morning?

How much milk is consumed in your family daily?

Do you know which unit is used to express the capacity of a tanker or an overhead water storage tank?

Name the largest water bodies found on the earth.

Accept their responses and interact if the students have any doubt or query.

[Critical Thinking]

EXPLORE

Measuring Ingredients

One of the best measurement activities examples in daily life is cooking. When kids get involved in baking or cooking, they naturally engage with measurements. By using measuring cups and spoons, they learn about volume and quantity. It's a delicious way to understand measurements and enjoy the results!

Ask students to learn a recipe at home and help parents/elders in measuring ingredients.

[Holistic Learning]



EXPLAIN

Refer textbook pages 177–178, explain about the derived units of capacity by putting the prefixes, kilo-, hecto-, deca-, deci-, centi- and milli- alongwith the base unit litre (L).

Further discuss about the inter-conversion of different units of capacity dealing with some examples on the board. Let them understand that:

- To convert a bigger unit into a smaller unit, we need to multiply the bigger unit.

$$\begin{aligned}\text{For example, } 3 \text{ kL } 650 \text{ L} &= 3 \text{ kL} + 650 \text{ L} = (3 \times 1000) \text{ L} + 650 \text{ L} && \text{(since } 1 \text{ kL} = 1000 \text{ L)} \\ &= 3000 \text{ L} + 650 \text{ L} = 3650 \text{ L}\end{aligned}$$

- To convert a smaller unit into a bigger unit, we need to divide the smaller unit.

$$\begin{aligned}\text{For example, } 8823 \text{ mL} &= 8000 \text{ mL} + 823 \text{ mL} = (8000 \div 1000) \text{ L} + 823 \text{ mL} && \text{(since } 1000 \text{ mL} = 1 \text{ L)} \\ &= 8 \text{ L } 823 \text{ mL}\end{aligned}$$

[Conceptual Understanding]

ELABORATE

After understanding the metric units of capacity, talk about some other units, such as a barrel and a gallon which are used in the International trade of crude oil. Refer 'Knowledge Desk' given on page 178.

[Cross-curricular Learning]

Hence, motivate students to solve questions given in the book.

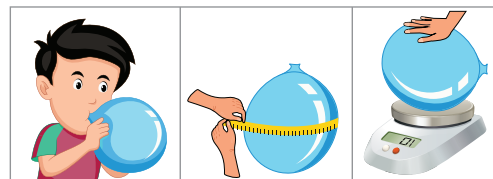
EVALUATE

Classwork: Ask to solve Q2 and 3 of Practice Time 9E.

Homework: Ask to solve remaining questions of Practice Time 9E.

ENHANCE

Balloons are more than just party decorations; they're tools for measuring weight activities. By inflating balloons to various sizes, students can measure their circumferences. This helps them understand how much air each balloon holds and how air capacity relates to the size and stretch of the balloon's material.



[Experiential Learning]

Periods: 12–13

Topic: Addition and Subtraction of Capacities

Suggested extra teaching aids: Math Genius 4 pages 179–180

ENGAGE

Talk about the importance of water and liquid in our diet. During the interaction, ask some questions, such as: Why is water necessary in our life?

What does a doctor do when a patient is suffering from dehydration?

When would you like to intake more water, in summer or in winter? Why?

A camel can drink as much as 100 litres of water at a time. If the camel gets only 45 L 500 mL of water, how much more water does he need?

Accept the responses and discuss the correct answers.

[Cross-curricular and Holistic Learning]

EXPLORE

Tell the students to explore the water consumption in different activities of their family. For this, make table for activities, such as cooking, brushing, flushing, bathing, washing clothes and utensils, cleaning home, vehicles, watering plants. Think how much water you will require for a day, a week, and a month.

Compare your data with your bench partner and check which family consumes less water and by how much. Accept their responses. **[Collaborative and Experiential Learning]**

EXPLAIN

Start the class with an interaction based on a real life situation. Refer textbook pages 179–180, explain how to add or subtract capacities. Let them know that they can perform the operation as they have learnt in case of addition and subtraction of length and weight. **[Conceptual Understanding]**

ELABORATE

Write some questions on the board and demonstrate how to add or subtract the measures of capacity. For example,

(a)

| L | | |
|---|---|---|
| 1 | 1 | |
| 1 | 6 | 5 |
| 1 | 0 | 6 |
| 2 | 6 | 8 |
| 5 | 3 | 9 |

| mL | | |
|----|---|---|
| | 1 | |
| 2 | 4 | 0 |
| 3 | 2 | 5 |
| 0 | 1 | 5 |
| 5 | 8 | 0 |

Thus, 165 L 240 mL + 106 L 325 mL
+ 268 L 15 mL = 539 L 580 mL

(b)

| kL | |
|--------------|--------------|
| 7 | 15 |
| 6 | 8 |
| 1 | 7 |

| L | | |
|--------------|---------------|---------------|
| 9 | 9 | |
| 0 | 10 | 10 |
| 0 | 4 | 5 |
| 0 | 5 | 4 |

| mL | | |
|---------------|---------------|--------------|
| 9 | 9 | |
| 10 | 10 | 10 |
| 0 | 6 | 5 |
| 9 | 3 | 5 |

Thus, 85 kL 100 L – 68 kL 45 L 65 mL
= 17 kL 54 L 935 mL

EVALUATE

Classwork: Ask to solve Q1, 4 and 5 of Practice Time 9F.

Homework: Ask to solve Q2, 3 and 6 of Practice Time 9F.

ENHANCE

Ask students to solve the Life Skills given on page 184.

Periods: 14–16

Topic: (Revision)
Chapter assessment

Suggested extra teaching aids:
Math Genius 4 pages 181–184

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, Chapter Assessment, Maths Connect and Challenge Question.

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 Maths Connect on page 183.

EVALUATE

Classwork: Ask to solve Q1 to 5 of ‘Chapter Assessment’ and ‘Maths Connect’ given on page 183.

Homework: Ask to solve Q6 to 10 of ‘Chapter Assessment’ and ‘Challenge Question’ given on page 183.

ENHANCE

Involve students to perform the activity discussed in ‘Gamified Learning’ section on page 184.



Perimeter and Area

Learning Objectives

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

- ◆ learn the concept of perimeter and find the perimeter of plane closed figures
- ◆ learn the concept of area and find the area of plane closed figures by counting squares

LESSON PLAN

Suggested number of periods: 10

Suggested Teaching Aids: Book: Math Genius 4, notebook, chalk, blackboard or whiteboard, projector, smartboard, some real-life objects like eraser, pen, pencil, A-4 size sheet, square grid paper, Geo-dotted paper, ruler, string, rubber bands and geo-board.

Keywords: Perimeter, Plane closed figure, Polygon, Triangle, Rectangle, Square, Irregular Shape, Area, Geo-dotted Paper and Geo-board.

Pre-requisite knowledge: Students must be familiar with standard units of measuring length and plane shapes.

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 | Topics: Perimeter; Perimeter of a Polygon, Triangle, Rectangle, Square; Perimeter of an Irregular Shape | Suggested extra teaching aids: Math Genius 4 pages 185–190 |
|---------------------|----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|

ENGAGE

Start the topic by recalling measuring length and polygons. Draw 2–3 polygons on the board and instruct the students to sketch the similar figures in their notebooks. Then, measure the length of each side and add them.

Ask: What is called the sum of sides of the plane figure?

Accept the responses. Hence, introduce perimeter of a closed plane figure.

[Experiential Learning]

EXPLORE

The teacher can interact with the students referring “Get Ready” section given in the book and help them understand where we need to find perimeter.

Divide the class into pairs. Tell them to look around the articles available and using a tailor’s tape or measuring rod find the perimeter. For example, they can find the perimeter of their desk, teacher’s table top, cover page of a book/notebook, floor tile, etc. Further, instruct them to compare their findings with other groups and discuss.

Monitor students’ participation and engagement during the activities. You can also conduct the activity as suggested in Gamified Learning section on page 197.

[Collaborative Learning]

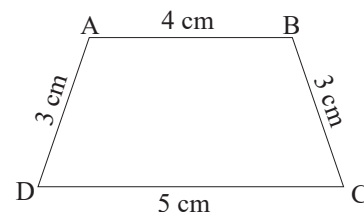
EXPLAIN

Explain that the perimeter of a closed figure is the sum of lengths of all its sides. Tell that unit of perimeter is same as unit of length of sides. So, its units can be expressed in cm, m, km, etc.

Thereafter, refer textbook pages 186–188 to have them learn about the perimeter of different polygons, such as a triangle, quadrilateral, rectangle and a square. For example, consider the quadrilateral ABCD.

The sum of all its sides is $AB + BC + CD + DA = 4 \text{ cm} + 3 \text{ cm} + 5 \text{ cm} + 3 \text{ cm} = 15 \text{ cm}$

The perimeter of the quadrilateral shown here is 15 cm.



Solve some questions on the board and encourage the students to solve questions given in the book for self-understanding.

[Conceptual Understanding]

ELABORATE

Take reference of the textbook to explain the perimeter formula for rectangle and square.

Perimeter of a rectangle = $2 \times (l + b)$, where l = length and b = breadth

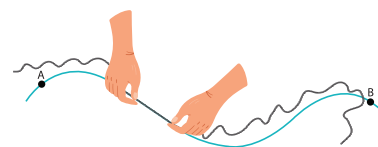
Perimeter of the square = $4 \times a$, where a = side

After understanding that the perimeter is the length of boundary of a closed figure, demonstrate how to find the perimeter of any irregular shape using a string and a ruler.

Consider the curvy shape given here.

Clearly, we cannot measure the boundary length by ruler directly. So, follow these steps to measure the perimeter of curved shape:

- Take a thread/string.
- Lay it around the shape tightly once and mark the end.
- Measure the length of marked thread/string along the ruler.



- Length of the thread/string gives the perimeter of the shape.

Hence, motivate students to do Activity suggested on page 189.

[Experiential Learning]

EVALUATE

Classwork: Ask to solve Q2, 3 and 5 of Practice Time 10A.

Homework: Ask to solve remaining questions of Practice Time 10A.

ENHANCE

Ask students to find how much fencing they will need for their kitchen garden, or length of coloured strip for decorating the project file or wood required for making a photo-frame for their family photograph.

[Holistic Learning]

Periods: 5–8

Topic: Area; Finding Area
using Geo Dotted Paper

Suggested extra teaching aids:
Math Genius 4 pages 190–194

ENGAGE

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

For which you need more space – to keep a Carom board or a Ludo board?

If you are asked 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 drawing sheet or on a notebook page?

Accept their responses and talk about the logic behind. Thereafter, introduce the term Area.

[Logical Thinking]

EXPLORE

Divide the class into pairs. Tell the pairs to take a square grid paper and instruct each partner to draw a rectilinear figure. Then, they will find the perimeter of the figures drawn and count how many squares are there inside the figures. Compare the result for the two figures. [Collaborative and Experiential Learning]

EXPLAIN

Start the class with an interaction based on a real life situation, such as buying bedsheets or blankets for a single bed and a double bed. Ask about the difference between their sizes. For better understanding, invite two groups of students with their notebook. Tell one group to lay their notebooks without overlapping or leaving gaps on a table. Similarly, instruct another group to lay the notebooks on a desk. Count the number of notebooks and find which one has larger area – a table top or a desk top.

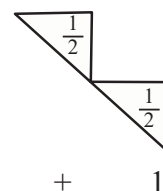
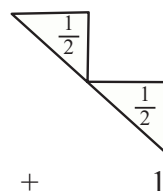
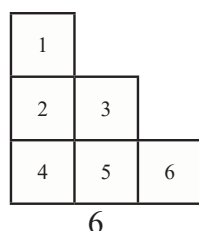
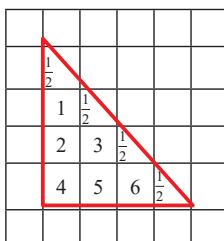
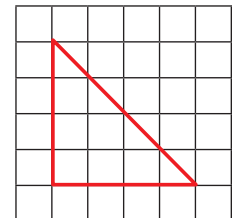
Now explain the concept of area and its unit. Refer textbook pages 190–193 for more explanation and examples.

[Conceptual Understanding]

ELABORATE

Consider any figure that has some half squares on a square grid paper. Demonstrate how to calculate its area by counting the unit squares. For example, look at the triangle 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.

EVALUATE

Classwork: Ask to solve Q1 of Practice Time 10B and ‘Think Tank’ given on page 192.

Homework: Ask to solve Q2 of Practice Time 10B.

ENHANCE

Ask students to do activity as suggested on page 193.

| | | |
|----------------------|-------------------------------------------------|-----------------------------------------------------------------------|
| Periods: 9–10 | Topic: (Revision) Chapter assessment | Suggested extra teaching aids: Math Genius 4 pages 194–197 |
|----------------------|-------------------------------------------------|-----------------------------------------------------------------------|

ENGAGE

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

EXPLAIN

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

ELABORATE

Discuss questions 1 to 3, and 8 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 ‘Maths Connect’ on page 194.

EVALUATE

Classwork: Ask to solve Q1 to 3 and 8 of ‘Chapter Assessment’ and ‘Maths Connect’ given on page 194.

Homework: Ask to solve Q4–7 and 9 of ‘Chapter Assessment’ and ‘Challenge Question’ given on page 196.

ENHANCE

Involve students to perform an activity discussed under Maths Fun section on page 197.



Time

Learning Objectives

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

- ◆ read and write time in hours, minutes and seconds
- ◆ convert 12-hour format to 24-hour format and vice-versa
- ◆ convert units of times
- ◆ add and subtract measures of time
- ◆ find time duration between two events
- ◆ convert days, months, years to each other
- ◆ calculate the number of days between two events

LESSON PLAN

Suggested number of periods: 12

Suggested Teaching Aids: Book: Math Genius 4, notebook, chalk, blackboard or whiteboard, projector, smartboard, some real-life objects like eraser, pen, pencil, clocks/dummy clocks, calender, A-4 size sheet.

Keywords: Time, Hours, Minutes, Seconds, 12-hour format, 24-hour format, Conversion, Time Duration, Days, Months, Years

Pre-requisite knowledge: Students must be familiar reading time in clocks at 5 minutes interval. Also, they should be aware about a calendar.

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: Recap; Reading and writing time in hours and minutes | Suggested extra teaching aids: Math Genius 4 pages 198–201 |
|---------------------|---------------------------------------------------------------------|-------------------------------------------------------------------|

ENGAGE

To introduce students to telling time, ask them to gather together in small groups and brainstorm.

On chart paper, write “TELLING TIME” in the middle and encourage students to brainstorm what they know about telling time and clocks and write down what they come up with.

ASK: “What is the time?”, “How do you tell time?”, “How many hours are there in a day?”, “What types of clocks are there?”, “What is the difference between the short-hand and long hand?”

Accept their answers. Then teacher will revise the learners’ previous knowledge of telling time with the help of “Let’s Recall” section given in the book. **[Holistic Learning]**

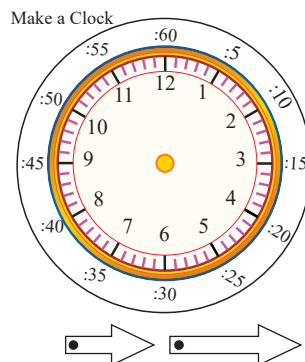
EXPLORE

Provide each student a “Make a Clock” template and a fastener pin. Students will create their own analog clock. Have them put together the clock.

Teacher will say a time (example: 5 o'clock) and the students will have to make that time on their analog clock. Once everyone has clocks set their, ask a volunteer to show that time in front of the class on the whiteboard to see if they are correct (do this 10–20 times with different times).

Monitor students' participation and engagement during the activities.

[Experiential Learning]



EXPLAIN

Start the class with a quick recall of analog clock terminology (example: clock face). Explain that the short-hand is the hour hand and the long-hand is the minute hand. Tell the different ways how they can say what time it is and show those times on a manipulative/interactive clock (example: you SAY “it is 5 o'clock” or “it is 8:15” or “it is half past 3”). Have them understand how they can write the time down (example: 5:00, 8:15, 3:30).

Thereafter, refer textbook pages 199–200 to explain how to tell time in hours and exact number of minutes. Make an analog clock either on the whiteboard or have a digital version up in front of the classroom. Set the hands of clock at different times and reiterate the time reading.

[Conceptual Understanding]

ELABORATE

Write the time on the chart paper and instruct students to visualize the time during discussion. Make sure that the students can set an analog clock to a specific time, and determine what time it is by reading the clock.

Hence, motivate students to solve questions given in the book.

[Experiential Learning]

EVALUATE

Classwork: Ask to solve Q1 of Practice Time 11A.

Homework: Ask to solve Q2 of Practice Time 11A.

ENHANCE

Ask students to explore which types of clocks the early people used to tell time. [Cross-curricular Learning]

Periods: 3–4

Topics: Time in Hours, Minutes and Seconds; 24-Hour Clock

Suggested extra teaching aids:
Math Genius 4 pages 201–206

ENGAGE

Draw an analog clock on the board or show the picture using projector.

Ask some questions about the clock and time.

Identify the hands of the clock.

How many numbers are there on the face of the clock?

Into how many parts is the dial divided?

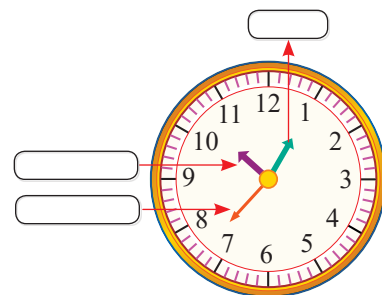
Name the hand that moves the fastest on the dial.

Name the hand that moves the slowest on the dial.

How many times does the minute hand move around the clock face in a day?

How many times does the thinnest hand move around the clock face in 1 hour?

Accept the students' responses and introduce the second hand.



[Critical Learning]



EXPLORE

Divide the class in small groups, ask them to list some activities and think about the time that those activities take to complete. Accept their responses. Then instruct them to do the task asked in 'Maths Fun' on page 202.

[Collaborative and Experiential Learning]

EXPLAIN

Start the class with an interaction based on a real life situation, such as a journey or travel. Ask where they have gone and how long they have spent there. Discuss the time of departure from home and arrival at the destination. Thereafter, explain the duration of a day equals to 24 hours, 1 hour = 60 minutes and 1 minute = 60 seconds. Have them realise the period of a minute and a second by digital/analog clock in the class.

Furthermore, discuss why we use 24-hour format and how to express a 12-hour clock time into a 24-hour clock time and vice versa. Refer textbook pages 201–205 for more explanation and examples.

[Conceptual Understanding]

ELABORATE

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

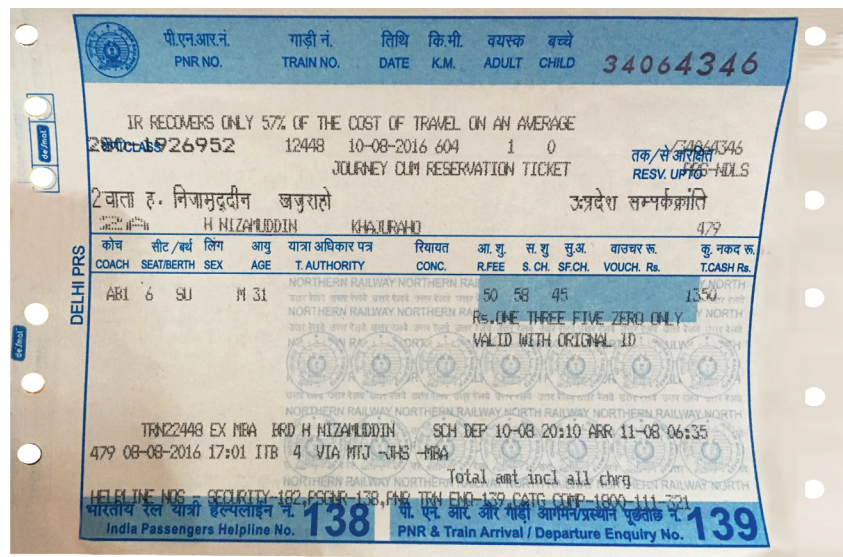
It has mentioned: The departure time on 10-08-2016 from H Nizamuddin is 20:10, which means 8:10 p.m.

Explanation: Here the first two digits show hour 20. It is more than 12, so subtract 12 from 20. $20 - 12 = 8$. The last two digits show 10 minutes, so keep it as it is and suffix p.m. to indicate the time between noon to midnight. Hence, 20:10 hours = 8:10 p.m., which indicates evening time.

The arrival time on 11-08-2016 to Khajuraho is 06:35, which means 6:35 a.m.

Explanation: Here the first two digits show hour 06. It is less than 12, so no need to subtract 12 from 6. The last two digits show 35 minutes, so keep it as it is and suffix a.m. to indicate the time between midnight to noon. Hence, 06:35 hours = 6:35 a.m., which indicates morning time.

Next have them understand how to express the time in hours if given in a.m./p.m.



| 12-hour clock | Method to convert | Examples |
|---------------------------|---------------------------------------------------|---------------------------------------------------------------------------------|
| 12 midnight to 12:59 a.m. | Subtract 12 hours and write the time without a.m. | 12:05 a.m. → 00:05 hours 12:55 a.m. → 00:55 hours |
| 1:00 a.m. to 12:59 p.m. | Write the same time without a.m. or p.m. | 2:45 a.m. → 02:45 hours 11:38 a.m. → 11:38 hours 12:28 p.m. → 12:28 hours |
| 1:00 p.m. to 11:59 p.m. | Add 12 hours and write the time without p.m. | 1:40 p.m. → 13:40 hours 4:23 p.m. → 16:23 hours 10:15 p.m. → 22:15 hours |

EVALUATE

Classwork: Ask to solve Q1 of Practice Time 11B and Q3, 4 of Practice Time 11C.

Homework: Ask to solve Q2 of Practice Time 11B and Q1, 2 of Practice Time 11C.

ENHANCE

Ask students to complete the Project given on page 204.

Periods: 5–6

Topic: Conversion of Units
of Time

Suggested extra teaching aids:
Math Genius 4 pages 206–208

ENGAGE

Start the class with an interaction based on real life. Ask the students some questions related to their daily activity.

How long do you watch your favourite cartoon on TV?

Is there any advertisement telecast during that period? If yes, guess how much time does it take?

Can you tell how many seconds are there in a minute?

How much time do you take to have your breakfast? Try to write your answer in seconds.

Suppose you spend 5 hours daily in your class. Can you tell how many minutes do you stay in the class?

[Logical Thinking]

EXPLORE

Make a list of some activities, such as singing, dancing, playing a musical instrument, storytelling, writing, drawing, etc. Instruct the students to choose any one. Ask how much time they will take to perform it in the class. Invite some students randomly to showcase the talent, instruct other students to note down the time and convert it in seconds.

[Experiential Learning]

EXPLAIN

Refer textbook pages 206–207, explain how to convert units of time, including converting between seconds, minutes and hours. Recall that

1 hour = 60 minutes or 60 minutes = 1 hour.

1 minute = 60 seconds or 60 seconds = 1 minute.

- To convert hours into minutes, we multiply the number of hours by 60.
- To convert minutes to seconds, we multiply the number of minutes by 60.

For example, 4 minutes = 4×60 seconds = 240 seconds

8 hours 15 minutes = 8×60 minutes + 15 minutes = 480 minutes + 15 minutes = 495 minutes

- To convert seconds into minutes, divide seconds by 60.
- To convert minutes into hours, divide minutes by 60.

For example, 8283 seconds = $(8283 \div 60)$ minutes

$$= 138 \text{ minutes} + 3 \text{ seconds}$$

$$= (138 \div 60) \text{ hours} + 3 \text{ seconds}$$

$$= 2 \text{ hours} + 18 \text{ minutes} + 3 \text{ seconds}$$

| | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| $\begin{array}{r} 60 \overline{)8283} \quad (138 \rightarrow \text{minutes}) \\ - 60 \\ \hline 228 \\ - 180 \\ \hline 483 \\ - 480 \\ \hline 3 \rightarrow \text{seconds} \end{array}$ | $\begin{array}{r} 60 \overline{)138} \quad (2 \rightarrow \text{hours}) \\ - 120 \\ \hline 18 \rightarrow \text{minutes} \end{array}$ |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|

[Conceptual Understanding]

Hence, motivate students to solve questions given in book.



ELABORATE

Give some more real life examples and then demonstrate how to apply the concept of converting the units of time. Suppose a ride on the giant wheel completes in 4 minutes. And it takes 6 minutes for people to climb on and come off. How many rides can the wheel complete if it is operated for 3 hours a day?

Total time required for a ride = $(4 + 6)$ minutes = 10 minutes

Operational time of the wheel in a day = 3 hours = 3×60 minutes = 180 minutes

So, number of rides that can be completed daily = $180 \div 10$ minutes = 18 **[Experiential Learning]**

EVALUATE

Classwork: Ask to solve Q1(c), (d), (e) and 2(b), (d) of Practice Time 11D.

Homework: Ask to solve remaining questions of Practice Time 11D.

ENHANCE

Ask students to express their sleeping time in minutes and seconds.

Periods: 7–8

Topics: Addition and Subtraction of Time; Time Duration

Suggested extra teaching aids: Math Genius 4 pages 208–211

ENGAGE

Talk about their daily routine work. Ask how much time they spend in doing different kind of works, such as: How much time do you take in completing homework? How long do you do self-study?

Find the total time spent on the study at home.

Do you study longer/shorter in school than at home? How much?

Teacher can also ask about some other activities, such as when they go to bed and when get up. Find the sleeping hours. Then instruct them to compare their responses with the bench partner.

[Collaborative and Experiential Learning]

EXPLORE

Tell the students to check how many seconds they can hold their breath. For this, they can use stopwatch in the mobile phone of their parents. They can also check the same of their family members. Hence find the difference between the longest and the shortest duration of breath holding time.

Also, they can be told to explore about the time required for baking their favourite recipe. They will ask their mothers and note down how much time it takes in preparation of materials and how long it takes in cooking. Hence, they will find the total time required.

Next tell them to find the finishing time of baking if they start the preparation at 10:00 a.m. Accept their responses.

[Cross-curricular and Holistic Learning]

EXPLAIN

Start the class with an interaction based on a real life situation. For example,

Anuj spent 6 h 35 min with family members and 4 h 55 min with friends on the last Sunday.

(a) How much time did he spend in all with family and friends?

(b) With whom did he spend longer time and by how much?

Explain how to solve such a problem on the board.

(a) The time spent with family members = 6 h 35 min

The time spent with friends = 4 h 55 min

So, total time spent with family and friends = 6 h 35 min + 4 h 55 min = 11 h 30 min

| h | min |
|----|--------------|
| 6 | 35 |
| + | 4 <u>55</u> |
| 10 | 90 = 60 + 30 |
| + | 1 |
| 11 | 30 |

(b) The time spent with family members = 6 h 35 min

The time spent with friends = 4 h 55 min

Clearly, 6 h 35 min > 4 h 55 min. That is, he spent more time with his family.

Now difference between the time spent with family and friends

$$= 6 \text{ h } 35 \text{ min} - 4 \text{ h } 55 \text{ min} = 1 \text{ h } 40 \text{ min}$$

Refer textbook pages 208–209 for more explanation and examples. Have the students understand the concept and then tell them to solve some questions of Practice Time 11E. Thereafter, deal the next topics Time Duration and Finding Finishing Time along with real life examples.

| h | min |
|--------------|---------------|
| ⑤ | ③⑤ |
| 6 | 35 |
| 4 | 55 |
| 1 | 40 |

[Conceptual Understanding]

ELABORATE

After learning how to add and subtract time periods, have them understand that they can calculate time elapsed/time duration using subtraction. Demonstrate it with examples.

Calculation of time elapsed/time duration

A T20 cricket match started at 3:48 p.m. and got over at 8:19 p.m. How long did the match last?

Using formula: Elapsed Time = End Time – Start Time

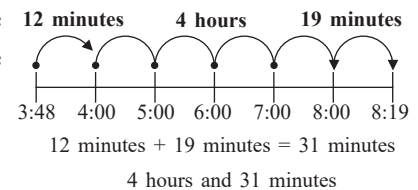
$$= 8:19 \text{ p.m.} - 3:48 \text{ p.m.}$$

$$= 8 \text{ h } 19 \text{ min} - 3 \text{ h } 48 \text{ min}$$

$$= 4 \text{ h } 31 \text{ min}$$

Using number line: To calculate the duration of time, we draw a line with the start time at one end and the end time at the other.

Here, the start time is not directly on the hour, so add up the minutes to the next hour. Do the same with the end time but to the previous hour. Add up the hours in between. Then, add the minutes as shown below.



Next, show how to find finishing time using addition of elapsed time.

Demonstrate it with examples.

Ashi started her journey at 5:00 am and reached her destination in 7 hours. At what time did she reach her destination?

Given, elapsed time = 7 hours and start time = 5:00 am.

Using the elapsed time formula, we have:

Elapsed Time = End Time – Start Time

So, End Time = Start Time + Elapsed Time

$$\Rightarrow \text{End time} = 5:00 \text{ am} + 7 \text{ hours} = 12 \text{ noon}$$

Hence, Ashi reached her destination at 12 noon.

Encourage the students to practise the questions given in the book.

EVALUATE

Classwork: Ask to solve Q3, 4, 5 of Practice Time 11E and Q1 and 4 of Practice Time 11F.

Homework: Ask to solve Q1 and 2 of Practice Time 11E and Q2, 3 and 5 of Practice Time 11F.

ENHANCE

Ask students to note down the time spent in different activities on weekend or on a holiday.

Hence, order the activities according to the longest to the shortest periods of time. Also, find the sum and difference of the longest and the shortest duration.

ENGAGE

Students are aware of the Calendar. Bring a current year calendar in the class and gather the students in small groups for discussion. Ask to find the day and date of some festivals or any important events.

You can also ask them to count the number of days between any two dates or identify the date for a particular day such as 3rd Saturday of June, 2nd Sunday of October, etc.

Accept their responses and interact if the students have any doubt or query. **[Discussion-based Learning]**

EXPLORE

Divide the class into pairs of students. Provide each group a calendar. Ask them to mark the birth date and find how many days are left or how many days have passed till date. They can also find the number of days between the birth dates of two partners. **[Experiential Learning]**

EXPLAIN

Refer textbook pages 212–214, explain about the use of a calendar. Have the students learn how many days are there in different months of a year. To remember the number of days they can learn the trick of using knuckles as explained in ‘Math Insight’ section on page 214. Also, deal the concept of a leap year as explained under ‘Knowledge Desk’ section on page 212.

Then explain how to convert a week/month/year into days and vice versa. Hence deal the concept of finding the number of days between two dates, or finding the starting/closing date when the closing/starting date along with number of days for any event are given. Solve some examples in the class and encourage the students to attempt the questions given in the book.

Amrit Udyan, New Delhi opened for public on Feb 2nd, 2024 to March 31st, 2024. For how many days was the Amrit Udyan open?

Number of days from 2nd February to 29th February = 28 days. (Since 2024 is a leap year)

Number of days from 1st March to 31st March = 31 days

So, the Amrit Udyan was open for $28 + 31 = 59$ days in 2024. **[Conceptual Understanding]**

ELABORATE

Students are familiar with smaller units of time, such as hours, minutes and seconds; and also have learnt about their inter-conversion. Now, write the relation among bigger units of time, such as days, week, months and year.

1 week = 7 days

1 month = 30 days or 4 weeks

1 year = 365 days or 12 months

Demonstrate how to change them from one to another on the board.

(a) How many months are there in 5 years 4 months?

5 years 4 months = 5×12 months + 4 months = 60 months + 4 months = 64 months

(b) How many weeks are there in a leap year?

We know that a leap year has 366 days and 7 days are there in a week.

To know the equivalent time of 366 days into weeks and days, we divide 366 by 7.

We get 52 complete weeks and 2 days leftover.

$$\begin{array}{r} 7 \overline{)366} (52 \rightarrow \text{weeks} \\ \underline{-35} \\ 16 \\ \underline{-14} \\ 2 \rightarrow \text{days} \end{array}$$

[Cross-curricular Learning]

Hence, motivate students to solve questions given in the book.



EVALUATE

Classwork: Ask to solve Q1, 5 and 6 of Practice Time 11G and ‘Fast Check’ given on page 212.

Homework: Ask to solve remaining questions of Practice Time 11G.

ENHANCE

Ask the students to complete the project work given on page 215.

[Life Skills]

Periods: 11–12

Topic: (Revision)
Chapter assessment

Suggested extra teaching aids:
Math Genius 4 pages 216–218

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 Life Skills.

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 217.

EVALUATE

Classwork: Ask to solve Q1 to 4 of ‘Chapter Assessment’.

Homework: Ask to solve Q5 to 8 of ‘Chapter Assessment’ and ‘Life Skills’ given on page 218.

ENHANCE

Involve students to perform the activity discussed in ‘Gamified Learning’ section on page 218.



Money

Learning Objectives

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

- ◆ compute the total amount of money given
- ◆ add and subtract the amount of money
- ◆ multiply and divide the given amount by any number
- ◆ understand and prepare a bill for a purchase
- ◆ solve the real life problems involving money

LESSON PLAN

Suggested number of periods: 10

Suggested Teaching Aids: Book: Math Genius 4, notebook, chalk, blackboard or whiteboard, projector, smartboard, some real-life objects like eraser, pen, pencil, dummy notes and coins, stickers and chits of some items, A-4 size sheet.

Keywords: Money, currency, notes, coins, amount, bills, customer, seller

Pre-requisite knowledge: Students must be familiar with Indian currency. Also, they should be aware about counting the amount of money.

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 | Topics: Recap; Computing the Total Amount of Money; Addition and Subtraction of Money | Suggested extra teaching aids: Math Genius 4 pages 219–223 |
|---------------------|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------|

ENGAGE

Interact with students and ask some questions to recall the previous knowledge of money.

What is money? What are its uses?

Which Indian currency are in circulation?

How much pocket allowance do you receive?

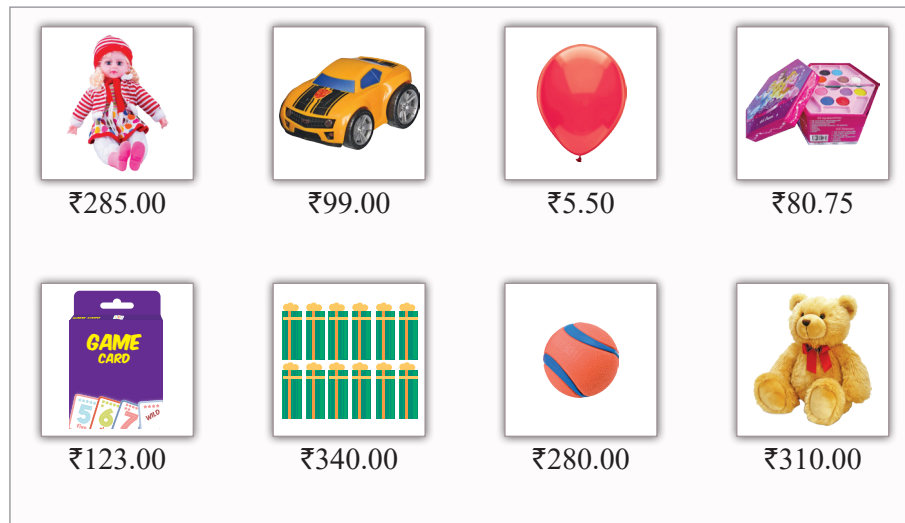
Would you like to save pocket money? Why?

Accept their responses. Then teacher will revise the learners' previous knowledge about Money with the help of "Get Ready" and "Let's Recall" sections given in the book. **[Holistic Learning]**

EXPLORE

Divide the class into pairs. Put some dummy notes and coins. Also, keep a catalogue of some articles.

Invite pair of students one by one. Tell one student to act as a seller and another as a buyer. Buyer has to select any item(s) and seller will calculate the amount. He asks the buyer to pay the amount and he will deliver the items at the customer's home. Buyer will check the amount and pay using dummy notes/coins. He will get the change, if any from seller.



Monitor students' participation and engagement during the activities.

[Experiential Learning]

EXPLAIN

Start the class with an interaction regarding any real life situation. Ask the students for what price they have bought something like their shoes, school uniform, bag, etc. You can also share your expenses on different things purchased last weekend. Then explain how to calculate the total payment and the balance amount.

Refer textbook pages 220–222 for explanation and examples. To check their understanding, reinforce them to solve the questions given in 'Think Tank' sections on pages 221 and 222.

[Conceptual Understanding]

ELABORATE

Use digital copy of notes of different denomination, visualise it on projector and explain about the details printed on it. If possible, you can show it using original notes and instruct the student to see at their home. Next, demonstrate how to count amount of money when there are several notes and coins. Thereafter, solve few problems on the board.

Hence, motivate students to solve questions given in the book.

EVALUATE

Classwork: Ask to solve Q.1, 3 of Practice Time 12A and Q.1, 3 and 8 of Practice Time 12B.

Homework: Ask to solve remaining questions of Practice Time 12A and 12B.


ENHANCE

Ask students to explore which modes of payment people use these days.

[Cross-curricular Learning]

ENGAGE

Start the class with a talk about the shopping. Ask students to share their experience if they have gone to the market or a nearby shop. Instruct them to tell how they select which item is better/cheaper. Then draw a table as shown below and ask the students to complete it.

| | | |
|----|--------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| 1. |  |  |
| | 1 shuttlecock for ₹35 | 4 shuttlecocks for ₹ _____ |
| 2. |  |  |
| | 1 pack of birthday return gift is for ₹ _____ | 12 packs of birthday return gift is for ₹348 |
| 3. | Set A  | Set B  |
| | Set of 3 spoons is for ₹180 | Set of 6 spoons is for ₹300 |
| | Which set is cheaper? _____ | |

Accept the students’ responses and introduce the operation of multiplication and division of money.

[Critical Learning]

EXPLORE

Divide the class in small groups, ask them to perform the activity as suggested in ‘Gamified Learning’ section on page 230.

[Collaborative and Experiential Learning]

EXPLAIN

Refer textbook pages 223–226, explain the operation of multiplication and division of money by solving some examples on the board.

$$\begin{array}{r}
 \text{₹} \quad 348.25 \\
 \times \quad \quad \quad 12 \\
 \hline
 \text{₹} \quad 696.50 \\
 + \text{₹} \quad 3482.50 \\
 \hline
 \text{₹} \quad 4179.00
 \end{array}$$

Hence, ₹348.25 × 12 = ₹4179.00

$$\begin{array}{r}
 14 \overline{)213.50} \quad (15.25 \\
 \underline{-14} \\
 73 \\
 \underline{-70} \\
 35 \\
 \underline{-28} \\
 70 \\
 \underline{-70} \\
 0
 \end{array}$$

Hence, ₹213.50 ÷ 14 = ₹15.25

After understanding it, explain about the bill by showing them a real bill of any purchase done last month.

[Conceptual Understanding]

ELABORATE

Divide the class into groups of 3–4 students. Assign a task to each group. Ask them to make a list of items and their quantities they need for the celebration of Teacher’s Day, Children’s Day, Republic Day, Diwali, Christmas, etc. Write the unit price of the items listed on the board and instruct the class to make a bill for their purchase. For instance, make a bill in the class so that they can learn how to prepare it.

| Bill No. 0718 | Name and Address: Maya, F-6, Punjabi Bagh, Delhi | All-in-One Shop Paschim Vihar, Delhi Phone: 011-xxxxxxxxxxx Date: 14/10/20xx | | |
|----------------------|-----------------------------------------------------------|---------------------------------------------------------------------------------------|----------------|-------------|
| S.No. | Items | Quantity | Rate | Amount |
| | | | ₹ | ₹ |
| 1. | Tricolour Balloons | 3 packets | ₹50 per packet | 150 |
| 2. | Flags | 4 dozen | ₹120 per dozen | 480 |
| 3. | Sweets | 2 kg | ₹360 per kg | 720 |
| 4. | Flowers | 500 g | ₹240 per kg | 120 |
| Grand Total = | | | | 1470 |

EVALUATE

Classwork: Ask to solve Q3, 4, 8, 9 of Practice Time 12C and Q1 of Practice Time 12D.

Homework: Ask to solve remaining questions of Practice Time 12C and 12D.

ENHANCE

Ask students to complete the ‘Life Skills’ given on page 226.

| | | |
|----------------------|-------------------------------------------------|-----------------------------------------------------------------------|
| Periods: 9–10 | Topic: (Revision) Chapter assessment | Suggested extra teaching aids: Math Genius 4 pages 227–230 |
|----------------------|-------------------------------------------------|-----------------------------------------------------------------------|

ENGAGE

Make students comfortable, so that they can ask any question on any previously taught topics. Clarify their doubts and 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 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’ given on page 229.

EVALUATE

Classwork: Ask to solve Q1 to 5 of ‘Chapter Assessment’.

Homework: Ask to solve Q6 to 10 of ‘Chapter Assessment’ and ‘Challenge Question’ given on page 229.



Data Handling

Learning Objectives

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

- ◆ organise data using tally chart
- ◆ represent the data using pictograph and interpret it
- ◆ represent the data using bar graph and interpret it

LESSON PLAN

Suggested number of periods: 10

Suggested Teaching Aids: Book: Math Genius 4, notebook, chalk, blackboard or whiteboard, projector, smartboard, some real-life objects like eraser, pen, pencil, information, some stickers or real objects, A-4 size sheet.

Keywords: Data, Tally Chart, Pictograph, Bar graph

Pre-requisite knowledge: Students must be familiar with data as a numerical information.

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 | Topics: Recap; Data; Organising Data; Pictorial Representation of Data: A Pictograph | Suggested extra teaching aids: Math Genius 4 pages 231–237 |
|---------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------|

ENGAGE

Interact with students and ask what are their favourite subjects. Make a table as shown below and instruct the students to put a bar (|) in the corresponding row of the subject.

| Subject | Tally marks | No. of students |
|-------------|-------------|-----------------|
| English | | |
| Hindi | | |
| Mathematics | | |
| EVS | | |
| GK | | |

Have them understand that we draw four vertical lines up to four observations and the fifth observation is represented by a line running diagonally over the previous vertical four lines, such as $\begin{array}{|l} | \\ | \\ | \\ | \\ \hline \end{array}$

After taking their responses, ask some questions based on the data collected.

Which subject is liked by the most?

How many students like EVS?

How many more/less students like Mathematics than English?

Then teacher will revise the learners' previous knowledge about Data Handling with the help of "Get Ready" section given in the book.

[Holistic and Experiential Learning]

EXPLORE

Divide the class into groups of 4–5 students. Assign a task to each group for collecting data, such as number of students present/absent in different classes/sections of a class, students having any pet, modes of transport they use to come school, and so on. After tabulation of data, instruct them to show them pictorially and describe what it represents.

Monitor students' participation and engagement during the activities.

[Collaborative and Experiential Learning]

EXPLAIN

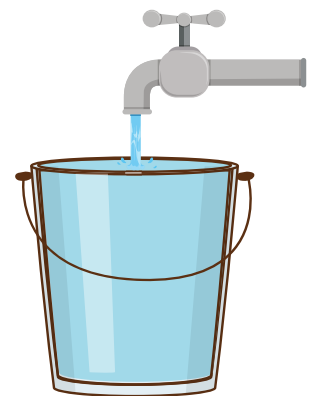
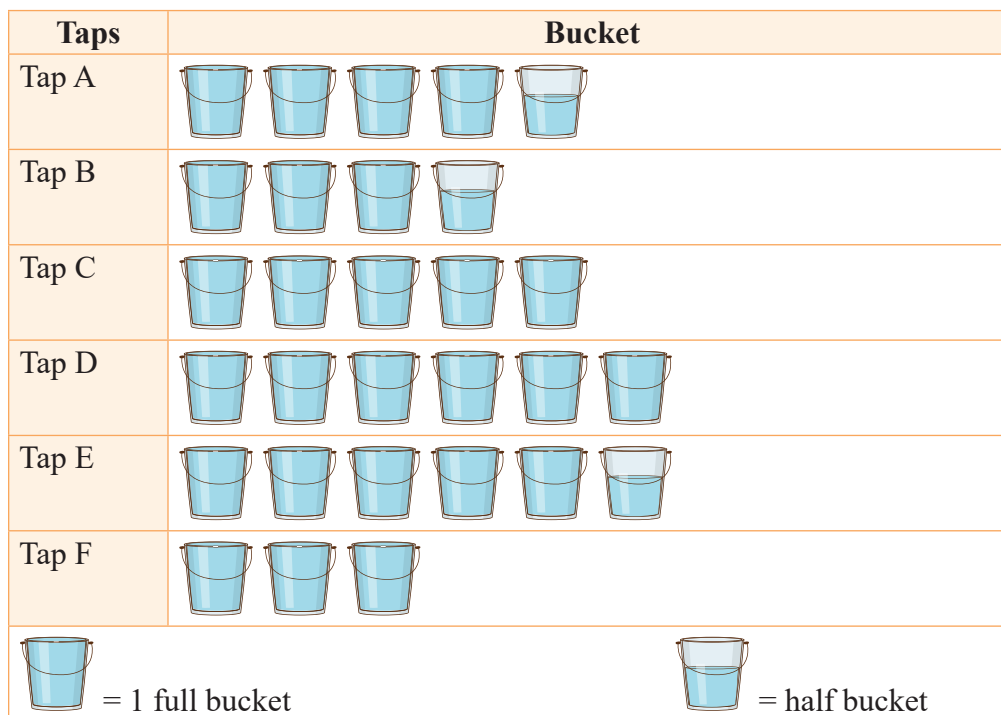
Start the class with an interaction regarding any real life situation. Consider any data and demonstrate how to represent it pictorially using symbols and pictures. Further, display any pictograph on the projector and explain how to interpret it. Refer textbook pages 230–235 for explanation and examples.

[Conceptual Understanding]

ELABORATE

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

The graph given below shows the number of buckets filled in 30 minutes by different taps.



For interpretation of the graph, ask some questions, such as:

In which tap water flows the fastest?

How many buckets can be filled in 1 hour by the tap in which water flows the slowest?



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

If a full bucket holds 20 L of water, how much water flows from tap B in 30 minutes?

Arrange the taps in order showing lowest to fastest running water.

Discuss the answers of these questions. Hence, motivate students to solve questions given in the book.

[Experiential Learning]

EVALUATE

Classwork: Ask to solve Q.1, 3 and 5 of Practice Time 13A.

Homework: Ask to solve remaining questions of Practice Time 13A.

ENHANCE

Ask students to solve 'Maths Connect' section given on page 234.

[Cross-curricular Learning]

Periods: 5–8

Topic: Bar Graph

Suggested extra teaching aids:
Math Genius 4 pages 237–240

ENGAGE

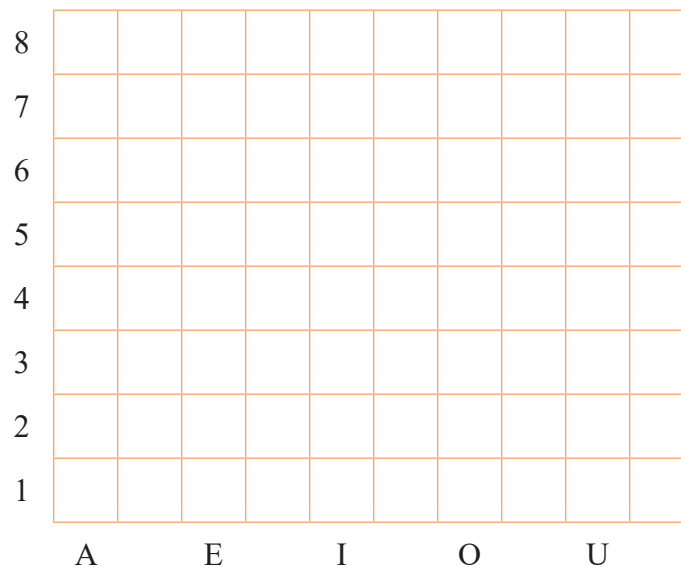
Start the class with a hands-on activity. Ask students to write 5 lines about their favourite cartoon character.

Instruct them to count the number of different vowels appear in their writing.

[Critical Learning]

EXPLORE

Tell the students to take a square grid paper. Write the five alphabets at the bottom of the sheet, leaving a gap of one box as shown below. Then colour the number of boxes as the number of vowels they have noted down earlier.



Have them understand that they have made a bar graph. Instruct them to compare their graphs with their bench partner and discuss.

[Collaborative and Experiential Learning]

EXPLAIN

Refer textbook pages 237-238, explain that bar graph is another way of representation of data. 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 title explaining the information given in the graph.
- the horizontal and vertical axes.

(c) the labels explaining the meaning of each bar.

(d) the scale that is chosen for given data.

Focus on these terms through an example.

The bar graph drawn alongside represents marks obtained by Riya in the unit tests.

In this bar graph, we observe that:

(a) **Title:** Riya's marks obtained in unit tests.

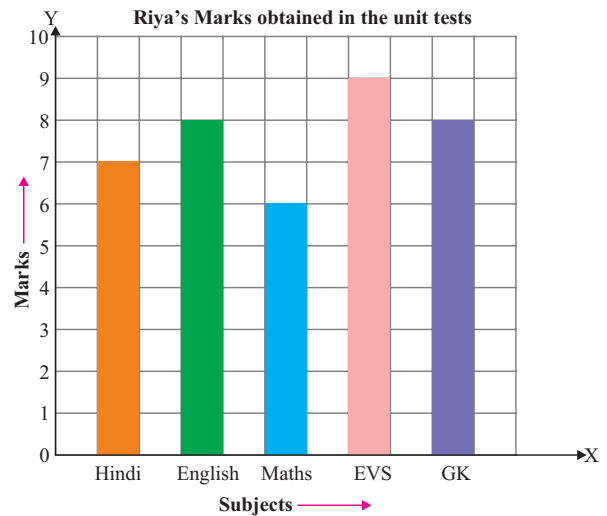
(b) **Axes:** Horizontal axis \rightarrow X-axis.

Vertical axis \rightarrow Y-axis.

(c) **Labels:** Subjects are labelled on X-axis and marks on Y-axis.

(d) **Scale:** On vertical axis, 1 unit length = 1 mark.

[Conceptual Understanding]



ELABORATE

Divide the class into groups of 3–4 students. Ask the groups to do the activity as suggested under 'Life Skills' section on page 239.

EVALUATE

Classwork: Ask to solve Q1 and 3 of Practice Time 13B.

Homework: Ask to solve Q2 of Practice Time 13B.

ENHANCE

Ask students to complete the Project given on page 241.

Periods: 9–10

**Topic: (Revision)
Chapter assessment**

**Suggested extra teaching aids:
Math Genius 4 pages 240–244**

ENGAGE

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

EXPLAIN

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

ELABORATE

Discuss questions 1 and 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 'Challenge Question' given on page 240.

EVALUATE

Classwork: Ask to solve Q1 and 5 of 'Chapter Assessment' and 'Challenge Question' given on page 240.

Homework: Ask to solve Q2 to 4 of 'Chapter Assessment'.

ENHANCE

Ask students to perform the activity as suggested in 'Gamified Learning' section given on page 244.