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MATH GENIUS

Think Smart, Solve Fast



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 Gamified Learning 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** 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.

- ❖ It enhances students' curiosity, interest, and engagement and help them access prior knowledge.
- ❖ It provides students with opportunities to construct learning experience through activities.
- ❖ It enables both teachers and students to recognise the impact of learning, reflect on what has been learned, and evaluate how it was learned.

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 teacher's community will be gratefully acknowledged by us.

—Publisher

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Patterns in Mathematics

Learning Objectives

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

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

LESSON PLAN

Suggested number of periods: 10

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

Keywords: Patterns, odd numbers, even numbers, triangular numbers, square numbers, cubes or cubic numbers, pentagonal numbers, hexagonal numbers, centred hexagonal numbers, fibonacci sequence, Virahanka numbers, regular polygons, tessellations, stacked triangles and stacked squares, Koch snowflakes and Sierpinski triangle, etc.

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

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

Periods: 1–2

Topics: What is a Pattern;
Understanding Patterns

NEP Skills: Collaborative Learning,
Discussion-Based Learning

TEACHER-PUPIL ACTIVITY

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

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

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

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

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

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

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

EXPLANATION

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

ASSIGNMENTS

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

Homework: Remaining questions of Practice Time 1A.

Periods: 3-4

Topics: Interesting Number Patterns;
Geometrical Patterns in Numbers

NEP Skills: Experiential Learning,
Collaborative Learning

TEACHER-PUPIL ACTIVITY

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


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

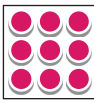
For example, one group could build a square shape using square numbers (1, 4, 9, 16), while another might create a triangle using triangular numbers (1, 3, 6, 10) and so on with each member drawing pattern of one number only.

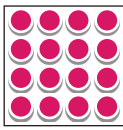
Ask students to connect each number in their pattern to a specific visual element.

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


$$1 \times 1 = 1$$



$$2 \times 2 = 4$$

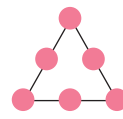

$$3 \times 3 = 9$$

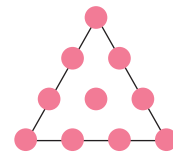

$$4 \times 4 = 16$$

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


$$1$$


$$3$$


$$6$$


$$10$$

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

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

Discuss what happens to the shape as the numbers increase.

EXPLANATION

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

ASSIGNMENTS

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

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

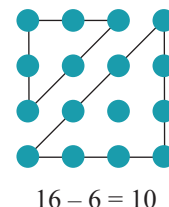
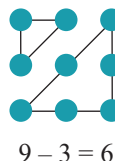
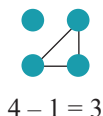
TEACHER-PUPIL ACTIVITY

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

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

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

Ask the students to extend the table with additional triangular numbers and square numbers they calculated. Using the above table, encourage the students to establish relationship between square and triangular numbers like,



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

EXPLANATION

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

ASSIGNMENTS

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

Homework: Remaining questions of Practice Time 1C.

TEACHER-PUPIL ACTIVITY

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

Divide the class into 4 teams.

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

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

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

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

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

EXPLANATION

Take reference of pages 17 and 18 of Math Genius 6 to explain about different patterns and shapes as given in the textbook.

ASSIGNMENTS

Classwork: Discuss ‘Create and solve’ on page 18, and Q.1-4 of Practice Time 1D.

Homework: Remaining questions of Practice Time 1D.

Periods: 9–10

Topic: Revision

NEP Skills: Critical Thinking,
Logical Thinking

TEACHER-PUPIL ACTIVITY

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

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

Divide the students into small groups and guide them to do the activity given in the ‘Gamified Learning’ section.

ASSIGNMENTS

Classwork: Challenge Question on page 20, few questions of section A-E of Chapter Assessment and Mental Maths on page 20.

Homework: Remaining questions of Chapter Assessment, Maths Connect and Maths Fun on page 20.

2

Lines and Angles

Learning Objectives

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

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

LESSON PLAN

Suggested number of periods: 16

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

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

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

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

Periods: 1–2

Topic: Basic Concepts of Geometry

NEP Skills: Collaborative Learning,
Discussion-Based Learning

TEACHER-PUPIL ACTIVITY

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

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

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

- ❖ Two plane shapes

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

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

Ask to submit the worksheets to the teacher after completing the evaluation.

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

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

EXPLANATION

Take reference of pages 25-29 of Math Genius 6 and explain the examples 1-4 on board.

ASSIGNMENTS

Classwork: Q.1-5 of Practice Time 2A; Fast Check on page 29.

Homework: Remaining questions of Practice Time 2A.

Periods: 3–6

Topics: More About Line Segments,
Measuring a line segment

NEP Skills: Experiential Learning,
Discussion-Based Learning

TEACHER-PUPIL ACTIVITY

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

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

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

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

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

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

Help students to measure line segments using dividers.

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

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

EXPLANATION

Take reference of pages 31-32 of Math Genius 6 to demonstrate comparison of line segments by observation, by tracing paper and using a divider. Also explain measuring of line segment using a divider and ruler with examples given on pages 32-33 on board.

ASSIGNMENTS

Classwork: Q.1-3 of Practice Time 2B; Fast Check on page 33.

Homework: Q4 of Practice Time 2B.

Periods: 7–8

Topics: Angles, Comparison of angles

NEP Skills: Experiential Learning,
Creative Thinking

TEACHER-PUPIL ACTIVITY

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

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

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

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

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

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

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

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

EXPLANATION

Further using the reference of pages 34-35 of Math Genius 6 to explain the concept of angles. Also explain the interior and exterior of angles using examples given on pages 35-36.

ASSIGNMENTS

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

Homework: Q3 of Practice Time 2C; Maths Talk on page 37; Fast Check on page 38.

Periods: 9–11

Topics: Magnitude of an Angle; Making your
own Protractor; Drawing Angles

NEP Skills: Collaborative Learning

TEACHER-PUPIL ACTIVITY

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

Discuss the concept of the magnitude (size) of the angle. Explain that the size is measured in degrees ($^\circ$) and we measure the angles using the protractor.

Distribute A4 sheets to all students in the classroom.

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

Ask to record their findings.

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

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

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

EXPLANATION

Take reference of pages 39-47 of Math Genius 6 to explain magnitude of an angle, making your own protractor and drawing angles by using the protractor and explain examples based on it on the board. Also, discuss 'A Pinch of History', 'Get it Right', angle bisector in the class.

ASSIGNMENTS

Classwork: Q.1-5 of Practice Time 2D and Q.1-3 of Practice time 2E; Maths Connect on page 42, Fast Check on page 45.

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

Periods: 12–14

Topics: Types of Angles;
Real life Application of Angles

NEP Skills: Experiential
Learning, Discussion-Based
Learning

TEACHER-PUPIL ACTIVITY

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

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

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

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

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

Discuss the different angles formed.

Also discuss the angles of yoga poses shown in "Get Ready" section on page 24.

EXPLANATION

By taking reference of pages 48-56 of Math Genius 6 explain the types of angles, and real life application of angles by explaining the examples given on pages 51-52 on board.

ASSIGNMENTS

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

Homework: Remaining questions of Practice Time 2F and 2G, Activity on page 50, Fast Check on page 51.

Periods: 15–16

Topic: Revision

NEP Skills: Logical Thinking,
Critical Thinking

TEACHER-PUPIL ACTIVITY

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

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

Divide the students into small groups and guide them to do the activity given in the ‘Gamified Learning’ section.

Motivate students to play “Labyrinth” in their leisure time on page 62.

ASSIGNMENTS

Classwork: Challenge Question on page 56, few questions of section A-E of Chapter Assessment and Mental Maths on page 56.

Homework: Remaining questions of Chapter Assessment.



Number Play

Learning Objectives

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

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

LESSON PLAN

Suggested number of periods: 16

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

Keywords: Numbers, subcells, supercells, digit sums of numbers, Palindromic numbers, Collatz conjecture, Kaprekar constant, Tarsia puzzle, estimation, etc.

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

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

Periods: 1–4	Topics: Journey of Numbers; Role of Numbers in Our Life; Large Numbers; Comparing Numbers	NEP Skills: Collaborative Learning, Discussion Based Learning, Logical Thinking
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TEACHER-PUPIL ACTIVITY

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

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

- Discuss the activity given on pages 67-68 of the textbook and ask the students to perform the activity based on this. Divide the class into groups of 6 pupils each. Teacher will write a 6-digit number on

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

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

54321	54312		
12345	12354		
13245			35412
45213	41325	42153	31245

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

54321	54312		
12345	12354		
13245			35412
45213	41325	42153	31245

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

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

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

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

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

EXPLANATION

Take reference of pages 66-72 of Math Genius 6 to recall and explain the journey of numbers, role of numbers in our life, large numbers, numbers on the number line, comparing numbers, subcells and supercells, and examples based on it on board.

ASSIGNMENTS

Classwork: Q.1-5 of Practice Time 3A; Fast Check on page 70.

Homework: Remaining questions of Practice Time 3A; Maths Connect on page 72, Think Tank on pages 67, 68 and 71.

TEACHER-PUPIL ACTIVITY

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

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

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

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

Once paired, students compare numbers and discuss any patterns.

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

EXPLANATION

Take reference of pages 73-74 of Math Genius 6 to demonstrate digit sum of numbers, digit detectives on board. Also, discuss example given on page 74.

ASSIGNMENTS

Classwork: Q.1-2 of Practice Time 3B; Fast Check on page 73.

Homework: Remaining questions of Practice Time 3B; Maths Talk on page 73.

TEACHER-PUPIL ACTIVITY

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

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

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

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

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

Continue till the given numbers are changed to palindromic numbers.

EXPLANATION

Take reference of pages 74-78 of Math Genius 6 to explain the formation of numbers, palindromic pattern on board with demonstrating and discussing the examples given on pages 75-78 on board.

ASSIGNMENTS

Classwork: Q.1-7 of Practice Time 3C; Activity on page 78.

Homework: Remaining questions of Practice Time 3C; Fast Check on page 76.

TEACHER-PUPIL ACTIVITY

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

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

$$10 \text{ (even)} \rightarrow 5 \text{ (odd)} \rightarrow 16 \text{ (even)} \rightarrow 8 \text{ (even)} \rightarrow 4 \text{ (even)} \rightarrow 2 \text{ (even)} \rightarrow 1$$

$$(10 \div 2) \quad (5 \times 3 + 1) \quad (16 \div 2) \quad (8 \div 2) \quad (4 \div 2) \quad (2 \div 2)$$

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

Allow the students to participate in working out the example.

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

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

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

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

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

The first one to reach 495 will get accolades.

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

EXPLANATION

Take reference of pages 79-83 of Math Genius 6 to discuss playing with number patterns, Collatz Conjecture, Kaprekar constant in detail and the examples given on pages 80 and 83 on board. Also, discuss “A Pinch of History” in the classroom if possible.

ASSIGNMENTS

Classwork: Q.1-4 of Practice Time 3D; Think Tank on page 80.

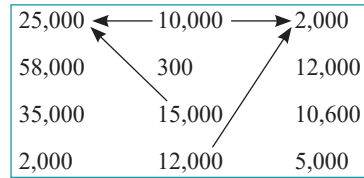
Homework: Remaining questions of Practice Time 3D; Project given on page 83.

TEACHER-PUPIL ACTIVITY

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

Also, discuss the topic Digits and Operations.

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



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

$$\diamond 10,000 \times 1 + 15,000 \times 1 = 25,000$$

$$\diamond 12,000 - 10,000 = 2,000$$

Ask the students to find as many combinations of middle numbers as possible to get the side numbers.

The group that finds the maximum combinations of numbers will be praised.

EXPLANATION

By taking reference of pages 84-87 of Math Genius 6, explain the concept of breaking up numbers by addition and subtraction and digits and operations in detail with examples given on pages 85-87 on board. Also, discuss “Tarsia Puzzle” given on page 87 under the section “Create and Solve”.

ASSIGNMENTS

Classwork: Q.1-3 of Practice Time 3E; Fast Check on page 85.

Homework: Remaining questions of Practice Time 3E; Maths Talk on page 86.

Periods: 13–14

Topic: Estimation

NEP Skills: Collaborative Learning, Experiential Learning, Logical Thinking

TEACHER-PUPIL ACTIVITY

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

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

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

EXPLANATION

By taking reference of pages 88-90 of Math Genius 6, explain estimation in detail by demonstrating the examples given on pages 89-90 on board.

ASSIGNMENTS

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

Homework: Remaining questions of Practice Time 3F.

TEACHER-PUPIL ACTIVITY

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

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

Divide the students into small groups and guide them to do the activity given in ‘Gamified Learning’ section.

ASSIGNMENTS

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

Homework: Remaining questions of Chapter Assessment, Mental Maths on page 93, Challenge Question on page 94.



Data Handling and Presentation

Learning Objectives

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

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

LESSON PLAN

Suggested number of periods: 16

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

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

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

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

Periods: 1–4 | **Topics:** What is Data; Need for Data; Types of Data; Recording Data; Organising Data

NEP Skills: Discussion-Based Learning, Collaborative Learning, Experiential Learning

TEACHER-PUPIL ACTIVITY

Start the class by discussing the scene given in “Get ready!” and questions of “Let’s recall” given on pages 95-96 of the textbook.

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

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

Take the reference of the examples 1-2 on pages 99-100. Also, reiterate the class that the number of times a particular observation or value occurs is called the frequency.

EXPLANATION

Take the reference to pages 96-100 of Math Genius 6 to recall and explain the data, its requirements, types, organisation and recording.

ASSIGNMENTS

Classwork: “Maths Connect” on page 97 and Q.1-2 of Practice Time 4A.

Homework: “Activity” given on page 100 and remaining questions of Practice Time 4A.

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

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

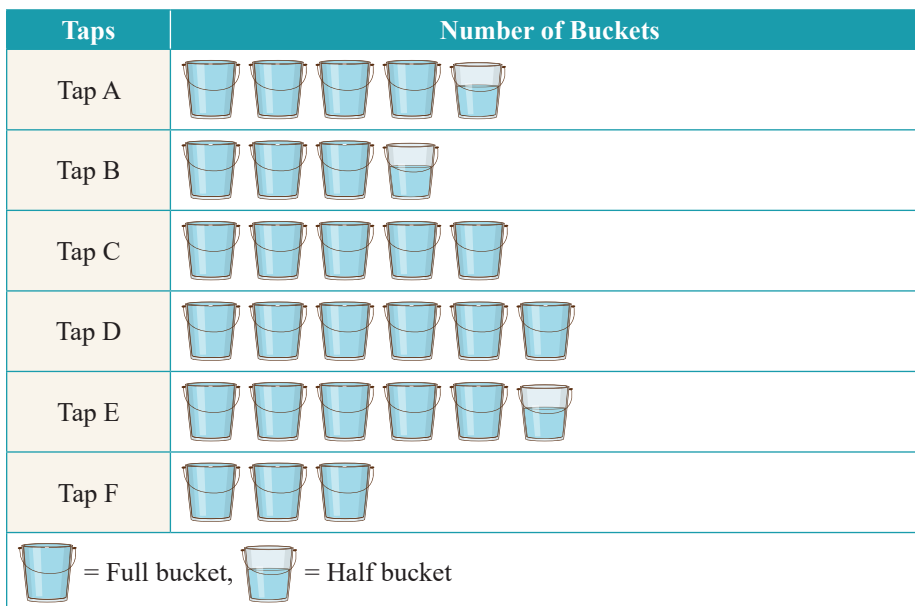
Show a simple example of a pictograph and explain the key elements:

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

Discuss how pictographs help in understanding data quickly.

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

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



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

- ❖ By which tap the water flow is the fastest?
- ❖ By which tap the water flow is the least?
- ❖ How many buckets can be filled in 1 hour by the tap A?
- ❖ How many buckets can be filled by tap B in 2 hours?

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

Discuss the answers of these questions.

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

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

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

After that discuss with the class about advantages and disadvantages of the pictograph. Take the reference of page 107 to explain this topic.

EXPLANATION

Take reference of pages 103-105 (including examples 3-4) of Math Genius 6 to explain the mentioned topics.

ASSIGNMENTS

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

Homework: Remaining questions of Practice Time 4B.

Periods: 8–11

Topics: Bar Graph; Interpretation of Bar Graph; Drawing a Bar Graph

NEP Skills: Creative Thinking, Discussion-Based Learning, Experiential Learning

TEACHER-PUPIL ACTIVITY

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

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

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

- ❖ Which fruit name/sweet name/subject name is liked by the most?
- ❖ Which fruit name/sweet name/subject name is liked by the least number of students?

Accept the response.

EXPLANATION

Take reference to pages 108-114 of Math Genius 6 for detailed explanation of topics mentioned above. Also, demonstrate the examples 5-8 on the board.

ASSIGNMENTS

Classwork: Discuss “Think Tank” on page 112 in the classroom and ask to solve Q. 1, 2 and 4 of Practice Time 4C.

Homework: Remaining questions of Practice Time 4C.

Periods: 12–14

Topic: Artistic and Aesthetic Considerations

NEP Skills: Art Integration, Experiential Learning

TEACHER-PUPIL ACTIVITY

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

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

Divide the class into groups. Distribute graph paper to each group. Instruct them to create a bar graph by using the data given on page 117.

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

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

EXPLANATION

Take reference to pages 116-118 to demonstrate the artistic and aesthetic way to represent the data.

ASSIGNMENTS

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

Homework: Remaining questions of Practice Time 4D.

Periods: 15–16

Topic: Revision

NEP Skills: Critical Thinking, Logical Thinking

TEACHER-PUPIL ACTIVITY

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

ASSIGNMENTS

Classwork: Challenge Question on page 119; Few questions of section A-D of Chapter Assessment.

Homework: Remaining questions of Chapter Assessment, Maths Fun on page 118.



Prime Time

Learning Objectives

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

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

LESSON PLAN

Suggested number of periods: 18

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

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

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

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

Periods: 1–3

Topic: Multiples and Factors

NEP Skills: Collaborative Learning,
Experiential Learning

TEACHER-PUPIL ACTIVITY

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

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

Accept the response.

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

Draw a table with two columns on the board: one column labelled as factors and the other labelled as multiples. Distribute some number flash cards up to number 70 to each team, so that each member of the team gets two flash cards.

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

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

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

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

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

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

EXPLANATION

Take reference of pages 126-129 of Math Genius 6 (including Get Ready!) to recall and explain about multiples and factors on board in detail.

ASSIGNMENTS

Classwork: Fast check on page 128 and Q. 1-2 of Practice Time 5A.

Homework: Remaining questions of Practice Time 5A.

Periods: 4–6

Topic: Common Multiples and Common Factors

NEP Skills: Collaborative Learning, Logical Thinking

TEACHER-PUPIL ACTIVITY

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

EXPLANATION

Take reference to pages 130-132 of Math Genius 6 to explain the topics mentioned above.

ASSIGNMENTS

Classwork: Think Tank on page 131; Fast Check on page 132; Q. 1, 5, 9 and 12 of Practice Time 5B.

Homework: Remaining questions of Practice Time 5B.

TEACHER-PUPIL ACTIVITY

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

Instruct to write 1 to 200 on it.

Instruct students to find out all prime and composite numbers by using the method of sieve using the reference given on page 135 of the textbook.

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

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

EXPLANATION

By taking reference of pages 135-137 of Math Genius 6, explain the topic mentioned above in detail.

ASSIGNMENTS

Classwork: Discuss and ask to solve Fast Check and Think Tank on page 136; and Q. 1, 3, 6 and 8 of Practice Time 5C.

Homework: Remaining questions of Practice Time 5C.

TEACHER-PUPIL ACTIVITY

- Divide the class into pairs. Write some numbers on the blackboard and ask the pairs to write the prime factors of the numbers by using factor tree and division methods. Accept the responses from the class. Take the reference of in-text examples of the textbook, to find the prime factorisation of other numbers.

EXPLANATION

Take reference to pages 138-140 of Math Genius 6 to explain the topics mentioned in detail with examples.

ASSIGNMENTS

Classwork: Think Tank on page 138 and Q. 1-3 of Practice Time 5D.

Homework: Remaining questions of Practice Time 5D.

TEACHER-PUPIL ACTIVITY

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

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

On behalf of this, explain to the class the concept of divisibility rules for different numbers and their properties.

Follow up by the hands-on activity given for prime art on pages 144-145 of the textbook.

EXPLANATION

Take reference to pages 141-145 of Math Genius 6 to explain the topics mentioned above in details. Also discuss “Enrichment” given on page 141.

ASSIGNMENTS

Classwork: Think Tank given on page 143 and 145, Fast Check on page 144, Maths Fun given on page 145 and Q. 1, 3, 5, 9 and 15 of Practice Time 5E.

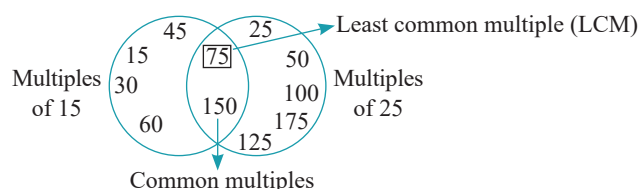
Homework: Remaining questions of Practice Time 5E.

TEACHER-PUPIL ACTIVITY

- Divide students into small groups. Assign each group a pair of numbers. For example, 24 and 36; 15 and 25; 32 and 68, etc. Ask each group to create factor trees for both numbers. Instruct them to identify the common prime factors and multiply them to find the HCF by discussing with each other.

- Next, ask them to draw a Venn diagram on A4 sheet or in a notebook.

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



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

Also, discuss facts about HCF and LCM with examples.

EXPLANATION

Take reference to pages 147-152 of Math Genius 6 to explain the topics mentioned in detail.

ASSIGNMENTS

Classwork: Fast Check on page 149 and 152, Think Tank on page 151, and Q. 1-5 of Practice Time 5F.

Homework: Remaining questions of Practice Time 5F.

TEACHER-PUPIL ACTIVITY

Make students comfortable, so that they can ask any question on any previously taught topics. Clarify their doubts or queries and start the revision of the exercise. Start the revision of the exercise, by using Mind Map, Challenge Question, Chapter Assessment, Life skills and Mental Maths. Divide the students into small groups and guide them to do the activity given in the ‘Gamified Learning’ section.

ASSIGNMENTS

Classwork: Challenge Question, Q. 1, 6 of Part A, Q. 3 of Part B, Q. 1, 4, 7 and 11 of Part E of Chapter Assessment and Mental Maths on page 153.

Homework: Remaining questions of Chapter Assessment and Life Skills on page 153.

6

Perimeter and Area

Learning Objectives

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

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

LESSON PLAN

Suggested number of periods: 15

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

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

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

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

Periods: 1–4

Topics: Perimeter; Perimeter of a rectangle, square, triangle, equilateral triangle and regular polygon

NEP Skills: Conceptual and experiential learning

TEACHER-PUPIL ACTIVITY

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

Divide the class into pairs of students.

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

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

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

Also, by taking reference to pages 163-164, explain to the students of the class about the formula of the perimeter of different regular geometrical figures, like:

Perimeter of a rectangle = $2(\text{length} + \text{breadth})$

Perimeter of a square = $4 \times \text{side}$

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

Perimeter of an equilateral triangle = $3 \times \text{side}$

Perimeter of a regular pentagon = $5 \times \text{length of a side}$

Perimeter of a regular hexagon = $6 \times \text{length of a side}$

Perimeter of a regular heptagon = $7 \times \text{length of a side}$

Perimeter of a regular octagon = $8 \times \text{length of a side}$

EXPLANATION

Take reference from pages 163-167 of Math Genius 6 to recall and explain the perimeter of a rectangle, square, triangle, equilateral triangle, and the perimeter of a regular polygon with detailed examples on the board.

ASSIGNMENTS

Classwork: Discuss “Think Tank” (pages 165, 166), “Maths Fun” (page 165), “Maths Talk” (page 167), and Q.1-2 of Practice Time 6A. Also, motivate to do the “Activity” given on page 168 in their leisure period or maths activity period

Homework: Remaining questions of Practice Time 6A.

Periods: 5–8

Topics: Understanding area; Area on square grid paper; Area of a square and a rectangle

NEP Skills: Conceptual and experiential learning

TEACHER-PUPIL ACTIVITY

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

Demonstrate that the area of square = $\text{side} \times \text{side}$.

Introduce the topic “Understanding area” and “Area on square grid paper” by referring to pages 168-170 of the textbook.

- Distribute grid paper to the students.

Ask students to draw squares of different sizes (e.g. $2 \text{ cm} \times 2 \text{ cm}$, $3 \text{ cm} \times 3 \text{ cm}$, $4 \text{ cm} \times 4 \text{ cm}$,...) on their grid paper using a ruler.

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

Ask them to verify if the count matches the formula

$$\text{Area} = \text{side} \times \text{side}$$

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

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

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

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

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

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

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

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

EXPLANATION

Take reference from pages 168-174 of Math Genius 6 to explain the area of regular and irregular shapes in detail with examples on the board.

ASSIGNMENTS

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

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

Periods: 9–10

Topics: Area of a triangle; Making different arrangements

NEP Skills: Conceptual, experiential and art integrated learning

TEACHER-PUPIL ACTIVITY

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

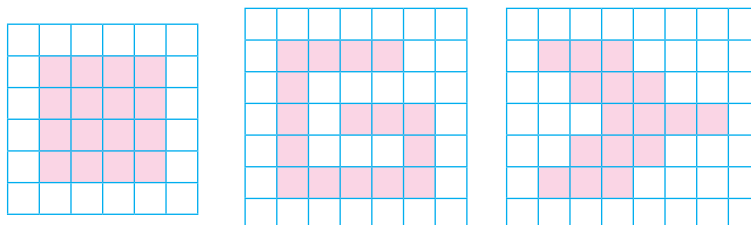
Ask students to construct a rectangle on the grid paper using a coloured pencil. Then, instruct them to cut the rectangle along one of its diagonals to get two triangles.

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

Then deduce the formula that:

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

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



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

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

EXPLANATION

By taking reference of pages 175-179 of Math Genius 6, explain the area of a triangle, the area and perimeter of different arrangements, and the area and perimeter related to different house plans with detailed examples.

ASSIGNMENTS

Classwork: Discuss and ask students to solve “Fast Check (Page 177)”, “Think Tank (Page 177)”, “Create and Solve (Page 180)”, and Q1 and Q2 of Practice Time 6D.

Homework: Remaining questions of Practice Time 6D.

Periods: 11–12

Topic: Area using a geoboard

NEP Skills: Collaborative and experimental learning

TEACHER-PUPIL ACTIVITY

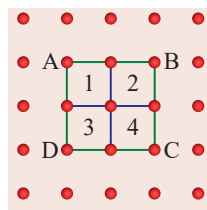
Show a geoboard in the classroom, and introduce it as a mathematical tool used to find the perimeter and area of any polygon by using the following activities:

- Show students how to stretch a rubber band around the peg/nails to form different shapes.
- Explain that each square unit on the geoboard represents **1 square unit of area** (e.g., 1 cm² if using a cm-scale board).

Divide the class into 4-5 groups.

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

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

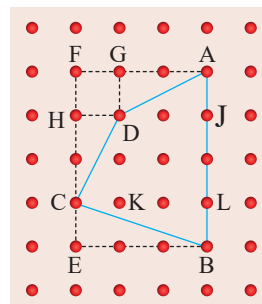
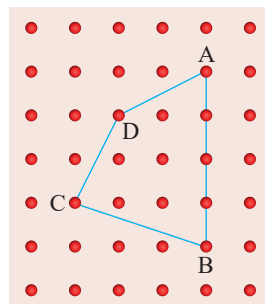


Area of square ABCD = 4 sq. units.

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

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

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



$$\begin{aligned} \text{Area of quadrilateral ABCD} &= \text{Area of rectangle ABEF} - (\text{Area of triangle AGD} + \text{Area of triangle} \\ &\text{DHC} + \text{Area of triangle CEB} + \text{Area of square FGDH}) = \\ &= \left\{ 12 - \left(1 + 1 + 1 + 1\frac{1}{2} \right) \right\} = 7\frac{1}{2} \text{ sq. units} \end{aligned}$$

EXPLANATION

Take reference from pages 181-182 to demonstrate the calculation of area using a geoboard in detail with examples.

ASSIGNMENTS

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

Homework: Remaining questions of Practice Time 6E.

Periods: 13–15

Topic: Revision

NEP Skills: Coceptual learning' to pupils

TEACHER-PUPIL ACTIVITY

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

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

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

ASSIGNMENTS

Classwork: Challenge Question, Sections A-E of Chapter Assessment and Mental Maths.

Homework: Remaining questions of the Chapter Assessment.



Fractions

Learning Objectives

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

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

LESSON PLAN

Suggested number of periods: 15

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

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

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

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

Period: 1

Topic: Fractions

NEP Skills: Conceptual, collaborative and experiential learning

TEACHER-PUPIL ACTIVITY

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

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

Accept the responses. Also, use the “Let’s Recall” section of the chapter.

Activity:

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

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

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

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

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

Divide the class into 4 to 5 groups.

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

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

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

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

EXPLANATION

Take reference of pages 189-190 of Math Genius 6 to recall and explain fractions in detail.

ASSIGNMENTS

Classwork: Discuss “Knowledge Desk” given on page 190.

Periods: 2–5

Topic: Representation of fractions on a number line; Types of fractions

NEP Skills: Conceptual, collaborative and experiential learning

TEACHER-PUPIL ACTIVITY

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

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

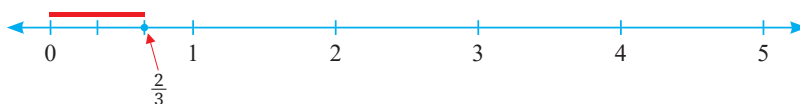
Recall the concept that fractions represent part of a whole.

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

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

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

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



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

Discuss placement and adjust and correct if needed.

Further discuss types of fraction.

Proper fraction: numerator < denominator

Improper fractions: numerator \geq denominator

Mixed fraction: whole number + fraction.

- Distribute flashcards with different fractions.

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

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

Teacher will go through sorted fractions and discuss any mistakes.

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

EXPLANATION

Take reference of pages 190-193 of Math Genius 6 to explain representation of fractions on a number line, types of fractions, conversion of an improper fraction into a mixed fraction and vice-versa.

ASSIGNMENTS

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

Homework: Remaining questions of Practice Time 7A. Also write a short note on uses of fractions from ancient India by using “pinch of history” given on page 194 of textbook and internet. [Tech connect]

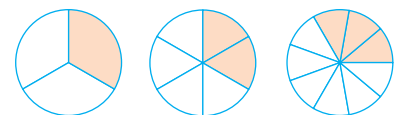
Periods: 6–9

Topics: Equivalent fractions; Comparing fractions

NEP Skills: Conceptual, collaborative and experiential learning

TEACHER-PUPIL ACTIVITY

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



$$\frac{1}{3}$$

$$\frac{3}{9}$$

$$\frac{2}{6}$$

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

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

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

If they have, they put a mark on it.

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

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



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

- Introduce comparison of fractions through an activity.

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

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

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

<p>Student 1</p> 	<p>Student 2</p> 	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #008080; color: white;"> <th style="padding: 5px;">Smaller Fraction</th> <th style="padding: 5px;">Greater Fraction</th> </tr> </thead> <tbody> <tr> <td style="padding: 10px; vertical-align: middle;">$\frac{2}{4}$</td> <td style="padding: 10px; vertical-align: middle;">$\frac{5}{6}$</td> </tr> </tbody> </table>	Smaller Fraction	Greater Fraction	$\frac{2}{4}$	$\frac{5}{6}$
Smaller Fraction	Greater Fraction					
$\frac{2}{4}$	$\frac{5}{6}$					

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

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

Further reiterate comparison of like fractions and unlike fractions by taking the reference of pages 198-199 of textbook.

EXPLANATION

Also, by taking reference of pages 195-199 of Math Genius 6, explain equivalent fractions and comparison of fractions in detail with examples.

ASSIGNMENTS

Classwork: Discuss “Activity”, ask to solve “Think Tank” and “Fast Check” given on pages 195, 197 and 198, respectively. And Q. 1, 2 and 3 of Practice Time 7B and Q. 1 and 2 of Practice time 7C.

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

Periods: 10–12

Topic: Operations on fractions

NEP Skills: Conceptual, collaborative learning

TEACHER-PUPIL ACTIVITY

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

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

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

$$(a) \frac{3}{13} + \frac{5}{13} = \frac{3+5}{13} = \frac{8}{13}$$

$$(b) \frac{9}{47} - \frac{4}{47} = \frac{9-4}{47} = \frac{5}{47}$$

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

(a) Add the fractions $\frac{3}{8}$ and $\frac{2}{3}$.

(b) Subtract $\frac{1}{5}$ from $\frac{5}{6}$.

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

(a) First convert the fraction into like fractions.

The LCM of the denominators 8 and 3 is 24.

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

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

(b) First convert the fraction into like fractions.

The LCM of the denominators 5 and 6 is 30.

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

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

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

EXPLANATION

Take reference of pages 200-202 to explain addition and subtraction of like, unlike and mixed fractions in detail with examples.

ASSIGNMENTS

Classwork: Classwork: “Fast Check” page-201, Q.1, 2 and 3 of Practice Time 7D.

Homework: Remaining questions of Practice Time 7D.

Periods: 13–15

Topic: Revision

NEP Skills: Conceptual learning,
experiential learning

TEACHER-PUPIL ACTIVITY

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

Start the revision of the exercise, by using Mind Map, Challenge Question and chapter assessment.

Divide the students into small groups and guide them to do the activity given in the ‘Gamified Learning’ section.

ASSIGNMENTS

Classwork: Challenge Question, Section A-D of Chapter Assessment.

Homework: Remaining questions of Chapter Assessment.



Playing with Constructions

Learning Objectives

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

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

LESSON PLAN

Suggested number of periods: 15

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

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

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

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

Periods: 1–5

Topics: Curves; Circle; Wavy wave; Squares and rectangles

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

TEACHER-PUPIL ACTIVITY

Start the class by asking to identify, classify and describe basic geometric shapes. For example, circle, rectangle, square, etc. Also discuss “Get ready”, given on page 209.

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

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

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

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

Further divide the class into pairs.

Ask each pair to create pair of eyes on an A4 chart paper by taking the reference of the pages 211-212 of the textbook.

Next, ask the class to exchange their partners and create the next diagram the “Wavy Wave” on A4 chart paper by taking the reference given on page 213 of textbook.

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

EXPLANATION

By taking reference of pages 210-215 of Math Genius 6 explain curves, circle, wavy wave, and construction based on it, squares and rectangles and its properties in detail.

ASSIGNMENTS

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

Homework: Remaining questions of Practice Time 8A.

Periods: 6–10

Topics: Constructing squares and rectangles; More about rectangles

NEP Skills: Conceptual, collaborative and experiential learning

TEACHER-PUPIL ACTIVITY

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

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

Rectangle: Opposite sides are equal, 4 right angles.

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

Give each group a set of sticks and clay.

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

Emphasise accurate measurement using rulers.

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

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

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

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

Also explain breaking rectangles with help of thread.

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

EXPLANATION

Take reference of pages 214-222 of Math Genius 6 to explain construction of squares, rectangles, breaking rectangles and shading the squares with examples on the board.

ASSIGNMENTS

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

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

Periods: 11–13

Topics: Exploring Diagonals of Rectangles and Squares; Points Equidistant from Two Given Points; To draw a square inscribed in a given circle.

NEP Skills: Conceptual, collaborative and experiential learning

TEACHER-PUPIL ACTIVITY

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

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

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

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

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

Instruct the class to draw a house on a chart paper or in their geometry notebooks by following the steps given in the textbook (page 226).

Encourage students to decorate their drawing using colors.

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

Measure the angles and distances to verify accuracy.

EXPLANATION

Also, by taking reference of pages 223-227 of Math Genius 6, explain construction of rectangles, points equidistant from two given points and to draw square inscribed in a given circle in detail with examples.

ASSIGNMENTS

Classwork: Discuss “Maths Talk”, ask to do the activity of “Create and Solve” and “Knowledge Desk” given on pages 223, 225, and 227 respectively. And Q1, 2 and 3 of Practice Time 8D.

Homework: Remaining questions of Practice Time 8D.

Periods: 14–15

Topic: Revision

NEP Skills: Conceptual learning, experiential learning

TEACHER-PUPIL ACTIVITY

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

Start the revision of the exercise by using Mind Map, Challenge Question and chapter assessment.

Divide the students into small groups and guide them to do the activity given in the ‘Gamified Learning’ section.

ASSIGNMENTS

Classwork: Challenge Question, Section A, B and C of Chapter Assessment.

Homework: Remaining questions of Chapter Assessment.



Symmetry

Learning Objectives

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

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

LESSON PLAN

Suggested number of periods: 15

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

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

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

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

Periods: 1–3

Topic: Symmetry

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

TEACHER-PUPIL ACTIVITY

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

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

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

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

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

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

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

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

- Divide the class into pairs.

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

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

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

EXPLANATION

By taking reference of pages 234-238 of Math Genius 6 explain symmetry, line of symmetry (Horizontal, vertical and diagonal), especially symmetry in geometrical shapes and in letters of English alphabet in detail with examples. Also explain the important fact that a regular polygon has as many lines of symmetry as the number of its sides, i.e., Equilateral triangle – 3, Square – 4, Regular hexagon – 6, and so on.

ASSIGNMENTS

Classwork: Discuss “Think Tank” given on page 238 and Q.1, 2 and 3 of 9A.

Homework: Remaining questions of Practice Time 9A.

Periods: 4–6

Topic: Reflection symmetry

NEP Skills: Conceptual, experiential and art integrated learning

TEACHER-PUPIL ACTIVITY

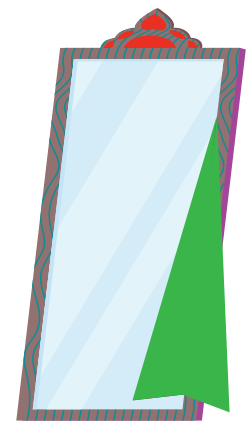
- Divide the class into groups.

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

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

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

If it does, ask to mark the line of symmetry on the shape using a pencil or marker. Repeat the activity with different shapes, including letters and irregular figures, to explore the line of symmetry.



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



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

EXPLANATION

Take reference of pages 239-240 of Math Genius 6 to explain reflection symmetry in detail. Also demonstrate symmetrical figures on graph paper with examples.

ASSIGNMENTS

Classwork: Discuss “Think Tank” given on page 240 and Q.1, 2, 3 and 7 of Practice Time 9B.

Homework: Remaining questions of Practice Time 9B.

Periods: 7–8

Topic: Rotational symmetry

NEP Skills: Conceptual, collaborative and experiential learning

TEACHER-PUPIL ACTIVITY

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

Divide the class into groups.

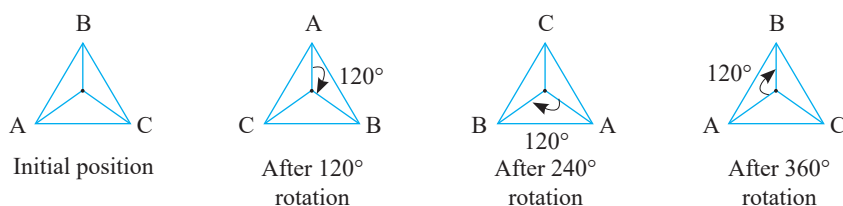
Distribute cut-outs of different shapes and ask the groups to pin them onto a cardboard surface.

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

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

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

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



EXPLANATION

Also, by taking reference of pages 242-244 of Math Genius 6, explain rotational symmetry in detail with in text examples. Also, discuss “Knowledge Desk” and “Maths Connect” given on page 244.

ASSIGNMENTS

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

Homework: Remaining questions of Practice Time 9C.

Periods: 9–10

Topic: Rangoli pattern

NEP Skills: Creative and innovative learning, conceptual, art integrated and collaborative learning, cultural awareness

TEACHER-PUPIL ACTIVITY

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

Divide the students in 4-5 groups.

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

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

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

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

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

EXPLANATION

Take reference of pages 246-247 to demonstrate different types of rangoli and the number/dot pattern used to make it in detail with examples.

ASSIGNMENTS

Classwork: Q.1 of Practice Time 9D.

Homework: Remaining questions of Practice Time 9D.

Periods: 11–12

Topic: Tile pattern or Tessellation

NEP Skills: Creative and innovative learning, conceptual, art integrated and collaborative learning

TEACHER-PUPIL ACTIVITY

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

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

- Distribute cutouts of geometrical shapes like: squares, triangles, hexagon, etc., to the students.

Ask students to arrange these shapes on a paper sheet to create a pattern.

Instruct them to trace and colour the pattern.

- Distribute graph paper to the students.

Ask them to draw and repeat a simple shape like a triangle, square, or hexagon to create a tessellation.

Ask them to color the pattern creatively.

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

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

EXPLANATION

Take reference of pages 248-249 to explain different types of tessellation patterns with examples.

ASSIGNMENTS

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

Homework: Remaining questions of Practice Time 9E.

Periods: 13–15

Topic: Revision

NEP Skills: Conceptual learning,
experiential learning

TEACHER-PUPIL ACTIVITY

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

Start the revision of the exercise, by using Mind Map, Challenge Question and chapter assessment.

Divide the students into small groups and guide them to do the activity given in the ‘Gamified Learning’ section.

ASSIGNMENTS

Classwork: Challenge Question, Section A-E of Chapter Assessment.

Homework: Remaining questions of Chapter Assessment.



The Other Side of Zero

Learning Objectives

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

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

LESSON PLAN

Suggested number of periods: 20

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

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

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

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

Periods: 1–5

Topics: Need for a new number system;
Integers; Negative of a negative integer

NEP Skills: Conceptual, collaborative
and experiential learning

TEACHER-PUPIL ACTIVITY

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

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

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

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

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

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

Explain that negative numbers are denoted by placing a ‘-’ sign before a natural number. For example, $-1, -2, -3, -4, \dots$ are negative numbers.

- Demonstrate the integers on the number line.

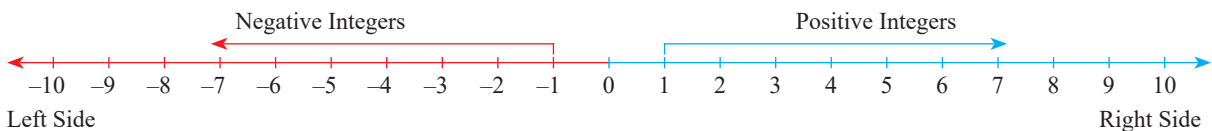
Draw a number line on the board.

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

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

Ask students:

- If 3 steps right means +3, what does 3 steps left mean? Accept response (-3).
- What is the opposite of +7? Accept response (-7)



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

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

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

Ask students to compare the integers of the pairs.

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

- Every positive integer is greater than a negative integer.
- Zero (0) is less than every positive integer and greater than every negative integer.
- The greater the integer, the lesser is its opposite.

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

- Divide the class into pairs.

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

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

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

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

EXPLANATION

By taking reference of pages 257–262 of Math Genius 6 explain “Need of a new number system”, “Integers”, Application of integers, Ordering of integers, “Negative of a negative integer” and Absolute value of integers in detail with examples.

ASSIGNMENTS

Classwork: Discuss “Let’s recall” (page 258), “Think Tank” (page 261), and Q.1, 2, 3, 4 and 5 of Practice Time 10A.

Homework: Remaining questions of Practice Time 10A.

Periods: 6–10

Topic: Addition of integers

NEP Skills: Conceptual, experiential and cross-curriculum learning

TEACHER-PUPIL ACTIVITY

Start the class by introducing an elevator analogy.

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

- Basements floors: $-1, -2, -3$
- Ground floor: 0
- Floors (above): $1, 2, 3, 4, 5, \dots, 10$.

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

- Divide the class into small groups.

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

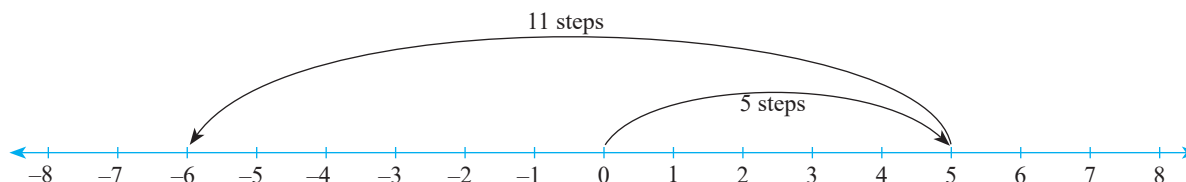
Ask from other groups questions like: “Start from floor -2 , move up 4 floors, on which floor you reach?” “Start from floor 3, move down 5 floors, on which floor you reach?” Accepted answers: $-2 + 4 = 2$ nd floor and $3 + (-5) = -2$ i.e., basement -2 .

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

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

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

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



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

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

EXPLANATION

Take reference of pages 264-266 of Math Genius 6 to explain addition of integers using lift analogy, on a number line and additive inverse of any integer in detail with examples. Also explain rules and properties of addition of integers with examples and “Knowledge Desk” given on page 267.

ASSIGNMENTS

Classwork: Discuss “Fast Check” given on page 265, and Q.1, 2, 3 and 7 of Practice Time 10B.

Homework: Remaining questions of Practice Time 10B.

Periods: 11–13

Topic: Subtraction of integers

NEP Skills: Conceptual, collaborative and experiential learning

TEACHER-PUPIL ACTIVITY

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

Discuss that:

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

EXPLANATION

By taking reference of pages 267-269 of Math Genius 6, explain subtraction of integers with in-text examples. Also discuss “Knowledge Desk” given on page 268 and rules and properties of subtraction of integers with examples.

ASSIGNMENTS

Classwork: Discuss “Life Skills” given on page 269 and ask to solve Q.1, 2, 3 and 4 of Practice Time 10C.

Homework: Remaining questions of Practice Time 10C.

Periods: 14–17

Topics: Token/Counter models of integers; Explorations with integers

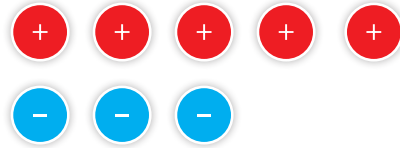
NEP Skills: Creative and innovative learning, conceptual, art integrated and collaborative learning

TEACHER-PUPIL ACTIVITY

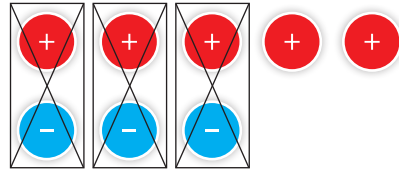
Start the class by reiterating the addition and subtraction of integers using tokens or counters through the following activity as follows:

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

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



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



Hence, $+5 + (-3) = +2$.

Similarly, demonstrate the subtraction of integers by referring to the example given on page 272 of the textbook.

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

Finally, the teacher will check the results and appreciate the group that does the maximum sums correctly.

EXPLANATION

Take reference of pages 270-274 to demonstrate addition and subtraction of integers with examples in detail. Also discuss “Explorations with integers” by motivating the students to solve the given in-text problems on the board.

ASSIGNMENTS

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

Homework: Remaining questions of Practice Time 10D.

Periods: 18–20

Topic: Revision

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

TEACHER-PUPIL ACTIVITY

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

Start the revision of the exercise, by using Mind Map, Challenge Question and chapter assessment.

Divide the students into small groups and guide them to do the activity given in the ‘Gamified Learning’ section.

Motivate students to solve “Labyrinth”, by discussing with each other.

ASSIGNMENTS

Classwork: Challenge Question, Sections A-E of Chapter Assessment.

Homework: Remaining questions of Chapter Assessment.