

PROFESSIONAL DEVELOPMENT FOR QUALITY EDUCATION

Mathematics Teachers' Guide Lesson Plans

Grade 5



Quaid-e-Azam Academy for Educational Development, Punjab
Wahdat Road, Lahore





PREFACE

The Quaid-e-Azam Academy for Education Development (QAED), Government of Punjab, was tasked with developing teacher guides on the Single National Curriculum (SNC) 2020. For this purpose, a team of education experts and teachers from government and non-government institutions was engaged. The subject specialists from Material Development Wing supervised this task. The teams not only critically reviewed the entire guide but also ensured the incorporation of its recommendations.

While developing this guide, the team recognized that instructional settings and availability of resources vary significantly in the province of Punjab. Therefore, considering the important aspects of SNC and active learning, a contextually relevant teaching process has been devised to ensure student learning outcomes.

On behalf of Quaid-e-Azam Academy for Education Development, Government of Punjab, I am deeply grateful to all involved in creating this guide. I hope that this book will be helpful for teachers to teach effectively and enable them to perform their duties properly.

Thank you,
The Director General
Quaid-e-Azam Academy for Educational Development,
Government of Punjab





Mathematics – Teacher Guide

Introduction

The Government of Punjab School Education Department notified Single National Curriculum (SNC) in 2021. To ensure its effective execution, Quaid-e-Azam Academy for Educational Development has taken the following initiatives:

Organized a professional development program for teachers to enhance their understanding of SNC

Develop teacher guides to improve instructions at the school level.

Through these initiatives, the teachers will be able to:

Observe the alignment between SNC, Academic Calendar & Textbooks.

Ensure the achievement of student learning outcomes given in SNC

Equip themselves with new teaching techniques.

Create an interactive learning environment.

Active Learning promotes students to learn by doing through collaborative activities such as problem-solving, role-playing, watching others, arguing, and many more.

Students will not passively acquire material owing to engaging activities and several types of evaluation. The objective is to improve students' capacity to think critically and creatively via the application of innovative instructional strategies and flexible evaluation techniques.

Using this form of instruction, students' knowledge will develop, their social skills will blossom, and their feeling of community will grow.

The course material is designed to have students thinking critically and solving mathematics problems that they'll encounter in the real world. For students to be able to defend their mathematical reasoning and understand the interconnectedness of mathematical ideas, we will arm them with the skills they need to do so.

We hope that they'll learn to apply mathematics not just to their coursework, but also to other areas of life.

To encourage the independence and self-confidence of students as learners, a range of instructional strategies are deployed to create an environment conducive to attaining the desired results.

SNC recommends that teachers utilize a range of materials, not simply the prescribed textbooks and teacher's guides.



SNC emphasizes developing analytical, critical, and creative thinking through a more activities-based approach rather than static teacher-centric learning. Furthermore, it focuses on equipping learners with principles and attributes such as truthfulness, honesty, tolerance, respect, peaceful coexistence, environmental awareness & care, democracy, human rights, sustainable development, global citizenship, personal care, and safety (SNC 2020).

- The SNC is standards, benchmarks, and outcomes-based across all subjects.
The components of the curriculum are given below:
 - **Competency:** A key learning area involving applied skills and knowledge enabling learners to perform successfully in educational, professional, and other life contexts.
 - **Standard:** It defines competency by broadly specifying the knowledge, skills, and attitudes to be acquired by students in a particular key learning area during the first five years of schooling.
 - **Benchmarks:** Further elaborate the expectations about what learners know under each standard, indicating what the students will accomplish at each developmental level to meet the standards.
 - **Student Learning Outcomes (SLOs):** These are built upon the descriptions of the benchmarks and describe (in key points) what students will accomplish at the end of each unit.

Along with standards and benchmarks, the curriculum also provides a progression matrix containing SLOs grade-wise. For further detail, please refer to the SNC 2020 for the specific subject. In addition, this guide includes lesson plans based on student learning outcomes and textbook content developed by Punjab Textbook Board.





Key Components of Lesson Plan:

TEMPLATE FOR LESSON PLAN

Topic

Lesson plan No.	
Grade:	Time:

SLO:

Material / Resources required:

Information for Teachers:

- New concepts
- New ideas
- Teaching tips

Introduction:

- Warm up
- Brainstorming
- Elicitation
- Mind map etc.

Development:

Activity1

Activity2 (Minimum two activities)

Conclusion / Sum up / Wrap up:

Assessment: Focus will be on formative assessment

Follow up:

- home work
- written work
- project

oral assignment etc.





List of Selected Students Learning Outcomes (SLOs)	
Mathematics-V	
Sr. No	Students' Learning Outcomes
Unit 1: Whole Numbers	
1.	<ul style="list-style-type: none">• Read numbers up to 1,000,000 (one million) in numerals and in words.• Write numbers up to 1,000,000 (one million) in numerals and in words.• Divide numbers, up to 5 digits, by a number up to 2-digit numbers.• Solve real life situation involving operations of addition, subtraction, multiplication and division.• Identify the pattern rule of a given increasing and decreasing pattern and extend the pattern for the next three terms.• Describe the pattern found in a given table chart.
Unit 2: HCF and LCM	
2.	<ul style="list-style-type: none">• Find HCF of:<ul style="list-style-type: none">○ Three number up to 2-digit numbers using prime factorization method and division method.• Solve real life situations involving HCF and LCM.
Unit 3: Fractions	
3.	<ul style="list-style-type: none">• Add and subtract two or three fractions with different denominators.• Multiply two or three fractions involving proper, improper fractions, and mixed numbers• Solve real life situations involving multiplication of fractions.• Divide a fraction by another fraction involving proper, improper fraction, and mixed numbers.• Solve real life situations involving division of fractions.
Unit 4: Decimals and Percentages	
4.	<ul style="list-style-type: none">• Add and subtract 4-digit numbers up to 3 decimal places in ascending order.• Multiply a 3-digit number up to 2 decimal places by a whole number up to 2 digits.• Multiply a 3-digit number up to 2 decimal places by a 3-digit number up to 2 decimal places.• Divide a 3-digit number up to 2 decimal places by 10, 100 and 1000.• Convert fraction to decimals using division.• Solve real life situations involving division of 3-digit numbers up to 2 decimal places.• Round off a 4-digit number up to 3 decimal places to the nearest tenth or hundredth.• Convert percentage to fraction and to decimal number and vice versa (only for numbers without decimal part i.e. 35%, 75% etc.).• Solve real life situations involving percentages.
Unit 5: Distance and time	
5.	<ul style="list-style-type: none">• Convert measures given in:<ul style="list-style-type: none">• Kilo meters to meters and vice versa.• Meters to centimeters and vice versa.• Centimeters to millimeters and vice versa.





- Notation of units for kilometer, meter & millimeters.
- Solve real life situations involving conversion, addition and subtraction of measures of distance.
- Convert measures given in:
 - hours to minutes and vice versa
 - Minutes to seconds and vice versa.
- Convert measures given in:
 - Years to months and vice versa.
 - Months to days and vice versa.
 - Weeks to days and vice versa.
- Add and subtract intervals of time in hours and minutes with carrying and borrowing.
- Solve real life situations involving conversion, addition and subtraction of intervals of time.

Unit 6: Unitary Method

6. • Calculate the value of many objects or the same kind when the value of some.

Unit 7: Geometry

7. • Classify angles as acute, right or obtuse.
- Use protractor and ruler to construct:
- A right angle
 - A straight angle
 - Reflex angles of different measures.
- Use protractor and ruler to construct a triangle when:
- Two angles and their included side is given.
 - Two sides and included angle is given.
- Measure the lengths of the remaining sides and angles of the triangle.
- Recognize the kinds of quadrilateral (square, rectangle, parallelogram, rhombus, trapezium, and kite).
- Use protractor and ruler to construct square and rectangle when lengths of sides are given.
- Find point of rotation and order of rotational symmetry of given 2-D figures.
- Identify cubes, cuboids and pyramids from their nets.
- Describe and make 3-D objects (cubes, cuboids, cylinder, cones, sphere, and pyramids).

Unit 8: Perimeter and Area

8. • Identify the units for measurement of perimeter and area.
- Find and apply formulas to find perimeter and area of a square and rectangular region.
- Solve real life situations involving perimeter and area of square and rectangular regions.





Unit 9: Information Handling

9.

- Find and describe average of given quantities in the data.
- Solve real life situations involving average.
- Organize the given data using bar graph.
- Read and interpret a bar graph given in horizontal and vertical form.
- Draw horizontal and vertical bar graphs for given data.
- Solve real life situations using data presented in bar graphs.





CONTENT LIST

No.	Topic	Page
Lesson 1:	Numbers Up to One Million	01
Lesson 2:	Numbers Up to One Million	04
Lesson 3:	Division	08
Lesson 4:	Real Life Situations Involving Addition and Subtraction	11
Lesson 5:	Real Life Situations Involving Multiplication	14
Lesson 6:	Real Life Situations Involving Division	17
Lesson 7:	Number Patterns	20
Lesson 8:	Number Patterns	24
Lesson 9:	Highest Common Factor (HCF)	27
Lesson 10:	Highest Common Factor (HCF)	30
Lesson 11:	Real Life Situations Involving HCF and LCM	33
Lesson 12:	Addition and Subtraction of Fractions	37
Lesson 13:	Addition and Subtraction of Fractions	40
Lesson 14:	Multiplication of Fractions	42
Lesson 15:	Multiplication of Fractions	46
Lesson 16:	Division of Fractions	49
Lesson 17:	Division of Fractions	53
Lesson 18:	Addition and Subtraction of Decimals	55
Lesson 19:	Multiplication of Decimals	59
Lesson 20:	Multiplication of Decimals	62
Lesson 21:	Multiplication of Decimals	65





No.	Topic	Page
Lesson 22:	Division of Decimals	68
Lesson 23:	Conversion of Fractions into Decimal	70
Lesson 24:	Rounding-off Decimal	72
Lesson 25:	Percentages	76
Lesson 26:	Real Life Situations Involving Percentages	79
Lesson 27:	Conversion of Units of Distance	82
Lesson 28:	Real Life Situations Involving Distance	85
Lesson 29:	Conversion of Units of Time	87
Lesson 30:	Word Problems Related to Conversion of Units of Time	89
Lesson 31:	Unitary Method	91
Lesson 32:	Angles	94
Lesson 33:	Construction of Angles	98
Lesson 34:	Construction of Triangles	101
Lesson 35:	Construction of Triangles	104
Lesson 36:	Quadrilaterals	106
Lesson 37:	Symmetry	109
Lesson 38:	3D Shapes	112
Lesson 39:	Perimeter and Area	115
Lesson 40:	Perimeter and Area	119
Lesson 41:	Average	121
Lesson 42:	Real Life Situations Involving Average	124
Lesson 43:	Real Life Situations Involving Average	127





No.	Topic	Page
Lesson 44:	Real Life Situation Involving Average	130
Lesson 45:	Reading a Bar Graph	133
Lesson 46:	Bar Graphs	135
	Glossary	138
	List of Contributors	143



NUMBERS UP TO ONE MILLION



Duration: 40 Minutes



Students Learning Outcome:

- Read numbers up to 1,000,000 (one million) in numerals and in words.



Materials:

Writing board, chalk / marker, duster, textbook, place value chart etc.

Information for Teachers:

- Numbers in the hundred thousand have six digits.
- Numbers in the million have seven digits.
- A place value chart is a useful way to read these numbers. Nine places are grouped into three periods: ones, thousands, and millions.
- The Place Values are Separated into groups of three, called periods.
- The periods are *ones*, *thousands*, *millions*, *billions*, *trillions*, and so on. In a written number, commas separate the periods.

Introduction:

- Elicit a few examples from the students of whole numbers and write them on the board, encouraging them to give numbers up to ten thousand (10 000).
- Write some numbers on the board. e.g., 123, 1000, 2345, 3054, 2235, on the board.
- Ask students to look at these numbers carefully.
- Ask volunteers to read these numbers.
- Tell students that numbers are everywhere, even the larger ones!
- Write distance of the earth to sun which is approximately 92520000 miles on the board.
- Ask students to read this large number.



Development:

Activity 1:

- Make a Place Value Chart of hundred thousand (100 000) on the board.
- Write few numbers on the board (49 501, 987 120, 215 403, 5 642).
- Ask the students to place the numbers in the Place Value Chart.
- Ensure that enough practice is provided for the students to understand the concept.

Activity 2:

- Divide the students in pairs.
- Distribute the “Place Value Chart” on the board to each pair.
- Ask them to place this number “925 200” in “Place Value Chart”.
- Help your students to place the digits in right box.
- Explain them to read the number by using “Place Value Chart”.
- Ask them to describe this number in words.
- Hence, the number is read as: Nine hundred twenty-five thousand and two hundred.
- Ask them to choose any number they like and put it in the place value chart and read it aloud.

Activity 3:

- Write a few numbers on the board (from the textbook).
- Ask students to work in pairs. Ask them to read the following numbers aloud.

Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones

- Place each digit in “Place Value Chart”.
242 140, 910 009, 495 523, 290 014, 688 069
- Ask them to read these numbers in pairs.
- First, one member will read the number and the other will listen.
- Second, the other member will the number read and the first will listen.
- After completion of task the teacher will take random responses.

Sum up / Conclusion:

- Ask students what they have learned in the lesson?
- Sum up the which point again already written on a side board.

Assessment:

- Divide the students into groups.
- Ask the students to read the following numbers. (Using place value chart)
1. 131 441



2. 286 019
3. 202 001
4. 471 518

Follow up:

Ask students to read & write these numbers in words with the help of “Place Value Chart”.

- a. 949 181
- b. 479 321
- c. 510 602
- d. 466 456
- e. 600 900

Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones

NUMBERS UP TO ONE MILLION

**Duration:** 40 Minutes**Students Learning Outcome:**

- Read numbers up to 1,000,000 (one million) in numerals and in words.

**Materials:**

Writing board, chalk / marker, duster, textbook, place value chart etc.

Information for Teachers:

- The place values are separated into groups of three, called periods.
- The periods are *ones, thousands, millions, billions, trillions*, and so on. In a written number, commas separate the periods.
- Nine places are grouped into three periods: ones, thousands, and millions.
- In this system, the periods are divided according to the rule of 3:3:3. This means starting from the right, the first comma is placed after 3 digits, then the next commas are also placed after every 3 digits. For example, notice the commas in the following number: 2,657,342,189

Introduction:

- Divide class into two groups A and B then draw Place Value of number chart up to Hundred Thousand on the board.

Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones

- Ask students from one group to suggest some digits to fill the chart.
- The other group will read the number. Repeat 5 times for each group.
- Ask students if we multiply a 100 with 10 000 can they guess, what would be the number of digits in the product? (Million)

- Do they know how to read that number?
- Tell them that today we will explore Place Values to make a number up to a million.

Development:

Activity 1:

- Ask students to look at this Place Value Chart.

HTh	TTh	Th	H	T	O

- Ask students to count the counters given in the place value charts.
- The counters are given in the Place Value Charts, which shows the values.
- Write down the number of counters under the place value charts.
- Ask students to read the given number in standard form (numeral) by taking random responses.

Activity 2:

- Tell them that today we will learn to write the numbers up to 1 million.
- Ask them to identify the number of digits in 459 862.
- Tell them to write it in the Place Value Chart.

Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
4	5	9	8	6	2

- Ask the question “What is the value of the digit 4 in the number 459 862?”
- Tell them by putting a number in a place value chart can help us to identify which place value the digit 4 is in.
- Explain to them that from the place value chart, we can see that the **digit 4** is in the hundred thousand columns. This means that the value of the **digit 4** in the number is 4 hundred thousand.
- Divide the students in groups.
- Distribute the “Place Value Chart” worksheet to each group.
- Ask them to write down the number of counters under each Place Value Charts.
- Explain them to read the number correctly by using “Place Value Chart”.
- Also write their amount in words correctly.
- Drill the usage of space/ periods in the standard and commas in the word form.

M	HTh	TTh	Th	H	T	O

Numerals: _____

Words: _____

M	HTH	TTH	TH	H	T	O

Numerals: _____

Words: _____

M	HTH	TTH	TH	H	T	O

Numerals: _____

Words: _____

M	HTH	TTH	TH	H	T	O

Numerals: _____

Words: _____

Activity 3:

- Divide the class in pairs.
- Ask each pair to write numbers in words.
 - a. 454 485
 - b. 808 808
 - c. 715 249
- Take random responses and ask the voluntaries to come and write the correct answer on the board.

Sum up / Conclusion:

- Write one 5- digit number on the board.
- Ask random students to write the place and place value of each digit of that number on the board.
- Ask students to write the number in words.
- Random responses will be taken from the students.



Assessment:

- Ask the students to write the following numbers in the place value chart and then write them in words individually.
- Take random feedback to check the answers.

Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones

1. 131 441
2. 286 019
3. 202 001

Follow up:

- Ask students to read write these numbers in words with the help of “Place Value Chart”.

Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones

1. 949 181
2. 479 321
3. 510 602
4. 466 456
5. 600 900

DIVISION

**Duration:** 40 Minutes**Students Learning Outcome:**

- Divide numbers up to 5-digits by a number up to 2-digit numbers.

**Materials:**

Writing board, chalk / marker, duster, textbook, flash cards etc.

Information for Teachers:

- Students should already know how to multiply, multiplication tables and concept of carrying forward while adding/subtracting.
- Students have done division of up to 4-digit numbers by a number up to 2-digit numbers.
- Division is a reverse process of multiplication. If multiplying 20 by 10 gives 200 then dividing 200 by 10 will give 20 and dividing 200 by 20 will give 10.
- Terminologies (refer to Figure 1):

- **Dividend:** The number that is to be divided.
- **Divisor:** The number that will be used to divide the dividend.
- **Quotient:** The value that you get after dividing. Multiplying the quotient and divisor gives the dividend (if there is no remainder).
- **Remainder:** The left-over quantity.

$$\begin{array}{r} 5 \text{ — Quotient} \\ 5 \overline{) 26} \text{ — Dividend} \\ \underline{25} \\ 1 \text{ — Remainder} \end{array}$$

Figure: Taken from
<https://satprepget800.com/wp-content/uploads/2013/03/remainder1.png>

Teaching tips:

- Throughout the lesson, keep revising appropriate multiplication tables with the students.
- At each step, ask students to calculate the answer for you.
- Go through the long division step by step for at least two examples.



- This lesson is introduction to long division for 5-digits and so at least 1 follow-up lessons will be required to reinforce the topic.

Introduction:

Note: For this activity, the example number of students in class is taken to be 31. This will be different for each class and the answers will change accordingly.

- Beginning of the lesson count the number of students in the class and write the number on the board: “Number of students in the class”: 31
- Tell students that the work will be done in pairs and groups. Ask them how many pairs of students will be there. Give students 1 minute to figure out an answer. Allow students to move about if needed. You should write the answer on the board.
ANSWER: There will be 15 pairs with one student remaining without a pair.
- Next ask students how many groups of 3 students can be formed. Give students 1 minute to find the answer. Allow students to move about if needed.
ANSWER: There will be 10 groups with four 1 student and 3 students are remaining.
- Next ask the students how many groups of 4 students can be formed. Give students 1 minute to find the answer. Allow students to move about if needed.
ANSWER: There will be 7 groups with of three with 3 students remaining.
- Introduce to students that these answers can be easily calculated using the process of “*division*”.
- Brainstorm with students’ examples of where they use division in their daily life. Student ideas should be written on board and briefly discussed.

Development

Activity 1:

- Introduce the term: **Long Division**. Tell students that this is a step-by-step process to calculate answers for complicated division questions.
- Remind students that they have done division of 3- and 4-digit numbers in previous classes and now we will be doing 5-digit numbers.
- Write down a 5-digit number question on the board: **$22034 \div 23$** and explain it.
- Complete the long division sum, by going through each step and asking students to give you relevant answers. You will need to remind students on methods of multiplication for 2-digit numbers.
- Highlight how the quotient is finalized and why there is no remainder left at the end.
- Show that the answer obtained is correct by multiplying the quotient and divisor to get the original dividend.
- Next, write down on the board: **$22040 \div 23$**
- Give students some time to get an answer themselves. Then, do the working on the board to get the final answer with a remainder.
- Show that the answer obtained is correct by multiplying the quotient and divisor and adding the remainder to get the original dividend.
-



Activity 2:

- Divide the class into pairs. Write the questions on the board.
 1. $56780 \div 20$
 2. $64454 \div 32$
- Ask each pair to solve these questions.
- Ask any volunteer student to solve them on the board.
- Discuss mistakes (if any) with the whole class so they all get it clear.

Conclusion / Sum up / Wrap up:

- Revise the rules for long division and explain how the answer can be checked by multiplication of quotient and divisor.

Assessment:

- Write the following questions on the board for the students to solve themselves:
 1. $73\ 810 \div 11$
 2. $86\ 449 \div 29$

Follow up:

Task: Solve the following questions:

1. $12879 \div 72$
2. $81092 \div 20$
3. $47917 \div 53$
4. $60071 \div 69$
5. $97163 \div 27$

REAL LIFE SITUATIONS INVOLVING ADDITION AND SUBTRACTION



Duration: 40 Minutes



Students Learning Outcome:

- Solve real life situation involving operations of addition, subtraction.



Materials:

Writing board, chalk / marker, duster, textbook, match sticks, rubber band, stones etc.

Information for Teachers:

A **word problem** in math is a *math* question written as one sentence or more that requires children to apply their *math* knowledge to a real-life context.

Tips for Teacher:

- Ask students to read the statement from book and underline the key words.
- Tell them about the key words of all four operations like altogether, added, total sum up, total numbers, difference, left, given away, more or less, equally divided, equally given/shared etc.
- Make clear understanding of students about statement questions.

Introduction:

- Ask students to recall all four operations previously taught.
- Make 3 groups of the whole class.
- Ask students to open their school bags and count the total numbers of book they all have in each group.
- Write the responses of each group on the board.
- Ask them “What are the total number of books in the whole class?”
- Take random responses from the students.
- Explain them it is addition. Tell them that they can do it by using subtraction.
- Ask which group has more or less books?



- After the responses, consolidate their learning by telling them that every day they encounter math problems in daily life.

Development:

Activity 1:

- Write a word problem on the board.
- Write the steps of solving word problems on the side of the board.
 1. Read the word problem.
 2. Underline the given information.
 3. Highlight the word which shows operation.
 4. Solve the problem.
- Tell students that they will become detectives and find clues given in the word problems.
- Follow the steps and solve the problems, asking students for their responses.
- Repeat the whole process with another question so students become familiar with the process.

Activity 2:

- Divide the class in four/ five groups.
- Provide each group with one-word problem. Ask them to apply all the steps to solve the problem
- Ask the students to read the situation carefully and ask the following question to convert the story into mathematical statement and solve it.
- After completion, ask each group to share their answers with the whole class.
- Encourage and prompt students to show/talk about their strategies.

Sum up / Conclusion:

- Ask students:
- Which words in a word problem usually means that addition is the correct operations to use?
- Which word usually indicates that subtraction should be used?
- Give two examples about addition and subtraction from your everyday life, make their questions and ask: “can you solve them?”

Assessment:

- Monthly income of Ali and Omer is Rs 53870 and Rs 65140. Find the total income of both. Who is earning more?
- Ask students to solve the question on their notebooks.
- Take random responses and ask a volunteer to solve the question on the board.

Follow up:

Ask students to solve:

- Ahmed read 1200 pages from a book. The book has 2435 pages. How many pages are left?



- In an examination, 75,236 students passed and 14,892 students failed. Find how many students appeared for the examination.
- There are 3,786 men, 3,672 women and 1,508 children in a village. Find the total population of the village.
- Ask the students to solve the questions given in their textbook.

REAL LIFE SITUATIONS INVOLVING MULTIPLICATION

**Duration:** 40 Minutes

Students Learning Outcome:

- Solve real life situation involving operations of multiplication.



Materials:

Writing board, chalk / marker, duster, textbook, match sticks, rubber band, stones etc.

Information for Teachers:

- **Multiplication** is a method of finding the product of two or more numbers.
- Multiplication is represented by the signs cross '×', asterisk '*' or dot '·'.
- When we multiply two numbers, the answer we get is called 'product'.



Multiplicand: Number to whom we want to multiply.

Multiplier: Multiplier Number with which we multiply the number.

Product: Product is the result of multiplicand and multiplier.

Tips for Teachers:

- Ask the students to read the statement from book and underline the key words.
- Tell them about the key words of all four operations like altogether, added, total sum up, total numbers, difference, left, given away, more or less, equally divided, equally given/shared etc.

Make clear understanding of students about statement questions.

Introduction:



- Divide the class into pairs.
 - Give each pair a pack of number cards.
 - Ask each student put down two number cards.
 - Put the digits together to create a two-digit number.
 - Ask them to multiply their two numbers together.
 - The first partner to solve the problem will be the winner.
- Example: Ahsan puts down a 7 and a 2. Bilal puts down a 2 and a 3.
The math problem is 72×23 . Whoever solves it first wins a point.

Development:

Activity 1:

- To recall the concept of multiplication, solve at least two multiplication sums e.g., $26\ 117 \times 34$ & $28\ 550 \times 15$ on the board.
- Ask students to work in pairs and do the questions.
- Remind them about the terms “multiplier, multiplicand, product”
- Asking students input throughout the whole process.

Activity 2:

- Write the given word problem on the board.
“Salman’s mother asked him to bring 3 packets of biscuits, if the cost of one packet is Rs.20, then how much did Salman pay to the shopkeeper?”
- Ask students to recall the steps to solve word problems taught in earlier class.
- Write the statement solving steps on the side of the board.
 - a. Read the word problem.
 - b. Under line the given information.
 - c. Highlight the word which shows operation.
 - d. Solve the problem.
- Tell them to follow the steps of solving word problem to convert the story into a mathematical statement.
Ask how many packets of biscuits did Salman buy? (Expected answer would be as; 3 packets)
- What is the price of one packet? (Expected answer would be as; Rs.20)
- What we have to find? (Expected answer would be as; cost of 3 packets)
- How will you find total cost?
(Expected answer would be as; adding ‘20’ three times)
- Ask one student to solve on the board.
Cost of 1 packet = Rs.20
Cost of 3 packets = Rs.60
- Ask random students to repeat the process for clarity.

Sum up / Conclusion:

- Ask students to recall the steps of solving word problems and also about the words which identify the operations.
- Ask them to share their strategies while solving the sums.



Assessment:

- Ask the students to do the following question in their notebooks individually. Fatima bought 17 notebooks; cost of each notebook is Rs.45 then find the cost of 17 notebooks.
- After completion, take random responses and ask a volunteer to solve the question on board.

Follow up:

Assign the task to students:

- Hassan works in a factory. He earns Rs.48 in 1 hour. If he works 8 hours daily, then, how much he earns daily?
- How many wheels would 10 bicycles have?
- There are 12 boxes of ice-cream in the freezer. If each box has 24 ice-creams in each box. How many ice-creams are there altogether?

Ask the students to solve the questions given in their textbook

REAL LIFE SITUATIONS INVOLVING DIVISION

**Duration:** 40 Minutes

Students Learning Outcome:

- Solve real life situation involving operation of division.



Materials:

Writing board, chalk / marker, duster, textbook, flash cards etc.

Information for Teachers:

- **Division** is a method of distributing a group of things into equal parts.
- **Division** is the opposite of multiplication.
- **Long division** involves dividing, multiplying, and subtracting.
- **Divisor:** The number by which we divide.
- **Dividend:** The number which is to be divided
- **Quotient:** The factor obtained in division process. .
- **Remainder:** If values do not divide completely, the left over is remainder.

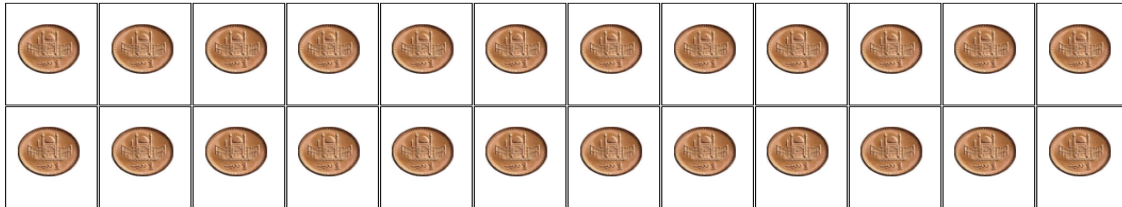
Tips for Teachers:

- Ask the students to read the statement from book and underline the key words.
Tell them about the key words of all four operations like altogether, added, total sum up, total numbers, difference, left, given away, more or less, equally divided, equally given/shared etc.

Introduction:

Write the given question on the board.

Three friends have 24 coins. If we divide the coins equally, then how many coins each get?



- Ask the students to solve individually. Ask any volunteer student to explain the steps of division by calling them on board.
- Revise the terms divisor, dividend, quotient & remainder. i.e.

$$\begin{array}{r} \text{Quotient} \\ \text{Divisor} \overline{) \text{Dividend}} \\ \hline \text{Remainder} \end{array}$$

Development:

Activity 1:

- Ask students to recall the steps to solve word problems taught in earlier class.
- Write the statement solving steps on the side of the board.
 - a. Read the word problem.
 - b. Underline the given information.
 - c. Highlight the word which shows operation.
 - d. Solve the problem.
- Tell students, today we will learn to solve word problems related to division.
- Write the given word problem on the board.

A toy factory makes 28 550 toys in 25 days. How many toys does it make in a day?
- Ask students to read the situation carefully.
- Elicit the process of solving word problem to convert the story into a mathematical statement
- Tell them to find the toys made in one day, we divide 28550 by 25.
- Explain solve the by involving the students.
- Repeat the process with another question from the textbook emphasizing on following the steps.

Activity 2:

- Divide the class into pairs.
- Write the question on the board.

Huma saved Rs. 16620 from her pocket money. She wants to distribute this amount in 12 children. How many rupees will each child get?
- Ask each pair to solve the question.
- Ask any volunteer student to solve them on the board.

Assessment:

- Ask students to solve the given question individually.



“A shopkeeper sells 13 440 masks in 15 days. How many masks will he sell in a day?”

- Check students work and provide feedback.

Sum up / Conclusion:

- Ask students to think about the main points covered in the lesson.
- Tell them that they will have to explain them within a minute.
- Ask any two or three students to volunteer to recap the main points covered in the lesson in one minute only.

Follow up:

Ask students to solve the word problem given in their textbook.

“Aliya has Rs. 22 580. She wants to distribute them among 18 needy people. Find how much amount will each person get? How much amount will be left?”

NUMBER PATTERNS



Duration: 40 Minutes



Students Learning Outcome:

- Identify the pattern rule of a given increasing and decreasing pattern and extend the pattern for the next three terms.



Materials:

Writing board, chalk / marker, duster, textbook, flash cards etc.

Information for Teachers:

- Pattern is a series or sequence that repeats. It follows a rule called pattern rule.
- Every item in the pattern is identified by its position. This position is called the term number.

Introduction:

- Ask students to look at the pattern drawn on the board and think of three things they know about it.



- Divide the students in pairs.
- Have students share their thoughts with a partner.
- Record several students' ideas.
- Ask what the next shape will be. (Expected Correct Answer: Triangle)
- Tell the students that today they will learn about pattern.

Development:

Activity 1:

- Tell students that a pattern is a design that repeats.
- Ask students to look again at this figure drawn on the board.



- Ask how many dots are in the first term. (Expected Answer = 1)
- How many dots are added for each new term? (Expected Answer = 2)
- Explain them the rule. Start with one dot and add two dots for each successive term.
- Ask them to rewrite the sequences as numbers. i.e. 1, 3, 5, 7.
- Explain them the rule. i.e. Start at 1, add 2 to each term.

Activity 2:

- Divide the class in pairs.
- Ask them to read the situation 1.
“Junaid has started exercising. His first three days exercise time is given in the table below. Complete the table to show his exercise time for next three days.”

Week Days	Exercise time in min.
Monday	5
Tuesday	11
Wednesday	17
Thursday	
Friday	
Saturday	

- Ask them to write the numbers in a sequence. i.e., 5, 11, 17, __, __, __.
- Ask them to identify the pattern rule. (Expected Answer: Start at 5, Adding 6 min. each time to get the next term)
- The sequence is: 5, 11, 17, 23, 29, 35.
- Elicit from them that this is **increasing pattern**.
- Now, ask them to read the situation 2.

“Sana bought a packet of 90 candies. The candies she ate in first three days are given in the table below. Complete the table to show her candies she ate for next three days.”

Days Number	Candies she ate
Day 1	90
Day 2	87
Day 3	84



Day 4	
Day 5	
Day 6	

- Ask them to write the numbers in a sequence. i.e., 90, 87, 84, __, __, __.
- Ask them to identify the pattern rule. (Expected Answer: Start at 90, Subtracting 3 candies each time to get the next term)
- The sequence is: 90, 87, 84, 81, 78, 75.
- Elicit from them that this is **decreasing pattern**.

Activity 3:

- Divide the class in groups.
- Write the following number patterns on the board.
 - a. 4, 12, 20, 28, 36, __, __, __.
 - b. 2, 4, 8, 16, __, __, __.
 - c. 32, 64, 128, __, __, __.
 - d. 100, 96, 91, 85, 78, __, __, __.
- Give each group one number pattern to solve.
- Ask them to find its rule and find the next three terms.
- After completion of the task, ask one of the group members to come and solve the pattern on the board.

Sum up / Conclusion:

Ask a few students to summarize their learning with the whole class.

Assessment:

Write the following number patterns on the board.

- a) 16, 14, 12, 10, __, __, __.
 - b) 45, 50, 55, 60, 65, __, __, __.
- Ask them by looking at each number patterns.
 - Find its rule and then find the next three terms.



Follow up:

Ask students to identify the rules of these pattern and also find the next 3 terms. (Given in their textbook)

- a) 10, 40, 160, 640, _____, _____, _____.
- b) 22, 220, 2200, _____, _____, _____.
- c) 352, 176, 88, _____, _____, _____.
- d) 780, 880, 980, _____, _____, _____.
- e) 560, 540, 520, 500, _____, _____, _____.

NUMBER PATTERNS

**Duration:** 40 Minutes

Students Learning Outcome:

- Describe the pattern found in a given table or chart.



Materials:

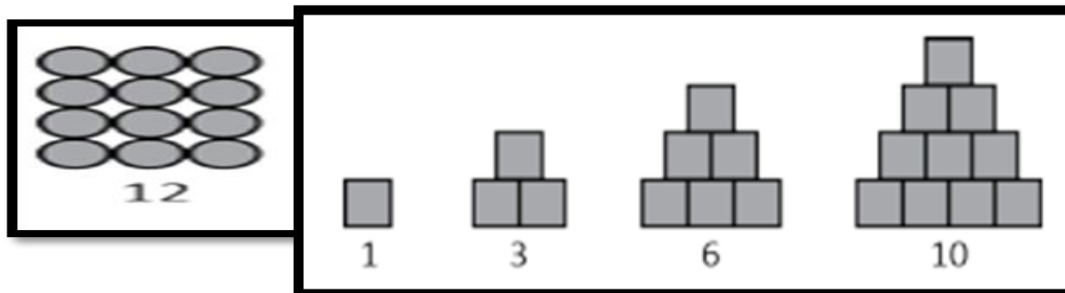
Writing board, chalk / marker, duster, textbook, flash cards, color pencils, hundred charts, counters/buttons in different colors etc.

Information for Teachers:

- An increasing pattern is a growing pattern where the size of the term increases in a predictable way.
- The terms in an increasing pattern grow by either a constant amount or by an increasing amount each time.
- A decreasing pattern is a shrinking pattern that decreases by a constant amount each time.

Introduction:

- Draw the given patterns on the board and ask students to look at these patterns



carefully.

- Divide the class in pairs.
- Ask them to recall what have they learnt in their previous lesson about patterns.



- Ask students to think about the number pattern given in these figures.
- Elicit from them that they have noticed in the patterns of these figures.
- Tell them to share their thoughts with a partner.
- Ask them to write the rule of these number patterns.
- Ask them about the next number in the given patterns?

Development:

Activity 1:

- Tell students that today they will learn to describe the patterns in a given table or a hundred number chart.
- Explain students to the hundred number chart that it can describes numerous number patterns.
- Divide students in groups.
- Distribute the number chart and colorful counters/button.
- Direct students to place counters on the chart on all multiples of 2. (Skip count by two's)
- And ask them to describe the resulting pattern.
- Similarly, ask them to place counters on the chart on all multiples of 3. (Skip count by three's)
- Elicit from them the rule for each sequence.

Activity 2:

- Ask students to work in pairs.
- Ask them to place counters/color on all numbers that have a 4 in the ones place or a 4 in the tens place.
- Ask them to explain the resulting pattern.
- Ask how many numbers have a counter on them.
- Next, have students place counters on all numbers that contain the digit 7.
- Ask them to describe the resulting pattern. Ask how many numbers have a counter on them.
- Have students try this with other digits to see whether they get the same result.

Sum up / Conclusion:

Ask a few volunteers to **BE THE TEACHER** and summaries main points of the lesson.

Assessment:

- Ask students to use the hundred chart given in their books.
- Write the rules of different number patterns on the board.
- **Rule of pattern 1:** Start at 10. Add 9 to get the next number.
- **Rule of pattern 2:** Start at 99. Subtract 11 to get the next number.
- Ask them to color these patterns on the hundred number chart.
- Ask them by looking at each number patterns, what they have noticed?
- Check their responses and provide them feedback.



Follow up:

- Ask them to draw the hundred number chart.
- Ask them to color the following numbers on the hundred number chart. i.e., 7, 13, 19, 25...
- Ask them to write the rule for the pattern 7, 13, 19, 25...?
- What would be the next three numbers in the pattern?
- Ask the students to create a table of patterns (at least two) of their own.
- Also, identify the rules of these pattern.

HIGHEST COMMON FACTOR (HCF)



Duration: 40 Minutes



Students Learning Outcome:

- Find HCF of three numbers up to 2-digit numbers using division method.



Materials:

Writing board, chalk / marker, duster, textbook, flash cards etc.

Information for Teachers:

- There are many methods of finding HCF of two or more numbers, e.g., through prime factorization or through division etc.
- If large numbers are given then it is hard to find all the common prime factors, in such situation, the HCF of these numbers can be found by using division.
- There are two methods of division to find HCF, one by continuous division process and second is Ladder Method.
- In continuous division process, from two given numbers, any one is taken as divisor and other is as dividend, and after division, now remainder is taken as divisor and the first divisor is taken as dividend and we repeat division process. The process keep continue until we get the remainder '0'. Hence the last non zero divisor is called G.C.D or HCF.
- To find out HCF of three given numbers using division method,
Step1: Find out HCF of any two numbers.
Step2: Find out the HCF of the third number and the HCF obtained in step 1.
Step3: HCF obtained in step 2 will be the HCF of the three numbers.

Introduction:

Activity 1:

- Tell the steps to calculate HCF of the given numbers.
- Write two numbers on the board. e.g., 16 and 24
- Ask students to divide 24 by 16 and find the remainder.
- Now, divide 16 by the remainder '8'.
- Ask them to observe that 16 is exactly divisible by 8 and remainder is zero.
- It means that '8' is the last divisor.
- Tell them that HCF is 8.

$$\begin{array}{r} 16 \overline{) 24} \quad (1 \\ \underline{16} \\ 8 \overline{) 16} \quad (2 \\ \underline{16} \\ \hline \text{x} \end{array}$$

Activity 2:

- Ask students to work in pairs.
- Now, write two numbers on the board. e.g., 18 and 30.
- Ask students to divide 30 by 18 and find the remainder.
- Now, divide 18 by the remainder '12'.
- Ask students to find the remainder.
- Now, divide 12 by the remainder '6'.
- Ask them to observe that 12 is exactly divisible by 6 and remainder is zero.
- It means that '6' is the last divisor.
- Tell them that HCF is 6.
- Tell them that in the above examples you have calculated the HCF of two numbers by division method.

$$\begin{array}{r} 8 \overline{) 46} \quad (5 \\ \underline{40} \\ 6 \overline{) 18} \quad (1 \\ \underline{6} \\ 2 \overline{) 12} \quad (3 \\ \underline{6} \\ \hline \text{x} \end{array}$$

Development:

Activity 1:

- Inform the students that today we will learn the new method of finding HCF, i.e. HCF by using division method.
- Write a question on the board.
Find the HCF of 32, 56 and 46 by using division method.
- Tell them to find out HCF of three given numbers using division method, we will follow the following steps.

$$\begin{array}{r} 18 \overline{) 30} \quad (1 \\ \underline{18} \\ 12 \overline{) 18} \quad (1 \\ \underline{12} \\ 6 \overline{) 12} \quad (2 \\ \underline{12} \\ \hline \text{x} \end{array}$$

$$\begin{array}{r} 32 \overline{) 56} \quad (1 \\ \underline{32} \\ 24 \overline{) 32} \quad (2 \\ \underline{24} \\ 8 \overline{) 24} \quad (3 \\ \underline{24} \\ \hline \text{x} \end{array}$$

Step 1: Find out HCF of any two numbers.

- Ask them to find out HCF of 32 and 56.



- '8' is the last divisor.
- So, HCF of 32 and 56 is 8.

Step 2: Find out the HCF of the third number and the HCF obtained in step 1.

- Ask them to find out HCF of 46 and 8.
- '2' is the last divisor.
- So, HCF of 46 and 8 is 2.

Step 3: HCF obtained in step 2 will be the HCF of the three numbers.

- Tell them that 2 is the HCF of 46 and 8.
- Hence, HCF of 32, 56 and 46 is 2.

Activity 2:

- Write any three numbers on the board. i.e., 16, 32, 96.
- Now divide students in groups.
- Ask students to find HCF of these numbers by division method.
- Let them think first and then solve it.
- Check the answers from each group.
- Now solve this question on board to enhance their understanding.

Sum up / Conclusion:

- Elicit what errors they can make while calculating the HCF.
- Ask students to repeat the steps of finding HCF using long division method.

Assessment:

- Write any two questions on the board. (From textbook)
- Find HCF of the following by division method.
 - a) 48, 76, 96
 - b) 51, 65, 75
- Ask them to find HCF of any one part individually.
- Check their responses and provide them feedback.

Follow up:

Ask them to find the HCF of the following numbers by using division method.

- a) 57, 76, 95
- b) 24, 48, 72
- c) 56, 84, 88

HIGHEST COMMON FACTOR (HCF)

**Duration:** 40 Minutes**Students Learning Outcome:**

- Find HCF of three numbers up to 2-digit numbers using prime factorization method

**Materials:**

Writing board, chalk / marker, duster, textbook, flash cards, color pencils etc.

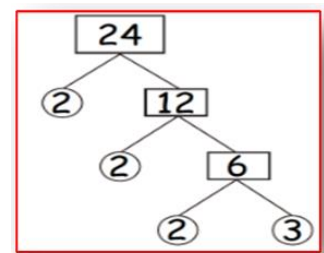
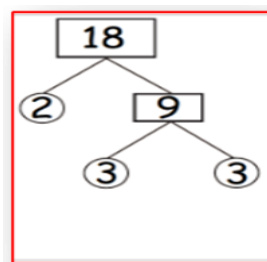
Information for Teachers:

- Factorization means to express a number as the product of its factors. These factors are either composite numbers or prime numbers. (Except 0 and 1 which are neither prime nor composite).
- Prime factorization means to express a number as the product of its prime factors.
e.g., $12 = 2 \times 2 \times 3$
- Factors shared by two or more numbers are called common factors.
e.g. $12 = 2 \times 2 \times 3$
 $14 = 2 \times 7$
- Because '2' is common in factors of both of these numbers so it is called common factor.
- The product of two or more common prime factors is the greatest number/factor, which is called Greatest Common Divisor (GCD) or Highest Common Factor (HCF).

Introduction:

Ask students to complete the factor tree of the following numbers 18 and 24.

As it is given below:





- Ask them to find the prime factors of 18 and 24 using prime factorization.
Prime factorization of 18 = $2 \times 3 \times 3$
Prime factorization of 24 = $2 \times 2 \times 3 \times 3$
- Ask them to write the common prime factors of 18 and 24.
i.e. Common prime factors of 18 and 24 = 2, 3
- Now, ask them to find the product of common prime factors of 18 and 24.
i.e. Product of common prime factors of 18 and 24 = $2 \times 3 = 6$
- Tell them that 6 is the Highest common factor which divides both 18 and 24 completely.
- So, 6 is the HCF of 18 and 24.

Development:

Activity 1:

- Inform the students that today we will learn to find HCF of three numbers up to 2-digit numbers using prime factorization method.
- Write a question on the board.
- Find the HCF of 16, 36 and 52 using prime factorization method.
- Ask them to find the prime factors of 16, 36 and 52 using prime factorization.
i.e. Prime factorization of 16 = $2 \times 2 \times 2 \times 2$
Prime factorization of 36 = $2 \times 2 \times 3 \times 3$
Prime factorization of 52 = $2 \times 2 \times 13$
- Ask them to write the common prime factors of 16, 36 and 52.
i.e. Common prime factors = 2, 2
- Now, ask them to find the product of common prime factors of 16, 36 and 52
- Product of common prime factors = $2 \times 2 = 4$
- Tell them that 4 is the Highest common factor which divides 16, 36 and 52 completely. So, 4 is the HCF of 16, 36 and 52.

Activity 2:

- Divide students in groups.
- Ask them to choose any three numbers between 1 and 100.
- Ask students to find HCF of these numbers according to the method learn.
- Let them think first and then solve it. Check the answers from each group.
- Now ask any volunteers to solve their question on board to consolidate their learning.

Sum up / Conclusion:

- Ask students to summarize the main points of the lesson.

Assessment:

- Write any two questions on the board. (From the textbook)
- Find HCF of the following:
 - a. 16, 32, 96
 - b. 51, 65, 75



- Ask them to find HCF of any one part individually.
- Check their responses and provide them feedback.

Follow up:

- Find the HCF of the following numbers by using prime factorization method.
 - a. 57, 76, 95
 - b. 24, 48, 72
56, 84, 88

REAL LIFE SITUATIONS INVOLVING HCF AND LCM



Duration: 40 Minutes



Students Learning Outcome:

- Solve real life situations involving HCF and LCM.



Materials:

Writing board, chalk / marker, duster, textbook, flash cards etc.

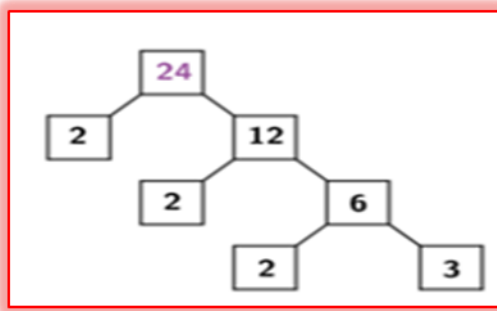
Information for Teachers:

There are many methods of finding HCF of two or more numbers, e.g. through prime factorization or through division etc.

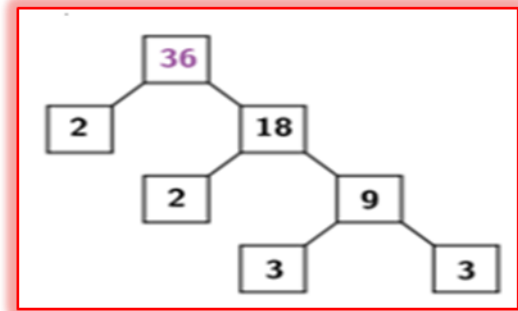
- The greatest number which divides 2 or more given numbers simultaneously is called their HCF.
- The LCM of two or more numbers is the smallest number which is completely divisible by the given numbers.
- $LCM = \text{Product of common factors} \times \text{Product of non-common factors}$
- In word problems teach students to look for vocabulary which shows either to find HCF or LCM.
- Whenever the question is related to **classification or distribution into groups**, then in all the cases it is HCF only. Whenever the question talks about the **smallest or minimum**, then in most of the cases it will be a question of LCM.
- Steps of solving word problems.
 1. Read the word problem.
 2. Underline the given information.
 3. Highlight the word which shows whether to find LCM or HCF.
 4. Solve the problem.

Introduction:

- Write two numbers on the board e.g., 24 and 36.
- Ask students to complete the factor tree of the following numbers 24 and 36. As it is given below:

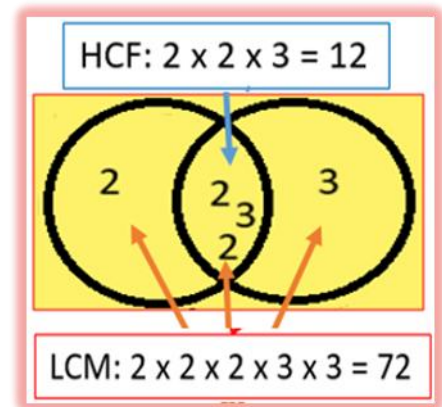


$$24 = 2 \times 2 \times 2 \times 3$$



$$36 = 2 \times 2 \times 3 \times 3$$

- Ask students to write the factors of 24 and 36 in Venn diagram. (As shown in figures)
- Tell them by using Venn diagram, we can easily find out the HCF and LCM of the given numbers.
- Ask them what factors are common in both? (Refer to the HCF of 24 and 36.) (As shown in figure)
- Tell them that the factors which are common and which are non- common, their product refers to LCM. (As shown in figure)
- Tell them that in this example, we have to find out HCF and LCM of given numbers.
- Tell them that there are some real-life situations in which we have to find HCF and LCM.
- So, in today's lesson, you will learn to find HCF and LCM in real life situations.



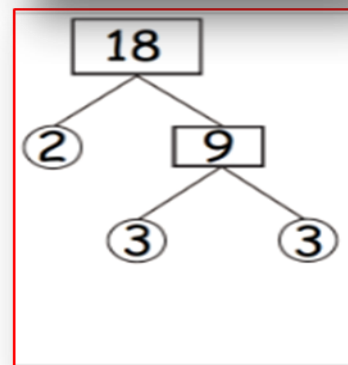
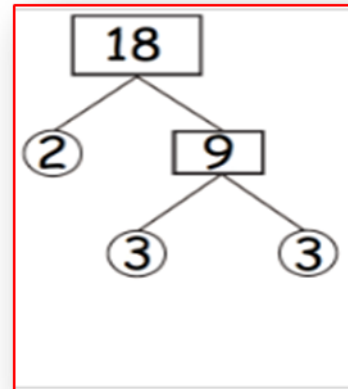
Development:

Activity 1:

- Ask students to recall the steps of solving word problems.
- Write the steps of solving word problems on the side of the board.
 - a. Read the word problem.
 - b. Underline the given information.
 - c. Highlight the word which shows whether to find LCM or HCF.
 - d. Solve the problem.
- Write a question on the board.

Q. “Sara has two pieces of ribbon whose lengths are 18 cm and 24 cm respectively. She wants to cut the ribbon into smaller pieces of equal length with no remainder. What will be the greatest possible length of each piece?”

- Tell them whenever the question is related to classification or distribution into groups, then in all the cases it is HCF only. Whenever the question talks about the smallest or minimum, then in most of the cases it will be a question of LCM.
- To solve this problem, we need to find the greatest number which can divide both 18 and 24 simultaneously. Here words like in equal lengths and without remainder tells that we have to find the HCF.
- Ask students to write the factor tree of the following numbers 18 and 24.
- Ask them to find the prime factors using prime factorization of 18 and 24. Prime factorization of $18 = 2 \times 3 \times 3$
Prime factorization of $24 = 2 \times 2 \times 2 \times 3$
- Ask them to write the common prime factors of 18 and 24.
i.e. Common prime factors = 2, 3
- Now, ask them to find the product of common prime factors.
i.e. Product of common prime factors = $2 \times 3 = 6$
- Tell them that 6 is the Highest common factor which divides both 18 and 24 simultaneously. So, 6 is the HCF of 18 and 24.
- Tell them that the greatest possible length of each piece will be 6 cm.



Activity 2:

- Divide the class in pairs.
- Write a question on the board.
Q. “A cinema runs its movies in two different halls 24/7. One movie runs for 80 minutes and the second one runs for 120 minutes. Both movies start at 1.00 p.m. When will the movies begin again at the same time?”
- Ask them to solve the question.
- Circulate amongst the class and check their responses.



Sum up / Conclusion:

- Review the concepts learnt in class using the 3-2-1 activity – 3 things the students understood, 2 things that were challenging and 1 thing that they do not understand still. (This can be done verbally).

Assessment:

- Write a question on the board. (From textbook)
Q. “The lengths of the two ropes are 24 meters and 14 meters respectively. If Ali wants to cut the ropes into pieces of equal length without any rope left. Find out what will be the maximum length of each piece?”
- Ask them to solve it individually. Check their responses and provide them feedback.

Follow up:

Ask them to solve these word problems.

1. Find the minimum length of the ribbon which can completely be cut into pieces of length 45cm, 75cm and 85cm without any left over.
2. Three water containers contain 12 liters, 24 liters and 42 liters of water. Find the maximum capacity of a measuring container that can fully measure the quantity of water in all three containers.
3. Find the lowest number which is exactly divisible by 18 and 24.
4. A shopkeeper sells candles in packets of 12 and candle stands in packet of 8. What is the least number of candles and candle stands Nita should buy so that there will be one candle for each candle stand?
5. The traffic lights at three different road crossings change after every 48 sec, 72 sec and 108 sec respectively. If they all change simultaneously at 8:20:00 hours, when will they again change simultaneously?

ADDITION AND SUBTRACTION OF FRACTIONS



Duration: 40 Minutes



Students Learning Outcome:

- Add and subtract two or three fractions with different denominators.



Materials:

Props – Introduction Activity 1: 4 glasses with marks on it to divide it into 8 parts, any colored liquid/juice, writing board, chalk / marker, duster etc.

Information for Teachers:

- It is expected that the students are aware of improper fractions, proper fractions and mixed numbers. They have already covered HCF and LCM in the previous unit and so a quick recap will be helpful.
- The students have covered addition and subtraction of fractions with same denominators already so the lesson should begin with a recap of that concept. It will be easier for students to understand and connect.

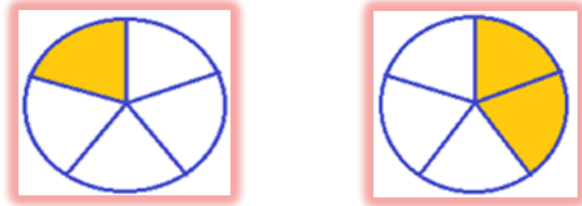
Introduction:

- Place the three marked glasses on the table. These should be of glass or clear plastic so that the students can see the level of liquid inside. Marked glasses or glasses with a scale drawn/printed/marked on them to divide the volume in the glass to 8 equal pieces.
- Begin with filling two of the marked glasses to $\frac{1}{4}$ mark. Ask the students what fraction of liquid is available in total. Get answers from several students. Verify the answers by pouring in the liquid from both glasses into the third glass and finding out what fraction of the third glass was filled. Answer: $\frac{3}{4}$.
- Repeat the steps by filling with $\frac{1}{2}$ of the first two glasses. For this you will need a fourth glass to add liquid to. Answer: 1 whole glass and $\frac{1}{2}$ glass: $1\frac{1}{2}$ OR $\frac{3}{2}$
- Use this activity to recap the previous concepts: proper fraction, improper fraction, mixed numbers, adding fractions with the same denominators.

Development:

Activity 1:

- Draw these figures on the board.



- Ask students to work in pairs and write the fractions of these figures.
- Then ask students to add these fractions.
- Ask any volunteer to come and solve it on the board. $\frac{1}{5} + \frac{2}{5}$ (Answer: $\frac{3}{5}$)
- Elicit from them that they were able to add as these fractions as they had like denominators.
- So, they can be added and subtracted easily.
- Do discuss with them the common mistakes students make is of adding denominators too.

Activity 2:

- Write the following fractions on the board and ask them identify the difference from the previous example they have just done. (Expected answer is unlike denominators)
- Elicit from them the process of solving these fractions. Encourage students to give their ideas.
- Ask the students to observe these steps to add/subtract the fractions of unlike denominators.
- Tell them that by using these steps, we can add and subtract fractions with like and unlike denominator.
- Explain them the following steps:

Add the following fractions:	Subtract the following fractions:
$\frac{1}{2} + \frac{1}{3}$	$\frac{2}{3} - \frac{2}{5}$
$\frac{1}{2} + \frac{1}{3} = \frac{1 \times 3}{2 \times 3} + \frac{1 \times 2}{3 \times 2} = \frac{5}{6}$	$\frac{2}{3} - \frac{2}{5} = \frac{2 \times 5}{3 \times 5} - \frac{2 \times 3}{5 \times 3} = \frac{4}{15}$

1. Make the fraction into improper fraction if a mixed fraction is given.
2. Look at the denominators to find whether they are like or unlike denominators.



3. For like denominators simply add or subtract the numerators.
 4. For unlike denominators, find the LCM of the denominators.
 5. Multiply both the numerator and the denominator by a number so that their denominators become equal to their LCM.
 6. Add/subtract only the numerators keeping the denominator same.
 7. Reduce if possible.
- Write the steps on the side board or chart paper for reference.
 - To ensure the concept is clear, write down the following question on the board and ask students to find the answer. Then ask volunteers to come and solve the question on the board.
- Q.1 $1\frac{3}{10} + 6\frac{14}{20}$
- Q.2 $2\frac{13}{24} - \frac{4}{18}$
- Ensure you remind students about converting improper fractions to mixed numbers while giving the final answer.

Sum up / Conclusion:

- Ask students to think about the main points covered in the lesson.
- Tell them that they will have to explain them within a minute.
- Ask any two or three students to volunteer to recap the main points covered in the lesson in one minute only.

Assessment:

- Write the following questions on the board.
- Q.1 $\frac{5}{6} + \frac{7}{8}$ (Answer: $1\frac{17}{24}$) Q.2 $\frac{9}{11} - \frac{2}{5}$ (Answer: $\frac{23}{55}$)
- Ask them to solve it individually.
 - Check their responses and provide them feedback.

Follow up:

- Homework: As a challenge question ask students to solve the given two questions:
- Q.1 $\frac{1}{4} + \frac{8}{10} + \frac{2}{6}$ Q.2 $\frac{3}{4} - \frac{1}{3} - \frac{2}{9}$

ADDITION AND SUBTRACTION OF FRACTIONS

**Duration:** 40 Minutes**Students Learning Outcome:**

- Add and subtract two or three fractions with different denominators.

**Materials:**

Textbook, writing board, chalk / marker, duster, textbook, chart papers etc.

Information for Teachers:

This lesson is the continuation of the previous lesson and is mainly used for reinforcement of concepts covered in the last lesson. No new concepts are introduced.

Introduction:

- At the beginning of the lesson, write the following question on one corner of the board.

$$1\frac{3}{10} + 6\frac{14}{20} - 2\frac{15}{40}$$

- Ask the students to try and solve the above equation in a time of 3 minutes.
- Take a few responses from the students.
- Ask a volunteer student to recap the steps that will be used to solve the above equation.
- Finally solve the question on the board, showing each step. Answer: $\frac{45}{8}$

Development

Activity 1:

- Ask students to recall the steps introduced in adding or subtracting fractions in previous lesson.
- Expected answer is:
 - a. Make the fraction into improper fraction if a mixed fraction is given.
 - b. Look at the denominators to find whether they are like or unlike denominators.



- c. For like denominators simply add or subtract the numerators.
 - d. For unlike denominators, find the LCM of the denominators.
 - e. Multiply both the numerator and the denominator by a number so that their denominators become equal to their LCM.
 - f. Add/subtract only the numerators keeping the denominator same.
 - g. Reduce if possible.
- Write the steps on the side board or chart paper for reference. **(It is highly recommended that teacher ensure that these steps are written in students note books).**
 - The first part of the lesson will be based on reviewing and practicing taking LCM and finding answers to the questions.
 - Divide students into groups of 3 – 4 and ask each group to solve the following questions on their notebooks together.
Textbook-Unit 2: Ex 2 Q1 (b, g); Q2 (f, h)
 - Circulate amongst the group and guide each group and help them get to correct answers. By the end of time, all students should have come to the correct answers.

Activity 2:

- Ask students to consider Textbook-Unit 2, Ex-2: Q4 as an example.
- Elicit from the students the steps to solve word problems.
- Write the steps of solving word problems on the side of the board or on a chart paper.
 1. Read the word problem.
 2. Underline the given information.
 3. Highlight the word which shows operation.
 4. Solve the problem.
- Solve this question step-by-step on the board, indicating how to extract data from the given word problem.
- Ask students for their responses in solving the sum.

Conclusion / Sum up / Wrap up:

- Recap the lesson's main learning points, including LCM calculation.
- Brainstorm ideas with students in what situations adding or subtracting of fractions is useful or required and motivate them to bring such questions/problems to the next class.

Assessment:

- Ask students to solve the question on their notebooks individually.
Q.1 $\frac{4}{6} - \frac{1}{12}$
Q.2 $\frac{2}{3} + \frac{13}{15} + \frac{11}{12}$
- Take random feedback and ask a volunteer to solve the question on the board.

Follow up:

- Homework: Textbook, Unit 2, Ex-2: Q3 & Q5

MULTIPLICATION OF FRACTIONS



Duration: 40 Minutes



Students Learning Outcome:

- Multiply two or three fractions involving proper, improper fractions, and mixed numbers



Materials:

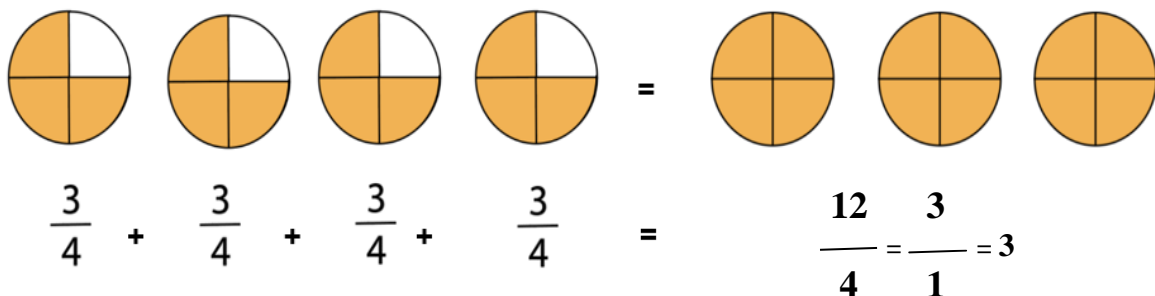
Textbook, Writing board, chalk / marker, duster, flash cards etc.

Information for Teachers:

- It is helpful to explain to the student how multiplication is linked to addition.
- Development activity no 1. is explained in the video. See the provided link <https://www.youtube.com/watch?v=kuHWXct8i0g>
- **Proper Fraction** – A fraction that is less than one with the numerator being less than the denominator. e.g. $\frac{3}{4}$
- **Improper Fraction** – A fraction in which the numerator is greater than the denominator. e.g., $\frac{5}{4}$
- **Mixed Number** – A number consisting of a whole number and a proper fraction. e.g., $4\frac{1}{2}$
- The steps involved in multiplying fractions are:
 1. Convert all numbers to fractions.
 2. Multiply the numerators.
 3. Multiply the denominators.
 4. Reduce to simplest form (if possible).

Introduction:

- On the board write down number 3, five times. Ask the student what the sum of these five numbers will be. $3 + 3 + 3 + 3 + 3$ Answer: 15
- Next ask them to count the number of times “3” is repeated. Write this number (5) on the board and multiply it by 3. And ask students what the answer would be now. 3×5 Answer: 15
- Discuss how multiplication is linked to addition.
- Ask students, let us multiply $\frac{3}{4} \times 4$ by using figures.
- Remind them that multiplication is the process of repeated addition.

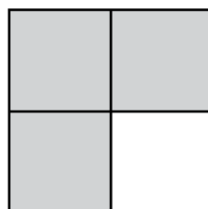


- Tell them that the product of $\frac{3}{4} \times 4 = 3$. (As it is shown in above figure)
- Ask them to multiply $\frac{2}{3} \times 5$ by using figures.
- Tell them that in today’s lesson we will multiply two or three fractions involving proper, improper fractions, and mixed numbers.

Development

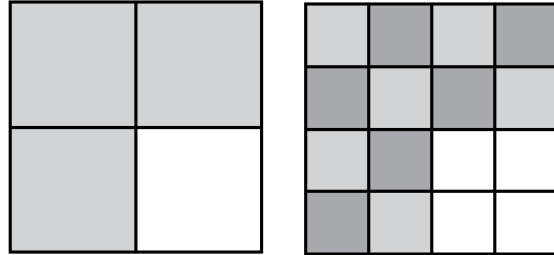
Activity 1:

- On the board write down the following question: $\frac{1}{2} \times \frac{3}{4}$
- Draw a 2×2 grid on the board and out of these shade 3 boxes (as shown in the given picture) with one color (if different colored chalks are unavailable then you can use different shading patterns).
- This colored grid represents the fraction $\frac{3}{4}$.



- Now explain to students that each box of the grid will have to be divided into 4 equal more boxes (as shown). Once the boxes are formed, for each large box color half of the region with a different color/pattern.
- Count the number of boxes with overlapping color. Write it down as the fraction of the total number of boxes. Then simplify the fraction.
- So, the answer for this question is

$$\frac{1}{2} \times \frac{3}{4} = \frac{6}{16} = \frac{3}{8}$$



Activity 2:

- Write a question on the board.
- Ask them to solve the fractions in pairs.
- Ask any volunteer to solve the question on the board.
- Repeat the process again by giving them one more question.
- Ask them to solve the following fractions.
- Multiply

$$\begin{aligned} & 2\frac{3}{5} \times 1\frac{1}{4} \times \frac{8}{13} \\ &= \frac{1\cancel{3}}{\cancel{15}^1} \times \frac{\cancel{5}^1}{\cancel{14}^1} \times \frac{\cancel{8}^2}{\cancel{13}^1} \\ &= \frac{1 \times 1 \times 2}{1 \times 1 \times 1} \\ &= \frac{2}{1} \\ &= 2 \end{aligned}$$

$$\begin{aligned} & \frac{2}{5} \times 3\frac{1}{3} \\ &= \frac{2}{\cancel{15}^1} \times \frac{\cancel{10}^2}{3} \\ &= \frac{(2 \times 2)}{(1 \times 3)} \\ &= \frac{4}{3} \\ &= 1\frac{1}{3} \end{aligned}$$

- To embed the concept, after students have done, explain all the steps to multiply the fractions on the board.

Conclusion / Sum up / Wrap up:

- Do a quick recap of the rules of multiplication by using last question from the activity 2.
- Also reinforce how it does not matter whether it is proper or improper fractions being multiplied. Review the process of simplification of fraction.

Assessment:

- Write a question on the board.
- Multiply the following fractions.
- Ask them to solve it individually.
- Check their responses and provide them feedback.

1.	$\frac{6}{7} \times 3$
2.	$9\frac{1}{9} \times 10\frac{1}{3} \times 5\frac{1}{2}$



3.	$\frac{6}{7} \times 5$
4.	$1\frac{1}{5} \times 2\frac{3}{7} \times 3\frac{3}{4}$

Follow up:

- Ask them to solve these fractions.
- Multiply the given fractions.

MULTIPLICATION OF FRACTIONS

**Duration:** 40 Minutes

Students Learning Outcome:

- Solve real life situations involving multiplication of fractions.



Materials:

Writing board, chalk / marker, duster, strips of papers to make chits, bowl/basket, textbook etc.

Information for Teachers:

- We use multiplication to find ‘**groups of**’ something e.g., $2 \times \frac{1}{3}$ means 2 groups of $\frac{1}{3}$.
- The steps involved in multiplying fractions are:
 1. Convert all numbers to fractions.
 2. Multiply the numerators.
 3. Multiply the denominators.
 4. Reduce to simplest form (if possible).

Introduction

- Write down the following question on the board and put a timer of 1 minute and ask students to calculate the answer. (Answer: $\frac{24}{168} = \frac{1}{7}$)

$$\frac{6}{7} \times \frac{4}{3} \times \frac{1}{8}$$

- Use the question to quickly revise the rules of multiplication and simplification.

Development:

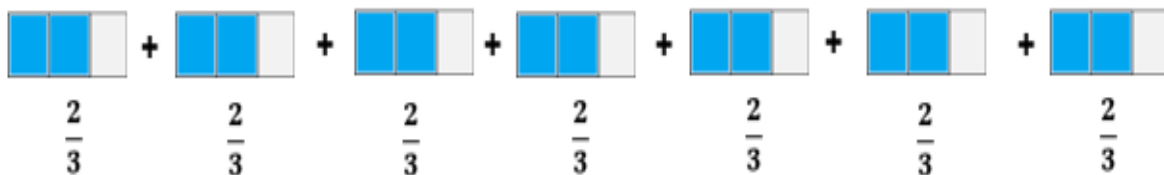
Activity 1:

- Revise with students how to convert mixed numbers into improper fractions.
- Discuss how the method of multiplication follows from this point forward.

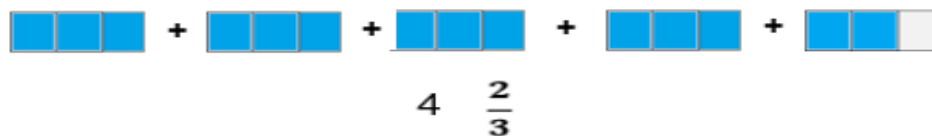
- Divide students into pairs and ask each pair of students to come up with one proper, one improper and one mixed number fraction. Write these on a piece of paper and fold it.
- Collect the chits of each pair and put it into a bowl.
- Shuffle all chits and circulate them across the classroom, so that each pair can choose a random chit from the bowl.
- Ask each pair to open the chit at the same time and multiply the three numbers given on it and find the answer. These answers should be written on the back of the chits.
- Collect the chits again and circulate the bowl once again. Each pair again randomly chooses one chit each and now checks the answer on the back is correct or not.
- All questions which might have been wrong should be done on the board so that mistakes can be identified.

Activity 2:

- Write a word problem on the board.
Q. “Fatima takes $\frac{2}{3}$ hours daily to complete her homework. How much time does she spend on her homework in a week?”
- Tell them we will begin to solve this word problem by drawing the figures.
- Ask them how many days in a week? (Expected answer: 7)
- Tell them that we multiply $\frac{2}{3}$ by 7 to find the total time.
- As, multiplication is repeated addition.
- Tell them that to multiply $\frac{2}{3}$ by 7, we add $\frac{2}{3}$ seven times.



- When we add $\frac{2}{3}$ seven times, we get $4 \frac{2}{3}$
- To reinforce the concept, ask students to recall steps of solving word problems.



- Repeat the process with another question (which is given below) on the board with help of students' input.
- **Q. “Umair exercises for $2 \frac{1}{5}$ hours daily. How many hours will he exercise in 30 days?”**



Conclusion / Sum up / Wrap up:

- Review the concepts learnt in class using the 3-2-1 activity – 3 things the students understood, 2 things that were challenging and 1 thing that they do not understand still. (This can be done verbally).

Assessment:

- Write a question on the board.
Q. “If $5\frac{1}{2}$ m of cloth is used to stitch one dress; how much cloth will be used to stitch 7 such dresses?”
- **Ask them to solve it individually. Check their responses and provide them feedback.**

Follow up:

- Ask them to solve the following word problems.
“Ahsan’s table is $\frac{4}{5}$ of a meter long and $\frac{2}{3}$ of a meter wide. Find the area of Ahsan’s table.”

DIVISION OF FRACTIONS



Duration: 40 Minutes



Students Learning Outcome:

- Divide a fraction by another fraction involving proper, improper fraction, and mixed numbers.

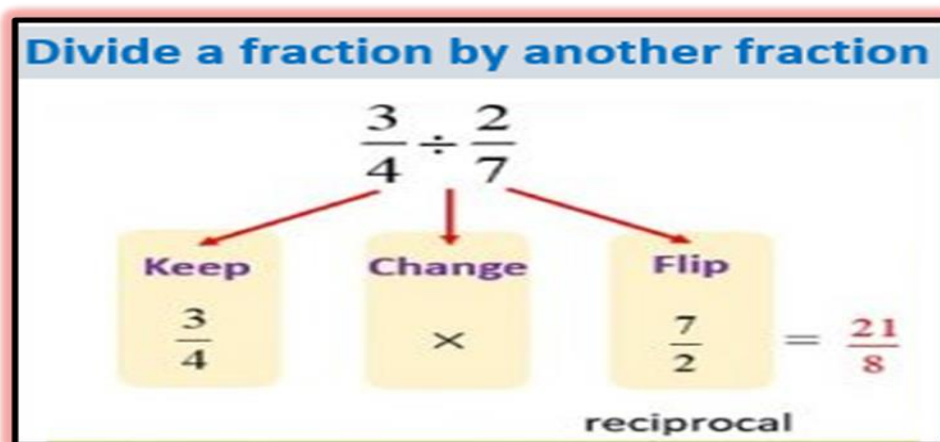


Materials:

Writing board, chalk / marker, duster, textbook, flash cards etc.

Information for Teachers:

- This lesson introduces the concept of division of fractions to students.
- It is important for students to understand that taking a reciprocal makes the question easier and is a multiplication problem then.



Introduction:

- Show students a long thread/rope and ask them how this could be divided equally amongst all students in the class.
- Ask them to discuss in pairs and take random responses.
- Lead student answers to the concept of division.

- Do a quick review of the process of division of simple numbers (refer to the unit of long division)

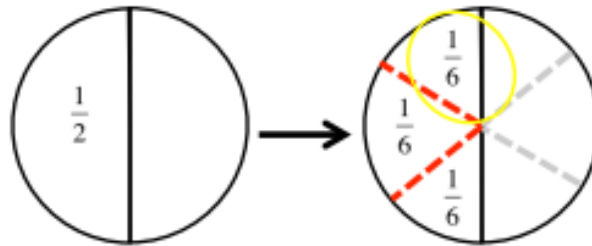
Development:

Activity 1:

- On one side of the board write down the following question.

$$\frac{1}{2} \div 3$$

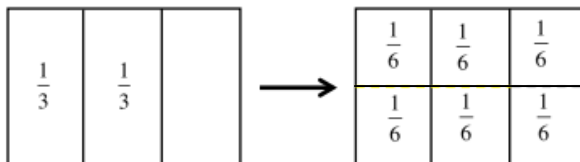
- Discuss with students on how this can be solved. Elicit responses from different students.
- Now on the board draw a circle and divide it into $\frac{1}{2}$. Show students how that can be divided into three parts and result in the answer of $\frac{1}{6}$.



- On the other side of the board, write down.

$$\frac{2}{3} \div 4$$

- Give students 3 minutes to figure out how to calculate the answer using the model shown.
- After getting several responses, from students solve the question using the same model:



- Ask students to solve the following on their notebook, using the same model.

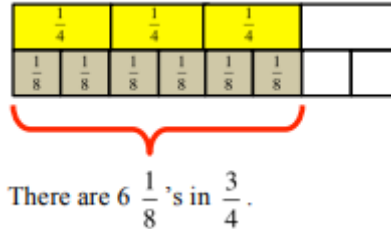
- $\frac{9}{10} \div 3$
- $\frac{6}{8} \div 2$

- Discuss the answers on the board.
- Now, solve the questions in the examples using the reciprocal method.
- Discuss how we take reciprocal of the second number to convert the \div into \times .
- Next ask students to re-do the questions above using this method. They should get the same answers as before.

Activity 2:

- Explain how this method can be extended to division of fractions.

- Write down the question on the board: $\frac{3}{4} \div \frac{1}{8}$
- Using the picture model to explain this solution.



So, the answer is 6.

- Repeat this question using the reciprocal method.
- Write down the following question on the board and ask students to solve them in groups using reciprocal method.

a. $\frac{1}{4} \div \frac{1}{2}$

b. $\frac{9}{10} \div \frac{3}{5}$

- Circulate amongst the group and guide each group and help them get to correct answers. By the end of time, all students should have come to the correct answers.
- Discuss answers on the board.

Conclusion / Sum up / Wrap up:

- Discuss how division can be considered a special multiplication process using the reciprocal method.
- Brainstorm situations of real life where dividing fractions is useful.

Assessment:

- Solve the following fractions.



1.	$\frac{4}{12} \div \frac{4}{18}$
2.	$\frac{1}{2} \div 1\frac{4}{9}$
3.	$\frac{1}{9} \div 3\frac{6}{7}$

- Ask them to solve it individually.
- Check their responses and provide them feedback.

Follow up:

- Homework: Textbook, Unit-3: Ex-2 Q3 (a, b, c)
- Ask them to solve these fractions. Solve the following fractions.

1.	$\frac{3}{25} \div \frac{9}{45}$
2.	$\frac{1}{7} \div 2\frac{6}{7}$
3.	$2\frac{5}{6} \div 4\frac{2}{9}$

Division of Fractions

**Duration:** 40 Minutes

Students Learning Outcome:

- Divide a fraction by another fraction involving proper, improper fraction, and mixed numbers.
- Solve real life situations involving division of fractions.



Materials:

Photocopy or enlarged cryptogram for the class display, Textbook, writing board, chalk / marker, duster etc.

Information for Teachers:

- This lesson is a reinforcement lesson for division. Students will understand how to apply these principals to real-world problems and do a challenge task.

Introduction:

- Divide students into groups. Do a rapid-fire round with students. For each question, give each group 40 seconds to write down the answer. The group with the greatest number of correct answers wins.
- Write the following questions on the board.

Q.1 $\frac{1}{3} + \frac{2}{5}$

Q.2 $\frac{4}{7} - \frac{2}{9}$

Q.3 $1\frac{3}{9} \times 25$

Q.4 $2\frac{13}{28} + \frac{3}{4} + 1\frac{4}{7}$

Q.5 $\frac{3}{12} \div \frac{3}{18}$

Q.6 $\frac{1}{7} \times 2\frac{6}{7}$

- Discuss these answers on the board.

Development:

- The starter activity has given a jumpstart to the reinforcement. This lesson will now be divided into two parts.

**Activity 1:**

- Write down the question on the board from Textbook, Unit 3: Ex-2 Q 9.
- Give 2 minutes to students to figure out an equation to solve this question.
- After the time is up, solve this question step-by-step on the board.
- Explain how the concept of division is applied to word problems.
- Ask students to do the following questions in their notebooks. Unit 3: Ex-2 (Q7, Q8)
- Circulate amongst the group and guide each group and help them get to correct answers. By the end of time, all students should have come to the correct answers.

Activity 2:

- This will be a group activity. Shuffle up the groups from the starter activity to make new groups.
- Explain to the students that we will be doing a **Cryptogram** (see **Appendix 1**). A cryptogram is a coded sentence that can only be decoded after solving the clues.
- This activity can be done by writing the question on the board/ making a poster beforehand or giving photocopies of the attached cryptogram to the students.

Conclusion / Sum up / Wrap up:

- Review the concepts learnt in class using the 3-2-1 activity – 3 things the students understood, 2 things that were challenging and 1 thing that they do not understand still. (This can be done verbally).

Assessment:

Formative assessment has been carried out via the three activities explained above.

Follow up:

- Ask students to do the following word problems in their notebooks.
 1. Bashir was given punishment at school for disturbing in class. He completes $\frac{3}{4}$ of his punishment in $5\frac{1}{2}$ hours. How many hours does he need to finish the whole punishment?
Write your answer as a mixed number.
 2. Anila wants to fill some bags with sand to block water from entering her flower garden. She has $7\frac{1}{2}$ loads of sand. If she puts $\frac{2}{3}$ of the load into each bag, how many bags can she fill?

ADDITION AND SUBTRACTION OF DECIMALS

**Duration:** 40 Minutes

Students Learning Outcome:

- Add and subtract 4-digit numbers up to 3 decimal places.



Materials:

Writing board, chalk / marker, duster, textbook, color pencils, notebook etc.

Information for Teachers:

- A decimal number is a number that has digits before and after a **decimal point**. The decimal point is placed after the ones digit.
- Each digit in a decimal number has a **place value** depending on its position.
- To add and subtract decimals, the steps are following:
 1. Line up the decimal points vertically. Fill in any 0's where necessary.
 2. Add or subtract the numbers as if they were whole numbers.
 3. Place the decimal point in the sum or difference so that it lines up vertically with the numbers being added or subtracted.

Place Value Chart (Decimals)					
Tens	Ones	Decimal	Tenths	Hundredths	Thousandths
	3	.	1	4	5

Introduction:

- Recall what a decimal is.
- Take responses from the students.
- With help of students draw and review decimal Place Value Chart.
- Ask volunteers to come up and add decimals in the Place Value Chart.
- Write a decimal in the table by using different colors i.e. 3.145

Number	Place Value (of the red digit)	Value of the Digit (of the red digit)
3.145	Ones	3
3.145	Tenths	$\frac{1}{10} = 0.1$
3.145	Hundredths	$\frac{4}{100} = 0.04$
3.145	Thousandths	$\frac{5}{1000} = 0.005$

- Ask students to first write down the place value of the digit that is colored in red.(As shown in the table given above)
- Then, ask them to write down value of the digit that is colored in red. (As shown in the table given above)

Development:

Activity 1:

- Write two decimals on the board. e.g., 4.463 and 3.24.
- Ask students to add them 4.463 and 3.24.
- Prompting students to draw Place Value Chart for decimals.
- Ask them to write the numbers and decimal in the chart.
- Tell them to add decimals follow these steps:
 1. Line up the decimal points vertically. Fill in any 0's where necessary.
 2. Add the numbers as if they were whole numbers.
 3. Place the decimal point in the sum so that it lines up vertically with the numbers being added.

Place Value Chart (Decimals)					
Tens	Ones	Decimal	Tenths	Hundredths	Thousandths
	4	.	4	6	3
	+3	.	2	4	0
	7	.	7	0	3

- Repeat the process by writing two decimals on the board e.g. 9.410 and 2.392.
- Ask the students to subtract 2.392 from 9.410.
- Remind them that same steps will be followed.
- Solve the question on board for clarity.

Place Value Chart (Decimals)					
Tens	Ones	Decimal	Tenths	Hundredths	Thousandths
	9	.	4	1	0
	- 2	.	3	9	2
	7	.	0	1	8

Activity 2:

- Write pair of two decimals numbers on the board. 1) 4.32 and 0.31 2) 1.03 and 4.23
- Divide students into pairs.
- Ask them to add these decimals.
- Now, write two pair of decimals numbers on the board.
1) 12.6 and 7.2 2) 9.55 and 9.18
- Ask them to subtract these decimals.
- Call volunteer pairs to come up and explain the solution.
- Explain students that the real life example of decimal with the help of question on the board.

Sum up / Conclusion:

- Ask few volunteers to **BE THE TEACHER** and summaries the main point of the lesson.

Assessment:

- Ask the students to solve the following questions.
Q.1 $4.131 + 8.3$ Q.2 $47.04 + 5.007$
Q.3 $11.45 - 2.86$ Q.4 $4.99 - 3.400$
Ask them to swap their work and check each other's answers.



Follow up:

- Solve the following questions.
 - Q.1** Mueez spent Rs. 65. 33 on Monday and Rs. 97.29 on Tuesday. How much money did he spend in two days?
 - Q.2** Fatima ran 5.13 Km on the first day and 2.33 Km on the second day. Find the difference of the distance she ran in two days.

MULTIPLICATION OF DECIMALS



Duration: 40 Minutes



Students Learning Outcome:

- Multiply a 3-digit number up to 2 decimal places by a whole number up to 2 digits.



Materials:

Writing board, chalk / marker, duster, textbook, notebook etc.

Information for Teachers:

- A decimal number is a number that has digits before and after a **decimal point**. The decimal point is placed after the ones digit.
- Each digit in a decimal number has a **place value** depending on its position.
- When a decimal number is multiplied by a whole number, the placement of the decimal point is to be considered carefully.
- The number of decimal places in the product depends on the number of decimal places in the multiplicand.
- The steps involved in multiplying decimals are:
Step 1: Write the decimal problem vertically.
Step 2: Ignore the decimal point and multiply them as whole numbers.
Step 3: Count all the places to the right of the decimal point in both the numbers.
Step 4: Count to the left the same number of places in the product to insert the decimal.

Introduction:

- Start the lesson with a quick pop quiz.
- Write few answers on the board and ask students to make question of these answers.
- Explain with one example that 8.5 expected question can be,
 0.85×10 or 0.085×100



- Write 4 answers on the board.

15.9	543	47.2	3420
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- Encourage students to come on the board and write their questions. When one number is 100.
- Tell them that in today’s lesson we will learn to multiply a 3-digit number up to 2 decimal places by a whole number up to 2

Development:

Activity 1:

- Write two decimals number questions on the board. 1) 0.32×8 2) 1.03×5
- Divide students into pairs.
- Ask them to multiply these decimals.
- Call volunteer pairs to come up and explain the solution.
- Appreciate their work.
- Make corrections and explain it to whole class (if needed).

Activity 2:

- Write a decimal sum on the board i.e., multiply 1.74 by 13.
- Start with: 1.74×13
- Multiply without decimal points: $174 \times 13 = 2262$
- 1.74 has 2 decimal places and 13 has no decimal place. The total number of decimal places is 2.
- Count to the left the number of places in the product to insert the decimal.
- Therefore, our answer has 2 decimal places: 22.62

Activity 3:

- Write a decimal word problem on the board.
Word problem: “The capacity of milk can is 7.55 liters. What will be the capacity of 45 such cans?”
- Remind them the steps to solve the word problems.
- Tell them that capacity of one can = 7.55 liters
- Elicit the information from the word problem, number of cans are 45. So, the total capacity will be calculated by multiplying 7.55 and 45.
- Start with: 7.55×45 .
- Multiply without decimal points: $755 \times 45 = 33975$.
- 7.55 has 2 decimal places and 45 has no decimal place. The total number of decimal places is 2.
- Count to the left the same number of places in the product to insert the decimal.
- Therefore, our answer has 2 decimal places: 339.75
- Hence, the total capacity of 45 cans = 339.75 liters

$$\begin{array}{r}
 22 \\
 7.55 \\
 \times 45 \\
 \hline
 37.75 \\
 302.00 \\
 \hline
 339.75
 \end{array}$$

Sum up / Conclusion:

- Review the concepts learnt in class using the 3,2,1 activity – 3 things the students understood, 2 things that were challenging and 1 thing that they do not understand still. (This can be done verbally).

Assessment:

- Ask the students to solve the following question written on the board.

$2.4 \times 20 =$

$2.4 \times \square = 480$

$0.24 \times 2 =$

$24 \times 20 = 480$

$240 \times 0.20 =$

$24 \times \square = 4.80$

$240 \times 2 =$

$2400 \times 0.020 =$

- After completion, write the answers on the board and ask students to self-check.

Follow up:

- Solve the following questions.
 - 4.91×34
 - 5.49×23
 - 2.50×43
- Word problem: A cement block weighs 4.23 Kg. What will be the weight of 12 such blocks?

Multiplication of Decimals



Duration: 40 Minutes



Students Learning Outcome:

- Multiply a 3-digit number up to 2 decimal places by a 3-digit number up to 2 decimal places.



Materials:

Writing board, chalk / marker, duster, textbook, notebook etc.

Information for Teachers:

- A decimal number is a number that has digits before and after a **decimal point**. The decimal point is placed after the ones digit.
- Each digit in a decimal number has a **place value** depending on its position.
- When a decimal number is multiplied by a whole number, the placement of the decimal point is to be considered carefully.
- The number of decimal places in the product depends on the number of decimal places in the multiplicand.

Introduction:

- Write two decimal questions on the board.
1) 0.32×11 2) 1.73×12
- Divide students into pairs.
- Ask them to multiply these decimals.
- Call volunteer pairs to come up and explain the solution.
- Appreciate their work.
- Make corrections and explain it to whole class (if needed).



- Tell them that in today's lesson we will learn to multiply a 3-digit number up to 2 decimal places by a 3-digit number up to 2 decimal places.

Development:

Activity 1:

- Write a question on the board. Multiply 5.21 by 3.35.
- Ask students about the steps to solve the sums.
- Start with: 5.21×3.35
- Multiply without decimal points: $5.21 \times 3.35 = 17.4535$
- 5.21 has 2 decimal places and 3.35 has two decimal places. The total number of decimal places is 4.
- Count to the left the number of places in the product to insert the decimal.
- Therefore, our answer has 4 decimal places: 17.4535
- Hence the product of $5.21 \times 3.35 = 17.4535$

Activity 2:

- Write a decimal word problem on the board.
Word problem: Fatima measured the length and breadth of her carpet in her room. The length is 3.91m and breadth is 2.45m. She wants area to cover by carpet.
- Ask them to recall the steps to solve the word problems.
- Elicit from the students that by multiplying the length and breadth of the carpet, we can find area covered by carpet.
Length of carpet = 3.91 m
Breadth of carpet = 2.45 m
- Start with: 3.91×2.45
- Multiply without decimal points: $3.91 \times 2.45 = 9.5795$
- 3.91 has 2 decimal places and 2.45 has 2 decimal places. The total number of decimal places is 4.
- Count to the left the number of places in the product to insert the decimal.
- Therefore, our answer has 4 decimal places: 9.5795. Hence, the area covered by carpet = 339.75 m^2

Sum up / Conclusion:

- Ask students to first think what the common mistakes they make while multiplying decimals are. (1 minute)
- Ask them to pair up and discuss in pairs. (2 minutes)
- Take random feedback of the common mistakes they make. (1 minute)

Assessment:

- Ask students to give you 10 decimal numbers which you will write on the board.
- Ask students to work in pairs. One student will use any two decimals to formulate a question the other will solve.
- Take random feedback to check the questions and their answers.



Follow up:

- Solve the following questions.
 - 1) 4.91×3.45
 - 2) 5.82×5.34
 - 3) 2.82×2.30
 - 4) 4.16×1.87
 - 5) 1.23×2.07
 - 6) 5.49×2.31
 - 7) 2.50×4.33
 - **Word problem:** A rectangular garden has the length 5.75 meters and breadth 3.25 meters. Find the area of this rectangular garden?
 - To solve the given question individually.
 - Convert the following as directed.
 - a. 56 years into months
 - b. 49 days into a week
 - c. 180 sec into min
 - d. 600 secs into min
 - e. 48 months in a year
- Textbook, Unit 5, Ex-2 Q1 & Q2

Multiplication of Decimals

**Duration:** 40 Minutes**Students Learning Outcome:**

- Divide a 3-digit number up to 2 decimal places by 10, 100 and 1000

**Materials:**

Writing board, chalk / marker, duster, textbook, notebook etc.

Information for Teachers:

- When divide a decimal by 10, 100, 1000 respectively, we move the decimal point 1, 2, and 3 places to the left respectively.
- When divide a decimal by 10, 100 and 1000, if the number of digits to the left side of the decimal places are not enough, we put the required number of zeros to the left side. **(Explain it on board)**

Introduction:

- Write decimal division question on the board.
a. $2.6 \div 2$ b. $3.9 \div 3$ c. $6.4 \div 4$ d. $0.25 \div 5$
- Ask students to divide these decimals.
- After completion, take random responses or ask volunteers to come on the board and solve the questions. Clarify any misconceptions.

Development:

Activity 1:

(Repeat the concept that each number has a decimal OR convert into decimal number).

- Divide students into pairs.
- Draw a table on the board and write a number i.e. 321.
- Ask the students to complete the table by dividing the number: 321 by 10, 100 and 1000 respectively.

	321
Divide 321 by 10	32.1
Divide 321 by 100	3.21
Divide 321 by 1000	0.321

- Ask them to observe the movement of decimal point in the table above.
- Ask them to guess where the decimal point moves when we divide the decimal number by 10, 100 and 1000. (Expected answer: to the left)
- Appreciate those students who gives you the correct response.

Activity 2:

Use different question having different decimal position. Try to relate it with real life examples i.e. 10 parts etc...)

- Divide the class in groups.
- Write a question on the board i.e. divide **4.73** by 10, 100 and 1000.
- Ask them that they will solve the question given in the table and write the rule.
- Ask them to draw a table and write a decimal **4.73** in it. (As shown in table below)

Decimal	4.73	Rule
Divide by 10	$4.73 \div 10 = 0.473$	Decimal point moves 1 place to the left
Divide by 100	$4.73 \div 100 = 0.0473$	Decimal point moves 2 places to the left
Divide by 1000	$4.73 \div 1000 = 0.00473$	Decimal point moves 3 places to the left

- Tell them that when divide a decimal by 10, 100 and 1000, if the number of digits to the left side of the decimal places are not enough, we put the required number of zeros to the left side.
- To consolidate, the concept asks them to solve the word problem written on the board. **Hina wants to cut 82.5 cm wire in 10 equal pieces. What will be the length of each piece of wire? (Alternatively, you can give each group same question but with a different multiple of 10).**
- Circulate amongst the group and check their working.

Sum up / Conclusion:

- Ask students to think about the main points covered in the lesson.



- Tell them that they will have to explain them within a minute.
- Ask any two or three students to volunteer to recap the main points covered in the lesson in one minute only.

Assessment:

- Ask students to solve the following.
a. $5.82 \div 10$ b. $2.82 \div 100$ c. $11.23 \div 1000$
- Check their responses and provide them feedback.

Follow up:

- Solve the following questions.
a. $4.91 \div 100$
b. $5.49 \div 100$
c. $2.50 \div 1000$
- Word problem: Saba wants to put 127.75 Kilogram of rice in 100 packets equally. How can she find the quantity of rice in each packet?

DIVISION OF DECIMALS

**Duration:** 40 Minutes**Students Learning Outcomes:**

- Divide a 3-digit number up to 2-decimal places by a 2-digit number up to 1-decimal places
- Solve real life situations involving division of 3-digit numbers up to 2 decimal places.

**Materials:**

Writing board, chalk / marker, duster, textbook, notebook etc.

Information for Teachers:

- Ask the students to read the statement from book and underline the keywords.
- Tell them about the of all four operations like altogether, added, total sum up, total numbers, difference, left, given away, more or less, equally divided, equally given/shared etc.
- Make clear understanding of students about statement questions.
- Steps for solving a word problem.
 1. Read the word problem.
 2. Underline the given information.
 3. Highlight the word which shows operation.
 4. Solve the problem.

Introduction:

- Ask students to work in pairs and find the answers.
 - a. $775 \div 5$
 - b. $484 \div 11$
 - c. $473 \div 10$
 - d. $82.8 \div 100$
- After completion, take random responses or ask volunteers to come on the board and solve the questions. Clarify any misconceptions.

Development:

Activity 1:



- Write a word problem on the board.
Aleena wants to cut 3.9 meters wire into 3 equal parts. What is the length of each piece of wire?
- Remind students the steps to solve word problems.
- Ask any volunteers students to solve this word problem on the board.
- Repeat the same process with another word problem.
- Write a word problem on the board.
In 15 bags, 53.25 kg of flour is to be packed. How much flour will be packed in each bag?
- Tell them to find flour can be packed in 1 bag, we divide 53.25 by 15.
- With the help of students' input solve the question.

Activity 2:

- Divide students into pairs.
- Each pair has to do the following questions from Textbook, Unit 4, Ex-4 in their notebooks:
 - Student A: Q4
 - Student B: Q5
- The students solve their individual questions and then share their notebooks with their paired students.
- Student B will have to check Student A's work, by solving the question and vice versa.
- Ask volunteer pairs to share their solutions with the class.

Conclusion / Sum up / Wrap up:

- Ask volunteer students **TO BE THE TEACHER** and summaries main points of the lesson.

Assessment:

Formative assessment has been carried out with **Activity 2**.

Follow up:

- Solve the following questions.
Q1. Fatima wants to fill 67.5 liters of oil in bottles. Find the number of bottles if the capacity of each bottle is 4.5 liters?
Q2. In 7 packets, 9.31 kg of sugar is to be packed. How much sugar will be packed in each bag?
Q3. Zainab wants to fill 67.5 liters of oil in bottles. Find the number of bottles if the capacity of each bottle is 2.5 liters?

CONVERSION OF FRACTIONS INTO DECIMAL**Duration:** 40 Minutes**Students Learning Outcome:**

- Convert fraction to decimals using division

**Materials:**

Writing board, chalk / marker, duster, textbook, notebook etc.

Information for Teachers:

- A decimal number is a number that has digits before and after a decimal point.
- The decimal point is placed after the ones digit.
- Each digit in a decimal number has a **place value** depending on its position.

Introduction:

- Divide students in pairs. Ask each pair to solve the following questions.
 - a) $26 \div 2$ (Answer=13)
 - b) $64 \div 4$ (Answer=14)
- Now, write decimal numbers on the board. Ask students to divide these decimals.
 - a) $2.6 \div 2$ (Answer=1.3)
 - b) $6.4 \div 4$ (Answer=1.4)
- Elicit from them that the difference in answers is just the placement of decimal numbers.
- Tell them that in today's lesson we will learn to convert fraction to decimals using division.
- Explain/repeat the concept of fraction: proper/improper fraction.

Development:**Activity 1:**

Solve at least two different examples)

- Write a situation on the board.
**Four students want to divide 7 liters of mango juice equally among themselves.
How much of mango juice will each student get?**

- Ask them to divide 7 by 4, i.e., $7 \div 4$
- Write in fraction. $7 \div 4 = \frac{7}{4}$
- Show them to divide by division method. (As shown below)

$$\begin{array}{r} 1.75 \\ 4 \overline{) 7.00} \\ \underline{- 4} \\ 30 \\ \underline{- 28} \\ 20 \\ \underline{- 20} \\ 0 \end{array}$$

- Ask them to write the answer in decimal. $\frac{7}{4} = 1.75$
- Hence, each student gets 1.75 liters mango juice.
- Repeat the process with any another example like $\frac{72}{45}$.

Activity 2:

- Divide the class in pairs.
- Give them 4 questions from the Textbook, Unit-4: Ex-5 Q1
- Ask them to solve the questions.
- After completion of the task, ask volunteers to come and solve the questions on the board.

Sum up / Conclusion:

- Ask a few volunteers to **BE THE TEACHER** and summaries the main point of the lesson.

Assessment:

- Ask the students to convert the given fractions $\frac{1}{4}$, $\frac{63}{12}$ into decimals.
- Ask them to swap their work and check each other answers.
- Take random responses and provide them feedback.

Follow up

- Ask them to convert these fractions into decimals.
 - a. $\frac{19}{25}$
 - b. $\frac{33}{100}$
 - c. $\frac{99}{55}$
- Artificial grass is being planted on $\frac{3}{4}$ part of a park. How can we write this as decimal?

ROUNDING-OFF DECIMAL

**Duration:** 40 Minutes

Students Learning Outcome:

- Round off a 4-digit number up to 3 decimal places to the nearest tenth or hundredth.



Materials:

Writing board, chalk / marker, duster, textbook, notebook etc.

Information for Teachers:

- Rounding means making a number **simpler** but keeping its value close to actual.
- When rounding, numbers can be rounded up or rounded down. This depends on the neighboring digit of the place value to be rounded. If it's **five or higher, round up**. If it's **lower than five, round down**.
- When rounding, use the following steps:

Step 1	Circle the place value of the digit to be rounded. This is the rounding digit.
Step 2	Look to the neighboring digit on the right.
Step 3	a) If the neighboring digit is less than five (0, 1, 2, 3, 4), keep the rounding digit the same. This is called rounding down. b) If the neighboring digit is five or greater (5, 6, 7, 8, 9), increase the rounding digit by one. This is called rounding up.
Step 4	a) When rounding to the left hand side of the decimal, all digits to the right side of the rounding digit will become 0 up until the decimal point. b) When rounding to the right hand side of the decimal, drop all digits to the right of the rounding digit.



Introduction:

Explain/Repeat the concept of Ones, Tens & Thousands in a number & a number).

Activity 1:

- Write whole numbers on the board.
a. 13 b. 95 c. 124 d. 347
- Divide students in pairs.
- Ask them to round off these whole numbers to nearest 10.
- Tell them just like you can round off whole numbers, you can round off decimal numbers as well.

Activity 2:

- Write decimal numbers on the board.
a. 2.5 b. 9.4 c. 13.6 d. 25.5
- Ask them to Round off to the nearest whole number.
- Ask them to work in the same pairs.
- Ask any volunteer pair to come up and explain the procedure how they solved.
- Tell them that in today's lesson we will learn to round off a 4-digit number up to 3 decimal places to the nearest tenth or hundredth.

Development:

Activity 1:

- Write a decimal number on the board. i.e., **21.67**
- Draw a table on the board. (As shown in the table below)
- Ask students to draw the same table on their notebook.
- Ask them to write the decimal number in the table.

Round to the nearest Tenth	Tens	Ones	Decimal point	Tenths	Hundredths	Thousandths
Number	2	1	.	6	7	
Rounded Number						

- Circle the digit in the tenths place.
- Look to the neighboring digit on the right.

Round to the nearest Tenth	Tens	Ones	Decimal point	Tenths	Hundredths	Thousandths
Number	2	1	.	6	7	
Rounded Number	2	1	.	7		

- Since the neighboring digit is greater than 5, increase the rounding digit by one.
- Drop all the digits on the right of the rounding digit.
- Tell the students that the rounded number is **21.7**

Activity 2:

- Write a decimal number on the board. i.e., **3.146**
- Ask students to draw the given table on their notebook.
- Ask them to write the decimal number in the table.

Round to the nearest Hundredths	Tens	Ones	Decimal point	Tenths	Hundredths	Thousandths
Number		3	.	1	4	6
Rounded Number						

- Circle the digit in the hundredths place.
- Look to the neighboring digit on the right.

Round to the nearest Hundredths	Tens	Ones	Decimal point	Tenths	Hundredths	Thousandths
Number		3	.	1	4	6
Rounded Number		3	.	1	5	

- Since the neighboring digit is greater than 5, increase the rounding digit by one.
- Drop all the digits on the right of the rounding digit.
- Tell the students that the rounded number is **3.15**

Activity 3:

- Write a decimal number on the board. i.e., **7.973**
- Ask students to draw the same table on their notebook.
- Ask them to write the decimal number in the table.

Round to the nearest Hundredths	Tens	Ones	Decimal point	Tenths	Hundredths	Thousandths
Number		7	.	9	7	3
Rounded Number						

- Circle the digit in the hundredths place.
- Look to the neighboring digit on the right.

Round to the nearest Hundredths	Tens	Ones	Decimal point	Tenths	Hundredths	Thousandths
Number		7	.	9	7	3
Rounded Number		7	.	9	7	

- Since the neighboring digit is less than 5, the rounding digit remains the same.
- Drop all the digits on the right of the rounding digit.
- Tell the students that the rounded number is **7.97**

**Conclusion / Sum up / Wrap up:**

- Review the concepts learnt in class using the 3-2-1 activity – 3 things the students understood, 2 things that were challenging and 1 thing that they do not understand still. (This can be done verbally).

Assessment:

- Round off the following decimals to the nearest tenths and hundredths.

Sr. #	Decimals	Round off to the nearest tenths	Round off to the nearest hundredths
a)	2.513		
b)	0.674		
c)	8.230		
d)	6.267		
e)	5.183		

- Ask them to complete the table.
- Write their rounded numbers in the relevant columns.
- Check their responses and provide them feedback.

Follow up:

- Round off the following decimals to the nearest tenths and hundredths.
 - a) 47.125
 - b) 90.267
 - c) 91.547
- Solve the following questions.
 - Q1. School library is at the distance of 1.47 km from the laboratory. Write this distance in kilometers to the nearest tenths.
 - Q2. The length of a road is 36.76 km. What is the length to the nearest km?

UNIT 4: DECIMALS AND PERCENTAGES

TOPIC: PERCENTAGES

**Duration:** 40 Minutes**Students Learning Outcome:**

- Convert percentage to fraction and to decimal number and vice versa (only for numbers without decimal part i.e., 35%, 75% etc.).

**Materials:**

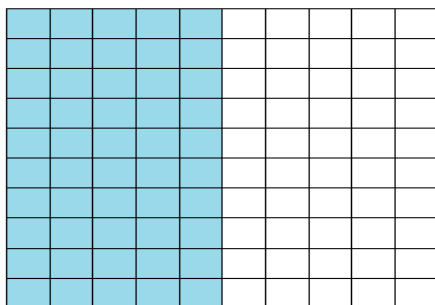
Writing board, chalk / marker, duster, textbook, notebook, 10 by 10 grid sheets etc.

Information for Teachers:

- The word percent comes from the Latin word **per centum**. The word **per** means ‘for each’ or ‘for every’ and the word **centum** means ‘out of hundred’.
- Percentage is the special kind of fraction with 100 as denominator. The symbol used to represent percentage is “%”

Introduction:

- Show the students 10 by 10 grid. Tell them it has 100 small squares.



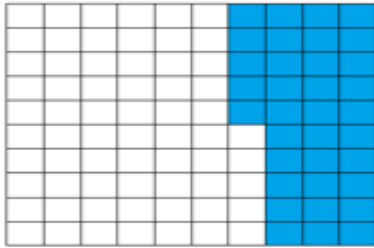
- Ask them to notice how many small squares have been colored blue? (Expected answer = 50)
- Tell them that 50 out of 100 are shaded. It means that 50 per 100
- Ask them what does it mean? (Expected answer = 50%)

- Take their responses.
- Tell them it represents 50% (50 per 100)

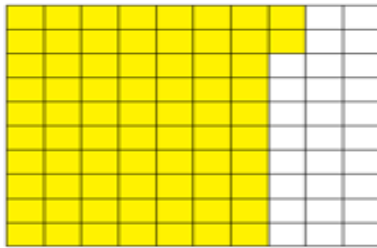
Development:

Activity 1:

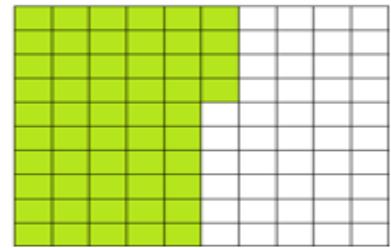
- Divide students in pairs.
- Distribute the sheets having squares.



A



B



C

- Ask them to look carefully at the given squares.
- Ask them to which part of the square is colored in each case.
- Ask them to write their responses in the table. (As shown below)

Name of Square	Coloured part	Percent %
A	35 out of 100	35 %
B	72 out of 100	72 %
C	54 out of 100	54%

- Ask any volunteer pair to come up and explain the procedure how they solved.
- Explain them that 35 % means 35/100 i.e. fractional form of %
- Tell them that in today's lesson we will learn to convert percentage to fraction and to decimal number and vice versa.

Activity 2:

- Make three columns on the board.
- In first column, write a question on the board.
Convert 35% into fraction and decimal.
- Ask them to convert 35% into fraction drop % sign and write the number "over" 100.
Reduce, if possible.
$$35\% = \frac{35}{100}$$
- Reduce the fraction into simplified form.
$$35\% = \frac{35}{100} = \frac{35 \div 5}{100 \div 5} = \frac{7}{20}$$
- Now, in second column write how to convert the percentage into decimal.
- Convert 35% to decimal, we just move the decimal point two places to left.
$$35\% = \frac{35}{100} = 0.35$$
- In the third column, write how to convert decimal into fraction.
- Convert decimal 0.72 into fractions.



- $0.72 = \frac{72}{100} = \frac{72 \div 4}{100 \div 4} = \frac{18}{25}$
- Divide the class in groups and ask them to fill the following table.

Fractions	Percentage	Decimal
		0.82
$\frac{27}{50}$		
	21 %	
		0.65
$\frac{7}{25}$		
	50 %	

Sum up / Conclusion:

- Ask few volunteers **TO BE THE TEACHER** and summaries the main points of the lesson.

Assessment:

- Convert the following fractions into percentages and decimals.

Fractions	Percentages	Decimals
$\frac{4}{100}$		
$\frac{28}{100}$		
$\frac{25}{100}$		

- Ask them to complete the table.
- Check their responses and provide them feedback.

Follow up:

Complete the questions given in Unit 4, Ex-7.

REAL LIFE SITUATIONS INVOLVING PERCENTAGES

**Duration:** 40 Minutes

Students Learning Outcome:

- Solve real life situations involving percentages.



Materials:

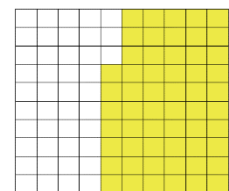
Writing board, chalk / marker, duster, textbook, notebook etc.

Information for Teachers:

- The word percent comes from the Latin word **per centum**. The word **per** means ‘for each’ or ‘for every’ and the word **centum** means ‘out of hundred’.
- Percentage is the special kind of fraction with 100 as denominator. The symbol used to represent percentage is “%”.

Introduction:

- Ask them to look at the grid carefully.
- Ask them the following questions:
 1. How many small squares in this grid? (Expected answer = 100)
 2. How many small squares are colored? (Expected answer = 57)
 3. Write the fraction of the colored and total squares? ($\frac{57}{100}$)
 4. Can you write it in percentage as well as decimal?
(Expected answer = 57%, 0.57)



- Write a question on the board.

Ayesha got 92 out of 100 marks in Mathematics test. Find the percentage of her marks and also write it in decimal? (Relate it with grid of 100 squares)

- Ask them the following questions.
 1. What are the total marks? (Expected answer = 100)
 2. How many marks she obtained? (Expected answer = 92)
 3. Write a fraction to obtained marks to total marks? ($\frac{92}{100}$)
 4. Write the percentage of her marks and give your answer in decimal also?
(Expected answer = 92%, 0.92)

- Tell them that in today's lesson we will learn to solve real life situations involving percentages.

Development:

(Solve one more real-life example related to class i.e. Attendance % etc...)

Activity 1:

- Write a question on the board.
- There are a total of 20 cars in the parking lot. 12 cars are green and 8 cars are blue.
- Draw a table on the board. (As shown in the table below)

Cars in Parking Lot			
Total Cars	20	Fraction	Percentage
Green Cars			
Blue Cars			

- Ask students to draw the same table on their notebook.
- Ask students to complete the table. (As shown below)

Cars in Parking Lot			
Total Cars	20	Fraction	Percentage
Green Cars	12	$\frac{12}{20}$	60%
Blue Cars	08	$\frac{8}{20}$	40%

- Ask them to write the numbers of green cars and blue cars.
- Tell them that numbers of green cars are 12 out of 20 total cars.
- Tell them that numbers of blue cars are 8 out of 20 total cars.
- Ask them to write their fractions. $\frac{12}{20}$ and $\frac{8}{20}$
- Ask them to find their percentages.
- Explain the whole procedure to the whole class.
- Tell them that there are 60% cars are green and 40% cars are blue.

Activity 2:

- Divide the class in pairs.
- Write a question on the board.
A factory produced 850 masks in a day. 72% masks are blue. Find the number of blue masks produced by the factory in a day.
- Ask the pair to solve the word problem.
- After completion of task, ask any volunteer pair to solve the question on board.
- Encourage the pair to talk about the strategies they used in solving the sum.

Sum up / Conclusion:



- To wrap up the lesson, do a Circle, Triangle and Square Activity with the students.
- (Circle) Something that is still going around in your head (Triangle) Something pointed that stood out in your mind (Square) Something that “Squared” or agreed with your thinking.
- Ask students to first think and then share with their partner.
- Teacher to take random feedback from the students.

Assessment:

- Solve the following questions. (From textbook)
Q1. Sajid scored 365 marks out of 500. What percentage did he score?
Q2. There are 40 students in a class. If 5% are absent on Monday, find
 - a) The number of absent students
 - b) The number of present students
- Check their responses and provide them feedback.

Follow up:

- Solve the following questions.
Word problem: 12% apples in a basket are red. Write this percentage in fraction and decimal.
Word problem: A tank can hold 85 litres of water. It’s 30% filled. What percentage of the tank is empty? Write the answer in decimal and fraction.

CONVERSION OF UNITS OF DISTANCE

**Duration:** 40 Minutes

Students Learning Outcomes:

- Convert measures given in:
 - Kilo meters to meters and vice versa.
 - Meters to centimeters and vice versa.
 - Centimeters to millimeters and vice versa.
- Notation of units for kilometer, meter & millimeters.



Materials:

Textbook, writing board, chalk / marker, duster, Meter rules + plastic small rulers (as many as number of groups to be made in class), etc.

Information for Teachers:

- This is beginning of a new concept/unit in class. It is expected that students already have an idea of unit conversions (for length from grade 4) and know why or how units are converted. Build on that knowledge to allow students to start converting between units of distance and time.
- Students should know the following units by the end of this lesson: kilometers, meters, centimeters, millimeters

Introduction:

- As a starter activity ask several students how far they live from the school.
- Ask students to move into four different corners of the classroom based on this distance. Discuss how this can help identify neighbors as well.
- Discuss which unit of distance have they have used and why?
Note: Some students might answer in terms of time, please correct them.
- Now get them back on their seats and ask about three different landmarks near the school. For each ask students to estimate the distance, from the classroom. Ensure one of the landmarks is from within school premises, e.g. canteen, head teacher's office etc.
- Use this to discuss how a change of unit is needed to represent closer and further away distances.

- Ask students what units of distances they know and make a list on the board.

Development:

Activity 1:

- Divide the class in pairs and provide each pair with one meter rule and one small plastic ruler.
- Ask students to look at the ruler and see how many millimeters make up one centimeter.
- Ask them to measure any two items they have like books, rubber, pencils, sharpener, geometry case, etc., with first the small scale then with meter ruler.
- Take random feedback and ask them to share their findings.

Activity 2:

- Divide the class into groups of no more than 5 students. On the board, use the list to make an empty conversion table and ask each student to note it down in their notebooks.

Unit	Millimeters	Centimeters	Meter	Kilometers
Millimeters				
Centimeters				
Meter				
Kilometer				

- Provide each group with one meter rule and one small plastic ruler.
- Ask students to look at the ruler and see how many millimeters make up one centimeter. Note it down. Next look at how many centimeters make one meter. Note it down.
- Now, discuss how taking the reciprocal will help calculate the unit in reverse:
For example:

$$10 \text{ mm} = 1 \text{ cm}$$

then

$$1 \text{ cm} = \frac{1}{10} \text{ mm}$$

- Ask students to fill out the reverse conversions in their table.
- Next step is to determine how many meters make up a kilometer. Relate the prefix kilo to kilogram and discuss how kilo represents 1000. (Using mass as an example from grade 3 and 4). Using this knowledge ask students to fill in the table.
- Using the following equations determine the remaining conversions. (Develop concept of multiplication/division by 1000 to convert km to m vice versa etc...)

$$\bullet 1 \text{ meter} = 100 \text{ centimeters} = 10 \times 100 \text{ millimeters}$$

$$1 \text{ kilometer} = 1000 \text{ meters} = 1000 \times 100 \text{ centimeters} = 10 \times 100 \times 1000 \text{ millimeters}$$

- By the end of the activity, the table would look like this:

Unit	Millimeters	Centimeters	Meter	Kilometers
Millimeters		$\frac{1}{10}$	$\frac{1}{1000}$	$\frac{1}{1000000}$



Centimeters	10		$\frac{1}{100}$	$\frac{1}{100000}$
Meter	1000	100		$\frac{1}{1000}$
Kilometer	1,000,000	100,000	1000	

- Discuss how these conversion tables can be used to convert between distances and units.
- Use the table to convert the following:
 - a. 2 km to m
 - b. 30 cm to km
 - c. 25 m to cm
 - d. 30 mm to cm
 - e. 13 m to mm

Conclusion / Sum up / Wrap up:

- Wrap up the lesson by talking about the importance of converting between units and why it is useful and necessary to make these conversions.

Assessment:

- Ask students to solve the question on their notebooks individually.
 - a. 5 km to m
 - b. 50 cm to km
 - c. 120 m to cm
 - d. 88 mm to cm
- Take random feedback and ask a volunteer to solve the question on the board.

Follow up:

Homework: Textbook, Unit 5, Ex-1: Q1

REAL LIFE SITUATIONS INVOLVING DISTANCE

**Duration:** 40 Minutes

Students Learning Outcomes:

- Convert measures given in:
 - Kilo meters to meters and vice versa.
 - Meters to centimeters and vice versa.
 - Centimeters to millimeters and vice versa.
- Solve real life situations involving conversion, addition and subtraction of measures of distance



Materials:

Textbook, writing board, chalk / marker, duster, one long pencil/piece of wood/straw/thread/stick, etc.

Information for Teachers:

- This lesson is to reinforce unit conversions and see how they apply to real life scenarios. A quick recap of the conversion methodology will be useful.
- It is also a good idea to draw the conversion table from last lesson on one corner of the board for easy refresh for the students.

Introduction:

- Draw the empty conversion table on the board and do a rapid fire with students to fill the table. You can ask students to come to the board and fill it.

Unit	Millimeters	Centimeters	Meter	Kilometers
Millimeters				
Centimeters				
Meter				
Kilometer				



- Place a long pencil on the table and ask students to estimate the length of the wood. Use the conversion table to convert between mm, cm, m and km.

Development:

Activity 1:

Add 1 more example of different measures with pictorial diagram)

- Write down the following example on the board:
The distance that Ali travels every day to go to school from his home is 3 km 25 cm. He then goes to his father's shop at a distance of 1 km 75 cm. What is the total distance he travels in one day?
- As a whole class, discuss how this distance can be calculated. Take a few answers from students before discussing the solution.
- Step-by-step show how the units will be converted and total distance calculated.
- Next, add the following question to the board.
How much more distance does Ali travel when going to school compared to going to the shop?
- Discuss this with the whole class, followed by step-by-step solution of the question.

Activity 2:

- Divide students into pairs.
- Each pair has to do the following questions from Textbook, Unit 5, Ex-1 in their notebooks:
 - Student A: Q2, Q6
 - Student B: Q4, Q7
- The students solve their individual questions and then share their notebooks with their paired students. There is then peer assessment conducted. Student B will have to check Student A's work, by solving the question and vice versa.

Conclusion / Sum up / Wrap up:

- Discuss the answers for activity 2 on the board.
- Brainstorm situations where the students have already used the concepts taught in class today.

Assessment:

Formative assessment has been carried out via **Development: Activity 2.**

Follow up:

Homework: Textbook, Page 91: Q3, Q5

CONVERSION OF UNITS OF TIME**Duration:** 40 Minutes**Students Learning Outcomes:**

- Convert measures given in:
 - hours to minutes and vice versa
 - Minutes to seconds and vice versa.
- Convert measures given in:
 - Years to months and vice versa.
 - Months to days and vice versa.
- Weeks to days and vice versa.

**Materials:**

Textbook, writing board, chalk / marker, duster, etc.

Information for Teachers:

- Even though this lesson discusses time, the process itself is very similar to what was covered in the previous lessons of unit conversion. The students should be able to grasp the unit conversions easily if properly linked to the previous concepts.

Introduction:

- To stimulate the students' thinking ask students the following questions.
 - Why do we measure time?
 - What units do we use to measure time?
 - What examples of time measurements do we have?
- Give a few examples such as age, lesson duration, time taken for a journey, parts of a day etc., and importance of time.

Development:**Activity 1:**

- Ask students the following and write the answers on the board.
 - How many months are there in one year?
 - How many days do we have in one month? (*The correct answer will be that it is dependent on which month – 28 – 31 days range.*)
 - How many weeks on average do we have in one month?



- How many days do we have in one week?
- How many hours do we have in one day?
- How many minutes do we have in one hour?
- How many seconds do we have in one minute?
- Once all of this is written, ask students to sit in pairs and calculate the following:
 - number of days in one year (guide students on how to arrive at 365)
 - number of minutes in one day
 - Number of seconds in one day
 - Number of seconds in one year
- Each pair of students turn to the pair sitting in front/behind them, making a group of 4 and discuss their answers for a few minutes.
- Each group then joins with their adjacent group to come to the conclusion of the final answer. Continue until two large groups are remaining and note down their answers on the board.
- Do calculation on the board to ensure every student understands how to arrive at the correct answer.
- Ask students to then copy and make a table in their notebooks.

Activity 2:

- Divide the class in pairs.
- Write down the following questions for the students to complete in their notebooks.
 - Q1. Ahmad got admission in Grade 1 and left the school after completing Grade 5. If he passed one class in a year then how many months did, he spend in the school?**
 - Q2. It takes 3 months to complete 3 chapters in science. How many days will this be?**
 - Q3. What is your age in months? In days? In years?**
- Ask each pair to solve the question.
- Ask any volunteer student to solve them on the board.
- Discuss mistakes (if any) with the whole class so they all get it clear.

Conclusion / Sum up / Wrap up:

- Wrap up the lesson by reviewing the unit conversions for time.
- Discuss with students how these are similar and different from unit conversions for distance.

Assessment:

- Ask the students to solve the given question individually.
- Convert the following as directed.
 - f. 56 years into months
 - g. 49 days into a week
 - h. 180 sec into min
 - i. 547 days into years
 - j. 48 months in a year

Follow up:

Homework: Textbook, Unit 5, Ex-2 Q1 & Q2

WORD PROBLEMS RELATED TO CONVERSION OF UNITS OF TIME**Duration:** 40 Minutes**Students Learning Outcomes:**

- Add and subtract intervals of time in hours and minutes with carrying and borrowing.
- Solve real life situations involving conversion, addition and subtraction of intervals of time.

**Materials:**

Textbook, writing board, chalk / marker, duster, etc.

Information for Teachers:

- This lesson uses conversion of units and simultaneously introduces concepts for subtracting/adding time.
- Students are already aware of the 12-hour and 24-hour formats. They also know how to add/subtract time without carrying and borrowing.

Introduction:

- Start with asking students the duration of their lunch break (time will be in minutes).
- Ask the students to convert this time to seconds and then to convert it into minutes.
- Now ask students the time they spend in class from morning to before break. There will be some mental calculations involved and students will answer in hours and minutes.
- Tell students that today's lesson will be to understand how to calculate time in these situations.

Development:**Activity 1:**

- Write down the following question on board.
 - **What is the difference between 8 hours and 20 minutes?**
- Show how this problem can be solved step by step. Explain how the unit conversions play a role in the solution.

$$\begin{array}{r}
 \text{Hour} \quad \text{Minute} \\
 8 \quad 00 \\
 - 0 \quad 20 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 \text{Hour} \quad \text{Minute} \\
 \overset{7}{\cancel{8}} \quad 60 \\
 - 0 \quad 20 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 \text{Hour} \quad \text{Minute} \\
 \overset{7}{\cancel{8}} \quad 60 \\
 - 0 \quad 20 \\
 \hline
 7 \quad 40
 \end{array}$$

- Once the students are clear on this, discuss how the same can be applied for addition questions.
- Write down the following question on board.

It took 9 days for seedlings to appear after the seeds were planted. Then it took 3 weeks and 2 days for the plants to reach 5 inches. Calculate the total time taken?

$$\begin{array}{r}
 \text{Week} \quad \text{Days} \\
 0 \quad 9 \\
 + 3 \quad 2 \\
 \hline
 \end{array}
 \qquad
 \begin{array}{r}
 \text{Week} \quad \text{Days} \\
 1 \quad 2 \\
 + 3 \quad 2 \\
 \hline
 4 \quad 4
 \end{array}
 \qquad
 \begin{array}{r}
 \text{Week} \quad \text{Days} \\
 1 \quad 2 \\
 + 3 \quad 2 \\
 \hline
 4 \quad 4
 \end{array}$$

- Remind students that the conversion rule is applied and simple straight forward carrying and borrowing cannot be done.

Activity 2:

- Divide students into pairs.
- Each pair has to do the following questions from Textbook, Unit 5, Ex-3 in their notebooks.
 - Student A: Q3, Q6
 - Student B: Q4, Q5
- The students solve their individual questions and then share their notebooks with their paired students.
- There is then peer assessment conducted. Student B will have to check Student A's work, by solving the question and vice versa.

Conclusion / Sum up / Wrap up:

- Write down the correct answers on the board and discuss the questions students got wrong.
- Review the steps for adding and subtracting time.

Assessment:

Formative assessment has been carried out via **Development: Activity 2.**

Follow up:

Textbook, Unit 5, Review Exercise Q5,6 & 7

UNITARY METHOD



Duration: 40 Minutes



Students Learning Outcome:

- Calculate the value of many objects or the same kind when the value of some of these is given.



Materials:

Grocery bill/ Electricity bills, writing board, chalk / marker, duster, textbook, notebook etc.

Information for Teachers:

- The word ‘**unitary**’ is taken from the word unit, which means “**of one**”.
- The **unitary method** is used to solve mathematical problems by finding the value of a single unit.
- When the value of **one item** is known, the value of **many items** of the same kind can be found by **multiplication**.
- When the value of **many items** of the same kind is known, then the price of **one item** can be found by **division**.

Introduction:

- Share your own experience of shopping at the local market. Tell them after shopping a bill was given to you which had details of where the money was spent. (Show/put a bill of glossary item to class/board for more clarification of concept).
- Elicit from them that how bills are made?
- Cost of each item bought is written on it and in the end the total amount.
- Share a scenario with the students.
- A pencil in their canteen is for Rs.10. What will be the cost of 15 pencils? Let them think and come up with the answer.
- Tell them that as we know the value of one pencil, we will be able to find the cost of 15 pencils.
- Tell students that in the same way if we are given value of certain objects / things we can find the value of other number or quantity of the same object / thing.



- (Add some pictorial diagram related to the topic).

Development:

Activity 1:

- Divide the class in pairs.
- Provide a list of 4 grocery items bought to each pair of students. (Alternatively, draw the table on the board)
- Ask them to calculate the price of each item.

Items bought	Price List
6 eggs	Price of 1 egg is Rs.7
2 loaves of bread	Price of 1 loaf of bread is Rs.120
4.5 kg sugar	Price of 1 kg of sugar is Rs.125
3.75 liters milk	Price of 1 liter of milk is Rs.120

- Take responses from the random pairs and write the total cost in front of each item.
- Encourage students to share their strategies while calculating the prices.
- With students' input calculate the total amount of bill.
- Show them that with the total cost price of 1 item can be calculated.
If the total cost of 4.5 kg sugar is Rs. 562.5 then price of 1 kg of sugar is 125
 $562.5 \div 4.5 = 125$
- Repeat the process with other items too for clarity of concept.

Activity 2:

- Divide the class in four groups and ask them to solve the given word problems.
- Give each group one problem sum.
 1. The cost of 20 chairs is Rs. 7240. How can we find the cost of 1 such chair?
 2. Father bought 12 tube lights for the home which costs Rs. 6900 altogether. What will be the price of 7 such tube lights?
 3. A train travels 6136 km in 52 hours. How much distance will it cover at the same speed in 45 hours?
 4. Sofia bought 4 meters material to sew her suit that costed her Rs.4800. How much does 1 meter of material cost? What will be the cost of 5 meters of the same material?
- After 8-10 minutes ask the groups to present their solutions to the whole class.
- Ask them to solve them on board for clarity.

Sum up / Conclusion:

- A short discussion should be held on the importance of the unitary method. Ask students where they use the unitary method in their daily life.

Assessment:

- Ask students to solve the given word problems in their notebooks.
 - Q1. The price of 10 mobile phones is Rs. 348 290. What will be the price of 29 mobile phones of the same model?
 - Q2. If the fare for 34 km is Rs. 1190. What will be the fare for 48 km?
- Check their responses and provide them feedback.



Follow up:

Solve the following question.

Word problem: There are 2940 pages in 30 notebooks. Complete the table given below.

a)	Number of pages in 30 notebooks =	
b)	Number of pages in 1 notebook =	
c)	Number of pages in 14 notebooks =	
d)	Number of pages in 21 notebooks =	

ANGLES

**Duration:** 40 Minutes**Students Learning Outcome:**

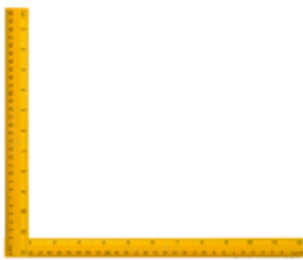
- Classification of / Classify angles as acute, right or obtuse.

**Materials:**

Writing board, chalk / marker, duster, textbook, notebook, ruler/scale/sticks/pencils, handmade clock, analog clock (if available) or handout of clock, blank circular cutouts (3 for each group) etc.

Information for Teachers:

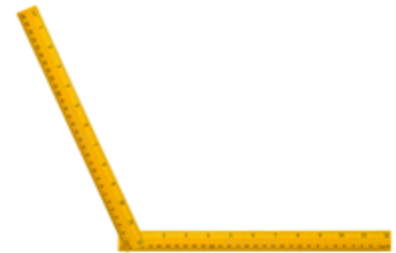
- The angle which is equal to 90° is called 'Right angle'.
- The angle which is less than 90° is called an 'Acute angle'.
- The angle which is greater than 90° and less than 180° is called an 'Obtuse angle'.



Equal to 90°
Right angle



Less than 90°
Acute angle



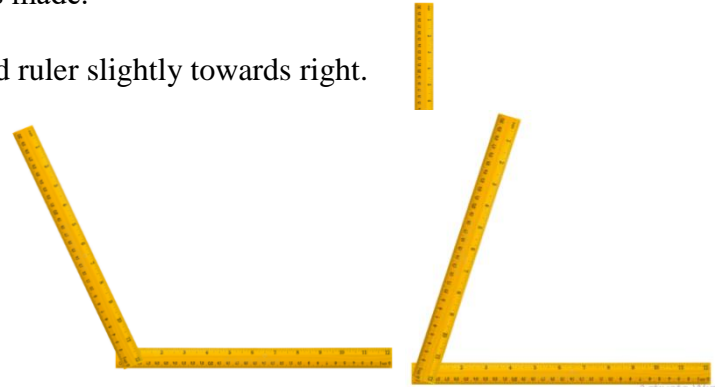
Greater than 90°
Obtuse angle

Introduction:

- Call two students in front of the class.
- Give them 1 ruler to each student.
- First student will place the ruler horizontally in the lower middle half of board.



- The other student will come and place his ruler vertically on one corner of the first ruler.
- Elicit from the students' which angle is made. (Expected answer is 90^0 angle)
- Ask one of the students to move second ruler slightly towards right.
- Ask one of the students to move second ruler slightly towards left.



- Ask them the following questions:
 - 1) What is the measurement of angle, when the second ruler is placed at the right angle to the first ruler? (Expected answer = 90^0)
 - 2) What is the measurement of angle, when the second ruler is moved slightly towards right? (Expected answer = Less than 90^0)
 - 3) What is the measurement of angle, when the second ruler is moved slightly towards left? (Expected answer = Greater than 90^0)
- Tell them that in today's lesson we will learn to classify angles as acute, right or obtuse

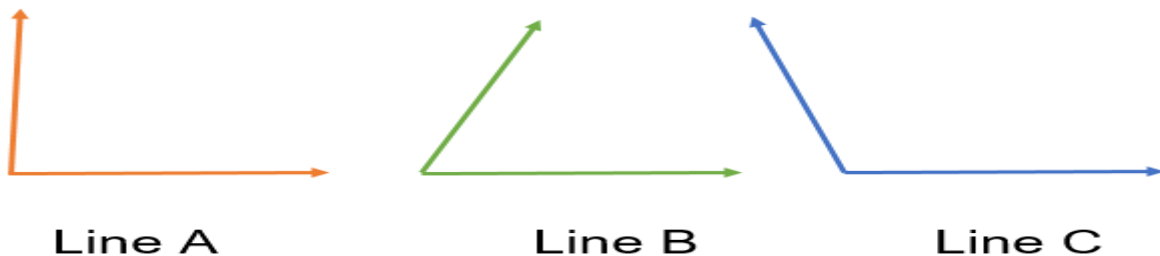
Development:

Activity 1:

- Divide the class in pairs.
- Tell the students that they will draw these three angles.
- For this ask them to draw three horizontal lines. (As shown below)



- Ask them to place second line on each of these horizontal lines. i.e.
 1. First, place second line vertically on line A, which shows 90^0 angle.
 2. Then, place second line vertically on line B, which shows less than 90^0 angle.
 3. Next, place second line vertically on line C, which shows greater than 90^0 angle.
- Now, ask them if they know what type of angles are made
- Elicit from them the angle which is equal to 90^0 is called 'Right angle'.



- The angle which is less than 90^0 is called an 'Acute angle'.

- The angle which is greater than 90° and less than 180° is called an 'Obtuse angle'.

Activity 2:

- Show students the analog clocks having different timings. (Handmade clock can be used)
- Ask them to look carefully at the arms and angles between the arms.



- Ask them to name the angles formed by the arms of the clock.

**Acute angle****Right angle****Obtuse angle**

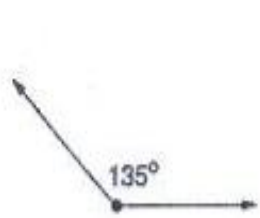
- Draw three columns on the board and label them Acute angle, Right angle and Obtuse angle.
- Distribute three blank circular cutouts to each group.
- Ask them to draw three clocks forming same type of angles but with different timing.
- Ask them to paste their respective clocks on the board in the right column according to the angle made.
- Appreciate students' responses and provide them the feedback.

Conclusion / Sum up / Wrap up:

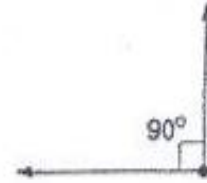
- Review the concepts learnt in class using the 3-2-1 activity – 3 things the students understood, 2 things that were challenging and 1 thing that they do not understand still. (This can be done verbally).

Assessment:

- Draw six angles on the board.
- Ask students to classify each angle as acute, obtuse or right angle.













Follow up:

Students will solve the Textbook, Unit 7. Ex-1: Q. 1

CONSTRUCTION OF ANGLES

**Duration:** 40 Minutes

Students Learning Outcomes:

- Use protractor and ruler to construct:
 - A right angle
 - A straight angle
- Reflex angles of different measures.



Materials:

Writing board, chalk / marker, duster, textbook, notebook, protractor, ruler, pencil etc.

Information for Teachers:

- The angle which is equal to 90^0 is called 'Right angle'.
- The angle which is less than 90^0 is called an 'Acute angle'.
- The angle which is greater than 90^0 and less than 180^0 is called an 'Obtuse angle'.
- The angle from one end to other end of line is called 'Straight Angle'.

Introduction:

- Ask the following questions.
- What do you know about right angle? (Expected answer: 90^0)
- Can you name the angle which is less than 90^0 ? (Expected answer: Acute angle)
- Can you name the angle which is greater than 90^0 ? (Expected answer: Obtuse angle)
- Ask them to draw the three angles (right, acute, obtuse) on their notebooks.
- Ask the following questions.
- Can you tell exact measurement of right angle? (Expected answer: 90^0)
- Can you tell exact measurement of acute angle which you have drawn? (Expected answer: No)
- Can you tell exact measurement of obtuse angle which you have drawn? (Expected answer: No)
- Explain them how the exact measurement of an angle can be taken.
- Tell them that in today's lesson we will learn to use protractor and ruler to construct a right angle, straight angle and reflex angles.

Development:

Activity 1:

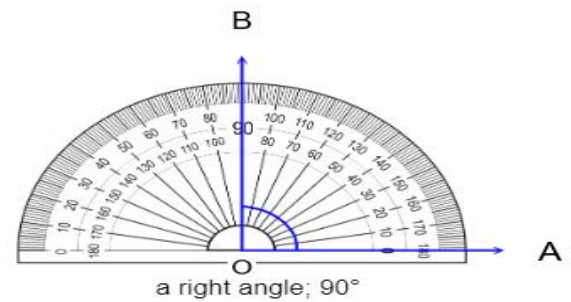
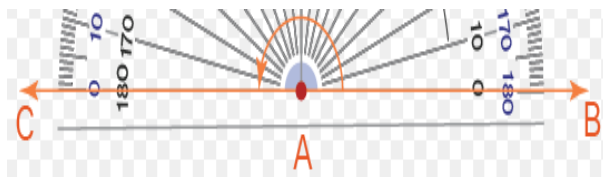
- Tell students about protractor and how use it.
- Tell students that an angle can be constructed by using a protractor and a ruler.
- Tell them to look at the steps of constructing a 90° angle using a protractor.

Step 1 - Draw a line segment OA.

Step 2 - Place the center of the protractor at point O.

Step 3 - Starting from point A in the anticlockwise direction and mark a point at 90 degrees by looking at the inner circle of the protractor. Label this point as B.

- Now ask volunteers to come on board and draw a straight line and calculate its angle.



Activity 2:

- Ask students to work in pairs and construct a 285° angle using a protractor.
- Elicit from them the steps of constructions. (Remind them that to construct a reflex angle, first subtract the Reflex angle from 360° and then draw the resulting angle.)
- Ask them to refer to steps given in the book, if needed.
- Once students have completed the task, take random feedback.
- Ask students to swap their work and their partner should check the angle drawn.

Sum up / Conclusion:

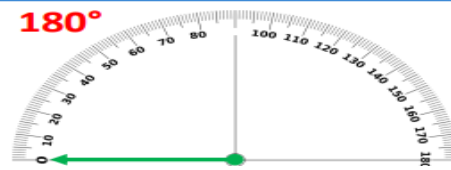
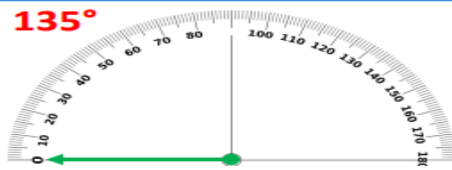
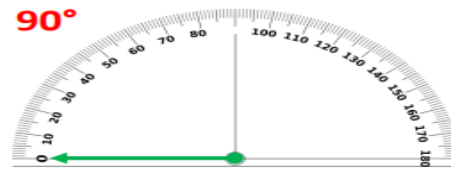
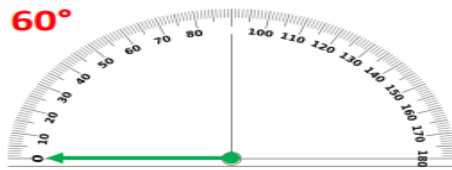
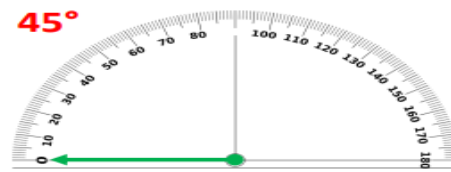
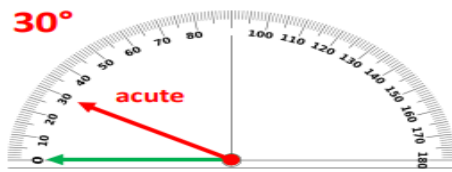
- Ask students to take 1 minute thinking time and identify the most difficult step.
- Share with the whole class so teacher can clarify any misconceptions.

Assessment:

- Ask students to draw the following angles by using protractor.
 - a) 90°
 - b) 180°
 - c) 240°
 - d) 300°
- Check their responses and provide them feedback.

Follow up:

- Draw a second ray to create the angle shown. Label each angle as acute, obtuse, right or straight. The first one is done for you.



CONSTRUCTION OF TRIANGLES



Duration: 40 Minutes



Students Learning Outcomes:

- Use protractor and ruler to construct a triangle when:
 - Two angles and their included side is given.
 - Two sides and included angle is given.
- Measure the lengths of the remaining sides and angles of the triangle.



Materials:

Protractor (large size for board), Meter rule, writing board, chalk / marker, duster, textbook etc.

Information for Teachers:

- This lesson is a continuation of the unit of Geometry.
- The students will have already covered concepts of angles and types of triangles. However, it is a good idea to recap all of these terminologies before beginning this lesson's activities.

Introduction:

- Before beginning review the terminologies with the students that will be used in the unit.
- To review we will use the **Turn and Talk Strategy**.
- Ask the question to the students in class. Give them 30 s to think of the answer and then ask them to turn and talk to their neighbors.
- Student A first gives his/her answer to student B in 30 s. As soon as the 30s are up, Student B then gives his/her answer to student A.
- Circulate in the class during answers to see if there are any corrections needed.
 - Questions:
 - What is an Acute Angle?
 - What is an Obtuse Angle?
 - What do we use to measure the size of an angle?
 - What is a triangle?
- Once all students are sure of these terminologies, inform that we are now going to use our knowledge of geometry to construct triangles.



Development:

Activity 1:

- Instruct the students that they will be listening to the instructions and constructing a triangle.
- Read out the following instructions:
 - Use your ruler and protractor to draw an acute angle $\angle ABC$.
 - Now join point A and C with a straight line.
 - Show your triangles. (The students can just show their drawn triangles by raising them in air)
 - Now draw and obtuse angle $\angle DEF$ and join points F and D.
 - Show your notebooks.
 - Next draw a right angle $\angle PQR$ and join points R and P.
 - Show your notebooks.
- Discuss how this was a simple way of constructing triangles when we do not have any measurements provided.
- Elicit from them any difficulty they faced and clarify any misconception.

Activity 2:

- Instruct them that we will now make triangles when measurements are given.
- Write down the following question on the board:
 - a. Construct a triangle ABC where $AB = 5 \text{ cm}$, $\angle A = 35^\circ$, $\angle B = 70^\circ$.
 - b. For this triangle find out the lengths BC and AC .
 - c. For this triangle find the angle $\angle C$.
 - d. Determine what type of triangle is this?
- Give students 5 minutes on their own to figure out how to construct an exact measurement of the triangle.
- Circulate the class to see how the students are doing.
- Explain on the board step-by-step how to construct the given triangle. The students should follow with each step.
- Ask students to calculate the sum of $\angle A, \angle B, \angle C$. (The answer should be equal to 180°). Inform them that this is true for every triangle.
- Ask students to swap their work with their partner and check the measurements of the triangle.

Sum up / Conclusion:

- Ask students to think about the main points covered in the lesson.
- Tell them that they will have to explain them within a minute.
- Ask any two or three students to volunteer to recap the main points covered in the lesson in one minute only.
- Review the steps for construction of a triangle. Reiterate that the steps remain the same for any measurements provided.

Assessment:

- Write the following question on the board.
- Give students 5 minutes to construct the following triangle:



- a. Construct a triangle **PQR** where **$PQ = 7$ cm, $\angle P = 40^\circ$, $\angle Q = 85^\circ$**
 - b. For this triangle find out the lengths **QR** and **PR**
 - c. For this triangle find the angle **$\angle R$**
 - d. Determine what type of triangle is this?
 - e. Calculate the sum of angles **$\angle P$, $\angle Q$ and $\angle R$**
- Check their responses and provide them feedback.

Follow up:

- a. Construct a triangle **PQR** where **$PQ = 9$ cm, $\angle P = 45^\circ$, $\angle Q = 60^\circ$**
- b. For this triangle find out the lengths **QR** and **PR**
- c. For this triangle find the angle **$\angle R$**
- d. Determine what type of triangle is this?

CONSTRUCTION OF TRIANGLES



Duration: 40 Minutes



Students Learning Outcomes:

- Use protractor and ruler to construct a triangle when:
 - Two angles and their included side is given.
 - Two sides and included angle is given.
- Measure the lengths of the remaining sides and angles of the triangle.



Materials:

Protractor (large size for board), Meter rule, writing board, chalk / marker, duster, textbook etc.

Information for Teachers:

- The students are aware of basic steps of constructing a triangle given two angles and one side. This lesson will extend this into construction of triangles where two sides and one angle are provided.

Introduction:

- Write down the steps of constructing a triangle on the board by asking students. As a whole class ask them to dictate step-by-step how a triangle is constructed.
- Inform that we will be modifying these steps slightly depending on the measurements provided to us.

Development:

Activity 1:

- Write down the following question on the board.
Construct a triangle ABC where AB = 4 cm, BC = 5 cm, $\angle B = 35^\circ$
- Give students 5 minutes on their own to figure out how to construct an exact measurement of the triangle.
- Circulate the class to see how the students are doing.



- Next explain on the board step-by-step how to construct the given triangle. The students should follow with each step.
- Next ask students to find out, for the triangle drawn, $\angle A$, $\angle C$ and length AC .
- Get the triangles peer assessed.

Activity 2:

- Students will now be constructing triangles on their own.
- Ask students to do the following questions from their Textbook, Unit 7, Ex-2 Q4 & Q6.
- For each of the triangles constructed, ask students to additionally find the missing angles and lengths.
- Ask students to check their partners' work after completion.
- Take random feedback from the students to consolidate their learning.

Conclusion / Sum up:

- Review the concepts learnt in class using the 3,2,1 activity – 3 things students understood, 2 things that were challenging and 1 thing that they do not understand still.
- Review the steps for construction of a triangle. Reiterate that the steps remain the same for any measurements provided.
- Ask students how this is useful in daily practice. Triangles are fundamental to how we build our infrastructure and are also the basics that are used further on in all other polygons.

Assessment:

Formative assessment has been carried out via **Development: Activity 2.**

Follow up:

- Homework: Textbook, Unit 7, Ex-2 Q3 & Q5
- Unit 7, Review Exercise Q6 & Q7

QUADRILATERALS



Duration: 40 Minutes



Students Learning Outcomes:

- Recognize the kinds of quadrilateral (square, rectangle, parallelogram, rhombus, trapezium, and kite).
- Use protractor and ruler to construct square and rectangle when lengths of sides are given



Materials:

- Quadrilaterals cut out of chart papers. The size of quadrilaterals should be large to be able to use as demonstration in class. Quadrilaterals needed: square, rectangle, parallelogram, rhombus, trapezium, kite. Protractor (large size for board), chart papers, Meter rule, writing board, chalk / marker, duster, textbook etc.

Information for Teachers:

- It is necessary to make students understand how what they learnt about triangles can be extended to other polygons. In this lesson we will be focusing on quadrilaterals.
- This lesson will introduce students to the various types of quadrilaterals as well as construction of squares and rectangles.

Introduction:

- Paste all the quadrilateral cut-outs on the board or a wall.
- Ask students what they all have in common. The correct answer is that all have 4 sides.
- Use this to introduce the term “quadrilateral” as a polygon having 4 sides.
- Inform students that we will be looking at properties and construction of quadrilaterals in today’s lesson.

Development:

Activity 1:



- Ask students to look around the room and identify as many quadrilaterals as they can. Make the list on the board. You may need to guide towards objects that are not rectangles and squares.
- Now discuss how quadrilaterals sometimes have special names based on the properties they have. On the other side of the board, list down these names: square, rectangle, parallelogram, rhombus, trapezium, kite
- As a whole class activity, ask students to identify which of the classroom item can be categorized as which shape.
- Discuss and outline how each shape can be recognized.
- Use the objects in the classroom to briefly discuss how each shape is different from the other based on their angles or length of sides.
- You can also use the board geometry box to measure lengths and angles to help identify differences in properties.
- Alternatively, you can move this class to outside in case there are more objects that are required. This activity can then be conducted outdoors.

Activity 2:

- Inform students that identification of quadrilaterals helps us in understanding how these quadrilaterals are constructed. In the lesson today however, we will be constructing only squares and rectangles.
- On the board write down the basic steps to construct the square.
 - Draw a horizontal line.
 - On both ends of the line, measure with a protractor and mark 90° .
 - Use a ruler to draw equal lengths of line segments for both right angles.
 - Join the two ends to complete the square.
- Ask them to identify how forming a square will be different from forming a rectangle.
- Lead the discussion to the properties of the rectangle. Use the discussion to write down similar steps for constructing a rectangle on the other side of the board.
- On the board, write down the basic steps to construct the rectangle: (as shown on Textbook, Unit-7, Construction of rectangle)
 - Draw a horizontal line of the given measurements.
 - On both ends of the line, measure with a protractor and mark 90° .
 - Use a ruler to draw equal lengths of line segments for both right angles.
 - Now mark points on the line segment of the given measurement of the other side of the rectangle.
 - Join the two points to complete the rectangle.
- Distribute $\frac{1}{2}$ chart paper to each pair. Ask them to cut it in two pieces.
- Now tell them to work in pairs and one partner construct a square and other rectangle using any measurements they like.
- Ask them to check their work and paste their work on the wall.

Conclusion / Sum up / Wrap up:

- Debrief the lesson by following the steps written on the board and drawing both the square and rectangle on the board to ensure each student understands the steps.

Assessment:



- Ask students to work independently and construct a square whose sides are 5 cm, and a rectangle of sides 7.5 cm and 3.5 cm.
- Check students' work and provide feedback where required.

Follow up:

Homework: Textbook, Unit 7, Ex-3 Q2 & Q3.

SYMMETRY

**Duration:** 40 Minutes

Students Learning Outcome:

- Find point of rotation and order of rotational symmetry of given 2-D figures.



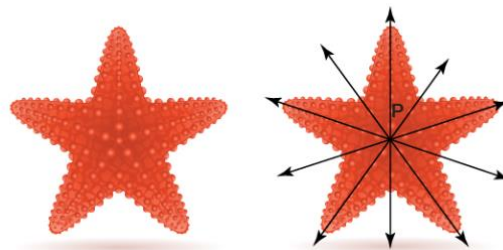
Materials:

- Wall clock, Hard cover book, chart papers, Meter rule, writing board, chalk / marker, duster, textbook etc.

Information for Teachers:

- It is expected that students are already aware of what is meant by symmetry and how a reflective symmetry is used to complete figures. However, a quick review of this is beneficial to link the concept of symmetry to rotational symmetry.
- **Reflective symmetry** is a type of symmetry where one-half of the object reflects the other half of the object. It is also known as mirror symmetry. For example, in general, human faces are identical on the left and right sides. The wings of most butterflies are identical on both sides, the left and right sides.
- An object when rotated in a particular direction, around a point is exactly similar to the original object is known to have **rotational symmetry**.

Rotational Symmetry



- The **order of rotational symmetry** of a shape is the number of times it can be rotated around a full circle and still look the same.
-



Introduction:

- Begin by drawing a large semi-circle on the board and ask a student to volunteer to come and complete the sketch.
- Next draw half a “kite” on the board and ask another volunteer student to complete the sketch.
- Follow this with drawing a slightly complicated half shape and ask a third student to complete the sketch.
- On all three sketches, at the center, draw a dotted line and indicate that this is the line of symmetry.
- Use the sketches to quickly recap what “symmetry” is and how it is used to complete a drawing of a shape.

Development:

Activity 1:

- Ask students to look around the room and identify as many objects as possible which are symmetrical. There will be objects such as wall clock and fan in that list. As the students identify object, discuss how these objects are symmetrical.
- Use the wall clock as an example. Take it off the wall and place it on the desk. Cover the clock with a blank paper so that the time and needles are not visible.
- Hold it vertically and ask the students to note down the position of the clock.
- Now rotate the clock by 180 degrees and ask students if they can see any difference. Rotate it by a further 180 degrees and repeat the question.
- Introduce the term “rotational symmetry” and explain that rotational symmetry is when an object or shape looks the same after some rotation through an angle less than 360 degrees.
- Now draw a vertical line to represent the diameter on the blank paper of the wall.
- Rotate the clock by 90 degrees and ask students if they can see something different. This time the students will be able to see that the vertical line becomes horizontal. Rotate it further by 90 degrees and ask if there is a change. Students should be able to identify that the line has now become vertical again.
- Rotate the clock through the entire 360 degrees and point out how the image of the paper looked exactly the same twice. Identify this as the order of symmetry.
- Now repeat the process with the book cover. Remember to cover it with a plain paper to ensure no marking is seen otherwise. Identify the order of rotational symmetry.
- For the third scenario, draw an arrow on the board and draw its subsequent positions after every 90-degree rotation. Discuss how this object has a zero order of rotation and therefore no rotational symmetry.
- Draw and use more pictorial examples to clear the concept.

Activity 2:

- Give each pair 3 sheets of paper. Ask them to draw, on each sheet:
 - A shape with the order of rotation of zero
 - A shape with the order of rotation of 3
 - A shape with the order of rotation of 4
- This might require them to think in terms of fractions.



- Once completed, ask each student to cut the shapes they have drawn.
- Next ask students to identify on their shapes, the order of rotation by drawing lines of symmetry

Conclusion / Sum up / Wrap up:

- Debrief the lesson by using some of the shapes drawn by students. Discuss how each object can have different order of rotations

Assessment:

- Ask students to complete the table individually.

Shape	Order of Rotational symmetry
Scalene Triangle	
Isosceles Triangle	
Equilateral Triangle	
Arrow	
Rectangle	

Follow up:

Homework: Textbook, Unit 7, Ex-3 Q1 & Q2

3D SHAPES



Duration: 40 Minutes



Students Learning Outcomes:

- Identify cubes, cuboids and pyramids from their nets.
- Describe and make 3-D objects (cubes, cuboids, cylinder, cones, sphere, and pyramids).



Materials:

- Colored papers, scissors, tape for students.
- Daily use objects in shape of cube (box), cuboid (duster), cylinder (can), cone (traffic cone), sphere (ball), pyramid (paper weight). Any easily available objects can be chosen.
- Six sets of paper made cube, cuboid and pyramid. These cones should be made using their nets. During the lesson the shape will be opened up to show the net diagram to the students.

Information for Teachers:

- It is expected that students understand that there are three dimensional objects and are able to recognize cubes, cuboids, pyramids, cylinders, cones and spheres by looking at them. The focus now will be understanding how the three-dimensional objects look in two dimensions, which leads to creation of “net” of the shape.
- Some pre-arrangement of the classroom will need to be done before beginning of the lesson. Divide the classroom into six zones by placing tables. Leave enough space for the students to move around and sit on the ground. On each table in the zone place one of the daily use objects.
- Label each zone as A, B, C, D, E and F. This lesson can be conducted outdoors as well in case of lack of space.

Introduction:

- Brainstorm what are 2D and 3D shapes?
- Ask Students classroom is 2D or 3D?
- Note down all the responses on the board.
- Ask and discuss what it is that makes a 3D shape different from 2D shapes? Where do we see these 3D shapes and where do we see 2D shapes?



- Take answers from students and give them the list of the six shapes they will be studying in the lesson: cube, cuboid, sphere, cone, pyramid and cylinder.

Development:

Activity 1:

- Start by dividing the class into six groups. Inform students that they will be working on identifying 3D shapes.
- Give instructions for the activity to the students.
- Students are divided into 6 groups. Each group will be assigned to one zone.

Group 1	Zone A
Group 2	Zone B
Group 3	Zone C
Group 4	Zone D
Group 5	Zone E
Group 6	Zone F

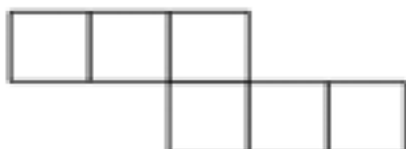
- Each group will have 2 minutes to look at the object on the table and identify the shape of the object.
 - Ask students to especially note the number of plane surfaces of each shape and the name of the shape of each surface.
 - When 2 minutes are up, the groups are going to switch. The teacher is going to say “ROTATE” and the groups will move.

Group 1	Zone B
Group 2	Zone C
Group 3	Zone D
Group 4	Zone E
Group 5	Zone F
Group 6	Zone A

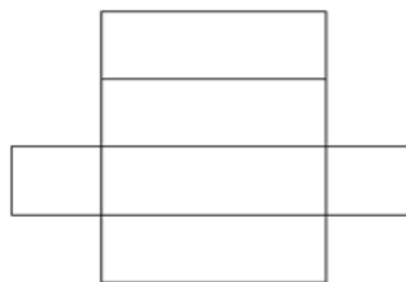
- The cycle repeats, until all groups have studied all six shapes.
- Once 10 minutes are up, debrief by asking each group to talk about properties of one shape each.
- Debrief the activity discussing how different 2-D shapes join together to make a 3D shape.

Activity 2:

- Each group is now given one set of the paper shapes (one cube, one cuboid, one cone and one pyramid). The students should now open the tape of each and layout the shapes as flat on the ground and note their shapes. Give them 3 minutes for this.
- Discuss how each shape has a certain flat shape. State that this is known as the net of the 3D object. Explain the significance of the net.
- Demonstrate to students how the net can be used as guide to fold the paper in a way to form the 3D object.
- Inform student that each 3D shape can have more than one possible 2D nets.
- Next distribute a few colored papers and scissors to each group.
- Draw the following patterns on the board and ask students to copy these on the colored papers and try and identify what shape the specific net will form.
- Write down some of the student answers on the board.



Net of a cube



Net of a cuboid



Net of a Pyramid

We ask students to cut their nets and join them to form a 3D shape. Give students time to form their 3D objects.

- Once the objects are complete, verify how many students had determined the right answer.

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Conclusion / Sum up / Wrap up:

- Debrief the lesson by reiterating the names of the 3D shape and the number and name of surfaces that they are made off. Discuss how these 3D shapes can be mapped onto 2D to form “nets” to act as guide to create the 3D shapes.

Assessment:

- Give students questions from the Textbook, Unit 7, Ex-5 Q 2 and 3 as self-assessment.
- After completion, take random responses to clarify any misconception.

Follow up:

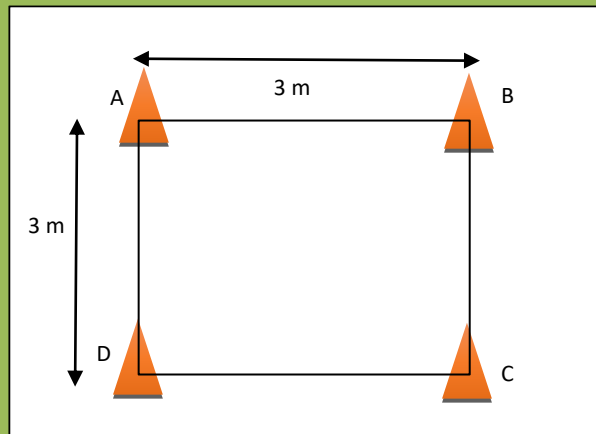
Homework: Reinforcement worksheets. (See Appendices 2& 3).

PERIMETER AND AREA**Duration:** 40 Minutes**Students Learning Outcomes:**

- Identify the units for measurement of perimeter and area.
- Find and apply formulas to find perimeter and area of a square and rectangular region.

**Materials:**

- Writing board, chalk / marker, duster, textbook, etc.
- Few traffic cones – we will be using them as markers so anything can be used as a replacement. In an open ground, use the cones to mark a large square of at least $3\text{ m} \times 3\text{ m}$ as shown. Alternatively, can use any large classroom/hallway for this. Set up a board near the square.

**Information for Teachers:**

- This lesson is done after the unit on geometry. Students still have their learnings of shapes fresh and therefore this can be used as a starter for this topic. Also useful is the unit on distance and time.
- This lesson is focused on area and perimeter of both squares and rectangles. Both these shapes are very common around the environment and therefore can be used as a teaching



aid fairly easily. Students are already aware of what a perimeter and area is and have calculated these using grids. These lessons will introduce the formula and allow students to apply these to real-life contexts.

- With the discussion of 3D shapes and their nets, it is easy for student to imagine real-life object in terms of a 2D layout. Connect this knowledge of the students to the idea of calculations of perimeter and areas.

Introduction:

- Begin the lesson by asking students the following questions: (For each question, give students about two minutes to think/discuss answers.
- Some guided pointers might be useful during the discussion). Do not inform the students about the topic of the lesson yet.

One wall of the classroom is to be completely painted. How can we find out how much paint is required?

- Guide students to how paint is measured in litres and we can find a relationship of how much paint is needed to cover a certain space and then use that to relationship to find the total amount of paint needed.

The edges of the wall have to be covered with tape to make a design. How much tape would be needed?

- Guide students on how in this case, the quantity to be used is length of tape and that if we measure all sides of the wall, we will know the total amount of tape needed.
- Use these two questions and their answers to discuss two important definitions:
 - **Area:** The space covered by any 2-dimentional shape is called its area.
 - **Perimeter:** The total length of the boundary of a closed region is called perimeter.
- Discuss briefly here what is meant by a closed region or closed shape.
- Discuss how area and perimeter are different. Also discuss what units are used for each. Use some object to clear the concept such as draw a square on the board and ell its area and perimeter.
- Inform students that the goal of the lesson is now to learn how to calculate areas and perimeters.
- Now take the students to the ground/class room corner where the square has been marked.

Development:

Activity 1:

- Show the students the square marked on the ground. For the given square, discuss how we can calculate the perimeter. Make the table given below on one side of the board.
- Choose a volunteer student and ask them to walk from cone A to cone B. Ask the rest of the class to count the total number of steps that the student takes. And note it down in the table.
- Next ask the student to move from cone B to cone C and fill in the table with the number of steps.
- Repeat for cone C to cone D and then from cone D to cone A.
Note: The number of steps will approximately be the same on each side.

Direction	Number of steps
Cone A to Cone B	
Cone B to Cone C	
Cone C to Cone D	
Cone D to Cone A	
Total	

- Ask students to find the total number of steps that the student has taken around the square.
- Discuss how this process has given the perimeter of the square. Focus on how steps on each side of the square are added together to reach the final answer.
- Introduce the perimeter of square formula on the board (use l to signify number of steps and connect it to length of one side):
Perimeter of square = $4l$ Units
- Inform students that the length of one side of the square was 3 m. Give them one minute to calculate the actual perimeter of the square using the formula.
- Point out here, how it is also possible to calculate the length of the square provided the perimeter is given by rearranging the equation.
- Now move the cones in such a way that a 3×5 m rectangle is formed. Repeat the above activity with a different student selected as volunteer.
- Introduce the perimeter of rectangle formula on the board:
Perimeter of Rectangle = $2(l + w)$ Units
- Inform students that the length of the rectangle was 5 m and width was 3 m. Give them one minute to calculate the perimeter of the rectangle using the formula.
- Point out here, how it is also possible to calculate one side of the rectangle provided the perimeter and other side is given, by rearranging the equation.
- Now move back into the class.

Activity 2:

- Write down the two formulas on the board and quickly recap what each symbol in this formula means.
- Now ask students to think about how the area for each shape can be calculated. Brainstorm ideas with the students.
- Write down the formula for area of square and area of rectangle on the board.
- It is necessary to point out how the two quantities are calculated using the same measurements.
- For the same square and rectangle, ask students to calculate the area of each.
- Discuss how this can be used in real-life. Link the discussion to how the area of the wall (in the introduction) can be calculated for example.
- Ask students to look around the classroom and identify at least one square and one rectangular surface and calculate its perimeter and area. (For this you can ask students to



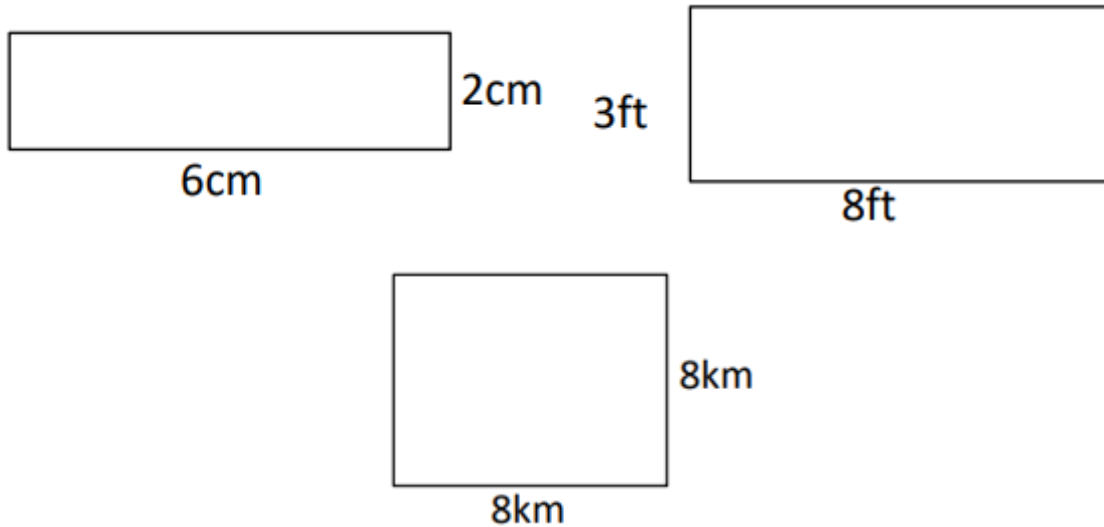
use their rulers to make measurements. Guide them to measure and calculate for smaller surfaces like notebook, table, duster, eraser etc.)

Conclusion / Sum up / Wrap up:

- Debrief the lesson by reviewing the formulas for both the quantities for both shapes.

Assessment:

- Ask students to work individually and identify whether each of these is a square or a rectangle and then calculate their area and perimeter:



Follow up:

Homework: Textbook, Unit 8, Ex-1 & 2

PERIMETER AND AREA**Duration:** 40 Minutes**Students Learning Outcome:**

- Solve real life situations involving perimeter and area of square and rectangular regions.

**Materials:**

- Writing board, chalk / marker, duster, textbook, etc.
- Bring six different items with square surface to the classroom, each labelled as either: “Perimeter: _____” or “Area: _____”.
- Bring six different items with a rectangular surface, each labelled as either: “Perimeter: _____, Length: _____” or “Area: _____, Width: _____”.
- Fill in these blanks by making appropriate measurements and calculations.

Information for Teachers:

- This lesson is in continuation of the lesson where the formula for perimeter and area is introduced to the students.

Introduction:

- Review the formula for perimeter and area of square and rectangle and write it down on the board.
- On the board draw the following shapes and give students 30 s each to calculate perimeter



- Next give students 30 s each to calculate area of the above shapes.
- Give students about 5 minutes for this task: Ask students to write down on small chits:
 - 3 examples where what they learnt was useful and can be applied



- 2 questions that they still have from what was done before
- 1 new question that arose in their mind.

Collect these chits, for your review after class. This also allows students to think about their learning and how it can be applied in their daily lives.

- Inform students that we will be now looking at some real-life scenarios of the application of these formulas.

Development:

Activity 1:

- Divide the students into six groups. Provide each group with one square and one rectangle item. Ask each group to find the missing value in each case.
- This will require students to rearrange the formula and find the unknown.
- Give 3 minutes for this task.
- Now, on the board, recap the steps to take to rearrange the equation. Give another minute to each group to change their answers if they feel the need to after your explanation.
- Ask each group to rotate the items once and do the required calculations for the new set of items. Give two minutes for this calculation.
- Repeat until each group has calculated for the missing variables for all 12 items.
- At the end list down the correct answers for all 12 items.
- Address any confusions the students might have at this point.

Activity 2:

- Now ask students to attempt the following questions, individually in their notebooks:
Q1. Sarah has a rug on her bedroom floor that has a length of 6 m and a width of 4 m. Calculate the area of the rug on the floor.
Q2. The perimeter of a rectangular playground is 36 m. If the length of the park is 6 m, what is the width of the park?
Q3. Zahid is decorating the notice board in the hall. The notice board is a 2.7 m by 3.6 m rectangle. He decides to add a black border around the entire notice board. What is the length of the border he needs?
Q4. The perimeter of a field is 24.5 m and it has a width of 3 m. What is the area of the field?

Conclusion / Sum up / Wrap up:

- Wrap up the lesson by asking one student to volunteer to give an elevator speech (i.e., recap the learning of the lesson in a time of 30 – 40 s only).
- Use student's summary to do a quick recap of the topic.

Assessment:

Formative Assessment has been carried out via **Development Activity 2**.

Follow up:

Homework: Textbook, Unit 8, Review Exercise.

AVERAGE**Duration:** 40 Minutes**Students Learning Outcome:**

- Find and describe average of given quantities in the data.

**Materials:**

- Writing board, chalk / marker, duster, textbook, etc.
- Matchsticks, pencils, wooden sticks, candies, pebbles. (Any one of these can be used but should be at least more than thrice the number of students in class, in quantity.)

Information for Teachers:

- Prior knowledge of students will include ability to add, subtract and divide. Students will already have worked with bar graphs, pie charts and other pictorial representation of data.
- **New concepts:** Average is introduced to students for the first time via this lesson.
- While teaching the concept, it is important to explain to student that the “average” number is a number which may or may not be included in the given data set.
- To find the average of the given quantities, we find the sum of the quantities and divide this sum by the number of quantities.

$$\text{Average} = \frac{\text{Sum of quantities}}{\text{Number of quantities}}$$

Introduction:

- Refer to the previous tests that students have given and discuss how well they did in those tests. Say statements like: “I was happy with the results you have. Most of the students got around ___ marks.” OR “I was not too happy with the results you have. Most of the students got around ___ marks.”
- Lead on with this discussion to the concept of how you can calculate “around how many marks the whole class got”. Link this to the concept of Average.

Development:**Activity 1:**



- Choose 10 students from the class as volunteers. Ask them to give their ages and write them on the board.
- Divide students into groups (maximum 4 students per group).
- Give them 3 mins to find out how to organize these ages so that they can fill in the blank “**The ten students are around ____ years old**”
- After the time is up, write each group’s answer on the board and as a whole class activity, discuss which of the answer’s seem right and why.
- Discuss with them that to find the right answer, we calculate average. Refer the students to the book and in the same groups, ask them to calculate the right answer by using the Key Fact.

Key Fact: To find the average of the given quantities, we find the sum of the quantities and divide this sum by the number of quantities.

$$\text{Average} = \frac{\text{Sum of quantities}}{\text{Number of quantities}}$$

- From the list of answers written on the board, highlight the answers the students are now getting.
- Finally, do the stepwise calculation for calculating average on the board and ask students to make corrections in the working they have done. Encircle the final answer on the board.

For example:

Student Ages:

10, 8, 9, 9, 8, 10, 9, 10, 8, 9

Average calculation:

$$\frac{10 + 8 + 9 + 9 + 8 + 10 + 9 + 10 + 8 + 9}{10} = \frac{90}{10} = 9$$

So,

The ten students are around 9 years old

Activity 2:

- For this activity you need any one category of props listed in the resources section above. For the purpose of this explanation, pencils have been used. Also, for explanation, it is assumed that there are 25 students in the class and you have 75 pencils.
- Show students a box of pencils and tell them the total number of pencils in the box are 75. The task is to divide these pencils equally amongst all students.
- Ask students to calculate how many pencils will each student get. Answer: 3 each
- Next remove 25 pencils and put them aside. Distribute the remaining 50 pencils, unequally amongst all students. Some students can be given “zero” pencils too.
- Once the distribution is complete, ask each student to count the number of pencils they have been given, write it on a piece of paper and hold it up for you to see. Write down all these numbers on the board.
- As students to look at all the numbers and tell you what is the number of pencils that should have been distributed to each student to ensure that each student got equal number of pencils.
- Link to the previous discussion of calculation of average and indicate how the calculation of average can help in answering such questions.



Activity 3:

- Write the following questions on the board for students to calculate average of each data set on their notebooks: (The answers are given in brackets)
 1. 50, 45, 40, 38, 35, 32, 30, 75, 25, 20 (Answer: 39)
 2. 58, 63, 98, 21, 55, 48, 63 (Answer: 58)
 3. 120.5, 121.8, 119.5, 120.3 (Answer: 120.525)

Conclusion / Sum up / Wrap up:

- Recap with students the steps to calculate average of any given data set.
- Brainstorm the situations where students will find average calculation useful. Assign practice questions for homework.

Assessment:

Formative assessment has been carried out via Development Activity 3.

Follow up:

Homework: Textbook, Unit 9, Exercise 1: Q1, Q2, Q3

Teacher Guide
Grade-5

Lesson Plan
42

REAL LIFE SITUATIONS INVOLVING AVERAGE



Duration: 40 Minutes



Students Learning Outcome:

- Solve real life situations involving average.



Materials:

- Textbook, writing board, chalk / marker, duster, etc.
- Blank Flash Cards – These can be blank rectangular cards made of chart papers.

Information for Teachers:

- The main aim of this lesson is to allow students to identify that the average formula can be used by rearranging and that it is not necessary that always a known set of data is provided.
- Students should be informed that the formula for average can be rearranged

For example:
$$\frac{\text{sum of all quantities}}{\text{Total number of quantities}} = \text{average}$$

Can be rearranged to give

$$\text{sum of all quantities} = \text{average} \times \text{total number of quantities}$$

OR

$$\text{total number of quantities} = \frac{\text{sum of all quantities}}{\text{average}}$$

Introduction:

- Inform students that this lesson will be a continuation of the last one on calculating averages.
- Quick recap of the formula for calculating of averages and check on the homework done by students.
- Write down the homework question 3 on board as follows:

Saad: 16 pencils	Average: 15 pencils.
Amna: 20 pencils	
Sara: 15 pencils	
Ahmad: 9 pencils	

- If needed, discuss how the answer has been calculated to ensure every student has understood.

Activity 2:

- Carry out the “Fist of five” activity. Ask your students to rate their understanding of the following statements using their fingers with 1 finger showing “unsurety” five fingers indicating confidence of the concept.
 1. I know why calculating an average is useful.
 2. I understand that the average number may or may not be present in the data set.
 3. I can calculate average for a data set containing several values.This will allow you to gauge which students need more help and adapt your instructions accordingly.

Development:

- Inform students how the formula for average can be manipulated to find other information as well.

Activity 1:

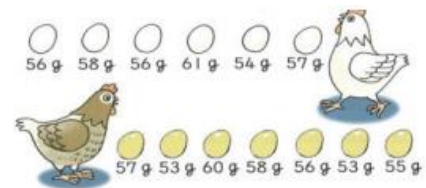
- Divide students into groups of four. Provide each group with equal number of blank flash cards.
- For example, there are 5 groups and each group is given 7 cards.
- Instruction to the students: Each group has the same number of cards. What is the total number of cards distributed?
- Do not allow students to move around or talk to other groups. However, they can discuss amongst their groups to arrive at an answer.
- After 3 minutes, take answers from different groups and write these on the board.
- As a whole class, determine what the correct answer is and discuss how the formula for average can be used to calculate this answer.

Activity 2:

- From the **Fist of Five activity** above, identify students who have weak concept and pair them with the students who have stronger concept of Average. The goal of this activity will be to do problem solving and find the answer.
- On the board, right down the following problem:
“Ali’s mother bought 45 sweets for his birthday party. His friends were all given an average of 5 sweets when they came to the party. How many friends attended the party?”
- Allow students to work in pair and arrive at the answer using average.
- Get a group with the right answer to come to the front and explain to the whole class how they calculated the answer.

Activity 3:

- Divide students in pairs.
- Give any two questions from the following question.
- On completion of task, ask volunteer pair to share their answer and method with the whole class.
 1. 10 students have 45 pencils. What would be the average number of pencils the students will have?
 2. Sonia collected 142 cans in 7 days. What would be the average number of cans she collected per day?
 3. Shahid ate 33 mangoes in 10 days. What would be the average number of mangoes he ate?





4. Refer to the diagram below. Which of the two chickens laid heavier eggs?
Note: Compare by calculating the mean weight of their eggs?

Conclusion / Sum up / Wrap up:

- Debrief the lesson and restate the main points and formulae given above.

Assessment:

- Do the following questions from the Textbook: Unit 9, Exercise -1, Q 4 & Q6.
- After students have completed the assessment, solve the two class work questions on the board and ask students to make corrections if required on their notebooks.

Follow up:

This task is in preparation for the next lesson on bar graphs.

Data Collection: In your notebook, note down the number of red, blue, white and green shirts that you have.

REAL LIFE SITUATIONS INVOLVING AVERAGE**Duration:** 40 Minutes**Students Learning Outcome:**

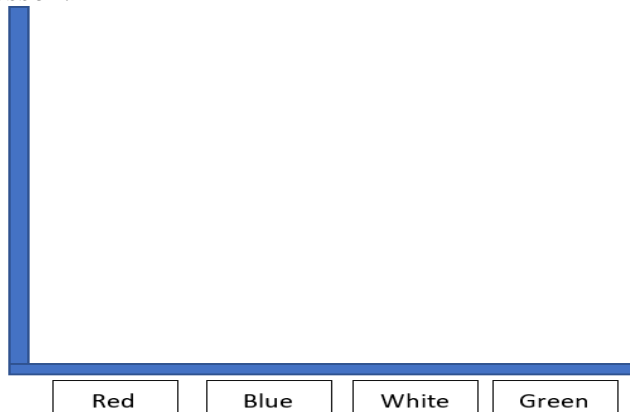
- Organize the given data using bar graph.

**Materials:**

- Textbook, writing board, chalk / marker, duster, permanent marker etc.
- Post-it notes (Can be replaced with small blank rectangular flash cards made using chart papers or plain papers. Should be at least three times the number of students in class.)
- Glue/Tape to paste on wall (in case of chart papers being used)

Information for Teachers:

- This topic builds on the student's previous knowledge of bar graphs and pie charts. This particular lesson is a review of what are bar graphs and how are they built.
- A bit of preparation for Activity 1 is required as follows: On an empty wall in the classroom, use tape and permanent marker to create a grid as shown in the image below. Include the labels of the colors given to students in their activity as homework in previous lesson.



- Preparation for Activity 2: On one side of the board draw a graph grid which will be used to introduce to the students how to make the bar graphs.

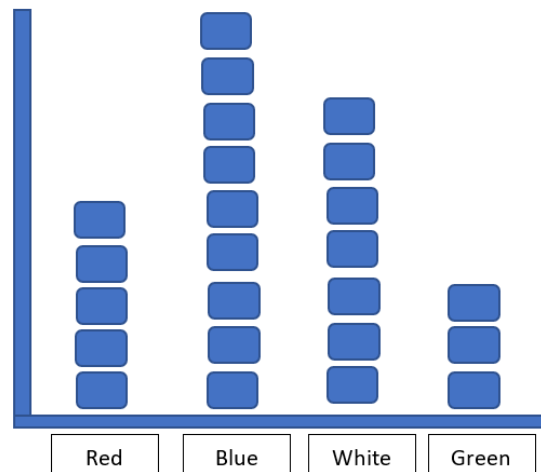
Introduction:

- Build up the context of the activity with the students by discussing how various sets of data are studied to find patterns.
- Randomly ask three – five students of the number of shirts of each color specified in the homework do they have.
- Write these numbers on the board and ask students what sort of information this gives us.
- Ask students how this data can be represented in a better way. Lead on the discussion to the idea of bar graphs.

Development:

Activity 1:

- The students were given home work to note down the number of red, blue, white and green shirts that they have at home.
- Distribute a few blank flash cards/post-it's to each student.
- Ask each student to write down the color of shirt, the number of times it is in quantity. For example, for a student having 1 red shirt, 3 blue shirts, 2 white shirts and zero green shirts will have one flash card with red written on it, three flash cards with blue written on it and two flash cards with white written on it.
- Ask all students to go to the prepare wall, turn by turn and paste their flash cards in vertical in the corresponding column.
- The wall should look like something below:



- Note: The height of each column will vary based on students. In case of a large number of students this activity can be performed on two separate walls simultaneously. In this case, divide the class into two groups and assign one wall to each group.
- The wall will now represent a bar graph. Use the formed bar graph to explain the concept of organizing data and representing it using a bar graph.
- Label the following: x-axis, y-axis, title of x-axis, title of y-axis, title of the bar graph.
- Next use the graph and ask the students to answer the following questions:
 - Which color of shirts is the most popular?
 - Which color of shirt is the least popular?
 - How many more red shirts are there than white shirts? (use the colors according to the graph formed).

- What is the average number of shirts of each color?

Activity 2:

- As a whole class, ask students who are right-handed to raise their hands. Write down this number on the board.
- Repeat for the students who are left-handed and for students who can write well with both hands.
- It is possible that there are no students in either of these three categories. In that case add yourself at that category).
- Repeat the steps to making a bar graph on the board now.
- Use the steps outlined in the Textbook, Unit 8, Topic: Organize the Data using a Bar Graph.
- Identify the x and y-axes. Label these axes and determine a scale. Ensure that the bar graphs drawn are of identical width.
- Discuss with students how this sort of a graph is helpful to represent statistical data.

Conclusion / Sum up / Wrap up:

- Discuss various situations in which we use bar graphs and how it is helpful in real-life. Some examples include:
 - Surveys on which product customers might like in a shop.
 - Progress chart of a student over the academic year.
 - Amount of rain in different parts of the city/country over a time period.
 - Preference of the population of a certain car/transport/food etc.
- Brainstorm further such situations with the students and wrap-up the lesson with reinforcing the significance of using bar graphs to identify patterns and trends.

Assessment:

- Ask students to solve any one of the following questions.

Q1. The percentage of total income spent under various heads by a family is given below.

Different Heads	Food	Clothing	Health	Education	House Rent	Miscellaneous
% Age of Total Number	40%	10%	10%	15%	20%	5%

Represent the above data in the form of bar graph.

Q2. Number of students in five different classes of a school was recorded as follows.

Classes	I	II	III	IV	V
Number of Students	150	200	175	250	225

Represent the above data in the form of bar graph.

Follow up:

Homework: Textbook, Unit 9, Ex-2

REAL LIFE SITUATIONS INVOLVING AVERAGE**Duration:** 40 Minutes**Students Learning Outcomes:**

- Read and interpret a bar graph given in horizontal and vertical form.
- Draw horizontal and vertical bar graphs for given data.

**Materials:**

- Textbook, writing board, chalk / marker, duster, permanent marker etc.

Information for Teachers:

- This lesson is a continuation of previous lessons. It is a good idea at the beginning of each lesson to reinforce previous lessons learnings.







Introduction:

- Do the **Circle/Triangle/Square** activity with the students.
- Ask students to draw a circle on their notebooks and in front of it write down something that is still going around in their head about the previous lesson.
- Next draw a triangle and write down something pointed that stood out in their minds.
- Next draw a square and write down something that agreed with what they believed/knew already.
- Go around the class and see student reflections. This will allow you to adapt your lessons accordingly.

Development:**Activity 1:**

- Review what a tally chart looks like.
- List down three vegetables on the board and ask students about which of these vegetables they like the most.
- Draw a tally chart for their choices.

- An example of tally chart is shown below:

Favourite vegetable	
Carrots 	
Broccoli 	
Beets 	

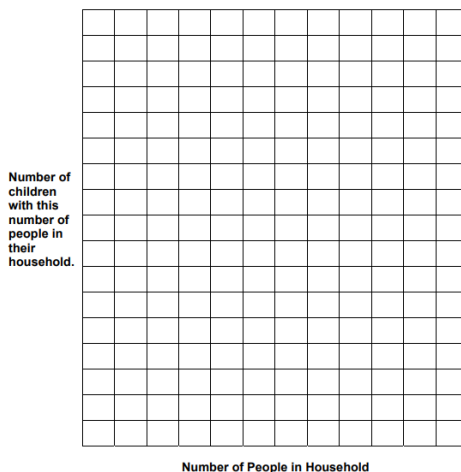
- The purpose of this activity is to help students understand method of data collection for the next activity.

Activity 2:

- Introduce to students to the activity by explaining that the number of people who live in a household can differ. For example:
Saba lives with her mother and her sister, so there are three people in her house.
Omar lives with his mother and father, two brothers, and his grandmother, so there are six people in his house.
- Ask each student to reflect on how many people live in their household?
- In their notebooks, the students should construct a tally table as below:

No of people in house	No of children with this number of people in their house
2	
3	
4	

- Ask students to move around in the classroom and ask each class fellow on how many numbers of people they have in their house. Ask students to complete their tally table. (5 minutes)
- Next ask the students to use a bar graph to represent the results. Use the points learnt in





previous lessons.

- While students draw the graph, write down the following questions on the board.
 1. What is the number of people in a household that occurs the most? What is the name we give to this number that occurs most often?
 2. How many children in your class have four people living in their household?
 3. What is the smallest number of people in a household? How many children have this number of people in their household?
 4. What is the largest number of people in a household? How many children have this number of people in their household?
 5. If you had to describe this information about the number of people that live in your classmates' households, what would you say?
- Give time to students to answer these questions.
- After 15 minutes are complete, discuss the answers with the whole class.

Conclusion / Sum up / Wrap up:

- Wrap-up the lesson by discussing that these are vertical bar graphs. The same bar graphs can be represented in horizontal direction.

Assessment:

- Give any one question to students to solve individually.
- Q1. Data for the number of cars made in different countries in the year 2000 are as shown:**
- a. Make an appropriate bar graph to represent the data.
 - b. Which country made the greatest number of cars?
 - c. How does the number of cars made in Japan compare to the number made in Spain?

Cars Made in 2000	
Country	Cars (millions)
Brazil	1
Japan	8
Germany	5
Spain	2
U.S.A.	6

Q 2. The number of absentees in class V was recorded in a particular week.

Days	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
Number of Absentees	130	120	135	130	150	80

- a. Represent this data on the bar graph
- b. On which day the maximum and minimum students were absent?
- c. How many students were absent on Wednesday and Friday?
- d. On which days the same number of students was absent?

Follow up:

Written work: Ask students to draw horizontal bar graph for the data collected in class in this activity.

READING A BAR GRAPHS

**Duration:** 40 Minutes**Students Learning Outcome:**

- Solve real life situations using data presented in bar graphs.

**Materials:**

- Textbook, writing board, chalk / marker, duster, etc.

Information for Teachers:

- This lesson is a continuation of previous lessons. It is a good idea at the beginning of each lesson to reinforce previous lessons learnings.
- This lesson will use primarily questions from the textbook to reinforce the concepts.

Introduction:

- Ask all students to show the horizontal bar graphs for the data of previous activity.
- Exchange the notebooks between students and ask them to mark their class fellows' graphs and identify if there are any mistakes.
- Get opinions from five different students to gauge overall class understanding of the topic.

Development:

Activity 1:

- Ask them to refer to the bar graph on (Textbook, Unit 8, Topic: Reading a bar Graph), Flowers in Huma's Garden.
- Ask students to answer the following questions:
 1. In which week did the maximum number of flowers bloomed?
(Answer: Week 5)
 2. In which week did the minimum number of flowers bloomed?
(Answer: Week 4)
 3. What is the average number of flowers blooming each week?
(Answer: 4.4)



4. Was there any week in which the average number of flowers bloomed exactly?
(Answer: No)

Activity 2:

- Instruct the class to work in pairs.
- Refer to the bar graph on (Textbook, Unit 8, Topic: Reading a Bar Graph), Shoe production at the Factory.
- Draw the bar graph on the board and ask students to close their books.
- Identify that this is a horizontal bar graph.
- Ask students to answer the questions listed on the same page, in their notebooks.
- Ask them to read the question and write down answers in their notebooks.
- Once all the questions are completed, ask students to conduct a peer assessment.
- Exchange notebooks between students and ask them to check answers of their class fellows.

Activity 3:

- Ask students to work individually and solve (Textbook, Unit 9, Ex-2 Q5 and Q6).
- Give students time to complete their work.
- Circulate in the class to monitor students' work.

Conclusion / Sum up / Wrap up:

- Conduct the 3-2-1 activity with the students:
- Give students 5 minutes for them to write down, on their notebooks:
 - Three new things they found out
 - Two interesting things they found out
 - One question they still have.
- Get two students to read out loud their answers to the whole class and give feedback on these.
- The answers to this activity can be used during the warm-up of the next lesson.

Assessment:

Formative Assessment conducted via Development Activity 3.

Follow up:

Homework: Textbook, Unit 9, Review exercise.

BAR GRAPHS

**Duration:** 40 Minutes**Students Learning Outcome:**

- Solve real life situations using data presented in bar graphs.

**Materials:**

- Textbook, writing board, chalk / marker, duster, permanent marker etc.

Information for Teachers:

- This lesson is a continuation of previous lessons. It is a good idea at the beginning of each lesson to reinforce previous lessons learnings.
- This lesson will also require data collected during the activity of previous lessons. It might be a good idea to have sample data available in case a student does not have access to his/her data.

Introduction:

- Based on the 3-2-1 activity of lesson 5, do a quick recap of the unit. Write down important formula and key points on the board.

Development:

Activity 1:

- Ask students to take out their graph and tally charts from the previous lesson.
- Use the data collected for this activity.
- Explain the context of today's activity:

The city planners need to know how many people there are in a household so that they can plan how much water, electricity and other services an area will be needing.

- Ask each student to reflect on how many people live in their household?
- Using the data, ask students to answer the following questions.
 1. Ask students what information the city planners would require?
(Answer: Average number of people in the household)

2. Calculate the average number of people in a household for the children in the data set.
 3. Is the number of people in your household above or below the average?
 4. What does it mean to say that the number of people in a household is below average? And above?
- Discuss the answers as a whole class activity.

Activity 2:

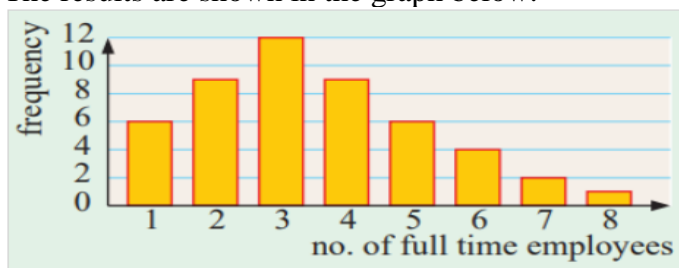
- Ask students to work individually and solve the following question.
Q1. The number of trees planted by Eco-club of a school in different years is given below.

Year	Number of trees
2005	150
2006	220
2007	350
2008	400
2009	300
2010	380

- a. Draw the bar graph to represent the data
- b. How many trees on average were planted in a year?
- c. Which year was the maximum number of trees planted?
- d. How many total number of trees were planted over six years?

Q2. A randomly selected sample of small businesses has been asked, “How many full-time employees are there in your business?”.

The results are shown in the graph below:



- a. How many small businesses gave data in the survey?
 - b. How many of the businesses had only one or two full-time employees?
 - c. How many of the businesses had five or more full-time employees?
- Give students time to complete their work.
 - Circulate in the class to monitor students' work.

Conclusion / Sum up / Wrap up:

- This is the last lesson of this unit. It is necessary to again go over the learning outcomes of the entire unit.
- Ask students to do a reflection activity.
- Turn to **I HAVE LEARNT** given at the end of Textbook, Unit 9.
- Each student should rank the key learning outcomes in the section “I have learnt to:” with 1 as least confident and 5 as most confident.

Assessment:

Formative assessment carried out via Development Activity 2.

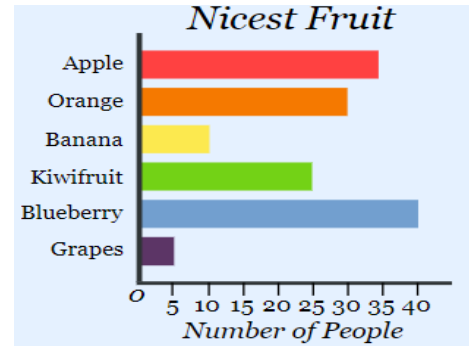
Follow up:

- Do the following question.

A survey of 145 people asked them "Which is the nicest fruit?" The results are shown in a horizontal bar graph. Use the graph to answer the following questions:

- Which fruit is the most popular amongst the group of 145 people?
- Which fruit is the least popular?
- How many more people liked orange than banana?

How many people liked apple and kiwifruit altogether?



Glossary

- **Place Value Chart:** A place value chart is a useful way to read these numbers.
- **Periods:** The place values are separated into groups of three, called periods.
- **Divisor:** The number by which we divide.
- **Dividend:** The number which is to be divided
- **Quotient:** The factor obtained in division process.
- **Remainder:** If values do not divide completely, the left over is remainder.
- **Multiplicand:** Number to whom we want to multiply.
- **Multiplier:** with which we multiply the number.
- **Product:** Result of multiplicand and multiplier.
- **Pattern:** Pattern is a series or sequence that repeats.
- **Factorization** means to express a number as the product of its factors. These factors are either composite numbers or prime numbers
- **Prime factorization** means to express a number as the product of its prime factors.
- **Highest Common Factor (HCF):** The product of two or more common prime factors is the greatest number/factor, which is called Greatest Common Divisor (GCD) or Highest Common Factor (HCF).
- **Like denominators:** When fractions have **like denominators**, they have the same denominator.
- **Unlike denominators:** When fractions have **unlike denominators**, their denominators are different.
- **Proper Fraction** – A fraction that is less than one with the numerator being less than the denominator. e.g. $\frac{3}{4}$
- **Improper Fraction** – A fraction in which the numerator is greater than the denominator. e.g. $\frac{5}{4}$
- **Mixed Number** – A number consisting of a whole number and a proper fraction. e.g., $4\frac{1}{2}$
- **Cryptogram:** A cryptogram is a coded sentence that can only be decoded after solving the clues.



- **Decimal point:** A decimal number is a number that has digits before and after a **decimal point**. The decimal point is placed after the ones digit.
- **Rounding** means making a number **simpler** but keeping its value close to what it was.
- **Rounding down:** If the neighboring digit is less than five (0, 1, 2, 3 and 4), keep the rounding digit the same. This is called **rounding down**.
- **Rounding up:** If the neighboring digit is five or greater (5, 6, 7, 8 and 9), increase the rounding digit by one. This is called **rounding up**.
- The word **percent** comes from the Latin word **per centum**. The word **per** means 'for each' or 'for every' and the word **centum** means 'out of hundred'.
- **Percentage** is the special kind of fraction with **100 as denominator**. The symbol used to represent percentage is “%”
- **Unitary method:** The word 'unitary' is taken from the word unit, which means “of one”. The **unitary method** is used to solve mathematical problems by finding the value of a single unit.
- **Reflective symmetry** is a type of symmetry where one-half of the object reflects the other half of the object. It is also known as mirror symmetry. For example, in general, human faces are identical on the left and right sides. The wings of most butterflies are identical on both sides, the left and right sides.
- **Rotational symmetry:** An object when rotated in a particular direction, around a point is exactly similar to the original object is known to have **rotational symmetry**.
- **Order of rotational symmetry** of a shape is the number of times it can be rotated around a full circle and still look the same.

Appendix-1

Cryptogram

How does the boat show affection?

$2\frac{1}{2}$	$1\frac{5}{8}$	$\frac{3}{8}$	$1\frac{7}{18}$	$\frac{1}{2}$	$4\frac{47}{63}$		
$1\frac{5}{8}$	$\frac{3}{8}$	$\frac{50}{99}$	$4\frac{47}{63}$	$\frac{3}{8}$	$\frac{7}{22}$	$\frac{2}{13}$	$\frac{50}{99}$



To solve the riddle, answer the following questions. Simplify your answers to the lowest terms and convert to mixed numbers if it is an improper fraction.

$\frac{5}{6} \times \frac{3}{5}$	= _____ (G)	$2\frac{1}{5} \div \frac{22}{25}$	= _____ (I)
$\frac{4}{8} \times \frac{3}{4}$	= _____ (H)	$\frac{6}{7} + 3\frac{8}{9}$	= _____ (S)
$\frac{6}{12} \div 3\frac{1}{3}$	= _____ (A)	$\frac{9}{11} - \frac{1}{2}$	= _____ (O)
$\frac{5}{9} + \frac{5}{6}$	= _____ (U)	$2\frac{3}{4} - 1\frac{1}{8}$	= _____ (T)
$\frac{7}{9} - \frac{3}{11}$	= _____ (E)	$\frac{3}{13} \times \frac{6}{9}$	= _____ (R)

Appendix 2

Match each net to its name and 3d representation.

	Cube	
	Cuboid	
	Tetrahedron (triangular based pyramid)	
	Square-based pyramid	
	Hexagonal prism	
	Triangular prism	

Appendix 3

List of Contributors		
Mathematics-V		
Sr.No.	Name	Organization
Management		
1.	Allah Rakha Anjum	Director General, Quaid-e-Azam Academy for Educational Development Punjab, Lahore
2.	Asif Majeed	Additional Director General, Quaid-e-Azam Academy for Educational Development Punjab, Lahore
Developers		
3.	Muhammad Imran	Subject Specialist, Quaid-e-Azam Academy for Educational Development, Kot Lakhpat, Lahore
4.	Aleena Tasneem Khan	Academic Manager, Mazen School, Lahore
Reviewer		
5.	Muneeza Juniad	Academic Lead, School for Contemporary and Islamic, Lahore
Quality Reviewer		
6.	Dr. Sumera Khan	Principle, Quaid-e-Azam Academy for Educational Development, Bosan Road, Multan
7.	Dr. Alia Sadiq	Senior Subject Specialist, Quaid-e-Azam Academy for Educational Development Punjab, Lahore
Proofreader		
8.	Shazia Manzoor	Textbook Writer/ Curriculum Developer, AFAQ, Lahore
Supervision and Coordination Team		
9.	Saif ur Rehman Toor	Course Coordinator, Quaid-e-Azam Academy for Educational Development Punjab, Lahore
10.	Dr. Alia Sadiq	Senior Subject Specialist, Quaid-e-Azam Academy for Educational Development Punjab, Lahore
11.	Ms. Fozia Inam	Senior Subject Specialist, Quaid-e-Azam Academy for Educational Development Punjab, Lahore
12.	Parveen Din Muhammad	Subject Specialist, Quaid-e-Azam Academy for Educational Development Punjab, Lahore
13.	Dr. Adila Khanam	Subject Specialist, Quaid-e-Azam Academy for Educational Development Punjab, Lahore
Designing, Composing & Layout		
14.	Asim Jacob	Assistant, Quaid-e-Azam Academy for Educational Development Punjab, Lahore
15.	Aneeq Rehman	Freelance

جملہ حقوق بحق ناشر قائد اعظم اکیڈمی فار ایجوکیشنل ڈویلپمنٹ پنجاب محفوظ ہیں اور اس پر حقوق نسخہ کے تمام قوانین نافذ العمل ہیں۔ اس کتاب کو معزز اساتذہ بچوں کی تدریس کے امدادی مواد کے طور پر استعمال کر سکتے ہیں لیکن اس کے مواد کے کسی حصے یا پوری کتاب کو از خود بغیر اجازت چھو انا ممنوع ہے ایسی صورت میں ادارہ ہذا قانونی چارہ جوئی کا حق رکھتا ہے۔



Mathematics Teachers' Guide Lesson Plans



Quaid-e-Azam Academy for Educational Development, Punjab
Wahdat Road, Lahore