



तत् त्वं पुष्य भपावृणु
केन्द्रीय विद्यालय संगठन

$$2 \times 3 = 6$$



$$\frac{3}{4}$$

KENDRIYA VIDYALAYA SANGATHAN

— ZIET CHANDIGARH —

WORKBOOK

$$\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$$

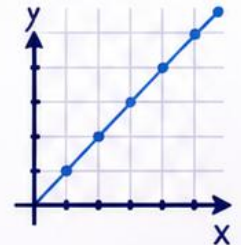


MATHEMATICS

FOR

%

CLASS VI



CONCEPTUAL
UNDERSTANDING



PRACTICE
REGULARLY



THINK
LOGICALLY



SUCCEED
CONFIDENTLY

$$6 \times 7 = 42$$

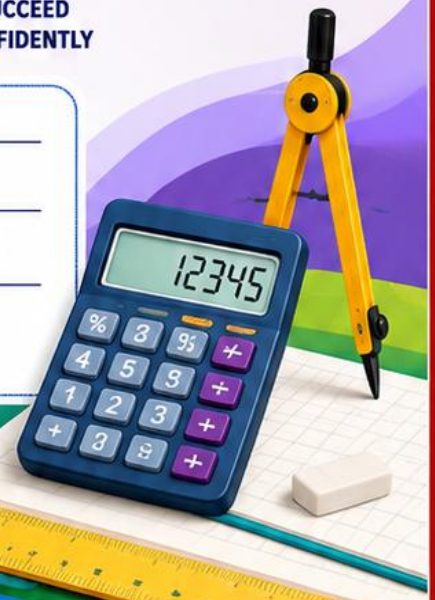


Name of Vidyalaya : _____

Name : _____

Class : _____ Section : _____

Roll No. : _____



संरक्षक

श्री विकास गुप्ता, भा. प्र. से.
आयुक्त
केन्द्रीय विद्यालय संगठन, नई दिल्ली

सुश्री चंदना मंडल
अपर आयुक्त (शैक्षिक)

सुश्री पी. बी. एस. उषा
संयुक्त आयुक्त (प्रशिक्षण)

श्रीमती श्रुति भार्गव
उपायुक्त एवं निदेशक
आंचलिक शिक्षा एवं प्रशिक्षण संस्थान, चंडीगढ़

श्री अजीत कुमार यादव
सह-कोर्स निदेशक
(प्राचार्य पीएम् श्री केंद्रीय विद्यालय -1 अम्बाला कैंट)

श्री असन कुमार
संसाधक
प्रशिक्षित स्नातक शिक्षक (गणित)
पीएम् श्री केंद्रीय विद्यालय -1 अमृतसर कैंट

श्रीमती हर्ष बाला
संसाधक
प्रशिक्षित स्नातक शिक्षक (गणित)
केंद्रीय विद्यालय खानपुर

FOREWORD

Education today aims to develop confident, creative, and competent learners who can apply their knowledge to solve real-life problems. In this context, the implementation of the National Education Policy (NEP) 2020 and the National Curriculum Framework (NCF) 2023 has brought a significant transformation in the teaching and learning of Mathematics. The new NCERT Class VI Mathematics textbook, *Ganita Prakash*, promotes conceptual understanding, logical reasoning, problem-solving, and joyful learning through meaningful experiences.

I am pleased to present the **"Workbook for Students of Class VI Mathematics based on the New NCERT Textbook."** This workbook has been thoughtfully designed to supplement classroom learning and provide students with ample opportunities to practice, explore, and strengthen mathematical concepts.

The workbook contains a variety of competency-based exercises, application-oriented questions, Challenging questions, self-assessment tasks, and real-life situations. These carefully designed learning experiences encourage students to think critically, reason logically, and develop confidence in applying mathematics in everyday life. The exercises also support continuous practice and formative assessment, enabling teachers to monitor students' progress effectively.

I sincerely appreciate the dedicated efforts of the Associate Course Director, Resource Persons and Mathematics faculty who have worked tirelessly to develop this learner-friendly resource. Their commitment towards academic excellence and quality education is truly commendable.

I am confident that this workbook will become a valuable companion for students in their mathematical journey and an effective classroom resource for teachers. I extend my best wishes to all students and teachers for a joyful, engaging, and successful learning experience.

(Deputy Commissioner)

Kendriya Vidyalaya Sangathan
Zonal Institute of Education & Training, Chandigarh

CONTENT PREPARED BY:

Topic	NAME OF TEACHER (TGT Maths)	Name of KV	REGION
PATTERNS IN MATHEMATICS	RAMANDEEP KAUR	SARAIKHAS	CHANDIGARH
LINES AND ANGLES			
NUMBER PLAY			
DATA HANDLING AND PRESENTATION			
PRIME TIME	PAWAN KUMAR	NO. 2 AMBALA CANTT.	GURUGRAM
PERIMETER AND AREA			
FRACTIONS			
PLAYING WITH CONSTRUCTIONS			
SYMMETRY	JILE SINGH	NO. 2 CHANDIMANDIR	GURUGRAM
THE OTHER SIDE OF ZERO			

MODERATED BY:

Topic	NAME OF TEACHER (TGT Maths)	Name of KV	REGION
PATTERNS IN MATHEMATICS	MANOJ SINGH RAWAT	NHPC BANBASA	DEHRADUN
LINES AND ANGLES	RAVINDRA SINGH	BHIMTAL	DEHRADUN
NUMBER PLAY	MANOJ NEGI	LOHAGHAT	DEHRADUN
DATA HANDLING AND PRESENTATION	SUNIL PATHAK	PITHORAGARH	DEHRADUN
PRIME TIME	PRIYANKA SAJWAN	UPPER CAMP DEHRADUN	DEHRADUN
PERIMETER AND AREA			
FRACTIONS	ANAMIKA SHAH	ITBP GAUCHAR	DEHRADUN
PLAYING WITH CONSTRUCTIONS	LATA BISHT	GWALDAM	DEHRADUN
SYMMETRY	PRIYANKA	MUSSORIE	DEHRADUN
THE OTHER SIDE OF ZERO	ARUNA GAUTAM	RISHIKESH	DEHRADUN

SUMMARY: PATTERNS IN MATHEMATICS

$$f(x+z) = \frac{(x-m)}{n}$$

$$n! = x(n-1) \dots$$

$$\frac{2n}{n+1} + b^2 = ?$$

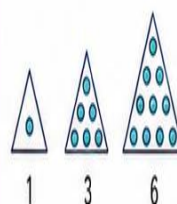
1. WHAT IS MATHEMATICS?



3. SPECIAL NUMBER & VISUAL PATTERNS

A. TRIANGLE NUMBERS

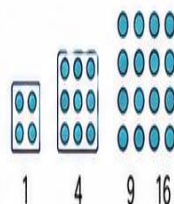
Sequence: 1, 3, 6, 10...



RULE: Add consecutive numbers (+1, +2, +3...).

B. SQUARE NUMBERS

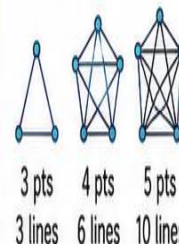
Sequence: 1, 4, 9, 16...



RULE: Number multiplied by itself ($n \times n$).

C. COMPLETE GRAPHS

Sequence: 1, 3, 6, 10...



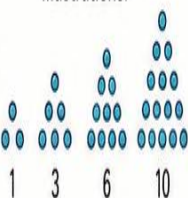
Every vertex connected to ALL others.

2. SPECIAL NUMBER & VISUAL PATTERNS

A. TRIANGLE NUMBERS

Sequence: 1, 3, 6, 10...

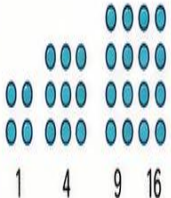
Illustrations:



RULE: Add consecutive numbers (+1, +2, +3...).

B. SQUARE NUMBERS

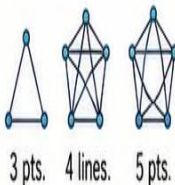
Sequence: 1, 4, 9, 16...



RULE: Number multiplied by itself ($n \times n$).

C. NUMBER SEQUENCES

Sequence: 1, 3, 6, 10...

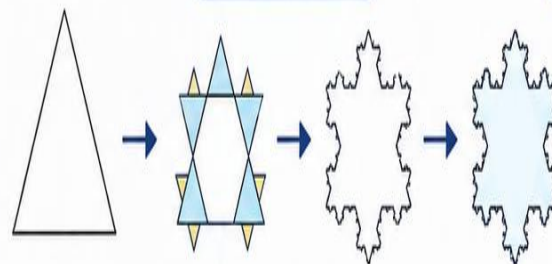


Every vertex connected to ALL others.

Generates TRIANGLE sequence.

4. ADVANCED GEOMETRIC PATTERNS (FRACTALS)

KOCH SNOWFLAKE



Starts as Triangle.
Replaces lines with mini-bumps.

Infinite repetition leads to highly complex shape.

MCQs Part 2 ($10 \times 1 = 10$ marks)

11. Virhanka numbers are:

- a) 1,3,6,10..... b) 1,2,3,5,8..... c) 1,8,27,64,125..... d) 1,7,19,37.....

12. What is the next number in the sequence 1,4,9,16?

- a) 20 b) 24 c) 25 d) 30

13. How many sides does a hexagon have?

- a) 5 b) 6 c) 7 d) 8

14. If you start with the number 2 and keep adding 2, what sequence are you creating?

- a) Even numbers b) Prime numbers c) Odd numbers d) Square numbers

15. $1+2+3+\dots+99+100+99+\dots+3+2+1$ is

- (a) 1000 (b) 2000 (c) 10000 (d) 200

16..... is both a triangular number and a square number

- a) 25 b) 8 c) 36 d) 4

17. Square numbers are :

- a) 1,3,6,10... b) 1,4,9,16... c) 1,8,27,64..... d) 1,7,19,37.....

18. The missing term in the sequence 1,10,....,1000,10000

- a) 100000 b) 100 c) 1000000 d) 11

19. The pattern 1,3,5,7..... is sequence of

- a) Even numbers b) Odd numbers c) Consecutive numbers d) Prime numbers

20. The sum of two consecutive triangular numbers is

- a) Square numbers b) Triangular numbers c) Virahanka numbers d) Hexagonal numbers

WORKSHEET -2

Section B: Short Answer ($10 \times 2 = 20$ marks)

1. Write the sequence of triangular numbers.

2. Write the sequence of cube numbers

3. Write the sequence of Virhanka numbers

4. Write the sequence of hexagon numbers

5. Visulize the square number 64.

6. Represent hexagonal numbers pictorially.

7. Which sequence do you get when you start to add the All 1 's sequence up?

8. What is the pattern rule followed by the sequence 88, 77, 66, 55, 44, 33,...?

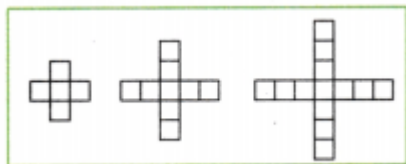
9 How many counters would come next?



10. Which number is missing in this pattern 41, 45, 49, ..., 57, 61, 65?

Section C: Short Answer ($6 \times 3 = 18$ marks)

11. How many cubes would be in the next shape?



12. Complete the dice pattern.



13. Alice used the rule 'double the number' to create the following pattern. 3, 6, 12, 24, _, Find the next two numbers.

14. What happens when you add up pairs of consecutive triangular numbers?

That is, take $1 + 3$, $3 + 6$, $6 + 10$, $10 + 15$, ... ?

Which sequence do you get? Explain it with a picture representation?

15. What happens when you multiply the triangular numbers by 6 and add 1? Which sequence do you get? Explain it with the help of picture.

16. Which sequence do you get when you start to add the counting numbers up? Give a smaller pictorial explanation?

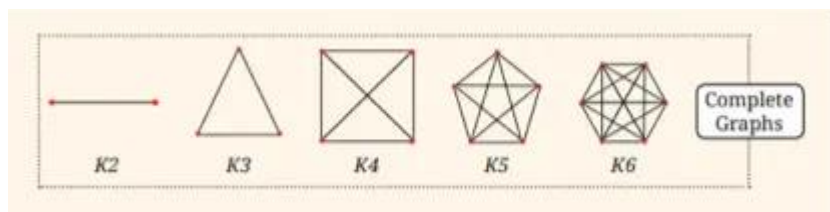
Section D: Long Answer ($4 \times 5 = 20$ marks)

17. If the first tower has 3 blocks, the second tower has 6 blocks and the third tower has 9 blocks, then how many blocks will the 8th tower have?

18. Draw the shape sequence of regular polygons.

19. Write the sequence when you start to add up powers of 3 starting with 1 i.e. $1, 1+3, 1+3+9, 1+3+9+27, \dots$

20. Count the number of lines in each shape in the sequence of Complete graph. Which number sequence do you get?



Case Study Based Questions ($2 \times 4 = 8$ marks)

21. Students of Sunrise school visit a plants nursery with their class teachers. In the nursery, they see that the plants are kept in rows where the number of plants in each row follows a pattern.

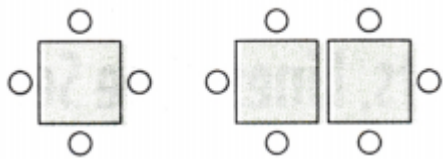


Based on the above information, answer the following questions.

(i) There are 3 plants in the first row, in the second row 6 and 9 plants in the third row. If the same pattern is followed, how many plants will be in the ninth row?

(ii) How many total plants would be there in the 25th row?

22. Mr. John is a professional table organiser. For today's event, he brought square tables. A single square table can seat 4 people, one at each side, as in the first picture below (each circle is a person). If Mr. John joins 2 tables along a side, as in the second picture below, he can seat 6 people.



(i) Draw and extend the pattern for next 2 steps

(ii) Write the number of persons if the number of tables are 5

Self Assessment:

I understood all the concepts

☐ Yes

☐ No

I need more practice

☐ Yes

☐ No

Name of Concepts having doubts/Not Cleared: _____

Parent's Assessment:

My ward understood all the concepts

☐ Yes

☐ No

He/She need more practice

☐ Yes

☐ No

Name of Concepts having doubts/Not Cleared: _____

Signature of Parent:

Teacher's Assessment

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Answers of Worksheet 1:

Q. No.	1	2	3	4	5	6	7	8	9	10
Answer	B	C	B	A	B	C	C	C	B	A
Q. No.	11	12	13	14	15	16	17	18	19	20
Answer	b	c	b	a	c	c	b	b	b	a

Answers of Worksheet 2:

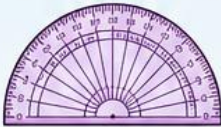
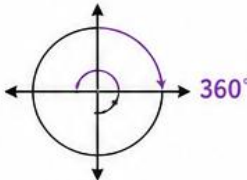
Q.No.	1	2	3	4	5
Ans	1,3,6,10.....	1,8,27,64,.....	1,2,3,5,8.....	1,7,19,37	Do yourself
Q.No.	6	7	8	9	10
Ans	Do yourself	1,2,3,4	Subtract 11	9	53
Q.No.	11	12	13	14	15
Ans	17	Do yourself	48,96	4,9,16	7,19, 37
Q.No.	16	17	18	19	20
Ans	1,3,6,10	24	Draw yourself	1,4,13	1,36,10
Q.No.	21	22			
Ans	27,75	12			



CHAPTER 2 – LINES AND ANGLES

SUMMARY OF CONCEPTS AND DEFINITIONS



POINT • A point determines a location.	It is denoted by a capital letter.	A • Notation: Point A			
LINE SEGMENT S T A line segment corresponds to the shortest distance between two points.	The line segment joining points S and T is denoted by $\overline{ST}$.	S T Notation: $\overline{ST}$			
LINE S T A line is obtained when a line segment is extended on both sides indefinitely.	It is denoted by $\overleftrightarrow{ST}$ or sometimes by a small letter like <i>m</i>.	S T or <i>m</i> Notation: $\overleftrightarrow{ST}$ or line <i>m</i>			
RAY D P A ray is a portion of a line starting at a point and going in one direction indefinitely.	It is denoted by $\overrightarrow{DP}$ where P is another point on the ray.	D P Notation: $\overrightarrow{DP}$			
ANGLE O P M An angle is formed by two rays starting from a common starting point.	- Two rays OP and OM form the angle $\angle POM$ (also called $\angle MOP$). - O is the vertex. - OP and OM are the arms of the angle.	O P M Vertex: O Arms: OP, OM Angle: $\angle POM$ or $\angle MOP$			
SIZE OF AN ANGLE O P M The size of an angle is the amount of rotation (turn) needed about the vertex to rotate one ray onto the other ray.	It does not depend on the length of the arms, only on the amount of turn.	O P M			
MEASUREMENT OF ANGLES 	- The sizes of angles are measured in degrees. - One full rotation or turn is 360°. - Degree measures of angles can be measured using a protractor.	 Units used: Degrees ($^\circ$) Full turn = 360°			
TYPES OF ANGLES (AND THEIR MEASURES) A O B	Straight Angle Measure = 180° • O P Q	Right Angle Measure = 90° O A B	Acute Angle Measure $> 0^\circ$ and $< 90^\circ$ O A B	Obtuse Angle Measure $> 90^\circ$ and $< 180^\circ$ O A B	Reflex Angle Measure $> 180^\circ$ and $< 360^\circ$ O A B



Angles help us describe turns and rotations in many things around us — doors, clocks, slopes, swings, directions and much more!



LINES AND ANGLES

WORKSHEET -1

Section A: MCQs (PART-1)(10 × 1 = 10 marks)

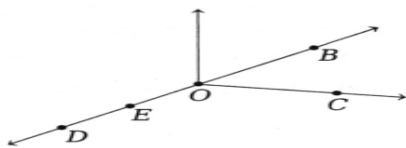
1. -----has no length, breadth and height.

- (a) point (b) ray (c) line segment (d) None of these

2 A -----is a portion of a line that starts at one point and goes on endlessly in a direction.

- (a) point (b) ray (c) line segment (d) line

3. How many points does the given figure has



- (a) 5 (b) 4 (c) 3 (d) 6

4. A line segment has

- (a) definite length but no end points (b) infinite length but no end point
(c) definite length and have end points (d) None of the above

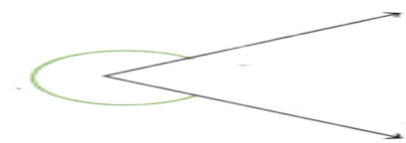
5. How many lines pass through two given points?

- (a) One (b) Two (c) Many (d) None

6. Which angle is less than 90° ?

- a) Right b) Obtuse c) Straight d) Acute

7 What is the name of angle in the given figure?



- (a) Right (b) Acute (c) Reflex (d) Obtuse

8 A protector is used to draw and measure -----

- a) angles b) line segments c) triangle d) none of these

9. The measure of straight angle is

- a) 90° b) 45° c) 180° d) 60°

10. There can be at least -----sides to form a polygon.

- a) 2 b) 3 c) 4 d) 5

MCQs (PART-2)(10 × 1 = 10 marks)

11. Which of the following has one endpoint and extends endlessly in one direction?

- a. Line b. Ray c. Line segment d. Point

12. Which statement is always true?

- a. A line has one endpoint. b. A ray has two endpoints.
c. A line segment has exactly two endpoints. d. A point has length.

13. Which object best represents a line segment?

- a. A stretched rope tied at both ends b. Sun rays
c. Railway track extending forever d. Beam of light from a lighthouse

14. If two rays have the same starting point, they form a:

- a. Line b. Line segment c. Angle d. Point

15. In $\angle PQR$, which point is the vertex?

- a. P b. Q c. R d. Both P and R

16. Which of the following angles is an acute angle?

- a. 35° b. 90° c. 120° d. 180°

17. Which of the following is an obtuse angle?

- a. 60° b. 90° c. 135° d. 45°

18. A straight angle measures:

- a. 90° b. 180° c. 270° d. 360°

19. A right angle is equal to:

- a. Half of a straight angle b. Half of a full angle
c. Double a straight angle d. One-third of a full angle

20. While measuring an angle with a protractor, the centre of the protractor should be placed on the:

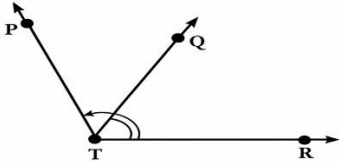
- a. End of one arm b. Middle of one arm
c. Vertex of the angle d. Longer arm

WORKSHEET -2

Section B: Short Answer ($10 \times 2 = 20$ marks)

1. The hands of a clock show 9 O'clock. Find the angle between the hands. Is it acute, right, obtuse, or straight?

2. Name the angles marked in the given figure



3. . Draw angles with the following degree measures:

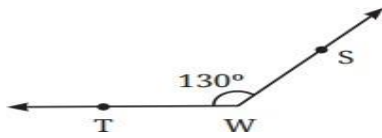
a) 140°

b) 70°

4(i) Triangle has ----- sides . (ii) Triangle has ----- angles .

5. Draw right angle and straight angle

6. Write the type of angle



7. The given picture is a good example of



Beam of light from a lighthouse

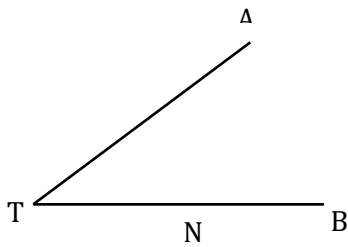
8. Draw any reflex angle.

9. Write how many right angles in your classroom.

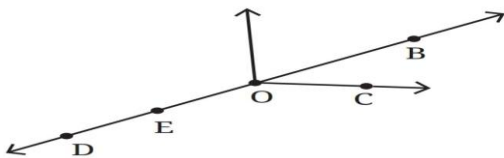
10. What is reflex angle?

Section C: Short Answer ($6 \times 3 = 18$ marks)

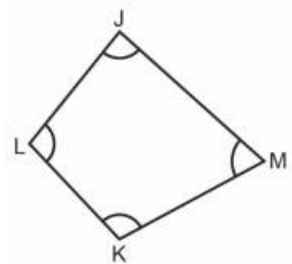
11. Name a) Starting point of each ray b) Two rays c) Write an example of ray from our nature



12 Write a.) Five points b.) A line. c.) Four rays



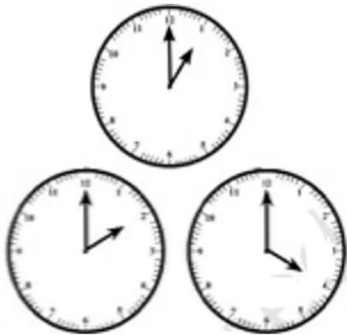
13. i) Name the type of polygon in the give fig. ii) Name the vertices



14 The Ashoka Chakra has 24 spokes. What is the degree measure of the angle between two spokes next to each other? What is the largest acute angle formed between two spokes?

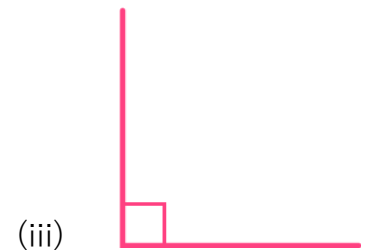
15. Give three examples of angles from your environment.

16. What will be the angle at 1 o'clock? and at 2 o'clock ? 4 o'clock

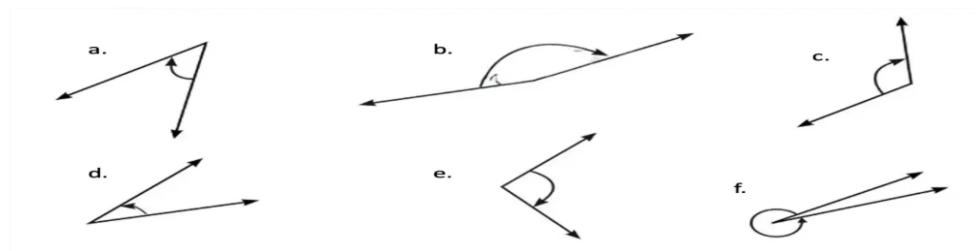


Section D: Long Answer ($4 \times 5 = 20$ marks)

17. Write types of angles



18 Estimate the angles.



19. Draw the letter 'M' such that the angles on the sides are 40° each and the angle in the middle is 60° .

20. Draw the letter 'Y' such that the three angles formed are 150° , 60° , and 150° .

Case Study Based Questions ($2 \times 4 = 8$ marks)

21. Mrs Namita, a maths teacher is guiding her class to identify the angles in English alphabets, like three acute angles and two obtuse angles in A.

Based on the above information answer the following questions

(a) Which letter represents only a right angle?

(ii) Which two letters represent only 4 right angles?

22. In a bustling city park, three friends, Alice, Ben, and Chloe, were discussing their afternoon plans. They were standing at a central intersection where three paved walking paths met. Alice pointed to the paths, noting the angles they formed. "Look," she said, "the path to the cafe and the one to the playground form a 120° angle. And the path to the playground and the one to the rose garden form a 95° angle."

(a) Find the measure of the third angle.

(b) What is the type of the third angle?

(c) What is the sum of the three angles?

Self Assessment:

I understood all the concepts

☐ Yes

☐ No

I need more practice

☐ Yes

☐ No

Name of Concepts having doubts/Not Cleared: _____

Parent's Assessment:

My ward understood all the concepts

☐ Yes

☐ No

He/She need more practice

☐ Yes

☐ No

Name of Concepts having doubts/Not Cleared: _____

Signature of Parent:

Teacher's Assessment

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Answers of Worksheet-1

Q.No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Ans	a	b	a	c	a	d	c	a	c	b	b	c	a	c	b	a
Q.No.	17	18	19	20												
Ans	c	b	a	c												

Answers of Worksheet-2

Q.No.	1	2	3	4	5	6	7	8
Ans	Right	<RTQ, <RTP	Draw correct angles	3,3	Draw correct angles	Obtuse	Ray	Draw correct angles
Q.No.	9	10	11	12	13	14	15	16
Ans	Draw correct angles	More than 180 and less than 360	T, TA, TB		Quad, K, M, J, L	15 ⁰ ,75 ⁰	DO yourself	30 ⁰ ,60 ⁰ 120 ⁰
	17	18	19	20	21	22		
	Acute, obtuse, right	Estimate correct angles	Draw correct angles	Draw correct angles	Ram,35,90	145 ⁰ ,obtuse,360 ⁰		

CHAPTER 3 – NUMBER PLAY

SUMMARY OF CONCEPTS & DEFINITIONS



BIG IDEA



Numbers can be used in many ways – to represent, compare, estimate, find patterns, solve puzzles, and play games. Thinking about numbers carefully helps us make strategies and solve problems.



1. REPRESENTING NUMBERS

- Numbers help us represent information and situations.
- We can use number lines to compare and order numbers.



2. PATTERNS IN NUMBERS

- Numbers can follow patterns. Finding patterns helps in prediction and problem solving.
- Examples: Counting patterns, repeating patterns, shape patterns.

2 4 6 8 10 ...

3. TYPES OF NUMBERS

- Even numbers end in 0, 2, 4, 6, 8.
- Odd numbers end in 1, 3, 5, 7, 9.
- Prime numbers have exactly 2 factors: 1 and the number itself.

Example: 2, 3, 5, 7, 11

4. PALINDROMES

- A number that remains the same when read forward and backward.
- Examples: 121, 1331, 4554

12321

5. SUPER CELLS

- In a row or table of numbers, a super cell is a number that is greater than all its neighbours.
- Useful in number puzzles.

12 25 30 18 40 22

↑ ↑

6. KAPREKAR'S ROUTINE

- Arrange a number and its reverse, subtract smaller from larger.
- Repeat the process.
- For 3-digit numbers, we always reach 495.

Example:

$$321 - 123 = 198$$

$$981 - 189 = 792$$

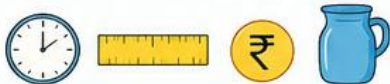
$$972 - 279 = 693$$

$$963 - 369 = 594$$

$$954 - 459 = 495 \checkmark$$

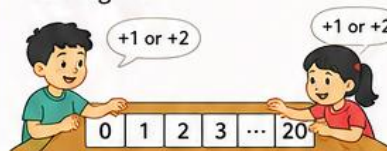
7. ESTIMATION

- We estimate to find an approximate value.
- It helps in daily life to make quick and useful decisions.
- Example: Estimating time, distance, cost, quantity, etc.



8. NUMBER GAMES (STRATEGY & WINNING)

- In some games, choosing the right numbers in the right order helps in winning.
- Look for patterns and use strategies.



9. COLLATZ CONJECTURE

- Take any whole number. If even, divide by 2. If odd, multiply by 3 and add 1. Repeat the steps.
- It is conjectured that we always reach 1.

Example (starting with 6):

$$6 \rightarrow 3 \rightarrow 10 \rightarrow 5 \rightarrow 16 \rightarrow 8 \rightarrow 4 \rightarrow 2 \rightarrow 1$$

10. KEY TAKEAWAYS

- Numbers are powerful tools used in many real-life situations.
- Looking for patterns and using strategies makes problem solving easier.
- Some number problems are simple to ask but hard to solve.
- Curiosity, practice and logical thinking help us enjoy 'Number Play'!

1 2 3
4 5 6
7 8 9 0

NUMBER PLAY

WORKSHEET-1

Section A: MCQs Part 1 (10 × 1 = 10 marks)

1. The greatest and the smallest 4-digit number which can be formed using the digits 9, 7, 4, 1 without repetition are

- (a) 9471, 1749 (b) 9174, 4719 (c) 9714, 4179 (d) 9741, 1479

2. The supercell in the given table is

34	94	86	56	43	20
----	----	----	----	----	----

- (a) 86 (b) 43 (c) 94 (d) 56

3. What is the difference between largest three-digit number and smallest 2-digit number ?

- (a) 898 (b) 899 (c) 989 (d) 998

4. Which of the following is the Kaprekar constant?

- (a) 4176 (b) 6174 (c) 7614 (d) 1476

5. A cell which is larger than its adjacent cells.

- (a) minor cel (b) major cell (c) supercell (d) none of these

6 What is the smallest 4 digit number

- (a)1000 (b)1001 (c)1100 (d)1010

7 Which of the following numbers is a palindrome?

- a) 12321 (b) 2001 (c)1100 (d)1000

8 Which of the following is the correct sum of digits for the number 176?

- (a) 12 (b) 14 (c) 16 (d) 17

9. The smallest 2 digit number whose digit sum is 9?

- (a) 81 (b) 72 (c) 18 (d) 27

10. Smallest 4digit number with different digits

- (a)1230 (b) 0123 (c)1023 (d)1234

WORKSHEET-2

Section B: Short Answer ($10 \times 2 = 20$ marks)

1. What is the sum of the digits in the number 898 and 717?

2. Write two numbers whose digit sum is 14.

3. The number 2754 lies on the _____ side of 3000 on the number line.

4. What is the first step of the Collatz conjecture for an even number?

5. The time now is 10:01. How many minutes until the clock shows the next palindromic time? What about the one after that?

6. Apply the Collatz Conjecture starting with the number 15.

7. Write 2 digit even palindromes.

8. Find 8-3 on the number line

9. Apply kaprekar constant to 1225

10. What is the next number in the collatz sequence after 8

Section C: Short Answer ($6 \times 3 = 18$ marks)

11. Apply the Kaprekar rule to the number 2114. Show each step and verify if the iteration leads to Kaprekar constant.

12. Write your year of birth on a piece of paper and start applying the Kaprekar's routine to your year of birth. Now, observe how many rounds does your year of birth take to reach the Kaprekar's constant?

13. Estimate the number of litres a mug,a bucket and an overhead can hold.

14 I am a 5-digit palindrome.

I am an odd number.

My 't' digit is double of my 'u' digit.

My 'h' digit is double of my 't' digit. Who am I

15. Estimate the number of words in a page of your maths textbook. If one page contains approximately 250 words, estimate how many words are in the whole book (assuming there are 100 pages).

16. Estimate the number of steps you would take to walk from your classroom to the school gate. If your school gate is 200 meters away and each step covers about 0.5 meters, how many steps will it take?

Section D: Long Answer ($5 \times 4 = 20$ marks)

17. Write all possible 3-digit palindromes using these digits 1,2,3.

18. Provide a list of all palindromes times in a 12 hour cycle.

19. Write 5 digit number and 3 digit number such that their sum is 186700

20. Check if the collatz conjecture holds for 35,22,19,18

Case Study Based Questions ($2 \times 4 = 8$ marks)

21. Geeta is trying to understand shifting digits with four tiles on which number 1, 2, 3, 4 is written.



(i) The number if she arranges tiles in increasing order is _____

(ii) What is the largest number?

(a) 4321

(b) 4123

(c) 3412

(d) 4231

(iii) What is the smallest number?

(a) 1234

(b) 4231

(c) 1342

(d) 1243

22. Kaprekar Contest Three friends—A, B, and C—decided to challenge themselves with a fascinating number puzzle called Kaprekar’s routine. Each picked a different four-digit number: A chose 8640, B selected 7032, and C took 5421. Their goal was to apply the Kaprekar steps repeatedly and see how many iterations it takes for each number to reach the mysterious constant 6174. They also wanted to find out who among them would reach 6174 first in this exciting mathematical race.

(a) How many steps for each? (b) Who reaches 6174 first?

Self Assessment:

I understood all the concepts ☐ Yes ☐ No

I need more practice ☐ Yes ☐ No

Name of Concepts having doubts/Not Cleared: _____

Parent’s Assessment:

My ward understood all the concepts ☐ Yes ☐ No

He/She need more practice ☐ Yes ☐ No

Name of Concepts having doubts/Not Cleared: _____

Signature of Parent:

Teacher’s Assessment

Answers of Worksheet -1:

Q.No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Ans	d	c	c	b	c	a	a	b	c	c	b	d	b	b	d	b
Q.No.	17	18	19	20												
Ans	a	b	a	b												

Answers of Worksheet -2:

Q.No.	1	2	3	4	5	6	7	8
Ans	25,15	59,68	left	Divide the no by2	11:11	Correct steps	22,44	5
Q.No.	9	10	11	12	13	14	15	16
Ans	Correct steps	4	Correct steps	Correct steps	Correct estimste	12421	25000	400
Q.No.	17	18	19	20	21	22		
Ans	111 121 131 212...	Do yourself	18000,670	Correct steps	1234,4321,1234	(i)6,3,2 (ii)c		



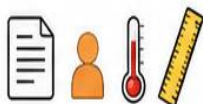
DATA HANDLING & PRESENTATION



The process of collecting, organising, presenting and interpreting data to obtain useful information and make decisions.

1. DATA

Facts, numbers, measures, observations or descriptions of things that convey information about those things.



2. DATA COLLECTION

The process of gathering information for a specific purpose.



Observation



Survey



Counting



Measurement

3. ORGANISING DATA

TALLY MARKS

Marks used to count frequencies quickly.



FREQUENCY

Number of times a particular value or observation occurs.

FREQUENCY TABLE

A table showing different observations and their frequencies.

Observation	Frequency
A	5
B	8
C	3
D	4
...	...

4. PRESENTING DATA

A. PICTOGRAPH

Data represented by pictures or symbols. Each picture stands for a fixed number (Scale/Key).

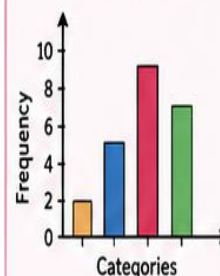
Key : = 5 apples

Fruit	Number of Apples
Mango	
Banana	
Orange	
Grapes	

Easy to read and compare.

B. BAR GRAPH

Data represented by bars of equal width. The height (or length) of each bar shows the frequency.

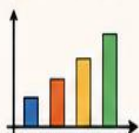


- Equal width bars
- Equal spacing
- Scale must be shown
- Start from zero

5. TYPES OF BAR GRAPHS

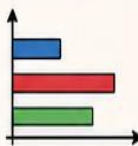
VERTICAL (COLUMN GRAPH)

Bars are vertical. Useful for comparing heights, populations, quantities etc.



HORIZONTAL BAR GRAPH

Bars are horizontal. Useful for comparing lengths, distances etc.



6. DATA INTERPRETATION

Reading and understanding the data presented in tables, pictographs or graphs.



Observe



Compare



Infer

Draw conclusions and make decisions.

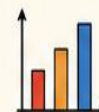
7. ARTISTIC & AESTHETIC ASPECTS



Use of colours



Use of pictures



Choice of bars



Clear and attractive



BE CAREFUL!

Fancy pictures or wrong scales can mislead. Always present data accurately.

SUMMARY OF KEY POINTS



Data helps us answer questions and make decisions.



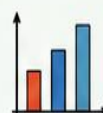
Tally marks help in counting and organising data.



Frequency table shows how many times each value occurs.



Pictographs use symbols with a key (scale).



Bar graphs use bars with equal width and proper scale.



Graphs help us compare data quickly.



Data presentation should be accurate, clear and non-misleading.

DATA HANDLING AND PRESENTATION

WORKSHEET-1

MCQs (PART-1) (10 × 1 = 10 marks)

1. The collection of numbers, figures, or objects gathered to give information is called

- (a) Data (b) mean (c) mode (d) median

2. In a pictograph, one symbol = 10 students. If 6 symbols represent students who like cricket, how many students like cricket?

- (a) 16 (b) 60 (c) 600 (d) 36

3. In a survey of 40 students 10 likes cricket rest of the student like hockey then how many students like hockey

- (a) 30 (b) 20 (c) 10 (d) 35

4. _____ makes the data easy to count.

- (a) Frequency (b) Data (c) Tally mark (d) Symbol

5. Arranging the data in a systematic form in the form of a table is

- (a) representation (b) tabulation (c) observation (d) None of these

6. The number of times a particular observation occurs is called

- (a) frequency (b) counting (c) tally marks (d) occurrences

7. Using tally marks, which one of the following represents the number eight?

(a) |||| ||||

(b)  

(c)   ||

(d)   |||

8. In a bar graph, space between rectangles is always .

- (a) unequal (b) increasing (c) equal (d) decreasing

9. If       stands for 120, how much does   stands for?

- (a) 120 (b) 80 (c) 60 (d) 40

10. A student collected data on the number of flowers in 5 gardens: 10, 15, 8, 12, 10. The range of this data is: (a) 5 (b) 7 (c) 10 (d) 15

MCQs (PART-2) ($10 \times 1 = 10$ marks)

11. Which of the following requires collecting data before answering?

- a. What is the capital of Rajasthan?
- b. Which fruit is liked the most by students in your class?
- c. How many days are there in a leap year?
- d. What is the national animal of India?

12. A frequency table shows that 18 students prefer football. What does the number 18 represent?

- a. Tally marks
- b. Frequency
- c. Category
- d. Scale

13. In a tally chart, the tally marks are shown as

|||| |||

How many objects are represented?

- a. 6
- b. 7
- c. 8
- d. 9

14. A pictograph uses ★ = 5 students. If a category has 6 stars, how many students does it represent?

- a. 25
- b. 30
- c. 35
- d. 40

15. A bar graph is preferred over a pictograph when

- a. The data has only two values.
- b. The amount of data is large.
- c. There are no numbers involved.
- d. Pictures are unavailable.

16. Which of the following is essential while drawing a bar graph?

- a. Bars of different widths
- b. Unequal spacing between bars
- c. Uniform width and equal spacing of bars
- d. Bars joined together

17. A bar graph uses the scale 1 unit = 20 books. A bar is 7 units high. How many books does it represent?

- a. 120
- b. 140
- c. 160
- d. 180

18. Which statement about pictographs is TRUE?

- a. Every symbol must always represent one object.
- b. Different symbols can represent different numbers according to the key.
- c. Pictographs cannot compare data.
- d. Pictographs cannot use half symbols.

19. Which type of graph is most suitable to compare the monthly rainfall of a city?

- a. Bar graph
- b. Number line
- c. Circle
- d. Line segment

20. A survey records the favourite sports of 120 students. Which is the first step before drawing a bar graph?

- a. Colour the bars.
- b. Arrange the data into categories and frequencies.
- c. Choose random heights for the bars.
- d. Draw the bars without a scale.

WORKSHEET-2

Section B: Short Answer ($10 \times 2 = 20$ marks)

1. Write 30 in tally marks.

2. If ☺ is equal to 4 persons, how many persons are represented by ☺ ☺ ☺ :

3. Complete the table

Sweets	Tally Marks	No. of Students
<i>Jalebi</i>		6
<i>Gulab jamun</i>		9
<i>Gujjiya</i>		_____
<i>Barfi</i>		_____
<i>Rasgulla</i>		_____

4. A survey was conducted on favorite sports: Football (15), Cricket (20), Basketball (10), Tennis(5). How many more students prefer Cricket than Tennis?

5. A bar graph represents the number of movies watched by students. The scale is 1 unit length = 2 movies. If a student watched 8 movies, what would be the height of the bar?

6. A survey was conducted on the number of books read by 10 students in a month:

4, 2, 5, 3, 4, 1, 5, 4, 2, 3. Arrange the data in ascending order. What is the most common number of books read?

7. A bar graph shows the population of a village over several years. The vertical axis represents the population in hundreds, and the scale is 1 unit = 500 people. If a bar is 10 units high, what is the population?

8. In a pictograph, a symbol , represents 5 balloons. To represent 28 balloons, how many symbols would you need?

9. The following data shows the marks obtained by a student in 5 subjects out of 100:

English: 85, Math: 95, Science: 80, Social Studies: 75, Hindi: 90.

If a bar graph is drawn with a scale of 1 unit length = 5 marks, what would be the height of the bars for Math and Science?

10. A bar graph has a scale of 1 unit length = 50 books. What is the total number of books represented by bars with heights of 6 units and 9 units?

Section C: Short Answer ($6 \times 3 = 18$ marks)

11. Thirty students were interviewed to find out, what they want to be in future. Their responses are as follow:

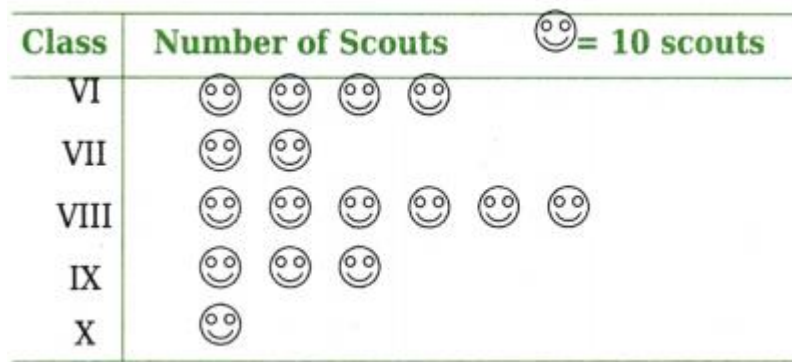
Doctor, Engineer, Doctor, Pilot, Officer, Doctor, Engineer, Doctor, Pilot, Officer,
Pilot, Engineer, Officer, Pilot, Doctor, Engineer, Pilot, Officer, Doctor, Officer,
Doctor, Pilot, Engineer, Doctor, Pilot, Officer, Doctor, Pilot, Doctor, Engineer
Arrange the data in a table using tally marks.

--

12. Make a table and enter the following data using tally marks. 7, 8, 6, 5, 6, 7, 7, 9, 8, 10, 7, 6, 7, 8, 8, 9, 10, 5, 7, 8, 7, 6

--

13. The number of scouts in a school is depicted by the following pictograph.



Observe the pictograph and answer the following questions,

(a) Which class has the minimum number of scouts?

(b) Which class has the maximum number of scouts?

(c) How many scouts are there in class VI?

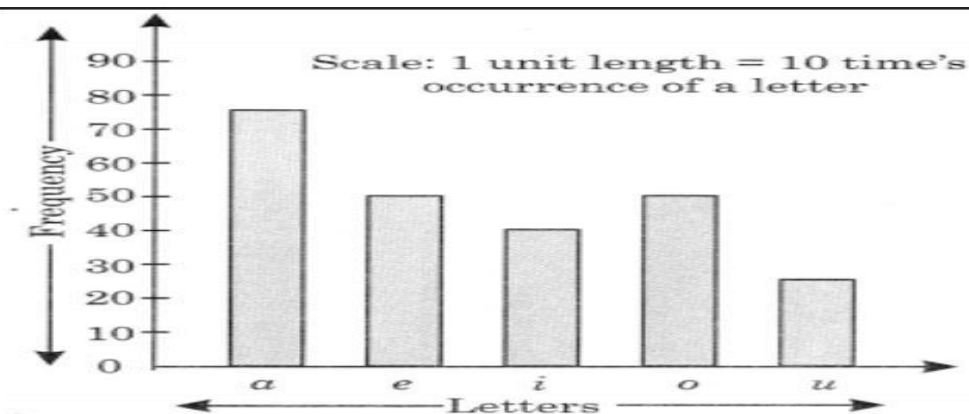
14 The number of students who joined different sports clubs in a school is as follows:

Football: 25, Cricket: 40, Basketball: 30, Tennis: 15. (a) Represent this data using tally marks in a frequency distribution table. (b) Which club has the least number of students

15. The following is the pictograph depicting the number of girls from class I to VIII 4. Which class has maximum number of girl students? 5. How many girls are there in class IV? 6. Find the ratio of girls in class I to Class V



16. The given bar graph represents the frequency of a, e, i, o, and u in a piece of English writing

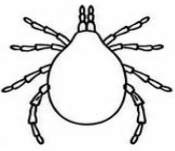
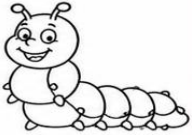
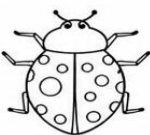
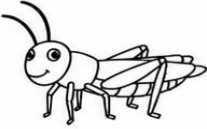


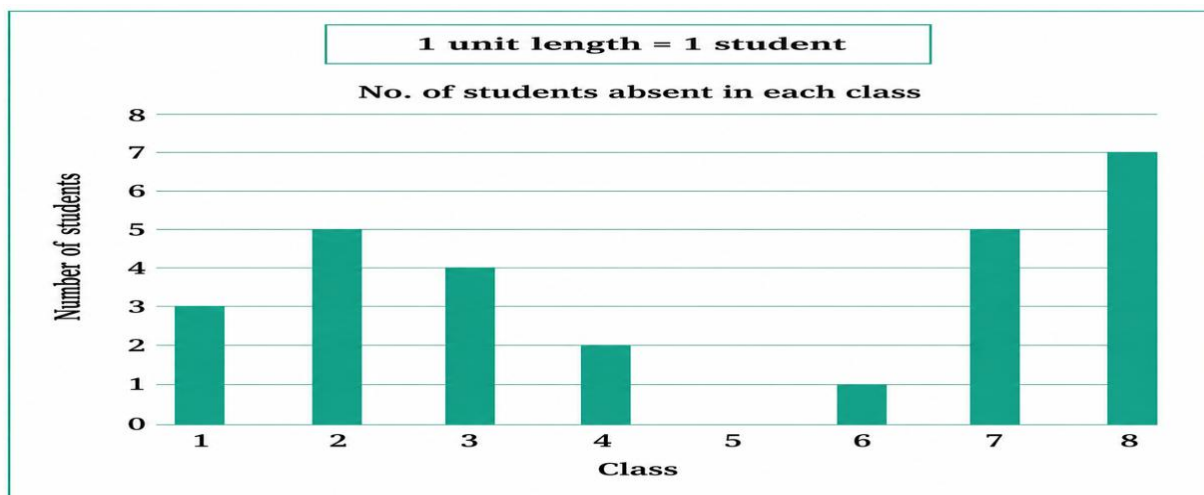
- Which letter occurred the maximum number of times?
- Which letter occurred 40 times?
- Which letter occurred less than 30 times?

Section D: Long Answer ($4 \times 5 = 20$ marks)

17. The number of visitors to a zoo on five consecutive days is recorded as: Monday: 300, Tuesday: 400, Wednesday: 250, Thursday: 500, Friday: 350. (a) Prepare a frequency distribution table for this data. (b) Draw a bar graph to represent the data, choosing a suitable scale.

18. Samantha visited a tea garden, and collected data of the insects and critters she saw there. Here is the data she collected: Help her prepare a bar graph representing this data.

				
Mites	Caterpillars	Beetles	Butterflies	Grasshoppers
6	10	5	3	2



Answer the following questions using the bar graph:

1. In Class 2, _____ students were absent that day.
2. In which class were the maximum number of students absent?
3. Which class had full attendance that day?

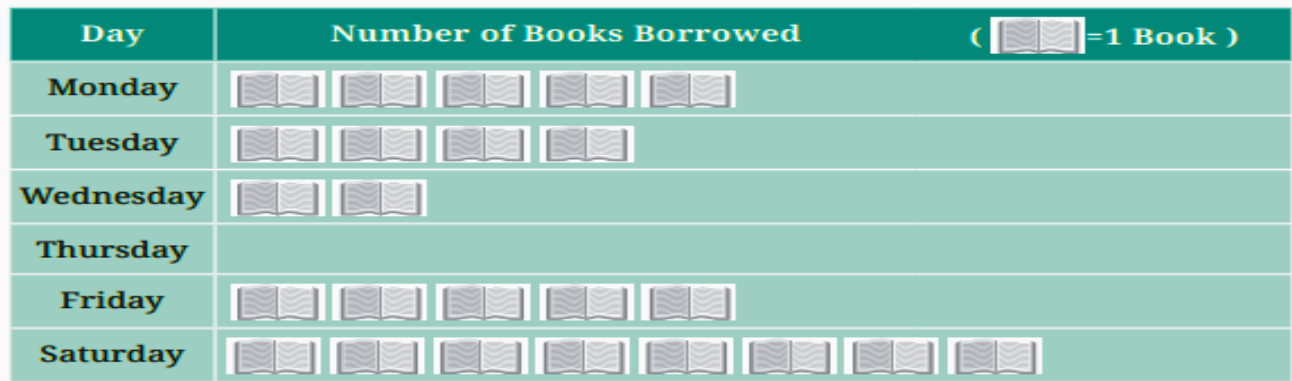
20. “What is mathematics? It is only a systematic effort of solving puzzles posed by nature”

Above given is a statement by a mathematician, read it and prepare a table as given below:

letter	a	e	i	o
No. of times found in stat.				

Case Study Based Questions (2 × 4 = 8 marks)

21. The following pictograph shows the number of books borrowed by students, in a week, from the library of Middle School, Ginnori-



- (a) On which day was the minimum number of books borrowed?
(b) What was the total number of books borrowed during the week?
(c) On which day were the maximum number of books borrowed? What may be the possible reason?

22 The following data represents the weekly wages (in ₹) of 16 workers in a factory
850, 800, 750, 900, 750, 800, 950, 900, 950, 750, 800, 850, 800, 850, 900, 950.

- (a) How many workers are getting less than ₹ 850 per week?
(b) How many workers are getting more than ₹ 800 per week?

Self Assessment:

I understood all the concepts

☐ Yes

☐ No

I need more practice

☐ Yes

☐ No

Name of Concepts having doubts/Not Cleared: _____

Parent's Assessment:

My ward understood all the concepts

☐ Yes

☐ No

He/She need more practice

☐ Yes

☐ No

Name of Concepts having doubts/Not Cleared: _____

Signature of Parent:

Teacher's Assessment

--

Answers of Worksheet 1:

Q.No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Ans	a	b	a	c	b	a	d	c	d	b	b	b	c	b	b	c
Q.No.	17	18	19	20												
Ans	b	b	a	b												

Answers of Worksheet 2:

Q.No.	1	2	3	4	5	6	7	8
Ans		12	13,3,7	15	4UNITS	4	5000	5 complete symbols and a partial
Q.No.	9	10	11	12	13	14	15	16
Ans	9, 16	750 books	Correct table	Correct table	X, viii 40	Tennis	a) class I b)14 girls 12:5	a, i, u
Q.No.	17	18	19	20	21	22		
Ans	Correct table and bar graph	Correct table and bar graph c	5,8,5		Thursday, 24, saturday	7,9		

Ans20

letter	a	e	i	o
No. of times found in above statement	4	6	6	5

SUMMARY OF CONCEPTS & DEFINITIONS

1. FACTORS & MULTIPLES

Factors



- If a number is divisible by another, the second number is called a **factor** of the first.

Example: 4 is a factor of 12 because $12 \div 4 = 3$.

- A number 1 and the number itself are factors of every number.

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

Multiples

(2, 4, 6, ...)

- The products we get when a number is multiplied by 1, 2, 3, ... are the multiples of that number.
- Every number is a multiple of itself.

Example: Multiples of 5 are 5, 10, 15, 20, 25, ...

Perfect Number



- A number for which the sum of all its factors is equal to twice the number is called a **perfect number**.

Example: 28 is a perfect number.

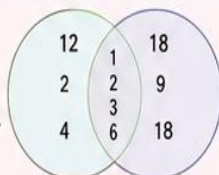
Factors: 1, 2, 4, 7, 14, 28

Sum = $56 = 2 \times 28$

Common Factors:

Factors that two or more numbers have in common.

Example: Common factors of 12 and 18 are 1, 2, 3, 6.

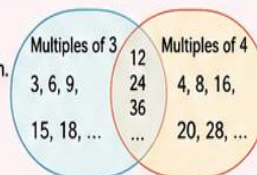


Common Multiples:

Multiples that two or more numbers have in common.

Example: Common multiples of 3 and 4 are

12, 24, 36, ...



2. PRIME NUMBERS & CO-PRIME NUMBERS

Prime Numbers



- Prime numbers are numbers that have exactly two factors: 1 and themselves.
- Examples:** 2, 3, 5, 7, 11, ...
- 2 is the only even prime number.
- A prime number is a building block of all numbers.

Composite Numbers



- Composite numbers are numbers that have more than two factors, i.e., at least one factor other than 1 and themselves.
- Examples:** 4, 6, 8, 9, 10, ...
- 1 is neither prime nor composite.

Co-prime Numbers



- Two numbers that do not have any common factor other than 1 are called **co-prime**.
- Example:** 8 and 15 are co-prime.
Factors of 8: 1, 2, 4, 8
Factors of 15: 1, 3, 5, 15
Common factor: only 1



How to Check Co-prime?

Find the prime factorisation of both numbers.

- If there is no common prime factor → They are co-prime.
- If there is a common prime factor → They are not co-prime.

Example:

$12 = 2 \times 2 \times 3$
 $25 = 5 \times 5$ } No common prime factor
⇒ 12 and 25 are co-prime.

3. DIVISIBILITY RULES (QUICK TESTS)

Divisible by 2

If the last digit is 0, 2, 4, 6 or 8.

Example: 374 (last digit 4)

⇒ Divisible by 2

Divisible by 5

If the last digit is 0 or 5.

Example: 325 (last digit 5)

⇒ Divisible by 5

Divisible by 10

If the last digit is 0.

Example: 780 (last digit 0)

⇒ Divisible by 10

Divisible by 4

If the last two digits form a number divisible by 4.

Example: 364 (last two digits 64)

⇒ Divisible by 4

Divisible by 8

If the last three digits form a number divisible by 8.

Example: 5728 (last three digits 728)

⇒ Divisible by 8

Divisible by 3

If the sum of the digits is divisible by 3.

Example: 123 ($1+2+3 = 6$)

⇒ Divisible by 3

Divisible by 9

If the sum of the digits is divisible by 9.

Example: 126 ($1+2+6 = 9$)

⇒ Divisible by 9



Remember: Prime factorisation helps in checking factors, divisibility and co-primality easily. It shows the unique way a number can be written as a product of prime numbers.



PRIME TIME

WORKSHEET-1

MCQs (PART-1) ($10 \times 1 = 10$ marks)

1. What is the smallest prime number?

- a) 1 b) 2 c) 0 d) 3

2. What is a number called that has only two factors (1 and itself)?

- a) Composite b) Even c) Odd d) Prime

3. Which of these is a 'perfect number' between 1 and 10?

- a) 4 b) 6 c) 8 d) 9

4. What is the units digit of any number divisible by 5?

- a) Only 0 b) Only 5 c) 0 or 5 d) Any even number

5. Which of the following is a composite number?

- a) 7 b) 13 c) 9 d) 11

6. Which of these pairs are 'twin primes'?

- a) 2 and 3 b) 3 and 5 c) 5 and 10 d) 7 and 9

7. A number is divisible by both 5 and 3. Which of the following statements is always true?

- A) The number is divisible by 8
B) The number is divisible by 15
C) The number is divisible by 9
D) The number is divisible by 25

8. Prime factorisation of 16 is?

- a) 8×2 b) $4 \times 2 \times 2$ c) $2 \times 2 \times 2 \times 2$ d) 16×1

9. which of the following pairs of numbers are co-prime?

- a) 2,3 b) 5,7 c) 9,8 d) all of the above

10. which of the following is not the factor of 36 :

- a) 12 b)18 c) 15 d)9

MCQs (PART-2) ($10 \times 1 = 10$ marks)

11. How many prime numbers are there between 1 and 20?

- a) 6 b) 7 c) 8 d) 9

12. The number 91 is:

- a) Prime b) Composite c) Even d) None

13. The prime factors of 30 are:

- a) 5,6 b) 2,3,5 c) 10,3 d) 2,15

14. Which of the following numbers is divisible by 9?

- (a) 1532 (b) 2187 (c) 3457 d) none of these

15. Which of the following statements is true about co-prime numbers?

- (a) They must both be prime numbers.
(b) They have no common factors other than 1.
(c) Their HCF is their product.
(d) They must both be odd numbers.

16. Which pair of numbers has the smallest common multiple equal to their product?

- a. 8 and 12 b. 9 and 10 c. 15 and 25 d. 14 and 21

17. Which of the following numbers has exactly three prime factors (counting repeated factors)?

- a. 18 b. 20 c. 30 d. 45

18. Without performing long division, which number is divisible by both 4 and 8?

- a. 7232 b. 7216 c. 7236 d. 7224

19. Which of the following statements is always true?

- a. Every odd number is prime.
b. Every prime number is odd.
c. Every composite number has more than two factors.
d. Every even number is composite.

20. Which of the following numbers is NOT co-prime with 35?

- a. 18 b. 24 c. 27 d. 49

WORKSHEET-2

Section B: Short Answer ($10 \times 2 = 20$ marks)

1. Find the prime factorization of 172.

2. Find the LCM of 12 and 18.

3. Write three multiples of 13 than 60.

4. Write the first five multiples of 5.

5. Find all the factors of 26.

6. Who am I? I am a number less than 40. One of my factors is 7. The sum of my digits is 8

7. State the divisibility rule for 9 and check if the number 45729 is divisible by 9.

8. Find all the prime numbers between 51 and 91

9. From the year 2024 till 2099, how many leap years are there?

10. What is the smallest digit that must be placed in the blank space of 37_7 to make it divisible by 3?

Section C: Short Answer ($6 \times 3 = 18$ marks)

11 find prime factorisation of 1024.

12. Show that 28 is a perfect number by listing its factors and finding their sum

13. Is the number 9135 divisible by 5 and 7? Explain your answer.

14. Find the largest and smallest 3-digit numbers that are divisible by 4 and are also palindromes

15. Write the first six multiples of 5 and the first six multiples of 8. From these lists, find the Least Common Multiple (LCM) of 5 and 8.

16. Two bells ring every 6 minutes and 8 minutes. After how many minutes will they ring together again?

Section D: Long Answer ($4 \times 5 = 20$ marks)

17. Find the smallest number that is a multiple of all the numbers from 1 to 10, except for 7.

18. A company produced **7,425 water bottles** and wants to pack them equally into cartons of **15 bottles each**. Using the appropriate divisibility test, check whether this arrangement is possible and justify your answer.

19. Using the divisibility test for 11, check if the numbers 121 and 1331 are divisible by 11. Explain your reasoning

20. Find the smallest number that is a multiple of all the numbers from 1 to 10

Case Study Based Questions ($2 \times 4 = 8$ marks)

21. A group of children plays the 'Idli-Vada' game up to the number 90. In this game, they say 'idli' for multiples of 5, 'vada' for multiples of 7, and 'idli-vada' for common multiples.

1. How many times will the children say '**idli**' (including the times they say 'idli-vada')?
2. How many times will they say '**vada**'?
3. How many times will they say '**idli-vada**'?
4. At what number will they say 'idli-vada' for the **2nd time**

22. or a school festival, lights blink at different intervals.

- Red lights blink every **15 seconds**.
- Yellow lights blink every **20 seconds**.
- Blue lights blink every **30 seconds**.

At 6:00 p.m., all lights blink together.

Questions

1. Find the prime factorisation of 15, 20, and 30.
2. Find the LCM of 15, 20, and 30 using prime factorisation.
3. After how many seconds will all the lights blink together again?

Self Assessment:

I understood all the concepts ☐ Yes ☐ No

I need more practice ☐ Yes ☐ No

Name of Concepts having doubts/Not Cleared: _____

Parent's Assessment:

My ward understood all the concepts ☐ Yes ☐ No

He/She need more practice ☐ Yes ☐ No

Name of Concepts having doubts/Not Cleared: _____

Signature of Parent:

Teacher's Assessment

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Answers of Worksheet -1:

Q.No.	1	2	3	4	5	6	7	8	9	10
ANS	b	d	b	c	c	b	B	c	d	c
Q.No.	11	12	13	14	15	16	17	18	19	20
ANS	c	b	b	b	b	b	a	b	c	d

Answers of Worksheet -2:

Q.No.	1	2	3	4	5	6	7	8
ANS	$2 \times 2 \times 43$	36	65,78,91	5,10, 15,20,25	1,2,13,26	35	yes	53,59, 61,63, 67,71,73, 79,83,89
Q.No.	9	10	11	12	13	14	15	16
ANS	19	1	2^{10}		yes	888,212	40	24
Q.No.	17	18	19	20	21	22		
	360	yes	yes	2520	18 12 2 70	3×5 $, 2 \times 2 \times 5, 2 \times 3 \times 5$ 60 60sec		

SUMMARY OF CONCEPTS & DEFINITIONS

1. PERIMETER

The perimeter of a closed plane figure is the distance covered along its boundary when you go around it once.

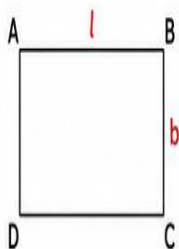


Perimeter of a polygon = Sum of the lengths of all its sides.

Perimeter Formulas for Common Figures

Rectangle

Opposite sides are equal.



$$\begin{aligned}\text{Perimeter} &= l + b + l + b \\ &= 2(l + b)\end{aligned}$$

Where, l = length,
 b = breadth

Square

All sides are equal.

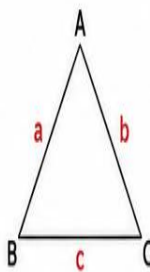


$$\begin{aligned}\text{Perimeter} &= s + s + s + s \\ &= 4s\end{aligned}$$

Where, s = length
of a side

Triangle

All sides may be unequal.



$$\text{Perimeter} = a + b + c$$

Where, a, b, c are
the lengths of sides

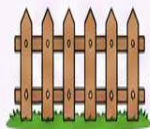
Key Points

- **Regular polygon:** all sides and all angles are equal.
Perimeter of a regular polygon = Number of sides $\times$ Length of a side.
- Two figures can have the same area but different perimeters, or the same perimeter but different areas.
- When shapes are rearranged, the perimeter can change.



Real-life Use

Perimeter helps us find the length of boundary, fencing, track distance, border length, etc.



2. AREA

The area of a closed figure is the amount of region enclosed by it.

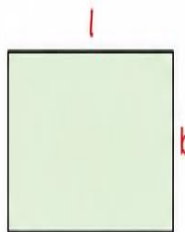


Area is measured in square units (sq units, sq cm, sq m, etc.).

Area Formulas for Common Figures

Rectangle

Area = length $\times$ breadth

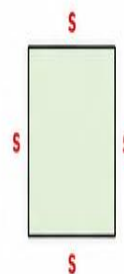


$$\text{Area} = l \times b$$

Where, l = length,
 b = breadth

Square

Area = side $\times$ side

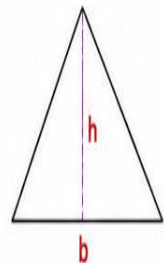


$$\text{Area} = s \times s = s^2$$

Where, s = length
of a side

Triangle

Area = $\frac{1}{2} \times \text{base} \times \text{height}$

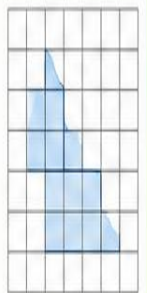


$$\text{Area} = \frac{1}{2} \times b \times h$$

Where, b = base,
 h = height

Important Points

- Area can be found by counting unit squares on a grid (estimate or exact).
- Any triangle is half of a rectangle having the same base and height.
- Areas of regions can be found by dividing them into rectangles and triangles.
- Different shapes can have the same area but different perimeters.



Real-life Use

Area helps us find surface to be covered (tiles, carpet, paint, agriculture, flooring, playgrounds, etc.)



Remember



- ✓ Perimeter measures the boundary.
- ✓ Area measures the space inside.

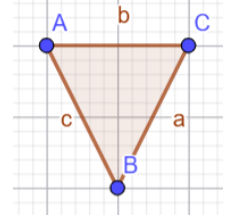


Practice with different shapes and real-life examples to understand perimeter and area better!

PERIMETER AND AREA

WORKSHEET-1

Section A: MCQs (PART-1) ($10 \times 1 = 10$ marks)



1. Perimeter of given fig. is...

- a) $a + b + c$ b) abc c) $ab+c$ d) $a+bc$

2. Perimeter of a square of side 9 cm is

- a) 81 cm b) 36 cm c) 26 cm d) 18 cm

3. The perimeter of a rectangular notebook is 70 cm, and its breadth is 14 cm. What is its length.

- a) 5 cm b) 21 cm c) 28 cm d) None of these

4. Diksha runs along the square track of side 120 m. Find the distance covered in 4 rounds.

- a) 480 m b) 960 m c) 1920 m d) None of these

5. The area of square whose perimeter is 16 cm is :

- a) 8cm^2 b) 4cm^2 c) 64cm^2 d) 16cm^2

6. A triangle has perimeter of 20 cm if two of its sides are 8 cm and 6 cm what is the length of the third side.

- a) 4 cm b) 5 cm c) 6 cm d) 7 cm

7. Find the cost of flooring a room at Rs 25 per m^2 whose area is 100 m^2 .

- a) Rs 2500 b) Rs 250 c) Rs 500 d) Rs 5000

8. Regular polygon has all sides equal and all angles _____.

- a) Different b) Unequal c) Equal d) None of these

9. Perimeter of regular hexagon :

- a) $\text{side} \times \text{side}$ b) $5 \times \text{side}$ c) $6 \times \text{side}$ d) None of these

10. What do you call the total boundary length of a closed figure?

- (a) Area (b) Perimeter (c) Volume (d) None of these

MCQs (PART-2) ($10 \times 1 = 10$ marks)

11. The side of a square is 5 cm. If its side is doubled, then its new perimeter is

- (a) 40 cm (b) 36 cm (c) 60 cm (d) 24 cm

12. The area of a square is 121 sq. cm. What is its perimeter?

- (a) 10 cm (b) 400 cm (c) 44 cm (d) 100 cm

13. Which figure has a larger perimeter?

- (a) A square of side 5 cm
(b) A rectangle of 6 cm length and 4 cm breadth
(c) Both are equal
(d) Cannot be determined

14. The perimeter of a regular pentagon is 25 cm. What is the length of one side?

- a) 6 cm b) 3 cm c) 5 cm d) 4 cm

15. Perimeter of a square of side 9 cm is....

- a) 81 cm b) 36 cm c) 26 cm d) 18 cm

16. A square and a rectangle have the same perimeter of 32 cm. The rectangle has a length of 10 cm. What is the difference between their areas?

- a. 8 cm^2 b. 12 cm^2 c. 16 cm^2 d. 20 cm^2

17. A rectangular playground measures $40 \text{ m} \times 25 \text{ m}$. A path of area 100 m^2 is made inside the playground. What is the remaining area available for playing?

- a. 800 m^2 b. 850 m^2 c. 900 m^2 d. 1000 m^2

18. Which of the following figures has the greatest perimeter if each has an area of 36 cm^2 ?

- a. Square of side 6 cm b. Rectangle of $9 \text{ cm} \times 4 \text{ cm}$
c. Rectangle of $12 \text{ cm} \times 3 \text{ cm}$ d. All have the same perimeter

19. A wire of length 48 cm is bent to form a regular hexagon. What will be the length of each side?

- a. 6 cm b. 7 cm c. 8 cm d. 9 cm

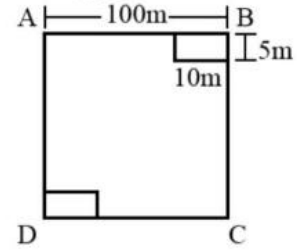
20. Which statement is always true?

- a. Figures with equal perimeter always have equal area.
b. Figures with equal area always have equal perimeter.
c. Two figures can have the same area but different perimeters.
d. The perimeter of a figure depends on its area only.

WORKSHEET-2

Section B: Short Answer ($10 \times 2 = 20$ marks)

1. A square-shaped park ABCD of side 100m has two equal flower beds, each of size $10\text{m} \times 5\text{m}$. Find Length of the boundary of remaining park.



rectangular
the

2. What is a curve? Give two examples by drawing.

3. A picture frame is 20cm long and 15cm wide, find the length of the ribbon needed to decorate its boundary.

4. Find the perimeter of a rectangle with length 8 cm and breadth 5 cm.

5. A rectangular field has a length of 50m and a breadth of 30m. If a path 2m wide is built around the field what is the area of the path?

6. Rani wants to put lace all around a rectangular tablecloth that is 3 m long and 2 m wide. Find the length of the lace required.

7. Reena and Rahul are comparing two photo frames. Reena's frame is a square with a side length of 25 cm. Rahul's frame is a rectangle with dimensions 30 cm by 20 cm. Whose frame has a larger area, and what is the difference in their areas?

8. A piece of string is 40 cm long. What will be the length of each side if the string is used to form a square?

9. A wire of length 36 cm is bent into the shape of an scalene triangle. Write any three possible combinations of length of sides of the triangle?

10. The perimeter of a square is 64 cm, find its area.

Section C: Short Answer ($6 \times 3 = 18$ marks)

11. Find the width of a rectangle whose length is 12 cm and perimeter is 30 cm..

12. The area of a rectangular plot of land is 300 square meters. If the length of the plot is 20 meters, calculate its perimeter.

13. Find the area of a rectangle of length 12 cm and breadth 7 cm.

14. A square park 'P1' has side 20 m. A rectangular park 'P2' has length 25 m and width 16 m. Which park has the greater area?

15. Find the perimeter of equilateral triangle whose one side is 13 cm.

16. A rectangular garden is 40 m long and 15 m wide. A gardener charges ₹12 per m^2 for laying grass. Find the total charge.

Section D: Long Answer ($4 \times 5 = 20$ marks)

17. Two rectangular parks have the same area of 300 m^2 . The first park has a length of 25m. Find the width of both parks if the second park is 30m long. Which park has a larger perimeter?

18. A rectangular hall is 18 m long and 12 m wide. Four workers can tile 72 m^2 in one day. How many days will they take to tile the hall?

19. A rectangular field measuring $50 \text{ m} \times 40 \text{ m}$ is to be fenced. Labourers charge ₹ 6 per metre for installation and fencing material costs ₹10 per metre. Find the total cost.

20. The floor of a room is 8m long and 6m wide , each tile used is 40cm× 40cm. How many tiles are required to cover the floor completely

Case Study Based Questions ($2 \times 4 = 8$ marks)

21. A local community wants to fence a rectangular public park that is **150 m long and 120 m wide**. The contractor for the project charges **₹40 per metre** for the fencing material and labour. To budget for the project, the community leaders must first calculate the perimeter of the park.

1. What are the dimensions of the rectangular park?
2. Calculate the perimeter of the public park.
3. What is the rate charged per metre for fencing?
4. What is the total cost required to fence the entire park?

22. Charan is reviewing the floor plan for his new home on a **35 ft × 30 ft rectangular plot**. His plan includes a master bedroom (15 ft × 15 ft), a kitchen (15 ft × 12 ft), and a small bedroom (15 ft × 12 ft). He also has a hall that measures **20 ft by 12 ft**. Charan wants to ensure the sum of the areas of his rooms and utilities fits within the total plot area.

1. What is the total area of Charan's rectangular plot?
2. What is the area of the master bedroom in Charan's house?
3. What is the area of the small bedroom ?
4. Which has more space kitchen or small bedroom ?

Self Assessment:

I understood all the concepts ☐ Yes ☐ No

I need more practice ☐ Yes ☐ No

Name of Concepts having doubts/Not Cleared: _____

Parent's Assessment:

My ward understood all the concepts ☐ Yes ☐ No

He/She need more practice ☐ Yes ☐ No

Name of Concepts having doubts/Not Cleared: _____

Signature of Parent:

Teacher's Assessment

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Answers of Worksheet 1:

Q	1	2	3	4	5	6	7	8	9	10	11	12	13
A	a	b	b	c	d	c	a	c	c	b	a	a	c
Q	14	15	16	17	18	19	20						
A	c	B	a	c	c	c	c						

Answers of Worksheet 2:

Q.No.	1	2	3	4	5	6	7	8
ANS	400		70m	26cm	336m ²	10m	Reena ,25m ²	10cm
Q.No.	9	10	11	12	13	14	15	16
ANS		256cm ²	3cm	70m	84 cm ²	equal	39cm	7200rs
Q.No.	17	18	19	20	21	22		
ANS	12m, 10m 2nd	3days	2880	300	150m, 120m 540m ₹40 ₹21600	1050ft ² 225ft ² 180ft ² equal		

SUMMARY OF CONCEPTS & DEFINITIONS

CHAPTER 7: FRACTIONS

1. FRACTION & EQUAL SHARE

- A fraction shows equal parts of a whole or a set of objects.
- It is written as $\frac{a}{b}$, where a and b are whole numbers and $b \neq 0$.

$\frac{a}{b}$ a = **numerator**
(top number)
 b = **denominator**
(bottom number)

Example:

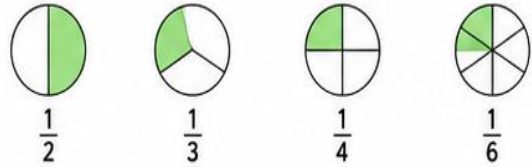
One whole roti shared equally among 4 children.



Each child gets $\frac{1}{4}$ roti.

2. FRACTIONAL UNITS

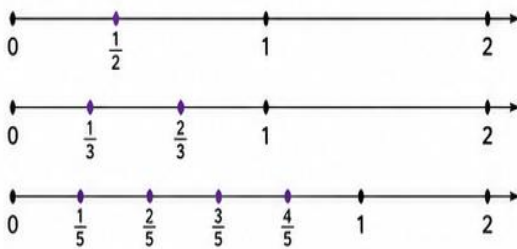
- When one whole unit is divided into equal parts, each part is called a fractional unit (or unit fraction).



Unit fractions: $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6}, \dots$

3. FRACTIONS ON THE NUMBER LINE

- Fractions can be represented on a number line.
- Between any two whole numbers, there are infinitely many fractions.

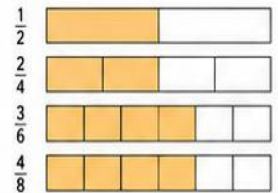


4. EQUIVALENT FRACTIONS

- Fractions that represent the same value or equal length are called equivalent fractions.
- We get equivalent fractions by multiplying or dividing both numerator and denominator by the same number ($\neq 0$).

Example:

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

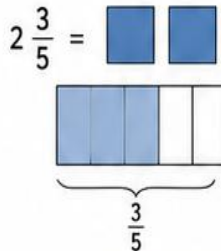


5. MIXED FRACTIONS

- A mixed fraction has a whole number part and a fractional part.

Example: $2\frac{3}{5}$ (2 is the whole part, $\frac{3}{5}$ is the fractional part)

Improper fraction $\frac{13}{5} = 2\frac{3}{5}$



6. LOWEST TERMS (SIMPLEST FORM)

- A fraction is in lowest terms when its numerator and denominator have no common factor other than 1.

Example: $\frac{8}{12} = \frac{8 \div 4}{12 \div 4} = \frac{2}{3}$ (lowest terms)

- We get lowest terms by dividing numerator and denominator by their greatest common factor (GCF).



Tip

Make numerator and denominator as small as possible.

7. ADDITION & SUBTRACTION OF FRACTIONS

A. Same Denominator

- Add or subtract the numerators.
- Keep the denominator same.

Example:

$$\frac{3}{7} + \frac{2}{7} = \frac{3+2}{7} = \frac{5}{7}$$

$$\frac{6}{7} - \frac{2}{7} = \frac{6-2}{7} = \frac{4}{7}$$

B. Different Denominators

- Make denominators same (use LCM).
- Convert to equivalent fractions.
- Then add or subtract numerators.

Example: $\frac{1}{4} + \frac{1}{3} = \frac{1 \times 3}{4 \times 3} + \frac{1 \times 4}{3 \times 4} = \frac{3}{12} + \frac{4}{12} = \frac{7}{12}$

$$\frac{3}{4} - \frac{1}{3} = \frac{9}{12} - \frac{4}{12} = \frac{5}{12}$$

8. COMPARING FRACTIONS

- Make denominators same.
- Compare numerators.

If a and b are fractions, then:

$$\text{If } a > b \rightarrow \frac{a}{b} > \frac{c}{d}$$

$$\text{If } a = b \rightarrow \frac{a}{b} = \frac{c}{d}$$

$$\text{If } a < b \rightarrow \frac{a}{b} < \frac{c}{d}$$

Example:

Compare $\frac{3}{4}$ and $\frac{2}{3}$

$$\frac{3}{4} = \frac{9}{12}, \frac{2}{3} = \frac{8}{12}$$

Since $9 > 8$,

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

KEY POINTS TO REMEMBER

- A fraction represents a part of a whole or a set.
- Equivalent fractions show the same value.
- Simplify fractions to lowest terms.
- Use same denominator to add, subtract and compare fractions.
- There are infinitely many fractions between two whole numbers.

COMMON FRACTIONS

$\frac{1}{2}$ → half	$\frac{1}{3}$ → one third
$\frac{1}{4}$ → one fourth	$\frac{3}{4}$ → three fourths
$\frac{1}{5}$ → one fifth	$\frac{2}{5}$ → two fifths

HISTORY HIGHLIGHT



General fractions and rules for their operations were developed in ancient India. Brahmagupta (628 CE) gave clear rules for adding and subtracting fractions – methods we still use today!

FRACTIONS

WORKSHEET-1

Section A: MCQs (PART-1) ($10 \times 1 = 10$ marks)

1. Which of the following is not the fractional unit ?

- a) $\frac{1}{2}$ b) $\frac{1}{4}$ c) $\frac{1}{7}$ d) $\frac{2}{7}$

2. Three notebooks together weigh 1 kg. Weight of each notebook is....

- a) $\frac{1}{3}$ kg b) 3kg c) $\frac{2}{3}$ kg d) 350 gram

3. Which of the following is a proper fraction?

- a) $\frac{3}{7}$ b) $\frac{7}{3}$ c) $\frac{4}{3}$ d) $\frac{5}{4}$

4. How many fractions lie between 0 and 1?

- a) 1 b) 0 c) 2 d) uncountable

5. How many whole units are there in $\frac{5}{2}$ and in $\frac{9}{2}$?

- a) 2, 3 b) 4, 2 c) 2, 4 d) none of these

6. Simplest form of $\frac{14}{42}$ is

- a) $\frac{7}{21}$ b) $\frac{2}{6}$ c) $\frac{1}{3}$ d) none of these

7. $\frac{5}{9} + \frac{4}{9} = ?$

- a) $\frac{1}{9}$ b) $\frac{9}{9}$ c) 1 d) both b and c

8. $\frac{1}{5} - \frac{1}{15} = ?$

- a) $\frac{2}{15}$ b) $\frac{2}{5}$ c) $\frac{1}{10}$ d) $\frac{3}{15}$

9. Which of these fractions is greater?

- a) $\frac{7}{3}$ b) $\frac{7}{4}$ c) $\frac{7}{2}$ d) $\frac{7}{5}$

10. A pizza is divided into 10 equal parts. You eat 4 parts. What fraction of the pizza remains?

- a) $\frac{4}{10}$ b) $\frac{6}{10}$ c) $\frac{6}{5}$ d) $\frac{4}{5}$

MCQs (PART-2) ($10 \times 1 = 10$ marks)

11. If 1 roti is divided equally among 5 children, each gets:

- a) $\frac{1}{2}$ b) $\frac{1}{4}$ c) $\frac{1}{3}$ d) $\frac{1}{5}$

12. Which of the following is a mixed fraction?

- a) $\frac{3}{5}$ b) $\frac{9}{5}$ c) $2\frac{2}{3}$ d) $\frac{2}{3}$

13. Expressing a fraction in lowest terms means:

- a) Numerator and denominator have only 1 as common factor
b) Numerator larger than denominator
c) Numerator smaller than denominator
d) none of these

14. Which of these fractions is greater?

- a) $\frac{7}{3}$ b) $\frac{8}{3}$ c) $\frac{9}{3}$ d) $\frac{6}{3}$

15. Which of the following is not the simplest form

- a) $\frac{12}{13}$ b) $\frac{15}{16}$ c) $\frac{31}{29}$ d) $\frac{26}{91}$

16. Which of the following fractions represents the greatest quantity?

- a. $\frac{5}{8}$ b. $\frac{3}{4}$ c. $\frac{7}{10}$ d. $\frac{2}{3}$

17. Riya coloured $\frac{2}{5}$ of a picture, and Aman coloured another $\frac{1}{5}$ of the same picture. What fraction of the picture is still uncoloured?

- a. $\frac{2}{5}$ b. $\frac{3}{5}$ c. $\frac{1}{5}$ d. $\frac{4}{5}$

18. Which pair of fractions is equivalent?

- a. $\frac{4}{6}$ and $\frac{6}{8}$ b. $\frac{3}{5}$ and $\frac{9}{15}$ c. $\frac{5}{8}$ and $\frac{10}{18}$ d. $\frac{7}{9}$ and $\frac{14}{20}$

19. Which mixed number is equal to the improper fraction $\frac{17}{5}$?

- a. $2\frac{2}{5}$ b. $3\frac{2}{5}$ c. $3\frac{3}{5}$ d. $4\frac{2}{5}$

20. Which statement is always true?

- a. Every improper fraction is less than 1.
b. Every equivalent fraction has the same value.
c. Every fraction with a larger denominator is greater.
d. The numerator of a proper fraction is always greater than the denominator.

WORKSHEET-2

Section B: Short Answer ($10 \times 2 = 20$ marks)

1. Make $\frac{1}{3}$ using a paper strip. Can you use this to also make $\frac{1}{6}$?

2. Khushi walked $\frac{2}{5}$ km in the morning and $\frac{3}{5}$ km in the evening. What is the total distance she walked? Express your answer in the simplest form.

3. A water bottle was $\frac{5}{6}$ full. Neha drank $\frac{1}{3}$ of the bottle's capacity. What fraction of the bottle remained filled?

4. Four apples together weigh 1 kg. Find the weight of each apple. What will be the weight of 3 apples in kg together ?

5. $\frac{7}{29} + \frac{17}{58}$.

6. Two students spent $\frac{2}{9}$ and $\frac{7}{9}$ of an hour solving a puzzle. Did they spend more than one hour . Show your calculations?

7. Draw a picture and write an addition statement for “ 6 times $\frac{1}{4}$ of a roti”.

8. Simplify and express as a mixed fraction: $\frac{15}{4} + \frac{9}{4}$.

9. Arrange the fractions $\frac{4}{3}$, $\frac{2}{3}$, $\frac{5}{3}$ in ascending order.

10. Write four equivalent fractions for $\frac{2}{6}$.

Section C: Short Answer ($6 \times 3 = 18$ marks)

11. Write the following fractions in ascending order : $\frac{3}{15}$, $\frac{3}{5}$, $\frac{9}{10}$

12. Hemant mixes $\frac{2}{3}$ litres of yellow paint with $\frac{3}{4}$ litres of blue paint to make green paint. What is the volume of green paint he has made ?

13. On a number line, draw lines of lengths $\frac{1}{10}$, $\frac{3}{10}$, and $\frac{4}{5}$.

14. Solve $\frac{13}{29} + \frac{1}{7} + \frac{16}{29}$

15.. A student scored $\frac{3}{5}$ marks in Mathematics and $\frac{7}{10}$ marks in science. In which subject did the student perform better? By what fraction?

16. $\frac{13}{11} - \frac{11}{13}$

Section D: Long Answer ($4 \times 5 = 20$ marks)

17. Write the following fractions in descending order. $\frac{15}{16}, \frac{5}{8}, \frac{11}{4}, \frac{17}{32}$

18. Maya's school is $\frac{8}{10}$ km from her home. She takes an auto for $\frac{1}{2}$ km from her home daily, and then walks the remaining distance to reach her school. How much does she walk daily to reach the school?

19. Three students spent $\frac{2}{9}$, $\frac{1}{3}$, and $\frac{1}{6}$ of an hour solving a puzzle.

Did they spend more than one hour all together?

20. Ram, Shyam, and Karan shared a pizza with 16 slices. Rohan ate 3 slices, Priya ate 5 slices, and Ali ate 4 slices. Answer the questions given below:

- a) What fraction of the whole pizza did all person eat?
- b) What fraction of the pizza was left over?

Case Study Based Questions ($2 \times 4 = 8$ marks)

21. In an IPL playoff match, Rajasthan Royals scored **180 runs** in 20 overs. Out of these:

- **60** runs were scored in boundaries (4s).
- **45** of the runs were scored through sixes.
- The remaining runs were scored by running between the wickets.

Meanwhile, Gujarat Titans scored **160 runs**. Out of these:

- **60** the runs came from boundaries.
- **36** runs came from sixes.
- The remaining runs were scored by running between the wickets.

Q a) What fraction of Rajasthan Royals' runs came from boundaries and sixes together?

Q b) What fraction runs scored through sixes by Gujarat Titan?

Q c) What fraction of Rajasthan Royals' total runs was scored by running between the wickets?

22. 120 Students of PM Shri Kendriya Vidyalaya No. 2 Ambala Cantt went on an educational tour to Indian Institute of Technology Guwahati. The total distance from Ambala Cantonment to Guwahati is approximately **2,000 km**. During the journey train covered 500 km on the first day. It covered $\frac{3}{8}$ of the distance on the second day. The remaining distance was covered on the third day. $\frac{1}{3}$ of the students were from Class VI. $\frac{1}{6}$ of the students were from Class VII. The remaining students were from other classes.

Read the case study carefully and answer the following questions.

Q a) What fraction of total distance was covered on the first day?

Q b) What fraction of the total distance was covered in the first two days?

Q c) The fraction of distance covered on the second day is $\frac{3}{8}$. Convert it into an equivalent fraction with denominator 24.

Self Assessment:

I understood all the concepts ☐ Yes ☐ No

I need more practice ☐ Yes ☐ No

Name of Concepts having doubts/Not Cleared: _____

Parent's Assessment:

My ward understood all the concepts ☐ Yes ☐ No

He/She need more practice ☐ Yes ☐ No

Name of Concepts having doubts/Not Cleared: _____

Signature of Parent:

Teacher's Assessment

--

Answers of Worksheet 1:

Q N	1	2	3	4	5	6	7	8	9	10	11	12	13
ANS	d	a	a	d	c	c	c	a	c	b	d	c	a
Q N	14	15	16	17	18	19	20						
ANS	c	d	b	a	b	b	b						

Answers of Worksheet 2:

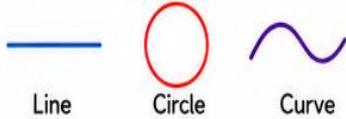
Q N	1	2	3	4	5	6	7	8
ANS		1km	1/2	$\frac{1}{4}, \frac{3}{4}$	31/58	No, 1 h		6
Q N	9	10	11	12	13	14	15	16
ANS	2/3, 4/3, 5/3	1/3, 3/9, 4/12	3/5, 13/15 ,9/10	17/12		8/7	Science, 1/10	48/143
Q N	17	18	19	20	21	22		
ANS	11/4, 15/16 , 5/8, 17/32	3/10	13/18 no	12/16, 4/16	105/180 36/160 75/180	1/4 5/8 9/24		

SUMMARY OF CONCEPTS & DEFINITIONS

CHAPTER 8 : PLAYING WITH CONSTRUCTIONS

1. CURVES & CIRCLES

- A curve is any shape drawn with a pencil. It includes straight lines, circles and other shapes.

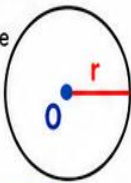


Line

Circle

Curve

- All points on a circle are at the same distance from its centre.
- This distance is called the **radius** of the circle.



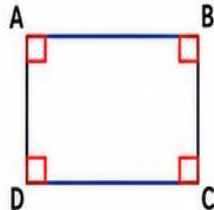
Use of Compass



- Used to draw circles and arcs.
- Used to mark points at a given distance.

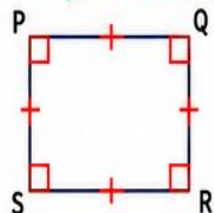
2. SQUARES & RECTANGLES

Rectangle ABCD



- Opposite sides are equal.
 $AB = CD$, $AD = BC$
- All angles are 90° .
 $\angle A = \angle B = \angle C = \angle D = 90^\circ$

Square PQRS



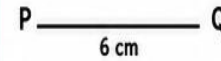
- All sides are equal.
 $PQ = QR = RS = SP$
- All angles are 90° .
 $\angle P = \angle Q = \angle R = \angle S = 90^\circ$

Naming Rule

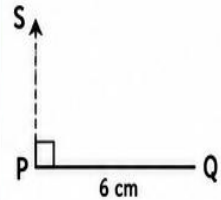
A rectangle or square can be named by listing its vertices in order around the figure (clockwise or anticlockwise). Any other order is not valid.

3. BASIC CONSTRUCTIONS

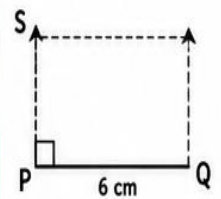
Construct a square of side 6 cm



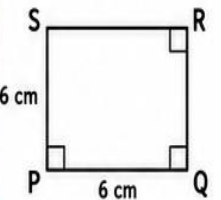
Step 1: Draw $PQ = 6$ cm.



Step 2:
Draw a line perpendicular to PQ at P and mark $PS = 6$ cm.



Step 3: Draw a line perpendicular to PQ at Q .

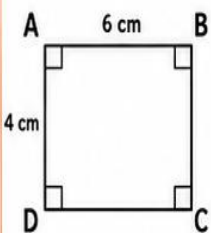


Step 4: Mark R on the line so that $QR = 6$ cm. Join SR to get square $PQRS$.

4. CONSTRUCTING RECTANGLES

(a) Given two sides

Example: 6 cm and 4 cm

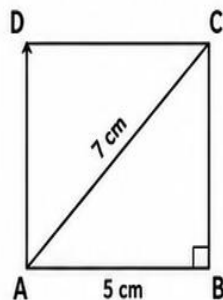


Steps:

- Draw $AB = 6$ cm.
- Draw $BC \perp AB$ and $BC = 4$ cm.
- Draw $CD = AB$ and $CD = 6$ cm.
- Draw $DA \perp CD$ and $DA = 4$ cm.
- Join ends to get rectangle $ABCD$.

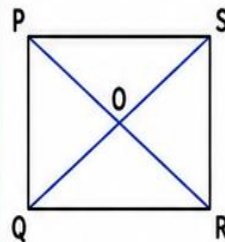
(b) Given one side and a diagonal

Example: $AB = 5$ cm, $AC = 7$ cm



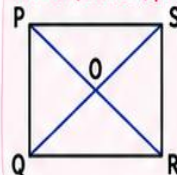
- Draw $AB = 5$ cm.
- At B , draw a perpendicular.
- With A as centre, draw an arc of radius 7 cm to cut the line at C .
- From C , draw line perpendicular to AB .
- From A , draw line parallel to BC to meet at D .
- $ABCD$ is the required rectangle.

5. EXPLORING DIAGONALS



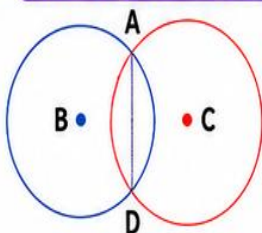
- PR and QS are the diagonals.
- Diagonals are equal in length.
 $PR = QS$
- Each diagonal divides a pair of opposite angles into two parts, but these parts are **NOT** necessarily equal in a rectangle.
- Opposite angles are equal:
 $\angle P = \angle R$ and $\angle Q = \angle S = 90^\circ$

In a SQUARE (special case of rectangle)



- Diagonals are equal.
- Diagonals bisect each other ($PO = OR = OQ = OS$).
- Each diagonal bisects each of the opposite angles (45° each).
- Diagonals are perpendicular to each other.

6. POINTS EQUIDISTANT FROM TWO POINTS



Points A and D are equidistant from B and C .

$$AB = AC \text{ and } DB = DC$$

The line joining A and D is the perpendicular bisector of BC .

7. KEY IDEAS & SKILLS

- Use ruler and compass for accurate constructions.
- Plan before constructing – draw a rough diagram.
- Use perpendicular lines and equal lengths for rectangles and squares.
- Intersecting arcs help find points equidistant from two points.
- Measure and verify to check if properties are satisfied.

COMMON CONSTRUCTIONS

- Line segment of a given length
- Perpendicular to a given line
- Circle of a given radius
- Point at a given distance from a point
- Rectangle and square (given side(s))
- Rectangle (given side and diagonal)
- Curve through given points



REMEMBER!

A circle has infinite points at the same distance (radius) from its centre.



A rectangle has opposite sides equal and all angles 90° .



A square has all sides equal and all angles 90° .



Good planning makes constructions easy and accurate.



Practice with ruler and compass builds precision and confidence.



MCQs (PART-2) ($10 \times 1 = 10$ marks)

11. While drawing a circle using a compass, the distance between the compass needle and the pencil is 5 cm. What does this distance represent?

- a. Diameter of the circle
- b. Circumference of the circle
- c. Radius of the circle
- d. Chord of the circle

12. A rectangle has a length of 9 cm and a breadth of 5 cm. Which statement is always true?

- a. All four sides are equal.
- b. Opposite sides are equal and all angles are 90° .
- c. All angles are less than 90° .
- d. Adjacent sides are always equal.

13. A student rotates a square through 45° . Which of the following changes after the rotation?

- a. Length of its sides
- b. Measure of its angles
- c. Its orientation only
- d. Shape of the figure

14. To locate a point that is exactly 6 cm from two given points A and B, each 6 cm apart, which construction should be used?

- a. Draw only one circle with centre A.
- b. Draw two circles of radius 6 cm with centres A and B.
- c. Draw two parallel lines through A and B.
- d. Join A and B and mark the midpoint.

15. Which instrument is most suitable for transferring the exact length of one line segment to another without measuring it repeatedly?

- a. Protractor
- b. Divider/Compass
- c. Set square
- d. Scale only

16. All the points that are at the same distance from a fixed point form a:

- a) Line
- b) Triangle
- c) Circle
- d) Square

17.. The point where two lines meet is called

- (a) ray
- (b) vertex
- (c) intersection point
- (d) mid point

18.. A quadrilateral with all sides equal is

- (a) rectangle
- (b) square
- (c) trapezium
- (d) parallelogram

19.. Radius =

- A. half of diameter
- B. double of diameter
- C. one fourth of diameter
- D. none of these

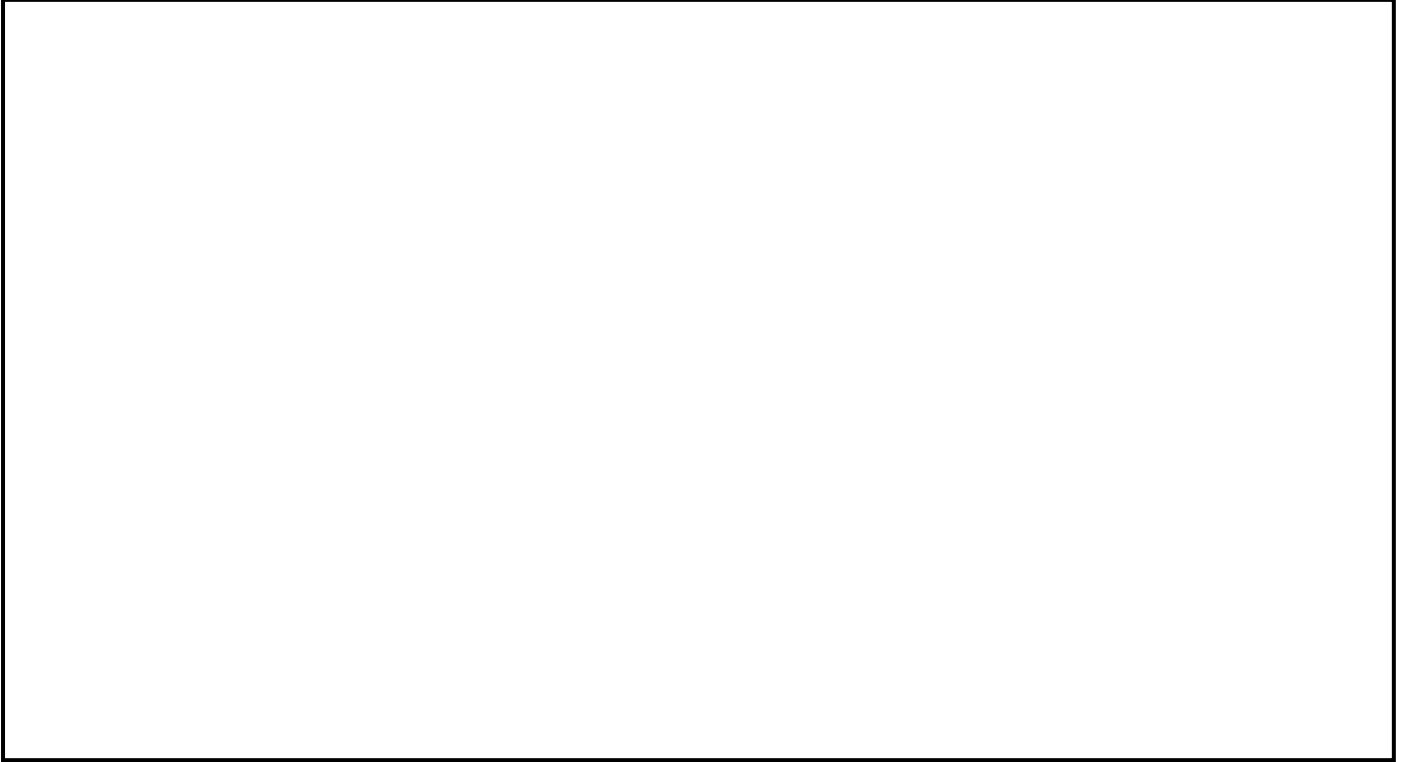
20. If a rectangle ABCD has side $AB = 7$ cm, what is the length of **side CD**?

- A. 4 cm
- B. 7 cm
- C. 11 cm
- D. 14 cm

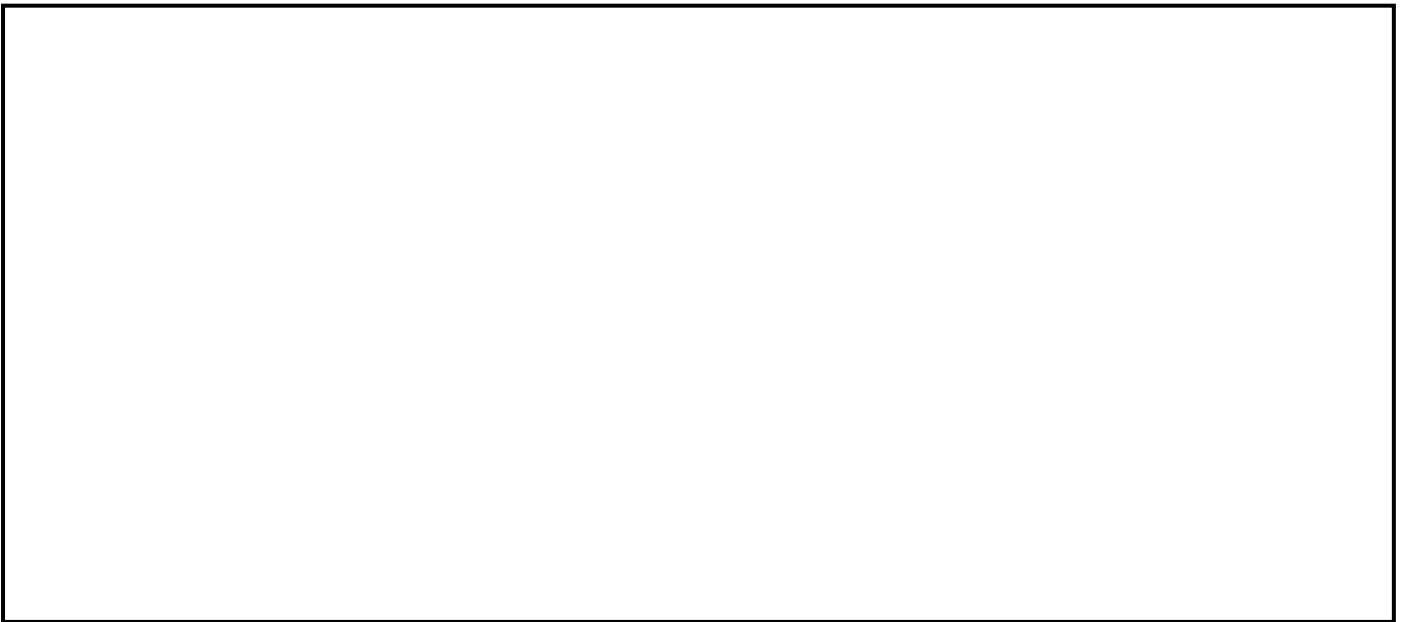
WORKSHEET-2

Section B: Short Answer ($10 \times 2 = 20$ marks)

1. Draw a rectangle with sides of length 3.5 cm and 7 cm .



2. Draw a square with a circular hole of radius 3 cm.



3. Match the following:

A

B

Ruler

measuring angle

Compass

comparing length

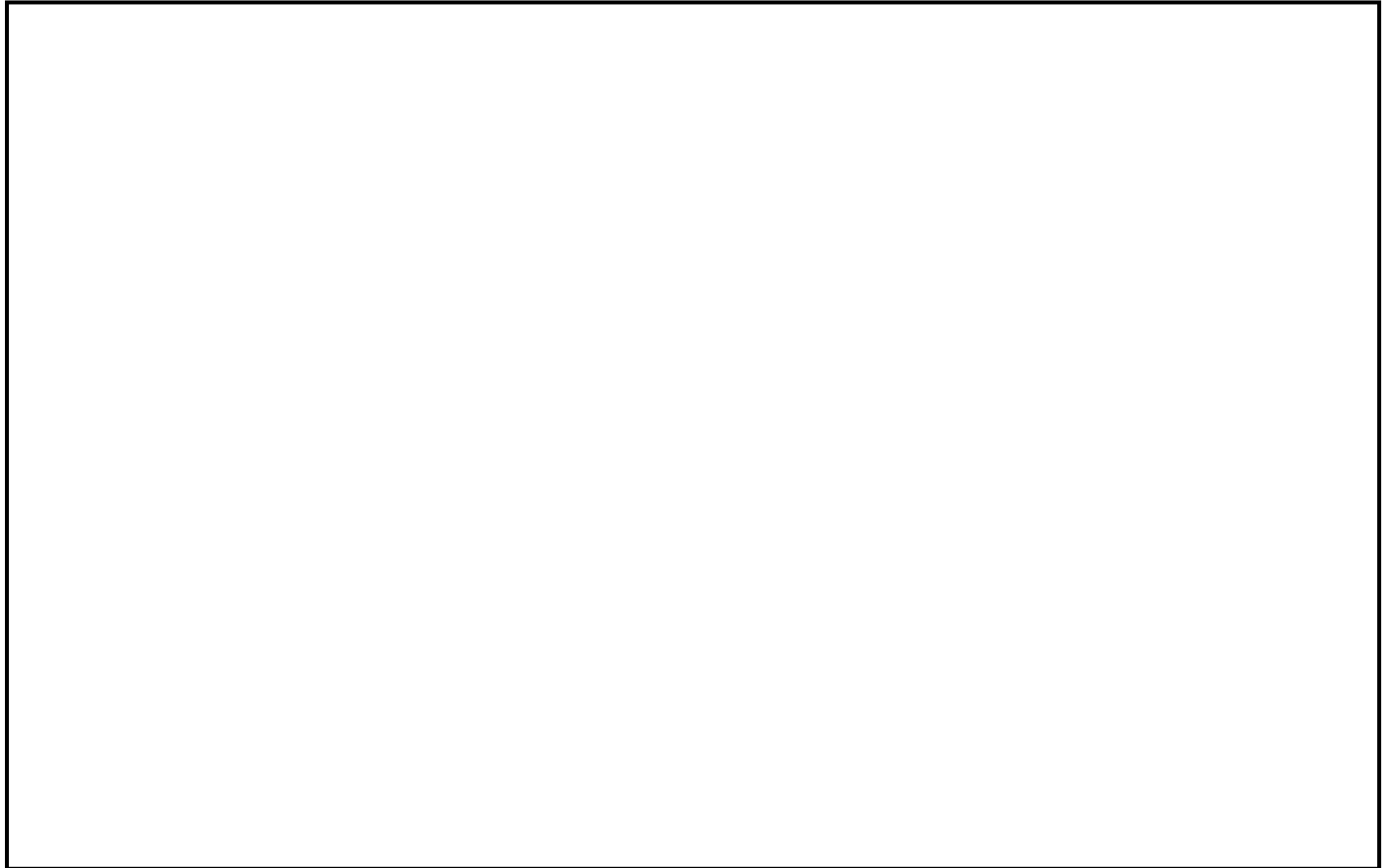
Divider

construct circles

Protractor

drawing a line

4. Draw circles with radii 4.5 cm and 6 cm



5. Let PQ be a line of length 9cm and R is the midpoint of PQ. What is the distance of R from Q?

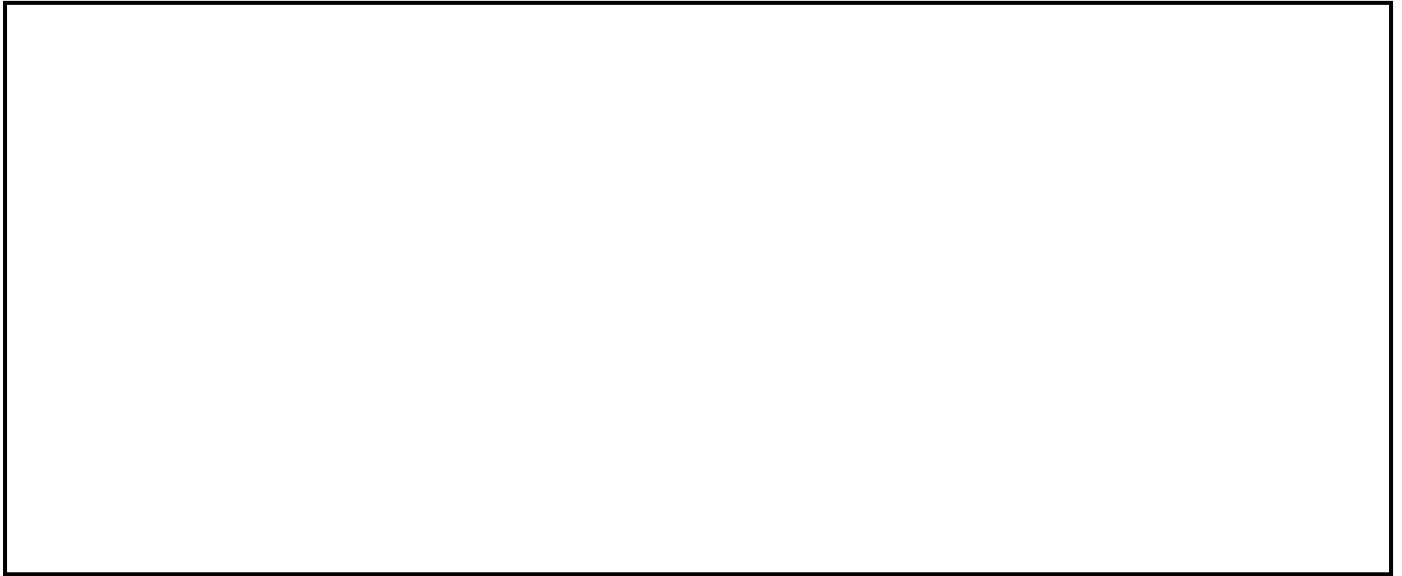


6. Construct a perpendicular line at point P on line segment PQ. Also write step of construction.

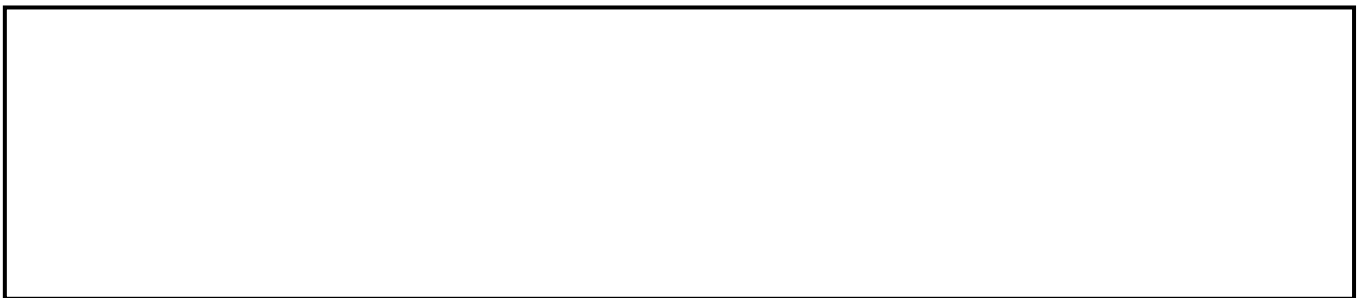
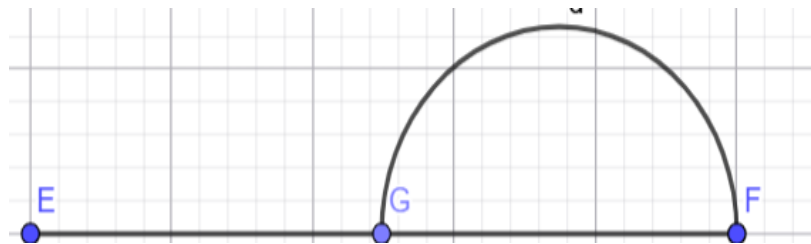
7. Construct a square of side 5.5cm.

8. Write two properties of square.

9. Draw a rectangle of sides 3cm and 5cm. Verify that the diagonals are equal in length.



10. In the figure given that EG is half of EF. If EF = 16cm then find the radius of the semicircle shown in the figure.

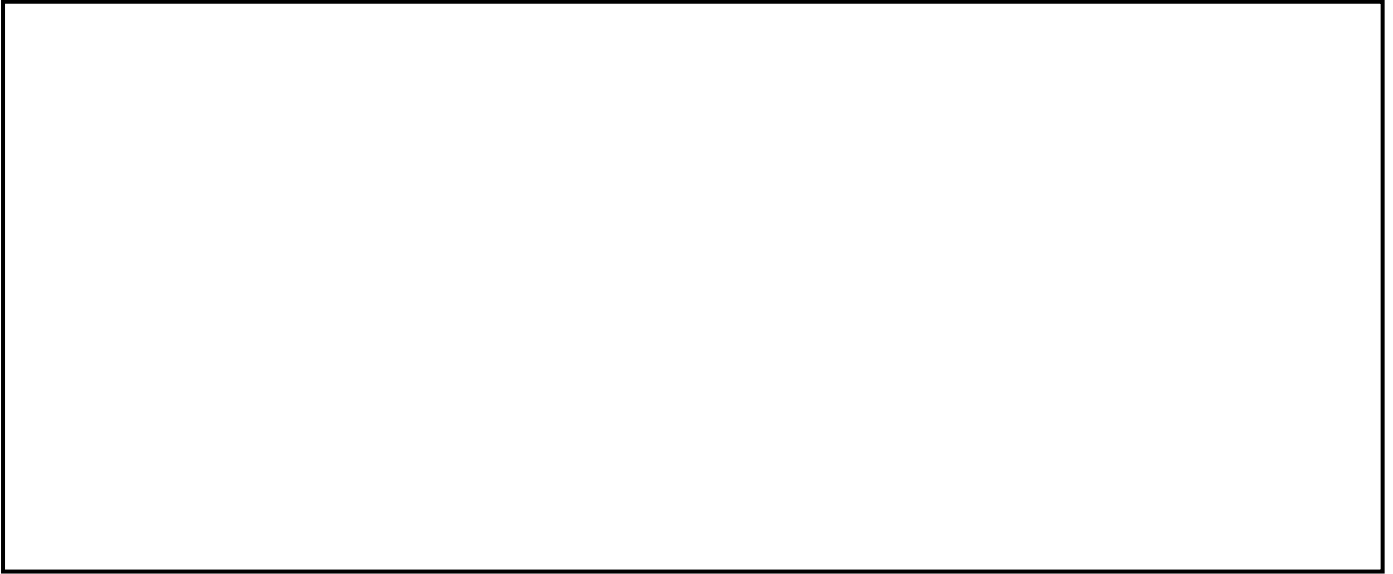


Section C: Short Answer ($6 \times 3 = 18$ marks)

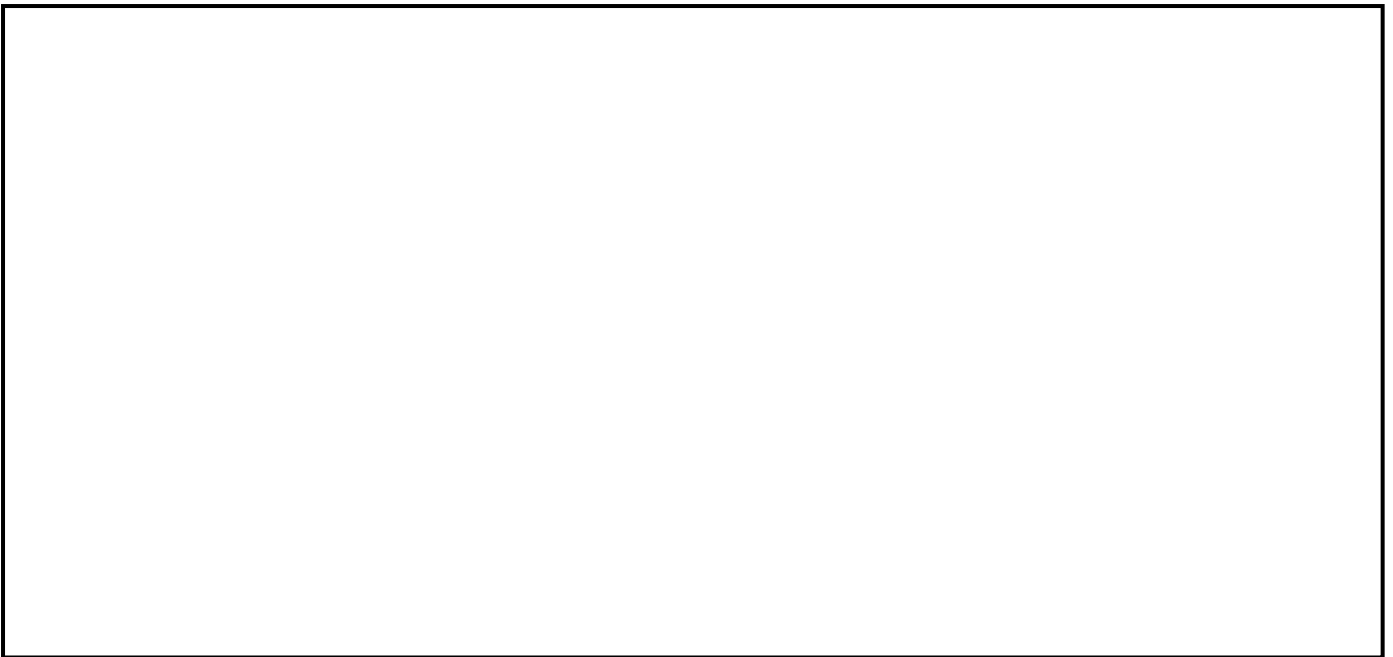
11. Construct a rectangle and divide it into two equal smaller squares.



12. Construct a rectangle with sides 4 cm and 3 cm. Measure the length of its diagonals.



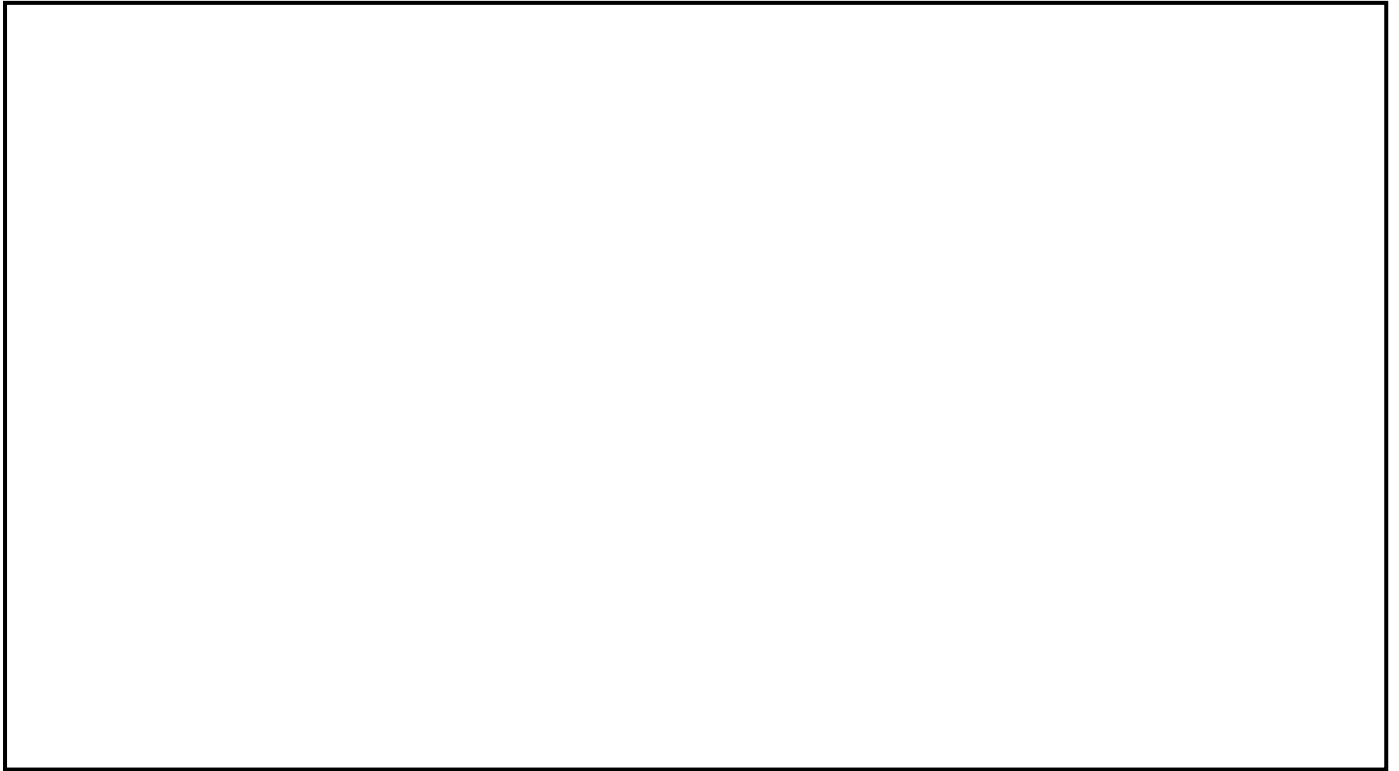
13. Construct a rectangle one of whose sides is 5 cm and the diagonal is of length 8 cm..



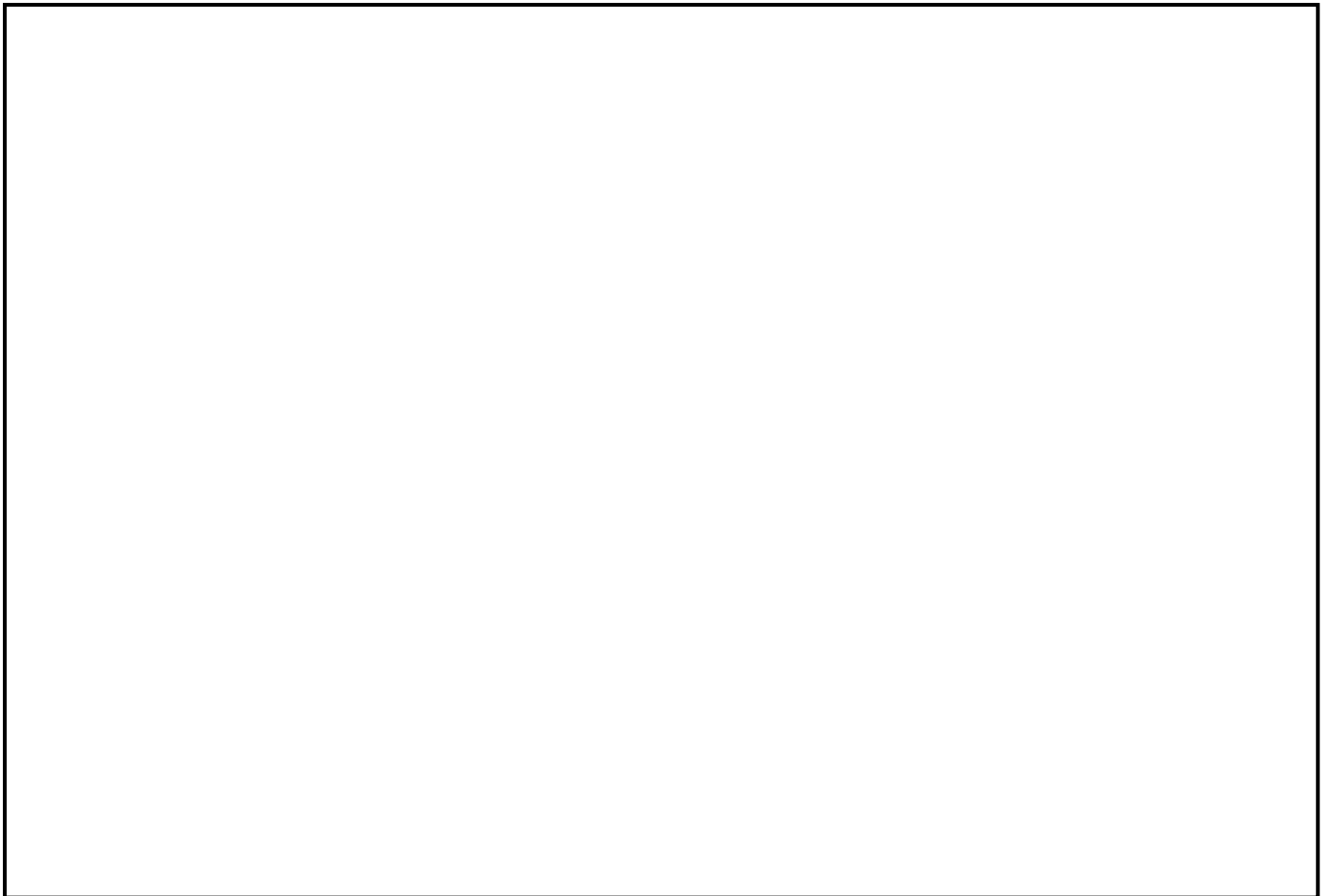
14. Describe how to find the exact centre of a square to place a circular hole.



15. Construct a rectangle where one of its sides is 5cm and the length of a diagonal is 7cm.



16. Construct a square of sides 7.5 cm and measure its diagonals.

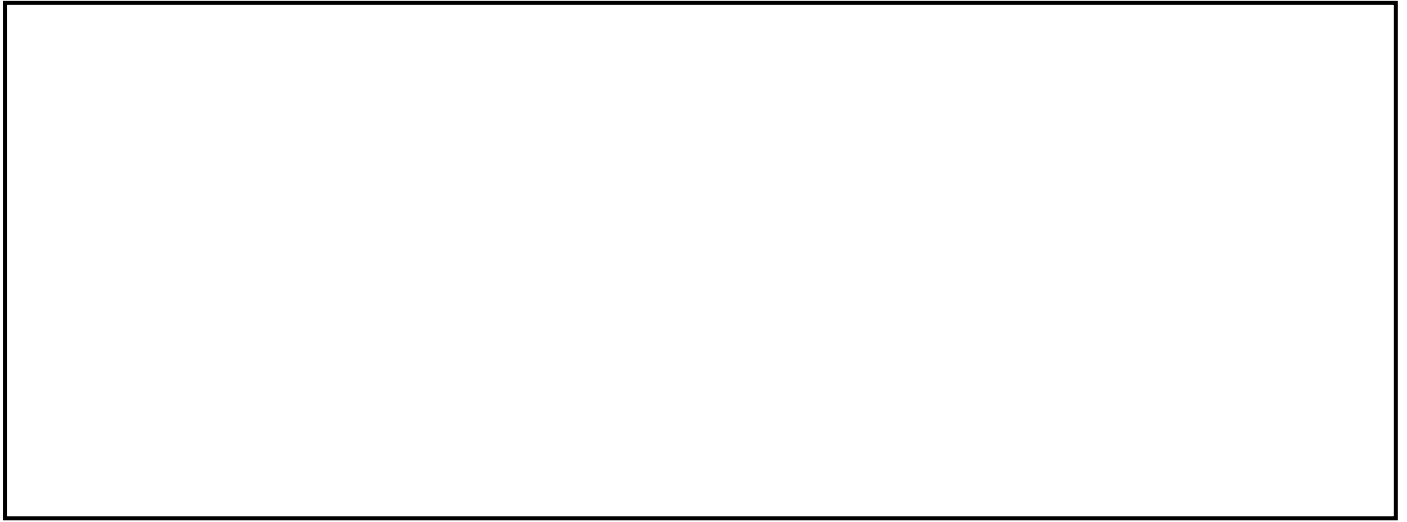


Section D: Long Answer ($4 \times 5 = 20$ marks)

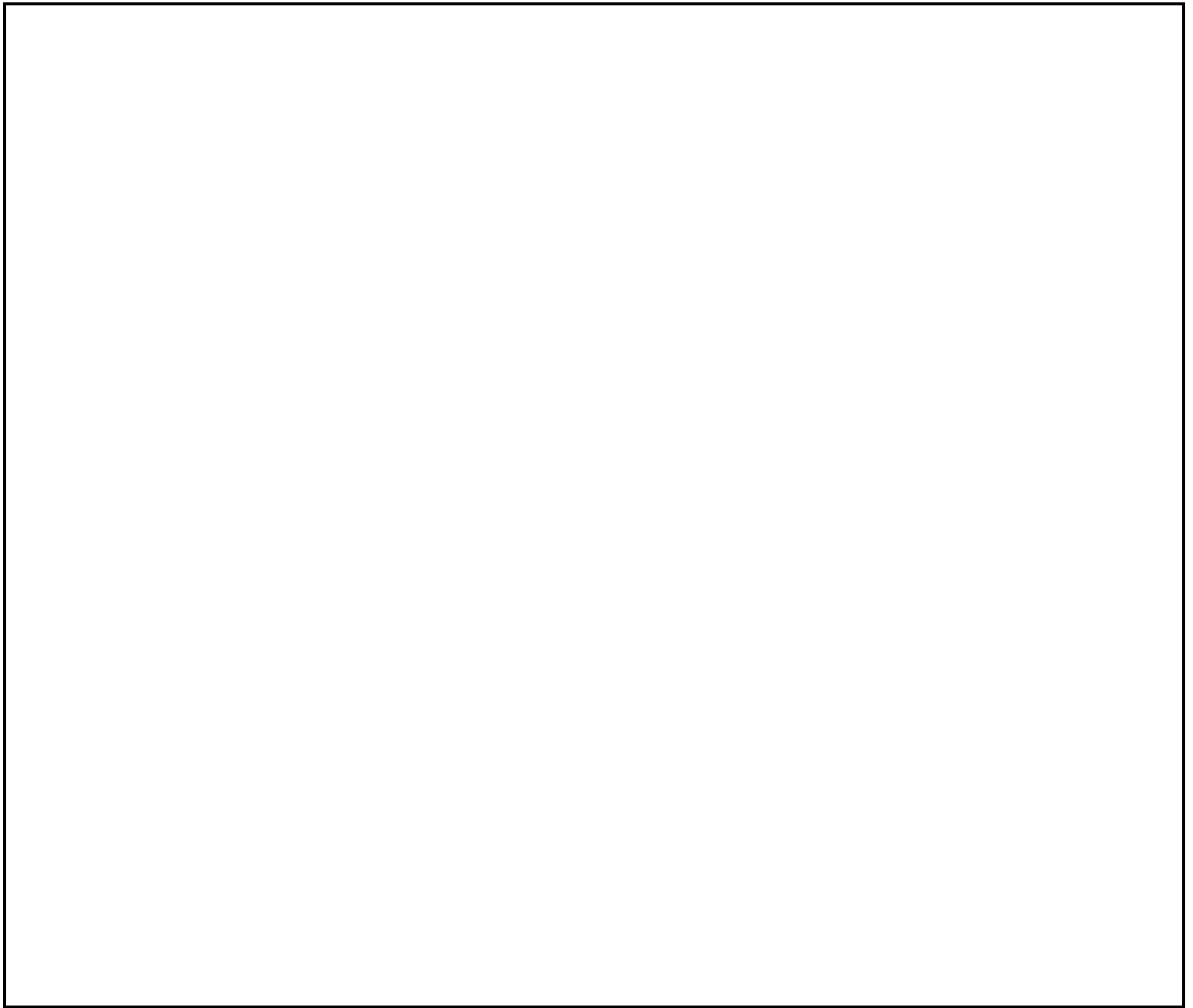
17. Construct a rectangle in which one of the diagonals divides the opposite angles into 30° and 60° . Also write step of construction.

18. Construct a rectangle of sides 8 cm and 4 cm. construct a square inside, rectangle, such that the centre of the square is the same as the centre of the rectangle.

19. Construct a rectangle and divide it into four equal smaller squares.

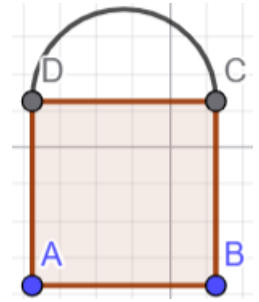


20. Construct a semicircle on diagonal of rectangle of side 8cm .



Case Study Based Questions ($2 \times 4 = 8$ marks)

21. A family is building a new house and wants a decorative entrance gate. The architect designs the gate in the shape shown in the figure: a square topped with a semicircle. To present the design to the family, a scale model of the gate is to be constructed using geometric instruments. The length of side square portion 4m. A semicircle is drawn to form the upper curved part of the gate.



Q. a) Identify the geometric shapes used in the gate design.

Qb) Name the line segment that acts as the diameter of the semicircle.

Qc) Using a scale of **1 cm = 1 m**, construct the model of the gate with a ruler and compass.

Qd). Write the steps of construction.

22. For a festival, Meera creates a rangoli using two concentric circles. The inner circle has diameter **36 cm** and the outer circle has diameter **70 cm**.

Qa) Which tool is used to make rangoli.

Qb) What is the radius of inner and outer circle.

Qc) Construct the rangoli with the help of compass.

Self Assessment:

I understood all the concepts

☐ Yes☐ No

I need more practice

☐ Yes☐ No

Name of Concepts having doubts/Not Cleared: _____

Parent's Assessment:

My ward understood all the concepts

☐ Yes

☐ No

He/She need more practice

☐ Yes☐ No

Name of Concepts having doubts/Not Cleared: _____

Signature of Parent:

Teacher's Assessment

[illegible]

Answers of Worksheet 1:

Q.No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
ANS	a	c	b°	c	a	c	c	d	b	b	c	b	c	b	b	c
Q N	17	18	19	20												
ANS	c	b	a	b												

Answers of Worksheet 2:

Q N	1	2	3	4	5	6	7	8
ANS					4.5			
Q N	9	10	11	12	13	14	15	16
ANS		4						
Q N	17	18	19	20	21	22		
ANS					Square, semicircle b) DC	a)compass b) 18cm,35cm		

SUMMARY OF CONCEPTS & DEFINITIONS

CHAPTER 9 : SYMMETRY

1. SYMMETRY

- When a figure has parts that repeat in a definite pattern, we say it has symmetry.
- Such a figure is called symmetrical.

Flower Butterfly Rangoli Pinwheel Clouds



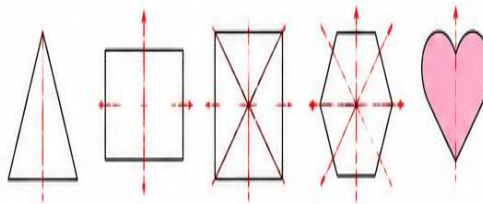
Symmetrical

Not symmetrical

2. LINE OF SYMMETRY (REFLECTION SYMMETRY)

A line that divides a figure into two parts that exactly overlap when folded along that line is called a line of symmetry (or axis of symmetry).

Examples



1 line

2 lines

4 lines

6 lines

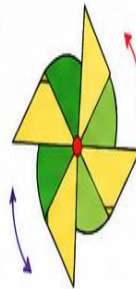
1 line

A figure may have one, more than one, or no line of symmetry.

3. ROTATIONAL SYMMETRY

A figure has rotational symmetry if it looks exactly the same after a rotation about a fixed point (centre of rotation).

Example: Pinwheel



Rotation (Clockwise)	Result
90° (¼ turn)	Same
180° (½ turn)	Same
270° (¾ turn)	Same
360° (1 turn)	Same

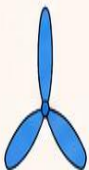
Angles of symmetry for pinwheel: 90°, 180°, 270°, 360°
(Order of rotational symmetry = 4)

4. ROTATIONAL SYMMETRY - RADIAL ARM FIGURES

For n equal radial arms:

- Smallest angle of symmetry = $\frac{360^\circ}{n}$
- Angles of symmetry are the multiples of the smallest angle.

3 arms



120°, 240°, 360°
(Order = 3)

4 arms



90°, 180°, 270°, 360°
(Order = 4)

5 arms



72°, 144°, 216°, 288°, 360°
(Order = 5)



A circle has infinite lines of symmetry and infinite angles of symmetry (any angle).

5. CONSTRUCTIONS (KEY IDEAS)

- Use ruler and compass for accurate constructions.
- Plan with a rough diagram before constructing.
- Use perpendicular lines and equal lengths.
- Intersecting arcs help find points equidistant from two points.
- Verify the figure to check properties.

Common Constructions



Line segment
of a given length

Perpendicular
to a given line

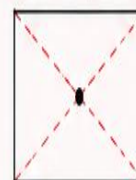
Circle of a
given radius

Point equidistant
from two points

6. KEY PROPERTIES

Rectangle

- Opposite sides are equal.
(AB = CD, AD = BC)
- All angles are 90°.
- Diagonals are equal.
(PR = QS)
- Diagonals bisect each other, but do NOT bisect the angles.



Square

- All sides are equal.
- All angles are 90°.
- Diagonals are equal perpendicular and bisect each other and all the angles (each 45°).



REMEMBER!

- ✓ Symmetry means a repeating pattern.
- ✓ Lines of symmetry → reflection (mirror) symmetry.
- ✓ Angles of symmetry → rotational symmetry.



NUMBER OF LINES OF SYMMETRY (Regular Polygons)

Triangle	Square	Pentagon	Hexagon	Heptagon	Octagon	Nonagon	Decagon
3	4	5	6	7	8	9	10

HISTORY HIGHLIGHT



Ideas of symmetry have been used in art, architecture and design since ancient times, in structures like the Taj Mahal, temples, rangoli, kolam and many more.

WORKSHEET-1

Section A: MCQs (PART-1) ($10 \times 1 = 10$ marks)

- How many lines of symmetry does a regular equilateral triangle possess?
 - 1
 - 2
 - 3
 - 0
- Which of the following geometric figures has exactly two lines of symmetry?
 - A rectangle
 - A square
 - A circle
 - A scalene triangle
- The number of lines of symmetry in a regular hexagon is equal to:
 - 4
 - 5
 - 6
 - Infinitely many
- Which capital letter of the English alphabet shows vertical reflection line symmetry?
 - B
 - M
 - E
 - N
- A circle has how many distinct lines of symmetry passing through its center?
 - 1
 - 4
 - 8
 - An infinite number
- What is the line of symmetry of an isosceles triangle called relative to its vertex angle?
 - Base side line
 - Median/Bisector
 - Hypotenuse line
 - External diagonal
- Which of the following shapes has zero lines of symmetry?
 - A scalene triangle
 - An isosceles triangle
 - A rhombus
 - A semi-circle
- A square has how many lines of symmetry?
 - 2
 - 3
 - 4
 - 6
- Which letter shows horizontal line reflection symmetry but not vertical symmetry?
 - A
 - K
 - O
 - X
- When an image is reflected across a mirror line, what happens to its orientation distance?
 - It doubles up
 - It remains identical but flips laterally
 - It becomes zero
 - It spins upside down

MCQs (PART-2) ($10 \times 1 = 10$ marks)

11. Which of the following English capital letters has exactly one vertical line of symmetry?

- a. Z b. M c. N d. F

12. A figure has exactly one line of symmetry and no rotational symmetry (other than 360°). Which of the following could it be?

- a. Square b. Rectangle c. Isosceles triangle d. Circle

13. A shape has rotational symmetry of order 8. What is its smallest angle of rotation?

- a. 30° b. 40° c. 45° d. 60°

14. Which of the following objects is most likely to have rotational symmetry but no line of symmetry?

- a. A three-bladed ceiling fan with curved blades b. A notebook
c. A window pane d. A ruler

15. A regular octagon has how many lines of symmetry?

- a. 4 b. 6 c. 8 d. 10

16. A figure looks the same after every 120° rotation. What is the order of its rotational symmetry?

- a. 2 b. 3 c. 4 d. 6

17. Which statement is always true for a circle?

- a. It has only one line of symmetry. b. It has exactly four angles of symmetry.
c. Every diameter is a line of symmetry. d. It has no rotational symmetry.

18. Which of the following figures has both reflection symmetry and rotational symmetry?

- a. Scalene triangle b. Regular hexagon c. Kite (ordinary) d. Trapezium

19. If the smallest angle of rotational symmetry of a figure is 72° , then the figure has rotational symmetry of order

- a. 4 b. 5 c. 6 d. 8

20. A designer creates a logo by arranging six identical petals equally around a centre. What is the smallest angle through which the logo can be rotated to look unchanged?

- a. 45° b. 60° c. 72° a. 90°

WORKSHEET-2

SECTION B: Short Answer (10×2=20 marks)

1. Define the core term 'Line of Symmetry' in your own words with respect to folding an object.

2. Draw a neat conceptual text example of an English alphabet letter that contains both a horizontal and a vertical line of symmetry.

3. State the exact total number of lines of symmetry present in a regular pentagon.

4. If a line segment of length 8 cm is symmetrical about an axis line, where does the axis intersect the segment?

5. Name a quadrilaterally balanced geometric shape that has exactly 4 lines of symmetry.

6. True or False: 'A parallelogram has exactly two distinct lines of symmetry across its principal diagonals.' Verify.

7. Write down the number of symmetric folding lines found in a standard isosceles trapezoid.

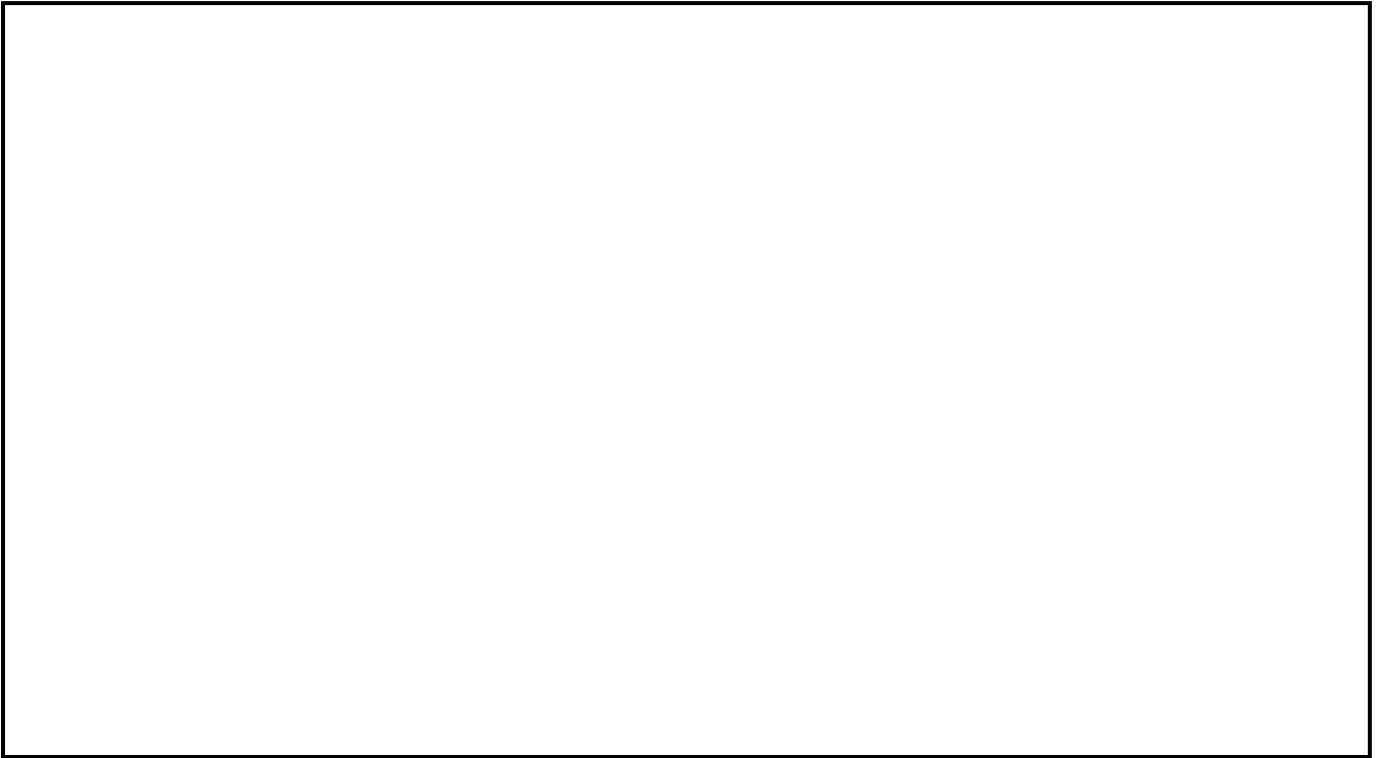
8. Draw or describe the orientation of the line of symmetry for the capital letter 'V'.

9. Give two distinct examples of symmetrical objects found commonly in natural environments.

10. Complete the missing structural alignment parameter: A kite shape is symmetrical across _____ diagonal(s).

Section C: Short Answer (6×3=18 Marks)

11. Sketch an Indian Place value grid layout style framework showing how a square and a rectangle differ in lines of symmetry across diagonals.



12. A symmetrical design contains half a pattern on a squared paper grid along with a vertical mirror line. Explain step-by-step how to trace the points to complete the image.



13. Identify all lines of symmetry for a regular quadrilateral shape (Square). Distinguish between median lines and diagonal axes lines.

14. Find the values of 'x' and 'y' if x represents the lines of symmetry of an equilateral triangle and y represents the lines of symmetry of a regular octagon.

15. A design studio creates a brand logo using a combination of a circle and an embedded rhombus. Calculate the net total lines of symmetry for this integrated logo form.

16. Draw a line segment measuring 7 cm. Using a folding logic setup, explain how its perpendicular bisector functions as its axis of mirror reflection symmetry.

Section D: Long Answer ($4 \times 5 = 20$ marks)

17. An architectural structural layout template outlines a series of columns arranged across a centralized floor plan axis. The primary baseline coordinate points are mapped symmetrically on a coordinate grid line. A column positioned at coordinates $(-4, 5)$ needs a matching symmetrical counterweight column on the right side across the vertical Y-axis mirror line. Find its reflection coordinate points and verify why the distance parameter matches perfectly.

18. Explore the symmetric structural layout properties of regular polygons. Write a detailed mathematical rule that links the total number of sides of any regular polygon to its total lines of symmetry. Provide explicit step-by-step verification examples using a regular triangle, a square, a regular pentagon, and a regular hexagon.

19. A standard mirror reflection operation is conducted on a clock interface tracking time metrics. If the real-time clock position shows exactly 3:00, determine the apparent lateral reflection time position displayed on an opposite vertical wall mirror plane. Detail the geometric angle symmetry transformations step by step.

20. Construct an abstract composite layout problem featuring an arrangement of a regular triangle nested inside a square. Design the nesting configuration such that the final total system assembly displays exactly 1 master line of symmetry. Explain the spatial alignment requirements step by step.

Case Study Based (2×4= 8 Marks)

Contextual Passage: A textile design firm creates symmetrical floral embroidery motifs for traditional fabrics. The primary layout uses a balanced axis grid mapped directly onto a tracing grid sheets arrangement. To optimize machinery stitching sequences, motifs must follow strict reflexive parameters: Net Line Density Baseline = $36 / [x + \{2 * (y - 1)\}]$, where x is the number of lines of symmetry in a regular triangle and y is the lines of symmetry in a standard rectangle. This metric prevents fabric warp and maintains geometric equilibrium.

22. If the pattern changes and the rectangle component y is upgraded to a regular square patch profile, re-evaluate the system expression to find the updated machinery stitching configuration.

Self Assessment:

I understood all the concepts

☐ Yes

☐ No

I need more practice

☐ Yes

☐ No

Name of Concepts having doubts/Not Cleared: _____

Parent's Assessment:

My ward understood all the concepts

☐ Yes

☐ No

He/She need more practice

☐ Yes

☐ No

Name of Concepts having doubts/Not Cleared: _____

Signature of Parent:

Teacher's Assessment

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Answers Worksheet 1:

Q.No.	1	2	3	4	5	6	7	8	9	10
Ans	c	a	c	b	d	b	a	c	b	B
Q.No.	11	12	13	14	15	16	17	18	19	20
Ans	b	c	c	a	c	b	c	b	b	b

Answers Worksheet 2:

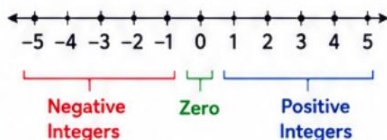
Q.No.	1	2	3	4	5	6	7	8	9	10
Ans	Folding axis...	H, O, or X	5	At midpoint (4cm)	Square	False (0 lines)	1 line	Vertical center	Leaf, Butterfly	one (1)
Q.No.	11	12	13	14	15	16	17	18	19	20
Ans	Grid/Diag setup	Reflex trace	4 total lines	x=3, y=8	4 lines total	Perp bisector	(4, 5)	Rule: n lines	9:00 position	Triangle inside sq
Q.No.	21	22								
Ans	7.2 density index	4 density index								

SUMMARY OF CONCEPTS & DEFINITIONS

CHAPTER 10 : INTEGERS – THE OTHER SIDE OF ZERO

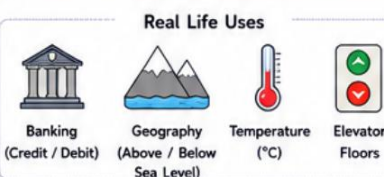
1. INTEGERS (Z)

- Integers include negative numbers, zero and positive numbers.
- They extend infinitely in both directions on the number line.
- Negative numbers lie to the left of zero and positive numbers lie to the right.



2. MEANING OF SIGNS

+ (Positive)	Move up / increase / credit / above sea level / above 0°C
- (Negative)	Move down / decrease / debit / below sea level / below 0°C
0 (Zero)	Reference point / neither positive nor negative



3. ADDITIVE INVERSE

The number which when added to a given number gives 0 is called its additive inverse.

$$+7 \longleftrightarrow -7$$

$$-4 \longleftrightarrow +4$$

$$+2 \longleftrightarrow -2$$

$$0 \longleftrightarrow 0$$

A number + its inverse = 0

4. ADDITION OF INTEGERS (Brahmagupta's Rules)

- $(+) + (+) = (+)$ (Add and keep + sign)
Example: $2 + 3 = 5$
- $(-) + (-) = (-)$ (Add without signs and put - sign)
Example: $(-2) + (-3) = -5$
- $(+) + (-)$ or $(-) + (+) =$ Sign of greater number and difference of numbers
Example: $(-5) + 3 = -2$, $3 + (-5) = -2$
- A number + its inverse = 0
Example: $5 + (-5) = 0$
- A number + 0 = the same number
Example: $-7 + 0 = -7$, $0 + 0 = 0$

5. SUBTRACTION OF INTEGERS

Subtraction is the same as adding the additive inverse of the number.

$$a - b = a + (-b)$$

Examples:

- $5 - 3 = 5 + (-3) = 2$
- $(-2) - (-4) = (-2) + 4 = 2$
- $7 - (-5) = 7 + 5 = 12$
- $(-8) - 3 = (-8) + (-3) = -11$

Token Model

$+ + - =$ token make a zero pair.
Cancel zero pairs to find the result.

$$(+5) + (-3) = +2$$

$$(-7) - (-5) = -2$$

6. COMPARING INTEGERS

- Numbers to the right are greater.
- Numbers to the left are smaller.



All negative numbers are less than 0. 0 All positive numbers are greater than 0.

Examples:

$$-5 < -2 \quad -3 < 0 \quad 0 < 4 \quad -10 < 5$$

7. PROPERTIES

Addition

- Commutative: $a + b = b + a$
- Associative: $(a + b) + c = a + (b + c)$
- Identity: $a + 0 = a$
- Inverse: $a + (-a) = 0$

Subtraction

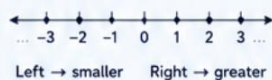
- $a - 0 = a$
- $0 - a = -a$
- $a - a = 0$
- $a - b = a + (-b)$

Order (Comparison)

- If $a > b$, then $a + c > b + c$
- If $a > b$, then $a - c > b - c$
- Smaller numbers are to the left on the number line.

Number Line

Used for addition, subtraction and comparison.



8. REAL LIFE APPLICATIONS

	Banking	Credits (+) increase balance. Debits (-) decrease balance.
	Geography	Heights above sea level are (+). Heights below sea level are (-).
	Temperature	Temperatures above 0°C are (+). Temperatures below 0°C are (-).
	Elevator	Press '+' to go up, '-' to go down. Floor 0 is the reference floor.

9. KEY TAKEAWAYS

- Integers extend infinitely in both directions on the number line.
- Addition and subtraction follow specific rules for positive and negative numbers (Brahmagupta's rules).
- Subtracting a negative number is the same as adding the corresponding positive number.
- Zero acts as the reference point.
- Integers are used in real life situations like banking, geography and temperature.

Think of lifts, number lines and tokens to understand integers better!

10. IMPORTANT FACTS TO REMEMBER

Zero is neither positive nor negative.

0

Every number has an additive inverse.

$$a + (-a) = 0$$

Smaller numbers are on the left; larger on the right.



Angles of movement on number line:

→ Right (+)
← Left (-)

Any subtraction can be converted to addition.

$$a - b = a + (-b)$$

11. HISTORY HIGHLIGHT

Negative numbers were first used in ancient India and China in the context of accounting. Brahmagupta (628 CE) was the first to give clear rules for operations on positive numbers, negative numbers and zero.



WORKSHEET-1

Section A: MCQs (PART-1) ($10 \times 1 = 10$ marks)

- Which of the following numbers represents a collection of values located on 'the other side of zero'?
 - Natural Numbers
 - Whole Numbers
 - Negative Integers
 - Positive Fractions
- On a horizontal standard number line, where are negative integers positioned relative to zero?
 - To the right side
 - To the left side
 - Directly above zero
 - Scattered randomly
- What is the additive inverse of the integer -15?
 - 15
 - 0
 - 15
 - 1
- Which of the following statements is true regarding integers?
 - 0 is greater than every positive integer
 - 5 is greater than -2
 - Every negative integer is less than 0
 - 1 is the smallest negative integer
- A submarine travels 350 meters below sea level. How is this depth represented as an integer?
 - +350
 - 350
 - 0
 - 35
- What is the value of the operation expression $(-8) + (+5)$?
 - 13
 - +13
 - 3
 - +3
- If you move 6 steps to the left of -2 on a standard number line, which integer do you reach?
 - +4
 - 8
 - 4
 - +8
- Which number is neither a positive integer nor a negative integer?
 - 1
 - 1
 - 0
 - 10
- The predecessor of the negative integer -9 is:
 - 8
 - 10
 - +10
 - +8
- Evaluate the absolute difference value magnitude between -3 and +3 on a number line:
 - 0
 - 3
 - 6
 - 6

MCQs (PART-2) ($10 \times 1 = 10$ marks)

11. A diver starts at sea level (0 m) and dives down 18 m. His position is represented by

- a. +18 m b. -18 m c. 18 m only d. 0 m

12. Which of the following statements is TRUE?

- a. Zero is a positive integer. b. Zero is a negative integer.
c. Zero is neither positive nor negative. d. Zero is the smallest integer.

13. A lift is on Floor -4. It goes up 9 floors. On which floor does it stop?

- a. +4 b. +5 c. -5 d. -13

14. Which integer is farthest from zero on the number line?

- a. -8 b. +7 c. -6 d. +5

15. A bank account has a balance of ₹250. After withdrawing ₹400, the new balance is

- a. ₹150 b. -₹150 c. ₹650 d. -₹650

16. Which expression represents moving 7 units to the left from +4 on the number line?

- a. $(+4) + (+7)$ b. $(+4) - (-7)$ c. $(+4) + (-7)$ d. $(-4) + (+7)$

17. If the temperature changes from -6°C to $+2^{\circ}\text{C}$, the increase in temperature is

- a. 4°C b. 6°C c. 8°C d. -8°C

18. Which pair of integers are additive inverses of each other?

- a. $(+6, +6)$ b. $(-6, -6)$ c. $(+6, -6)$ d. $(+6, 0)$

19. Which of the following is arranged in increasing order?

- a. -5, -3, -1, 2 b. -1, -3, -5, 2
c. 2, -1, -3, -5 d. -3, -5, -1, 2

20. A mountain peak is 1,850 m above sea level, and a submarine is 350 m below sea level. What is the difference in their heights?

- a. 1,500 m b. 1,850 m c. 2,200 m d. 2,500 m

WORKSHEET-2

Section B: Short Answer (10×2=20 Marks)

1. Write the opposite/inverse of the statement: 'A deposit of Rs 5000 in a savings account'.

2. Represent the following real-world scenario using a directed signed integer: 'A temperature of 7 degrees below 0°C '.

3. Arrange the following integers in increasing/ascending sequence order: -4, 7, 0, -12, 3.

4. Find the sum of the integers -210 and -150 using arithmetic principles.

5. Draw an abstract horizontal representation text link showing the positions of -3, -1, 0, and 2.

6. Evaluate the operation statement: $(+12) - (-6)$.

7. Write two distinct negative integers greater than -5.

8. Find the additive inverse of the integer sum: $(-3) + (+10)$.

9. Compare the pair values using absolute order parameters ($<$, $>$, or $=$): -99 _____ -100 .

10. A person climbs up 15 steps and then descends down 20 steps. Represent their final spot relative to the

Section C: Short Answer ($6 \times 3 = 18$ marks)

11. Compute the structural evaluation of the sequence expression step by step:

$$(-13) + (+25) - (-10) + (-5).$$

12. Using a localized mental number line framework, explain how to compute the net final value of 4 more

13. A container ship has an altitude level of $+25$ meters relative to dock floor lines, while an underwater anchor lies at -18 meters directly underneath. Find the total distance between them.

14. Find the values of 'x' and 'y' if x is the successor of -1 and y is the predecessor of -15 .

15. Formulate and solve: Subtract the sum of -45 and 30 from the additive inverse of -10.

16. Fill in the blanks with appropriate signs to validate the equation path:

$(-8) + (-4)$ _____ $(-8) - (-4)$.

Section D: Long Answer (4×5=20)

17. A high-altitude weather balloon ascends from an initial ground station baseline at an elevation of 1,200 meters. It rises another 4,500 meters, drops 1,800 meters due to structural thermal adjustments, and finally descends 900 meters to anchor at a cloud peak line. Represent each movement as an integer and find the balloon's net final height relative to the ground station.

18. Verify the structural mathematical property of associativity using the sample integer array set

$a = -5$, $b = +3$, and $c = -2$. Show all individual steps of bracket grouping calculations.

19. At 6:00 AM, the temperature of a high-altitude Himalayan valley was recorded at -3°C . By noon, the sun warmed the air and the temperature rose by 11°C . Later at midnight, a heavy sub-zero blizzard caused the temperature to plunge by 14°C . Calculate the final midnight temperature step by step.

20. Construct a comprehensive numerical progression problem containing at least three negative integers and two positive integers using multi-layered brackets such that the final computed value yields 0. Verify your design step by step.

Case Study Based Questions ($2 \times 4 = 8$ marks)

Contextual Passage: A deep-earth research team logs geothermal data fluctuations in an active drilling fault line. The central datum baseline point zero reflects standard crust level. Digging deeper lowers the metric value negatively, while building infrastructure elevations raises it positively. On Monday morning, the specialized remote probe starts tracking at -45 meters. By evening, automated hydraulics shift the probe down by 35 meters, followed by an administrative retrieval pull upwards of 20 meters on Tuesday noon.

21. Frame a single structural arithmetic integer expression to show the exact depth history of the probe and calculate its final depth location on Tuesday noon.

22. Find the total absolute vertical distance traversed by the probe through all its structural shifts combined across Monday and Tuesday.

Self Assessment:

I understood all the concepts ☐ Yes ☐ No

I need more practice ☐ Yes ☐ No

Name of Concepts having doubts/Not Cleared: _____

Parent's Assessment:

My ward understood all the concepts ☐ Yes ☐ No

He/She need more practice ☐ Yes ☐ No

Name of Concepts having doubts/Not Cleared: _____

Signature of Parent:

Teacher's Assessment

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Answers of Worksheet 1:

Q.No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
ANS	c	b	c	c	b	c	b	c	b	c	b	c	b	a	b	c
Q N	17	18	19	20												
ANS	c	c	a	c												

Answers of Worksheet 2:

Q N	1	2	3	4	5	6	7	8
ANS	A withdrawal of ₹5000 from a savings account.		-12, -4, 0, 3, 7	-360		+18	-4, -3	-7
Q N	9	10	11	12	13	14	15	16
ANS	-99 > -100.	4	17	-3	43 m	0, -16	25	<
Q N	17	18	19	20	21	22		
ANS	3000m		-6°C		-60	55m		