

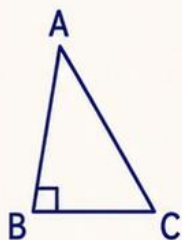


तत त्वं पूषन अपावृणु
केन्द्रीय विद्यालय संगठन

$$3x + 2 = 11$$



$$\frac{5}{8}$$



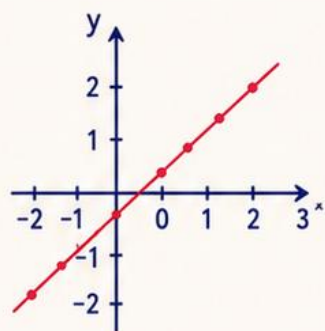
KENDRIYA VIDYALAYA SANGATHAN

• ZIET CHANDIGARH •

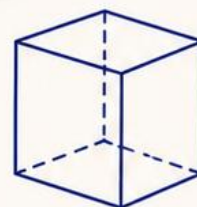
WORKBOOK

MATHEMATICS

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



FOR
CLASS VII
(PART I)



$$-2 + 9 = 7$$



**CONCEPTUAL
UNDERSTANDING**



**PRACTICE
REGULARLY**

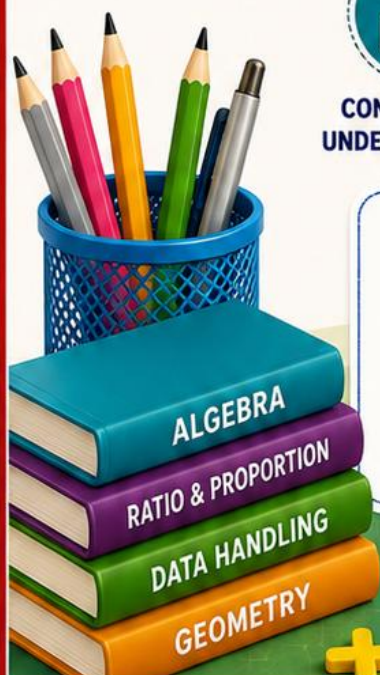


**THINK
LOGICALLY**



**SUCCEED
CONFIDENTLY**

π

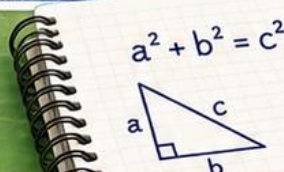


Name of Vidyalaya : _____

Name : _____

Class : _____ Section : _____

Roll No. : _____



संरक्षक

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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)

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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 VII Mathematics (Part I) 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
LARGE NUMBERS AROUND US	JILE SINGH	NO. 2 CHANDIMANDIR	GURUGRAM
ARITHMETIC EXPRESSIONS			
A PEEK BEYOND THE POINT	MUKESH KUMAR	KARNAL	GURUGRAM
EXPRESSIONS USING LETTER- NUMBERS			
PARALLEL AND INTERSECTING LINES			
NUMBER PLAY			
A TALE OF THREE INTERSECTING LINES	DEEPAK AGARWAL	AFS NO. 1 SIRSA	GURUGRAM
WORKING WITH FRACTIONS			

MODERATED BY:

TOPIC	NAME OF TEACHER (TGT Maths)	NAME OF KV	REGION
LARGE NUMBERS AROUND US	RAJESH KAMAL	NO.1 AKHNOOR	JAMMU
ARITHMETIC EXPRESSIONS	AJAY KUMAR	AWANTIPUR	JAMMU
A PEEK BEYOND THE POINT	ANIL KUMAR	JYOTIPURAM	JAMMU
EXPRESSIONS USING LETTER-NUMBERS	SANTOSH	NO.1 UDHAMPUR	JAMMU
PARALLEL AND INTERSECTING LINES	SARBJEET SINGH	KISHTWAR	JAMMU
NUMBER PLAY			
A TALE OF THREE INTERSECTING LINES	ALKA	HUMHAMA	JAMMU
WORKING WITH FRACTIONS	NIDHI GUPTA	NAGROTA	JAMMU

LARGE NUMBERS AROUND US

WORKSHEET-1

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

1. One crore is equal to:
a) 10,00,000 b) 1,00,00,000 c) 1,00,000 d) 10,000
2. The place value of 7 in 45,67,890 is:
a) 7,00,000 b) 70,000 c) 7,000 d) 700
3. Which of the following is the smallest number?
a) 1,23,456 b) 12,34,560 c) 1,23,45,600 d) 12,34,56,000
4. 5 million is equal to how many lakhs?
a) 5 lakh b) 50 lakh c) 500 lakh d) 5,000 lakh
5. The successor of 99,99,999 is:
a) 1,00,00,000 b) 99,99,998 c) 1,00,00,001 d) 10,00,000
6. In the International system, 1,23,45,678 is written as:
a) 123,456,78 b) 12,345,678 c) 1,2345,678 d) 12345678
7. The number of zeroes in one crore is:
a) 6 b) 7 c) 8 d) 5
8. Which is the correct expanded form of 8,76,54,321?
a) $8,00,00,000 + 70,00,000 + 6,00,000 + 50,000 + 4,000 + 300 + 20 + 1$
b) $80,00,000 + 7,00,000 + \dots$ c) 8 crore + 76 lakh + ... d) Both a and c are suitable
9. Approximate 4,56,789 to the nearest lakh:
a) 4,00,000 b) 5,00,000 c) 4,60,000 d) 4,57,000
10. The smallest 8-digit number is:
a) 99,99,999 b) 1,00,00,000 c) 10,00,000 d) 1,00,00,001

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

11. One million is equal to how many lakhs?

- a) 10 b) 100 c) 1,000 d) 10,000

12. The place value of 6 in 56,78,901 is:

- a) 6,00,000 b) 60,000 c) 6,000 d) 600

13. The smallest 8-digit number is:

- a) 99,99,999 b) 1,00,00,000 c) 10,00,000 d) 1,00,00,001

14. 1 crore is equal to:

- a) 10 million b) 100 million c) 1 million d) 10 billion

15. Which is the correct International numeral for 2,34,56,789?

- a) 23456789 b) 23,456,789 c) 2,34,56,789 d) 234,56,789

16. A wildlife sanctuary recorded 9,87,654 visitors in a year. Which of the following is the nearest lakh?

- a. 9,00,000 b. 10,00,000 c. 9,50,000 d. 8,00,000

17. Which of the following numbers is greater than 75 lakhs but less than 8 crores?

- a. 6,75,00,000 b. 82,00,000 c. 7,25,00,000 d. 65,00,000

18. A calculator has only +1000 and +100 buttons. What is the minimum number of button presses needed to display 24,700?

- a. 247 b. 31 c. 43 d. 52

19. Which of the following can be calculated most quickly using the multiplication shortcut discussed in the chapter?

- a. 48×15 b. 256×125 c. 147×17 d. 93×19

20. The population of a town increased from 4,98,200 to 5,27,600. Approximately, the increase is:

- a. 20,000 b. 25,000 c. 30,000 d. 35,000

WORKSHEET-2

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

1. Write the number name of 2,34,56,789 in the Indian system.

2. Write 75,00,000 in the International system and its number name.

3. Find the place value of 9 and 4 in the number 9,87,65,432.

4. Compare: 1,23,45,678 and 1,23,46,789 using $>$, $<$ or $=$.

5. Convert 3,45,67,890 into expanded form (Indian system).

6. Estimate the sum of $4,56,789 + 3,45,678$ by rounding to nearest lakh.

7. How many thousands make one crore? Show calculation.

8. Write any two properties observed while adding large numbers.

9. A farmer harvested 12,45,678 kg of rice. Write this number in words.

10. Insert commas in 98765432 according to Indian and International systems.

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

11. Write the place value chart for 5,67,89,432 (Indian system) and its expanded form.

12. Add: $23,45,678 + 45,67,890 + 12,34,567$. Show steps.

13. Subtract 15,67,890 from 98,76,543.

14. A city has a population of 1,25,67,890. Round it to the nearest ten lakh and write in words.

15. Find the product of 1,234 and 5,678 (use estimation first).

16. Convert 450 lakhs into crores and also write in International system.

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

17. The population of a state is 8,76,54,321. If it increases by 12,34,567 next year, what will be the new population? Write in both Indian and International systems.

18. A company earned ₹ 45,67,89,012 last year. This year it earned ₹ 52,34,56,789. How much more did it earn this year? Estimate first, then calculate exactly.

19. Draw a place value chart (up to crore) and mark the digits for the number 7,89,01,234. Also write its number name.

20. During a book fair, 2,34,567 people visited on Day 1, 3,45,678 on Day 2 and 1,98,765 on Day 3. Find the total visitors and estimate the total to the nearest lakh.

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

21. A seed bank has collected 1,25,678 varieties of seeds so far. If they aim to collect 5 lakh varieties, how many more varieties do they need? Write the target in International system.

22. India's population is approximately 1.4 billion. Express 1.4 billion in Indian system (crores) and estimate how many crores that is.

Answers of Worksheet-1:

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

Answers of Worksheet-2:

Q	1	2	3	4
Ans		7500000	9000000,4,000	1,23,45,678< 1,23,46,789
	5	6	7	8
	3,00,00,000+45,00,000+ 67,000+800+90	8,00,000	10,000	Commutative Associative Additive Identity
Q	9	10	11	12
Ans		Indian: 9,87,65,432 International: 98,765,432		81,48,135
Q	13	14	15	16
Ans	83,08,653	1,30,00,000	7,00,6652	4.5 crore
Q	17	18	19	20
Ans	8,88,88,888(Indian) , 88,888,888 (International)	Rs 6,66,67,777		7,80,000
Q	21	22		
Ans	Target : 500,000	140 crore		

SUMMARY OF CONCEPTS & DEFINITIONS

CHAPTER 2 : ARITHMETIC EXPRESSIONS

1. WHAT IS AN ARITHMETIC EXPRESSION?

A mathematical phrase formed using **numbers and operations** (+, -, ×, ÷) is called an **arithmetic expression**.

► **Every expression has a value** (the number it evaluates to).

Example: $13 + 2 = 15$
 ↓ ↓
 Expression Value

Different expressions can have the same value.

For example:

$10 + 2$, $15 - 3$, 3×4 , $24 \div 2$
all have the value 12.



2. TERMS IN AN EXPRESSION

- Terms are the parts of an expression separated by '+' sign.
- All '-' signs are converted to '+' of the inverse (opposite sign).

Expression	As sum of terms	Terms
$13 - 2 + 6$	$13 + (-2) + 6$	13, -2, 6
$5 + 6 \times 3$	$5 + 6 \times 3$	5, 6×3
$4 + 15 - 9 + 2$	$4 + 15 + (-9) + 2$	4, 15, -9, 2
$23 - 2 \times 4 + 16$	$23 + (-2 \times 4) + 16$	23, -2×4 , 16

Examples of terms

7

-5

3×4

$18 \div 3$

All are single terms.

3. COMPARING EXPRESSIONS

We compare expressions based on their values using '>', '<' or '='.



$10 + 2 > 7 + 1$
(12 is greater than 8)

$13 - 2 < 4 \times 3$
(11 is less than 12)

$15 - 5 = 2 \times 5$
(10 is equal to 10)



4. BRACKETS AND ORDER OF OPERATIONS

- Brackets () tell us which part to evaluate first.
- Rule: Evaluate inside brackets first, then do the remaining operations.

Example 1:

$30 + (5 \times 4) = 30 + 20 = 50$
(First do 5×4 , then add 30)

Example 2:

$100 - (15 + 56) = 100 - 71 = 29$
(First do $15 + 56$, then subtract)



5. PROPERTIES OF ADDITION (FOR TERMS)

Commutative Property

Swapping terms does not change the sum.

$$a + b = b + a$$

Example:

$$7 + (-3) = (-3) + 7 = 4$$

Associative Property

Grouping terms in any way does not change the sum.

$$(a + b) + c = a + (b + c)$$

Example:

$$(5 + 2) + (-4) = 5 + (2 + (-4)) = 3$$

Conclusion

In an expression with only addition/subtraction, order and grouping of terms do not change the value.



6. REMOVING BRACKETS

When brackets are preceded by a '-' sign, the signs of the terms inside change.

With Brackets	Without Brackets
$-(a + b)$	$= -a - b$
$-(a - b)$	$= -a + b$

When brackets are **NOT** preceded by '-' sign, the signs remain same.

$$a + (b + c) = a + b + c$$

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



7. DISTRIBUTIVE PROPERTY

The multiple of a sum (or difference) is the same as the sum (or difference) of the multiples.

$$a \times (b + c) = a \times b + a \times c$$

$$a \times (b - c) = a \times b - a \times c$$

Example:

$$4 \times (3 + 2) = 4 \times 3 + 4 \times 2 = 20$$

$$5 \times (8 - 3) = 5 \times 8 - 5 \times 3 = 25$$



8. CHANGING TERMS AND VALUES

Changing a term changes the value of the expression.

Expression	Change in term	Change in value
$a + b + c$	Increase a by 1	Value increases by 1
$a + b + c$	Decrease b by 1	Value decreases by 1
$a - b + c$	Increase c by 1	Value increases by 1
$a - b - c$	Decrease b by 1	Value increases by 1

Helps us estimate and compare expressions without full calculation.



ARITHMETIC EXPRESSIONS

WORKSHEET-1

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

1. According to the BODMAS rule, which operation should be performed first in the expression $25 - 4 \times (6 + 2) / 2$?

- a) Subtraction
- b) Multiplication
- c) Addition/Brackets
- d) Division

2. What is the value of the arithmetic expression $12 + 18 / 3 \times 2 - 5$?

- a) 15
- b) 19
- c) 20
- d) 11

3. The mathematical expression for 'subtract the product of 4 and 5 from 50' is:

- a) $4 \times 5 - 50$
- b) $50 - (4 \times 5)$
- c) $50 - 4 + 5$
- d) $(50 - 4) \times 5$

4. Simplify the expression inside the brackets first: $3 \times [15 - \{2 \times (6 - 3)\}]$

- a) 27
- b) 18
- c) 45
- d) 9

5. Which of the following represents the correct placement of brackets to make the statement $4 + 8 \times 2 = 24$ true?

- a) $4 + (8 \times 2)$
- b) $(4 + 8) \times 2$
- c) $4 + 8 \times (2)$
- d) None of these

6. What is the value of $100 - 3 \times 10^2 + 50$?

- a) -150
- b) -250
- c) 50
- d) 200

7. Evaluating $45 / (5 \times 3)$ gives:

- a) 27
- b) 3
- c) 9
- d) 15

8. In the arithmetic expression $8 + 4 - 2 \times 3$, which operation has the highest precedence?

- a) Addition
- b) Subtraction
- c) Multiplication
- d) All equal

9. The value of $0 / 15 \times (45 + 5)$ is:

- a) 0
- b) 15
- c) 50
- d) Undefined

10. Simplify: $16 + 4 \times 4 - 16 / 4$

- a) 12
- b) 28
- c) 16
- d) 24

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

11. A school buys 8 boxes of chalk, each containing 25 pieces, and then receives 40 extra pieces as a donation. Which expression represents the total number of chalk pieces?

- a. $(8 + 25) \times 40$ b. $8 \times (25 + 40)$ c. $(8 \times 25) + 40$ d. $8 + 25 \times 40$

12. Which expression has the same value as $120 - (45 + 15)$?

- a. $120 - 45 + 15$ b. $120 + 45 - 15$ c. $120 - 45 - 15$ d. $120 + 45 + 15$

13. Evaluate the expression: $18 + 4 \times 7$

- a. 154 b. 46 c. $154 \div 2$ d. 126

14. Which of the following is equivalent to $9 \times (12 + 8)$?

- a. $9 \times 12 + 8$ b. $9 \times 12 + 9 \times 8$ c. $12 + 8 \times 9$ d. $9 + 12 \times 8$

15. If $56 \times 19 = 1064$, then 56×20 is:

- a. 1084 b. 1120 c. 1104 d. 1140

16. Which expression represents "5 less than the product of 12 and 9"?

- a. $(12 - 5) \times 9$ b. $12 \times (9 - 5)$ c. $(12 \times 9) - 5$ d. $5 \times (12 + 9)$

17. Which pair of expressions is always equal?

- a. $6 \times (15 - 4)$ and $6 \times 15 - 6 \times 4$ b. $6 \times (15 - 4)$ and $6 \times 15 - 4$
c. $6 \times (15 + 4)$ and $6 \times 15 + 4$ d. $6 \times (15 + 4)$ and $15 \times 4 + 6$

18. A fruit seller packs 15 apples in each basket. He sells 12 baskets and later gives away 18 apples. Which expression gives the number of apples left from the packed apples?

- a. $15 \times (12 - 18)$ b. $(15 \times 12) - 18$ c. $15 + 12 - 18$ d. $15 \times 18 - 12$

19. Which expression has three terms?

- a. 8×6 b. $12 + 5 \times 3 - 8$ c. $25 \div 5$ d. $9 \times (4 + 2)$

20. Which statement is correct?

- a. Brackets are ignored if multiplication is present.
b. Multiplication is performed before addition when there are no brackets.
c. Addition is always performed before multiplication.
d. Division is always performed after addition.

WORKSHEET-2

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

1. Write the algebraic/arithmetic expression statement for: 'Divide 60 by the sum of 8 and 4'.

2. Solve the expression using BODMAS: $24 / 6 + 3 \times 2$.

3. Insert brackets in the expression $5 + 5 \times 5 - 5$ to get a final result of 45.

4. Evaluate the arithmetic expression: $40 - [20 - \{15 - 5\}]$.

5. Translate the mathematical statement $(18 - 3) \times 5$ into an English sentence phrase.

6. Find the value of $50 - 4 \times 5 + 12 / 3$.

7. Simplify the expression and find the missing value: $12 \times 3 - \underline{\hspace{1cm}} = 20$.

8. Write the precedence sequence order of operators as per the BODMAS template rule.

9. Use nested brackets to frame an expression representing: 'Multiply 3 with the difference of 20 and the quotient of 8 divided by 2'.

10. State whether true or false and verify: $12 + 6 / 3 = 6$.

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

11. Evaluate step-by-step using order of operations: $75 - [18 + \{14 - (12 - 8)\}]$.

12. A student evaluated $20 + 10 / 5$ as 6, while another evaluated it as 22. Explain who is correct and why.

13. Simplify the following expression completely: $(100 / 10) \times [50 - \{4 \times (15 - 12)\}]$.

14. Write the expression and solve: A shopkeeper buys 6 boxes of chocolates with 10 chocolates inside each. He distributes 12 chocolates. How many are left?

15. Form and evaluate the expression: The product of 15 and 4 is added to the quotient of 36 divided by 9

16. Simplify the expression by eliminating innermost nested brackets first:

$$8 + 2 \times [15 - \{3 \times (8 - 6)\}].$$

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

17. Solve the multi-layered dynamic bracket expression:

$$118 - [121 / (11 \times 11) - (-4) - \{3 - (9 - 6)\}].$$

18. Ram bought 5 notebooks at Rs. 40 each and 3 pens at Rs. 15 each. He handed a Rs. 500 note to the shopkeeper. Construct a single arithmetic expression to calculate his change and solve it.

19. Simplify the fractional and operator heavy expression step-by-step: $25 - \frac{1}{2}$ of $\{40 - (4 - 2)\} + 15 / 3$.

20. Formulate an arithmetic expression with nested brackets that contains all four primary math operators (+, -, ×, /) along with round and curly brackets such that its final answer is exactly 10. Verify step by step.

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

Contextual Passage: In a smart automated fulfillment center, a main computational algorithm processes batches of customer item orders using systematic arithmetic sequencing. Batch order volume runs on the dynamic operational baseline parameter formula:

$250 - 4 \times [15 + \{2 \times (12 - 4)\}]$. This helps dispatch engineers scale cloud load balances correctly during sale cycles.

21. Solve the system expression inside the baseline parameter formula step by step to find the exact net batch order volume capacity.

22. If the operational configuration shifts and the round brackets are modified to $(12 + 4)$ instead of $(12 - 4)$, compute the revised batch parameter step by step.

Answers of Worksheet-1:

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

Answers of Worksheet-2:

Q	1	2	3	4
Ans	$60 \div (8+4)$	10	45	30
Q	5	6	7	8
Ans	The product of 5 and the difference of 18 and 3.	34	16	B – Brackets O – Orders (powers, exponents, roots) D – Division M – Multiplication A – Addition S – Subtraction
Q	9	10	11	12
Ans	48	false	47	Second students
Q	13	14	15	16
Ans	380	$(6 \times 10) - 12$ 48	$(15 \times 4) + (36 \div 9)$ 64	26
Q	17	18	19	20
Ans	113	$500 - [(5 \times 40) + (3 \times 15)]$ 255	11	$20 - \{8 - (6 \div 3)\} \times 2$
Q	21	22		
Ans	126	62		



SUMMARY OF CONCEPTS & DEFINITIONS



CHAPTER 3 : A PEEK BEYOND THE POINT



1. NEED FOR SMALLER UNITS

- Sometimes the basic unit (cm, g, ₹ etc.) is not enough to measure accurately.
- So, we divide the unit into smaller equal parts to get more exact measurements.

Example:

Two screws look the same but have slightly different lengths.

Measure using smaller divisions on a scale (mm, tenths, etc.).



2. TENTHS (ONE-TENTHS)

- 1 unit is divided into 10 equal parts. Each part is $\frac{1}{10}$ or one-tenth.
- 10 one-tenths make 1 unit.
- Numbers with tenths are written using decimal point.

Fraction	Decimal	Read as
$\frac{4}{10}$	0.4	four-tenths
$\frac{4}{10}$	4.4	four and four-tenths
$\frac{41}{10}$	4.1	four and one-tenth
$\frac{41}{10}$	41.1	forty-one and one-tenth



1.4 is 1 unit and 4 one-tenths.

3. HUNDREDTHS (ONE-HUNDREDTHS)

Each one-tenth is divided into 10 equal parts.

- Each part is $\frac{1}{100}$ or one-hundredth.
- 10 hundredths = 1 tenth
100 hundredths = 1 unit

Example: The folded paper has length $4\frac{4}{10} \cdot \frac{5}{100}$ units (or 4.45 units)



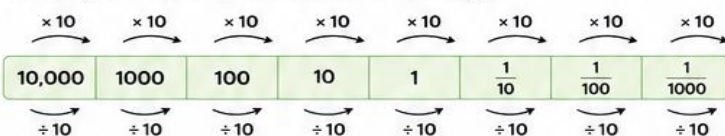
Some equivalent forms:

- $4\frac{4}{10} \cdot \frac{5}{100}$ = four and four-tenths and five-hundredths
- 4.45 = decimal notation
- $\frac{445}{100}$ = four hundred forty-five hundredths

4. DECIMAL PLACE VALUE SYSTEM

Place	Hundreds	Tens	Units	Tenths	Hundredths	Thousandths
Value	100	10	1	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$
Example	7	0	5	.	5	→ 70.50

- The decimal point (.) separates the whole number part from the fractional part.
- Moving right → place value becomes 10 times smaller.
- Moving left → place value becomes 10 times bigger.



5. READING & WRITING DECIMALS

- Read as "... point ..." (e.g., 4.05 → four point zero five)
- Trailing zeros after decimal do not change the value.

Decimal	Read as	Same as
4.5	four point five	4.50, 4.500
0.2	zero point two	0.20, 0.200
0.02	zero point zero two	— (not same as 0.2)
1.005	one point zero zero five	—

Compare decimals: Compare digits from left to right at each place value.

6. ADDITION & SUBTRACTION OF DECIMALS

- Write numbers one below the other so that the decimal points are in the same column.
- Add or subtract as in whole numbers.
- Put the decimal point in the answer in the same column.

Addition

$$\begin{array}{r} 75.345 \\ + 86.691 \\ \hline 162.036 \end{array}$$

Subtraction

$$\begin{array}{r} 84.691 \\ - 77.345 \\ \hline 7.346 \end{array}$$

Regroup if needed (just like in whole numbers).

7. UNITS OF MEASUREMENT

Length



$$\begin{aligned} 1 \text{ cm} &= 10 \text{ mm} \\ 1 \text{ mm} &= \frac{1}{10} \text{ cm} = 0.1 \text{ cm} \\ 1 \text{ m} &= 100 \text{ cm} \\ 1 \text{ cm} &= \frac{1}{100} \text{ m} = 0.01 \text{ m} \\ 1 \text{ mm} &= \frac{1}{1000} \text{ m} = 0.001 \text{ m} \end{aligned}$$



Weight

$$\begin{aligned} 1 \text{ kg} &= 1000 \text{ g} \\ 1 \text{ g} &= \frac{1}{1000} \text{ kg} = 0.001 \text{ kg} \end{aligned}$$



Money

$$\begin{aligned} 1 \text{ rupee} &= 100 \text{ paise} \\ 1 \text{ paise} &= \frac{1}{100} \text{ rupee} = 0.01 \text{ rupee} \end{aligned}$$

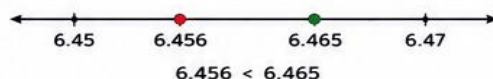
8. ESTIMATION & COMPARISON

- To estimate sums/differences, compare whole number parts first.
- Sum of two decimals is greater than the sum of their whole parts and less than the sum of their whole parts + 2.

Example: For $25.936 + 8.202$

$$\begin{aligned} 25 + 8 &< \text{Sum} < (25 + 1) + (8 + 1) \\ 33 &< \text{Sum} < 35 \end{aligned}$$

- Locate decimals on the number line to compare.



A PEEK BEYOND THE POINT

WORKSHEET-1

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

1. The length $2\frac{7}{10}$ cm is read as:

- a) Two point seven cm
- b) Two and seven-tenth cm
- c) Twenty-seven cm
- d) Two and seventy cm

2. Ten one-tenths make:

- a) 10 units
- b) 100 units
- c) 1 unit
- d) 1 tenth

3. Which decimal represents 4 units and 5 tenths?

- a) 4.05
- b) 45.0
- c) 4.5
- d) 0.45

4. One hundred hundredths are equal to:

- a) 10
- b) 100
- c) 1
- d) 0.1

5. Which of the following is greater?

- a) 0.5
- b) 0.05
- c) 0.005
- d) 0.0005

6. 1 mm = _____ cm

- a) 1
- b) 0.1
- c) 10
- d) 0.01

7. 254 g in kilograms is:

- a) 2.54 kg
- b) 0.254 kg
- c) 25.4 kg
- d) 0.0254 kg

8. 75 paise is equal to:

- a) ₹7.5
- b) ₹0.75
- c) ₹75
- d) ₹0.075

9. Which of the following are equal?

- a) 0.2 and 0.02
- b) 0.2 and 0.20
- c) 0.02 and 0.002
- d) 2.0 and 0.2

10. 5.6 cm is equal to:

- a) 56 mm
- b) 5.6 mm
- c) 560 mm
- d) 0.56 mm

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

11. Which of the following represents 7 units and 35 hundredths?

- a) 7.350 b) 7.35 c) 7.305 d) 73.5

12. A ribbon is 2.6 m long and another ribbon is 3.45 m long. What is their total length?

- a) 5.95 m b) 6.05 m c) 5.15 m d) 6.95 m

13. Which of the following decimal numbers lies between 4.5 and 4.6?

- a) 4.49 b) 4.57 c) 4.61 d) 4.70

14. Which of the following is equal to 0.8?

- a) 8 hundredths b) 80 hundredths c) 8 thousandths d) 800 hundredths

15. A notebook is 18 mm thick. Its thickness in centimetres is:

- a) 0.18 cm b) 1.8 cm c) 18 cm d) 0.018 cm

16. Which decimal is the greatest?

- a) 5.407 b) 5.470 c) 5.4070 d) 5.47

17. Which number is closest to 6?

- a) 5.91 b) 6.08 c) 5.98 d) 6.15

18. If $250 \text{ g} = 0.250 \text{ kg}$, then 750 g is equal to:

- a) 7.50 kg b) 0.075 kg c) 0.750 kg d) 75 kg

19. Which of the following statements is correct?

- a) $0.45 = 0.450 = 0.4500$ b) $0.45 > 0.450$
c) $0.45 < 0.450$ d) $0.45 \neq 0.4500$

20. A bottle contains 1.75 L of juice. After using 0.85 L, how much juice remains?

- a) 0.80 L b) 0.90 L c) 1.00 L d) 0.95 L

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

1. Write $\frac{34}{10}$ in mixed form.

2. Express 4 units and 8 tenths as a decimal.

3. What is one-hundredth of a unit?

4. Convert 12 mm into cm.

5. Convert 15 cm into metres.

6. Write 705 in place value form.

7. Write the decimal form of 5 hundredths.

8. Convert 68 g into kilograms.

9. Convert 99 paise into rupees.

10. Arrange in increasing order: 0.4, 0.04, 0.44

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

11. Add: $2\frac{7}{10} + 3\frac{6}{10}$

12. Subtract: $12\frac{4}{10} - 6\frac{7}{10}$

13. Convert 234 tenths into decimal form.

14. Explain why $0.2 = 0.20$.

15. Convert: (a) 36 cm into m (b) 325 cm into m

16. Convert: (a) 465 g into kg (b) 1560 g into kg

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

17. Find: $15\frac{3}{10}\frac{4}{100} + 2\frac{6}{10}\frac{8}{100}$

18. Find: $15\frac{3}{10}\frac{4}{100} - 2\frac{6}{10}\frac{8}{100}$

19. Draw a number line and mark: 1.4, 1.7 and 1.9



20. Explain the decimal place value chart up to hundredths with an example.



21. Riya measured a ribbon of length 3.4 m and another ribbon of length 2.8 m.

(i) Find the total length of both ribbons.

(ii) Which ribbon is longer?



22. A shopkeeper sold 250 g sugar, 500 g rice and 750 g flour.

(i) Find the total weight in grams.

(ii) Convert the total weight into kilograms.



Answers of Worksheet-1

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

Answers of Worksheet-2

Q.No.	1	2	3	4	5	6	7	8
Ans	$3\frac{4}{10}$	4.8	0.01	1.2	0.15	7 Hundreds 5 ones	0.05	0.068
Q.No.	9	10	11	12	13	14	15	16
Ans	0.99	0.04 0.4 0.44	$6\frac{3}{10}$	$5\frac{7}{10}$	23.4	Explanation	0.36, 3.25	0.465, 1.560
Q.No.	17	18	19	20	21	22		
Ans	18.02	12.66	Drawing and marking	Explanation	6.2m, first	1500g, 1.5 kg		



CHAPTER 4 : EXPRESSIONS USING LETTER-NUMBERS



SUMMARY OF CONCEPTS

1. LETTER-NUMBERS & ALGEBRAIC EXPRESSIONS

- Letters used to represent numbers are called letter-numbers (or variables).
- Expressions containing letter-numbers are called algebraic expressions.
- They help express general relationships in a concise way.



Examples

- Shabnam is 3 years older than Aftab.
If Aftab's age = a , then Shabnam's age = s

$$s = a + 3$$

- Aftab's age in terms of s :

$$a = s - 3$$

- Matchstick pattern (each L uses 2 sticks)
If number of L's = n , then

$$\text{Number of sticks} = 2n$$



- Cost of c coconuts (₹35 each) and j kg jaggery (₹60 per kg)



$$\text{Total amount} = 35c + 60j$$

2. ARITHMETIC EXPRESSIONS – KEY IDEAS

- Terms can be added in any order (swapping).
- Terms can be grouped conveniently (grouping).
- Brackets show which part to evaluate first.
- A minus before a bracket changes the signs inside.
- Distributive Property:

$$k(a + b) = ka + kb$$

Examples

- $23 - 10 \times 2 = 23 + (-20) = 3$
- $83 + 28 - 13 + 32$
 $= (83 + 32) + (28 - 13) = 115 + 15 = 130$
- $68 - (18 + 13) = 68 - 31 = 37$
or $68 - 18 - 13 = 37$
- $20 + 8 \times (16 - 6) = 20 + 8 \times 10 = 100$

3. OMITTING MULTIPLICATION SIGN

- $\times$ is usually omitted between a number and a letter.
- Write the number first, then the letter.

Examples

$$4 \times n = 4n \quad 7 \times k = 7k \quad 5 \times m = 5m$$

Value of expressions

- If $k = 4$, then $7k = 7 \times 4 = 28$
- If $m = 2$, then $5m + 3 = 5 \times 2 + 3 = 13$

Do not confuse!

$5u$ means
 $5 \times u$
(five times u)

$5 + u$ means
5 more than u

Check with values

u	2	5	8	11
$5u$	10	25	40	55
$5 + u$	7	10	13	16

Different values $\rightarrow$ Not equal expressions.

4. SIMPLIFICATION OF ALGEBRAIC EXPRESSIONS

Like Terms

- Terms with the same letter(s) are called like terms.
- They can be added or subtracted.
- Examples: $5c$, $3c$, $-8c$ are like terms.

Unlike Terms

- Terms with different letter(s) are unlike terms.
- They cannot be combined.
- Examples: $5c$ and $3d$ are unlike terms.

Rules of Simplification

- Remove brackets using sign rules.
- Combine like terms.
- Add or subtract the numbers.
- Use distributive property.

Common forms

- $2a + 3a = 5a$
- $7a - 2a = 5a$
- $(a + b) + (c + d) = a + b + c + d$
- $2(a + b) = 2a + 2b$
- $a - (b + c) = a - b - c$

Examples

Expression	Simplified form	Expression	Simplified form
$5c + 3c + 10c$	$18c$	$7p - 3q + 8p - 4q + 6p - 2q$	$21p - 9q$
$(40x + 75y) - (6x + 10y)$	$34x + 65y$	$3a + 9b - 6 + 8a - 4b - 7a + 16$	$4a + 5b + 10$
$4(x + y) - y$	$4x + 3y$		

5. ALGEBRA TO DESCRIBE PATTERNS

(A) Repeating Design Pattern



- Positions of A : $3n - 2$
- Positions of B : $3n - 1$
- Positions of C : $3n$

To find design at any position p :

$$\begin{aligned} p \equiv 0 \pmod{3} &\rightarrow C \\ p \equiv 1 \pmod{3} &\rightarrow B \\ p \equiv 2 \pmod{3} &\rightarrow A \end{aligned}$$

(B) Calendar Pattern (2×2 Square)

a	$a + 1$
$a + 7$	$a + 8$

Diagonal sums:

$$\begin{aligned} a + (a + 8) &= 2a + 8 \\ (a + 1) + (a + 7) &= 2a + 8 \end{aligned}$$

$\therefore$ Diagonal sums are always equal.

(C) Calendar Cross (3×3 Shape)

EXPRESSIONS USING LETTER-NUMBERS

WORKSHEET-1

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

1.If Aftab's age is represented by **a**, then Shabnam's age (3 years older) is:

- a) $a - 3$ b) $a + 3$ c) $3a$ d) $a/3$

2.Number of matchsticks required to make **n** L-shapes is:

- a) n b) $n + 2$ c) $2n$ d) n^2

3.The perimeter of a square of side **q** is:

- a) q^2 b) $2q$ c) $3q$ d) $4q$

4.Which expression represents 5 more than a number **x**?

- a) $5x$ b) $x - 5$ c) $x + 5$ d) $5 - x$

5.If $k = 4$, then $7k =$

- a) 11 b) 28 c) 74 d) 3

6.Simplified form of $p + p + p + p$ is:

- a) p^4 b) $4p$ c) $p + 4$ d) $4 + p$

7.Which pair are like terms?

- a) $5x$ and $3y$ b) $4a$ and $2a$
c) $2p$ and $3q$ d) $6m$ and $5n$

8.Simplify: $5c + 3c + 10c$

- a) 18 b) $15c$ c) $18c$ d) $8c$

9.The expression for perimeter of a rectangle is:

- a) $l \times b$ b) $l + b$ c) $2l + 2b$ d) $2lb$

10.Which expression means “13 less than 2 times a number **n**”?

- a) $13 - 2n$ b) $2n - 13$ c) $13 + 2n$ d) $2(n - 13)$

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

11. A toy shop sells a ball for ₹45 each. If n balls are sold, which expression represents the total amount earned?

- a) $n + 45$ b) $45n$ c) $45 + n$ d) $45 - n$

12. The length of a rectangle is x cm and its breadth is 6 cm. Which expression represents its perimeter?

- a) $x + 6$ b) $2x + 6$ c) $2(x + 6)$ d) $x \times 6$

13. If $m = 7$, what is the value of $5m - 8$?

- a) 27 b) 35 c) 43 d) 29

14. Which pair consists of like terms?

- a) $4x$ and $4y$ b) $6a$ and $3a$ c) $5m$ and 5 d) $2p$ and $2q$

15. Simplify the expression: $8x + 5 - 3x + 7$

- a) $11x + 12$ b) $5x + 12$ c) $5x + 2$ d) $11x + 2$

16. The number of books on one shelf is b . There are 6 identical shelves. Which expression represents the total number of books?

- a) $b + 6$ b) $6b$ c) $b - 6$ d) $6 + b^2$

17. A pattern begins with 6 tiles, and 4 tiles are added at every new step. Which expression gives the number of tiles in the n^{th} step?

- a) $4n$ b) $6 + 4n$ c) $6 + 4(n - 1)$ d) $4(n + 1)$

18. Which expression is equivalent to $3(a + 5)$?

- a) $3a + 5$ b) $3a + 15$ c) $15a$ d) $8a$

19. If $x = 4$ and $y = 3$, what is the value of $2x + 3y$?

- a) 15 b) 16 c) 17 d) 18

20. Which statement is correct?

- a) $7a + 5a = 12a$ b) $7a + 5 = 12a$ c) $7a \times 5a = 12a$ d) $7a - 5a = 35a$

WORKSHEET-2

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

1. Write an algebraic expression for: 4 more than a number x .

2. Write an algebraic expression for: 7 less than a number y .

3. If $a = 18$, find the value of $a + 3$.

4. Find the value of $5m + 3$ when $m = 2$.

5. Write the formula for the perimeter of a regular pentagon of side p .

6. A pipe of length 20 m is joined with another pipe of length k m. Write the expression for total length.

7.Simplify: $3b - 2b - b$

8.Simplify: $p + q - p + q$

9.Write an expression for the total cost of x coconuts at ₹35 each.

10.Write an expression for the total cost of y kg jaggery at ₹60 per kg.

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

11.Simplify: $7p - p + 5q - 2q$

12.Simplify: $4(x + y) - y$

13.Find the perimeter of a square with side length 7 cm using the formula $4q$.

14.A shopkeeper sells 5 pencils, 3 pencils and 10 pencils on three days. If one pencil costs c rupees, write and simplify the expression for total earnings.

15.Simplify: $(40x + 75y) - (6x + 10y)$

16.Charu's quiz scores are: $7p - 3q$, $8p - 4q$ and $6p - 2q$. Find her total score.

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

17.The price of one coconut is ₹35 and one kg jaggery is ₹60. Write an expression for the total amount paid for c coconuts and j kg jaggery.

18.A rectangle has length l and breadth b . Derive the simplified expression for its perimeter.

19.Explain why: $4v + 3v = 7v$ using the distributive property.

20. Simplify completely: $(4x + 3y) - (3x + 4y)$

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

21. Matchstick Pattern

Parthiv makes L-shapes using matchsticks. Each L requires 2 matchsticks.

- (i) How many matchsticks are needed for 8 L-shapes?
- (ii) Write an expression for n L-shapes.

22. Furniture Rental

A shop rents:

- Chair = ₹40
- Table = ₹75

If x chairs and y tables are rented:

- (i) Write an expression for total amount paid.
- (ii) If 2 chairs and 3 tables are rented, find the amount paid.

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 needs 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	c	d	c	b	b	b	c	c	b
Q.No.	11	12	13	14	15	16	17	18	19	20
Ans	b	c	a	b	b	b	c	b	c	a

Answers of Worksheet-2

Q.No.	1	2	3	4	5	6	7	8
Ans	$x + 4$	$Y - 7$	21	13	$5p$	$20 + k$	0	$2q$
Q.No.	9	10	11	12	13	14	15	16
Ans	$35x$	$60y$	$6p + 3q$	$4x + 3y$	28cm	18c	$34x + 65y$	$21p - 9q$
Q.No.	17	18	19	20	21	22		
Ans	$35c + 60j$	$2l + 2b$	Like terms: $(4 + 3)v = 7v$	$x - y$	16, 2n	$40x + 75y$, ₹305,		



CHAPTER 5 : PARALLEL AND INTERSECTING LINES



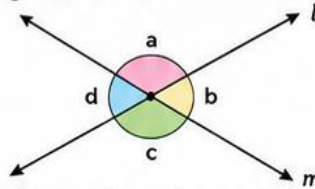
SUMMARY OF CONCEPTS

1. BASIC IDEAS

- ★ A line is a straight path that extends infinitely in both directions.
- ★ Two lines that meet at a point are said to **intersect**.
- ★ The point where they meet is called the **point of intersection**.
- ★ Two lines that never meet, however far they are extended on a plane, are called **parallel lines**.

2. INTERSECTING LINES

When two lines l and m intersect at a point, four angles are formed.



- Vertically opposite angles are equal.

$$\angle a = \angle c \quad \text{and} \quad \angle b = \angle d$$

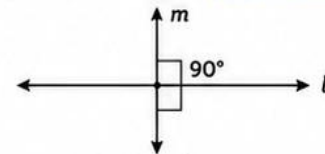
- Linear pairs add up to 180° .

$$\angle a + \angle b = 180^\circ \quad \angle b + \angle c = 180^\circ$$

(Similarly for other linear pairs)

3. PERPENDICULAR LINES

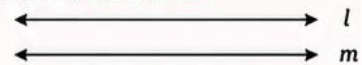
Two lines intersecting each other at right angles (90°) are called **perpendicular lines**.



Notation : $l \perp m$

4. PARALLEL LINES

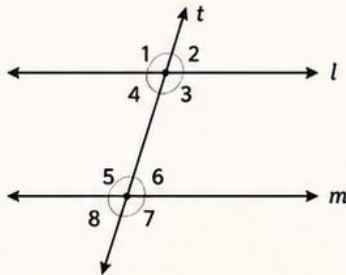
Two lines on the same plane that do not meet, however far they are extended, are called **parallel lines**.



Notation : $l \parallel m$

5. TRANSVERSAL AND ANGLES FORMED

A transversal is a line that intersects two (or more) lines at distinct points.



Corresponding angles

Angles in the same relative position at each intersection.

Pairs : (1,5), (2,6), (3,7), (4,8)

Alternate angles

Angles on opposite sides of the transversal and between the two lines.

Pairs : (3,6) and (4,5)

Interior angles on the same side

Angles between the two lines and on the same side of the transversal.

Pairs : (3,5) and (4,6)

Key Properties

- ✓ If a transversal intersects a pair of parallel lines, then corresponding angles are equal.
- ✓ If corresponding angles are equal, then the two lines are parallel.
- ✓ Alternate angles formed by a transversal intersecting a pair of parallel lines are equal.
- ✓ Interior angles on the same side of a transversal intersecting a pair of parallel lines add up to 180° .

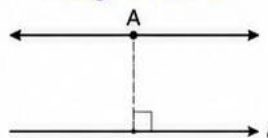
6. DRAWING PARALLEL LINES

Using Set Square

1. Draw a line l .
2. With a set square, draw a line perpendicular to l .
3. Shift the set square along a ruler and draw another perpendicular line.
4. The two perpendicular lines are parallel to each other.



Through a Point A



1. Draw a line perpendicular to l .
2. Through point A, draw a line perpendicular to this.
3. The new line through A is parallel to l .

7. IMPORTANT DEFINITIONS

- **Intersecting lines** : Lines that meet at a point.
- **Perpendicular lines** : Lines that intersect at right angles (90°).
- **Parallel lines** : Lines on the same plane that never meet.
- **Transversal** : A line that intersects two (or more) lines at distinct points.
- **Corresponding angles** : Angles in the same relative position.
- **Alternate angles** : Angles on opposite sides of the transversal and between the lines.
- **Interior angles on the same side** : Angles between the lines and on the same side of the transversal.
- **Linear pair** : A pair of adjacent angles whose sum is 180° .
- **Vertically opposite angles** : Opposite angles formed by two intersecting lines; they are equal.

8. QUICK REFERENCE

Concept	Condition	Result / Property
Vertically opposite angles	Two lines intersect	Opposite angles are equal ($\angle a = \angle c$, $\angle b = \angle d$)
Linear pair	Two adjacent angles on a straight line	Sum = 180°
Corresponding angles	Transversal cuts two lines	Equal (if lines are parallel)
Alternate angles	Transversal cuts two parallel lines	Equal
Interior angles on same side	Transversal cuts two parallel lines	Sum = 180°

9. REAL LIFE CONNECTIONS



Railway tracks are parallel.



Zebra crossings have parallel white lines.



Window frames have perpendicular horizontal and vertical lines.



Ladder rungs are parallel.

★ REMEMBER!

- ✓ Use a set square to draw perpendicular lines.
- ✓ Use equal corresponding angles to check if lines are parallel.
- ✓ Always identify the type of angles before applying any property.
- ✓ Visualise carefully and reason – that's geometry!

PARALLEL AND INTERSECTING LINES

WORKSHEET-1

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

1. When two lines meet at a point, they are called:

- a) Parallel lines
- b) Intersecting lines
- c) Perpendicular lines
- d) Curved lines

2. Two intersecting lines form:

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

3. Vertically opposite angles are:

- a) Supplementary
- b) Equal
- c) Complementary
- d) Unequal

4. The sum of a linear pair is:

- a) 90°
- b) 180°
- c) 270°
- d) 360°

5. Perpendicular lines intersect at:

- a) 45°
- b) 60°
- c) 90°
- d) 180°

6. Parallel lines:

- a) Meet at one point
- b) Meet at two points
- c) Never meet
- d) Form right angles

7. A line intersecting two other lines is called:

- a) Ray
- b) Segment
- c) Transversal
- d) Curve

8. Corresponding angles formed by a transversal on parallel lines are:

- a) Equal
- b) 90°
- c) Unequal
- d) Complementary

9. Alternate angles formed by a transversal on parallel lines are:

- a) Equal
- b) 180°
- c) 90°
- d) Unequal

10. Interior angles on the same side of a transversal add up to:

- a) 90°
- b) 120°
- c) 180°
- d) 360°

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

11. Two roads cross each other forming four angles. One of the angles measures 68° . What is the measure of the angle vertically opposite to it?

- a) 68°
- b) 112°
- c) 90°
- d) 136°

12. Two straight lines intersect. One angle is 125° . Which angle forms a linear pair with it?

- a) 125°
- b) 55°
- c) 65°
- d) 90°

13. A carpenter joins two wooden strips so that they meet at a right angle. The strips are:

- a) Parallel b) Perpendicular c) Intersecting but not perpendicular d) Skew

14. Two railway tracks remain at the same distance from each other and never meet even if extended. They are an example of:

- a) Intersecting lines b) Perpendicular lines c) Parallel lines d) Transversal lines

15. A transversal cuts two parallel lines. If one corresponding angle is 78° , another corresponding angle will be:

- a) 102° b) 78° c) 156° d) 90°

16. In a figure, two lines are cut by a transversal. One pair of corresponding angles is equal. What can you conclude?

- a) The lines intersect at right angles. b) The lines are parallel.
c) The lines are perpendicular. d) The transversal is parallel to both lines.

17. A transversal cuts two parallel lines. If one alternate angle measures 135° , the other alternate angle is:

- a) 45° b) 90° c) 135° d) 180°

18. When a transversal cuts two parallel lines, the interior angles on the same side of the transversal always add up to:

- a) 90° b) 180° c) 270° d) 360°

19. Which of the following statements is always true?

- a) Every intersecting pair of lines is perpendicular.
b) Every pair of parallel lines has equal corresponding angles when cut by a transversal.
c) Parallel lines meet at infinity on a plane.
d) Vertically opposite angles are supplementary.

20. A student draws two lines that appear parallel, but the corresponding angles formed by a transversal are 82° and 84° . What is the correct conclusion?

- a) The lines are parallel because they look parallel.
b) The lines are perpendicular.
c) The lines are not parallel because corresponding angles are unequal.
d) More information is needed.

WORKSHEET-2

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

1. Two straight lines intersect. One of the angles formed is 72° . Find all the remaining three angles.

2. Explain why the opposite sides of a rectangular window are parallel and the adjacent sides are perpendicular.

3. A transversal cuts two parallel lines. One corresponding angle measures 115° . Find the alternate angle and justify your answer.

4. State any two differences between intersecting lines and parallel lines.

5. A student says, "If two lines never meet, they are always parallel." Is the statement always correct? Explain.

6. Two lines intersect to form four angles. If one angle is 135° , find the vertically opposite angle and one adjacent angle.

7. A transversal cuts two parallel lines. One alternate angle is 68° . Find the corresponding angle and the interior angle on the same side.

8. Why are corresponding angles useful in deciding whether two lines are parallel?

9. Draw two perpendicular lines and state two properties of perpendicular lines.

10. What happens to corresponding angles when a transversal intersects parallel lines?

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

11. Two lines intersect and one angle measures 120° . Find the other three angles.

12.If two lines intersect and one angle is 75° , find its vertically opposite angle and adjacent angle.

13.Explain why all four angles formed by perpendicular lines are equal.

14.Draw and label: A pair of parallel lines , A pair of perpendicular lines

15.State any three properties of parallel lines.

16.Explain the relationship between corresponding angles and parallel lines.

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

17. A transversal intersects two parallel lines. One corresponding angle is 65° . Find:

- (i) its corresponding angle
- (ii) its alternate angle
- (iii) the adjacent angle.

18. Explain with a diagram:

- (a) Linear Pair
- (b) Vertically Opposite Angles

19. Describe the paper-folding activity used to obtain parallel and perpendicular lines.

20. Draw two parallel lines and a transversal. Mark all corresponding angle pairs and alternate angle pairs.

Section E: Case Study Based Questions ($2 \times 4 = 8$ Marks)

21. Railway Track

Rohan observes railway tracks while travelling.

- (i) Why are the rails considered parallel lines?
- (ii) Will they ever meet if extended indefinitely?

22. Road Crossing

Two roads cross each other making an angle of 110° .

- (i) What is the measure of the vertically opposite angle?
- (ii) What is the measure of each adjacent angle?

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 needs more practice:

☐ Yes

☐ No

Name of Concepts having doubts/Not Cleared: _____

Signature of Parent:

Teacher's Assessment:

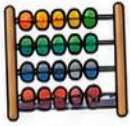
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Answers of Worksheet-1

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

Answers of Worksheet-2

Q.No.	1	2	3	4	5	6
Ans	2°, 108°, 72°, 108°	Explanation	115°	Explanation	No.	135° 45°
	7	8	9	10	11	12
	68° 112°	Explanation	They intersect at exactly one point. They form four right angles of 90° each	Equal	60°, 120°, 60°	75°, 105°
Q.No.	13	14	15	16	17	18
Ans	Explanation	Drawing	Statement	Explanation	(i)65° (ii)65° (iii) 115°	Explanation
Q.No.	19	20	21	22		
Ans	Description	Drawing	Explanation	(i)110° (ii) 110 (iii)70°		



CHAPTER 6 : NUMBER PLAY

SUMMARY OF CONCEPTS



1. NUMBERS TELL US THINGS

A sequence can be represented by numbers showing a rule or pattern.

Example Rule:

Each child calls out the number of people in front of them who are taller than them.



0 0 1 0 3 0 3

Key Observations

- First person always says 0.
- Tallest person always says 0.
- Largest number said can be $(n - 1)$ in a group of n people.

2. PICKING PARITY

Parity means whether a number is EVEN or ODD.



Even Numbers

Can be arranged in pairs.



Examples:

2, 4, 6, 8, ...

Odd Numbers

Cannot be arranged in pairs.



Examples:

1, 3, 5, 7, ...

Important Parity Rules

- even + even = even
- odd + odd = even
- even + odd = odd
- even - even = even
- odd - odd = even
- even - odd = odd
- odd - even = odd

Helpful Facts

- Sum of two consecutive numbers is always odd.
- Sum of any two odd numbers is even.
- Sum of numbers 1 to $2n$ is even.

3. SUMS IN GRIDS & MAGIC SQUARES

Row and column sums help us check if a grid can be filled.

Example:

4	7	5	16
6	1	2	9
3	9	8	20
13	17	15	

Key Points

- In a 3×3 grid with numbers 1 - 9:
 - Each row sum = 15
 - Each column sum = 15
 - Total of all row or column sums = 45
- A magic square is a square grid in which each row, column and diagonal has the same sum.

General Form (with centre number m)

$m + 3$	$m - 4$	$m + 1$
$m - 2$	m	$m + 2$
$m - 1$	$m + 4$	$m - 3$

Magic sum
= $3m$
(three times the centre number)

4. VIRAHĀṆKA-FIBONACCI NUMBERS

The sequence : 1, 2, 3, 5, 8, 13, 21, 34, 55, ...

Rule:

Each number is the sum of the two previous numbers.

- Discovered in India in the context of poetry (rhythms of short (1 beat) and long (2 beats) syllables).
- First described by Virahāṅka (around 700 CE).
- Later known in the West as Fibonacci numbers.
- Appears in nature (flowers, leaves, pinecones, etc.), art, architecture and science.

Parity Pattern

Odd, Even, Odd, Odd, Even, Odd, Odd, Even, ...

1 2 3 5 8 13 21 34 55 89 ...

O E O O E O O E O E ...



5. CRYPTARITHMS (DIGITS IN DISGUISE)

Digits are replaced by letters.
Each letter stands for a digit (0 - 9).
Use logical reasoning to find the digits.

Example 1

$$\begin{array}{r} T \\ + T \\ \hline UT \end{array}$$

Solution:

$T = 5, U = 1$
Because
 $5 + 5 = 10$
 $5 + 5 + 5 = 15$
 $\rightarrow UT = 15$

Example 2

$$\begin{array}{r} K2 \\ + K2 \\ \hline HMM \end{array}$$

Solution:

$K = 6, M = 2, H = 1$
 $62 + 62 = 124$

Other Examples

$$\begin{array}{r} YY \ B5 \\ + Z \ + 3D \\ \hline ZOO \ ED5 \end{array}$$

$$\begin{array}{r} KP \ C1 \\ + KP \ + C \\ \hline PRR \ 1FF \end{array}$$

6. IMPORTANT DEFINITIONS

- **Intersecting lines** : Lines that meet at a point.
- **Linear pair** : A pair of adjacent angles on a straight line; their sum is 180° .
- **Vertically opposite angles** : Opposite angles formed when two lines intersect; they are equal.
- **Perpendicular lines** : Two lines that intersect at right angles (90°).
- **Parallel lines** : Lines on the same plane that never meet, however far they are extended.
- **Transversal** : A line that intersects two (or more) lines at distinct points.
- **Corresponding angles** : Angles in the same relative position at each intersection.
- **Alternate angles** : Angles on opposite sides of the transversal and between

WORKSHEET-1

a) 76 b) 81 c) 89 d) 90

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

11. Five consecutive numbers are added together. Which of the following is always true about their sum?
- a) It is always even. b) It is always odd.
c) It is always a multiple of 5. d) It is always prime.
12. Which expression always gives an even number for every whole number n ?
- a) $4n + 1$ b) $6n + 5$ c) $8n + 2$ d) $3n + 2$
13. A rectangle has 21 rows and 14 columns of unit squares. The total number of unit squares is:
- a) Odd b) Even c) Prime d) Cannot be determined
14. If one term in the Virahāṅka (Fibonacci) sequence is **55** and the previous term is **34**, the next term will be:
- a) 79 b) 88 c) 89 d) 90
15. Which of the following can **never** be the sum of four odd numbers?
- a) 28 b) 32 c) 30 d) 31
16. In a 3×3 magic square formed using nine consecutive numbers, if every entry is increased by **4**, the new magic sum increases by:
- a) 4 b) 8 c) 12 d) 16
17. Which of the following expressions represents all odd numbers?
- a) $2n$ b) $2n - 1$ c) $4n$ d) $6n$
18. A staircase has 6 steps. A child can climb either 1 step or 2 steps at a time. Which sequence helps determine the number of possible ways?
- a) Prime numbers b) Square numbers
c) Virahāṅka (Fibonacci) numbers d) Multiples of 6
19. A number puzzle replaces digits with letters, where each letter always represents the same digit. such puzzles are called:
- a) Sudoku b) Cryptarithms c) Tangrams d) Magic Triangles
20. Three odd numbers are added together. Which statement is always true?
- a) The sum is even. b) The sum is odd.
c) The sum is divisible by 4. d) The sum is prime.

WORKSHEET-2

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

1. What is meant by parity?

2. Find the parity of: (a) Even + Even (b) Odd + Odd

3. What is the largest number possible in a group of 8 people in the height-arrangement activity?

4. Find the parity of: (a) Even – Even (b) Odd – Odd

5. What is the parity of the number of small squares in a 27×13 grid?

6. Write an expression that always gives odd numbers.

7. Write the formula for the n th even number.

8. Write the formula for the n th odd number.

9. Write the first six terms of the Virahāṅka sequence.

10. What is a magic square?

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

11. Find the parity of:

- (a) Sum of 2 even numbers and 2 odd numbers
- (b) Sum of 2 odd numbers and 3 even numbers

12. Lakpa has an odd number of ₹1 coins, an odd number of ₹5 coins and an even number of ₹10 coins. Can the total amount be ₹205? Give reason.

13. Find the parity of the number of small squares in:

(a) 42×78 grid

(b) 135×654 grid

14. Write the next four terms: 1, 2, 3, 5, 8, 13, 21, 34, 55,

15. Explain why the magic sum of a 3×3 magic square using numbers 1–9 is 15.

16. What is the 100th odd number?

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

17. A light bulb is ON. Dorjee toggles its switch 77 times. Will the bulb be ON or OFF? Explain.

18. The consecutive Virahāṅka numbers are 987 and 1597. Find:

- (i) Next two terms (ii) Previous two terms

19. Angaan wants to climb an 8-step staircase and can take either 1 step or 2 steps at a time. In how many different ways can he reach the top?

20. Solve the cryptarithm:

$$\begin{array}{r} \text{UT} \\ + \text{TA} \\ \hline \text{TAT} \end{array}$$

Section E: Case Study Based Questions ($2 \times 4 = 8$ Marks)

21. Magic Square

A 3×3 magic square is formed using numbers 1 to 9.

- (i) What number must be at the centre?
- (ii) What is the magic sum?

22. Virahāṅka Numbers

The sequence is 1, 2, 3, 5, 8, 13, 21, 34, 55, ...

- (i) What is the next term?
- (ii) What rule is used to obtain the next term?

Answers of Worksheet-1

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

Answers of Worksheet-2

Q.No.	1	2	3	4	5
Ans	Explanation	(a) Even (b) Even	7	(a) Even (b) Even	Odd
	6	7	8	9	10
Ans	$2x + 1$ or $2x - 1$	$2n$	$2n - 1$	1,1,2,3,5,8	Explanation
Q.No.	11	12	13	14	15
Ans	(a) Even (b) Even	No, Reason	(a) Even (b) Even	89 144 233 377	Explanation
Q.No.	16	17	18	19	20
Ans	199	Off, Explanation	(i) 2584, 4181 (ii) 610, 377	34 different ways	$U = 9$ $T = 1$ $A = 0$
Q.No.	21	22			
Ans	(i) 5 (ii) 15	(i) 89 (ii) Add previous two terms			



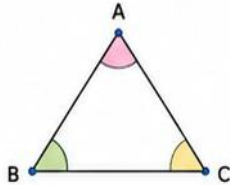
CHAPTER 7 : A TALE OF THREE INTERSECTING LINES



SUMMARY OF CONCEPTS

1. TRIANGLE – BASICS

- A triangle is a closed figure with 3 vertices and 3 sides.
- It has 3 angles.

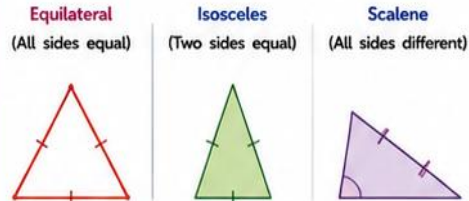


Naming a Triangle

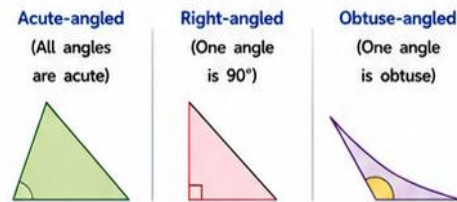
A triangle is named using its vertices. The order of vertices can be any.
Example: $\triangle ABC$, $\triangle BCA$, $\triangle CAB$

2. TYPES OF TRIANGLES

(A) By Sides



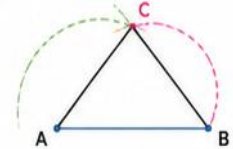
(B) By Angles



3. CONSTRUCTING TRIANGLES

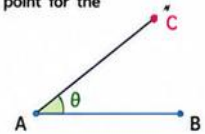
(A) When Three Sides are Given (SSS)

- Draw the base AB = given longest side.
- With centres A and B , draw arcs with the other two lengths as radii.
- Their intersection is C .
- Join AC and BC .



(B) When Two Sides and Included Angle are Given (SAS)

- Draw the base (one given side).
- At one end, construct the given angle.
- On the other arm, mark the point for the other side length.
- Join the two points.



4. TRIANGLE INEQUALITY

For any triangle with sides a , b , c :

$$a < b + c \quad b < c + a \quad c < a + b$$

- If the three lengths satisfy the above inequalities, a triangle exists.
- If any one inequality is not satisfied, a triangle does not exist.

Visual Test (Using Circles)

Take the longest side as base AB . Draw circles with the other two lengths as radii from A and B .

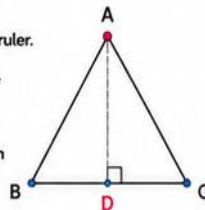
- Circles intersect internally $\rightarrow$ Triangle exists
- Circles touch at one point $\rightarrow$ No triangle
- Circles do not intersect $\rightarrow$ No triangle

5. CONSTRUCTING ALTITUDES

An **altitude** is a perpendicular from a vertex to the opposite side.

Steps to construct altitude from A to BC :

- Place ruler along BC .
- Place set square along the ruler. Slide it till the vertical edge passes through A .
- Draw the perpendicular from A to meet BC at D .

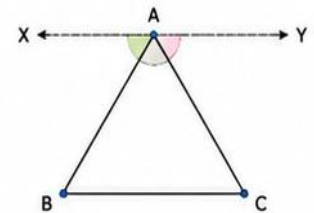


Key Points

- Right triangle: One side is an altitude.
- Other altitudes: From B to AC , and from C to AB .
- Altitudes lie inside the triangle.

6. ANGLE SUM PROPERTY

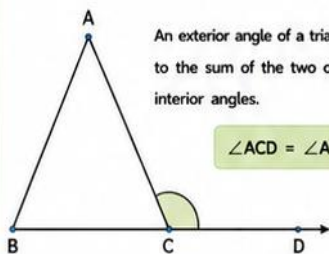
The sum of the three angles of any triangle is 180° .



Proof idea:

- Draw a line XY through A parallel to BC .
- By alternate angles: $\angle XAB = \angle B$ and $\angle YAC = \angle C$.
- $\angle XAB + \angle BAC + \angle YAC = 180^\circ$ (straight line).
- Hence, $\angle A + \angle B + \angle C = 180^\circ$.

7. EXTERIOR ANGLE PROPERTY



An exterior angle of a triangle is equal to the sum of the two opposite interior angles.

$$\angle ACD = \angle A + \angle B$$

Useful for finding unknown angles.

8. IMPORTANT DEFINITIONS

- Vertex** : A corner point of a triangle.
- Side** : A line segment joining two vertices.
- Angle** : Formed by two sides at a vertex.
- Altitude** : Perpendicular from a vertex to the opposite side.
- Equilateral Triangle** : All sides equal.
- Isosceles Triangle** : Two sides equal.
- Scalene Triangle** : All sides different.
- Right Triangle** : One angle is 90° .
- Acute Triangle** : All angles are acute (less than 90°).
- Obtuse Triangle** : One angle is obtuse (greater than 90°).

9. KEY TAKEAWAYS

- Triangle inequality tells whether a triangle can exist.
- Triangles can be constructed using SSS, SAS or ASA (two angles and included side).
- The sum of interior angles of a triangle is 180° .
- An exterior angle equals the sum of the two opposite interior angles.
- Altitudes help in many constructions and proofs.
- Triangles are classified by sides and by angles.



Remember: Observe $\rightarrow$ Visualise $\rightarrow$ Reason $\rightarrow$ Construct $\rightarrow$ Conclude



A TALE OF THREE INTERSECTING LINES

WORKSHEET-1

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

1. When two sides of a triangle are equal, it may be a

- a) Equilateral Triangle b) Isosceles Triangle
- c) Equilateral or Isosceles Triangle d) None of these

2. Adjacent angles share:

- a) A common arm and vertex b) No common Vertex
c) Only one side d) always have Equal measures

3. If three sides AB, BC & AC is made by joining three points with each other A, B and C to form a straight line, then

- a) $AB + BC > AC$ b) $AB + BC = AC$ c) $AB + BC < AC$ d) None of these.

4. Two circles intersect maximum at _____ points.

- a) 2

5. When two circles of radii R_1 and R_2 intersect each other at maximum no of points, then distance between the centers of circles is

- a) more than $R_1 + R_2$ b) less than $R_1 + R_2$ c) Equal to $R_1 + R_2$ d) More than both R_1 and R_2

6. Angles forming a Linear Pair may not be _____

- a) Both Right angles b) one Obtuse & one Acute c) Both Acute d) None of these

7. Which pair of angles are always equal?

- a) Adjacent angles b) Complementary angles c) Vertically opposite angles d) Supplementary angles

8. A perpendicular line segment from a vertex to its opposite side is called _____

- a) Median b) Altitude c) Diagonal d) Perpendicular Bisector

9. How many points of intersection are there when three distinct lines intersect in a plane such that no two lines are parallel?

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

10. Right angled triangle cannot be a/an _____ triangle

- a) Isosceles b) Scalene c) Equilateral d) None of these

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

11 A carpenter has three wooden strips of lengths **8 cm, 11 cm, and 18 cm**. What should he conclude?

- a) They can form an equilateral triangle.
- b) They can form an isosceles triangle.
- c) They cannot form a triangle.
- d) They form a right triangle.

12. In a triangle, two angles measure **52°** and **68°** . The third angle is:

- a) 50°
- b) 60°
- c) 70°
- d) 80°

13. Which of the following sets of lengths can be used to construct a triangle?

- a) 7 cm, 9 cm, 17 cm
- b) 6 cm, 8 cm, 13 cm
- c) 5 cm, 6 cm, 12 cm
- d) 4 cm, 7 cm, 12 cm

14. A triangle has angles **90°** , **35°** , and **55°** . It is classified as:

- a) Acute-angled triangle
- b) Right-angled triangle
- c) Obtuse-angled triangle
- d) Equilateral triangle

15. In $\triangle ABC$, $\angle A = 45^\circ$ and $\angle B = 65^\circ$. The exterior angle at vertex C is:

- a) 70°
- b) 90°
- c) 110°
- d) 135°

16. Which instrument is most suitable for drawing an altitude accurately in a triangle?

- a) Divider only
- b) Compass only
- c) Set square with a ruler
- d) Protractor only

17. Which statement is always true for an equilateral triangle?

- a) It has one right angle.
- b) It has three unequal sides.
- c) All its angles are equal.
- d) It has one obtuse angle.

18. Two sides of a triangle are **9 cm** and **12 cm**. Which of the following **cannot** be the length of the third side?

- a) 5 cm
- b) 10 cm
- c) 15 cm
- d) 22 cm

19. If one side of a triangle is used as the base, the altitude corresponding to that base is always:

- a) Parallel to the base
- b) Equal in length to the base
- c) Perpendicular to the base (or its extension)
- d) Bisects the base

20. A triangle has side lengths **5 cm, 5 cm, and 8 cm**. It is classified according to its sides as:

- a) Scalene triangle
- b) Right triangle
- c) Isosceles triangle
- d) Equilateral triangle

WORKSHEET-2

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

1. List all the elements of Δ ATM.

2. If two angles of a triangle are 80° and 60° , find out the measure of the third angle?

3. If two sides of a triangle are 3 cm and 4 cm. What could be all possible integer values of third side of a triangle.

4. Directions: In the following questions, a statement of Assertion (A) is followed by a statement of Reason

(R). Choose the correct option as:

- (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
- (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
- (c) Assertion (A) is true but Reason (R) is false.
- (d) Assertion (A) is false but Reason (R) is true.

(i) Assertion (A): A triangle can be formed with sides 5 cm, 7 cm, and 13 cm.

Reason (R): The sum of the lengths of any two sides of a triangle must be greater than the third side.

(ii) Assertion (A): A triangle may have angles measuring 60° , 40° , and 80° .

Reason (R): In a triangle, the sum of the three interior angles is always 180° .

5. State whether the following statements are true (T) or False (F).

(i). We can construct a triangle if its two sides are given.

(ii) 4. The altitude of a triangle is always inside the triangle.

6. How many altitudes a triangle can have? In which triangle, altitude is outside the figure.

7. If the angles of a triangle are in the ratio 3: 4: 5, then find the three angles of a triangle.

8. Name the pairs of vertically opposite angles when lines AB and CD intersect at point O.

9. Two angles of a triangle are 30° & 60° . Name the triangle based on its angles. Mention the locations of altitude of a triangle with respect to the figure.

10. Fill in the blanks:

(i) The acute angles of a right-angled triangle are 40° &

(ii) A triangle with all angles less than degrees is called an acute-angled triangle.

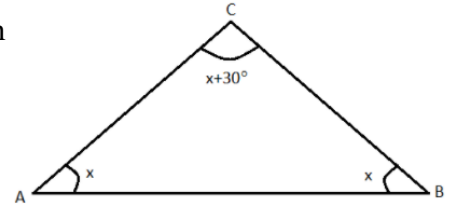
Section C: Short Answer ($6 \times 3 = 18$ marks)

11. Three offices are set at three locations A, B and C in a city in the form of a triangular network as shown in the figure.

The angle made at the corners is shown as below.

Find measure of angle x.

Which two offices are equidistant from the third office.



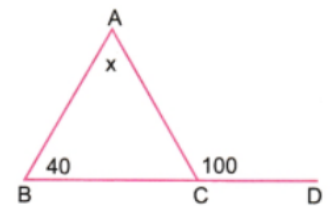
12. Construct a triangle with given measurements: 30° , 6 cm and 90° .

13. Can we say anything about the existence of a triangle for given sets of lengths 10 km, 15 km and 25 km. Explain your answer.

14. In ΔSAT , where $\angle A = \angle T$ and $\angle S = 50^\circ$. What is the measure of $\angle A$ and $\angle T$? Classify the ΔSAT on the basis of angles measure and categorize, if possible, the triangle classified on sides based.

15. An exterior angle of a triangle is 150° , and one of the interior opposite angles is double the other. Find all the interior angles of the triangle.

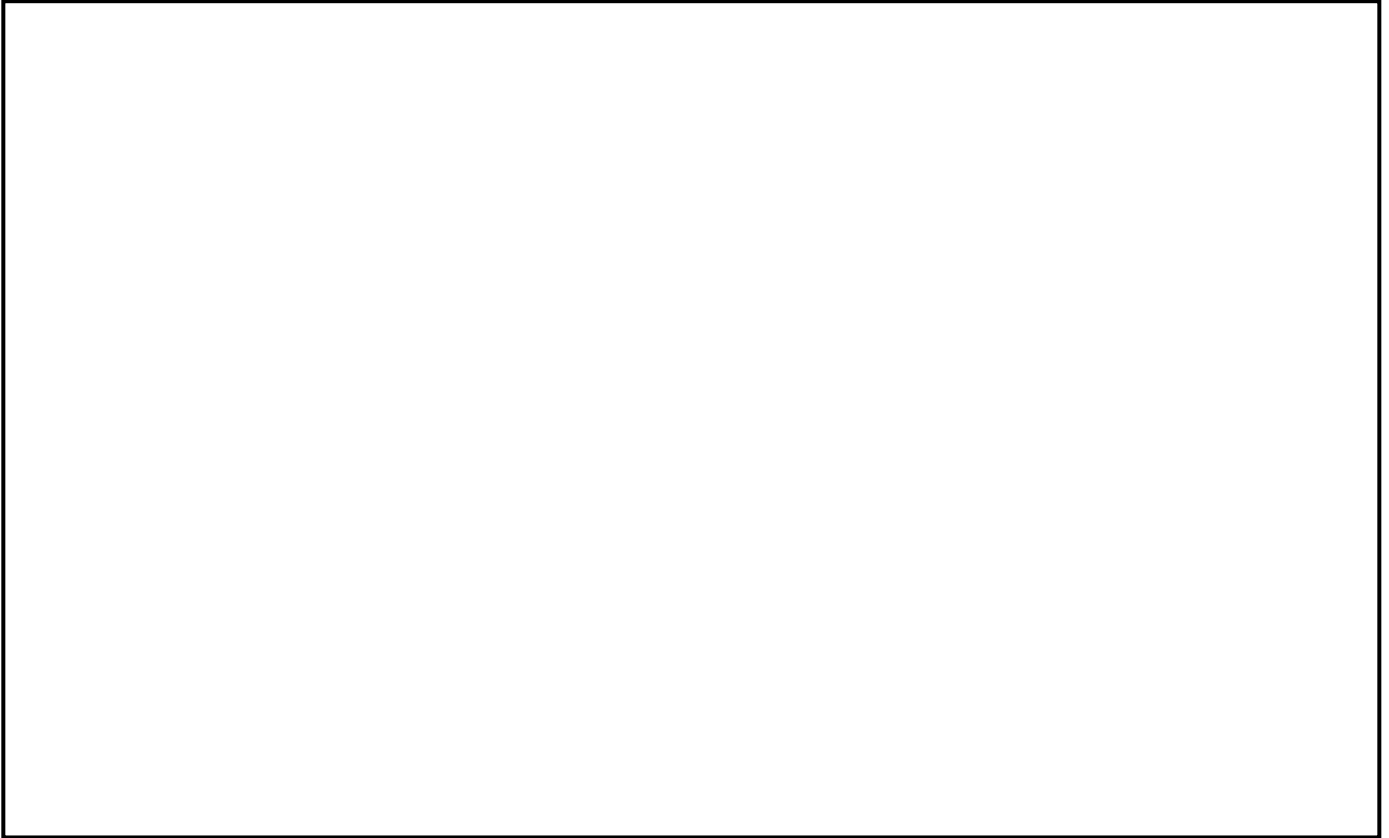
16. In the given figure, find the value of angle x and find $\angle ACB$.



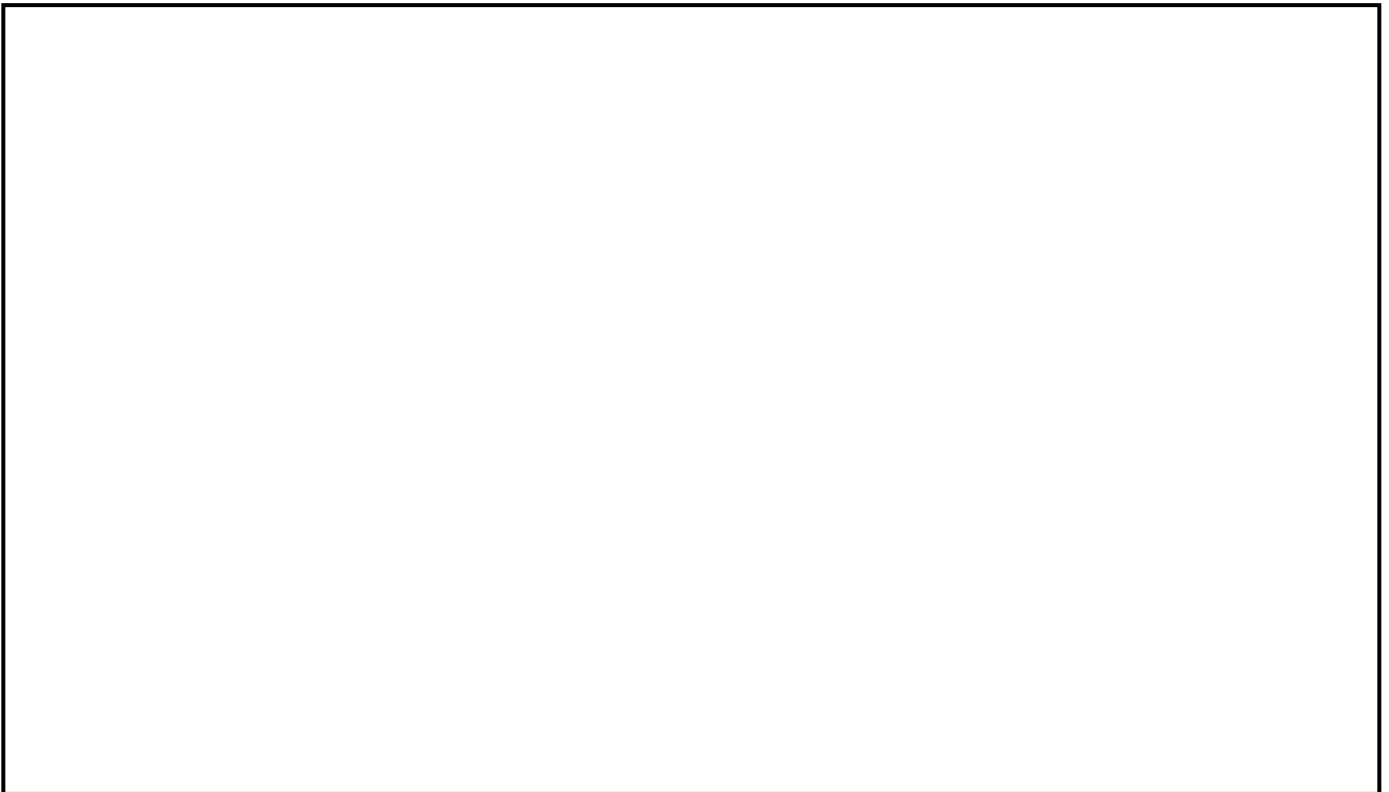
Section D: Long Answer ($4 \times 5 = 20$ marks)

17. If two adjacent angles formed by pair of intersecting lines are $(3y + 15)^\circ$ and $(2y - 5)^\circ$, find the value of y and both angles.

18. Construct a triangle FAT with $AT = 5$ cm, $FA = 6$ cm, $FT = 5$ cm. Construct an altitude from F to AT.

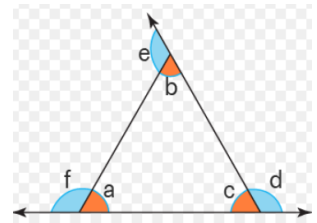


19. Construct a triangle DRY with $RY = 4$ cm, $DR = 7$ cm, $\angle R = 140^\circ$. Construct an altitude from D to RY



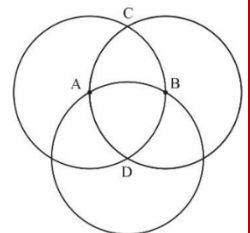
20. Six angles are given in the figure as a, b, c, d, e, f. (1 + 1 + 2 + 1)

- (i) Write a relationship between angles c and d with property.
- (ii) Write relationship between interior angles of a triangle.
- (iii) Write a relationship between exterior angle and two of its interior angles.
- (iv) Write a relationship between exterior angles of a triangle.



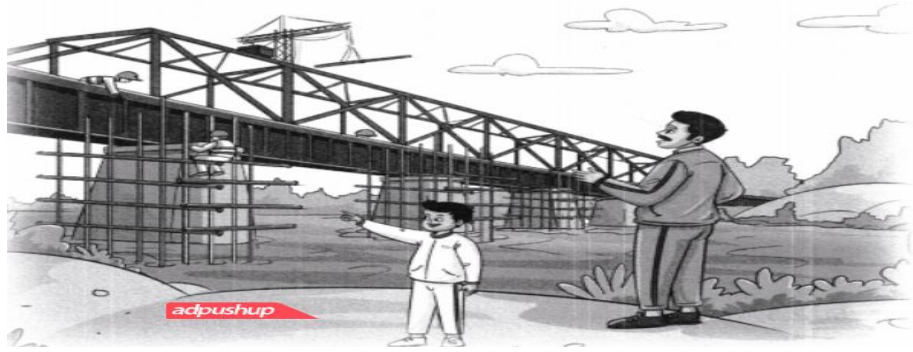
Case Study Based Questions (2 × 4 = 8 marks)

21. Four Friends Anju, Bhawna, Chetna and Divya are sitting in the playground and playing the game of passing the ball to each other from A to C to C to B and B to D and then to A in clock-wise direction. The circles which is formed in the figure are congruent of radius 7 cm. (1 + 1 + 1 + 1)



- (i) What is the distance travel by ball in the game between A and B.
- (ii) What is the distance covered during one complete round of passing the ball game.
- (iii) Which point/ points are equidistant from A and B.
- (iv) Name the type of triangle formed by points A, B and C. Name the type of triangle formed by points A, C and D.

22. Bridge



One morning, Rohan went to the morning walk with his father near a river and saw a bridge that was under construction.

Rohan.: Papa! Look at this bridge, It Is composed of a series of triangles.

Papa: Yes, this Is called a truss bridge. Triangular shapes are used for good support and distributes the weights evenly without disturbing the structure. (1 + 1 + 2)

- i. What minimum parts required out of six parts of a triangle to be constructed.
- ii. Can triangle be constructed using three angles of a triangle.
- iii. The sum of the two equal angles of an isosceles triangle is equal to the third angle. Find the largest of all angles.



Answers of Worksheet-1:

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

Answers of Worksheet-2:

Q.No	1	2	3
	3 sides & 3 angles	40°	2,3,4,5,6
	4	5	6
	(d) , (a)	i.False ii. False	3, Obtuse angled triangle
	7	8	9
	45°, 60° and 75°	2	Right angled triangle. 2 Side and 1 inside
	10	11	12
	i. 50° ii. 90°	50° , C	Construct by ASA
	13	14	15
	Not Possible, as inequality condition for triangle is not satisfied	$\angle A = \angle T = 65^\circ$. Acute angles and Isosceles triangle	50°, 100° and 30°
	16	17	18
	$x = 60^\circ$ $\angle ACB = 80^\circ$	$y = 34^\circ$ & Angles are 117° & 63°	Construct SSS & Altitude
	19	20	21
	Construct SAS & Altitude	(i) $c + d = 180^\circ$ (ii) $a + b + c = 180^\circ$ (iii) $b + c = f$ or $a + b = d$ or $a + c = e$ (iv) $d + e + f = 360^\circ$.	i. 10 cm ii. 20 cm iii. C & D iv. Equilateral Isosceles.
	22		
	i.3 ii. No iii. 90°		



CHAPTER 8 : WORKING WITH FRACTIONS



SUMMARY OF CONCEPTS

1. FRACTION - BASICS

- A fraction represents a part of a whole or a collection.
- A fraction $\frac{a}{b}$ has:
 - a - numerator (top part)
 - b - denominator (bottom part, $b \neq 0$)

Numerator
(How many parts we take)

Denominator
(Total equal parts)

$$\frac{3}{4} = \text{Three-fourths}$$

2. MULTIPLICATION OF FRACTIONS

Rule (Brahmagupta) $\frac{a}{b} \times \frac{c}{d} = \frac{a \times c}{b \times d}$

Steps

- Multiply the numerators.
- Multiply the denominators.
- Simplify the result (cancel common factors) to lowest form.

Examples

$$\frac{1}{2} \times \frac{1}{4} = \frac{1 \times 1}{2 \times 4} = \frac{1}{8}$$

$$\frac{2}{3} \times \frac{3}{5} = \frac{2 \times 3}{3 \times 5} = \frac{6}{15} = \frac{2}{5}$$

$$3 \times \frac{3}{4} = \frac{3}{1} \times \frac{3}{4} = \frac{9}{4} = 2\frac{1}{4}$$

- ★ When one of the numbers is 1, the product remains the other number.

3. DIVISION OF FRACTIONS

Rule (Brahmagupta)

$$\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \times \frac{d}{c} = \frac{a \times d}{b \times c}$$

Steps

- Find the reciprocal of the divisor ($\frac{c}{d} \rightarrow \frac{d}{c}$).
- Multiply the dividend by this reciprocal.
- Simplify the result.

Examples

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

$$\frac{3}{4} \div \frac{2}{5} = \frac{3}{4} \times \frac{5}{2} = \frac{15}{8} = 1\frac{7}{8}$$

$$\frac{5}{12} \div \frac{7}{18} = \frac{5}{12} \times \frac{18}{7} = \frac{90}{84} = \frac{15}{14} = 1\frac{1}{14}$$

- ★ **Reciprocal of** $\frac{a}{b}$ is $\frac{b}{a}$.
 $\left(\frac{a}{b}\right) \times \left(\frac{b}{a}\right) = 1$

4. RELATION BETWEEN NUMBERS

Situation	Condition	Product is
1. Both > 1 (e.g., 3×5)	Both numbers greater than 1	Greater than both numbers
2. Both between 0 and 1 (e.g., $\frac{3}{4} \times \frac{2}{5}$)	Both numbers between 0 and 1	Less than both numbers
3. One > 1 , one between 0 and 1 (e.g., $\frac{3}{4} \times 5$)	One number greater than 1 and the other between 0 and 1	Less than the number > 1 but greater than the number between 0 and 1

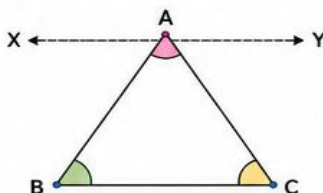
Order of Multiplication

$$\frac{3}{b} \times \frac{c}{d} = \frac{c}{d} \times \frac{a}{b}$$

(Order does not matter)

5. ANGLE SUM PROPERTY

The sum of the interior angles of a triangle is always 180° .

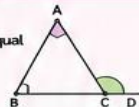


Proof idea:

- Draw a line XY through A parallel to BC.
- By alternate angles,
 $\angle XAB = \angle B$ and $\angle YAC = \angle C$.
- $\angle XAB + \angle BAC + \angle YAC = 180^\circ$
(straight line)
- Hence, $\angle A + \angle B + \angle C = 180^\circ$.

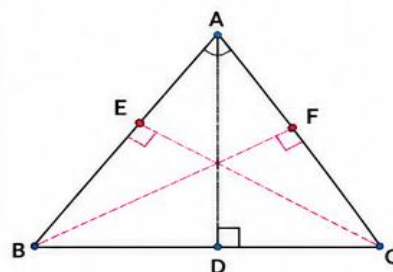
Exterior Angle Property

An exterior angle of a triangle is equal to the sum of the two opposite interior angles.



6. ALTITUDES OF A TRIANGLE

An **altitude** is a perpendicular from a vertex to the opposite side.



- AD, BE and CF are the three altitudes.
- In a right triangle, one side

WORKING WITH FRACTIONS

WORKSHEET-1

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

1. Which of the following is equivalent to $\frac{3}{5}$?

(a) $\frac{6}{15}$

(b) $\frac{9}{15}$

(c) $\frac{12}{25}$

(d) $\frac{15}{20}$

2. What is $\frac{2}{3} + \frac{1}{6}$?

(a) $\frac{3}{9}$

(b) $\frac{5}{6}$

(c) $\frac{1}{2}$

(d) $\frac{4}{6}$

3. Which fraction is the largest?

(a) $\frac{3}{4}$

(b) $\frac{5}{8}$

(c) $\frac{7}{12}$

(d) $\frac{2}{3}$

4. The product of $\frac{4}{7}$ and $\frac{21}{8}$ is:

(a) $\frac{84}{56}$

(b) $\frac{3}{2}$

(c) $\frac{2}{3}$

(d) $\frac{7}{4}$

5. What is $\frac{5}{6} - \frac{1}{4}$?

(a) $\frac{4}{12}$

(b) $\frac{7}{12}$

(c) $\frac{1}{2}$

(d) $\frac{11}{12}$

6. $\frac{3}{5}$ expressed as a decimal is:

(a) 0.35

(b) 0.6

(c) 0.53

(d) 0.06

7. Dividing $\frac{2}{3}$ by $\frac{4}{9}$ gives:

(a) $\frac{8}{27}$

(b) $\frac{3}{2}$

(c) $\frac{6}{12}$

(d) $\frac{2}{3}$

8. Which of the following fractions is in its lowest terms?

(a) $\frac{12}{18}$

(b) $\frac{7}{21}$

(c) $\frac{11}{13}$

(d) $\frac{8}{12}$

9. The product of a fraction and its reciprocal is:

a) 0

b) 1

c) 2

d) Fraction itself

10. The reciprocal of $2\frac{1}{3}$ is:

(a) $\frac{3}{7}$

(b) $\frac{7}{3}$

(c) $\frac{1}{3}$

(d) $\frac{3}{2}$

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

11. A cyclist travels 18 km in one hour. How far will the cyclist travel in $\frac{5}{6}$ hour?

- a) 12 km b) 15 km c) 16 km d) 18 km

12. A recipe requires $\frac{3}{5}$ cup of flour for one cake. How much flour is needed for 4 cakes?

- a) $\frac{12}{5}$ cups b) $\frac{7}{5}$ cups c) $\frac{3}{20}$ cups d) $\frac{15}{4}$ cups

13. Which expression correctly represents $\frac{4}{7} \div \frac{2}{3}$?

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

14. A rectangular garden has length $\frac{7}{4}$ m and breadth $\frac{2}{3}$ m. Its area is:

- a) $\frac{14}{12}$ m² b) $\frac{7}{6}$ m² c) $\frac{21}{8}$ m² d) $\frac{9}{7}$ m²

15. Which pair of numbers has a product less than both the numbers?

- a) $\frac{3}{4}$ and $\frac{2}{5}$ b) 3 and 4 c) 2 and $\frac{3}{2}$ d) 5 and $\frac{6}{5}$

16. The reciprocal of $2\frac{1}{4}$ is:

- a) $\frac{9}{4}$ b) $\frac{4}{9}$ c) $\frac{5}{2}$ d) $\frac{2}{5}$

17. A water tank is $\frac{3}{4}$ full. Half of the water is used. What fraction of the tank remains filled?

- a) $\frac{1}{4}$ b) $\frac{3}{8}$ c) $\frac{1}{2}$ d) $\frac{3}{4}$

18. If 6 notebooks require $\frac{3}{4}$ metre of ribbon, then ribbon required for one notebook is:

- a) $\frac{1}{8}$ m b) $\frac{1}{12}$ m c) $\frac{1}{4}$ m d) $\frac{3}{8}$ m

19. Which statement is always true?

- a) Multiplying a number by a fraction greater than 1 makes it smaller.
b) Dividing a number by a fraction less than 1 makes it larger.
c) Dividing by 1 changes the number.
d) Multiplying by 0 increases the number.

20. Ravi walks $\frac{2}{3}$ km in $\frac{1}{4}$ hour. His walking speed is:

- a) $\frac{2}{3}$ km/h b) $\frac{3}{8}$ km/h c) $\frac{8}{3}$ km/h d) $\frac{5}{6}$ km/h

WORKSHEET-2

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

1. Convert $\frac{7}{4}$ into a mixed fraction and represent it on a number line.

2. Find three equivalent fractions for $\frac{5}{9}$.

3. Compare using $<$, $>$, or $=$: $\frac{4}{7}$ and $\frac{5}{9}$

4. Simplify: $\frac{2}{5} + \frac{3}{10} + \frac{1}{2}$

5. A rope is $\frac{7}{8}$ m long. If $\frac{1}{4}$ m is cut off, what length remains?

6. Find the product: $1\frac{2}{5} \times \frac{5}{7}$

7. Divide: $\frac{9}{10} \div \frac{3}{5}$

8. Express $\frac{17}{5}$ as a mixed number and as a decimal.

9. Which is greater: $\frac{5}{6}$ or 0.85? Show your working.

10. Reduce $\frac{48}{72}$ to its lowest terms.

11. Arrange the following fractions in descending order: $\frac{5}{6}, \frac{7}{9}, \frac{11}{12}, \frac{3}{4}$

Show all steps using LCM.

12. Ravi read $\frac{2}{5}$ of a book on Monday and $\frac{1}{4}$ on Tuesday. What fraction of the book has he read in total? What fraction is still left to read?

13. A farmer has $12\frac{1}{2}$ kg of seeds. He uses $\frac{2}{5}$ of it for planting wheat. How many kilograms of seeds did he use for wheat?

14. Find three fractions between $\frac{1}{3}$ and $\frac{1}{2}$. Explain your method.

15. Simplify and express in lowest terms/mixed fractions: $\frac{5}{8} - \frac{1}{6} + \frac{3}{4}$

16. A tank can hold 60 litres of water. It is $\frac{3}{4}$ full. How much more water is needed to fill it completely? If $\frac{1}{5}$ of the current water is used, how much water remains?

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

17. (a) Define equivalent fractions with two examples.

(b) A piece of ribbon is $8\frac{3}{4}$ m long. It is cut into pieces, each of length $\frac{5}{8}$ m. How many complete pieces can be cut? What length of ribbon is left over?

18. (a) Represent $\frac{2}{3}$, $\frac{5}{6}$, and $\frac{1}{2}$ on the same number line.

(b) In a class of 50 students, $\frac{2}{5}$ are girls. Of the girls, $\frac{3}{4}$ participate in sports. How many girls participate in sports? How many boys are there in the class?

19. (a) Explain with an example why we take the reciprocal when dividing fractions.

(b) A car travels $45\frac{1}{2}$ km on $3\frac{1}{4}$ litres of petrol. How far can it travel on 1 litre of petrol? How much petrol is needed to travel 84 km?

20. (a) Convert 0.625 and 1.75 into fractions in lowest terms.

(b) Three friends share a pizza. Anil eats $\frac{1}{3}$, Bina eats $\frac{1}{4}$, and Charu eats $\frac{1}{6}$ of the pizza. What fraction did they eat together? What fraction is left? If the pizza cost ₹360, what is the cost of the leftover pizza?

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

21. Case Study 1: The School Garden Project

Class VII students are developing a rectangular school garden measuring 20 m by 15 m. The garden is divided into sections for different purposes.



- $\frac{2}{5}$ of the garden is for vegetables,
- $\frac{1}{4}$ of the garden is for flowers, $\frac{1}{10}$ of the garden is for a walking path
- The remaining portion is for herbs

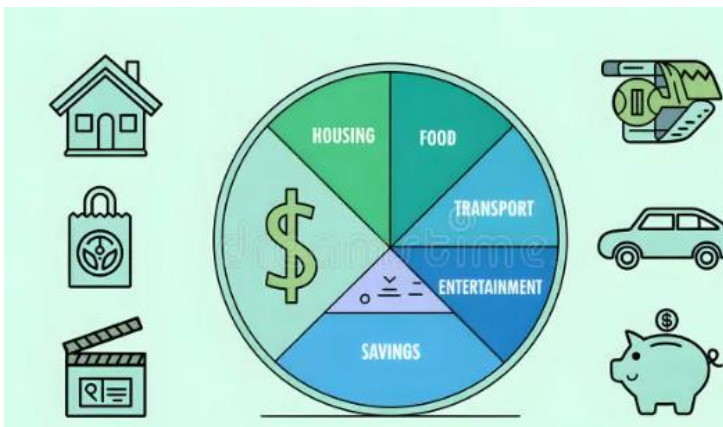
Based on the above information, answer the following:

- What fraction of the garden is used for vegetables and flowers together?
- What fraction of the garden is allocated for herbs?
- Calculate the area (in square metres) of the portion used for the walking path.
- If the cost of planting flowers is ₹25 per square metre, what is the total cost of planting flowers in the flower section?

22. Case Study 2: Meera's Monthly Savings

Meera earns ₹24,000 per month. She plans her expenses carefully:

- $\frac{1}{3}$ on rent
- $\frac{1}{4}$ on food and groceries
- $\frac{1}{8}$ on transportation



- $\frac{1}{12}$ on utilities
- The rest is saved

Based on the above information, answer the following:

- (i) What fraction of her salary does Meera spend on rent and food combined?
- (ii) What fraction of her salary does Meera save each month?
- (iii) How much money (in ₹) does she spend on transportation?
- (iv) Meera wants to save $\frac{1}{3}$ of her salary instead. By what fraction must she reduce her total expenses? How much is this reduction in rupees?

Answers of Worksheet-1:

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

Answers of Worksheet-1:

Q	1	2	3	4	5	6
Ans	represent it on number line	And many such fractions	$\frac{4}{7} > \frac{5}{9}$	$1\frac{2}{10}$	$\frac{5}{8}$ m	1
Q	7	8	9	10	11	12
Ans	$\frac{3}{2}$	3.4	0.85	$\frac{2}{3}$	$\frac{11}{12}, \frac{5}{6}, \frac{7}{9}, \frac{3}{4}$	$\frac{13}{20}, \frac{7}{20}$
Q	13	14	15	16	17	18
Ans	5 Kg	Any three fractions between $\frac{1}{3}$ and $\frac{1}{2}$	$1\frac{5}{24}$	15 litres 45litres. 36litres.	(b) 14 and no length of ribbon is left behind.	15, 30
Q	19	20	21	22		
Ans	14 km, 6	$\frac{7}{4}, \frac{3}{4}, \frac{1}{4}$ ₹ 90	$\frac{13}{20}$ $\frac{1}{4}$ 30 m ² ₹ 1875	$\frac{7}{12}$ $\frac{5}{24}$ ₹ 3000 $\frac{3}{24}$ ₹ 3000		