

# RATIONAL NUMBERS

## I. Important Concepts/ Result

Any fraction with non-zero denominators is a rational number. Some of the examples of rational numbers are  $\frac{1}{2}, \frac{1}{5}, \frac{3}{5}$ , and so on. The number “0” is also a rational number, as we can represent it in many forms such as  $\frac{0}{1}, \frac{0}{2}, \frac{0}{3}$ , etc. But,  $\frac{1}{0}, \frac{2}{0}, \frac{3}{0}$ , etc. are not rational, since they give us infinite values.

## II. Some illustrations/Examples (with solution)

Each number below is a rational number.

$$0 = \frac{0}{2}, 7 = \frac{7}{1}, 5\frac{2}{3} = \frac{17}{3}, 0.43 = \frac{43}{100}, -\frac{4}{9}, -\frac{-4}{9},$$

$$\text{And also: } -\frac{1}{3}, \frac{2}{5}, 0.7 \text{ or } \frac{7}{10}, \text{ and } -0.3 \text{ or } -\frac{3}{10}.$$

### i) MCQs:

Question 1. Which of the following statements is true?

- (a) Natural numbers are closed under division.
- (b) Whole numbers are not closed under division.
- (c) Integers are closed under division.
- (d) Rational numbers are closed under division.

Question 2. ‘0’ is not \_\_\_\_\_

- (a) a natural number. (b) a whole number. (c) an integer. (d) a rational number

Question 3. Which of the following is the multiplicative identity for rational numbers?

- (a) 1 (b) -1 (c) 0 (d) None of these

Question 4. The additive identity for rational numbers is

- (a) 1 (b) -1 (c) 0 (d) None of these

**ANSWER MCQs :** 1 (c). 2 (a). 3 (a). 4 (c)

### ii) Case based study: 1

Three friends Ram, Rahim and David went to “RADHEY SWEET MART” to purchase some sweets, namkin and cold drinks for New year party. The following chart shows the price and available stock of sweets and namkin in the shop.

S.NO.	SWEETS AND NAMKIN	AVAILABLE STOCK	PRICE
1	SWEET LADDU	10 Kg	Rs. 400 per Kg
2	JALEBI	8 Kg	Rs. 360per Kg
3	BARFI	7 Kg	Rs. 300 per Kg
4	MIX-NAMKIN	100 packets	Rs. 80 per packet
5	POTATO CHIPS	80 packets	Rs. 30 per packet
6	COLD DRINKS	50 Bottles	Rs. 50per bottle
7	ROASTED DRY FRUITS	12 Kg	Rs. 1000 per Kg

**Question 1.1:** After purchasing 500gm of sweet laddu, jalebi and barfi each, Ram had Rs. 150 left with him. How much money does Ram had before the purchase?

**Question 1.2:** Ram wants to purchase one packet of Mix-Namkin and two packets of potato chips with the remaining Rs. 150. Explain whether he can purchase it or not.

**Question 1.3:** Rahim had Rs. 200 and wants to purchase one packet of Mix-Namkin, one packet of potato chips, 250gm Sweet laddu and one bottle of cold drink. But due to insufficient money he had to reduce the quantity of one of the item. Find out the name of that item along with reason.

**Question 1.4:** David had Rs. 250 and wants to purchase those items which were not purchased by his friends. Choose the correct list of items he will purchase. (i) Jalebi (ii) Roasted Dry fruits (iii) Barfi (iv) Potato chips

**ANSWER Case based study:** 1.1 Rs. 680

1.2 Rs. 140, Yes

1.3 Namkin

Packet

1.4 Jalebi, Dry Fruit, Barfi

**Short answer type question:**

**Question 1.** Pick up the rational numbers from the following numbers:  $\frac{6}{7}, \frac{(-1)}{2}, 0, \frac{1}{0}, \frac{100}{0}$

**Solution:** Since rational numbers are in the form of  $\frac{a}{b}$  where  $b \neq 0$ . Only  $\frac{6}{7}, \frac{-1}{2}$ , and 0 are the rational numbers.

**Question 2.** Find the reciprocal of the following rational numbers: (a)  $-\frac{3}{4}$  (b) 0

**Question 3.** Write two such rational numbers whose multiplicative inverse is same as they are.

**ANSWERS. Short answer type question:** 1.  $\frac{6}{7}, -\frac{1}{2}, 0$ , 2. (a)  $-\frac{4}{3}$  (b)  $\frac{1}{0}$  3. 1 and  $-1$

**Long answer type questions: 2**

**Question 1.** Find 7 rational numbers between  $\frac{1}{3}$  and  $\frac{1}{2}$ .

**Question 2.** If  $x = \frac{1}{2}, y = -\frac{2}{3}$  and  $z = \frac{1}{4}$ , verify that  $x \times (y \times z) = (x \times y) \times z$ .

**ANSWER:-Long answer type questions:** 1.  $\frac{21}{60}, \frac{22}{60}, \frac{23}{60}, \frac{24}{60}, \frac{25}{60}, \frac{26}{60}, \frac{27}{60}$

**Questions for Practice:**

**MCQs:**

1. Write additive inverse of  $-\frac{7}{13}$ :

(a)  $\frac{7}{13}$  (b) 13 (c) -13 (d) 0

2. Find the multiplicative inverse of -17

(a)  $-\frac{1}{17}$  (b) 289 (c) -289 (d) -17

3. Multiply  $\frac{7}{13}$  by the reciprocal of  $-\frac{7}{16}$

(a)  $-\frac{16}{13}$  (b)  $\frac{16}{13}$  (c)  $\frac{3}{16}$  (d)  $-\frac{13}{16}$

4. Fill in the blanks: \_\_\_\_\_ has no reciprocal.

(a) One (b) Zero (c) Two (d) Three

5.  $\frac{13}{6}$  is the reciprocal of \_\_\_\_\_.

(a)  $\frac{6}{13}$  (b)  $-\frac{13}{6}$  (c)  $-\frac{6}{13}$  (d) 0

6. Find the rational number between  $\frac{2}{3}$  and  $\frac{1}{2}$ .

(a)  $-\frac{7}{12}$  (b)  $\frac{7}{12}$  (c)  $\frac{5}{3}$  (d)  $\frac{6}{3}$

7. Choose rational number greater than -3

(a) -3 (b) -4 (c) -5 (d) -1/2

8. Write the additive inverse of

(a)  $\frac{6}{13}$  (b)  $\frac{13}{16}$  (c)  $-\frac{13}{6}$  (d)  $\frac{6}{5}$

9. Which of the following is the multiplicative identity for rational numbers?

(a) 1 (b) -1 (c) 0 (d) None of these

10. The additive identity for rational numbers is

(a) 1 (b) -1 (c) 0 (d) None of these

**ii) Short answer type question:**

1. What is the sum of the rational numbers  $-\frac{8}{19}$  and  $-\frac{4}{57}$ .
2. What number should be added to  $\frac{3}{8}$  to get  $-\frac{1}{24}$ ?
3. Which of the rational numbers  $\frac{4}{9}$ ,  $\frac{-5}{6}$ ,  $\frac{-7}{12}$  and  $\frac{11}{-24}$  is the smallest?
4. Which of the rational numbers  $\frac{-4}{9}$ ,  $\frac{5}{-12}$ ,  $\frac{7}{-18}$ ,  $\frac{2}{-3}$  is the greatest?
5. Simplify:  $\frac{2}{3} + \frac{-4}{5} + \frac{7}{15} + \frac{-11}{20}$
6. What number should be subtracted from  $\frac{-3}{4}$  so as to get  $\frac{5}{6}$ ?
7. The sum of two rational numbers is  $-7$ . If one of the numbers is  $\frac{-15}{19}$ , find the other number.
8. The product of two numbers is  $\frac{-20}{9}$ . If one of the numbers is  $4$ , find the other.
9. Fill in the blanks:  $\frac{5}{12} \div (\text{_____}) = \frac{-35}{18}$
10. Find the value of  $(\frac{-16}{21} \div \frac{-4}{3})$ .

**iii) long answer type questions:**

**1. Fill in the blanks:**

- (i) The product of a positive number and its reciprocal is \_\_\_\_\_.
- (ii) The rational number \_\_\_\_\_ has no reciprocal.
- (iii) The reciprocal of the reciprocal of a number is \_\_\_\_\_.
- (iv) The rational number \_\_\_\_\_ is neither positive nor negative.
- (v) \_\_\_\_\_ is the only rational number which is equal its additive inverse.

**2. Write:**

- (i) A rational number which has no reciprocal.
- (ii) A rational number whose product with a given rational number is equal to the given rational number.

**iii) Case based study:**

1. A dog buried 3 bones in the backyard. The first bone is buried  $-2\frac{1}{2}$  feet, the second bone is buried  $-2\frac{2}{6}$  feet and third bone is  $-\frac{30}{4}$  feet.
  - (a) Simplify.  $(-2\frac{1}{2}) \times (-2\frac{2}{6}) (-\frac{30}{4})$
  - (b) How much deeper is third bone buried from the first bone?
2. Raju earns Rs16000/month. He spends  $\frac{1}{4}$  of his income on food;  $\frac{3}{10}$  of the remainder on house rent and  $\frac{5}{21}$  of the remainder on education of children.
  - (a) How much money is still left with him?
  - (b) On which segment Raju spent maximum money?

**ANSWER :- MCQs :** 1. (a) 2. (a) 3. (a) 4. (b) 5. (a) 6. (b) 7. (d) 8. (a) 9. (a) 10. (c)

- Short answer type question:** 1.  $\frac{28}{57}$       2.  $\frac{-5}{12}$       3.  $\frac{-5}{6}$       4.  $\frac{-7}{18}$       5.  $\frac{-13}{60}$   
 6.  $\frac{-19}{12}$       7.  $\frac{-118}{19}$       8.  $\frac{-5}{9}$       9.  $\frac{-14}{3}$       10.  $\frac{4}{70}$

**long answer type questions:-** Fill in the blanks 1. (i) One (ii) Zero (iii) One (iv) Zero (ii) One  
 2. (i) Zero (ii) One

**Case based study:** 01 (a)  $-96\frac{7}{8}$  (b) -5 Case based study: 02 (a) Rs. 6400 (b) Food

**Chapter Test (One 20 mark)**

**SECTION A (2 MARKS FOR EACH QUESTION)**

- What is the sum of the rational numbers  $\frac{-8}{19}$  and  $\frac{-4}{57}$ .
- What number should be added to  $\frac{3}{8}$  to get  $\frac{-1}{24}$ ?
- Which of the rational numbers  $\frac{4}{9}$ ,  $\frac{-5}{6}$ ,  $\frac{-7}{12}$  and  $\frac{11}{-24}$  is the smallest?
- Which of the rational numbers  $\frac{-4}{9}$ ,  $\frac{5}{-12}$ ,  $\frac{7}{-18}$ ,  $\frac{2}{-3}$  is the greatest?
- Simplify:  $\frac{2}{3} + \frac{-4}{5} + \frac{7}{15} + \frac{-11}{20}$
- What number should be subtracted from  $\frac{-3}{4}$  so as to get  $\frac{5}{6}$ ?

**SECTION A (4 MARKS FOR EACH QUESTION)**

- The sum of two rational numbers is -7. If one of the numbers is  $\frac{-15}{19}$ , find the other number.
- The product of two numbers is  $\frac{-20}{9}$ . If one of the numbers is 4, find the other.

**Chapter Test (One 30 mark)**

**SECTION A (2 MARKS FOR EACH QUESTION)**

- Write additive inverse of  $\frac{-7}{13}$
- Find the multiplicative inverse of -17
- Multiply  $\frac{7}{13}$  by the reciprocal of  $\frac{-7}{16}$
- Find the rational number between  $\frac{2}{3}$  and  $\frac{1}{2}$ .
- What is the sum of the rational numbers  $\frac{-8}{19}$  and  $\frac{-4}{57}$ .
- Fill in the blanks:  $\frac{5}{12} \div (\text{_____}) = \frac{-35}{18}$

**SECTION B (3 MARKS FOR EACH QUESTION)**

- What number should be added to  $\frac{3}{8}$  to get  $\frac{-1}{24}$ ?
- Find the value of  $(\frac{-16}{21} \div \frac{-4}{3})$ .

**SECTION C ( 4 MARKS FOR EACH QUESTION)**

9. Find 7 rational numbers between  $\frac{1}{3}$  and  $\frac{1}{2}$ .

**10. Question 2.**

If  $x = \frac{1}{2}$ ,  $y = \frac{-2}{3}$  and  $z = \frac{1}{4}$ , verify that  $x \times (y \times z) = (x \times y) \times z$ .

**11. Fill in the blanks:**

- (i) The product of a number and its product is \_\_\_\_\_.
- (ii) The rational number \_\_\_\_\_ has no reciprocal.
- (iii) The reciprocal of the reciprocal of a number is \_\_\_\_\_.
- (iv) The rational number \_\_\_\_\_ is neither positive nor negative.

# LINEAR EQUATION IN ONE VARIABLES

## Important Concepts/ Result

The linear equations in one variable is an equation which is expressed in the form of  $ax+b = 0$ , where  $a$  and  $b$  are two integers, and  $x$  is a variable and has only one solution.

For example,  $2x + 3 = 8$  is a linear equation having a single variable in it. Therefore, this equation has only

one solution, which is  $x = \frac{5}{2}$ .

Some illustrations/Examples (with solution)

**Equation** A statement of equality which contains one or more unknown quantity or variable (literals) is called an equation.

## Example

$3x + 7 = 12$ , and  $\frac{x}{3} + 5 = \frac{x}{2} - 3$  are equations in one variable  $x$ .

## Rules for Solving Linear Equations in One Variable

We learnt the rules for solving an equation in one variable. Let us recall them. They are :

Rule 1 : Same quantity (number) can be added to both sides of an equation without changing the equality.

Rule 2 : Same quantity can be subtracted from both sides of an equation without changing the equality.

Rule 3 : Both sides of an equation may be multiplied by the same non-zero number without changing the equality.

Rule 4 : Both sides of an equation may be divided by the same non-zero number without changing the equality. It should be noted that some complicated equations can be solved by using two or more of these rules together.

## i) MCQs

1. Find the solution of  $2x - 5 = 10$

- (a)  $\frac{15}{2}$  (b)  $\frac{7}{2}$  (c)  $\frac{5}{2}$  (d)  $\frac{9}{2}$

2. Solve  $8x - \frac{5}{2}x = 2$

- (a)  $x = \frac{4}{11}$  (b)  $x = \frac{7}{2}$  (c)  $x = \frac{3}{4}$  (d)  $x = \frac{5}{12}$

3. Solve  $2x - 3 = x + 2$

- (a)  $x = 4$  (b)  $x = 3$  (c)  $x = 7$  (d)  $x = 5$

4.  $4z + 2 = 6 + 2z$

- (a)  $z = 4$  (b)  $z = 3$  (c)  $z = 2$  (d)  $z = 5$

ANSWER:- 1. (a) 2. (a) 3. (d) 4. (c)

## ii) Case based study question

A home-owner is installing a fence around the square garden. The garden has a perimeter of 6480 cm. Write and solve the equation to find the garden's dimensions.

- (a) Find out the side of garden.  
(b) Why garden is important for us?

ANSWER (a) 1620 cm (b) Think And write yourself



### iii) Short answer type question

Fill in the blanks to make each statement true.

1. In a linear equation, the \_\_\_\_\_ power of the variable appearing in the equation is one.
2. The solution of the equation  $3x - 4 = 1 - 2x$  is \_\_\_\_\_.
3. The solution of the equation  $2y = 5y - \frac{18}{5}$  is \_\_\_\_\_.
4. Any value of the variable which makes both sides of an equation equal is known as a \_\_\_\_\_ of the equation.

Answer :- 1. Highest 2. 1 3.  $\frac{6}{5}$   
4. Solution

### iv) Long answer type questions:

**Solve the equation**

1.  $0.25(4x - 5) = 0.75x + 8$

2.  $\frac{3x+2}{2x-3} = \frac{-3}{4}$

Answer :- 1.  $X = 37$  2.  $\frac{-3}{17}$

### III. Questions for Practice

Q1. A linear equation in one variable has

- (a) Only one solution (b) Two solutions (c) More than two solutions (d) No solution

Q2. What is the length of the rectangle whose breadth is 10 cm & perimeter 60 cm.

- (a) 15cm (b) 16cm (c) 20cm (d) 25cm

Q3. What should be added to  $\frac{-3}{5}$  to get  $\frac{-7}{5}$ .

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

Q4. If x % of 50 is 10, then the value of 'x' is

- (a) 30 (b) 15 (c) 10 (d) 20

Q5. Two numbers are in the ratio 3: 5. If their sum is 64, then the numbers are

- (a) 24 & 40 (2) 15 & 24 (c) 10 & 24 (d) 20 & 24

Q6. The sum of the ages of three persons is 100 years. What will be the sum of their ages after 5 years.

- (a) 100yrs. (b) 115yrs. (c) 300 yrs. (iv) 305yrs.

Q7. The sum of three consecutive multiples of '5' is 45. Which is the smallest of the three multiples.

- (a) 10 (b) 15 (c) 20 (d) 25

Q8. If  $z + 5 = \frac{z}{9} + 4$ , then the value of 'z' is

- (a) 5                      (b) 4                      (c) 7                      (d) 8

Q9. Sum of two numbers is 95. If one exceeds the other by 15, then the numbers are

- (a) 25 & 40                      (b) 50 & 65                      (c) 30 & 45                      (d) 40 & 55

Q10. If  $2x + 1 = 15$  then the value of 'x' is

- (a) 5                      (b) -8                      (c) 7                      (d) 3

**ii) Short answer type question:**

**Solve the equations**

1.  $\frac{x}{2} - \frac{1}{5} = \frac{x}{3} + \frac{1}{4}$

2.  $\frac{x-5}{5} = \frac{x-3}{3}$

3.  $\frac{6x+1}{3} + 1 = \frac{x-3}{6}$

4.  $5x + \frac{7}{2} = \frac{3x}{2} + 14$

5.  $3x = 2x + 18$

8.  $4z + 3 = 6 + 2z$

6.  $5t - 3 = 3t - 5$

9.  $2x - 1 = 14 - x$

7.  $5x + 9 = 5 + 3x$

10.  $8x + 4 = 3(x - 1) + 7$

**iii) Long answer type questions:**

**Solve the equations**

1.  $3(t - 3) = 5(2t + 1)$

2.  $15(y - 4) - 2(y - 9) + 5(y + 6) = 0$

3.  $3(5z - 7) - 2(9z - 11) = 4(8z - 13) - 17$

4.  $0.25(4f - 3) = 0.05(10f - 9)$

5. The sum of three consecutive even natural numbers is 48. Find the greatest of these numbers.

6. Divide 54 into two parts such that one part is  $\frac{2}{7}$  of the other.

**iv) Case based study 01:**

Two sisters Riya and Tanu went to a mela organized in their society on the occasion of New Year. Their mother gave them Rs. 200. They bought some toys for them. Tanu spent Rs. 20 more than Riya. When they returned home from the mela, they had Rs. 20 left with them.

- Find the amount spent by Riya.
- Find the amount spent by Tanu.
- Determine the ratio of amount spent by Tanu to that of Riya.
- What type of motion is exhibited by Giant-wheel?



son

**Case based study 02:**

Anima left one-half of her property to her daughter, one-third to her son and donated the rest to an educational institute. If the donation was worth Rs. 1,00,000.

- How much money did Anima have?
- How much money educational institute have?
- How much money did Anima's son and daughter have?

**ANSWER :- MCQs :** 1. (a) 2. (c) 3. (c) 4. (d) 5. (a) 6. (a) 7. (a) 8. (a) 9. (d) 10. (c)

**Short answer type question: ANSWER :-** 1.  $X = \frac{27}{10}$  2.  $X=0$  3.  $X= -1$  4.  $X= 3$  5.  $X= 18$  6.  $t = -1$



7.  $X = -2$  8.  $Z = \frac{3}{2}$  9.  $X = 5$  10.  $X = 0$

**Long answer type questions:-** 1.  $t = -2$  2.  $y = \frac{2}{3}$  3.  $z = 2$  4.  $f = \frac{3}{5}$  5. 18 6. 42, 12

**Case based study: 01** 1. Riva Rs. 80 2. Tanu Rs. 100 3. 4:5 4. Circular Motion

**Case based study: 02** (a) Rs. 3,00,000 (b) Rs. 1,00,000 (c) Son Rs. 50,000 Daughter Rs. 1,50,000

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**Chapter Test (One 20 mark)**  
**SECTION A ( 2 MARKS FOR EACH QUESTION)**

1. Find the solution of the equation  $3x - 4 = 1 - 2x$ .
2. Find solution of the equation  $2y = 5y - \frac{18}{5}$ .

Solve the equation

3.  $\frac{6x+1}{3} + 1 = \frac{x-3}{6}$
4.  $5x + \frac{7}{2} = \frac{3x}{2} + 14$
5.  $3x = 2x + 18$
6.  $5t - 3 = 3t - 5$

**SECTION A ( 4 MARKS FOR EACH QUESTION)**

7. The sum of three consecutive even natural numbers is 48. Find the greatest of these numbers.
8. Divide 54 into two parts such that one part is  $\frac{2}{7}$  of the other.

**Chapter Test (One 30 mark)**

**SECTION A ( 2 MARKS FOR EACH QUESTION)**

1.  $3x = 2x + 18$
2.  $5t - 3 = 3t - 5$
3.  $5x + 9 = 5 + 3x$
4.  $4z + 3 = 6 + 2z$
5.  $2x - 1 = 14 - x$
6.  $8x + 4 = 3(x - 1) + 7$

**SECTION B ( 3 MARKS FOR EACH QUESTION)**

7.  $\frac{x}{2} + \frac{x}{4} + \frac{x}{5} + 10000 = x$
8. Arpita's present age is thrice of Shilpa. If Shilpa's age three years ago was  $x$ . Find Arpita's present age.

**SECTION C ( 4 MARKS FOR EACH QUESTION)**

9. Distance between two stations A and B is 690 km. Two cars start simultaneously from A and B towards each other, and the distance between them after 6 hours is 30 km. If the speed of one car is less than the other by 10 km/hr, find the speed of each car.
10. Solve the equation  $0.25(4x - 5) = 0.75x + 8$
11. The sum of three consecutive even natural numbers is 48. Find the greatest of these numbers.

# UNDERSTANDING QUADRANGLES

## IMPORTANT CONCEPTS

Polygon – polygon is a simple closed curve formed an only live segment.

Convex and concave polygons – a polygon is said to be convex if it has no portion of its diagonal in its exterior otherwise it is a triangular polygon.

Regular and irregular polygons – a polygon which is both, all angles and all sides are equal is called regular polygon otherwise it is irregular polygon.

Special name of polygon according to its sides (3 side, triangle) (4 sides, quadrilateral) (5 sides, pentagon) , (6 sides, hexagon)

Sum of exterior angle angles of polygon is always  $360^\circ$ .

$$\text{Exterior angle of polygon} = \frac{360^\circ}{n}$$

$$\text{Number of sides of regular polygon} = \frac{360^\circ}{\text{one exterior angle}}$$

$$\text{Interior angle of regular polygon} = \frac{(n-2)180^\circ}{n}$$

Def. of triangles, Types of triangles.

Sum of interior angles of interior angles of triangles of its  $180^\circ$

Def. of quadrilateral, types of quadrilaterals and its properties

Sum of interior angles of quadrilateral is  $360^\circ$

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## Examples with solutions:

- What is the name of regular polygon with 4 sides?  
a. Equilateral triangle    b. square    c. rectangle    d. kite
- How many sides a regular polygon will have if its exterior angles are of  $45^\circ$ ?  
a. 4    b. 6    c. 3    d. 5
- What is the name of regular polygon of 6 sides?  
a. Square    b. pentagon    c. hexagon    d. octagon
- How many diagonals does a quadrilateral have?  
a. 1    b. 2    c. 3    d. 4

**ANSWER:** Q1 (b)    Q2 (c)    Q3 (c)    Q4 (b)

## Case Study Based Questions

- Identify polygon in red colour?
- What is the measure of each interior angle of the polygon?
- What is the measure of each exterior angle of the polygon?

**Answer Case Study Based Question:** 1) Hexagon 2)  $120^\circ$  3)  $60^\circ$



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## Short Answer Type Questions

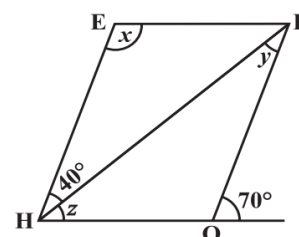
- How many sides does a regular polygon have if each its interior angle is  $165^\circ$ ?
- What is the minimum interior angle possible in a regular polygon?
- How many sides does a regular polygon have if the measure of its exterior angle is  $36^\circ$ ?

**Short Answer Question:** Q1 24sides    Q2  $60^\circ$     Q3 10 Sides

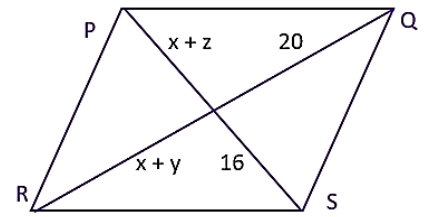
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## Long Answer Type Questions

- ABCD is a parallelogram. Find the angle if x, y and z.



2. In a parallelogram PQRS find the value of x and y.



**Answer Long Answer Type Questions:**

Q1  $x = 110^0, y = 30^0, z = 40^0$

Q2  $x = 11, y = 5$

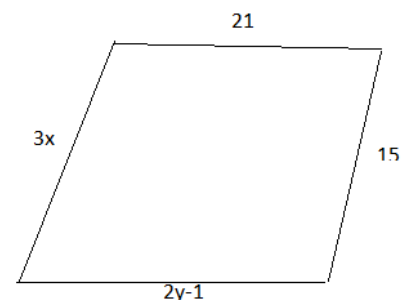
**PRACTICE QUESTIONS:**

**MCQs**

1. In a parallelogram opposite angles are?
  - a. Equal
  - b. half
  - c. doubled.
  - d. none of these
2. In a rectangle all angles are?
  - a.  $45^\circ$
  - b.  $90^\circ$
  - c.  $100^\circ$
  - d.  $180^\circ$
3. In a square both the diagonals are?
  - a. Equal
  - b. unequal
  - c. sometimes equal, sometimes unequal
  - d. none of these
4. How many diagonals does a pentagon have?
  - a. 4
  - b. 5
  - c. 6
  - d. 7
5. What is the name of regular polygon of 4 sides?
  - a. Equilateral triangle
  - b. square
  - c. rectangle
  - d. kite
6. The measure of exterior angle of a regular polygon of 9 sides is?
  - a.  $30^\circ$
  - b.  $40^\circ$
  - c.  $50^\circ$
  - d.  $60^\circ$
7. The sum of measure of exterior angle of any polygon is?
  - a.  $90^\circ$
  - b.  $180^\circ$
  - c.  $720^\circ$
  - d.  $360^\circ$
8. How many sides does a regular polygon have if its interior angle is  $150^\circ$ ?
  - a. 8
  - b. 10
  - c. 12
  - d. 14
9. What is the name of a regular polygon of 10 sides?
  - a. Hexagon
  - b. octagon
  - c. decagon
  - d. none of these.
10. How many vertices does a quadrilateral have?
  - a. 4
  - b. 3
  - c. 5
  - d. 6

**Short Answer Types Questions**

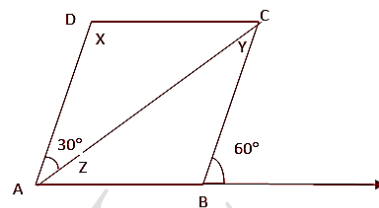
1. What is a regular polygon, State the name of regular polygon of 5 sides.
2. Find the sum of interior angle of a pentagon.
3. Is it possible to have a regular polygon with measure of each exterior angle  $25^\circ$ ?
4. Is rhombus a square?
5. Is rectangle a parallelogram?
6. How many sides does a regular polygon have if each of the interior angle is  $165^\circ$ ?
7. In a parallelogram one angle is  $70^\circ$ . Find all the other angles of the parallelogram?
8. The four angles of a Quadrilateral are in the ratio 1:2:3:4 find the measure of smaller and greater angle.
9. ABCD find the value of x and y
10. In a parallelogram PQRS,  $\angle P : \angle Q = 1:2$  Then find  $\angle Q = ?$



**Long Answer Type Question**

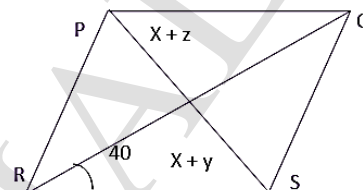
1. In a parallelogram two adjacent angles are in the same ratio 4:5 find each angle of the parallelogram?

- Perimeter of rectangle is 120 cm. if their length and width are in the ratio 2:3. Find the length and breadth of the diagonals.
- If two diagonal of a parallelogram are  $x + y = 8$  and  $x - y = 2$  find the length the diagonals.
- The angles of a quadrilateral and its ratio its ratio 2: 3: 4: 6 . Find its all angles.
- In a parallelogram ABCD. Find the value of x, y and z. name type of triangle ABC.



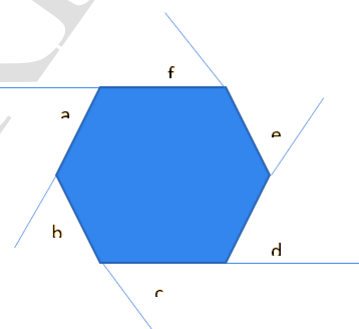
the

- ABCD is a rhombus find the value of x y and z.



### Case Study Based Question

- Take a regular hexagon and answer the following questions:
  - What is the sum of measure of its exterior angles a, b, c, d, e, f?
  - Is  $a = b = c = d = e = f$  ? why?
  - What is the measure of each exterior angle and interior angle?



and

### ANSWER

#### MCQS

- Q1 (a)      Q2 (b)      Q3 (a)      Q4 (5)      Q5 (b)      Q6 (b)      Q7 (d)  
 Q8 (c)      Q9 (C)      Q10 (a)

#### SHORT ANSWER TYPE QUESTION

- Q1: All sides are equal, Pentagon      Q2:  $540^0$       Q3: NO      Q4: NO      Q5: YES  
 Q6: 24      Q7:  $70^0, 110^0, 70^0, 110^0$       Q8:  $x = 5, y = 11$       Q9:  $360^0, 144^0$       Q10  $<Q = 120^0$

#### LONG ANSWER TYPE QUESTION

- Q1  $80^0, 100^0$       Q2 L = 24cm B = 36 cm      Q3  $x = 5, y = 3$       Q4  $48^0, 72^0, 96^0, 144^0$   
 Q5  $x = 120^0, y = 30^0, z = 30^0$       Q6  $x = 50^0, y = 50^0, z = 90^0$

CASE STUDY BASE QUESTION: (i)  $360^0$       (ii) Yes polygon is regular      (iii)  $60^0$

**TEST-1 (20 MARKS)**

**SECTION A (2 marks each)**

1. What is the name of regular polygon of 6 sides?
2. In a parallelogram opposite angles are?
3. In a rectangle all angles are?
4. In a square both the diagonals are?
5. How many diagonals does a pentagon have?
6. What is the name of regular polygon of 4 sides?

**SECTION B (4 marks each)**

7. In a parallelogram two adjacent angles are in the same ratio 4:5 find each angle of the parallelogram?
8. Perimeter of rectangle is 120 cm. if their length and width are in the ratio 2:3. Find the length and breadth of the rectangle.

**TEST-2 (30 MARKS)**

**SECTION A (2 marks each)**

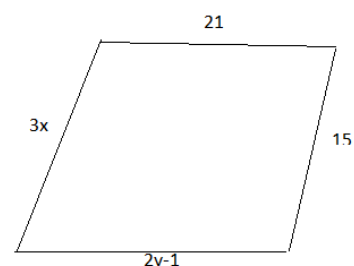
1. The sum of measure of exterior angle of any polygon is?
2. How many sides does a regular polygon have if its interior angle is  $150^\circ$ ?
3. What is the name of a regular polygon of 10 sides.

**SECTION B (3 marks each)**

4. How many sides does a regular polygon have if each of the interior angle is  $165^\circ$ ?
5. In a parallelogram one angle is  $70^\circ$ . Find all the other angles of the parallelogram?
6. Two diagonals of a parallelogram are  $x + y = 8$  and  $x - y = 2$  find the lengths of the diagonals.
7. The angles of a quadrilateral and its ratio its ratio 2:3:4:6 find its all angles.

**SECTION C (4 marks each)**

8. The four angles of Quadrilateral are in the ratio 1:2:3:4 find the measure of smaller and greater angle.
9. ABCD find the value of x and y.
10. In a parallelogram PQRS,  $\angle P : \angle Q = 1:2$  Then find



## DATA HANDLING

### Important Concepts:

In your day-to-day life, you might have come across information, such as:

- (a) Runs made by a batsman in the last 10 test matches.
- (b) Number of wickets taken by a bowler in the last 10 ODIs.

The information collected in all such cases is called **data**. Data is usually collected in the context of a situation that we want to study

Usually, data available to us is in an unorganized form called raw data. To draw meaningful inferences, we need to organize the data systematically either in ascending or descending order or in grouped form

Thus, the frequency distribution table for the above data can be written as

Subject	Tally Marks	Number of Students
Art		7
Mathematics		5
Science		6
English		4

**FREQUENCY OF DATA:** Occurrence of an observation in the data is called frequency of the observation  
Here 7 students have opted Art here 5 students opted Maths here

**Grouping Data:** We put the data in Grouped form by making a group of 2,3,5 ... as depends on the number of observations

### **ILLUSTRATION:**

The following marks (out of 50) obtained in Mathematics by 60 students of Class VIII: 21, 10, 30, 22, 33, 5, 37, 12, 25, 42, 15, 39, 26, 32, 18, 27, 28, 19, 29, 35, 31, 24, 36, 18, 20, 38, 22, 44, 16, 24, 10, 27, 39, 28, 49, 29, 32, 23, 31, 21, 34, 22, 23, 36, 24, 36, 33, 47, 48, 50, 39, 20, 7, 16, 36, 45, 47, 30, 22, 17.

Groups	Tally Marks	Frequency
0-10		2
10-20		10
20-30		21
30-40		19
40-50		7
50-60		1
	<b>Total</b>	<b>60</b>

**Note :** Here in the above table in first class interval 0 – 10 there are number from 0 to 9 has occurred 2 times hen 2 is the frequency of the class 0 – 10

Limit of the Class Interval In the class interval 0 – 10 , 0 is called Lower limit and 10 is Upper limit

$$\text{CLASS SIZE} = \text{UL} - \text{LL} \ \& \ \text{CLASS MARK} = (\text{UL} + \text{LL}) / 2$$

Sometimes, data is represented **graphically** to give a clear idea of what it represents.

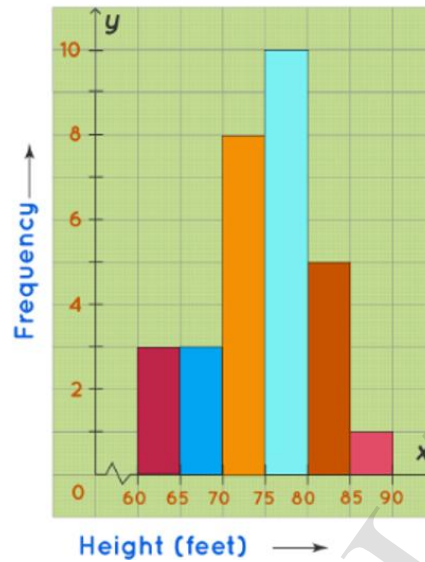
We have learnt different types of graphs in earlier classes: **Pictograph, Bar graph**

There are some more types of graphs like Histogram and Pie Chart

**Histogram:** A histogram is a diagram involving rectangles whose area is proportional to the frequency of a variable and width is equal to the class interval.

**Illustration:** Dr Rao's Garden with 30 black cherry trees. Each tree is of a different height. The height of the trees (in inches): 61, 63, 64, 66, 68, 69, 71, 71.5, 72, 72.5, 73, 73.5, 74, 74.5, 76, 76.2, 76.5, 77, 77.5, 78, 78.5, 79, 79.2, 80, 81, 82, 83, 84, 85, 87.

Height Range (ft)	Number of Trees (Frequency)
60-75	3
66-70	3
71-75	8
76-80	10
81-85	5
86-90	1



**PIE DIAGRAM:-** The “pie chart” is also known as a “circle chart”, dividing the circular statistical graphic into sectors or sections to illustrate the numerical problems. Each sector denotes a proportionate part of the whole.

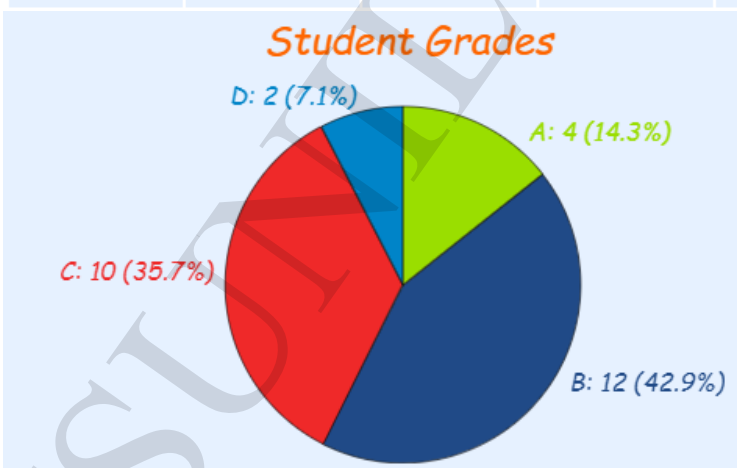
Comedy	Action	Romance	Drama	SciFi
4	5	6	1	4

This data is represented as Pie chart or graph

Now to figure out how many degrees for each "pie slice" (correctly called a [sector](#)).

A Full Circle has **360 degrees**, so we do this calculation:

Comedy	Action	Romance	Drama	SciFi	TOTAL
4	5	6	1	4	<b>20</b>
<b>20%</b>	<b>25%</b>	<b>30%</b>	<b>5%</b>	<b>20%</b>	<b>100%</b>
$4/20 \times 360^\circ$ = <b>72°</b>	$5/20 \times 360^\circ$ = <b>90°</b>	$6/20 \times 360^\circ$ = <b>108°</b>	$1/20 \times 360^\circ$ = <b>18°</b>	$4/20 \times 360^\circ$ = <b>72°</b>	<b>360°</b>



**CHANCE AND PROBABILITY:** Sometimes it happens that during rainy season, you carry a raincoat every day and it does not rain for many days. However, by chance, one day you forget to take the raincoat and it rains heavily on that day.



Suppose a coin is tossed at random. When we speak of a coin, we assume it to be 'fair' (as being 'unbiased'). By the phrase 'random toss', the coin can only land in one of two possible ways — either head up or tail up. We can reasonably assume that each outcome, head or tail, is as likely to occur as the other. We refer to this by saying that the outcomes head and tail, are equally likely. Similarly for Dice

**EVENT or OUTCOMES:** Tossing a coin in an experiment and getting Head or Tail are OUTCOMES or EVENT

$N(E)$  = Nos of favorable outcomes and  $N(S)$  = Nos of all possible events

In a single toss of a coin  $S = \{Head, Tail\}$ , If you favor to come up head  $E = \{Head\}$

The probability of an event  $P(E)$  is given as  $P(E) = \frac{\text{Number of outcomes favourable to } E}{\text{Number of all possible outcomes of the experiment}}$

$$0 \leq P(E) \leq 1$$

**Example:** In a single throw of a dice find the probability of odd prime number.

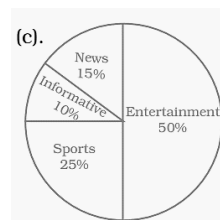
**Sol.**  $S = \{1,2,3,4,5,6\}$  hence  $N(S) = 6$ ,  $E = \{3,5\}$  hence  $N(E) = 2$

Probability of odd prime numbers =  $P(\text{Odd Prime}) = \frac{N(E)}{N(S)} = \frac{2}{6} = \frac{1}{3}$

### PROBLEMS ON DATA HANDLING

#### MCQ TYPE

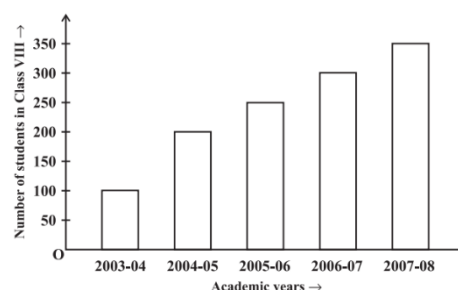
- The range of the data— 9, 8, 4, 3, 2, 1, 6, 4, 8, 10, 12, 15, 4, 3 is  
 (a) 15 (b) **14** (c) 12 (d) 10
- The following data: 2, 5, 15, 25, 20, 12, 8, 7, 6, 16, 21, 17, 30, 32, 23, 40, 51, 15, 2, 9, 57, 19, 25 is grouped in the classes 0–5, 5–10, 10–15 etc. Find the frequency of the class 20–25.  
 (a) 5 (b) 4 (c) **3** (d) 2
- The pie chart depicts the information of viewers watching different type of channels on TV. Which type of programmes are viewed the most?  
 (a) News (b) Sports (c) Informative (d) **Entertainment**
- The central angle of the sectors in a pie chart will be a fraction of the angle  
 (a)  $360^\circ$  (b)  $180^\circ$  (c)  $100^\circ$  (d) none of these



#### CASE STUDY BASED

5. In a city Delhi, there was a huge demand of opening new KVVs as big change in admission was reported. The admission from the year 2003 to 2008 was shown by a graph on the basis of the given graph answer the following.

- In which year 300 students were admitted?
- In the year 2004-2005, How many students were admitted?
- Name the type of Graph by which data is shown



#### SHORT ANSWER TYPE

- In a single toss of a coin, find the probability of getting Tail.
- What is the upper limit of the class interval 70 – 80?
- What is the frequency of 15 in the data: 10,15,65,45,32,15,12,54 ?

#### LONG ANSWER TYPE

9. Draw the Pie chart for the given data

Favourite food	North Indian	South Indian	Chinese	Others
Number of people	30	40	25	25

10. Draw the double Bar graph for the following data

Expenditure per Month (Rs)	JANUARY	FEBRUARY	MARCH	AUGUST	SEPTEMBER
Family in Chandigarh	15000	18000	25000	27000	20000
Family in Delhi	8000	9000	9500	15000	13000

11. The weekly wages (in Rs.) of 30 workers in a factory are 830, 835, 890, 810, 835, 836, 869, 845, 898, 890, 820, 860, 832, 833, 855, 845, 804, 808, 812, 840, 885, 835, 835, . Using tally marks, make a frequency distribution table with class intervals 800 – 810, 810 – 820 and so on.

**SOLUTION:**

Q1	C	Q2	C	Q3	D	Q4	A	Q5-i	2006-07
Q5-ii	200	Q5-iii	Bar graph	Q6	0.5	Q7	80	Q8	2

**PRACTICE QUESTIONS**

**MCQ:**

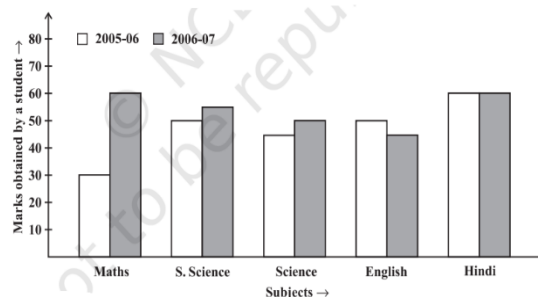
- A dice is thrown two times and sum of the numbers appearing on the dice are noted. The number of possible outcomes is  
 (a) 6 (b) 11 (c) 18 (d) 36
- In a single throw of a dice what is the probability of getting 7?  
 (a) 6 (b) 1 (c) 0 (d) 3
- In a bag, there are 4 Red balls and 6 Green balls. A ball is picked up at random, what is the probability of getting a red ball?  
 (a) 0.6 (b) 1 (c) 0.5 (d) 0.4
- What is the Lower limit of the class interval 30 - 40?  
 (a) 40 (b) 30 (c) 35 (d) 10
- The correct statement about probability is  
 (a)  $P = 1$  (b)  $P \geq 1$  (c)  $0 \geq P \leq 1$  (d)  $0 \leq P \leq 1$
- Sum of all central angle in the Pie chart is  
 (a)  $360^0$  (b)  $180^0$  (c)  $100^0$  (d). None of these
- Probability of rising the sun from east is  
 (a) 0.6 (b) 1 (c) 0.5 (d) 0.2
- What does the height of rectangle shows in a Histogram?  
 (a) Upper limit (b) Lower limit (c) Frequency (d) Range
- Today is Sunday, what is the chance of Monday tomorrow?  
 (a) 0.6 (b) 1 (c) 0.5 (d) 0.2
- In a single toss of a coin what is the sum of probability of getting Head and Tail?  
 (a) 1 (b) 6 (c) 0 (d) 3

**SHORT ANSWER TYPE**

- What does the height of a rectangle show in a histogram?
- What do you say a geometric representation showing the relationship between a whole and its parts?
- What is the range of the data 30, 61, 55, 56, 60, 20, 26, 46, 28, 56 61
- Write one example of a random experiment
- What is the probability of choosing a vowel from the alphabets?
- A double bar graph as given below shows the performance of a student in two sessions.

Read the above graph, answer the following:

- What is the information given by the double bar graph?
- In which subject has the performance improved the most?
- In which subject has the performance deteriorated?
- In which subject is the performance at par?



(e) How many marks are scored by the student in science in both sessions?

**LONG ANSWER TYPE**

Q1. A glass jar contains 6 red, 5 green, 4 blue and some yellow marbles of same size. Ram takes out a marble from the jar at random. If Probability of choosing blue ball is 0.2.

- (a) What is the probability that the chosen marble is of Red colour?
- (b) What is probability that the chosen marble is green colour?



Q2. Draw the Pie chart for the given information .

ACTIVITY	TIME SPENT (Hrs)
Sleeping	4
School	8
Home work	6
Playing	4
Others	2

Q3. Draw the Bar Graph for the following data:

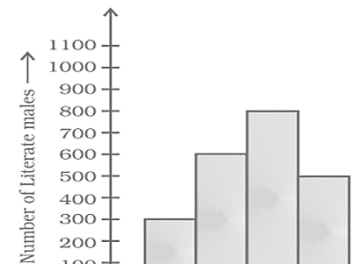
Village	Nos Of Borewell (In Hundreds)
MAURANIPUR	4
KATERA	8
RAJGARH	6
SAFA	4
RAMPURA	2

Q.4 Draw the Histogram for the given data

Class interval	30-35	35-40	40-45	45-50	50-55	55-60
frequency	15	40	35	75	38	25

**CASE STUDY BASED PROBLEMS**

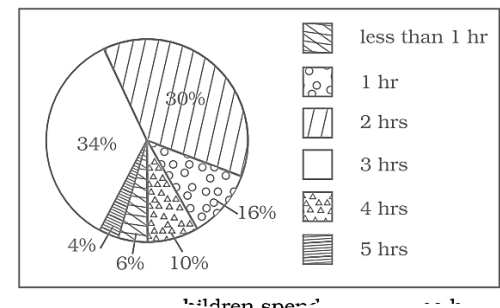
Q1. In a survey of a town of Uttar Pradesh, Hamirpur, 1800 males were surveyed above the age of 20 the information collected was represented by a Histogram as given below.



Reading the above graph answer the following

- (a) How many males are literate for the Age groups 10 to 30 years?
- (b) Which age group has maximum numbers of literate Males?

27. Government of India Planned a surveyed in a district of Madhya Pradesh and the Given below is a pie chart showing the time spend by a group of 350 children in different games. Observe it and answer the questions that follows:



- (A) How many children spend at least one hour in playing games?
- (B) How many children spend more than 2 hours in playing games?

**ANSWER**

Q1	d	Q6	a	Q11	frequency	Q16	41	Q21	0.3
Q2	c	Q7	b	Q12	Pie chart	Q17	Mark compare	Q22	0.25
Q3	d	Q8	c	Q13	41	Q18	Eng		
Q4	b	Q9	b	Q14	Toss a coin	Q19	Hindi		
Q5	d	Q10	b	Q15	5/26	Q20	50,45		

All questions are compulsory

**MCQ TYPE ( 1 Mark each)**

- In the class intervals 10 –20, 20 –30, 30-40 ,40 -50 etc., respectively, 20 lies in which class Intervals?  
 (a) 10 – 20            (b) 20 – 30            (c) 30 – 40            (d) 40 – 50
- What is the probability of sun rising from west?  
 (a) 6                      (b) 1                      (c) 0                      (d) 3
- What sector angle will a sleep activity of 8 hrs in a day make at the centre?  
 (a)  $120^{\circ}$             (b)  $180^{\circ}$             (c)  $100^{\circ}$             (d). $360^{\circ}$
- The Data available in an unorganised form is called  
 (a) Grouped            (b)Primary            (c) Raw            (d) None
- An experiment whose outcomes cannot be predicted exactly in advance is called a.  
 (a) Biased            (b) sure            (c) Random            (d) None

**SHORT ANSWER TYPE ( 1 Mark each )**

- A bag contains 6 Red balls 2 Green Balls 2 Green balls; a ball is picked up at random What is the probability of getting a red ball?
- Write the range for the data: 6, 8, 16, 22, 8, 20, 7, 25 ?
- What scale on the A4 Graph Paper will you prefer to draw the bar graph for the given data?

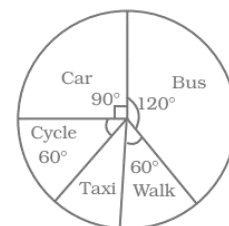
Village	A	B	C
Population	720	600	150

- Write the sixth-class interval for a grouped data whose first two class intervals are 10 – 15 and 15 – 20.
- What is the class size for a given Class interval?

**CASE STUDY BASED ( 05 Marks each)**

11. The pie chart on the right shows the result of a survey carried out to find the modes of travel used by the children to go to school.

Study the pie chart and answer the questions that follows:



- What is the most common mode of transport?
- What fraction of children travel by car?
- If 18 children travel by car, how many children took part in the survey?
- How many children use taxi to travel to school?

**LONG ANSWER TYPE ( 5 Marks )**

- A dice is rolled once. What is the probability that the number on top will be  
 (a) Odd            (b) Greater than 5            (c) A multiple of 3            (d) Less than 1

Q1. A group of 20 students recorded their heights (in cm). The data received were as given below. What is the range?

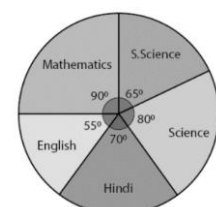
150, 120, 112, 160, 155, 151, 158, 142, 148, 149, 161, 165, 140, 157, 156, 146, 148, 153, 138, 135. (2)

Q2. What is the probability of a number selected from the numbers 1, 2, 3, …., 20 such that it is a prime number? (2)

Q3. A bag contains 3 blue and 2 red balls. A ball is drawn at random. What is the probability of drawing a red ball? (2)

Q4. A die is thrown. What is the probability of getting: (4)  
 (i) an even number? (ii) an odd number? (iii) A number between 3 and 6? (iv) A prime number.

Q5. The adjoining pie chart gives the marks scored in an examination by a student in Hindi, English, Mathematics, Social Science and Science. If the total marks obtained by the students were 540, answer the following questions.



- In which subject did the student score 105 marks?

- (ii) How many more marks were obtained by the student in Mathematics than in Hindi?
- (iii) Examine whether the sum of the marks obtained in Social Science and Mathematics is more than that in Science and Hindi. (4)

Q6. Draw a Bar Graph for the given data: (4)

School Supplies	Clip Board	crayon	Folder	Highlighter	Notebook	Binder
Items Sold	6	7	7	9	12	14

Q7. Construct a pie chart for the given data: (4)

Method of travel	Walk	Bike	Car	Bus
Frequency	9	3	6	12

Q8. From a well shuffled deck of 52 playing cards, a card is selected at random. Find the probability of getting

- (i) a black card
- (ii) a black king
- (iii) an ace
- (iv) a card of diamond

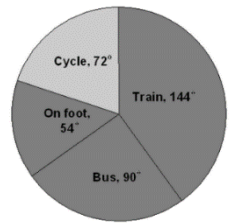
Q9. There are 1000 workers who travel from home to factory. (4)

The pie-graph shows the proportion of workers using various mode for traveling to work.

Study the pie-graph and answer the questions given below:

How many workers travel to factory

- (i) by bus?
- (ii) by train?
- (iii) by cycle?
- (iv) on foot?



# SQUARE AND SQUARE ROOTS

## Square Numbers

If a natural number  $m$  can be expressed as  $n^2$ , where  $n$  is also a natural number, then  $m$  is a square number.

Example: 1, 4, 9, 16 and 25.

## Finding the Square of a Number

If  $n$  is a number, then its square is given as  $n \times n = n^2$ .

For example: Square of 5 is equal to  $5 \times 5 = 25$

## Properties of Square Numbers

Properties of square numbers are:

If a number has 0, 1, 4, 5, 6 or 9 in the unit's place, then it may or may not be a square number. If a number has 2, 3, 7 or 8 in its units place then it is not a square number.

If a number has 1 or 9 in unit's place, then its square ends in 1.

If a square number ends in 6, the number whose square it is, will have either 4 or 6 in unit's place.

For example, consider the number 64. The unit digit of 64 is 4 and it is a square number. Because the square of 8 is 64 and 64 is considered to be a square number.

Consider a number 11 (i.e., the unit's place of 11 is 1). Thus, the square of 11 is 121. Hence, square number 121 also has 1 in the unit's place.

## Finding square of a number with unit's place 5

The square of a number  $N5$  is equal to  $(N(N + 1)) \times 100 + 25$ , where  $N$  can have one or more than one digits.

For example: If  $N = 1$ , then  $15^2 = (1 \times 2) \times 100 + 25 = 200 + 25 = 225$

If  $N = 20$ , then  $205^2 = (20 \times 21) \times 100 + 25 = 42000 + 25 = 42025$

## Perfect Squares

A number which is obtained from square of the other number is called perfect squares. For example, 81 is a perfect square number, which is obtained by taking the square of the number 9.

## Numbers between Square Numbers

There are  $2n$  non – perfect square numbers between squares of the numbers  $n$  and  $(n + 1)$ , where  $n$  is any natural number.

- There are two non-perfect square numbers (2, 3) between  $1^2 = 1$  and  $2^2 = 4$ .
- There are four non-perfect square numbers (5, 6, 7, 8) between  $2^2 = 4$  and  $3^2 = 9$ .

## Square of an odd number as a sum

Square of an odd number  $n$  i.e.  $(n^2)$  can be expressed as sum of two consecutive positive integers:

$$\frac{(n-1)^2}{2} \text{ and } \frac{(n+1)^2}{2}$$
$$n^2 = \frac{(n-1)^2}{2} + \frac{(n+1)^2}{2}$$

## Product of Two Consecutive Even or Odd Natural Numbers

The product of two even or odd natural number can be calculated as,  $(a + 1) \times (a - 1) = (a^2 - 1)$ , where  $a$  is a natural number, and  $a - 1$ ,  $a + 1$ , are the consecutive odd or even numbers.

For example:  $11 \times 13 = (12 - 1) \times (12 + 1) = 12^2 - 1 = 144 - 1 = 143$

Example:

$$1 + 3 = 4 = 2^2, \quad 1 + 3 + 5 = 9 = 3^2$$

**Pythagorean Triplets:** For any natural number  $m > 1$ , we have  $(2m)^2 + (m^2 - 1)^2 = (m^2 + 1)^2$ .

$2m, (m^2 - 1)$  and  $(m^2 + 1)$  forms a Pythagorean triplet.

For  $m = 2, 2m = 4, m^2 - 1 = 3$  and  $m^2 + 1 = 5$ . So, **3, 4, 5 is the required Pythagorean triplet.**

If  $a, b$  and  $c$  are three numbers such that any one of the following three relations holds

(A)  $a^2 + b^2 = c^2$  or (B)  $b^2 + c^2 = a^2$  or (C)  $c^2 + a^2 = b^2$

then the numbers  $a, b, c$  are said to form a Pythagorean triple.

Q1. Write a Pythagorean triplet whose one number is 6.

**SOL.** Let  $2m = 6, M = \frac{6}{2} = 3$ , Therefore  $m^2 - 1 = 3^2 - 1 = 9 - 1 = 8$   
 $M^2 + 1 = 3^2 + 1 = 9 + 1 = 10$ , So a Pythagorean whose one number is 6.

### Examples

Q 1. Find the non-perfect square numbers between: (i) 30 and 40

**Solution:**  $30 \times 2 = 60$

Q 2. Can we say whether the following numbers are perfect squares. How do we know?

(i) 1057 (ii) 23453 (iii) 7928 (iv) 222222

**Solution:** No, as we know that if unit digit of any number is 2,3,7 and 8 then such numbers are not perfect squares.

Q 3. Find whether each of the following numbers, Is a perfect square or not?

(i) 121 (ii) 55 (iii) 81 (iv) 49

**Solution:** (i) Yes,  $121 = 11 \times 11 = 11^2$  (ii) No,  $55 = 5 \times 11$ , factors are not in pairs (Group of two).

(iii) Yes,  $81 = 9 \times 9 = 9^2$  (iv) No,  $222222 = 2 \times 3 \times 7 \times 11 \times 13 \times 37$ , factors are not in pairs.

Q4. What will be the unit digit of the following numbers?

(i) 81 (ii) 272 (iii) 799 (iv) 3853

**Solution:** (i) Unit digit = 1 (ii) Unit digit = 4 (iii) Unit digit = 1 (iv) Unit digit = 9

### IMPORTANT POINTS

#### (i) Square Roots

The square root of a number 'a' is that number which when multiplied by itself gives that number 'a' as product. Thus, if b is the square root of a

Then  $b \times b = a$  or  $b^2 = a$

#### Important Points

1. The numbers which can be expressed as the product of the number with itself are called square numbers or perfect squares.

2. If a natural number  $m$  can be expressed as  $an^2$ , where  $n$  is also a natural number, then  $m$  is called a square number.

For example, 100 is square of 10, as  $100 = 10 \times 10 = 10^2$ . So 100 is a square number.

121 is the square of 11, as  $121 = 11 \times 11 = 11^2$ . So, 121 is a square number.

### PROPERTIES OF SQUARE NUMBER

(I) All square numbers end with 0,1,4,5,6 or 9 only at unit's place, i.e., all square numbers have unit's digit as 0,1,4,5,6 or 9 only.

(II) No square number ends with 2,3,7 or 8 at its unit's place.

(III) Square numbers can have only even number of zeros at the end.

(IV) No square number ends with odd number of zeros at the end.

### METHODS TO FIND SQUARE ROOTS

(I) Square root by repeated subtraction method

(II) Square root by prime factorisation method.

(III) Square root by long division method

### PRACTICE QUESTIONS:MCQ:

Q1. Which of the following is a perfect square?

A. 1057 B. 625 C. 7928 D. 64000

Q2. Which of the following will have 6 at unit place?

A.  $19^2$  B.  $11^2$  C.  $24^2$  D.  $13^2$

Q3. If 5278 is squared, then what will be at unit place?

- A. 8                      B. 7                      C. 6                      D. 4

Q4. What will be the number of zeros in square of 400?

- A. 2                      B. 3                      C. 4                      D. 6

Q5. How many natural numbers lie between  $9^2$  and  $10^2$ ?

- A. 17                      B. 18                      C. 19                      D. 20

Q6. What is the sum of the first four odd natural numbers?

- A. 16                      B. 17                      C. 18                      D. 20

Q7. The value of  $9^2 - 1$  is equal to:

- A. 81                      B. 80                      C. 79                      D. None of the above

Q8. The square of 42 is:

- A. 1764                      B. 1664                      C. 1564                      D. 1504

Q9. The Pythagorean triples whose smallest number is 8:

- A. 8, 16 17                      B. 8, 17, 18                      C. 8, 15, 17                      D. 8, 15, 16

### SHORT ANSWER QUESTIONS

Q1. Find the square root of 729 by prime factorisation method.

Q2. Find the length of the side of a square whose area is  $441 \text{ m}^2$ .

Q3. Find the square root of the following number by long division method: 2304

Q4. Find the smallest whole number by which 252 should be multiplied, to get a perfect square.

Q5. Find the square root of 4096 by prime factorisation method.

Q6. Find the square root of 169 by repeated subtraction method.

Q7. Write the Pythagorean triplet whose one number is 16.

Q8. Without doing any calculation, find whether 257 is a perfect square or not.

Q9. Write a greatest two-digit number which is a perfect square.

Q10. Find the value of  $\sqrt{17} + \sqrt{64}$ .

### LONG ANSWER QUESTION(LAQ)

Q1. Write a Pythagorean triplet whose one member is 35.

Q2. Find the square root of 225 by repeated subtraction method.

Q3. Use the identity and find the square of 189.

Q4. Find the smallest whole number by which 1008 should be divided, to get a perfect square number. Also, find the square root of the square number so obtained.

Q5. Find the smallest square number that is divisible by each of the numbers 6, 15 and 20.

Q6. Find the square root of 6241 using long division method.

### CASE BASED STUDY QUESTION(CSBQ)

A king wanted to reward his advisor, a wise man of the kingdom. So, he asked the wiseman to name his own reward. The wiseman thanked the king but said that he would ask only for some gold coins each day for a month. The coins were to be counted out in a pattern of one coin for the first day, 3 coins for the second day, 5 coins for the third day and so on for 30 days.

Q.1 Without making calculations, find how many coins will the advisor get in that month?



**ANSWERS: MCQ- Q1. B Q2. C Q3. D Q4.C Q5. C Q6. B Q7. A Q8. B Q9. C**

**ANSWER SAQ:** Q1. 27      Q2. 21 m      Q3. 48      Q4. 7      Q5. 48      Q6. 13

Q7. 16, 63, 65      Q8. No, prime factors.      Q9. 81      Q10. 5

**ANSWER LAQ:** Q1. 35, 12, 36      Q2. 15      Q3. 35721      Q4. 7 and  $\sqrt{144} = 12$       Q5. 900

Q6. 79

**ANSWER CSBQ:** Q1. 900



**TEST -1 SQUARES AND SQUARE ROOTS      MM 20**

- Q1. Find the perfect square numbers between 30 and 40. (1)  
Q2. Write a Pythagorean triplet whose one number is 6. (2)  
Q3. How many natural numbers lie between  $8^2$  and  $9^2$ . (2)  
Q4. Find the square of 105. (2)  
Q5. Find the square root of 1764 by prim factorisation method. (2)  
Q6. Find the square root of 4489 by Division method. (2)  
Q7. Find the square root of 100 by repeated subtraction method. (2)  
Q8. Find the number of digits in the square root of 27225. (2)  
Q9. Find the least number which must be subtracted from 1989 to get a perfect square. (2)  
Q10. Find the smallest number whole number by which 252 should be multiplied to get a perfect square. Also find the square root number obtained. (3)

**TEST-2: SQUARE AND SQUARE ROOTS****MM 30**

- Q1. The square of which of the following numbers would be an odd number/an even. (2)  
Q2. Express 49 as the sum of 7 odd numbers. (2)  
Q3. Find the square root of 2304 by Division method. (2)  
Q4. Find the unit digit of the number 78. (2)  
Q5. If  $25^2 = 625$ , then find the square root of 625. (2)  
Q6. Find the square of 42 without actual multiplication. (2)  
Q7. Write a Pythagorean triplet whose smallest member is 8. (2)  
Q8. Find the square root of 6400. (2)  
Q9. Find the square roots of 169 by the method of repeated subtraction. (2)  
Q10. Find the greatest 4-digit number which is a perfect square. (2)  
Q11. Find the least number that must be added to 1300 to get a perfect square. Also find the square root of the perfect square. (2)  
Q12. Find the square root of 12.2 (2)  
Q13. Find the length of the side of a square whose area is  $441 m^2$ . (3)  
Q14. A gardener has 1000 plants. He wants to plant these in such a way that the number of rows and the number of columns remain same. Find the minimum number of plants he needs more for this. (3)

# COMPARING QUANTITIES

## I. Important Concepts/ Result

- Discount is a reduction given on marked price.
  - Discount = Marked Price - Sale Price (S.P.)
- Discount can be calculated when discount percentage is given.
  - Discount = *Discount % of Marked Price*
  - Discount per cent =  $\frac{\text{Discount}}{\text{Marked Price}} \times 100\%$
- Additional expenses made after buying an article are included in the cost price and are known as overhead expenses.
  - cost price = buying price + overhead expenses
- Sales Tax is charged on the sale of an item by the government and is added to the Bill Amount.
  - Sales tax = Tax% of sale amount
  - Nowadays, prices include Value Added Tax (VAT). Since July 1, 2017, India implemented the Goods and Services Tax (GST), a unified tax on goods and services.
- Interest is the extra money paid for deposited or borrowed funds. Simple interest occurs when the principal remains constant, calculated using the formula:
- Simple Interest = (Principal x Rate x Time)/100. Amount equals the sum of the principal and simple interest.
- Deducing a formula for compound interest  $A = P \left(1 + \frac{R}{100}\right)^n$

Where, P = Principal, R = Rate of interest per annum compounded annually,

n = Number of years, A = Amount, CI = A - P

- Compound interest formula finds applications in population growth, bacterial growth, and evaluating the value of an item with increased or decreased prices. The formula considers R to be positive for increase and negative for decrease.

## Multiple Choice Questions:

- The fraction  $\frac{2}{5}$  converted to percentage is  
(a) 20% (b) 30% (c) 40% (d) 50%. **Ans: (c) 40%**
- Out of 100 students of a class, 30% like to watch T.V. How many students like to watch T.V.?  
(a) 70 (b) 60 (c) 50 (d) 30. **Ans: (d) 30.**
- Apala has 200 with her. She spent 80% amount she had. How much money is left with her?  
(a) 10 (b) 20 (c) 30 (d) 40 **Ans: (d) 40.**
- There are 1275 trees in Chaudhary Farm. Out of these 36% trees are of fruits. How many trees of fruits are there in Chaudhary Farm?  
(a) 459 (b) 549 (c) 945 (d) 954 **Ans: (a) 459**

## Case Study Based Question:

5. Ragav took a loan of Rs 8,000 from the bank at a simple interest rate of 5% per annum for two years, and he has to pay back the total amount at the end of two years. Answer the following questions based on the case study:

- What is the total amount Ragav has to pay back after two years?
- What is the interest money that Ragav has to pay?
- What would be the interest amount if Ragav had borrowed the same amount at a rate of 7% per annum?
- What would be the total amount due if Ragav borrowed Rs 10,000 at the same 5% per annum simple interest rate for three years?

**Ans:** A. To find the total amount Ragav must pay back after two years, we need to use the formula for simple interest:

$$\text{Simple Interest} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

Here, Principal = Rs 8,000, Rate = 5% per annum, and Time = 2 years.

So, the simple interest on the loan would be:

$$\text{Simple Interest} = \frac{8000 \times 5 \times 2}{100} = \text{Rs } 800$$

The total amount Ragavhas to pay back after two years would be the sum of the Principal and the Simple Interest:

Total Amount = Principal + Simple Interest

$$\text{Total Amount} = \text{Rs } 8,000 + \text{Rs } 800 = \text{Rs } 8,800$$

Therefore, Ragavhas to pay back Rs 8,800 after two years.

**B.** The interest money that Ragav has to pay would simply be the Simple Interest calculated above:

Interest = Simple Interest, Interest = Rs 800

Therefore, Ragavhas to pay Rs 800 as interest.

**C.** If Ragav had borrowed the same amount at a rate of 7% per annum for two years, then the interest amount would be:

$$\text{Simple Interest} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

$$\text{Simple Interest} = (8000 \times 7 \times 2)/100 = \text{Rs } 1,120$$

So, the interest amount would be Rs 1,120 if the rate of interest was 7% per annum.

**D.** If Ragav borrowed Rs 10,000 at the same 5% per annum simple interest rate for three years, then the interest amount would be:

$$\text{Simple Interest} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

$$\text{Simple Interest} = (10,000 \times 5 \times 3)/100 = \text{Rs } 1,500$$

The total amount due after three years would be the sum of the Principal and the Simple Interest:

Total Amount = Principal + Simple Interest

$$\text{Total Amount} = \text{Rs } 10,000 + \text{Rs } 1,500 = \text{Rs } 11,500$$

Therefore, the total amount due would be Rs 11,500 if the loan amount was Rs 10,000 and the rate of interest was 5% per annum for three years.

### **Short answer type question**

6. A shirt has a marked price of ₹1200. If a discount of 20% is given, what will be the selling price of the shirt?

**Answer:** To find the selling price, first find the discount amount.

$$\text{Discount amount} = \frac{(\text{Marked Price} \times \text{Discount percent})}{100}$$

$$\text{Discount amount} = \frac{(\text{₹}1200 \times 20)}{100} = \text{₹}240$$

Selling Price = Marked Price - Discount amount

$$\text{Selling Price} = \text{₹}1200 - \text{₹}240 = \text{₹}960$$

Hence, the selling price of the shirt after the discount is ₹960.

7. A book has a market price of ₹300 excluding tax. If 6% GST is added to the cost of the book, what will be the total cost of the book including GST?

**Answer:** To find the total cost of the book including GST, first calculate the GST amount.

$$\text{GST amount} = \frac{(\text{Marked Price} \times \text{GST rate})}{100}$$

$$\text{GST amount} = \frac{(\text{₹}300 \times 6)}{100} = \text{₹}18$$

Total Cost of the book = Marked Price + GST amount

$$\text{Total Cost} = \text{₹}300 + \text{₹}18 = \text{₹}318$$

Hence, the total cost of the book, including GST, is ₹318.

8. John invested ₹2000 at a compound interest rate of 6% per annum for 2 years. Calculate the compound interest.

**Answer:** To calculate the compound interest, we first need to find the amount at the end of 2 years.

The formula for compound interest is:  $A = P \left(1 + \frac{R}{100}\right)^n$

where: A is the amount at the end of the period, P is the principal amount (₹2000 in this case)  
r is the interest rate (6% per annum), n is the number of years (2 years)

$$A = 2000 \left(1 + \frac{6}{100}\right)^2 = 2000 (1 + 0.06)^2 = 2000 (1.06)^2$$

$$A = 2000 \times 1.1236 = ₹2247.20$$

Now that we have the amount, we can calculate the compound interest:

$$CI = A - P = ₹2247.20 - ₹2000 = ₹247.20$$

So, the compound interest that John earned after 2 years is ₹247.20.

### Long answer type questions

9. Seema buys a dress originally priced at Rs. 1,000 but with a 20% discount and a 5% GST applied. Rahul invests Rs. 10,000 in a mutual fund with a 6% annual compound interest rate. Determine the final cost of the dress for Seema after accounting for the discount and GST, as well as the total amount Rahul will earn after two years with the compound interest.

#### **Ans: Case 1:**

To find the final amount Seema needs to pay, we'll first calculate the discount and then apply the GST.

**Step 1:** Calculate the discount amount

Discount percentage = 20%

$$\text{Discount} = (\text{Marked price} \times \text{Discount percentage}) = (1000 \times 20\%) = \text{Rs. } 200$$

**Step 2:** Calculate the selling price after discount

$$\text{Selling price after discount} = \text{Marked price} - \text{Discount} = \text{Rs. } 1000 - \text{Rs. } 200 = \text{Rs. } 800$$

**Step 3:** Calculate the GST on the discounted price: GST percentage = 5%

$$\text{GST} = (\text{Selling price after discount} \times \text{GST percentage}) = (800 \times 5\%) = \text{Rs. } 40$$

**Step 4:** Calculate the final amount by adding GST

$$\text{Final amount} = \text{Selling price after discount} + \text{GST} = \text{Rs. } 800 + \text{Rs. } 40 = \text{Rs. } 840$$

So, Seema needs to pay a final amount of Rs. 840 for the dress after considering the discount and GST.

**Case 2:** To find the amount Rahul will receive at the end of two years and the total interest he earns, we can use the compound interest formula.

Compound interest formula:  $A = P \left(1 + \frac{R}{100}\right)^n$

Where, A = Final amount, P = Principal amount = Rs. 10,000

r = Annual interest rate = 6% (0.06 as decimal),

n = Number of times interest is compounded per year = 1 (compounded annually), t = Number of years = 2

**Step 1:** Calculate the final amount using the compound interest formula

$$A = 10000 \left(1 + \frac{0.06}{1}\right)^{1 \times 2} = 10000(1 + 0.06)^2 = 10000(1.06)^2$$

$$A = 10000 \times 1.1236 = \text{Rs. } 11,236$$

**Step 2:** Calculate the total interest earned

$$\text{Total interest} = \text{Final amount} - \text{Principal amount} = \text{Rs. } 11,236 - \text{Rs. } 10,000 = \text{Rs. } 1,236$$

So, Rahul will receive Rs. 11,236 at the end of two years and will earn a total interest of Rs. 1,236.

10. Tom is an investor who has invested Rs 15,000 in the stock market, which is growing at a rate of 7% per annum. Meanwhile, his friend Mary bought a computer for Rs 75,000, however, its value is depreciating at a rate of 10% per annum. Tom wonders how much his investment will be worth after five years, while Mary is curious to know the value of her computer after three years. How will their respective investments perform over time?

Ans: Let's find the future value of Tom's investment and the depreciated value of Mary's computer separately.

For Tom's investment:

He has invested Rs 15,000 in the stock market, which is growing at a rate of 7% per annum.

Step 1: Identify the variables

- Principal amount (P) = Rs 15,000
- Growth rate (R) = 7% per annum
- Time (n) = 5 years

Step 2: Calculate the future value (A) using compound interest formula:  $A = P \left(1 + \frac{R}{100}\right)^n$

Step 3: Put in the values and evaluate:

$$A = 15000 \left(1 + \frac{7}{100}\right)^5$$

$$A = 15000(1 + 0.07)^5$$

$$A = 15000(1.07)^5$$

$$A = 15000 \times 1.40255 \text{ (rounded to 5 decimal places)}$$

$$A = \text{Rs } 21,038.25$$

So, Tom's investment will be worth Rs 21,038.25 after five years.

For Mary's computer:

She bought the computer for Rs 75,000, and its value is depreciating at a rate of 10% per annum.

Step 1: Identify the variables

- Initial value (P) = Rs 75,000
- Depreciation rate (R) = 10% per annum
- Time (T) = 3 years

Step 2: Calculate the depreciated value (A) using the depreciation formula:  $A = P \left(1 - \frac{R}{100}\right)^n$

Step 3: Putting in the values and evaluate:

$$A = 75000 \left(1 - \frac{10}{100}\right)^3 = 75000(1 - 0.1)^3 = 75000(0.9)^3$$

$$A = 75000 \times 0.729 \text{ (rounded to 3 decimal places)} = \text{Rs } 54,675$$

So, the value of Mary's computer will be Rs 54,675 after three years.

### **MCOs (Questions for Practice)**

- Convert the fraction  $\frac{3}{4}$  to percentage.
  - 60%
  - 70%
  - 75%
  - 80%
- Convert the decimal 0.25 to percentage.
  - 2.5%
  - 10%
  - 25%
  - 50%
- Convert the percentage 30% to a fraction in its simplest form.
  - $\frac{1}{3}$
  - $\frac{3}{10}$
  - $\frac{7}{10}$
  - $\frac{1}{5}$
- Convert the percentage 40% to a decimal.
  - 0.04
  - 0.4
  - 4
  - 0.004
- Which is larger: 20% of 250 or 30% of 200?
  - 20% of 250
  - 30% of 200
  - Both are equal
  - Cannot be determined
- If the cost price (CP) of an item is Rs 80 and the selling price (SP) is Rs 100, what is the profit?
  - Rs 10
  - Rs 20
  - Rs 30
  - Rs 40
- Calculate the profit percentage when the cost price (CP) is Rs 400 and the selling price (SP) is Rs 500.
  - 20%
  - 25%
  - 30%
  - 35%
- If the marked price (MP) of an item is Rs 150, and a 20% discount is offered, calculate the selling price (SP).
  - Rs 100
  - Rs 110
  - Rs 120
  - Rs 130
- The simple interest on a principal amount of Rs 500 at a rate of 5% per annum for 2 years is:
  - Rs 25
  - Rs 50
  - Rs 75
  - Rs 100
- A customer has to pay 7% sales tax on an item worth Rs 100. Calculate the total amount the customer needs to pay, including the sales tax.
  - Rs 93
  - Rs 100
  - Rs 107
  - Rs 120

### **Short answer type question(For Practise)**

- What is the profit obtained when an item with a cost price of Rs 100 is sold at a selling price of Rs 150?
- Calculate the loss incurred if an item with a cost price of Rs 80 is sold for Rs 60.

3. If the cost price of an item is Rs 200 and the profit is calculated as 25%, what is the selling price?
4. A shopkeeper offers a 10% discount on a product with a marked price (Sales price) of Rs 300. What is the selling price after discount?
5. Calculate the discount percentage if a product with a marked price of Rs 500 was sold for Rs 400.
6. Express a 25% discount as a fraction and a decimal.
7. If you invest Rs 1000 at a 5% annual interest rate, how much simple interest will you receive after 2 years?
8. Calculate the compound interest earned on an investment of Rs 5000 at a 6% annual interest rate, compounded annually for 3 years.
9. Compare the simple and compound interest for an investment of Rs 2000 at a 4% annual interest rate over 4 years.
10. If a sales tax of 5% is levied on an item with a cost price of Rs 350, what is the final price including sales tax?

### **Long answer type questions (For Practise)**

1. A tree grows at a rate of 12% per year. If the initial height of the tree is 25 meters, how tall will the tree be after 4 years?
2. Kelly purchased 50 notebooks for a total of Rs 500. She sold each notebook for Rs 12. Calculate the total profit or loss on the transaction and the profit or loss percentage.
3. A product has a Marked Price (MP) of Rs 80 and a Selling Price (SP) of Rs 68, after applying a discount. Calculate the discount amount, discount percentage, and represent the discount as a fraction and decimal.
4. Calculate Compound Interest, the amount after 3 years, and compare it to the Simple Interest. Given: Principal = Rs 400, Rate = 8%, and Time = 3 years.
5. Find the principal, rate of interest, and time, if the simple interest on a particular amount is Rs 600, and the total amount after 2 years is Rs 2600.
6. A person buys a television for Rs 1500, which includes 10% VAT. Calculate the original cost of the television before VAT, and the amount of VAT paid.

### **Case Study Based Questions (For Practise)**

#### **Clothing Store**

John runs a small clothing store in his town. Last month, he sold a limited-edition shirt with different discount offers. He noticed two schemes brought significantly different sales.

**Scheme A:** - A marked price (MP) of Rs 80. - A discount percentage of 25%.  
- The selling price (SP) can be calculated by converting the discount to a fraction or decimal.

**Scheme B:** - A marked price (MP) of Rs 100. - A flat discount of Rs 24 on each shirt.  
- The selling price (SP) can be calculated using the discount.

- (a). What were the selling prices for both schemes?
- (b). Which scheme generated more revenue if he sold 100 shirts under each scheme?

#### **Case Study 2: Savings For Education**

Amit wants to invest Rs 10,000 for his son's education. He is considering two options for investment: a simple interest-bearing account and a compound interest-bearing account. Below are the available investment options:

**Option 1 (Simple Interest):** - Principal: Rs 10,000.- Rate of interest: 6% per year. - Time: 10 years.  
- Calculate the simple interest and the total amount after 10 years.

**Option 2 (Compound Interest):** - Principal: Rs 10,000. - Rate of interest: 5% per year, compounded annually. - Time: 10 years.

Calculate the compound interest and the total amount after 10 years.

- (a). Which option would result in a higher return at the end of 10 years?
- (b). If Amit has the option of including a 5% VAT (Value-Added Tax) on the interest earned for one of the options, which option should he choose for maximizing the final amount?

**Answers MCO (PRACTISE)**

1. c. 75%                      2. c. 25%                      3. b. 3/10                      4. b. 0.4  
5.. a. 20% of 250            6. b. Rs 20                    7. b. 25%                    8. c. Rs 120  
9.. d. Rs 100                    10. c. Rs 107

**Answers: (Sort Answer Type Questions)**

1. Profit = SP - CP = Rs 150 - Rs 100 = Rs 50.  
2. Loss = CP - SP = Rs 80 - Rs 60 = Rs 20.  
3. Profit amount = Rs 50. Selling Price = CP + Profit amount = Rs 250.  
4. Discount amount = Rs 30. Selling Price (SP) = MP - Discount amount = Rs 270.  
5. Discount amount = Rs 100. Discount percentage = 20%.  
6. As a fraction:  $25/100 = 1/4$ . As a decimal: 0.25.  
7. Simple Interest = Rs 200.  
8. Compound Interest  $\approx$  Rs 955.08.  
9. Simple Interest = Rs 320. Compound Interest  $\approx$  Rs 341.19.  
10. Sales tax amount = Rs 17.50. Final price = Rs 367.50.

**Answers: (Long Answer type Questions)**

1. Height of the tree would be approximately 48.69 meters.  
2. Total Profit = Rs 100, Profit Percentage = 20%  
3. Discount amount = Rs 12, Discount Percentage = 15%, Fraction = 3/20, Decimal = 0.15  
4. Compound Interest > Simple Interest (Rs 104 > Rs 96)  
5. Principal = Rs 2000, Rate of interest = 15%, Time = 2 years  
6. Cost before VAT = Rs 1363.64, VAT amount = Rs 136.36

**Answer Key: (Case Study 1: Clothing Store)**

1. Scheme A: Rs 60, Scheme B: Rs 76.  
2. Scheme A: Rs 6,000 in revenue, Scheme B: Rs 7,600 in revenue.  
Hence, Scheme B generated more revenue.

**Answer Key: (Case Study 2: Savings For Education)**

1. Option 1 (Simple Interest): Rs 16,000, Option 2 (Compound Interest): Rs 6,386.16.  
Hence, Option 2 (Compound interest) would result in a higher return.  
2. Adding 5% VAT on the interest earned in Option 1: Rs 16,300, Adding 5% VAT on the interest earned in Option 2: Rs 16,705.47.  
Therefore, Amit should choose Option 2 (Compound interest) for maximizing the final amount.

**Test-1 (20 marks)**

**Section A: Multiple Choice Questions (MCQs) - 1 marks each (5 marks)**

Question 1: The percentage of profit or loss is calculated on which of the following?

- a) Selling Price            b) Marked Price            c) Cost Price            d) Discount

Question 2: If a discount of 20% is given on an article, what fraction is equal to the discount percentage?

- a) 1/5                      b) 1/4                      c) 1/3                      d) 1/6

Question 3: The formula for simple interest is:

- a)  $P \times R \times T$             b)  $P \times R \times T/100$             c)  $P \times T/100$             d)  $P \times R/100$

Question 4: In compound interest, the interest for each period is calculated on:

- a) Principal            b) Principal + Accumulated Interest            c) Principal – Interest            d) Principal  $\times$  Interest

Question 5: Which of the following is the formula to find the amount under compound interest?

- a)  $A = P(1 + \frac{R}{100})^T$             b)  $A = P + \frac{P \times R \times T}{100}$             c)  $A = P \times (1 + R \times T)$             d)  $A = P -$

**Section B: Short-Answer Questions - 2 marks each (6 marks)**

Question 6: What is the difference between simple interest and compound interest in terms of calculation?

Question 7: If an item costs \$500 and is sold for \$600, how much is the profit percentage?

Question 8: Convert 25% of discount into a decimal.

**Section C: Long-Answer Question - 5 marks (5 marks)**

Question 9: Explain the impact of applying GST and compound interest on the price of an item.

**Section D: Case Study Based Question - 2 marks each (4 marks)**

Question 10: Case Study: A business owner purchased an article for Rs 2000 and marked its price 20% above the cost price. The owner offered a discount of 10% during a sale. Calculate the selling price and profit percentage after the discount.

**Chapter Test 2 (30 marks)**

**Multiple Choice Questions (6 questions, 1 mark each):**

- If the selling price of an item is Rs 300 and the cost price is Rs 250, what is the profit?  
a) Rs 50      b) Rs 150      c) Rs 450      d) Rs 350
- If the profit percentage is 20% and the cost price of an item is Rs 400, what is the selling price?  
a) Rs 480      b) Rs 550      c) Rs 320      d) Rs 500
- The marked price of a product is Rs 250. If a discount of 30% is given, what is the selling price?  
a) Rs 175      b) Rs 200      c) Rs 225      d) Rs 150
- Convert a 20% discount into a decimal.  
a) 0.2      b) 0.25      c) 0.15      d) 0.325.
- If the principal amount is Rs 1000 and the simple interest is calculated at 5% per annum for 2 years, what is the total amount after 2 years?  
a) Rs 1100      b) Rs 1080      c) Rs 1200      d) Rs 1050
- Which is generally higher, simple interest or compound interest for the same initial investment and the same interest rate?  
a) Simple interest      b) Compound interest      c) Both are equal      d) Cannot be determined

**Short Answer Type Questions (3 questions, 2 marks each):**

- Calculate the profit percentage if the cost price of an item is Rs 250 and the selling price is Rs 325.
- Calculate the amount of GST on a product with a price of Rs 350 if the GST rate is 5%.
- Find the time in years when the principal amount of Rs 500 becomes Rs 700 at an interest rate of 8% per annum simple interest.

**Long Answer Type Questions (2 questions, 5 marks each):**

- Explain the differences between simple interest and compound interest using examples.
- A shopkeeper offers a discount of 10% on the marked price of a product. If the marked price of the product is Rs 400, calculate the selling price of the product and the discount being given in both percentage and decimal. Also, calculate the amount of GST charged if the rate is 12%.

**Case Study Based Questions (2 questions, 4 marks each):**

- Radha invests Rs 6000 in a compound interest savings account at an annual interest rate of 3% compounded annually. Calculate the interest she earns after 3 years and compare it to what she would have earned if it were simple interest.
- John borrows Rs 15000 from a bank at a simple interest rate of 6% per annum. Calculate the total interest he has to pay after 4 years. Later, when John gets a loan for his business at a compound interest rate of 6% per annum, calculate the compound interest he has to pay after the same period of 4 years.



**Answer Key: TEST 1**

**Section A:**

1. c) Cost Price      2. a)  $1/5$       3. b)  $P \times R \times T / 100$       4. b) Principal + Accumulated Interest  
5. a)  $A = P \left(1 + \frac{R}{100}\right)^n$

**Section B:**

6. In simple interest, interest is calculated on the principal amount, while in compound interest, interest is calculated on the principal amount plus accumulated interest.  
7. Profit Percentage =  $(100 \times 100) / 500 = 20\%$       8. 0.25

**Section C:**

9. When GST and compound interest are applied to the price of an item, they increase the overall cost of the item. GST is a tax applied by the government on goods and services, increasing their base price. Compound interest is the interest calculated on the principal amount plus accumulated interest for each period and as a result, the total amount payable increases over time.

**Section D:**

10. Marked Price =  $2000 + (20\% \times 2000) = \text{Rs } 2400$   
Discounted Price =  $2400 - (10\% \times 2400) = \text{Rs } 2160$   
Selling Price = Rs 2160  
Profit Percentage =  $((2160 - 2000) / 2000) \times 100 = 8\%$

**Answer Key: TEST 2**

1. a) Rs 50      2. a) Rs 480      3. a) Rs 175      4. a) 0.2      5. c) Rs 1200      6. b) Compound interest  
7. 30%      8. Rs 17.50      9. 5 years  
10. Explanation of the differences between simple interest and compound interest  
11. [Detailed calculations of selling price, discount percentage, discount in decimal, and GST amount]  
12. Compound interest: Rs 560.36, Simple interest: Rs 540  
13. Simple interest: Rs 3600, Compound interest: Rs 3847.94

# ALGEBRAIC EXPRESSION AND IDENTITIES

## Important Concepts/ Result

1. Terms are formed by the product of variables and constants, e.g.  $-3xy$ ,  $2xyz$ ,  $5x$ , etc.
2. Terms are added to form expressions, e.g.  $-2xy + 5x$ .
3. Expressions that contain exactly one, two and three terms are called monomials, binomials and trinomials, respectively.
4. In general, any expression containing one or more terms with non-zero coefficients (and with variables having non-negative exponents) is called a polynomial.
5. Like terms are formed from the same variables and the powers of these variables are also the same. But coefficients of like terms need not be the same.
6. There are number of situations like finding the area of rectangle triangle, etc. in which we need to multiply algebraic expressions.
7. Multiplication of two algebraic expressions is again an algebraic expression.
8. A monomial multiplied by a monomial always gives a monomial.
9. While multiplying a polynomial by a monomial, we multiply every term in the polynomial by the monomial using the distributive law  $a(b+c) = ab + ac$ .
10. In the multiplication of a polynomial by a binomial (or trinomial), we multiply term by term, i.e. every term of the polynomial is multiplied by every term in the binomial (or trinomial) using the distributive property.

## MCOs (illustrations/Examples)

1. Subtract the algebraic expressions:  $6a - 3b$  and  $4a + 2b$ .

- A.  $2a - 5b$
- B.  $2a + 5b$
- C.  $10a - 5b$
- D.  $10a + 5b$

Answer: B.  $2a + 5b$

2. Evaluate the product using the distributive property:  $(5x + 3y)(4x - 2y)$ .

- A.  $20x^2 - 6xy$
- B.  $20x^2 + 18xy$
- C.  $20x^2 - 10xy + 6y^2$
- D.  $20x^2 + 22xy - 6y^2$

Answer: C.  $20x^2 - 10xy + 6y^2$

3. Multiply the trinomials:  $(x + 2y + 3z)(x - 2y - 3z)$ .

- A.  $x^2 - 4y^2 - 9z^2$
- B.  $x^2 + 4y^2 + 9z^2$
- C.  $x^2 - 4y^2 + 9z^2$
- D.  $x^2 + 4y^2 - 9z^2$

Answer: A.  $x^2 - 4y^2 - 9z^2$

4. Evaluate the product:  $(2x + y)(x^2 - xy + y^2)$ .

- A.  $2x^3 + 3x^2y - 2xy^2 + y^3$
- B.  $2x^3 - x^2y + xy^2 + y^3$
- C.  $2x^3 + x^2y - 3xy^2 + y^3$
- D.  $2x^3 - x^2y + 2xy^2 + y^3$

Answer: B.  $2x^3 - x^2y + xy^2 + y^3$

## Case Study

5 In a small town, there is a group of students from 'Creative Minds' school. The Mathematics teacher, Mr. Sharma, has given students a challenge to find the total area of three unique gardens A, B, and C, and to compare these three gardens to determine which one has the largest area. To complete this challenge, the students need to apply their knowledge of algebraic expressions and their skills of addition, subtraction, multiplication, and simplification.

The area of each garden is represented as follows:

Garden A:  $(x^2 + 3x)$  sq. meters

Garden B:  $(2x^2 - 7x)$  sq. meters

Garden C:  $(\frac{1}{2}x^2 + 5x + 8)$  sq. Meters

Question 1: Find the sum of algebraic expressions representing the area of Garden A and Garden B.

Solution 1:

Sum of the area of Garden A and Garden B

$$= (x^2 + 3x) + (2x^2 - 7x)$$

$$= x^2 + 3x + 2x^2 - 7x$$

$$= (x^2 + 2x^2) + (3x - 7x)$$

$$= 3x^2 - 4x$$

Question 2: Simplify the algebraic expression representing the area of Garden C.

Solution 2:

$$\text{Area of Garden C} = \frac{1}{2}x^2 + 5x + 8$$

Since there are no like terms present, this expression is already simplified.

Question 3: Find the product of the area of Garden A and Garden B.

Solution 3:

$$\text{Product of area of Garden A and Garden B} = (x^2 + 3x)(2x^2 - 7x)$$

Now we need to multiply each term in the first expression by each term in the second expression:

a. Monomial multiplied by a monomial  $= x^2 \times 2x^2 = 2x^4$

b. Monomial multiplied by a binomial or trinomial (expanding brackets):

$$= x^2 \times (-7x) + 3x \times (2x^2) + 3x \times (-7x)$$

$$= -7x^3 + 6x^3 - 21x^2$$

c. Combine the results from steps a and b and simplify the expression:

$$= 2x^4 + (-7x^3 + 6x^3) - 21x^2$$

$$= 2x^4 - x^3 - 21x^2$$

The product of the area of Garden A and Garden B is  $2x^4 - x^3 - 21x^2$ .

## Short answer type question

Q1. If  $A = 5x^2 - 3x + 2$  and  $B = 2x^2 + 4x - 5$ , find the sum and the difference of A and B.

Solution:

$$\text{Sum: } A + B = (5x^2 - 3x + 2) + (2x^2 + 4x - 5)$$

$$= (5x^2 + 2x^2) + (-3x + 4x) + (2 - 5) = 7x^2 + x - 3$$

$$\text{Difference: } A - B = (5x^2 - 3x + 2) - (2x^2 + 4x - 5)$$

$$= (5x^2 - 2x^2) + (-3x - 4x) + (2 + 5) = 3x^2 - 7x + 7$$

2. Simplify the following expression using the distributive property:  $2(x + 3) + 5(2x - 1)$

Solution:

Using the distributive property, we get:

$$= 2x + 6 + 10x - 5$$

$$= 12x + 1$$

Therefore, the simplified expression is  $12x + 1$ .

3 Find the product of two trinomials  $-(2x + y - 3z)$  and  $(x + 2y + z)$  using the distributive property.

Solution:

$$\begin{aligned} &= -(2x + y - 3z)(x + 2y + z) \\ &= (2x)(x) + (2x)(2y) + (2x)(z) + (y)(x) + (y)(2y) + (y)(z) - (3z)(x) - (3z)(2y) - (3z)(z) \\ &= 2x^2 + 4xy + 2xz + xy + 2y^2 + yz - 3zx - 6zy - 3z^2 \\ &= 2x^2 + 5xy + 2y^2 - zx - 6zy + 2xz + yz - 3z^2 \end{aligned}$$

### Long answer type questions

1 In the given expressions, (A)  $2x^2 - 5x + 1$  and (B)  $7x^2 - 11x + 2$ , add and subtract the expressions, and simplify the resulting expressions. Furthermore, multiply expression (A) with expression (B) using the distributive property and simplify.

Solution:

Step 1: Addition of algebraic expressions.

$$\begin{aligned} &(2x^2 - 5x + 1) + (7x^2 - 11x + 2) \\ &= 2x^2 - 5x + 1 + 7x^2 - 11x + 2 \text{ (Combine like terms.)} \\ &= (2x^2 + 7x^2) + (-5x - 11x) + (1 + 2) \\ &= 9x^2 - 16x + 3 \end{aligned}$$

Step 2: Subtraction of algebraic expressions.

$$\begin{aligned} &(2x^2 - 5x + 1) - (7x^2 - 11x + 2) \\ &= 2x^2 - 5x + 1 - 7x^2 + 11x - 2 \text{ (Combine like terms.)} \\ &= (2x^2 - 7x^2) + (-5x + 11x) + (1 - 2) \\ &= -5x^2 + 6x - 1 \end{aligned}$$

Step 3: Multiplication of algebraic expressions using the distributive property.

$$\begin{aligned} &(2x^2 - 5x + 1)(7x^2 - 11x + 2) \\ &= 2x^2(7x^2) + 2x^2(-11x) + 2x^2(2) - 5x(7x^2) - 5x(-11x) - 5x(2) + 1(7x^2) - 1(11x) + 1(2) \\ &= 14x^4 - 22x^3 + 4x^2 - 35x^3 + 55x^2 - 10x + 7x^2 - 11x + 2 \\ &= 14x^4 + (-22x^3 - 35x^3) + (4x^2 + 55x^2 + 7x^2) + (-10x - 11x) \\ &= 14x^4 - 57x^3 + 66x^2 - 21x + 2 \end{aligned}$$

The added expression is  $9x^2 - 16x + 3$ . The subtracted expression is  $-5x^2 + 6x - 1$ . The product of the expressions using the distributive property is  $14x^4 - 57x^3 + 66x^2 - 21x + 2$ .

2 Consider the following algebraic expressions: expression (A)  $3x^3 - 5x^2 + 4x - 6$  and expression (B)  $2x^2 - 3x + 1$ . Find the product of expression (A) by the monomial  $2y$ , and expression (B) by the binomial  $(x - 4y)$ . Use the distributive property to expand the product.

Solution:

Step 1: Product of expression (A) by the monomial  $2y$ .

$$\begin{aligned} &(3x^3 - 5x^2 + 4x - 6)(2y) \\ &= 3x^3(2y) - 5x^2(2y) + 4x(2y) - 6(2y) \\ &= 6x^3y - 10x^2y + 8xy - 12y \end{aligned}$$

Step 2: Product of expression (B) by the binomial  $(x - 4y)$ .

$$\begin{aligned} & (2x^2 - 3x + 1)(x - 4y) \\ = & 2x^2(x) + 2x^2(-4y) - 3x(x) - 3x(-4y) + 1(x) + 1(-4y) \\ = & 2x^3 - 8x^2y - 3x^2 + 12xy + x - 4y \end{aligned}$$

The product of expression (A) and the monomial  $2y$  is  $6x^3y - 10x^2y + 8xy - 12y$ . The product of expression (B) and the binomial  $(x - 4y)$  is  $2x^3 - 8x^2y - 3x^2 + 12xy + x - 4y$ .

### MCQs (Questions for Practice)

- What is the sum of the algebraic expressions:  $3x + 5y$  and  $2x - 4y$ ?  
A.  $1x + 1y$   
B.  $5x + 1y$   
C.  $5x - 1y$   
D.  $5x + 9y$
- Simplify the algebraic expression:  $4(3m - 2n) - 2(4m + 5n)$ .  
A.  $-2m - 16n$   
B.  $-2m + 16n$   
C.  $2m + 16n$   
D.  $2m - 16n$
- Multiply the monomials:  $4x^2y \times 3xy^3$   
A.  $12x^2y^4$   
B.  $7x^3y^3$   
C.  $12x^3y^4$   
D.  $12x^3y^3$
- Multiply the monomial by the binomial:  $3x(2x - 5)$ .  
A.  $6x^2 - 15x$   
B.  $5x^2 - 15x$   
C.  $6x^2 + 5x$   
D.  $5x^2 + 15x$
- Multiply the binomials using the distributive property:  $(a + 5)(2a - 3)$ .  
A.  $2a^2 - 3a + 10$   
B.  $2a^2 + 7a + 15$   
C.  $2a^2 + 10a - 15$   
D.  $2a^2 - 3a + 10a - 15$
- Simplify the expression:  $(x^2 + 3x - 2)(x - 1)$ .  
A.  $x^3 + 2x^2 - 5x + 2$   
B.  $x^3 + 2x^2 + 5x - 2$   
C.  $x^2 + 2x^2 - 5x - 2$   
D.  $x^2 + 2x^2 + 5x + 2$
- Expand the binomial expression:  $(2x + 3)(3x - 4)$ .  
A.  $6x^2 - 5x - 12$   
B.  $6x^2 - 8x + 9x - 12$   
C.  $6x^2 + x - 12$   
D.  $6x^2 - 3x + 12$
- Expand and simplify the expression:  $(2m - n)(2m + n)$ .  
A.  $4m^2 - n^2$   
B.  $4m^2 + n^2$   
C.  $4m^2 - 2mn + n^2$   
D.  $4m^2 + 2mn - n^2$
- Evaluate the expression:  $(4x^2 - 3xy + 2y^2)(2x + y)$ .  
A.  $8x^3 - x^2y + 2xy^2$   
B.  $8x^3 + 5x^2y - xy^2$   
C.  $8x^3 - x^2y - xy^2$   
D.  $8x^3 + 6x^2y + xy^2$
- Simplify the expression:  $(3a - 2b)(a^2 + 2ab + b^2)$ .  
A.  $3a^3 - 6a^2b + 3ab^2 + 2ab^3$   
B.  $3a^3 - 6a^2b + 4b^3$   
C.  $3a^3 - 4b^3$   
D.  $3a^3 - 2a^2b + 2b^3$

### Short answer type question

1. Add the following algebraic expressions:  $2x + 5y$ ,  $3x - 4y$ ,  $-x + 6y$
2. Subtract the following algebraic expressions:  $(3a - 4b) - (2a + 5b)$
3. Multiply the following monomials:  $4x$  and  $5x$
4. Multiply the following monomials:  $-3a^2b$  and  $4ab^2$
5. Multiply the following algebraic expressions:  $2x(3x - 4y)$
6. Multiply the following algebraic expressions:  $5a(2a^2 - 3ab + b^2)$
7. Multiply the following binomials:  $(x + 3)(x - 2)$
8. Multiply the following binomials:  $(2x - 5)(x + 4)$
9. Multiply the following trinomials:  $(x^2 + 2x + 1)(x + 1)$
10. Simplify  $(a + b)(2a - 3b + c) - (2a - 3b)c$ .

### Long answer type questions

1. Consider two algebraic expressions:  $A = 4x^2 - 5xy + 7y^2$  and  $B = -3x^2 + 2xy - 9y^2$ . Find the sum and difference of these two algebraic expressions.
2. Given two monomials:  $M1 = 3x^2y$  and  $M2 = -5xy^2$ . Calculate the product of  $M1$  and  $M2$ .
3. Compute the product of the monomial  $(2x^2)$  with the binomial  $(3x - 4y)$ .
4. Calculate the product of the monomial  $(-x)$  with the trinomial  $(6x^2 - 8xy + 9y^2)$ .
5. Multiply the following pair of binomials:  $(4x - 3y)$  and  $(2x + 5y)$ .
6. Find the product of two trinomials:  $(x^2 - 2x + 1)$  and  $(x^2 - 4x - 3)$ .

Answers: **MCOs (Questions for Practice)**

1.  $5x + 1y$
2.  $-2m - 16n$
3.  $12x^3y^4$
4.  $6x^2 - 15x$
5.  $2a^2 - 3a + 10a - 15$
6.  $x^3 + 2x^2 - 5x + 2$
7.  $6x^2 - 8x + 9x - 12$
8.  $4m^2 - n^2$
9.  $8x^3 + 5x^2y - xy^2$
10.  $3a^3 - 6a^2b + 4b^3$

Answer Key: **Short answer type questions**

1.  $4x + 7y$
2.  $a - 9b$
3.  $20x^2$

4.  $-12a^3b^3$
5.  $6x^2 - 8xy$
6.  $10a^3 - 15a^2b + 5ab^2$
7.  $x^2 + x - 6$
8.  $2x^2 + 3x - 20$
9.  $x^3 + 3x^2 + 3x + 1$
10.  $2a^2 - 3b^2 - ab + 4bc - ac$

Answer Key: **Long answer type questions**

1.  $Sum = 1x^2 - 3xy - 2y^2$   
 $Difference = 7x^2 - 7xy + 16y^2$
2.  $-15x^3y^3$
3.  $6x^3 - 8x^2y$
4.  $-6x^3 + 8x^2y - 9xy^2$
5.  $8x^2 + 14xy - 15y^2$
6.  $x^4 - 6x^3 + 6x^2 + 6x - 3$

**Test 1 (Total Marks: 20)**

- Q1. List the coefficients and variables/variables in the following expression: (2marks)
- a)  $-4x^3 + 2x^2y - 5xy^2 + 3y^3$
  - b)  $6z^2 - 8yz + 5xz^3 - 10y^3z^2$
- Q2. Find the product of the following expressions: (2 marks)
- a)  $(x - 3y)(x + 2y)$
  - b)  $(3a + 5)(3a - 5)$
- Q3. Identify the coefficients of the terms in the following algebraic expressions. (2marks)
- a)  $3x - 4y + 5z$
  - b)  $5x^2y - 7xy^4 + 11y^3$
- Q4. Evaluate the expressions below when  $a = 3$ ,  $b = -2$ , and  $c = 4$ . (4marks)
- a)  $3a^2 + 5c - b$
  - b)  $a^2 - b^3 + 3c^2$
  - c)  $(2a + c)(a - 2b) - b^2$
  - d)  $2(3a - 5b) + \frac{1}{2}(4c - 10a)$
- Q5. Simplify the following expressions: (3)
- a)  $3x - 7y + 2x + y$
  - b)  $(2a - 3b) + (-5a + 4b)$
  - c)  $\frac{1}{2}(8m - 12n) - \frac{1}{3}(9m + 18n)$
- Q6. Determine whether the following pairs are like terms or unlike terms: (3 marks)
- a)  $5xy, -2yx$
  - b)  $6xyz, 6x^2y$
  - c)  $3ab^2, 3b^2a$
- Q7 Write the algebraic expressions for the following statements. (4 marks)
- a)  $x$  is multiplied by 2 and then added to 5
  - b) The difference between twice  $y$  and 3
  - c)  $x$  is multiplied by the sum of  $y$  and 7
  - d)  $z$  is divided by 3 and subtracted from the product of 5 and  $x$

**Test 2 (30 marks)**

Objective Type Questions (1 mark each)

1. Simplify the expression:  $3x + 5 - 2x$ 
  - a)  $x + 5$
  - b)  $x - 2$
  - c)  $5x$
  - d)  $5x + 5$
  
2. The coefficient of  $x^2$  in the term  $4x^3y^5 - 5x^2y^2$  is:
  - a) -5
  - b) 4
  - c) 2
  - d) 5
  
3. Which of the following is a like term for  $5x^2y$ ?
  - a)  $7x^2y$
  - b)  $5x^2y^2$
  - c)  $5x^3y$
  - d)  $7xy$

Multiple Choice Questions (2 marks each)

4. Express  $-5x^3 - 10x^2 + 15$  as a product of its factors.
  - a)  $-5x(x^3 + 2x^2 - 3)$
  - b)  $-5x(x^2 + 2x - 5)$
  - c)  $-5x(x^3 - 2x^2 + 5)$
  - d)  $5x(x^3 - 2x^2 - 3)$
  
5. Find the product of  $(2x - 3y)(x + y)$ 
  - a)  $2x^2 - xy - 3y^2$
  - b)  $2x^2 - 3xy + 3y^2$
  - c)  $2x^2 + xy - 3y^2$
  - d)  $2x^2 - xy + 3y^2$

Short Answer Type Questions (3 marks each)

6. If  $A = 2x^3y^2 - 5xy^2 + x^2y$  and  $B = x^2y - 3x^3y^2 + 4xy^2$ , find  $A + B$ .
  
7. Solve for  $x$ :  $4x - 3(2x - 1) = 5x + 6$

Long Answer Type Questions (4 marks each)

8. Simplify the expression:  $2(x - y)^2 + 3(x^2 - y^2) - (x^2 - 2xy + y^2)$  and find its value when  $x = -1$  and  $y = 2$ .
  
9. Karan received 200 coins consisting of  $x$  nickels and  $(200 - x)$  dimes. If the total amount of money he received was Rs 18, write an algebraic expression to represent this situation and find the number of nickels.

Case Study Based Question (4 marks)

11. A factory is packaging instant noodles in two types of boxes. Box A contains 3 packages of chicken-flavored noodles, 2 packages of beef-flavored noodles, and 1 package of vegetable-flavored noodles. Box B contains 5 packages of chicken-flavored noodles and 1 package of beef-flavored noodles. If the total number of packages of chicken-flavored noodles is  $C$ , packages of beef-flavored noodles is  $B$ , and packages of vegetable-flavored noodles is  $V$ , write algebraic expressions for the total number of packages in box A and box B. Then, find the total number of packages for each flavor if the factory produced 100 box A's and 150 box B's.



Answer key (TEST 1)

Q1.

- a) Coefficients: -4, 2, -5, 3; Variables: x, y  
b) Coefficients: 6, -8, 5, -10; Variables: z, y, x

Q2.

- a)  $x^2 - 3yx + 2yx - 6y^2 = x^2 - y^2$   
b)  $(9a^2 - 15a + 15a - 25) = 9a^2 - 25$

Q3.

- a) Coefficients: 3, -4, 5  
b) Coefficients: 5, -7, 11

Q4.

- a)  $3(3)^2 + 5(4) - (-2) = 3(9) + 20 + 2 = 27 + 22 = 49$   
b)  $(3)^2 - (-2)^3 + 3(4)^2 = 9 - (-8) + 3(16) = 9 + 8 + 48 = 65$   
c)  $(2(3) + 4)(3 - 2(-2)) - (-2)^2 = (6 + 4)(3 + 4) - 4 = 10(7) - 4 = 70 - 4 = 66$   
d)  $2(3(3) - 5(-2)) + \frac{1}{2}(4(4) - 10(3)) = 2(9 + 10) + \frac{1}{2}(16 - 30) = 2(19) - 7 = 38 - 7 = 31$

Q5.

- a)  $3x - 7y + 2x + y = (3x + 2x) + (-7y + y) = 5x - 6y$   
b)  $(2a - 3b) + (-5a + 4b) = (2a - 5a) + (-3b + 4b) = -3a + b$   
c)  $\frac{1}{2}(8m - 12n) - \frac{1}{3}(9m + 18n) = 4m - 6n - 3m - 6n = (4m - 3m) + (-6n - 6n) = m - 12n$

Q6.

- a) Like terms  
b) Unlike terms  
c) Like terms

Q7.

- a)  $2x + 5$   
b)  $2y - 3$   
c)  $x(y + 7)$   
d)  $5x - \frac{7}{3}$

Answer Key: (TEST 2)

1. a)  $x + 5$   
2. a)  $-5$   
3. a)  $7x^2y$   
4. b)  $-5x(x^2 + 2x - 5)$   
5. a)  $2x^2 - xy - 3y^2$   
6.  $-x^3y^2 - xy^2 + x^2y$   
7.  $x = 1/5$   
8.  $5x^2 - 4xy + 5y^2$ , when  $x = -1$  &  $y = 2$ ; the value is 57  
9.  $x = 160$  (number of nickels)  
10. Box A:  $3C + 2B + V$   
Box B:  $5C + B$   
-  $C = 3(100) + 5(150) = 900$   
-  $B = 2(100) + 1(150) = 350$   
-  $V = 1(100) = 100$

## MENSURATION

### I IMPORTANT CONCEPTS :

- Area of a parallelogram = Base X Height
- Area of triangle =  $\frac{1}{2}$  X base X height
- Area of trapezium =  $\frac{1}{2}$  X ( sum of parallel sides) X Height
- Area of a rhombus = product of diagonals
- Surface area of
  - (i) A cuboid =  $2[ lb + bh + lh]$
  - (ii) A cube =  $6l^2$
  - (iii) A cylinder =  $2\pi r( r + h)$
- Volume of
  - (i) Cuboid =  $l \times b \times h$
  - (ii) Cube =  $l^3$
  - (iii) Cylinder =  $\pi r^2 h$

$1m^3 = 1000$  litres

### II Some illustrations/ examples

#### • MCOs

(1) The volume of cube whose edge is  $3x$  is

- a)  $27x^3$                       b)  $9x^3$                       c)  $6x^3$                       d)  $3x^3$

**Volume** =  $(3x)^3 = 27x^3$

(2) The perimeter of trapezium is 52 cm and its each non parallel sides is equal to 10cm with its height 8 cm.

Its area is

- a)  $124cm^2$                       b)  $118cm^2$                       c)  $128cm^2$                       d)  $112cm^2$

Sum of two parallel sides = perimeter of trapezium - sum of non - parallel sides  
 $= 52 - 20 = 32$  cm

Area of trapezium =  $\frac{1}{2} \times 32 \times 8 = 128cm^2$

(3) A metal sheet  $27cm \times 8cm \times 1cm$  is melted into a cube . The side of cube is

- a) 8cm                      b) 6cm                      c) 24cm                      d) 20cm

Soln. side of cube =  $\sqrt[3]{\text{volume}} = \sqrt[3]{27 \times 8 \times 1} = \sqrt[3]{3^3 \times 2^3 \times 1^3} = 3 \times 2 \times 1 = 6cm$

(4) The ratio of radii of two cylinders is 1: 2 and heights are in the ratio 2: 3 . The ratio of their volumes is

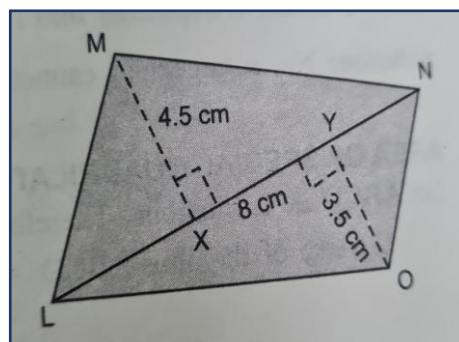
- a) 1:6                      b) 1:9                      c) 1:3                      d) 2:9

Vol. of cylinder 1 : vol of cylinder 2

$= \pi (1x)^2 (2y) : \pi (2x)^2 (3y) = 1:6$

#### • SHORT ANSWER TYPE QUESTIONS

1. Find the area of the quadrilateral LOMN



Soln.

$$\begin{aligned}\text{Area of quadrilateral LOMN} &= \text{Area of } \triangle LNM + \text{Area of } \triangle LON \\ &= \frac{1}{2} \times LN \times MX + \frac{1}{2} \times LN \times YO = \frac{1}{2} \times LN \times (MX + OY) \\ &= \frac{1}{2} \times 8 \times (4.5 + 3.5) = 32 \text{ cm}^2\end{aligned}$$

2. An aquarium is in the form of a cuboid whose external measures are 80cm x 30cm x 40cm . The base, side faces and back faces are to be covered with a coloured paper. Find the area of the paper needed.

Soln. Area of the base =  $l \times b = 80 \times 30 = 2400 \text{ cm}^2$   
Area of the side face =  $b \times h = 30 \times 40 = 1200 \text{ cm}^2$   
Area of the back face =  $l \times h = 80 \times 40 = 3200 \text{ cm}^2$   
Required area = Area of the base + area of the back face  
+ (2 × area of a side face)  
=  $2400 + 3200 + (2 \times 1200) = 8000 \text{ cm}^2$

- 3 .  $160\text{m}^3$  of water is to be used to irrigate a rectangular field whose area is  $800\text{m}^2$  . What will be the height of water level in the field?

Soln. Volume of water =  $160\text{m}^3$ , area of field =  $800\text{m}^2$   
Volume of water = volume of cuboid formed on the field by water  
 $160 = \text{area of base} \times \text{height} = 800 \times h$   
 $H = 160 / 800 = 0.2$   
Required height = 0.2 m

### LONG ANSWER TYPE QUESTIONS

1. Radius of a cylinder is  $r$  and the height is  $h$ . Find the change in the volume if the  
a) Height is doubled    b) height is doubled and radius is halved    c) radius is halved height remains the same.

Soln. Volume of cylinder =  $\pi r^2 h$

a) New height =  $h^1 = 2h$

Volume of cylinder =  $\pi r^2 h^1 = \pi r^2 (2h) = 2 \pi r^2 h = \text{double the original}$

b)  $h^1 = 2h$  ,  $r^1 = \frac{1}{2} r$

Volume of cylinder =  $\pi (r^1)^2 h^1 = \pi (\frac{1}{2})^2 (2h) = \pi (1/4) r^2 2h = \frac{1}{2} \pi r^2 h = \text{half of original volume}$

c)  $r^1 = 1/2r$

vol. of cylinder =  $\pi (r^1)^2 h = \pi (1/4) r^2 h = 1/4 \pi r^2 h = \text{one - fourth of original volume}$

2. A company is selling its suitcases according to surface area . A suitcase can be bought at the rate of Rs. 0.05 per  $\text{cm}^2$  . If the size purchased by Ramita is 80cm X 47cm X 24cm , find the cost paid by Ramita for 100 suitcases.

Soln. total sur.area of one suitcase =  $2(lb + bh + hl) = 2(80 \times 48 + 48 \times 24 + 80 \times 24)$   
 $= 2(2840 + 1152 + 1920) = 2(6912) = 13824 \text{ cm}^2$

Surface area of 100 suitcases =  $13824 \times 100 = 1382400 \text{ cm}^2$

Cost of 100 suitcases =  $0.05 \times 1382400 = \text{Rs. } 69120$

### • CASE STUDY BASED QUESTIONS

Anup after retirement thought to stay in village's house. After going there he found there was shortage of water in village , so he thought of constructing a well. He hired some labourers and guided them that well should be 7m in diameter and 20m deep.

Based on the above information answer the following questions

1. What will be the shape of the well ?

Ans. Cylindrical

2. What will be the radius of the well?

Ans. Radius =  $\frac{1}{2}$  diameter = 3.5 m

3. What volume of earth will be dug out?

Ans. Volume of cylinder =  $\pi r^2 h = \frac{22}{7} \times 3.5 \times 3.5 \times 20 = 770 \text{m}^2$

### III QUESTIONS FOR PRACTICE

#### MCQs

- The area of parallelogram is given by  
a) base x height      b)  $\frac{1}{2}$  x base x height      c) 2 x base x height      d) none of these
- Area of trapezium is given by  
a) 2 x height x (sum of parallel sides)      b) height x (sum of parallel sides)  
c)  $\frac{1}{2}$  x height x (sum of parallel sides)      d)  $\frac{1}{2}$  x (sum of parallel sides)
- Total surface of right circular cylinder  
a)  $\pi r^2 h$       b)  $2 \pi r^2 h$       c)  $2 \pi r h^2$       d)  $2 \pi r(r+h)$
- The area of rhombus is given by  
a)  $\frac{1}{2}$  x sum of diagonals      b)  $\frac{1}{2}$  x product of diagonals      c) product of diagonals  
d) 2x product of diagonals
- The edge of cube is 1m . Its surface area is given by  
a)  $1 \text{m}^2$       b)  $4 \text{m}^2$       c)  $6 \text{m}^2$       d)  $3 \text{m}^2$
- The edge of cube is 2m . its volume is given by  
a)  $6 \text{m}^3$       b)  $8 \text{m}^3$       c)  $6 \text{m}^2$       d) none of these
- The sum of the parallel sides of trapezium is 8 cm. if its height is 2 cm, then its area is Given by :  
a)  $8 \text{cm}^2$       b)  $16 \text{cm}^2$       c)  $32 \text{cm}^2$       d) none of the above
- In a parallelogram, base = height = 1cm . What its area ?  
a)  $1 \text{cm}^2$       b)  $2 \text{cm}^2$       c)  $3 \text{cm}^2$       d)  $4 \text{cm}^2$
- What is the curved surface area of a cylinder whose radius =  $\frac{7}{2}$  cm and height = 7 cm?  
a)  $154 \text{cm}^2$       b)  $308 \text{cm}^2$       c)  $77 \text{cm}^2$       d) none of these
- How many small cubes with edge of 20cm each can be just accommodated in a cubical Box of 2m edge ?  
a) 10      b) 100      c) 1000      d) 10000

#### SHORT ANSWER TYPE QUESTIONS

- The area of a trapezium is  $34 \text{cm}^2$  and the length of one of the parallel sides is 10 cm and its height is 4 cm. Find the length of the other parallel side.
- The diagonal of a quadrilateral shaped field is 24 m and the perpendiculars dropped on it from the remaining opposite vertices are 8 m and 13 m. Find the area of the field.
- Find the area of a rhombus whose side is 5 cm and whose altitude is 4.8 cm. If one of its diagonals is 8 cm long, find the length of the other diagonal
- The internal measures of a cuboidal room are  $12 \text{m} \times 8 \text{m} \times 4 \text{m}$ . Find the total cost of whitewashing all four walls of a room, if the cost of white washing is Rs. 5 per  $\text{m}^2$
- Find the height of a cylinder whose radius is 7 cm and the total surface area is  $968 \text{cm}^2$

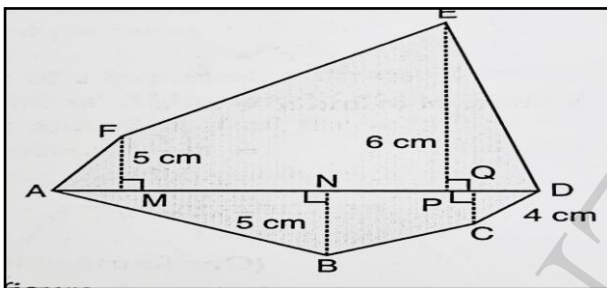
- 6) Find the volume of a cube whose surface area is  $600 \text{ cm}^2$ .
- 7) Rukhsar painted the outside of the cabinet of measure  $1 \text{ m} \times 2 \text{ m} \times 1.5 \text{ m}$ . How much surface area did she cover if she painted all except the bottom of the cabinet.
- 8) A godown is in the form of a cuboid of measures  $60 \text{ m} \times 40 \text{ m} \times 30 \text{ m}$ . How many cuboidal boxes can be stored in it if the volume of one box is  $0.8 \text{ m}^3$  ?
- 9) Given a cylindrical tank, in which situation will you find surface area and in which situation volume.
- (a) To find how much it can hold.
- (b) Number of cement bags required to plaster it
- 10) Find the height of the cylinder whose volume is  $1.54 \text{ m}^3$  and diameter of the base is  $140 \text{ cm}$ ?

### LONG ANSWER TYPE QUESTIONS

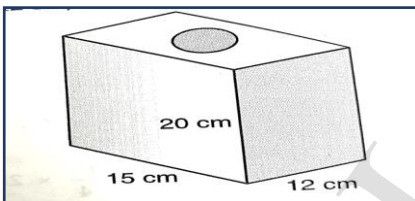
1) If each edge of a cube is tripled,

- (i) how many times will its surface area increase?  
 (ii) how many times will its volume increase?

2) Find the area of the polygon ABCDEF, if  $AD = 18 \text{ cm}$ ,  $AQ = 14 \text{ cm}$ ,  $AP = 12 \text{ cm}$ ,  $AN = 8 \text{ cm}$ ,  $AM = 4 \text{ cm}$ , and FM, EP, QC and EN are perpendiculars to AD.

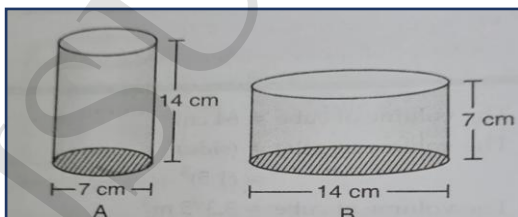


3) Find the area to be painted in the following block with a cylindrical hole. Given that length is  $15 \text{ cm}$ , width  $12 \text{ cm}$ , height  $20 \text{ cm}$  and radius of the hole is  $2.8 \text{ cm}$



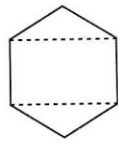
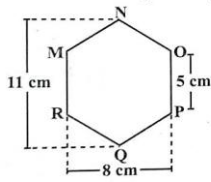
4) A swimming pool is  $200 \text{ m} \times 50 \text{ m}$  and has an average depth of  $2 \text{ m}$ . By the end of a summer day, the water level drops by  $2 \text{ cm}$ . How many cubic metres of water is lost on the day?

5) Diameter of cylinder A is  $7 \text{ cm}$ , and the height is  $14 \text{ cm}$ . Diameter of cylinder B is  $14 \text{ cm}$  and height is  $7 \text{ cm}$ . Without doing any calculations can you suggest whose volume is greater? Verify it by finding the volume of both the cylinders. Check whether the cylinder with greater volume also has greater surface area

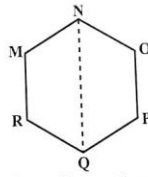


6) There is a hexagon MNPQR of side  $5 \text{ cm}$  (Fig given below). Aman and Ridhima

divided it in two different ways. Find the area of hexagon in both the ways



Ridhima's method



Aman's method:

### CASE STUDY BASED QUESTIONS

1) A box contains a cylinder and a cube . The height and radius of cylinder are 7cm and 14cm respectively. It has been observed that side of cube is half of the radius of cylinder.

Based on the above information answer the following questions

- Find the side of the cube
- Find the curved surface area of cylinder?
- which has greater volume cube or cylinder? Why?

2) A company packages its milk powder in cylindrical containers whose base has a diameter of 16.8 cm and height 20.5 cm. company places a label 1.5cm from the top and the bottom around the curve surfaces of the containers as shown

On the basis of the above information anser the following questions

- Find the radius of the base of the container
- Find the height of the label
- Find the area of the label

### ANSWERS

#### MCQS

- 1)a 2)c 3) d 4)b 5)c 6)b 7)a 8)a 9)b 10)c

#### SHORT ANSWER QUESTIONS

- 1)7cm 2)252m<sup>2</sup> 3)24cm<sup>2</sup>, 6cm 4)Rs 800 5)15cm 6)1000cm<sup>2</sup> 7)11m<sup>2</sup> 8)90000

- 9)volume ,surface area 10)1m

#### LONG ANSWER QUESTIONS

- 1)9 times, 27 times 2)127cm<sup>2</sup> 3)1390.72 cm<sup>2</sup> 4)200m<sup>3</sup> 5)surface area of both cylinders are equal , vol. of B is greater than vol. of A 6)64cm<sup>2</sup>

#### CASE STUDY BASED QUESTION

- a) 7cm b)616cm<sup>2</sup> c)cylinder( calculate)
- a)8.4cm b)17.5cm c)924cm<sup>2</sup>

CLASS – VIII

Topic- Mensuration

MM-20

I Very Short answer type questions

5

- Find the area of a rhombus whose diagonals are 8cm and 11cm.
- Find the volume of cube whose edge is 2a.
- Find the volume of cylinder of radius 1cm and height 7cm.
- Find the height of cuboid whose surface area is 180cm<sup>2</sup>. and volume is 900cm<sup>3</sup>
- What is the surface area of a cylinder of radius r and height h.

II Write the formula for the following:

7

1. Area of trapezium
2. Volume of cuboid
3. Area of 4 walls of cuboidal room
4. Curved surface area of cylinder
5. Lateral surface area of cube
6. Area of 4 walls and ceiling of a room
7. Area of parallelogram

III Short answer type questions (Any 4)

8

1. A cuboid of dimensions 60cm X54cm X 30cm. How many small cubes with side 6cm can be placed in the given cuboid?
2. The diagonal of a quadrilateral shaped field is 24 m and the perpendiculars dropped on it from the remaining opposite vertices are 8 m and 13 m. Find the area of the field.
3. Sonam painted the outside of the cabinet of measure 1 m × 2 m × 1.5 m. How much surface area did she cover if she painted all except the bottom of the cabinet
4. The area of a rhombus is 240 cm<sup>2</sup> and one of the diagonals is 16 cm. Find the other diagonal.
5. A closed cylindrical tank of radius 7 m and height 3 m is made from a sheet of metal. How much sheet of metal is required?

CLASS – VIII

Topic- Mensuration

MM-30

I Write the formula of the following :

3+3+4

- 1) Volume of
  - a) Cube
  - b) Cuboid
  - c) Cylinder
- 2) Total surface area of
  - a) Cube
  - b) Cuboid
  - c) Cylinder
- 3) a) lateral surface area of cuboid  
 b) curved surface area of cylinder  
 c) Area of rhombus  
 d) Area of trapezium

II Short answer type questions

2X5=10

- 1) What is the curved surface area of a cylinder whose radius =  $\frac{7}{2}$  cm and height = 14cm?
- 2) The area of a trapezium shaped field is 480 m<sup>2</sup>, the distance between two parallel sides is 15 m and one of the parallel side is 20 m. Find the other parallel side
- 3) The diagonals of a rhombus are 7.5 cm and 12 cm. Find its area
- 4) Find the side of a cube whose surface area is 600 cm<sup>2</sup>
- 5) The lateral surface area of a hollow cylinder is 4224 cm<sup>2</sup>. It is cut along its height and formed a rectangular sheet of width 33 cm. Find the perimeter of rectangular sheet? .

III) Long answer type questions

3+3+4=10

- 1) If each edge of a cube is doubled,
  - (i) How many times will its surface area increase?
  - (ii) How many times will its volume increase?

2) Mohan wants to buy a trapezium shaped field. Its side along the river is parallel to and twice the side along the road. If the area of this field is  $10500 \text{ m}^2$  and the perpendicular distance between the two parallel sides is  $100 \text{ m}$ , find the length of the side along the river.

3) The internal measures of a cuboidal room are  $12 \text{ m} \times 8 \text{ m} \times 4 \text{ m}$ . Find the total cost of whitewashing all four walls and ceiling of a room, if the cost of white washing is Rs.  $5$  per  $\text{m}^2$ . Also find the volume of the air occupied



# EXPONENTS AND POWERS

## I IMPORTANT CONCEPTS

- $X^3$  here X means base and 3 is its exponent , it is read as X raised to power 3
- some laws of exponent
- $x^m \times x^n = x^{m+n}$
- $x^m \div x^n = x^{m-n}$
- $(x^m)^n = x^{mn}$
- $x^m \times y^m = (xy)^m$
- $\frac{x^m}{y^m} = \left[\frac{x}{y}\right]^m$
- $x^{-1} = \frac{1}{x}$
- $x^0 = 1$
- $(-1)^{an \text{ even no.}} = 1$
- $(-1)^{an \text{ odd no.}} = -1$
- A number is said to be in standard form , if it is expressed as the product of a no. between 1 to 10 and the integral power of 10.
- $14800000000 = 1.48 \times 10^{10}$   
 $0.0000056 = 5.6 \times 10^{-6}$

## II Some illustrations/ examples

### • MCQs

1)  $\left(\frac{-7}{5}\right)^{-1}$  is equal to

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

Soln.  $\left(\frac{-7}{5}\right)^{-1} = \frac{5}{-7}$  (ans. b)

2)  $9^3 \div 9^8 =$

a)  $9^5$    b)  $9^{-5}$    c)  $-9^5$    d)  $-9^{-5}$

Soln.  $9^{3-8} = 9^{-5}$  (ans. b)

3) Cube of  $\left(\frac{-1}{2}\right)$  is

a)  $\frac{-1}{8}$    b)  $\frac{1}{16}$    c)  $\frac{1}{8}$    d)  $\frac{1}{4}$

Soln.  $\left(\frac{-1}{2}\right)^3 = \left(\frac{-1}{2}\right)\left(\frac{-1}{2}\right)\left(\frac{-1}{2}\right) = \frac{-1}{8}$  (ans. a)

4) The value of p, for which  $7^7 \div 7^{-p} = 7^{10}$  is

a) 1   b) 2   c) 3   d) 4

Soln.  $7^{7-(-p)} = 7^{10}$

$7+p = 10$  (bases are same so powers are equal)

$p=3$  (ans. c)

## SHORT ANSWER TYPE QUESTIONS

1) simplify:  $\left[\frac{1}{4}\right]^{-2} + \left[\frac{1}{2}\right]^{-2} + \left[\frac{1}{3}\right]^{-2}$

Sol.  $4^2 + 2^2 + 3^2 = 16 + 4 + 9 = 29$

2) simplify:  $\frac{2^3 \times 2^7}{3^1 \times 4^6}$

Soln.  $\frac{2^{3+7}}{(2^2)^6 \times 3} = \frac{2^{10}}{2^{12} \times 3} = \frac{2^{10-12}}{3} = \frac{2^{-2}}{3} = \frac{1}{3 \times 2^2} = \frac{1}{12}$

3) Find the value of m for which  $5^m \div 5^{-3} = 5^5$

Soln.  $5^{m-(-3)} = 5^5$

$\Rightarrow 5^{m+3} = 5^5$

since bases are equal, therefore exponents will also be equal

$m+3 = 5 \Rightarrow m = 5-3 = 2$

4) Find the multiplicative inverse of  $(7^{-2} \div 90^{-1})$

Soln.  $\frac{1}{7^2} \div \frac{1}{90}$

$= \frac{1}{49} \div \frac{1}{90}$

$= \frac{1}{49} \times 90$

$= \frac{90}{49}$

the multiplicative inverse of  $(7^{-2} \div 90^{-1}) = \frac{49}{90}$

**LONG ANSWER TYPE QUESTIONS**

1) If  $\frac{5^m \times 5^3 \times 5^{-2}}{5^{-5}} = 5^{12}$  find m

Soln.  $5^m \times 5^3 \times 5^{-2} \times 5^5 = 5^{12}$

$= 5^{m+3-2+5} = 5^{12}$

$= 5^{m+6} = 5^{12}$

$\Rightarrow m+6 = 12$  [ as bases are same]

$\Rightarrow m = 12-6 = 6$

2) Simplify:  $(\frac{1}{5})^{45} \times (\frac{1}{5})^{-60} - (\frac{1}{5})^{28} \times (\frac{1}{5})^{-43}$

Soln.  $(\frac{1}{5})^{45-60} - (\frac{1}{5})^{28-43}$

$= (\frac{1}{5})^{-15} - (\frac{1}{5})^{-15}$

$= 5^{15} - 5^{15} = 0$

**CASE STUDY BASED QUESTIONS**

A child was reading about cells of which living things are made of, while reading he finds the size of red blood cell to be 0.000007m that of a plant cell size of 0.0000129m.

Based on above situation answer the following questions

- a) Express the size of both cells in standard form
- b) Can we see the cells by naked eyes?
- c) Compare the sizes of cell?

Soln.

a) size of red blood cell is  $0.000007m = 7 \times 10^{-6}m$

size of a plant cell is  $0.0000129m = 1.29 \times 10^{-5}m$

b) no, as minimum size which we can observe is mm.

c) comparison of their sizes  $= \frac{7 \times 10^{-6}m}{1.29 \times 10^{-5}m} = \frac{7 \times 10^{-6+5}}{1.29} = \frac{7 \times 10^{-1}}{1.29} = \frac{7}{1.29 \times 10} = \frac{7}{12.9} = \frac{7}{13}$   
 $= \frac{1}{2}$  approx i.e the size of red blood cell is half the size of plant cell.

**III QUESTIONS FOR PRACTICE**

**MCQs**

1)  $(x^m)^n$  is expressed as

a)  $x^{m+n}$

b)  $x^{mn}$

c)  $x^{m-n}$

d)  $x^{m \div n}$

2)  $(\frac{x}{y})^m$  is expressed as

- a)  $(x - y)^m$                       b)  $(x + y)^m$                       c)  $x^m Xy^{-m}$                       d) all are incorrect
- 3) What is the value of  $\left(\frac{1}{2}\right)^{-2}$   
a)  $\frac{1}{-4}$                       b)  $\frac{1}{4}$                       c) -4                      d) 4
- 4) What is the value of  $2^0 + 7^0 \times 10^0$   
a) 72                      b) 9                      c) 1                      d) 2
- 5)  $(2^{-1} + 3^{-1} + 4^{-1})^0$  equals to  
a) 2+3+4                      b) 1+1+1                      c)  $\frac{1}{2} + \frac{1}{3} + \frac{1}{4}$                       d) 1
- 6) In  $5^n$ , n is known as  
a) base                      b) exponent                      c) constant                      d) number
- 7) The standard form for 0.000064  
a)  $64 \times 10^4$                       b)  $64 \times 10^{-4}$                       c)  $6.4 \times 10^{-5}$                       d)  $6.4 \times 10^5$
- 8) What is the value of  $4.05 \times 10^6$  in usual form ?  
a) 40500                      b) 405000                      c) 0.0000045                      d) 4050000
- 9) What is value of  $(2 \times 3)^2$ ?  
a) 12                      b) 18                      c) 36                      d) 8
- 10) What is value of  $\left(\frac{1}{10}\right)^0$   
a) 1                      b) 10                      c) 0                      d)  $\frac{1}{10}$

### SHORT ANSWER TYPE QUESTIONS

- Simplify :  $3^{-7} \div 3^{-10} \times 3^{-5}$
- Find the value of :  $(3^0 + 4^{-1}) \times 2^2$
- Find the value of :  $(3^{-1} \times 4^{-1}) \div 2^{-2}$
- Evaluate :  $\frac{8^{-1} \times 5^3}{2^{-4}}$
- Find m so that  $(-3)^{m+1} \times (-3)^5 = (-3)^7$
- Simplify and express in exponential form :  $(2^5 \div 2^8)^5 \times 2^{-5}$
- Evaluate :  $\left\{ \left(\frac{1}{3}\right)^{-1} - \left(\frac{1}{4}\right)^{-1} \right\}^{-1}$
- Express following in usual form : a)  $4.5 \times 10^4$ , b)  $3 \times 10^{-3}$
- Express in standard form : a) 3080000, b) 0.00067
- Simplify and express in exponential form :  $(-3)^4 \times \left(\frac{5}{3}\right)^4$

### LONG ANSWER TYPE QUESTIONS

- Simplify :  $\frac{25 \times t^{-4}}{5^{-3} \times 10^1 \times t^{-8}}$
- Simplify :  $\frac{3^{-5} \times 10^{-5} \times 125^1}{5^{-7} \times 6^{-5}}$
- Find x :  $\left(\frac{2}{5}\right)^{2x+6} \times \left(\frac{2}{5}\right)^3 = \left(\frac{2}{5}\right)^{x+2}$
- By what number should  $(-8)^{-3}$  be multiplied so that the product may be equal to  $-6^{-3}$ ?
- Simplify :  $\left(\frac{4}{13}\right)^4 \times \left(\frac{13}{7}\right)^2 \times \left(\frac{7}{4}\right)^3$

6) By what number should  $\left(\frac{-3}{2}\right)^{-3}$  be divided so that the quotient is  $\left(\frac{9}{4}\right)^{-2}$ ?

**CASE STUDY BASED QUESTIONS**

1) In a stack there are 5 books each of thickness 20mm and 5 paper sheets each of thickness 0.016 mm.

- a) What is the thickness of 5 books in cm?
- b) What is the thickness of 5 paper sheets in mm?
- c) What is the total thickness of the stack.

2) The distance between Sun and Earth is  $1.496 \times 10^{11}$  m and the distance between Earth and Moon is  $3.84 \times 10^8$  m. During solar eclipse moon comes in between Earth and Sun.

a)  $3.84 \times 10^8 \text{ m} = 384 \times \underline{\hspace{1cm}}$ .

b)  $1.496 \times 10^{11} = \underline{\hspace{1cm}} \times 10^8$

c) Find the distance between Moon and Sun.

**ANSWERS OF PRACTICE QUESTIONS**

**MCQs**

- 1)b 2)c 3)d 4)d 5)d 6)b 7)c 8)d 9)c 10)c

**SHORT ANSWER TYPE QUESTIONS**

1) $\frac{1}{9}$  2)5 3) $\frac{1}{3}$  4)250 5)1 6) $\frac{1}{20}$  7)-1 8)a)45000 b)0.003

9)a) $3.08 \times 10^6$  b) $6.7 \times 10^{-4}$  10)625

**LONG ANSWER TYPE QUESTIONS**

1) $\frac{625 t^4}{2}$  2)3125 3)-7 4) $\frac{64}{27}$  5) $\frac{28}{169}$  6) $\frac{-3}{2}$

**CASE STUDY BASED QUESTION**

- 1) a)10cm b)0.08mm c) $1.0008 \times 10^2$  mm
- 2) a) $10^6$  m b) $1496 \times 10^8$  c) $1492.16 \times 10^8$  m

I Fill in the blanks :

(10)

1.  $\left(\frac{-7}{5}\right)^{-1}$  is equal to \_\_\_\_
2.  $(-1)^{103} =$  \_\_\_\_
3. The multiplicative inverse of  $\left(\frac{-5}{3}\right)^{-99}$  is \_\_\_\_
4. The standard form of 0.000064 is \_\_\_\_
5. The value of  $\left(\frac{-5}{7}\right)^3 \times (7)^3 =$  \_\_\_\_
6.  $\frac{1}{25}$  expressed as power of 5 is \_\_\_\_
7.  $10^8 \times 10^{-10} =$  \_\_\_\_
8. The value of  $\left(\frac{3}{2}\right)^{-2}$  is \_\_\_\_
9.  $7 \times 10^{-6}$  \_\_\_\_  $129 \times 10^{-7}$  (< or >)
10.  $5^0 + 6^0 =$  \_\_\_\_

II Short answer type questions :

5X2 =10

1. simplify:  $\left[\frac{1}{4}\right]^{-2} + \left[\frac{1}{2}\right]^{-2} + \left[\frac{1}{3}\right]^{-2}$
2. Find the value of m for which  $2^m \div 2^{-2} = 2^5$
3. Simplify :  $5^{-7} \div 5^{-10} \times 5^{-5}$
4. Evaluate :  $\left\{\left(\frac{1}{3}\right)^{-1} - \left(\frac{1}{4}\right)^{-1}\right\}^2$
5. Express following in usual form : a)  $7.5 \times 10^4$  ,b)  $2.3 \times 10^{-3}$

Long answer type questions

(8)

- 7) Find x :  $\left(\frac{2}{5}\right)^{2x+6} \times \left(\frac{2}{5}\right)^3 = \left(\frac{2}{5}\right)^{x+2}$
- 8) In a stack there are 5 books each of thickness 20mm and 5 paper sheets each of thickness 0.016 mm. Find the total thickness of stack in standard form.

I Fill in the blanks :

(10)

11.  $\left(\frac{-7}{5}\right)^{-1}$  is equal to \_\_\_\_
12.  $(-1)^{103} =$  \_\_\_\_
13. The multiplicative inverse of  $\left(\frac{-5}{3}\right)^{-99}$  is \_\_\_\_
14. The standard form of 0.000064 is \_\_\_\_
15. The value of  $\left(\frac{-5}{7}\right)^3 \times (7)^3 =$  \_\_\_\_

16.  $\frac{1}{25}$  expressed as power of 5 is \_\_\_\_

17.  $10^8 \times 10^{-10} =$  \_\_\_\_

18. The value of  $\left(\frac{3}{2}\right)^{-2}$  is \_\_\_\_

19.  $7 \times 10^{-6}$  \_\_\_\_  $129 \times 10^{-7}$  (< or >)

20.  $5^0 + 6^0 =$  \_\_\_\_

II Short answer type questions :

5X2 =10

6. simplify:  $\left[\frac{1}{4}\right]^{-2} + \left[\frac{1}{2}\right]^{-2} + \left[\frac{1}{3}\right]^{-2}$

7. Find the value of m for which  $2^m \div 2^{-2} = 2^5$

8. Simplify :  $5^{-7} \div 5^{-10} \times 5^{-5}$

9. Evaluate :  $\left\{\left(\frac{1}{3}\right)^{-1} - \left(\frac{1}{4}\right)^{-1}\right\}^2$

10. Express following in usual form : a)  $7.5 \times 10^4$  ,b)  $2.3 \times 10^{-3}$

CLASS – VIII TOPIC: Exponents and powers

MM -30

Very short answers questions

(5)

1. Find the value of  $\left(\frac{-2}{5}\right)^{-2}$

2. Find the Cube of  $\left(\frac{-1}{2}\right)$

3. Find the standard form of 0.00007.

4. Find usual form of  $3.06 \times 10^4$

5. Find multiplicative inverse of  $\left(\frac{-3}{5}\right)^{57}$

MCQS (5)

1)  $9^3 \div 9^8 =$

a)  $9^5$  b)  $9^{-5}$  c)  $-9^5$  d)  $-9^{-5}$

2) The value of p, for which  $7^7 \div 7^{-p} = 7^{10}$  is

a) 1 b) 2 c) 3 d) 4

3)  $x^m \times x^n$  is expressed as

a)  $x^{m+n}$  b)  $x^{mn}$  c)  $x^{m-n}$  d)  $x^{m \div n}$

4)  $(2^{-1} + 3^{-1} + 4^{-1})^0$  equals to

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

5) In  $5^n$ , n is known as

a) base b) exponent c) constant d) number

Short answer type questions

(12)

1) Evaluate :  $\frac{8^{-1} \times 5^3}{4^{-2}}$

2) Find m so that  $(-7)^{m+1} \times (-7)^5 = (-7)^8$

3) Simplify and express in exponential form :  $(2^5 \div 2^8)^5 \times 2^{-5}$

4) Evaluate :  $\left\{\left(\frac{1}{3}\right)^{-1} - \left(\frac{1}{4}\right)^{-1}\right\}^{-1}$

- 5) Express following in usual form : a)  $4.5 \times 10^4$  ,b)  $5 \times 10^{-3}$   
6) Express in standard form : a) 3080000 , b) 0.00067

**Long answer type questions**

(8)

9) Find x :  $\left(\frac{2}{5}\right)^{2x+6} \times \left(\frac{2}{5}\right)^3 = \left(\frac{2}{5}\right)^{x+2}$

- 10) In a stack there are 5 books each of thickness 20mm and 5 paper sheets each of thickness 0.016 mm.  
Find the total thickness of stack in standard form.

## DIRECT AND INVERSE PROPORTIONS

1. **DIRECT PROPORTION**:- Two quantities x and y are said to be in **direct proportion** if they increase (decrease) together in such a manner that the ratio of their corresponding values remains constant.

That is,  $\frac{x}{y} = k$ , where k is a positive number, if x and y are in direct proportion or vary directly.

In case of direct proportion, if  $y_1$  and  $y_2$  are the values of y corresponding to the values  $x_1$  and  $x_2$  of x respectively, then  $\frac{x_1}{y_1} = \frac{x_2}{y_2}$ .

**Real-life examples of direct proportion are:**

1. The weight of a person can be related to the clothing size that they might use.
2. The number of construction workers that are working can be related to how much time it takes to finish a project.
3. The number of bananas can be related to the number of boxes needed to store them.

2. **Inverse proportion**

Two quantities x and y are said to be in inverse proportion if an increase in x causes a proportional decrease in y and vice-versa, in such a manner that the product of their corresponding values remains constant.

That is,  $xy = k$  where k is a positive number, if x and y are in inverse proportion. In this case, if  $y_1, y_2$  are the values of y corresponding to the values  $x_1, x_2$  of x respectively,

then  $x_1 y_1 = x_2 y_2$  Or  $\frac{x_1}{x_2} = \frac{y_2}{y_1}$ .

**Real-life examples of inverse proportion are:**

1. As the speed of the car increases the time taken to cover a certain distance decreases.
2. More people in the room means less space in the room.
3. The number of people doing something and the time it takes to do it. As the number of people increases, the time it takes to finish decreases.

### II. Examples Questions:-

1. If the weight of 12 sheets of thick paper is 40 grams, how many sheets of the same paper would weigh 2500 grams?

- A. 750      B. 800      C. 850      D. 950

**Ans: option A 750**

2. The scale of a map is given as 1:300. Two cities are 4 km apart on the map. The actual distance between them is:

- A. 1000 km      B. 1100 km      C. 1200 km      D. 1300 km

**Ans: option C      1200 km**



3. If 12 workers can build a wall in 50 hours, how many workers will be required to do the same work in 40 hours?

- A. 10      B. 13      C. 14      D. 15

**Ans: option D 15 workers**

4. A man walks 20 km in 5 hours. How much time will it take for him to walk 32 km?

- A. 3 hours      B. 4 hours      C. 6 hours      D. 8 hours

**Ans: option D 8 hours**

**5. Case based question:-**

The students of Anju's class sold posters to raise money. Anju wanted to create a ratio for finding the amount of money her class would make for different numbers of posters sold. She knew they could raise Rs 250 for every 60 posters sold.

- (a) How much money would Anju's class make for selling 102 posters?  
 (b) Could Anju's class raise exactly Rs 2,000? If so, how many posters would they need to sell? If not, why?  
 (c) Suppose her classmates sell 40 posters for Rs. 400, how much money would they make for selling 25 posters?



Ans: (a) On selling 1 poster anju's class make =Rs  $\frac{250}{60}$

For selling 102 posters, money raised =  $\frac{250}{60} \times 102 = \text{Rs. } 425$

(b) To raise 2000 they need to sell =  $\frac{60}{250} \times 2000 = 480$  posters

(c) for one poster, money raised =  $\frac{400}{40}$

Money raised for 25 posters =  $\frac{400}{40} \times 25 = 250$  posters

**Short answer type question:**

6. A packet of sweets was distributed among 10 children and each of them received 4 sweets. If it is distributed among 8 children, how many sweets will each child get?

Ans:

No. of children	10	8
No. of sweets received by each child	4	y

Since, it is inverse proportion  $x_1 y_1 = x_2 y_2$

$$\Rightarrow 10 \times 4 = 8 \times y$$

$$\Rightarrow y = 5 \text{ sweets}$$

7. At a particular time, the length of the shadow of Qutub Minar whose height is 72 m is 80 m. What will be the height of an electric pole, the length of whose shadow at the same time is 1000 cm?

Ans: Length of Qutub Minar = 72 m

At a particular time its shadow = 80 m

Shadow of the electric pole has a length of = 1000 cm = 10 m

$$\text{Length of electric pole} = \frac{72}{80} \times 10 = 9 \text{ m}$$

8. A farmer has enough food to feed 20 animals in his cattle for 6 days. How long would the food last if there were 10 more animals in his cattle?

Ans: Let the number of days be  $x$

$$\text{Total number of animals} = 20 + 10 = 30$$

No. of animals	20	6
No. of days	30	$y$

Here the number of animals and the number of days are in inverse proportion.

$$\frac{20}{30} = \frac{y}{6}$$

$$y = \frac{20 \times 6}{30} = 4$$

Hence the food will last 4 days.

### Long answer type questions:

9. By travelling at a speed of 48 kilometres per hour, a car can finish a certain journey in 10 hours. To cover the same distance in 8 hours, what should be the speed of the car?

Ans: Let  $x$  km/hr be the speed. Then

Time (in hours)	10	8
Speed (in km/hr)	48	$y$

By inverse variation,  $x_1 y_1 = x_2 y_2$

$$\Rightarrow 10 \times 48 = 8 \times y$$

$$\Rightarrow y = 480 / 8 = 60$$

speed required = 60 km/hr.

10. Rehman is making a wheel using spokes. He wants to fix equal spokes so that the angles between any pair of consecutive spokes are equal. Help him by completing the following table.



Number of spokes	4	6	8	10
Angle between a pair of consecutive spokes	$90^\circ$	$60^\circ$	....	.....

(i) Are the number of spokes and the angles formed between the pairs of consecutive spokes inversely proportional?

(ii) Find out the angle between a pair of consecutive spokes on a wheel with 15 spokes.

(iii) If the angle between a pair of consecutive spokes is 40 degrees, how many spokes would be needed?

Sol:- Here, we can see that the number of spokes is inversely proportional to the angle between the pair of consecutive spokes as the number of spokes increases and the angle between the pair of consecutive spokes decreases.

And we know that the centre of a circle is  $360^\circ$ .

Therefore, When the number of spokes is 8, then the angle between the pair of consecutive spokes =  $360^\circ/8 = 45^\circ$

And when the number of spokes is 10, then the angle between a pair of consecutive spokes =  $360^\circ/10 = 36^\circ$

And when the number of spokes is 12, then the angle between a pair of consecutive spokes =  $360^\circ/12 = 30^\circ$

Number of spokes	4	6	8	10
Angle between a pair of consecutive spokes	$90^\circ$	$60^\circ$	$45^\circ$	$36^\circ$

(i) Yes. The number of spokes is inversely proportional to the angle between a pair of consecutive spokes.

(ii) When the number of spokes is 15, the angle between the pair of consecutive spokes =  $360^\circ/15^\circ = 24^\circ$

(iii) Number of spokes needed if the angle between the pair of consecutive spokes is  $40^\circ = 360^\circ/40^\circ = 9$

### III. Questions for Practice:

#### MCQ

- y is directly proportional to x, and  $y = 24$  when  $x = 4$ . What is the value of y when  $x = 3$ ?  
a. 18            b. 20            c. 23            d. 43
- The circumference (C cm) of a circle is directly proportional to its diameter (d cm). The circumference of a circle of diameter 3.5 cm is 11 cm. What is the circumference of a circle of diameter 4.2 cm?  
a. 9.17            b. 11.7            c. 14            d. 13.2
- Which of the following vary inversely with each other?  
a. speed and distance covered.            b. distance covered and taxi fare.  
c. distance travelled and time taken.    d. speed and time taken.
- 100 persons had food provision for 24 days. If 20 persons left the place, the provision will last for how many days?  
a. 30            b. 120            c. 40            d.  $\frac{96}{5}$
- Five people complete 10 jobs in 20 minutes. How many minutes will 30 people take to complete 30 similar jobs?  
a. 40            b. 180            c. 10            d. 360
- A boy runs 1 km in 5 minutes. How long will it take to run 600 m?  
a. 2 minutes            b. 3 minutes            c. 4 minutes            d. 6 minutes
- 8 grams of sandalwood cost ₹ 400. What will 54 gram sandalwood cost?  
a. ₹ 200            b. ₹ 100            c. ₹ 2700            d. ₹ 800
- If x and y vary inversely with respect to each other such that  $x = 15$  when  $y = 6$ . Find the value of x when  $y = 15$ .  
a. 2            b. 4            c. 5            d. 6
- Both x and y are in direct proportion, then  $\frac{1}{x}$  and  $\frac{1}{y}$  are in  
a. in indirect proportion.  
b. in inverse proportion.  
c. neither in direct nor in inverse proportion.  
d. sometimes in direct and sometimes in inverse proportion.
- If 8 men can do a piece of work in 20 days, in how many days could 20 men do the same work?  
a. 4 days            b. 6 days            c. 8 days            d. 10 days

### **SHORT ANSWER TYPE QUESTION:**

11. A car travels 14 km in 25 minutes. Find out how far the car can travel in 5 hours if the speed remains the same?
12. If 15 workers can finish a task in 42 hours, calculate the number of workers required to complete the same task in 30 hours.
13. If 3 kg of sugar contains  $9 \times 10^8$  crystals. How many sugar crystals are there in 4 kg of sugar?
14. The cost of 5 metres of cloth is ₹ 210. Tabulate the cost of 2, 4, 10 and 13 metres of cloth of the same type.
15. Mohit deposited a sum of ₹ 12000 in a Bank at a certain rate of interest for 2 years and earned an interest of ₹ 900. How much interest would be earned for a deposit of ₹ 15000 for the same period and at the same rate of interest?  
(ANS 5: the required amount of interest = ₹ 1125)
16. A garrison of 120 men has provisions for 30 days. At the end of 5 days, 5 more men joined them. How many days can they sustain on the remaining provision?
17. If two cardboard boxes occupy 500 cubic centimetres space, then how much space is required to keep 200 such boxes?
18. Find the value of x and y if  $x : y = 2 : 3$  and  $2 : x = 1 : 2$ .
19. Ranjith has enough money to buy 75 machines worth Rs. 200 each. How many machines can he buy if he gets a discount of Rs.50 on each machine?
20. A worker is paid Rs. 420 for 2 days work. If his total income of the month is Rs. 1890, For how many days did he work?

### **LONG ANSWER TYPE QUESTIONS**

21. A water tanker can finish a certain journey in 10 hours at the speed of 40 km/hr. By how much should its speed be increased so that it may take only 8 hours to cover the same distance?
22. The amount of extension in the length of the elastic string directly varies as the weight hangs on it. If a weight of 500 gm produces an extension of 3 cm, then what weight would produce an extension of 36 cm. Write the solution in Kg.
23. 1200 children in a hostel had enough food for 28 days. After 4 days, some children were shifted to another hostel. As a result, the food now lasted for 32 days. How many students were shifted?

24. A 5m 60cm high vertical pole casts a shadow which is 3m 20cm long. Find at the same time  
 (i) length of the shadow cast by a different pole which is 10m 50cm high.  
 (ii) height of a pole which casts a shadow 5m long.

25. In a Television game show, total prize money of Rs. 1,00,000 has to be divided equally among the winners. Complete the below table and find out whether the prize money given to one individual winner is directly or inversely proportional to the total number of winners:

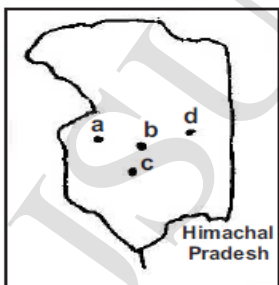
No. of winners	1	2	4	5	8	10	20
Prize for each winner (in rupees)	1,00,000	50,000	.....	.....	.....	.....	.....

26. Two people could fit new windows in a house in 3 days.  
 (i) One of the persons fell ill before the work started. How long would the job take now?  
 (ii) How many people would be needed to fit the windows in one day?

**CASE BASED QUESTIONS :-**

27. Many schools have a recommended students-teacher ratio as 35:1. Next year, the school expects an increase in enrolment by 280 students.  
 (i) How many new teachers will they have to appoint to maintain the students-teacher ratio?  
 (ii) Board members of school XYZ decided to keep the ratio as 30:1. Total how many teachers will be appointed if the strength of the school is 1800?  
 (iii) A school has 15 teachers working. How many more teachers will be needed if the total strength of school is 735 and they want to maintain a ratio of 35:1?

28. Jagmeet has a road map with a scale of 1 cm = 20 km.  
 (i) He drives on a road for 72 km. What would be his distance covered in the map?  
 (ii) Suppose the distance between two places on the map is 3.5cm, find the exact distance between the two places.  
 (iii) Jagmeet went from place a to b to meet his parents and then b to c to join his office. If the distance between a and b is 4cm and the distance between b and c is 2 cm on the map, total how much distance is covered by Jagmeet.



#### IV. ANSWERS

1. a
2. d
3. d
4. a
5. c
6. b
7. c
8. d
9. b
10. c
11. 168km
12. 21 workers
13.  $1.2 \times 10^9$  crystals
- 14.

Length of cloth (m)	5	2	4	10	13
Cost (in Rs.)	210	84	168	420	546

15. Rs.1125
16. 24 days
17. 50,000 cm<sup>3</sup>
18.  $y=6$
19. 100
20. 9 days
21. 10km/h
22. 6 kg
23. 300 students
- 24.

Length of pole (m)	5.6	10.5	8.75
Length of shadow (m)	3.2	6	5

25.

No. of winners	1	2	4	5	8	10	20
Prize for each winner (in rupees)	1,00,000	50,000	25000	20000	12500	10000	5000

26. (i) 6 days (ii) 6 persons
27. (i) 8 teachers (ii) 60 teachers (iii) 6 teachers
28. (i) 3.6 cm (ii) 70 km (iii) 120 k

**TEST 1 (MM:20)**

**Section A (MCQ 1 MARK EACH)**

1. If 15 oranges cost Rs. 70, what do 39 oranges cost?  
(a) Rs. 180 (b) Rs. 182 (c) Rs. 190 (d) none of these
2. If 22.5 m of a uniform iron rod weighs 85.5 kg, what will be the length of 22.8 kg of the same rod?  
(a) 5 m (b) 6 m (c) 7 m (d) none of these
3. Travelling 900 km by rail costs Rs. 280. What would be the fare for a journey of 360 km when a person travels by the same class?  
(a) Rs. 118 (b) Rs. 112 (c) Rs. 119 (d) none of these
4. If 25 metres of cloth costs Rs. 1575, how many metres of it can be bought for Rs. 2016?  
(a) 30 m (b) 32 m (c) 36 m (d) none of these

**SECTION B (2 MARKS EACH)**

5. A machine in a soft drink factory fills 840 bottles in six hours. How many bottles will it fill in five hours? (the machine will fill up 700 bottles in 5 hours.)
6. A loaded truck travels 14 km in 25 minutes. If the speed remains the same, how far can it travel in 5 hours?
7. 3 lambs finish eating turnips in 8 days. How many days will it take for 2 lambs to finish?

**SECTION C (3 MARKS EACH)**

8. Suppose 2 kg of sugar contains  $9 \times 10^6$  crystals. How many sugar crystals are there in  
(i) 5 kg of sugar? ( $2.25 \times 10^7$  crystals)  
(ii) 1.2 kg of sugar? ( $5.4 \times 10^6$ )
9. A 5m 60cm high vertical pole casts a shadow which is 3m 20cm long. Find at the same time  
(i) length of the shadow cast by a different pole which is 10m 50cm high.  
(ii) height of a pole which casts a shadow 5m long.

**SECTION D (4 MARKS)**

10. If 25 metres of cloth costs Rs 337.50, then  
(i) What will be the cost of 40 metres of the same type of cloth?  
(ii) What will be the length of the cloth bought for Rs 810?



**TEST 2 (MM:30)**

**Section A (MCQ 1 MARK EACH)**

1. If the cost of 9 toys is Rs. 333, find the cost of 16 such toys.  
(a) Rs. 594 (b) Rs. 596 (c) Rs. 592 (d) none of these
2. A car can cover a distance of 522 km on 36 litres of petrol. How far can it travel on 14 litres of petrol?  
(a) 230 km (b) 232 km (c) 203 km (d) none of these
3. A train covers a distance of 51 km in 45 minutes. How long will it take to cover 221 km?  
(a) 3 hours (b) 3 hrs 15 min (c) 3 hrs 30 min (d) 2 hrs 45 min
4. If the thickness of a pile of 16 cardboards is 44mm, how many cardboards will be there in a pile which is 71.5 cm thick?  
(a) 270 (b) 260 (c) 250 (d) none of these
5. In a hospital, the monthly consumption of milk of 60 patients is 1350 litres. How many patients can be accommodated in the hospital if the monthly ration of milk is raised to 1710 litres, assuming that the quota per head remains the same?  
(a) 75 (b) 76 (c) 77 (d) none of these
6. Shreya cycles to her school at an average speed of 12 km/hr. It takes her 20 minutes to reach the school. If she wants to reach her school in 15 minutes, what should be her average speed?  
(a) 15 km/hr (b) 16 km/hr (c) 18 km/hr (d) none of these

**SECTION B (2 MARKS EACH)**

7. A photograph of a bacteria enlarged 50,000 times attains a length of 5 cm. What is the actual length of the bacteria?
8. A car travels 432 km on 48 litres of petrol. How far would it travel on 20 litres of petrol?
9. If 40 metres of a cloth costs Rs. 1940, how many metres can be bought for Rs. 727.50?
10. If  $x$  and  $y$  vary inversely as each other and  $x = 10$  when  $y = 6$ . Find  $y$  when  $x = 15$ .

**SECTION C (3 MARKS EACH)**

11. If a box of sweets is divided among 24 children, they will get 5 sweets each. How many would each get, if the number of the children is reduced by 4?
12. A train is moving at a uniform speed of 75 km/hour.  
(i) How far will it travel in 20 minutes?

(ii) Find the time required to cover a distance of 250 km.

13. Six pumps working together empty a tank in 28 minutes. How long will it take to empty the tank if 4 such pumps are working together?

14. A factory requires 42 machines to produce a given number of articles in 63 days. How many machines would be required to produce the same number of articles in 54 days?

(49 machines are required for 54 days.)

SECTION D (4 MARKS)

15. Ravi starts for his school at 8:20 a.m. on his bicycle. If he travels at a speed of 10 km/h, then he reaches his school late by 8 minutes but on travelling at 16 km/h he reaches the school 10 minutes early. At what time does school start?

# FACTORISATION

## IMPORTANT CONCEPTS:

**1. Prime factor form :** A number written as a product of prime factors is said to be in the prime factor form. For example: The prime factor form of  $30 = 2 \times 3 \times 5$ .

**2. Factors of algebraic expressions :** Like any natural number, an algebraic expression is also the product of its factors. In the case of algebraic expression, it is said to be an irreducible form instead of prime factor form. For example :  $8ab = 8 \times a \times b$  ( irreducible form)

**3. Factorisation :** Factorisation of an algebraic expression is writing it as a product of factors. These factors may be numbers, algebraic variables or algebraic expressions.

### 4. Methods of Factorisation :

- Methods of common factors.
- Factorisation by regrouping terms
- Factorisation using identities .

### Methods of common factors:

Example : Factorise  $12xy^2 - 24y$  .

Solution : Factors of  $12xy^2 = 2 \times 2 \times 3 \times x \times y \times y$

Factors of  $24y = 2 \times 2 \times 2 \times 3 \times y$

common factors of two terms are 2 , 2 , y.

$$\begin{aligned}12xy^2 - 24y &= (2 \times 2 \times 3 \times x \times y \times y) + (2 \times 2 \times 2 \times 3 \times y) \\ &= 2 \times 2 \times 3 \times y [(x \times y) + (2)] \\ &= 12y \times (xy + 2) \\ &= 12y (xy + 2)\end{aligned}$$

### Factorisation by regrouping terms :

Example : Factorise  $8p - q + pq - 8$  by regrouping terms.

$$\begin{aligned}8p + q - pq - 8 &= 8p - 8 - pq + q \\ &= 8(p - 1) - q(p - 1) \\ &= (p - 1)(8 - q)\end{aligned}$$

Factorisation using Identities :

$$\begin{aligned}\text{Algebraic Identities : } &(a + b)^2 = a^2 + 2ab + b^2 \\ &(a - b)^2 = a^2 - 2ab + b^2 \\ &(a + b)(a - b) = a^2 - b^2 \\ &(x + a)(x + b) = x^2 + (a + b)x + ab\end{aligned}$$

### 4.Division of Algebraic Expressions

Consider  $7x^3 \div 14x$

$$7x^3 \div 14x = \frac{7x^3}{14x}$$

$$\begin{aligned} & \frac{7 \times x \times x \times x}{2 \times 7 \times x} \\ = & \frac{x^2}{2} \end{aligned}$$

### SOME ILLUSTRATIONS:

1. The factorisation of  $18a^2b + 15ab^2$  is

- a)  $3ab(6a + 5b)$       b)  $3a^2b(6a + 5b)$       c)  $3ab^2(6a + 5b)$       d)  $3a^2b^2(6a + 5b)$

Ans: a)  $3ab(6a + 5b)$

2. The common factor of  $x^2y^2z$  and  $x^3y^3z^2$  is

- a)  $x^2y^2z$       b)  $x^3y^3z$       c)  $x^2y^3z$       d)  $x^3y^2z$

Ans: a)  $x^2y^2z$

3. The factorisation of  $6xy - 4y + 6 - 9x$  is

- a)  $(3x - 2)(2y - 3)$       b)  $(3x + 2)(2y - 3)$       c)  $(3x - 2)(2y + 3)$       d)  $(3x + 2)(2y + 3)$

Ans: a)  $(3x - 2)(2y - 3)$

4. The factors of  $4y^2 - 12y + 9$  is:

- a)  $(2y+3)^2$       b)  $(2y-3)^2$       c)  $(2y-3)(2y+3)$       d) None of the above

Ans: b)  $(2y-3)^2$

### Case Study Based Questions:

1. Riddhi wants to make a garden in her house in the shape of a parallelogram ABCD, the area of which is  $4x^2 - 9$  and side BC is of length 3m.

(i) If the height corresponding to side AB is  $2x+3$ , then find the length of side CD.

(ii) she fenced the garden with wire which cost a total of rupees x. Find the rate of wire per unit length.

(iii) find the area of parallelogram shaped garden for  $x=4$  units.

Ans: (i)  $(2x - 3)$  m

(ii) Rs4

(iii)  $55 \text{ m}^2$

### Short Answer Questions:

1. Factorise  $p^2 - 2p + 1$ .

$$\begin{aligned}\text{Ans: } p^2 - 2p + 1 &= p^2 - p - p + 1 \\ &= p(p-1) - 1(p-1) \\ &= (p-1)(p-1) \\ &= (p-1)^2\end{aligned}$$

2. Factorise:  $6ab + 12bc$

$$\begin{aligned}\text{Ans: } 6ab + 12bc &= (2 \times 3 \times a \times b) + (2 \times 2 \times 3 \times b \times c) \\ &= 2 \times 3 \times b(a + 2c) \\ &= 6b(a + 2c)\end{aligned}$$

3. Expand using suitable identities :  $(7x + 5)^2$

$$\begin{aligned}\text{Ans: } (7x + 5)^2 &= (7x)^2 + 2 \times 7x \times 5 + 5^2 \quad [(a + b)^2 = a^2 + 2ab + b^2] \\ &= 49x^2 + 70x + 25\end{aligned}$$

### Long Answer Questions:

1. Factorise the following using the identity  $(a + b)(a - b) = a^2 - b^2$

a)  $4x^2 - 25y^2$       b)  $\frac{4x^2}{9} - \frac{9y^2}{16}$

Ans:

$$\begin{aligned}\text{a) } 4x^2 - 25y^2 &= (2x)^2 - (5y)^2 \\ &= (2x + 5y)(2x - 5y)\end{aligned}$$

$$\text{b) } \frac{4x^2}{9} - \frac{9y^2}{16} = \frac{(2x)^2}{3^2} - \frac{(3y)^2}{4^2}$$

$$= \left(\frac{2x}{3}\right)^2 - \left(\frac{3y}{4}\right)^2$$

$$= \left(\frac{2x}{3} + \frac{3y}{4}\right)\left(\frac{2x}{3} - \frac{3y}{4}\right)$$

2. Factorize  $(x + y)^2 - 4xy$

Ans:  $(x + y)^2 = x^2 + 2xy + y^2$

$$(x + y)^2 - 4xy = x^2 + 2xy + y^2 - 4xy$$
$$= x^2 + y^2 - 2xy$$

$$(x - y)^2 = x^2 + y^2 - 2xy$$

$$(x + y)^2 - 4xy = (x - y)^2$$

## PRACTICE

### A) MCQ

1. Which of the following is the common factor of  $25a^2b$  and  $55ab^2$ ?

- (a)  $5ab^2$       (b)  $5a^2b$       (c)  $5ab$       (d)  $5a^2b^2$

2. The common factor of  $6a^2b^4c^2$ ,  $21a^2b$  and  $15a^3$  is

- (a)  $3a^3$       (b)  $6a^3$       (c)  $6a^2$       (d)  $3a^2$

3. The factorisation of  $x^2yz + xy^2z + xyz^2$  is

- (a)  $xyz(x + y + z)$       (b)  $x^2yz(x + y + z)$   
(c)  $xy^2z(x + y + z)$       (d)  $xyz^2(x + y + z)$

4. If  $x^2 - x - 42 = (x + k)(x + 6)$  then  $k =$

- (a) 6      (b) -6      (c) -7      (d) 7

5. The quotient of  $12a^8b^8 \div (-4a^6b^6)$  is

- (a)  $3a^2b^2$       (b)  $3a^2b$       (c)  $3ab^2$       (d)  $-3a^2b^2$

6. The factors of  $6xy - 4y + 6 - 9x$  are:

- a.  $(3x + 2)(2y + 3)$       b.  $(3x - 2)(2y - 3)$   
c.  $(3x - 2)(2y + 3)$       d.  $(3x + 2)(2y - 3)$

7. The factors of  $49p^2 - 36$  are:

- a.  $(7p+6)^2$       b.  $(7p-6)^2$       c.  $(7p - 6)(7p + 6)$       d. none of the above

8. The common factor of  $24a^3b^4$ ,  $36a^4c^4$  and  $48a^3b^2c$  is:

- a.  $12a^3$       b.  $24a^3$       c.  $36a^3$       d.  $48a^3$

9. The factors of  $xyz$  are:

- a.  $x$       b.  $y$       c.  $z$       d. all of the above

10. The value of  $3.5 \times 3.5 - 2.5 \times 2.5$  is

- (a) -6      (b) 6      (c) 60      (d) 1

### B) SHORT ANSWER QUESTIONS

1. Subtract : (i)  $5a^2b^2c^2$  from  $-7a^2b^2c^2$
2. Simplify  $(ab - c)^2 + 2abc$
3. Expand using suitable identities :  $\left(\frac{4a}{5} + \frac{5b}{4}\right)^2$
4. Carry out the following divisions: (ii)  $76x^3yz^3 \div 19x^2y^2$
5. Factorise the following :  $x^2 - 8x + 16$
6. Factorise the expressions.  $(lm + l) + m + 1$
7. Factorise  $(a^2 - 2ab + b^2 - c^2)$
8. Factorise  $m^4 - 256$
9. Obtain the factors of  $z^2 - 4z - 12$ .
10. Carry out the following divisions.  $12a^8b^8 \div (-6a^6b^4)$

### LONG ANSWER TYPE :

1. Find the common factors of the following:
  - (i)  $6xyz$ ,  $24xy^2$  and  $12x^2y$
  - (ii)  $3x^2y^3$ ,  $10x^3y^2$  and  $6x^2y^2z$
2. Solve for  $(4x^2 - 100) \div 6(x + 5)$
3. Factorize the expressions and divide them as directed.  $(m^2 - 14m - 32) \div (m + 2)$
4. Factorize  $9a(6a - 5b) - 12a^2(6a - 5b)$
5. The area of a square is given by  $4x^2 + 12xy + 9y^2$ . Find the side of the square.
6. The area of a circle is given by the expression  $\pi x^2 + 6\pi x + 9\pi$ . Find the radius of the circle.
7. Factorise the expressions and divide them as directed:
  - (i)  $(x^4 - 16) \div x^3 + 2x^2 + 4x + 8$
8. Factorize  $(q^2 - 10q + 21)$
9. Factorize  $x^2 + \frac{1}{x^2} + 2 - 3x - \frac{3}{x}$
10. If  $m - n = 16$  and  $m^2 + n^2 = 400$ , then find  $mn$ .

### CASE BASED QUESTIONS:-

1. Ramesh has a cuboidal box, the volume of which is  $x^3 + 3x^2 + 2x$ .
  - (i) write an expression for its length, breadth and height in terms of  $x$ .
  - (ii) find the dimensions of box if its height  $6m$  is the largest dimension.
  - (iii) how many rectangular sheets will be used to cover the base of box if



of dimension  $(1 \times x)$ ?

2. The total amount paid by Neha for purchasing some books at the rate of Rs.  $x$  is  $x^3 - x$ . The number of books is 1 more than the cost of each book.
  - (i) How many books she can purchase with the amount she has?
  - (ii) How many sets of books she can purchase from  $x^3 - x$  rupees if number of books in each set is  $x - 1$ ?
  - (iii) If the cost of each book is Rs. 10, total how much money was spent in purchasing 4 sets of books?



## ANSWERS:

### Solution of MCQs

1. c                      2. d                      3. a                      4. c                      5. d                      6. b  
7. c                      8. a                      9. d                      10. b

### Solution Short Answer Questions:

1.  $-2a^2b^2c^2$ .                      2.  $a^2b^2 + c^2$                       3.  $\frac{16a^2}{25} + \frac{25b^2}{16} + 2ab$                       4.  $\frac{4xz^3}{y}$   
5.  $(x-4)^2$                       6.  $(l+1)(m+1)$                       7.  $(a-b)(a-b+c)$                       8.  $(m-2)(m+2)(m^2+4)$   
9.  $(z-6)(z+12)$                       10.  $-2a^2b^4$

### Solutions of Long Answers Questions:

1. (i)  $6xy$                       (ii)  $x^2y^2$                       2.  $\frac{(x+5)}{3}$                       3.  $(m-16)$                       4.  $(2x+3y)^2$   
5.  $(2x+3y)$  units                      6.  $(x+3)$  units                      7.  $(x-2)$                       8.  $(x-7)(x-3)$   
9.  $\left(x + \frac{1}{x}\right)\left(x + \frac{1}{x} - 3\right)$                       10.  $mn = 72$

### Solutions Of Case Studt Based Questions :

1. (i)  $x$  units ,  $(x+2)$  units ,  $(x+1)$  units                      (ii) 5 units , 4 units                      (iii)  $(x+1)$   
2. (i)  $(x^2-1)$                       (ii)  $x(x+1)$                       (iii) Rs 440

### TEST-1( 20 marks)

#### 1. Factorise

(i)  $(16x^5 - 144x^3)$

(ii)  $x^2 + 9x + 20$ .

#### 2. Find the common factors of the given terms.

(i)  $20x^3, -4x^2, 32x$

(ii)  $12pq, 20pqr, 30rp$

3. Factorise  $(z - 7 + 7xy - xyz)$

4. The area of a rectangle is  $(x^2 + 7x + 12)$ . If its breadth is  $(x + 3)$ , then find its length

5. Perform the following divisions:  $(x^3y^3 + x^2y^3 - xy^4 + xy) \div xy$

### TEST-2 ( 30 marks)

#### 1. Factorise the following expressions.

(i)  $3pqr - 6p^2q^2r^2 - 15r^2$

(ii)  $-xy - ay$

#### 2. Expand the following, using suitable identities



$$(x^2y - xy^2)^2$$

3. Simplify  $(1.5p + 1.2q)^2 - (1.5p - 1.2q)^2$

4. Factorise the expressions.

(i)  $5y^2 - 20y - 8z + 2yz$

(ii)  $10ab + 4a + 5b + 2$

5. Factorise the expressions and divide them as directed.

$$39y^3 (50y^2 - 98) \div 26y^2 (5y + 7)$$

6. The area of a square is given by  $4x^2 + 12xy + 9y^2$ . Find the side of the square.

7. Find the factors of  $3m^2 + 9m + 6$ .

8. Factorise

(i)  $p^4 - 81$

(ii)  $x^4 - (y + z)^4$

# INTRODUCTIN TO GRAPHS

## I. IMPORTANT CONCEPTS / RESULTS:

- I. A line graph displays data that changes continuously over periods of time.
- II. A line graph which is a whole unbroken line is called a linear graph.
- III. The horizontal line is called the x-axis and the vertical line is called the y-axis.
- IV. Independent variable (or sometimes control variable) and Dependent variable.
- V. Some Applications :
  - a. Quantity and Cost
  - b. Principal and Simple Interest
  - c. Time and Distance

## II. EXAMPLES AND ILLUSTRATIONS:

1. Every point on the y axis is of the form.

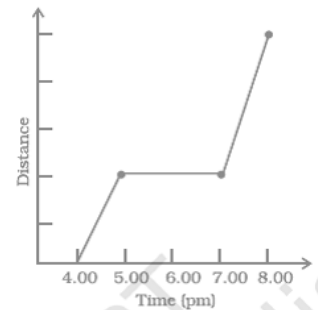
- (a) (0, y)                      (b) (x, 0)  
(c) (x, y)                      (d) (x, 1)

**Solution: The correct answer is (a).**

2. The given graph shows Amar's trip to an exhibition by a car. Observe the graph carefully and find what was he doing between 5 pm and 7 pm?

- (a) Driving to the mall.  
(b) Driving back home.  
(c) Was not driving.  
(d) Not enough data to answer.

**Solution : The correct answer is (c).**



3. The coordinates of a point at a distance of 3 units from the x axis and 6 units from the y axis is  
(a) (0, 3)                      (b) (6, 0)                      (c) (3, 6)                      (d) (6, 3)

**Solution : The correct answer is (c).**

4. The point (3, 4) is at a distance of

- (a) 3 from both the axis                      (b) 4 from both the axis  
(c) 4 from the x axis and 3 from y axis                      (d) 3 from x axis and 4 from y axis

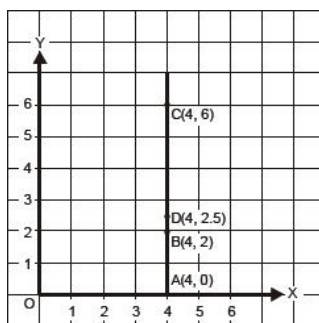
**Solution : The correct answer is (d).**

5. Plot the following points on a graph sheet. Verify if they lie on a line

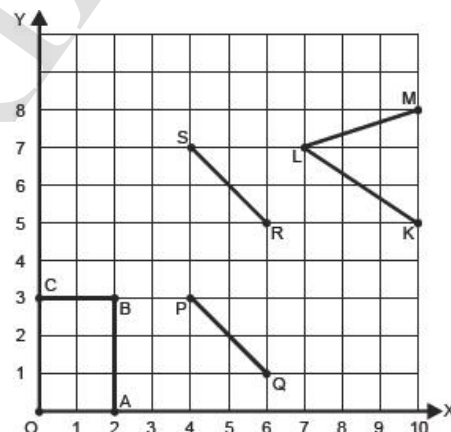
- (a) A(4, 0), B(4, 2), C(4, 6), D(4, 2.5)  
(b) P(1, 1), Q(2, 2), R(3, 3), S(4, 4)  
(c) K(2, 3), L(4, 3), M(5, 5), N(2, 5).

**Solution :** Draw the x-axis and y-axis. Plot the points A (4,0), B (4, 2), C (4, 6) and D (4, 2.5) as shown.

Clearly, these points lie on a line ABDC.



6. Write the coordinates of the vertices of each of the figures given below.



**Solution :** Clearly, from the graph the coordinates of points are:

- O (0, 0), A (2, 0), B (2, 3) and C (0, 3);
- P (4, 3), Q (6, 1), R (6, 5) and S (4, 7);
- L (7, 7), M (10, 8) and K (10, 5).

7. Plot the point (4, 3) on a graph sheet. Is it the same as the point (3, 4)?

**Solution:** Locate the x, y axes, (they are actually number lines!). Start at O (0, 0). Move 4 units to the right; then move 3 units up, you reach the point (4, 3). From Fig 15.13, you can see that the points (3, 4) and (4, 3) are two different points.

8. Draw the graphs for the following tables of values, with suitable scales on the axes.

**Distance travelled by a car:**

Time (in hours)	6am	7am	8am	9am
Distances (in km)	40	80	120	160

- (i) How much distance did the car cover during the period 7.30 a.m. to 8 a.m.?
- (ii) What was the time when the car had covered a distance of 100 km since it's start?

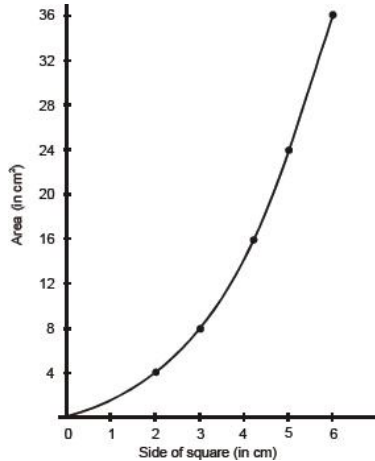
**Solution:** 1) 20km

2) 7:30am

9. Draw a graphs for the following. Is it a linear graph?

Side of square (in cm)	2	3	4	5	6
Area (in cm <sup>2</sup> )	4	9	16	25	36

**Solution:** Plot points (2, 4), (3, 9), (4, 16), (5, 25), (6,36) It is not a linear graph.



### III. QUESTIONS FOR PRACTICE:

- (o, y) are the co-ordinates of a point lying on which of the following?
  - origin
  - x-axis
  - y-axis
  - none of these.
- The point (3, 2) is nearer to:
  - x-axis
  - y-axis
  - origin
  - none of these.
- The point (-5, 6) is nearer it:
  - x-axis
  - y-axis
  - origin
  - none of these.
- The point (-3, -3) is
  - nearer to x-axis
  - y-axis
  - near to origin
  - equidistant from x-axis and y-axis.
- The point (0, 4) lies on which of the following:
  - x-axis
  - y-axis
  - origin
  - none of these.
- The point (-3, 0) lies on which of the following?
  - x-axis
  - y-axis
  - origin
  - none of these.
- The points (-3, 2) and (2, -3) represent:
  - different points
  - same point
  - the origin
  - none of these.
- By joining (-1, -1), (0, 0) and (3, 3) represent:
  - a triangle
  - a curved line
  - a straight line passing through origin
  - a straight line not passing through origin.
- By joining (-3, 2), (-3, -3) and (-3, 4), which of the following is obtained?
  - a triangle
  - A straight line not passing through origin
  - A straight line passing through origin
  - none of these.
- Which of the following points lies on y-axis?
  - (-4, 0)
  - (4, 0)
  - (0, -4)
  - (-4, 4)

**Answers :**

- 1)ii      2)i      3)ii      4)iv      5)ii  
 6)i      7)i      8)iii      9)ii      10)iii

**CHAPTER TEST – I**

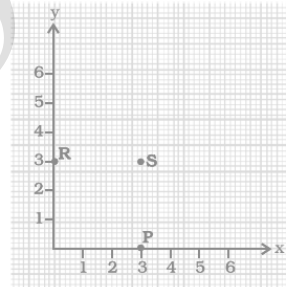
**MAX.MARKS: 20**

**TIME: 35MIN**

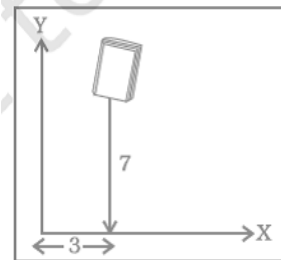
**I. Choose the correct answer.**

**(4 × 1M = 4M)**

- A graph that displays data that changes continuously over periods of time is  
 (a) bar graph      (b) pie chart      (c) histogram      (d) line graph
- A point which lies on both the axis is \_\_\_\_\_  
 (a) (0, 0)      (b) (0, 1)      (c) (1, 0)      (d) (1, 1)
- In the given graph the letter that indicates the point (0, 3) is  
 (a) P      (b) Q      (c) R      (d) S



- In the given figure the position of the book on the table may be given by  
 (a) (7, 3)      (b) (3, 7)      (c) (3, 3)      (d) (7, 7)



**II. Answer the following questions.**

**(3 × 2M = 6M)**

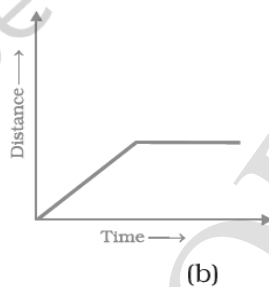
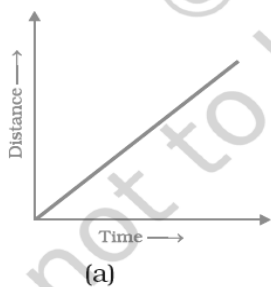
- If y-coordinate is 3 times x -coordinate, form a table for it.(atleast 2 points)
- Plot the given points on a graph sheet.  
 (a) (5, 4)      (b) (2, 0)      (c) (3, 1)      (d) (0, 4)
- Complete the given tables and draw a graph for each.

x	0	1	2	3
y = 3x + 1	1	4	-	-

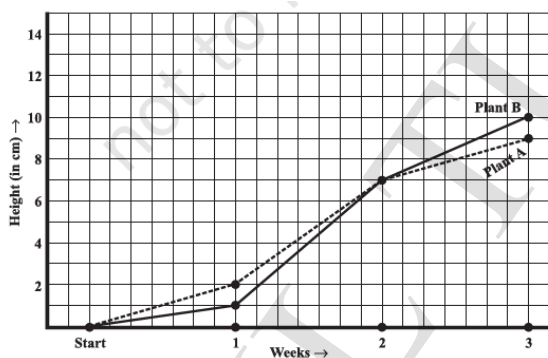
III. Answer the following questions.

(2 × 3M = 6M)

8. The cost of a note book is Rs 10. Draw a graph after making a table showing cost of 2, 3, 4, .... note books. Use it to find
  - (a) the cost of 7 notebooks.
  - (b) The number of note books that can be purchased with Rs 50.
9. Explain the situations represented by the following distance-time graphs.



- IV. **CASE STUDY:** A biology teacher teaching Botany to her class VIII students and explaining them about the growth of plants. To make it more exciting, she took two different plants, plant A and plant B and were grown under similar laboratory conditions. The students were asked to measure their heights at the end of each week for 3 weeks. The results are shown by the following graph. (4M)



Answer the following based on your observations:

1. How high was Plant A after 2 weeks? 1M
2. How high was Plant B after 3 weeks? 1M
3. Were the two plants of the same height during any week shown here? Specify. 1M
4. How much did Plant B grow from the end of the 2nd week to the end of the 3rd week? 1M

**CHAPTER TEST – II**

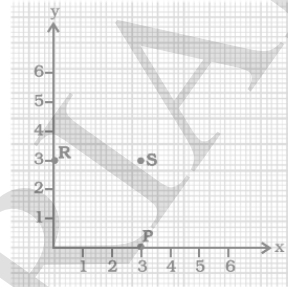
**MAX.MARKS: 30**

**TIME: 60MIN**

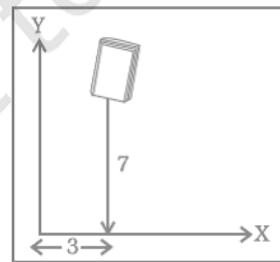
I. Choose the correct answer.

(5 × 1M = 5M)

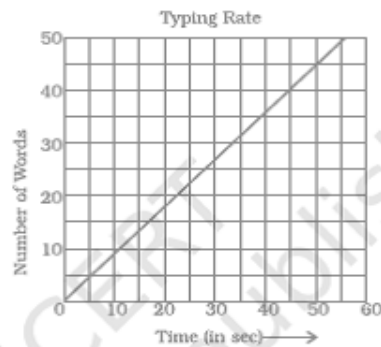
- A graph that displays data that changes continuously over periods of time is  
 (a) bar graph            (b) pie chart            (c) histogram            (d) line graph
- A point which lies on the y – axis only is \_\_\_\_\_  
 (a) (0, 0)            (b) (0, 1)            (c) (1, 0)            (d) (1, 1)
- In the given graph the letter S indicates the point.....  
 (a) (3, 0)            (b) (0, 3)            (c) (0, 0)            (d) (3, 3)



- In the given figure the position of the book on the table may be given by  
 (a) (7, 3)            (b) (3, 7)            (c) (3, 3)            (d) (7, 7)



- Data was collected on a student’s typing rate and graph was drawn as shown below. Approximately how many words had this student typed in 30 seconds?  
 (a) 20            (b) 24            (c) 28            (d) 34



**II. Answer the following questions. (4 × 2M = 8M)**

- Make a line graph for the area of a square as per the given table. Is it a linear graph?

Side (in cm)	1	2	3	4
Area (in cm <sup>2</sup> )	1	4	9	16

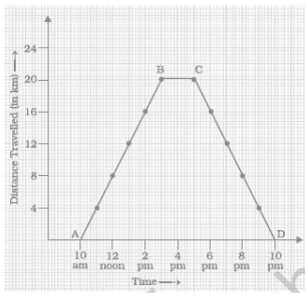
7. If  $x$ -coordinate is 2 times  $y$ -coordinate, form a table for it.(atleast 2 points)
8. Plot the given points on a graph sheet and find the shape.  
(5, 4) (2, 0) (3, 1) (0, 4)
9. Complete the given tables and draw a graph for each.

$x$	0	1	2	3
$y = 3x + 1$	1	4	-	-

III. Answer the following questions.

(3 × 3M = 9M)

10. The cost of a note book is Rs 10. Draw a graph after making a table showing cost of 2, 3, 4, .... note books. Use it to find
  - (a) the cost of 7 notebooks.
  - (b) The number of note books that can be purchased with Rs 50.
11. Explain the situations represented by the following distance-time graphs.

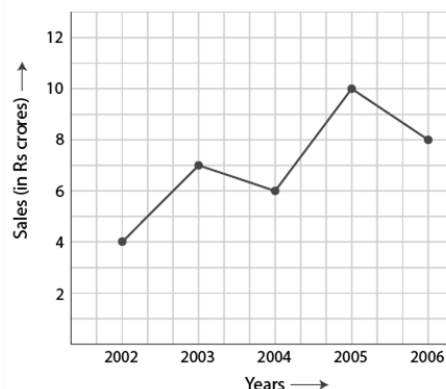


12. Draw the graph for the Distance travelled by a car with suitable scales on the axes and Find , how much distance did the car cover during the period 7.30 a.m. to 8 a.m?

Time (in hours)	6am	7am	8am	9am
Distances (in km)	40	80	120	160

- IV. **CASE STUDY- I:** Amar and Ravi went to a Chocolate making company with their maths teacher for a visit. When they were going around in the company they observed a graph projected on a wall which shows the yearly sales of the company. Their maths teacher was explaining the graph to them. Then he asked few questions. Please help Amar and Ravi in answering th equestions.

(4M)





Answer the following based on your observations:

1. What were the sales in (i) 2002 (ii) 2006? 1M
2. What were the sales in (i) 2003 (ii) 2005? 1M
3. In which year was there the greatest difference between the sales as compared to its previous year? 1M

V. **CASE STUDY- II:** Study the graph given below of a person who started from his home and returned at the end of the day. Answer the questions that follow. (4M)

At what time did he cover 16 km of his journey? 1M

1. What was he doing from 3 pm to 5 pm? 1M
2. Calculate the average speed of the man from (a) A to B (b) B to C 2M

