

# MATHEMATICS WORK BOOK

## Class - VIII



State Council of Educational Research and Training  
Govt. of Tripura

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# **MATHEMATICS WORK BOOK**

**Class - VIII**

**First Edition  
September, 2021**

**Cover Design  
Asoke Deb, Teacher**

**Type & Setting : SCERT, Tripura**

**Printed by :  
Satyajug Employees Co-operative Industrial Society Ltd.  
13/1A Prafulla Sarkar Street, Kolkata-72**

**Publisher :  
State Council of Educational Research and Training  
Government of Tripura**


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শিক্ষার প্রকৃত বিকাশের জন্য, শিক্ষাকে যুগোপযোগী করে তোলার জন্য প্রয়োজন শিক্ষাসংক্রান্ত নিরন্তর গবেষণা। প্রয়োজন শিক্ষা সংশ্লিষ্ট সকলকে সময়ের সঙ্গে সঙ্গে প্রশিক্ষিত করা এবং প্রয়োজনীয় শিখন সামগ্রী, পাঠ্যক্রম ও পাঠ্যপুস্তকের বিকাশ সাধন করা। এস সি ই আর টি ত্রিপুরা রাজ্যের শিক্ষার বিকাশে এসব কাজ সূনামের সঙ্গে করে আসছে। শিক্ষার্থীর মানসিক, বৌদ্ধিক ও সামাজিক বিকাশের জন্য এস সি ই আর টি পাঠ্যক্রমকে আরো বিজ্ঞানসম্মত, নান্দনিক এবং কার্যকর করবার কাজ করে চলেছে। করা হচ্ছে সুনির্দিষ্ট পরিকল্পনার অধীনে।

এই পরিকল্পনার আওতায় পাঠ্যক্রম ও পাঠ্যপুস্তকের পাশাপাশি শিশুদের শিখন সক্ষমতা বৃদ্ধির জন্য তৈরি করা হয়েছে ওয়ার্ক বুক বা অনুশীলন পুস্তক। প্রসঙ্গত উল্লেখ্য, ছাত্র-ছাত্রীদের সমস্যার সমাধানকে সহজতর করার লক্ষ্যে এবং তাদের শিখনকে আরো সহজ ও সাবলীল করার জন্য রাজ্য সরকার একটি উদ্যোগ গ্রহণ করেছে, যার নাম 'প্রয়াস'। এই প্রকল্পের অধীনে এস সি ই আর টি এবং জেলা শিক্ষা আধিকারিকরা বিশিষ্ট শিক্ষকদের সহায়তা গ্রহণের মাধ্যমে প্রথম থেকে দ্বাদশ শ্রেণির ছাত্র-ছাত্রীদের জন্য ওয়ার্ক বুকগুলো সুচারুভাবে তৈরি করেছেন। ষষ্ঠ থেকে অষ্টম শ্রেণি পর্যন্ত বিজ্ঞান, গণিত, ইংরেজি, বাংলা ও সমাজবিদ্যার ওয়ার্ক বুক তৈরি হয়েছে। নবম দশম শ্রেণির জন্য হয়েছে গণিত, বিজ্ঞান, সমাজবিদ্যা, ইংরেজি ও বাংলা। একাদশ দ্বাদশ শ্রেণির ছাত্র-ছাত্রীদের জন্য ইংরেজি, বাংলা, হিসাবশাস্ত্র, পদার্থবিদ্যা, রসায়নবিদ্যা, অর্থনীতি এবং গণিত ইত্যাদি বিষয়ের জন্য তৈরি হয়েছে ওয়ার্ক বুক। এইসব ওয়ার্ক বুকের সাহায্যে ছাত্র-ছাত্রীরা জ্ঞানমূলক বিভিন্ন কার্য সম্পাদন করতে পারবে এবং তাদের চিন্তা প্রক্রিয়ার যে স্বাভাবিক ছন্দ রয়েছে, তাকে ব্যবহার করে বিভিন্ন সমস্যার সমাধান করতে পারবে। বাংলা ও ইংরেজি উভয় ভাষায় লিখিত এইসব অনুশীলন পুস্তক ছাত্র-ছাত্রীদের মধ্যে বিনামূল্যে বিতরণ করা হবে।

এই উদ্যোগে সকল শিক্ষার্থী অতিশয় উপকৃত হবে। আমার বিশ্বাস, আমাদের সকলের সক্রিয় এবং নিরলস অংশগ্রহণের মাধ্যমে ত্রিপুরার শিক্ষাজগতে একটি নতুন দিগন্তের উন্মেষ ঘটবে। ব্যক্তিগত ভাবে আমি চাই যথাযথ জ্ঞানের সঙ্গে সঙ্গে শিক্ষার্থীর সামগ্রিক বিকাশ ঘটুক এবং তার আলো রাজ্যের প্রতিটি কোণে ছড়িয়ে পড়ুক।

  
(রতন লাল নাথ)

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# Rational Numbers

**Key points and formulae :**

- ◆ Natural numbers : 1, 2, 3, .....
- ◆ Whole numbers : 0, 1, 2, 3, .....
- ◆ Integers : 0,  $\pm 1$ ,  $\pm 2$ ,  $\pm 3$  .....
- ◆ Rational number : A number that can be expressed in the form of  $\frac{m}{n}$ , where m and n are integers and  $n \neq 0$ , is called a rational number.
- ◆ Lowest form of a rational number : A rational number  $\frac{m}{n}$  is said to be in the lowest form or simplest form if m and n have no common factor other than 1 and  $n \neq 0$ .
- ◆ Rational numbers are closed under the operations of addition, subtraction and multiplication.
- ◆ The operations addition and multiplication are -
  - i) Commutative for rational numbers.
  - ii) Associative for rational numbers.
- ◆ The rational number 0 is the additive identity for rational numbers.
- ◆ The rational number 1 is the multiplicative identity for rational numbers.
- ◆ The additive inverse of the rational number  $\frac{m}{n}$  is  $-\frac{m}{n}$  and vice - versa.
- ◆ The reciprocal or multiplicative inverse of the rational number  $\frac{m}{n}$  is  $\frac{n}{m}$ , if  $\frac{m}{n} \times \frac{n}{m} = 1$ .
- ◆ Distributivity of rational numbers : For all rational numbers a, b and c.  
 $a(b + c) = ab + ac$  and  $a(b - c) = ab - ac$ .
- ◆ Rational numbers can be represented on a number line.
- ◆ Between any two given rational numbers there are countless rational numbers.
- ◆ The idea of mean helps us to find rational numbers between two rational numbers.

## Exercise - 1

### Group - A

Very short answer type questions : (1 mark each)

Choose the correct answer :

- $\frac{5}{7}$  is  
(a) a natural number (b) a whole number (c) an integer (d) a rational number
- Additive inverse of -1 is  
(a) 0 (b) 1 (c)  $\frac{1}{3}$  (d)  $-\frac{1}{2}$
- The number that has no reciprocal is  
(a) -7 (b) 0 (c)  $\frac{1}{4}$  (d)  $\frac{1}{2}$
- The least whole number is  
(a) -1 (b) 0 (c) 1 (d) -2
- Rational number less than -8 is  
(a)  $-\frac{39}{26}$  (b)  $\frac{-168}{17}$  (c)  $\frac{-28}{7}$  (d)  $\frac{-49}{14}$

Fill in the blanks :

- Rational numbers are not closed under \_\_\_\_\_.
- The number equivalent to  $\frac{3}{8}$  with numerator 21 is \_\_\_\_\_.
- To locate the position of  $\frac{5}{6}$  on number line the portion between 0 and 1 is divided into \_\_\_\_\_ parts.
- The rational number  $\frac{-1}{5}$  lies on \_\_\_\_\_ side of zero on the number line.
- The value of each negative rational number is \_\_\_\_\_ than each positive rational number.



**State whether the given statements are True or False :**

11. Whole numbers are not closed under addition.
12. Reciprocal of any rational number is always an integer.
13.  $\frac{7}{4}$  is a rational number lies between 2 and 3.
14.  $\frac{-5}{2}$  is less than  $-1$ .
15. Integers can be located on number line.

**Answer the following questions :**

16. Which one is greater, among the rational numbers  $-\frac{5}{9}$  and  $-\frac{4}{9}$  ?
17. Find the value of  $\frac{5}{8} + (-\frac{7}{12})$
18. Find the multiplicative inverse of  $\frac{3}{-8}$
19. Write  $\frac{16}{-80}$  in lowest form.
20. When a number is doubled it becomes  $-3$ . What is the original number?

**Group - B**

**Short answer type questions : (2 marks each)**

1. Find the value of  $a$ , if  $a = b + c$ , when  $b = \frac{7}{6}$  and  $c = -\frac{4}{18}$
2. Sum of two rational numbers is  $-8$ . If one number is  $-\frac{4}{3}$  then find the other number.
3. Write seven rational numbers between  $-1\frac{1}{3}$  and  $2\frac{2}{3}$ .
4. What should be added to  $-5$  to get the number  $\frac{3}{8}$  ?
5. What should be subtracted from  $-\frac{3}{4}$  to get  $-\frac{5}{9}$  ?

6. Find the value of  $\frac{5}{-13} + \frac{9}{26}$ .
7. Cost of a piece of cloth of length  $3\frac{1}{5}$  metre is ₹  $65\frac{1}{5}$ . Find the cost of per metre of the cloth.
8. Product of two rational numbers is  $-\frac{7}{13}$ . If one number is  $-\frac{7}{39}$ , then find the other.
9. By which number  $\frac{-77}{32}$  is to be divided to get  $\frac{-7}{16}$ ?
10. Cost of 40 oranges is ₹  $316\frac{2}{3}$ . Find the cost of one orange.

### Group - C

#### Long answer type questions : ( 3/4 marks each)

1. Arrange in ascending order -  $\frac{8}{-18}, \frac{-10}{24}, \frac{14}{-36}, \frac{-4}{6}$
2. Divide the sum of the rational numbers  $\frac{5}{16}$  and  $\frac{3}{4}$  by their difference.
3. Simplify :  $\frac{15}{2} + \frac{-11}{3} + 6 + \frac{-7}{6} + \frac{9}{8}$
4. Product of two rational numbers is  $\frac{-24}{55}$  and one number is  $\frac{6}{5}$ . Find the difference between the largest and smallest number.
5. Area of a rectangle is  $25\frac{5}{8}$  sq. metre. If its breadth is  $6\frac{1}{4}$  metre, find its length.
6.  $\frac{5}{7}$  part of a number is 38 more than its  $\frac{3}{8}$  part. Find the number.
7. Speed of a bus is  $40\frac{1}{4}$  km/hr. How many minutes needed by the car to cover a distance of  $\frac{1000}{3}$  km.
8. A roof is there on  $\frac{5}{6}$  part of seats of galary of a cricket stadium and 3000 seats are out of the roof. Find total number of seats in the galary.

9. A father and his two son purchased a car with ₹ 5,00,000. Elder son gives  $\frac{2}{5}$  part of the total price. Younger son gives half of the amount of money paid by their father. What amount of money was given by the younger son?
10. Kanti babu earns ₹ 35000 per month. He expenses  $\frac{2}{7}$  part of his income for food,  $\frac{1}{5}$  part of the remaining for house rent and  $\frac{3}{10}$  part of the remaining for his children education. What amount of money he saves per month?

### Answers

#### Group - A

- |                    |                    |          |                    |                    |                    |
|--------------------|--------------------|----------|--------------------|--------------------|--------------------|
| 1. (d)             | 2. (b)             | 3. (b)   | 4. (b)             | 5. (b)             | 6. Division        |
| 7. $\frac{21}{56}$ | 8. Six             | 9. Left  | 10. Less           | 11. False          | 12. False          |
| 13. False          | 14. True           | 15. True | 16. $\frac{-4}{9}$ | 17. $\frac{1}{24}$ | 18. $\frac{-8}{3}$ |
| 19. $\frac{-1}{5}$ | 20. $\frac{-3}{2}$ |          |                    |                    |                    |

#### Group - B

- |                        |                       |   |                   |                         |
|------------------------|-----------------------|---|-------------------|-------------------------|
| 1. $a = \frac{17}{18}$ | 2. $\frac{-20}{3}$    | 3. $\frac{-3}{3}, \frac{-2}{3}, \frac{-1}{3}, \frac{0}{3}, \frac{1}{3}, \frac{2}{3}, \frac{3}{3}$ | 4. $\frac{43}{8}$ | 5. $-\frac{7}{36}$      |
| 6. $\frac{-1}{26}$     | 7. ₹ 20 $\frac{3}{8}$ | 8. 3  | 9. $\frac{11}{2}$ | 10. ₹ 7 $\frac{11}{12}$ |

#### Group - C

- |  |                    |                     |                    |                      |        |
|--|--------------------|---------------------|--------------------|----------------------|--------|
| 1. $\frac{-4}{6}, \frac{8}{-18}, \frac{-10}{24}, \frac{14}{-36}$ | 2. $\frac{-17}{7}$ | 3. $\frac{235}{24}$ | 4. $\frac{86}{55}$ | 5. $4\frac{1}{10}$ m | 6. 112 |
| 7. 496.6 minutes   | 8. 18,000          | 9. ₹ 100000         | 10. ₹ 14000        |                      |        |

# Formation of Linear Equations in one Variable and their Solutions

## Key points and formulae :

- ◆ An algebraic equation is an equality involving variables. It has an equality sign (=).
- ◆ The expression on the left of the equality sign is the left hand side (LHS) and the expression on the right of the equality sign is the right hand side (RHS).
- ◆ Equations where the expressions which form the equation contain only one variable and the highest power of the variable appearing in the equation is 1, are called linear equations in one variable. e.g.  $2x - 7 = 9$ .
- ◆ A linear equation may have linear expressions on both sides of the equality sign.
- ◆ In an equation the values of the expressions on the LHS and RHS are equal for certain values of the variables. These values are the solutions of the equation.
- ◆ To find the solution of an equation we perform the same mathematical operations on both side of the equation, so that the balance between the LHS and RHS is not disturbed.
- ◆ A linear equation may have any rational number as its solution.
- ◆ In an equation, terms can be transposed from one side of the equation to the other.

## Exercise - 2

### Group - A

#### Very short answer type questions : (1 mark each)

#### Choose the correct answer :

1. The standard form of a linear equation in one variable  $x$  is  $ax + b = 0$ , if  
(a)  $a = b = 0$                       (b)  $b \neq 0$                       (c)  $a \neq 0$                       (d)  $\frac{a}{b} = 0$
2. Linear equation in one variable has only  
(a) One variable with any power  
(b) One term with a variable

(c) One variable with power 1

(d) Constant term

3. If  $17z + 6 = 10 + 12z$ , then  $z$  is

(a) Positive integer      (b) Negative integer      (c) Fraction      (d) Whole number

4) The sum of two consecutive multiples of 7 is 77, then the equation is

(a)  $x + 5x = 77$       (b)  $x + x + 15x = 77$       (c)  $x + x + 7 = 77$       (d)  $x + 10 = 77$

5) The equation  $9a = 81$  represents the statement that \_\_\_\_\_ times a number is 81.

(a) 8      (b) 7      (c) 9      (d) a

**Fill in the blanks :**

6. Algebraic equations shows equality by \_\_\_\_\_ symbol.

7. The solution of the equation  $\frac{x}{3} + 8 = 10$  is \_\_\_\_\_

8. A term may be transposed from one side of the equation to the other side, but its \_\_\_\_\_ will be changed.

9. The numerator of a rational number is less than its denominator by 5. The fraction is \_\_\_\_\_.

10. If 6 is added to thrice a number, the result is 27, then the equation is \_\_\_\_\_.

**State whether the given statements are True or False :**

11. A linear equation in one variable has one solutions.

12. The solution of the equation  $\frac{3x}{4} - \frac{3}{2} = \frac{1}{2}$  is  $\frac{8}{3}$

13. In the equation  $2x + 5 = 6$ , transposing 5 to right hand side (RHS), we get  $2x = 3$ .

14. The value of a variable can vary but the value of a constant remains fixed.

15. The statement, “ $3\frac{1}{7}$  times a number is 131,” can be expressed by the equation  $3 + \frac{1}{7}x = 131$

**Answer the following questions :**

16. Solve :  $7x - 2x = 19 + 4(x - 1)$

17. What is the value of x for the equation  $\frac{4}{5}(x - 4) = 20 - 5x$
18. Five times a number added to 2 gives 62. Write the equation for the statement.
19. A number multiplied by 17 gives 189. Write the equation for the statement.
20. Rewrite the equation  $x - a = b$  after transposing a.

### Group - B

#### Short answer type questions : ( 2 marks each)

1. The sum of the three consecutive odd natural number is 69. Find the prime number out of these numbers.
2. Find a number whose fifth part increased by 30 is equal to its fourth part decreased by 30.
3. Divide 54 into two parts such that one part is  $\frac{2}{7}$  of the other.
4. Two equal sides of a triangle are each 4m less than three times the third side. Find the dimensions of the triangle, if its perimeter is 55 m.
5. After 12 years, shyamal shall be 3 times as old as he was 4 years ago. Find his present age.
6. If  $\frac{1}{2}$  is subtracted from a number and the difference is multiplied by 4, the result is 5. What is the number ?
7. Denominator of a number is 4 less than its numerator. If 6 is added to the numerator it becomes thrice the denominator. Find the fraction.
8. Solve :  $\frac{3t-2}{3} + \frac{2t+3}{2} = t + \frac{7}{6}$
9. Solve :  $2m - \frac{m-2}{4} = 3 - \frac{m-7}{5}$
10. Solve :  $\frac{1}{2}(x+1) + \frac{1}{3}(x-1) = \frac{5}{12}(x-2)$

### Group - C

#### Long answer type questions : (3/4 marks each)

1. Solve :  $(6y - 5) - (\frac{5}{3}y + 2) = 6$
2. Solve :  $0.8(3 - x) = 0.3(4 - x)$

3. Solve :  $\frac{2}{x-3} + \frac{4}{x-5} = \frac{6}{x-7}$
4. Solve the equation and verify the solution :  $\frac{3y}{3y-1} + \frac{3y+1}{3y} = 2$
5. Two numbers are in the ratio 8:5, if they differ by 15, then what are the numbers ?
6. Three numbers are in the ratio 4: 5: 6. If the sum of the largest and the smallest is equal to the sum of the second and 55. Find the numbers.
7. The perimeter of a rectangular field is 320 m. If its breadth is 14m less than the length, find the length and breadth of the rectangle.
8. Five years ago, Manish was four times as old as his son and three years hence, thrice of his age will be equal to eight times that of his son. Find their present ages.
9. Priyanka purchased a photo frame and expenses the same cost for its decoration. If the cost of decoration is 20 less and price of the photo frame is ₹15 more then the cost of photo frame becomes double the cost of the decoration. What is the price of the photo frame ?
10. The length of a rectangle is 9m more than its breadth. If the length is increased by 5m and breadth is decreased by 2m, then the area is increased by 74 sq.m. Find the length and breadth of the rectangle.
11. A steamer goes downstream and covers the distance between two ports in 5 hours, while it covers the same distance upstream in 6 hours. If the speed of the stream is 1 km/h, then find the speed of the steamer in still water.
12. Distance between two places A and B is 210 km. Two cars start simultaneously from A and B in opposite directions and distance between them after 3 hours is 54 km. If speed of one car is less than that of other by 8 km/h, then find the speed of each.

## Answers

### Group - A

1. (c) 2. (c) 3. (c) 4. (c) 5. (c) 6. equal (=) 7. 6 8. sign  
9.  $\frac{x-5}{x}$  10.  $3x + 6 = 27$  11. True 12. True 13. False 14. True  
15. False 16.  $x = 15$  17.  $x = \frac{116}{29}$  18.  $5x + 2 = 62$  19.  $17x = 189$   
20.  $x = a + b$

### Group - B

1. 23 2. 1200 3. 42 and 12 4. 9m, 23m, 23m 5. 12 years 6.  $\frac{7}{4}$  7.  $\frac{9}{5}$   
8.  $t = \frac{1}{3}$  9.  $m = 2$  10.  $x = -\frac{12}{5}$

### Group - C

1.  $y = 3$  2.  $x = \frac{12}{5}$  3.  $x = \frac{16}{9}$  4.  $y = \frac{1}{6}$  5. 40, 25 6. 44, 55, 66  
7. 87, 73 8. 45 years, 15 years 9. ₹ 55 10. 43m, 34m 11. 11 km/hr  
12. 22 km/hr, 30 km/hr



# Understanding Quadrilaterals

**Key points and formulae :**

- ◆ **Polygon :** A simple closed curve made up of only line segments is called a polygon.
- ◆ Classification of Polygons :

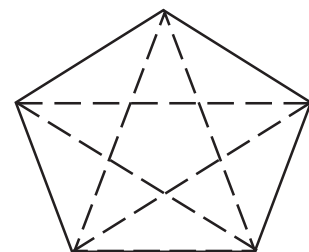
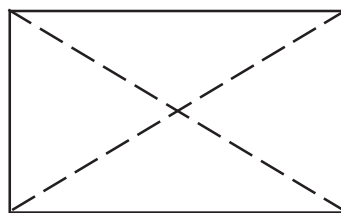
Number of sides or vertices	3	4	5	6
Classification	Triangle	Quadrilateral	Pentagon	Hexagon

Number of sides or vertices	7	8	9	10	....	n
Classification	Heptagon	Octagon	Nonagon	Decagon	....	n-gon

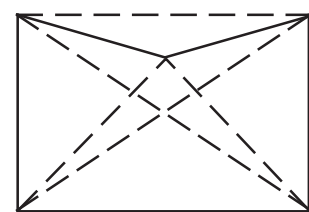
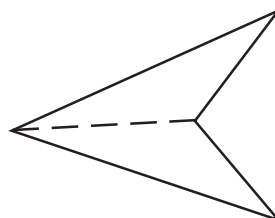
- ◆ **Diagonals :** The line segment joining by two non-consecutive vertices of a polygon is known as diagonal of the polygon.

- ◆ Number of diagonals of a polygon of n sides =  $\frac{n(n-3)}{2}$

- ◆ **Convex polygon :** If no part of diagonals of a polygon is outside the polygon then it is known as convex polygon. Each angle of a convex polygon is less than 180°.



- ◆ **Concave polygon :** If any part of diagonals of a polygon is outside the polygon then it is known as concave polygon. At least one angle of a concave polygon is more than 180°.



- ◆ **Regular polygon** : A regular polygon is a polygon whose all sides are equal and also all angles are equal.
- ◆ **Angle sum property** : The sum of interior angles of a polygon of  $n$  sides is  $(n - 2)$  straight angles i.e  $(n - 2) \times 180^\circ$  .
- ◆ The sum of interior angles of a quadrilateral is  $360^\circ$  .
- ◆ The sum of exterior angles, taken in an order, of a polygon is  $360^\circ$  .
- ◆ **Trapezium** is a quadrilateral in which a pairs of opposite sides is parallel.
- ◆ **Kite** is a quadrilateral which has two pairs of equal consecutive sides.
- ◆ **Parallelogram** is a quadrilateral in which each pair of opposite sides are parrallel.
- ◆ **Rhombus** is a parallelogram in which adjacent sides are equal.
- ◆ Rectangle is a parallelogram in which one angle is of  $90^\circ$  .
- ◆ **Square** is a parallelogram in which adjacent sides are equal and one angle is of  $90^\circ$  .
- ◆ In a parallelogram, opposite sides are equal, opposite angles are equal and diagonals bisect each other.
- ◆ In a rhombus diagonals intersect at right angles.
- ◆ In a rectangle diagonals are equal.
- ◆ In a kite diagonals are perpendicular to one another and one of the diagonals bisects the other.

### Exercise – 3

#### Group – A

**Very short answer type questions : (1 mark each)**

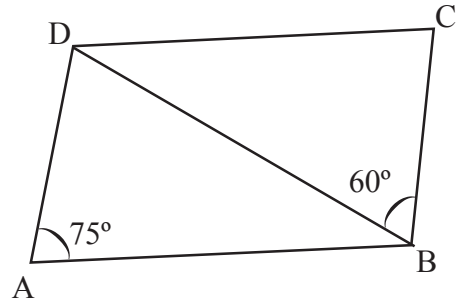
**I. Multiple choice questions. choose the correct answer :**

1. Diagonals of a convex polygon remains –
 

(a) inside the polygon	(b) outside the polygon
(c) inside and outside the polygon	(d) none of these
  
2. Sum of interior angles of a polygon of  $n$  sides is –
 

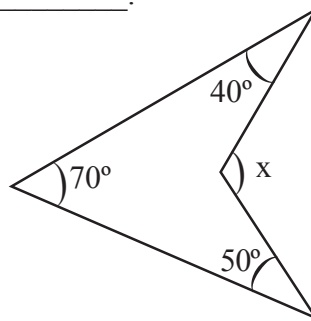
(a) $180^\circ$	(b) $360^\circ$	(c) $(n - 2) \times 90^\circ$	(d) $(2n - 4) \times 90^\circ$
-----------------	-----------------	-------------------------------	--------------------------------

3. Polygon with seven sides is called –  
 (a) hexagon (b) pentagon (c) heptagon (d) quadrilateral
4. The maximum number of obtuse angle in a quadrilateral is –  
 (a) one (b) two (c) three (d) four
5. In the given figure ABCD is a parallelogram, in which  $\angle DAB = 75^\circ$  and  $\angle DBC = 60^\circ$  then  $\angle BDC$  is  
 (a)  $75^\circ$  (b)  $60^\circ$  (c)  $45^\circ$  (d)  $55^\circ$



**II. Fill in the blanks :**

6. Number of diagonals of a polygon with n sides is \_\_\_\_\_.
7. Measure of each external angle of a regular polygon with 9 sides is \_\_\_\_\_.
8. Value of x in the adjoining figure is \_\_\_\_\_.



9. In parallelogram PQRS, the value of  $\angle PQR + \angle QRS$  is \_\_\_\_\_.
10. Two line segment of length 9 cm each bisect each other perpendicularly. If end points of the line segments are joined in order then the figure so formed is a \_\_\_\_\_.

**III. State whether the following statements are True or False :**

11. PQRS is a square. PR and SQ intersect at O. Then  $\angle POQ$  is a right angle.
12. If each interior angle of a regular polygon is of  $135^\circ$ , then it is a hexagon.
13. One pair of opposite angles of a kite are equal in measure.
14. All isosceles triangle are regular polygon.

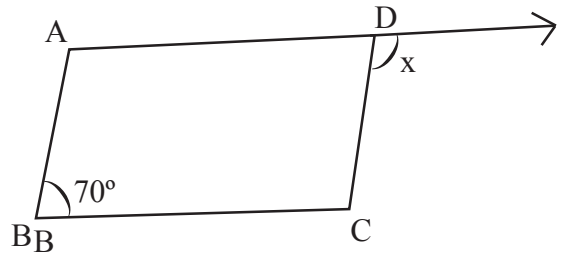
15. The rhombus with equal diagonals is a square.

**IV. Answer the following questions :**

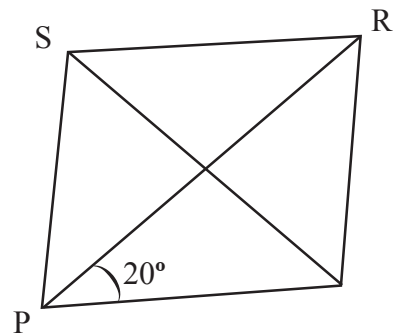
16. One angle of a parallelogram is  $65^\circ$ . What is the measure of its adjacent angle?

17. What is the measure of each exterior angle of a regular polygon with 3 sides?

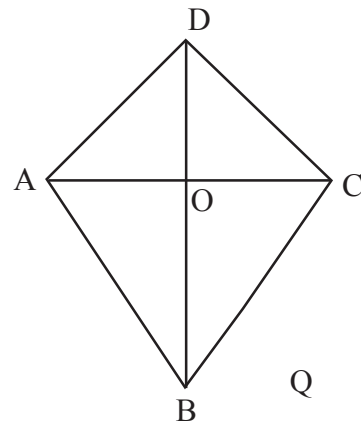
18. In the given figure, ABCD is a parallelogram where  $\angle ABC = 70^\circ$ , then find x.



19. In the given figure, PQRS is a rhombus. If  $\angle QPR = 20^\circ$  then what is the measure of  $\angle QSR$ ?



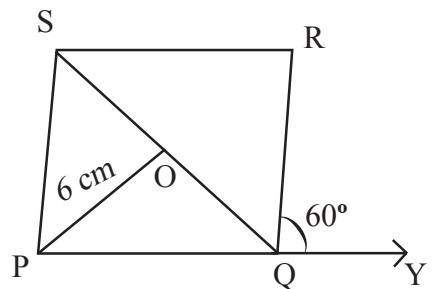
20. In the given figure, if ABCD is a kite and  $AO = 2$  cm then what is the length of AC?



**Group - B**

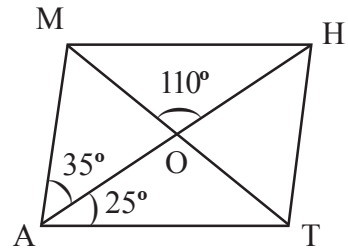
**Short answer type questions: (2 marks each)**

- Find the number of diagonals of a hexagon.
- PQRS is a parallelogram in which O is the mid point of SQ,  $OP = 6$  cm and  $\angle RQY = 60^\circ$ . Find PR and  $\angle PSR$ .

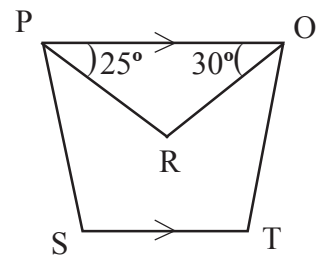


- In kite ABCD,  $\angle ABC = 30^\circ$  and  $\angle CDA = 110^\circ$ . Find its other two angles.
- In a square ABCD,  $AB = (2x + 3)$  cm and  $BC = (3x - 5)$  cm. Find the value of  $x$ .
- Length of two diagonals of a rhombus are 16 cm and 12 cm. Find its perimeter.

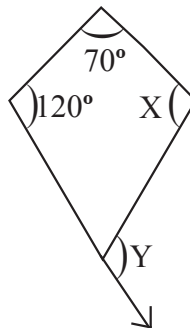
- In the given figure, MATH is a parallelogram. Find  $\angle TMH$  and  $\angle OTH$ .



- In trapezium STOP, PR and OR are bisector of  $\angle P$  and  $\angle O$  respectively. Find  $\angle PST$  &  $\angle OTS$ .



- Find the value of  $x$  and  $y$  in the given kite.

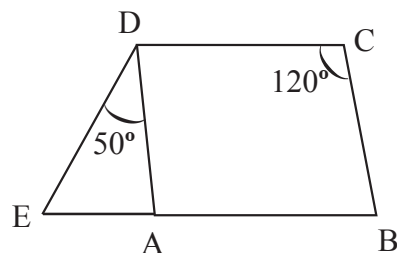


- In a quadrilateral ABCD,  $\angle A = 50^\circ$ ,  $\angle B = 50^\circ$  and  $\angle C = 60^\circ$ . Find  $\angle D$ . Is this quadrilateral convex or concave? Give reason.
- Measure of each internal angle of a regular polygon is  $108^\circ$  more than its each external angle. Find its number of sides.

### Group - C

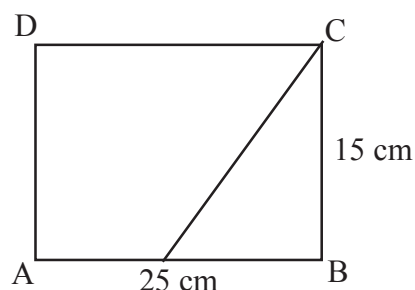
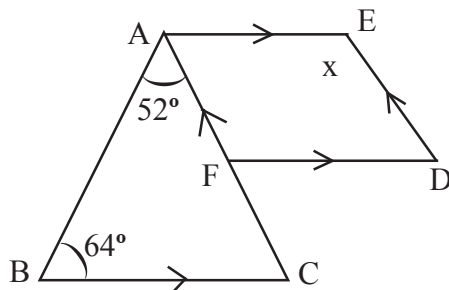
#### Long answer type questions : (3/4 marks each)

- In the given parallelogram ABCD,  $\angle DCB = 120^\circ$  and BA is extended to point E such that  $\angle EDA = 50^\circ$ . Find  $\angle AED$ .
- The ratio of external and internal angle of a regular polygon is 1:5. Find the number of sides of the polygon.



- Ratio of four angles of a quadrilateral is 1:2:4:5 . Find its all angle.
- Perimeter of a parallelogram is 150 cm. If its one side is 33 more than its other side then find the length of all sides of the parallelogram.
- In a rectangle ABCD, AB = 25 cm and BC = 15 cm. In what ratio does the bisector of  $\angle C$  divide AB ?

- In the given figure,  $FD \parallel BC \parallel AE$  and  $AC \parallel ED$ . Find the value of x.



- ABCD is a parallelogram in which  $\angle DAB = 120^\circ$ ,  $\angle ABC = 5X + 10$  and  $\angle BCD = 6y$  . Find the value of x and y.
- The exterior angle of a regular polygon is one-fifth of its interior angle. How many sides has the polygon ?

### Answers

#### Group - A

I. 1.(a) 2. (d) 3. (c) 4. (b) 5. (c)

II. 6.  $\frac{n(n-3)}{2}$  7.  $40^\circ$  8.  $160^\circ$  9.  $180^\circ$  10. Square

III. 11. True 12. False 13. True 14. False 15. True

IV. 16.  $115^\circ$  17.  $120^\circ$  18.  $110^\circ$  19.  $70^\circ$  20. 4 cm

#### Group - B

1.9 2. 12 cm,  $120^\circ$  3.  $110^\circ$ ,  $110^\circ$  4. 8 5. 20 cm 6.  $45^\circ$ ,  $75^\circ$   
 7.  $130^\circ$ ,  $120^\circ$  8.  $120^\circ$ ,  $130^\circ$  9.  $200^\circ$ , concave ( $\because 200^\circ > 180^\circ$ ) 10. 10

#### Group - C

1.  $70^\circ$  2. 12 3.  $30^\circ$ ,  $60^\circ$ ,  $120^\circ$ ,  $150^\circ$  4. 21 cm, 54 cm 5. 2:3  
 6.  $116^\circ$  7. 10, 20 8. 12

# Practical Geometry

## Key points and formulae :

- ◆ Five measurement can determine a quadrilateral uniquely.
- ◆ A quadrilateral can be constructed uniquely if the lengths of its four sides and a diagonal are given.
- ◆ A quadrilateral can be constructed uniquely if the lengths of its three sides and two diagonals are given.
- ◆ A quadrilateral can be constructed uniquely if its two adjacent sides and three angles are given.
- ◆ A quadrilateral can be constructed uniquely if its three sides and two included angles are given.

## Exercise : 4

### Group - A

#### Very short answer type questions : (1 mark each)

#### I. Multiple choices questions. Choose the correct answers :

1. To construct a unique rectangle, the minimum number of measurements required is  
(a) 4                                      (b) 3                                      (c) 2                                      (d) 1
2. Measure of only one side of a quadrilateral is given. If it is possible to draw the quadrilateral, then it is a  
(a) Square                                      (b) Kite                                      (c) rectangle                                      (d) trapezium
3. To construct a unique parallelogram, the minimum number of measurement required is  
(a) 2                                      (b) 3                                      (c) 4                                      (d) 5
4. If a diagonal of a quadrilateral bisects both the angles, then it is a  
(a) Kite                                      (b) Parallelogram                                      (c) Rhombus                                      (d) Rectangle
5. Two diagonals with equal measure perpendicular to each other. Then the quadrilateral is a  
(a) Square                                      (b) Rhombus                                      (c) Rectangle                                      (d) trapezium

#### II. Fill in the blanks :

6. A unique quadrilateral can be drawn if its \_\_\_\_\_ sides and one diagonal is given.

7. A unique rhombus can be drawn if its one side and \_\_\_\_\_ angle (s) is given.
8. To construct a square, measurement of atleast \_\_\_\_\_ is needed to be given.

**III. State whether the following statements are True or False :**

9. Diagonals of a square bisect each other perpendicularly.
10. Measurement of only three sides are sufficient for the construction of a unique quadrilateral.
11. A rhombus can be constructed uniquely if both diagonals are given.
12. Measurement of four sides are sufficient for the construction of a unique quadrilateral.

**IV. Answer the following questions :**

13. Write any five conditions for the construction of a unique quadrilateral.
14. A parallelogram PQRS is constructed with sides  $QR = 6$  cm,  $PQ = 4$  cm and  $\angle PQR = 90^\circ$ . What is the name of PQRS ?
15. How to proceed to construct a quadrilateral ABCD with sides  $AB = 7$  cm,  $BC = 5$  cm and  $\angle A = 75^\circ$ ,  $\angle D = 120^\circ$  &  $\angle B = 105^\circ$  ?

**Group - B**

**Short answer type questions : (2 marks each)**

1. Can we construct a unique rhombus ABCD if  $AB = 5$  cm and  $BD = 6$  cm ? Give reason.
2. If PQRS is a parallelogram in which  $PQ = 6$  cm,  $QR = 4$  cm and  $\angle SPQ = 60^\circ$  then can you construct the parallelogram ? Justify your answer.
3. How to construct an equilateral trapezium EFGH with side  $EF = 8$  cm,  $EH = 5$  cm and  $\angle EHG = 120^\circ$  ?
4. Length of two adjacent sides of a rectangle are 5 cm and 6 cm. How to construct the rectangle ?
5. Is it possible to construct a quadrilateral ABCD in which  $AB = 3$  cm,  $BC = 4$  cm,  $CD = 5.4$  cm,  $DA = 5.9$  cm and diagonal  $AC = 8$  cm ? If not, Why ?

**Group - C**

**Long answer type questions : (3/4 marks each)**

1. Construct a quadrilateral NEWS in which  $NE = 6.5$  cm,  $EW = 5.5$  cm,  $\angle N = 60^\circ$ ,  $\angle E = 110^\circ$  and  $\angle S = 85^\circ$ .



2. Construct a rhombus whose side is 6 cm and one angle is of  $75^\circ$ .
3. Construct a parallelogram EFGH in which  $EF = 5.5$  cm,  $FG = 7.2$  cm and  $\angle F = 60^\circ$ .
4. Construct an equilateral trapezium in which two adjacent sides are of length 6.6 cm and 4.5 cm and a base angle is  $60^\circ$ .
5. Draw a circle of radius 3.5 cm and draw its diameter and label it as PR. Construct its perpendicular bisector and let it intersect the circle at Q and S. What type of quadrilateral is PQRS? Justify your answer.
6. Construct a parallelogram in which length of one side is 4 cm and two diagonals are 5.6 cm and 7 cm. Measure the other side.

### Answers

#### Group - A

- |      |                              |               |                                |           |        |
|------|------------------------------|---------------|--------------------------------|-----------|--------|
| I.   | 1. (c)                       | 2. (a)        | 3. (b)                         | 4. (c)    | 5. (a) |
| II.  | 6. (four)                    | 7. one        | 8. one side                    |           |        |
| III. | 9. True                      | 10. False     | 11. True                       | 12. False |        |
| IV.  | 13. Four side and a diagonal | 14. Rectangle | 15. Find $\angle C = 60^\circ$ |           |        |

#### Group - B

1. Yes. Because BD is a diagonal which is unique.
2. Yes. Because in parallelogram PQRS we have  $\angle SPQ + \angle PQR = 180^\circ$ ,  $\therefore \angle PQR = 120^\circ$
3. Here,  $EF \parallel HG$ .  $\therefore \angle EHG + \angle HEF = 180^\circ$ ,  $\Rightarrow \angle HEF = 60^\circ$   $\therefore \angle EFG = 60^\circ$ . Now construct equilateral trapezium EFGH with  $EF = 8$  cm,  $\angle HEF = 60^\circ$ ,  $\angle EFG = 60^\circ$ ,  $EH = 5$  cm and  $FG = 5$  cm.
4. In a rectangle all angles are right angle.
5. No. In triangle ABC,  $AB = 3$  cm,  $BC = 4$  cm and  $AC = 8$  cm.  $\therefore AB + BC < AC$ .

# Data Handling

## Key points and formulae :

- ◆ **Data** : The information collected in term of numbers is called data.
- ◆ **Raw data** : Data available in an unorganised form are called raw data.
- ◆ **Frequency** : The number of times a particular observation occurs in a given data is called its frequency.
- ◆ **Class Interval** : Large amount of data can be arranged in groups and each group is known as class interval or class.
- ◆ **Frequency distribution table** : A table showing the frequencies of various observations or class intervals of a given data is called a frequency distribution table.
- ◆ **Upper and Lower class limit** : The upper value of a class interval is called its upper class limit and the lower value of the class interval is called its lower class limit.
- ◆ **Class width or size** : The difference between the upper class limit and lower class limit of a class is called the class width or class size of the class.
- ◆ **Range** : The difference between the lowest and highest observation in a given data is called its range.
- ◆ **Pictograph** : The pictorial representation of data is called pictograph.
- ◆ **Histogram** : Histogram is a type of bar diagram. Grouped data can be represented by a histogram and there is no gap between the bars as there is no gap between the class intervals.
- ◆ **Pie chart (cricle graph)** : Data can also be represented using a pie chart or circle graph. It shows the relationship between a whole and its parts.
- ◆ **Chance** : The possibility of something happening is called chance. When the chance is defined in mathematics, it is called probability.
- ◆ **Equally likely** : There are certain experiments whose outcomes have an equal chance of occuring. Such outcomes are said to be equally likely.
- ◆ **Probability** : Probability of an event =  $\frac{\text{Number of outcomes that make an event}}{\text{Total number of outcomes of the experiment}}$  ,  
when the outcomes are equally likely.
- ◆ **Playing cards** : A pack (deck) of 52 playing cards contains 4 suits, viz, spades ♠, Hearts ♥, Diamonds ♦, Clubs ♣, having 13 cards in each suit.

Spades and Clubs are black cards. Hearts and diamonds are red cards.

The cards in each suit are Ace, king, Queen, Jack, 10, 9, 8, 7, 6, 5, 4, 3, and 2.

King, Queen and Jack are face cards . So, there are 12 face cards and 4 ace (A) cards in the deck of 52 playing cards.

### Exercise - 5

#### Group - A

##### Very short answer type questions : (1 mark each)

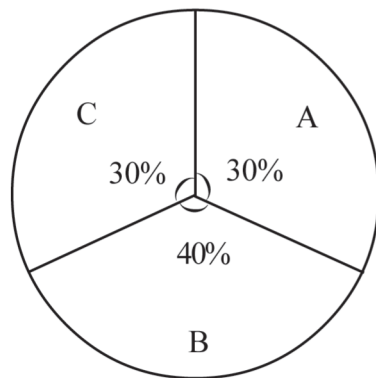
##### D) Choose the correct answers :

- The range of the data 7, 9, 5, 4, 3, 1, 2, 5, 15, 11, 10, 2, 5, 4 is  
(a) 15                      (b) 14                      (c) 12                      (d) 10
- A geometric representation showing the relationship between a whole and its parts is a  
(a) Histogram              (b) Bar graph              (c) Pie chart              (d) Pictograph
- The following data : 5, 2, 15, 20, 25, 12, 8, 6, 7, 21, 16, 17, 30, 23, 32, 40, 51, 2, 15, 57, 9, 25, 19 is grouped in the classes 0-5, 5-10, 10-15, etc. Find the frequency of the class 20-25.  
(a) 2                      (b) 3                      (c) 4                      (d) 5
- The height of a rectangle in a histogram shows the  
(a) Width of the class                      (b) Upper limit of the class  
(c) Lower limit of the class                      (d) Frequency of the class
- In a Pie chart, the total angle at the centre of the circle is  
(a)  $180^\circ$                       (b)  $360^\circ$                       (c)  $270^\circ$                       (d)  $90^\circ$
- A graph showing two sets of data simultaneously is known as  
(a) Double bar graph                      (b) Pictograph                      (c) Pie chart                      (d) Histogram
- Tally marks are used to find  
(a) Class intervals      (b) Range                      (c) Frequency                      (d) Upper limit
- A coin is tossed 100 times and head appeared 60 times. The probability of getting a head in this experiment is  
(a)  $\frac{3}{5}$                       (b)  $\frac{1}{5}$                       (c)  $\frac{4}{5}$                       (d)  $\frac{2}{5}$

9. In a throw of a dice, the probability of getting the number 7 is  
 (a)  $\frac{1}{2}$                       (b)  $\frac{1}{6}$                       (c) 1                      (d) 0
10. A coin is tossed three times. The number of possible outcomes is  
 (a) 3                      (b) 4                      (c) 6                      (d) 8

**II. Fill in the blanks :**

11. In the class interval 50-65, 65 is known as the \_\_\_\_\_.
12. The number of times a particular observation occurs in the given data is called its \_\_\_\_\_.
13. The probability of choosing a vowel from the alphabets is \_\_\_\_\_.
14. Data available in an unorganised form is called \_\_\_\_\_ data.
15. The sixth class interval for a grouped data whose first two class intervals are 20 - 25 and 25 - 30 is \_\_\_\_\_.
16. In the class intervals 10 - 20, 20 - 30, .....etc, 20 lies in the class \_\_\_\_\_.
17. The class mark of the class 20 - 30 is \_\_\_\_\_.
18. The probability of an impossible event is \_\_\_\_\_.
19. The central angle for sector A in the given pie chart is \_\_\_\_\_.



20. A die is thrown once. The probability of getting an even prime number is \_\_\_\_\_.

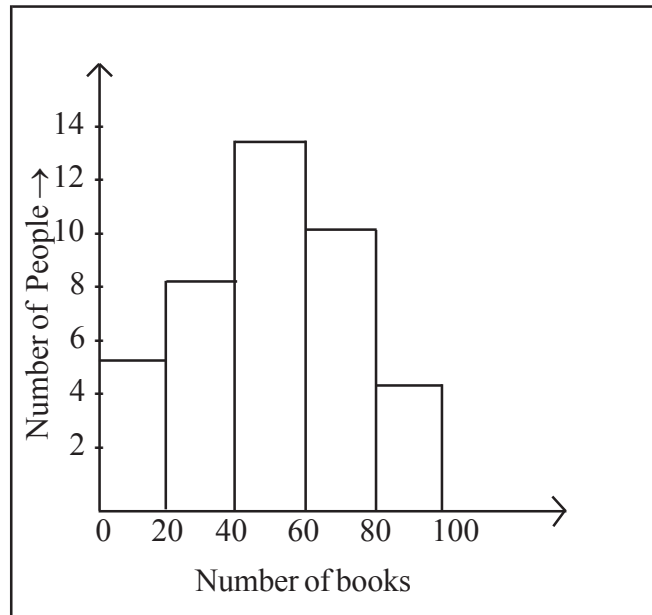
**III. State whether the statements are true (T) or false (F) :**

21. The frequency of a class may be negative.
22. In a pie chart two central angles can be of  $180^\circ$ .
23. Getting a prime number on throwing a die is an event.
24. One or more outcomes of an experiment make an event.

25. The probability of getting number 4 in a throw of a dice is  $\frac{1}{4}$ ,

**IV. Answer the following questions :**

The given histogram shows number of people owning the different number of books. Answer 26 to 28 based on it.



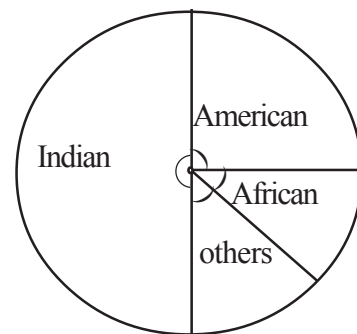
- 26. What is the number of people owning books more than 60 ?
- 27. Find the total number of people surveyed.
- 28. Find the number of people having books more than 40 and less than 60.
- 29. When two coin are tossed simultaneously then write down the total possible outcomes.
- 30. A die is thrown once. What is the probability of getting 2 or 4 ?

**Group - B**

**Short answer type questions : (2 marks each)**

**Answer the following questions :**

- 1. What is raw data ?
- 2. Define frequency of an observation.
- 3. A class consists of 21 boys and 9 girls. A student is to be selected for social work. Find the probability that
  - (i) a girl is selected (ii) a boy is selected.
- 4. A jar contain 6 red, 5 green, 4 blue and 5 yellow marbels of same size. Riya takes out a marble from the jar at random. What is the probability that the chosen marble is of (i) red colour ? (ii) blue or yellow colour?
- 5. The following Pie chart depicts the ratio of the number of students, nation wide. What is the percentage of
  - (i) Indian students ?
  - (ii) African students ?



6. What is the difference between bar graph and histogram ?

**Group - C**

**Long answer type questions : (3/4 marks each)**

**Answer the following questions :**

1. The weekly wages (in Rs.) of 30 workers in a factory are  
890, 835, 830, 835, 810, 836, 869, 845, 898, 820, 890, 860, 832, 833, 855, 845, 804, 808, 812,  
835, 840, 885, 836, 835, 878, 840, 868, 806, 840, 890.

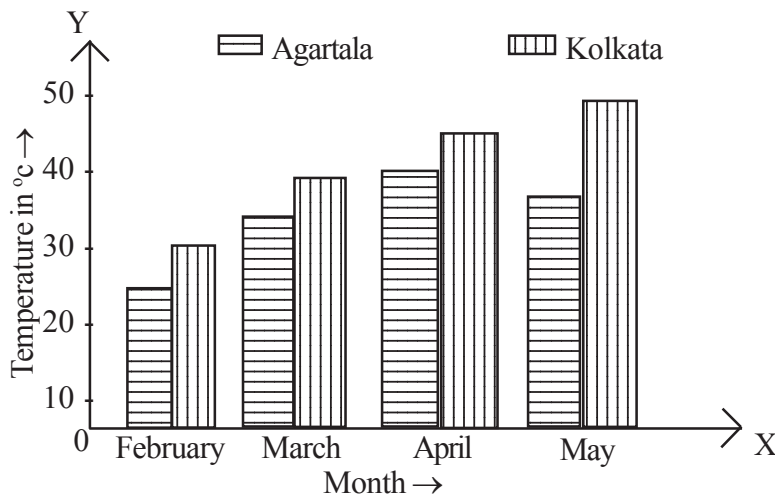
Using tally marks, make a frequency distribution table with class intervals 800 - 810, 810 - 820 and so on.

2. Draw a histogram for the following data :

Class interval	10-15	15-20	20-25	25-30	30-35	35-40
Frequency	30	98	80	58	29	50

3. The double bar graph shows the average monthly temperatures of two cities over 4 months period. Read the graph and answer the questions given below :

- (i) What is the average monthly temperature in Agartala for the whole 4 months?
- (ii) In which months was the difference between the temperature of Agartala and Kolkata maximum and how much ?
- (iii) What was the average monthly temperature of Kolkata in April ?

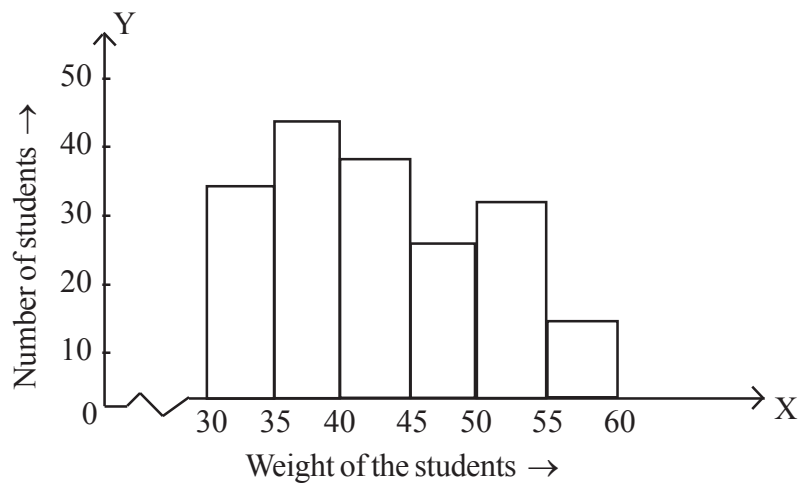


4. The following table represents the number of students in a school like five different games :

Games	Number of students
Football	120
Cricket	200
Badminton	100
Tennis	75
Hockey	90

Draw a bar graph for the given information.

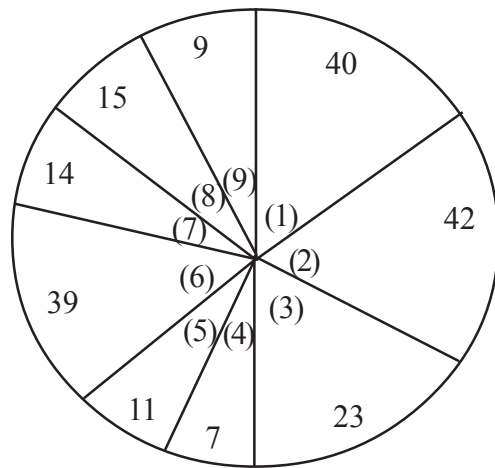
5. Prepare a grouped frequency table for the given histogram.



6. The following data represents the different number of animals in a zoo. Prepare a pie chart for the given data.

Animals	Number of animals
Deer	60
Elephant	10
Rhinoceros	4
Tiger	10
Lion	6

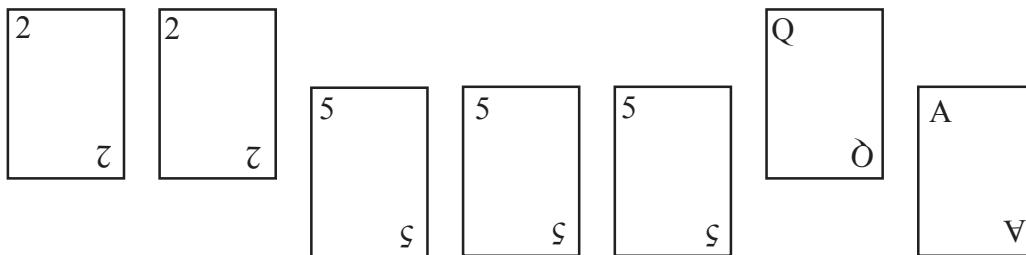
7. Following is a Pie chart showing the amount spent (in thousand rupees) by a company on various modes of advertising for a product.



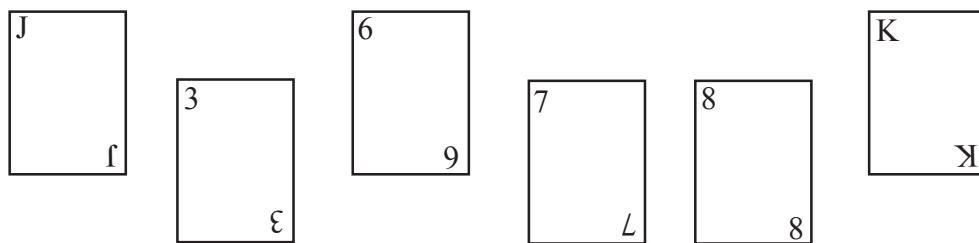
- (1) Television
- (2) Newspaper
- (3) Magazine
- (4) Radio
- (5) Business paper
- (6) Direct mail
- (7) Yellow pages
- (8) Out door
- (9) Miscellaneous

**Answer the following questions :**

- (i) Which type of media advertising is the greatest amount of the total ?
  - (ii) What percent of the advertising amount is spent on newspaper and magazine advertisements ?
  - (iii) Which type of media advertising is the least amount of the total ?
8. Rana draws a ball from a bag that contains white and yellow balls. The probability of choosing a white ball is  $\frac{2}{9}$ . If the total number of balls in the bag is 36, find the number of yellow balls.
9. From a pack of playing cards the following cards are kept face down :



- (a) Sampa wins if she picks up a face card. Find the probability of Sampa winning ?
- (b) Now the following cards are added to the above cards :





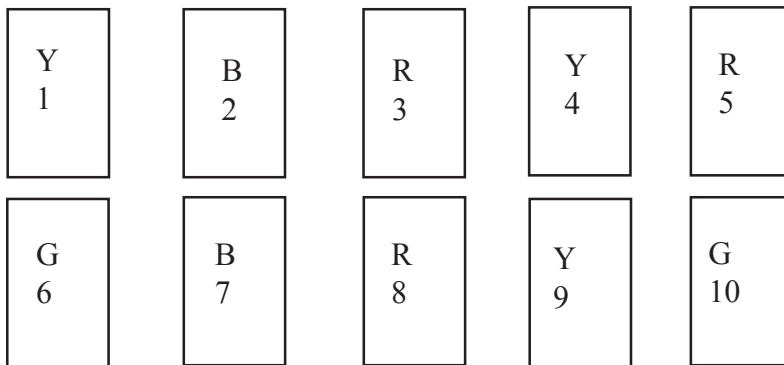
What is the probability of Sampa winning now ? Rima wins if she picks up a 5. What is the probability of Rima winning ?

[Queen (Q), King (K) and Jack (J) cards are called face cards]

10. The following data represents the approximate percentage of water in various oceans. Prepare a pie chart for the given data.

Pacific	–	40%
Atlantic	–	30%
Indian	–	20%
Others	–	10%

11. Rajat picks up a card from the given cards.



Calculate the probability of getting

- (i) a R card      (ii) an even number      (iii) an odd number      (iv) a Y card      (v) a B card
12. A school bag has 3 science books, 4 social studies books, 2 mathematics books, 1 bengali book and one english book.
- (a) What is the probability of getting a social studies book ?
- (b) What is the probability of getting either bengali book or english book ?
- (c) What is the probability of getting a science book or a mathematics book ?
13. Three coins are tossed together. What are the possible outcomes ? Find the probability of getting (i) all heads (ii) two heads (iii) at least two heads.
14. One card is drawn from a well shuffled deck of 52 cards. Find the probability of getting (i) an ace (ii) a black card (iii) a card of diamond (iv) a red king.
15. Cards numbered from 1 to 20 are mixed up together and then a card is drawn at random. What is the probability that the card is (i) multiple of 4 (ii) multiple of 3 and 7 (iii) a prime numbered card ?

**Answers**

**Group - A**

- I) 1. (b)                      2. (c)                      3. (b)                      4. (d)                      5. (b)  
       6. (a)                      7. (c)                      8. (a)                      9. (d)                      10. (d)
- II) 11. Upper class limit    12. Frequency    13.  $\frac{5}{26}$                       14. Raw                      15. 45-50  
       16. Second (2nd)        17. 25                      18. 0                      19.  $108^\circ$                       20.  $\frac{1}{6}$
- III) 21. F                      22. T                      23. T                      24. T                      25. F
- IV) 26. 14                      27. 42                      28. 14                      29. HH, HT, TH, TT    30.  $\frac{1}{3}$

**Group - B**

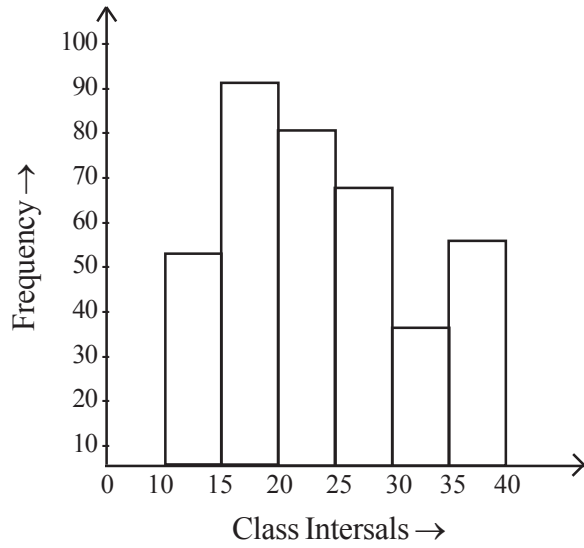
3. (i)  $\frac{3}{10}$ , (ii)  $\frac{7}{10}$                       4. (i)  $\frac{3}{10}$ , (ii)  $\frac{9}{20}$                       5. (i) 50%, (ii)  $12\frac{1}{2}\%$

**Group - C**

1.

Class interval	Tally marks	Frequency
800 - 810	///	3
810 - 820	//	2
820 - 830	/	1
830 - 840	/// ///	9
840 - 850	///	5
850 - 860	/	1
860 - 870	///	3
870 - 880	/	1
880 - 890	/	1
890 - 900	///	4
<b>Total</b>		<b>30</b>

2.

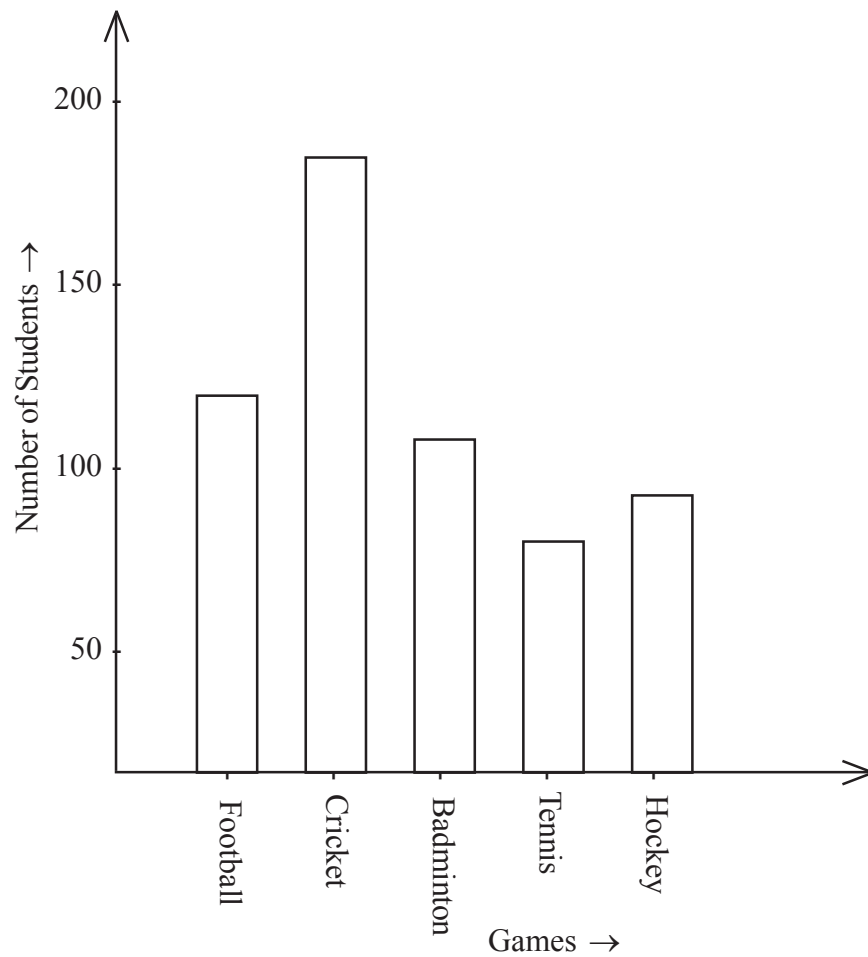


3. (i)  $\left(33\frac{3}{4}\right)^{\circ}\text{C}$ ,

(ii) May,  $15^{\circ}\text{C}$

(iii)  $45^{\circ}\text{C}$

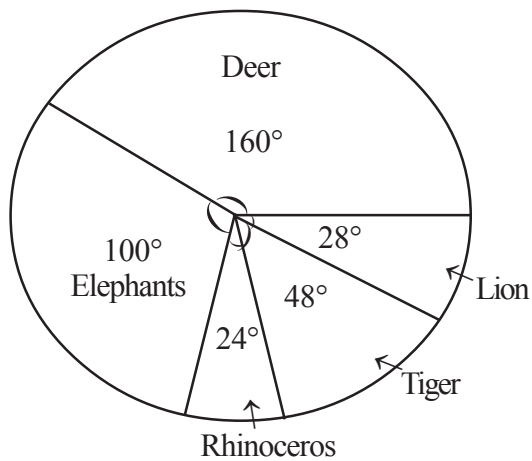
4.



5.

Class (weight)	Frequency (Number of students)
30 - 35	35
35 - 40	45
40 - 45	40
45 - 50	20
50 - 55	30
55 - 60	10

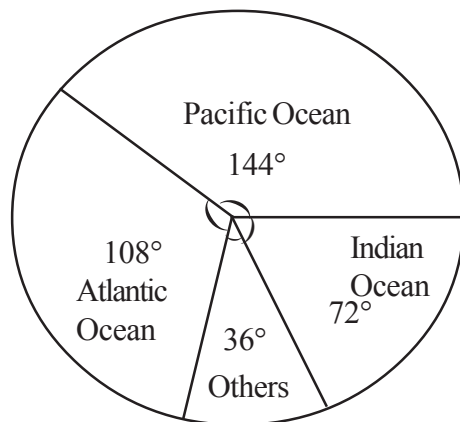
6.



7. (i) Newspaper (ii) Newspaper = 21% , Magazine = 11.5% , (iii) Radio

8. Number of yellow ball = 28 , 9. (a)  $\frac{2}{7}$  , (b)  $\frac{4}{13}$  , (c)  $\frac{3}{13}$

10.



11. (i)  $\frac{3}{10}$ , (ii)  $\frac{1}{2}$  (iii)  $\frac{1}{2}$  (iv)  $\frac{3}{10}$  (v)  $\frac{1}{5}$

12. (a)  $\frac{4}{11}$ , (b)  $\frac{2}{11}$  (c)  $\frac{5}{11}$

13. HHH, HHT, HTH, THH, HTT, THT, TTH, TTT (13) (i)  $\frac{1}{8}$  (ii)  $\frac{3}{8}$  (iii)  $\frac{1}{2}$

14. (i)  $\frac{1}{13}$ , (ii)  $\frac{1}{2}$  (iii)  $\frac{1}{4}$  (iv)  $\frac{1}{26}$

15. (i)  $\frac{1}{4}$ , (ii)  $\frac{3}{10}$  (iii)  $\frac{2}{5}$

# Square and Square Roots

## Key points and formulae :

- ◆ The product obtained by multiplying a number with itself is called a square number. If  $x$  is a given number then the square of  $x$  will be  $x \times x$  i. e.  $x^2$ .
- ◆ A natural number is called a perfect square number if it is the square of some natural number. i. e. If  $m = n^2$ , then  $m$  is a perfect square where  $m$  and  $n$  are natural numbers.
- ◆ The unit digit of a perfect square can be only 0, 1, 4, 5, 6 or 9.
- ◆ A number will not be a perfect square number if the unit place digit of the number is either 2, 3, 7 or 9.
- ◆ If a number is ended with even number of zeros then it will be a perfect square number.
- ◆ If a number is ended with odd number of zeros then it will never be a perfect square number.
- ◆ The square of a number having :
  - 0 at the units place ends in 0.
  - 1 or 9 at the units place ends in 1.
  - 2 or 8 at the units place ends in 4.
  - 3 or 7 at the units place ends in 9.
  - 4 or 6 at the units place ends in 6.
  - 5 at the units place ends in 5.
- ◆ Squares of even numbers are even.
- ◆ Squares of odd numbers are odd.
- ◆ A perfect square can always be expressed as the product of pairs of prime factors.
- ◆ There are  $2n$  natural numbers between the squares of numbers  $n$  and  $n+1$ .
- ◆ The sum of first  $n$  odd natural number is  $n^2$ .
- ◆ Difference between the square of two consecutive natural number is always equal to the sum of that two numbers.

i. e.  $(n+1)^2 - n^2 = n^2 + 2n + 1 - n^2 = 2n + 1 = n + (n+1)$ .

- ◆ Product of any two consecutive even or odd numbers is always 1 less than square of the number between them.

i. e.  $(n+1)(n-1) = n^2 - 1$ , where n is the number between the numbers (n+1) and (n-1).

- ◆ Three natural numbers a, b, c are said to form a pythagorean triplet if  $a^2 + b^2 = c^2$ .
- ◆ For every natural number  $m > 1$ ,  $2m$ ,  $m^2 - 1$ , and  $m^2 + 1$  form a pythagorean triplet.
- ◆ The square root of a number x is the number whose square is x. Positive square root of a number x is denoted by  $\sqrt{x}$ .
- ◆ Square root is the inverse operation of square.
- ◆ If a perfect square is of n digit, then its square root will have  $\frac{n}{2}$  digit if n is even, or  $\frac{n+1}{2}$  digit if n is odd.

### Exercise - 6

#### Group - A

#### Very short answer type questions : (1 Mark each)

1. A perfect square number can never have the following digit at ones' place is -  
a) 7                      b) 0                      c) 4                      d) 5
2. Which of the following is the square of an odd number ?  
a) 256                      b) 361                      c) 144                      d) 400
3. If the smallest number is 3, then the pythagorean triplet would be as  
a) 3, 4, 6                      b) 3, 4, 8                      c) 3, 4, 5                      d) 3, 4, 9
4. The number of odd numbers starting from 1 is required to subtract to get the square root of 169 is -  
a) 7                      b) 9                      c) 13                      d) 11
5.  $\sqrt{0.4} \times \sqrt{3.6} = ?$   
a) 0.12                      b) 1.2                      c) 1.44                      d) 12

#### Fill in the blanks :

6. \_\_\_\_\_ is the inverse operation of square.

7. Number of zeroes in the square number of 700 is \_\_\_\_\_.
8. The square root of 16384 will have \_\_\_\_\_ digits.
9. The digit of one's place of  $\sqrt{1296}$  is \_\_\_\_\_.
10.  $1 \text{ m}^2 =$  \_\_\_\_\_  $\text{cm}^2$ .

**State whether the following statements are True or False :**

11. There are 35 natural numbers between  $18^2$  and  $19^2$ .
12. The square of 0.4 is 1.6 .
13. Square of a prime number is also be a prime number.
14. Sum of first 7 odd natural number is 59.
15. The square root of 512 is  $16\sqrt{2}$  .

**Answer the following question :**

16. Which is the largest two digit square number ?
17. Is the square of 89 an even or an odd number ?
18. If a number has 3 or 7 at its unit's place then what will be the digit at unit's place of it's square ?
19. How many digit will be there in the square root of the number 1681 ?
20. If x, y, z form pythagorean triplet, then what is the relation between them.

### **Group - B**

**Short answer type questions : (2 Marks each)**

1. Find the greatest 4 digit square number.
2. Without adding find the sum of  $1+3+5+7+9+11+13+15$ .
3. How many square numbers lie between 121 and 289 ? Also find them.
4. A square board has an area of 625 square metre. How long is each side of the board ?
5. By what smallest numbers should 216 be divided so that the quotient will be a perfect square.
6. What is the least number that should be added to 6200 to make it a perfect square?
7. A decimal number is multiplied by itself. If the product is 84.64 . Find the number.



8. Find the side of a square whose area is equal to the area of a rectangle with sides 6.4m and 2.5m.
9. Find the value of  $\sqrt{0.1681}$ .
10. Find the value of  $\sqrt{721 + \sqrt{52 + \sqrt{144}}}$ .

### Group - C

#### Long answer type questions : (3/4 Marks each)

1. Find the square root of 361 by the method of repeated subtraction.
2. Find the area of a square field if its perimeter is 96 m.
3. Find the least square number which is exactly divisible by 3,4,5,6 and 8.
4. Find the square root of 5625 by long division method.
5. During a mass drill exercise 6571 students of different school are arranged in rows such that the number of students in each rows is equal to the number of rows. In doing so, the instructor finds out that 10 children are left out. Find the number of rows of the square.
6. Find the least number of 6 digits, which is a perfect square number. Also, find the square root of the number so obtained.
7. Three numbers are in the ratio 1:2:3 and the sum of their square is 3150. Find the numbers.
8. How many square metres of carpet will be required for a square room of side 6.5 m to be carpeted ?
9. Find the number of plants in each row if 1024 plants are arranged so that number of plants in a row is the same as the number of rows.
10. A general wishes to draw up this 7500 soldiers in the form of a square. After arranging, he found out that some of them are left out. How many soldiers were left out ?
11. 8649 students were sitting in a class room in such a manner that there were as many students in the row as there were rows in the class room. How many students were there in each row of the class room?
12. Some students of class viii of a school collected Rs. 112.50 for Prime Minister Relief fund. If each students contributes double of 25 paise as the number of students then find how many students contributed.
13. The area of a rectangular field whose length is thrice its breadth is 1323 m<sup>2</sup>. Find the perimeter of the field.

14. Area of a square field is  $2025 \text{ m}^2$ . A man drives a car along its boundary at  $4 \text{ km/hr}$ . In how much time will he return to the starting point?

**Answers**

**Group - A**

- |           |                |           |            |                     |
|-----------|----------------|-----------|------------|---------------------|
| 1. (a)    | 2. (b)         | 3. (c)    | 4. (c)     | 5. (b)              |
| 6. Square | 7. 4           | 8. 3      | 9. (b)     | 10. 10,000          |
| 11. False | 12. False      | 13. False | 14. False  | 15. True            |
| 16. 81    | 17. Odd number | 18. 9     | 19. 2 Nos. | 20. $x^2+y^2 = z^2$ |

**Group - B**

- |         |               |                               |        |         |
|---------|---------------|-------------------------------|--------|---------|
| 1. 9801 | 2. $8^2 = 64$ | 3. 5; 144, 169, 196, 225, 256 | 4. 25m |         |
| 5. 6    | 6. 41         | 7. 9.2                        | 8. 4m  | 9. 0.41 |
| 10. 27  |               |                               |        |         |

**Group - C**

- |        |                      |           |                    |         |
|--------|----------------------|-----------|--------------------|---------|
| 1. 19  | 2. $576 \text{ m}^2$ | 3. 3600   | 4. 75              | 5. 81   |
| 6. 320 | 7. 15, 30, 45        | 8. 42.25  | 9. 32              | 10. 104 |
| 11. 93 | 12. 15               | 13. 168 m | 14. 2 mins 42 secs |         |

# Cube and Cube Roots

## Key points and formulae :

- ◆ Number obtained when a number is multiplied by itself three times are called cube number. i.e. if  $x$  is a given number then cube of  $x = x \times x \times x = x^3$ .
- ◆ A natural number is called a perfect cube if it is the cube of some natural number. i.e. if  $m = n^3$ , then  $m$  is a perfect cube where  $m$  and  $n$  are natural numbers.
- ◆ Cubes of even numbers are even.
- ◆ Cubes of odd numbers are odd.
- ◆ A perfect cube can always be expressed as the product of triplets of prime factors.
- ◆ Cubes of the numbers ending with the digits 0, 1, 4, 5, 6 and 9 end with digits 0, 1, 4, 5, 6 and 9 respectively.
- ◆ Cubes of the numbers ending with the digits 2 or 8 end with digits 8 or 2.
- ◆ Cubes of the number ending with the digits 3 or 7 end with digits 7 or 3.
- ◆ The cube root of a number  $x$  is the number whose cube is  $x$ . It is denoted by  $\sqrt[3]{x}$ .
- ◆ Cube root are the inverse operation of cubes.
- ◆ Cube root of the number ending in 8 ends in 2.
- ◆ Cube root of the number ending in 7 ends in 3.

## Exercise - 7

### Group - A

#### Very short answer type questions : (1 mark each)

#### Choose the correct answers :

1. A number ending in 8 will have the units place of its cube as  
(a) 5                      (b) 2                      (c) 9                      (d) 4

2. The one's digit of the cube of 43 is  
 (a) 9                    (b) 3                    (c) 7                    (d) 8
3. Which of the following numbers is not a perfect cube ?  
 (a) 343                    (b) 116                    (c) 492                    (d) 516
4. Which of the following numbers is not a perfect cube ?  
 (a) 512                    (b) 729                    (c) 243                    (d) 64
5. If  $x$  is the cube root of  $y$ , then  $y$  is  
 (a)  $x^3$                     (b)  $\sqrt{x}$                     (c)  $\frac{x}{3}$                     (d)  $\sqrt[3]{x}$

**Fill in the blanks :**

6. There are \_\_\_\_\_ perfect cubes between 5 and 500.
7. The cube of an odd number is always an \_\_\_\_\_ number.
8. Cube of a number ending in 7 will end in the digit \_\_\_\_\_.
9. The cube of 200 will have \_\_\_\_\_ zeroes.
10. Cube root are the inverse operation of \_\_\_\_\_ .

**State whether the following statements are true or false.**

11. Each prime factor appears 2 times in its cube.
12. The cube root of 6400 is 40.
13. The cube of 0.6 is 0.216.
14.  $1\text{m}^3 = 100000\text{cm}^3$
15. 243 is a perfect cube.

**Answer the following questions :**

16. Which is the smallest two digit perfect cube number ?
17. What is the one's digit of the cube of 37 ?
18. What is the cube root of 64 ?
19. Is 999 is a perfect cube ?

20. What will be the cube of an even number ?

### Group - B

#### Short answer type questions : (2 marks each)

1. Find the cube roots of 9261 by prime factorisation method.
2. Is 29160 a perfect cube ? If not, find the smallest number by which it should be divided to get a perfect cube.
3. By what smallest number should 1800 be multiplied so that the product is a perfect cube.
4. If one side of a cube is 18 m in length, find its volume.
5. Three numbers are in the ratio 1:2:3 and the sum of their cubes is 4500. Find the numbers.
6. Find the length of each side of a cube if its volume is  $729 \text{ cm}^3$ .
7. Priyanshu makes a cuboid of sides 7 cm, 3 cm and 7 cm. How many such cuboids will he need to form a cube ?
8. Find the cube of  $\frac{5}{7}$ .
9. Show that 576 is not a perfect cube.
10. Find  $\sqrt[3]{125 \times (-343)}$
11. If  $x = \sqrt[3]{-3\frac{3}{8}}$ , find the value of x ?
12. Given that  $\sqrt[3]{x} = -6$ , find the value of x ?

### Group - C

#### Long answer type questions : (3/4 marks each)

1. Difference of two perfect cubes is 189. If the cube root of the smaller of the two numbers is 3, find the cube root of the larger number.
2. Find the smallest number by which 8788 should be divided to get a perfect cube. Also find the cube root of the quotient.
3. Find the smallest number by which 648 should be multiplied to get a perfect cube. Also find the cube root of the product.
4. Show that  $-1728$  is a perfect cube. Also, find the number whose cube is  $-1728$ .

5. Show that 0.001728 is the cube of a rational number. Find that rational number whose cube is 0.001728.
6. If the surface area of a cube is  $486 \text{ cm}^2$ , find its volume.
7. The volume of a cubical box is  $1331 \text{ cm}^3$ . What is its side ?
8. Find  $\sqrt[3]{\frac{8000}{4913}}$
9. Find the value of  $\sqrt[3]{2188 + \sqrt[3]{722 + \sqrt[3]{343}}}$
10. The cube of a number is 8 times the cube of another number. If the sum of the cubes of numbers is 243, What is the difference of the numbers ?
11. A metallic cuboid with dimensions  $16 \text{ cm} \times 8 \text{ cm} \times 4 \text{ cm}$  was melted and recast into a cube. What is the length of the edge of the cube ?
12. The volume of liquid in a measuring jar is  $20 \text{ cm}^3$ . A cube of side 7 cm is immersed in the liquid. What is the reading on the measuring jar ?
13. A cubical tank holds 27000 litres of water. How many litres of water would a similar pond hold, if its dimensions were double the first one ?
14. A cube is made of  $24389 \text{ cm}^3$  of wood. What is the measure of its edge ?

### Answers

#### Group - A

- |        |                 |        |           |        |       |
|--------|-----------------|--------|-----------|--------|-------|
| 1. (b) | 2. (c)          | 3. (a) | 4. (c)    | 5. (d) | 6. 6  |
| 7. odd | 8. 3            | 9. 6   | 10. cubes | 11. F  | 12. F |
| 13. T  | 14. F           | 15. F  | 16. 64    | 17. 3  | 18. 4 |
| 19. No | 20. even number |        |           |        |       |

#### Group - B

- |       |                      |          |                       |            |        |
|-------|----------------------|----------|-----------------------|------------|--------|
| 1. 21 | 2. 5                 | 3. 15    | 4. $5832 \text{ m}^3$ | 5. 5,10,15 | 6. 9cm |
| 7. 63 | 8. $\frac{125}{343}$ | 10. - 35 | 11. $-\frac{3}{2}$    | 12. - 216  |        |

#### Group - C

- |                   |                    |           |         |                   |                        |
|-------------------|--------------------|-----------|---------|-------------------|------------------------|
| 1. 6              | 2. 4, 13           | 3. 9, 18  | 4. - 12 | 5. $\frac{3}{25}$ | 6. $729 \text{ cm}^3$  |
| 7. 11cm           | 8. $\frac{20}{17}$ | 9. 13     | 10. 3   | 11. 8 cm          | 12. $543 \text{ cm}^3$ |
| 13. 216000 litres |                    | 14. 29 cm |         |                   |                        |

# Comparing Quantities

## Key points and formulae :

- ◆ **Ratio** : Comparing by division is called ratio. Quantities written in ratio have the same unit. Ratio has no unit. Equality of two ratios is called proportion.
- ◆ **Product of extremes = product of means.**
- ◆ **Percentage** : Percentage means for every hundred. The result of any division in which the divisor is 100 is a percentage. It is denoted by a special symbol %, read as percent.
- ◆ **Profit and loss** :
  - (i) **Cost price (CP)** : The amount for which an article is bought.
  - (ii) **Selling price (SP)** : The amount for which an article is sold.
- ◆ Additional expenses made after buying an article are included in the cost price known as overhead expenses. These may include expenses like amount spent on repairs, labour charges transportation etc. Therefore  $CP = \text{buying price} + \text{overhead expenses}$ .
- ◆ **Sales tax** is charged on the sale of an item by the government and is added to the bill amount.  
Sales tax = Tax % of Bill Amount.
- ◆ **GST** stands for goods and service tax and is levied on supply of goods or services on both.
- ◆ **Discount** is a reduction given on marked price.  
Discount = Marked price – sale price.
- ◆ Discount can be calculated when discount percentage is given.  
Discount = Discount % of marked price.
- ◆ **Simple Interest** : If the principle remains the same for the entire loan period, then the interest paid is called simple interest.  
 $SI = \frac{P \times R \times T}{100}$ , P is principle, R is rate of interest and T is time period.
- ◆ **Amount** : Principle + Interest.
- ◆ **Compound Interest** : The interest calculated on the amount of the previous year (on duration at which interest is compounded) is known as compound interest. compound interest allows the principle to grow faster than simple interest.

- ◆ Amount (A) when interest is compounded annually is  $A = P \left(1 + \frac{R}{100}\right)^n$ , where P = Principle, R = Rate of interest, n = Time period.
- ◆ Amount when interest is compounded half yearly is given by,  $A = P \left(1 + \frac{R}{200}\right)^{2n}$ , where  $\frac{R}{2}$  = Half-yearly rate and 2n = Number of half years.
- ◆ Amount when interest is compounded quarterly is given by,  $A = P \left(1 + \frac{R}{400}\right)^{4n}$ , where  $\frac{R}{4}$  = Quarterly rate and 4n = Number of quarters.

## Exercise - 8

### Group - A

#### Very short answer type questions : (1 mark each)

#### Choose the correct answer :

1. The ratio of 10 m to 10 km is  
 (a)  $\frac{1}{10}$             (b)  $\frac{1}{100}$             (c)  $\frac{1}{1000}$             (d) 1000
2. The price of a scooter was Rs 34,000 last year. It has increased 20% this year. Now the price is  
 (a) Rs. 30,800            (b) Rs. 40, 800            (c) Rs. 30, 400            (d) Rs. 40, 400
3. The present population of a town is 25000. It grows at 4%, 5% and 8% during first year, second year and third year respectively. The population after 3 years will be  
 (a) 29484            (b) 28696            (c) 24576            (d) 30184
4. If the difference in S.I. and C.I. on a certain sum of money in 2 years at 15% p.a. is Rs 144, then the sum is  
 (a) Rs. 6000            (b) Rs. 6200            (c) Rs. 6300            (d) Rs. 6400
5. If an item marked at Rs. 840 is sold for Rs. 714, then the discount % is  
 (a) 20 %            (b) 10 %            (c) 15 %            (d) None of these
6. If a profit of 5% is made on a cycle of Rs. 700 with Rs. 50 as overhead charges then its selling price (SP) is  
 (a) Rs 600            (b) Rs. 787.50            (c) Rs. 780            (d) None of these



7. The price of a shirt is Rs. 176. If a discount of 20% is allowed in its marked price, then the marked price of the shirt is  
 (a) Rs. 160                      (b) Rs. 180                      (c) Rs. 200                      (d) Rs. 220
8. Rohan bought a second hand refrigerator for Rs. 2500 . If he spent Rs. 500 on its repairs and sold it for Rs. 3, 300, then his loss or gain percent is  
 (a) Loss 15%                      (b) Loss 10%                      (c) Profit 10%                      (d) profit 15%
9. Conversion of the ratio 4 : 5 in to percentage is  
 (a) 80%                      (b) 75%                      (c) 60%                      (d) 65%
10. 30% of x is 600 then value of x is  
 (a) 1000                      (b) 2000                      (c) 1500                      (d) 1800

**Fill in the blanks :**

11. 2500 is greater than 500 by \_\_\_\_\_%
12. Sales tax = tax % of \_\_\_\_\_.
13. \_\_\_\_\_ is a reduction on the marked price of the article.
14. Discount = Discount % of \_\_\_\_\_.
15. Four times a number is a \_\_\_\_\_ % increase in the number.
16. When principle P is compounded semi – annually at r % per annum for t years, then amount = \_\_\_\_\_
17.  $\frac{9}{5} =$  \_\_\_\_\_%
18. The discount on an item is calculated on the \_\_\_\_\_.
19. If M.P = Rs. 5450 and discount = 5% then S.P = \_\_\_\_\_.
20. By selling 50 pens, a shopkeeper lost the amount equal to the selling price of 10 pens. His loss percent is \_\_\_\_\_.

**State whether the following statements are true (T) of false (F)**

21. Compound interest is the interest calculated on the previous year's amount.
22. Discount is a reduction given on cost price of an article .
23. Cost price = Marked price – Discount.
24. Sales tax is always calculated on the cost price of an item and is added to the value of the bill.
25. The cost of a book marked at Rs. 190 after paying a sales tax of 2% is Rs. 193.8.

26. The ratio 5 : 4 expressed as a percent equals 125%.
27. In 3 years Rs. 1000 amount to Rs. 1331 at 10% p.a. compounded annually.
28. If an item marked at Rs. 840 is sold for Rs. 714, then here discount is 10%.
29. Ratio means comparing two quantities.
30. The population of a city was 20, 000 in the year 1997. It increased at the rate of 5% p.a. , then the population at the end of the year 2000 was 23153.

**Answer the following questions :**

31. Write the ratio of 90 cm to 1.5 m.
32. A car can go 150 km with 25 litres of petrol. How far can it go with 30 litres of petrol ?
33. Determine 5% of (25% of Rs. 1600)
34. Write half of 1 percent as a decimal.
35. The marked price of an article is Rs. 80 and it is sold at Rs. 76, then find the discount %.
36. If a % is the discount percent on a marked price  $x$ , then find the discount.
37. Jatin got 10% increase in his salary. If his new salary is Rs. 55000, find his previous salary.
38. Rina gets 94 marks in her exams.. These are 47% of the total marks. Find the maximum number of marks.
39.  $z\%$  of 100 + 10% of 50 = 100. Find the value of  $z$  .
40. An agent of an insurance company gets a commission of 8% on the basic premium he collects. What will be the commission earned by him if he collects Rs. 4800 ?

**Group - B**

**Short answer type questions : ( 2 marks each)**

1. The marked price of a ceiling fan is Rs. 1250 and the shopkeeper allows a discount of 6% on it. Find selling price of a fan.
2. By selling a T-shirt Rs. 216, a shopkeeper loss 4%. What will be the actual price of a T-shirt ?
3. Mohan bought a CD for Rs. 750 and sold it for Rs. 875. Find his gain percent ?
4. Find the compound interest on Rs. 5000 for 1 year at 8% per annum compounded half-yearly.
5. Convert the following ratios into percentage : (a) 7:4 (b) 3:5
6. The simple interest on Rs. 2400 is Rs. 60 more than the interest on Rs. 2000 for 3 years. Find the rate of interest per annum.

7. Basic salary of a worker is increased by 20%. What amount does worker get if his last salary was Rs. 8800?
8. A car travels 225 km with 15 litre of petrol. How many litre petrol are needed to travel 135 km.
9. A certain project can be completed by 5 workers in 24 days. How many workers are needed to finish the project in 15 days ?
10. In a company, 40% of the employees are female. What is the ratio of the number of female employees to the number of male employees.
11. A television set costs Rs. 16060 including 10% value added tax. What is the cost of the television set without tax ?
12. If selling price of an article Rs. 495 and discount allows 1% then find its marked price .

### Group - C

#### Long answer type questions: (3/4 marks each)

1. A shopkeeper offers 10% off-season discount to the customers and still makes a profit of 26% . What is the cost price for the shopkeeper on a pair of shoes marked at Rs. 1120 ?
2. Shruti bought a set of cosmetic items for Rs. 345 including 15% value added tax and a purse for Rs. 110 including 10% VAT. What percent is the VAT charged on the whole transaction ?
3. In 15 days, the earth picks up  $1.2 \times 10^8$  kg of dust from the atmosphere. In how many days it will pick up  $4.8 \times 10^8$  kg of dust ?
4. A can do a piece of work in 40 days and B in 45 days. They work together for 10 days and B goes away. In how many days will A finish the remaining work ?
5. Rs. 3500 is to distributed among three people so that the first person gets 50% of the second, the second person gets 50% of the third. How much will each of them get ?
6. A's income is 60% more than that of B. What percent is B's income less than A's ?
7. Find the amount and compound interest on Rs. 8000 for  $1\frac{1}{2}$  years at 10 % per annum compounded half-yearly.
8. The price of petrol goes up by 10%. By how much percent must a motorist reduce the consumption of petrol so that the expenditure on it remain unchanged.
9. Gunpowder contain 75% nitre and 10% sulpher. Find the amount of gun powder which carries 9kg nitre. What amount of gunpowder would contain 2.5 kg sulpher ?
10. The cost of 12 candles is equal to the selling price of 15 candles. Find the loss percent.
11. Sumit bought two cricket bats for Rs. 840 and Rs. 360 respectively. He sells the first bat a gain of 15% and second one at a loss of 5% . Find the gain or loss percent in the whole transaction.

12. The difference between the compound interest and the simple interest on a certain sum for 3 years at 10% per annum is Rs. 93. Find the sum.
13. What sum of money will amount to Rs. 21296 in 3 years at 10% per annum, compound annually?
14. The value of a machine depreciates every year by 20%. If the present value of the machine be Rs. 16000, what was its value last year?
15. The count of bacteria in a certain experiment was increasing at the rate of 2% per hour. Find the number of bacteria at the end of 2 hours if the count was initially 500000.

### Answers

#### Group - A

- |                  |   |                       |  |              |                 |
|------------------|---|-----------------------|--|--------------|-----------------|
| 1. (c)           | 2. (b)                                    | 3. (a)                | 4. (d)                                     | 5. (c)       | 6. (b)          |
| 7. (d)           | 8. (c)                                    | 9. (a)                | 10. (b)                                    | 11. 400      | 12. Bill amount |
| 13. Discount     | 14. Marked price                          | 15. 300               | 16. $P\left(1 + \frac{R}{200}\right)^{2t}$ | 17. 180      |                 |
| 18. Marked Price | 19. Rs. 5177.5                            | 20. $16\frac{2}{3}\%$ | 21. T                                      | 22. F        |                 |
| 23. F            | 24. F                                     | 25. T                 | 26. T                                      | 27. T        | 28. F           |
| 29. T            | 30. T                                     | 31. 3 : 5             | 32. 180 km                                 | 33. 20       | 34. 0.005       |
| 35. 5%           | 36. $x \times \left(\frac{a}{100}\right)$ | 37. Rs. 5000          | 38. 200                                    | 39. $z = 95$ |                 |
| 40. Rs. 384      |   |                       |  |              |                 |

#### Group - B

- |             |            |                      |              |
|-------------|------------|----------------------|--------------|
| 1. Rs. 1175 | 2. Rs. 225 | 3. $16\frac{2}{3}\%$ | 4. Rs. 408   |
| 5. (a) 175% | (b) 60%    | 6. 5%                | 7. Rs. 10560 |
| 8. 9        | 10. 2 : 3  | 11. Rs. 14,600       | 12. Rs. 500  |

#### Group - C

- |            |                                |                      |                         |                                |
|------------|--------------------------------|----------------------|-------------------------|--------------------------------|
| 1. Rs. 800 | 2. 13.75%                      | 3. 60 days           | 4. $21\frac{1}{9}$ days | 5. Rs. 500, Rs. 1000, Rs. 2000 |
| 6. 37.5%   | 7. CI = Rs. 1261, A = Rs. 9261 | 8. $9\frac{1}{11}\%$ | 9. 12 kg, 25 kg         |                                |
| 10. 20%    | 11. 9%                         | 12. Rs. 3000         | 13. Rs. 16000           |                                |
| 14. 20,000 | 15. 520200                     |                      |                         |                                |

# Algebraic Expressions and Identities

## Key points and formulae :

- ◆ An algebraic expression is a combination of some algebraic variables and constant terms.
- ◆ Terms of an algebraic expression are formed by the product of variables and constants, e.g.  $2x$ ,  $-3xy^2$  etc.
- ◆ Terms are added to form expressions.
- ◆ Expressions that contain exactly one, two and three terms are called monomials, binomials and trinomials respectively.
- ◆ Terms formed by same variable (may have different coefficients) are called like terms and the terms formed by different variables are called unlike terms.
- ◆ Product of two algebraic expressions is also an algebraic expression.
- ◆ A monomial multiplied by a monomial always gives a monomial.
- ◆ While multiplying a polynomial by a monomial, we multiply every term in the polynomial by the monomial using the distributive law :  $a(b+c) = ab + ac$ .
- ◆ While multiplying a polynomial by a binomial (or trinomial) we multiply every term in the polynomial by every term in the binomial (or trinomial) by using distributive law.
- ◆ Some standard identities :
  - (i)  $(a + b)^2 = a^2 + 2ab + b^2$
  - (ii)  $(a - b)^2 = a^2 - 2ab + b^2$
  - (iii)  $(a + b)(a - b) = a^2 - b^2$
  - (iv)  $(x + a)(x + b) = x^2 + x(a + b) + ab$
- ◆ A mathematical equality, which is true for all values of its variable in the equality, called an identity.
- ◆ When we add or subtract two algebraic expressions we add or subtract like terms.

## Exercise - 9

### Group - A

Very short answer type questions : (1 mark each)

Choose the correct answer :

- When a binomial is multiplied by a trinomial then total number of terms will be  
(a) 6                      (b) 6 or less than 6                      (c) 6 or more than 6                      (d) 5
- Identify the correct identity  
(a)  $(x + y)^2 = x^2 + y^2$                       (b)  $x^2 - y^2 = (x - y)^2$   
(c)  $x^2 - y^2 = x^2 + 2xy - y^2$                       (d)  $(x+y)^2 = x^2 + 2xy + y^2$
- Product of all monomials  $4p, -7q^3, -7pq$  is  
(a)  $196 p^2q^4$                       (b)  $196 pq^4$                       (c)  $-196 p^2q^4$                       (d)  $196 p^2q^3$
- Simplified value of  $3ab^2 - 2a^2b + a^2b^2 - a(ab + b^2)$  is  
(a)  $2ab^2 - 3a^2b$                       (b)  $2ab^2 + 3a^2b + a^2b^2$   
(c)  $a^2b^2 + 2ab^2 - 3a^2b$                       (d)  $3ab^2 - 2a^2b + a^2b^2$
- Which one of the following is a binomial  
(a)  $7 \times a + a$                       (b)  $6a^2 + 7b + 2c$                       (c)  $4a \times 3b \times 2c$                       (d)  $6(a^2 + b)$
- Like term as  $4x^2y^3$  is  
(a)  $3x^3y^2$                       (b)  $-3x^3y^3$                       (c)  $-2x^2y^3$                       (d)  $2xy$
- Value of  $x(x - y) + x(x + y)$  when  $x = 1$  is  
(a) 2                      (b) 3                      (c) 4                      (d) 0
- If the length, breadth and height of a rectangular box are  $ax, bx$  and  $cx$  respectively, then its volume will be  
(a)  $(a+b+c)x$                       (b)  $(ax + bx) \times cx$                       (c)  $abcx^3$                       (d)  $3abcx$
- Coefficient of 3rd term in the expression  $3x^2 + 2x - \frac{y}{3}$  is  
(a)  $\frac{1}{3}$                       (b)  $-\frac{1}{3}$                       (c) 3                      (d) 0
- Simplified value of  $2pq(p+q) - 3pq(p-q)$  is  
(a)  $5pq(p+q)$                       (b)  $p^2q - 5pq^2$                       (c)  $pq(5q - p)$                       (d)  $-pq(p - q)$

**II. Fill in the bank :**

11.  $a^2 - b^2 = (a - b) \times$  \_\_\_\_\_.
12. Number of terms in  $a^2 + a(b - a)$  is \_\_\_\_\_.
13. Common factor of  $ax^2$  and  $abx$  is \_\_\_\_\_.
14. Product of a monomial and binomial is always \_\_\_\_\_.
15. In case of multiplication the name of the law in which  $a \times b = b \times a$  is \_\_\_\_\_ law.
16. If length and area of a rectangle are respectively  $3xy$  and  $6xy$  then breadth will be \_\_\_\_\_.
17. Maximum number of terms when 3 like terms and 2 unlike terms are added \_\_\_\_\_.
18.  $(x+a)(x+b) = x^2 + (a+b)x +$  \_\_\_\_\_.
19. Cost of 1 pen is ₹  $(x + 1)$  then cost of  $(x - 2)$  pens will be \_\_\_\_\_.
20. Number of terms in the simplified form of  $x(y - z) + y(z - x) + z(x - y)$  is \_\_\_\_\_.

**III. State whether the following statements are True or False :**

21. In the expression  $y(2x+3y-2)$  coefficients of  $y$  is 3
22.  $a(2b - 3a) + 3a^2$  is a binomial expression.
23.  $(a - b)^2 = b^2 - 2b.a + a^2$
24. An expression is formed by the combination of two or more than two variables and constants.
25. An identity is true for all values of its variable.

**IV) Answer the following questions :**

26. What should be added to  $x$  to get  $y$  ?
27. What will be sum of all coefficients in the algebraic expression  $x - 2y + 3z$  ?
28. Add :  $1 - x + y$ ,  $1 + x - y$ ,  $x + y - 1$ .
29. Multiply :  $ab^2$ ,  $3a^2$ ,  $5a^2p$ .
30. Find value of  $(100 + 2)(100 - 2)$
31. Simplify :  $(2 \times x \times x \times y \times y^2) + (2x \times xy \times y^2) + (3x^2 \times y \times y \times y)$ .
32. Using identity find simplified value of  $(x - 3)(x + 2)$ .
33. Using identity simplify  $(4x + 5)(4x + 1)$ .
34. Write expression when  $(y+1)$  is reduced from  $x$ .

35. Simplify :  $(3x + 2y)^2 + (3x - 2y)^2$

**Group - B**

**Short answer type questions : (2 marks each)**

**Answer the following questions :**

1. Simplify :  $\frac{48^2 - 28^2}{20}$
2. If  $(2x + 3)^2 = 4x^2 + 12x + k$  is an identity then find value of k.
3. Multiply  $\left(\frac{3}{4}x - \frac{4}{3}y\right), \left(\frac{2}{3}x + \frac{3}{2}y\right)$
4. Add  $3a(2b + 5c)$  and  $3c(2a + 2b)$
5. Using identity find the value of  $99^2$ .
6. Subtract  $(4x + xy - 3y + 10)$  from  $(12x - 3xy + 5y + 12)$
7. Simplify :  $(x - y)(x^2 + xy + y^2) + (x + y)(x^2 - xy + y^2)$
8. If  $x + y = 12$  and  $xy = 22$ , find the value of  $(x^2 + y^2)$
9. Using identity  $a^2 - b^2 = (a + b)(a - b)$  find the value of  $(52.7)^2 - (47.3)^2$
10. Find the value of  $(3x + 2y + 6z)^2$  when  $x = 2, y = 3, z = -1$

**Group - C**

**Long answer type questions : (3/4 marks each)**

**Answer the following questions :**

1. If  $x - \frac{1}{x} = 7$  then find the value of  $x^2 + \frac{1}{x^2}$ .
2. If  $a^2 + b^2 = 164$  and  $ab = 32$  find  $a - b$ .
3. Using identity simplify :  $297 \times 303 \times 102^2$
4. Simplify :  $(a - b)(a + b + c) + (b - c)(a + b + c) + (c - a)(a + b + c)$
5. Show that  $\left(\frac{2}{3}x - \frac{3}{2}y\right)^2 + 4xy = \left(\frac{2}{3}x + \frac{3}{2}y\right)^2$
6. Subtract  $(3t^4 - 5t^3 - t^2 - 5t + 6)$  from  $(-4t^4 + 8t^3 - 4t^2 - 3t + 10)$ .



7. Simplify :  $(2.5p + 1.5q)^2 - (2.5p - 1.5q)^2$
8. Simplify :  $(a + b)(3a + b) + (a + 3b)(a - b)$
9. If area of a square is  $(4x^2 + 12xy + 9y^2)$ , then find the length of side of the square.
10. The length and breadth of a rectangular garden are  $(x + 3)$  and  $(x + 2)$  respectively. If area of garden is 56, find its actual length and breadth.

### Answers

#### Group - A

- |      |                   |                       |                 |                    |                 |                |
|------|-------------------|-----------------------|-----------------|--------------------|-----------------|----------------|
| I.   | 1. b              | 2. d                  | 3. a            | 4. c               | 5. d            | 6. c           |
|      | 7. a              | 8. c                  | 9. b            | 10. c              |                 |                |
| II.  | 11. a+b           | 12. 1                 | 13. ax          | 14. binomial       | 15. commutative |                |
|      | 16. 2             | 17. 3                 | 18. ab          | 19. $(x+1)(x-2)$   | 20. 0           |                |
| III. | 21. False         | 22. False             | 23. True        | 24. True           | 25. True        |                |
| IV.  | 26. $y - x$       | 27. 2                 | 28. $(1+x+y)$   | 29. $15 a^5 b^2 p$ | 30. 9996        | 31. $7x^2 y^3$ |
|      | 32. $x^2 - x - 6$ | 33. $16x^2 + 24x + 5$ | 34. $x - y - 1$ | 35. $18x^2 + 8y^2$ |                 |                |

#### Group - B

- |                        |            |  |                       |         |
|------------------------|------------|--|-----------------------|---------|
| 1. 76                  | 2. $k = 9$ | 3. $\frac{1}{2}x^2 + \frac{17}{72}xy - 2y^2$ | 4. $6ab + 21ac + 6bc$ | 5. 9801 |
| 6. $8x - 4xy + 8y + 2$ | 7. $2x^3$  | 8. 100                                       | 9. 540                | 10. 36  |

#### Group - C

- |          |                        |              |                              |                                    |
|----------|------------------------|--------------|------------------------------|------------------------------------|
| 1. 51    | 2. $\pm 10$            | 3. 100395    | 4. 0                         | 6. $-7t^4 + 13t^3 - 3t^2 + 2t + 4$ |
| 7. 15 pq | 8. $4a^2 + 6ab - 2b^2$ | 9. $2x + 3y$ | 10. length = 8 , breadth = 7 |                                    |

# Visualising Solid Shapes

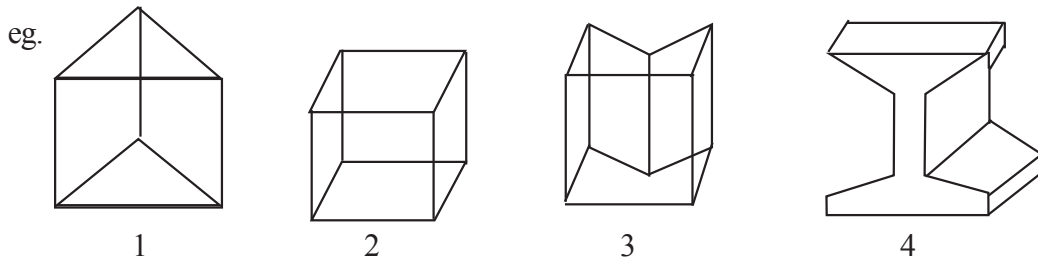
**Key points and formulae :**

- ◆ 3D shapes / objects are those which do not lie completely in a plane.
- ◆ 3D objects have different views from different positions.
- ◆ A solid is a polyhedron if it is made up of only polygonal faces, the faces meet at edges which are line segments and the edges meet at a point called vertex.

◆ **Types of polyhedron :**

**(a) Convex polyhedron :**

A convex polyhedron is one in which all faces make it convex.

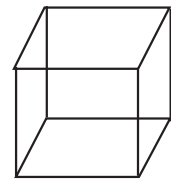


(1) and (2) are convex polyhedrons whereas (3) and (4) are non convex polyhedron.

**(b) Regular polyhedra or platonic solids :**

A polyhedron is regular if its faces are congruent regular polygons and the same number of faces meet at each vertex.

For example, a cube is a platonic solid because all six of its faces are congruent Squares. There are five such solids – tetrahedron, cube, octahedron, dodecahedron and icosahedron.



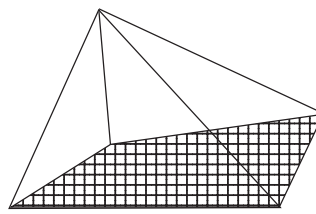
Cube.

- ◆ A **prism** is a polyhedron whose bottom and top faces (known as bases) are congruent polygons and faces known as lateral faces are parallelograms (when the side faces are rectangles, the shape is known as right prism).

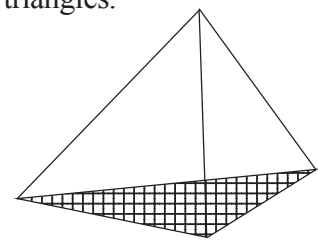


prism.

- ◆ A **pyramid** is a polyhedron whose base is a polygon and lateral faces are triangles.



(i)



(ii)

Fig. (i) and (ii) are pyramid

◆ Euler's formula for any polyhedron is,  $F + V - E = 2$ , where F stands for number of faces, V for number of vertices and E for number of edges. eg.

Solid	Faces(F)	Vertices (V)	Edges (E)	F + V	E + 2
Cuboid	6	8	12	$6+8=14$	$12+2=14$
Triangular pyramid	4	4	6	$4+4=8$	$6+2=8$
Triangular prism	5	6	9	$5+6=11$	$9+2= 11$
Pyramid with square base	5	5	8	$5+5=10$	$8+2=10$
Prism with square base	6	8	12	$6+8=14$	$12+2=14$
Prism with pentagonal base	7	10	15	$7+10=17$	$15+2=17$

- ◆ A **map** depicts the location of a particular object /place in relation to other objects/places.
- ◆ Scale is the relationship between the drawings / model's dimensions to the actual object's dimensions.
- ◆ In a map, symbols are used to depict the different objects and places.
- ◆ Maps involve a scale which is fixed for a particular map.
- ◆ Scale of map =  $\frac{\text{Size drawn}}{\text{Actual size}}$

### Exercise - 10

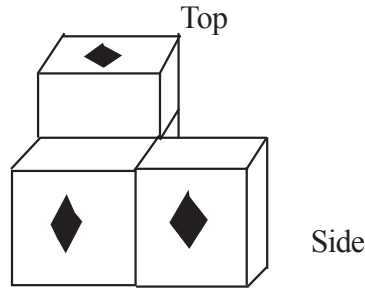
#### Group - A

**Very short answer type questions : (1 mark each)**

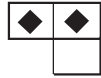
**Choose the correct answer :**

1. Which of the following is a regular polyhedron ?  
 (a) Cuboid                      (b) Triangular Prism                      (c) Cube                      (d) Square prism
2. Which of the following can be the base of a pyramid ?  
 (a) Octagon                      (b) Oval                      (c) Circle                      (d) Line segment
3. Which of the following 3D shapes does not have a vertex ?  
 (a) Cone                      (b) Prism                      (c) Sphere                      (d) Pyramid
4. Solid having only line segments as its edges is a  
 (a) Sphere                      (b) Cylinder                      (c) Polyhedron                      (d) Cone
5. In a solid if  $F = 6$  and  $V = 4$ , then the number of edges in this shape is  
 (a) 4                      (b) 6                      (c) 2                      (d) 8

6. Which of the following is the top view of the given shape ?



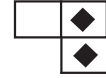
(a)



(b)



(c)

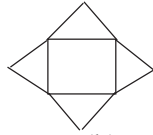


(d)

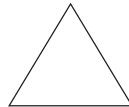
7. Which of the nets given below will generate a cone ?



(a)



(b)



(c)



(d)

8. Side of a square garden is 30 m. If the scale used to draw its picture is 1 cm : 5 m, the perimeter of the square in the picture is

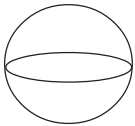
(a) 30 cm

(b) 20 cm

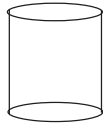
(c) 24 cm

(d) 28 cm

9. Which of the following shapes has a vertex ?



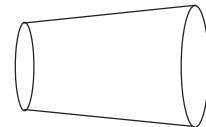
(a)



(b)

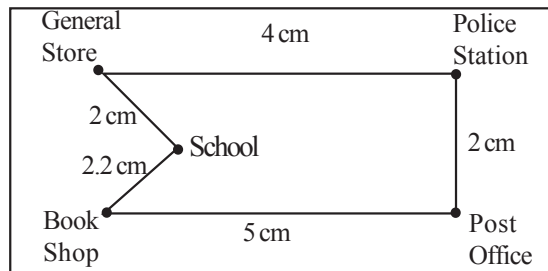


(c)



(d)

10. In the given map, the distance between the places is shown using the scale 1 cm : 0.5 km. Then the actual distance (in km) between school and the book shop is



(a) 1.1

(b) 1.25

(c) 2.5

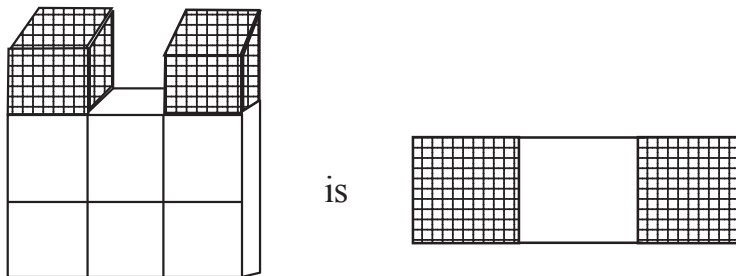
(d) 2

**Fill in the blanks :**

11. Rectangular prism is also called a \_\_\_\_\_.
12. A solid figure with only one vertex is a \_\_\_\_\_.
13. Total number of faces in a pyramid which has eight edges is \_\_\_\_\_.
14. The net of a rectangular prism has \_\_\_\_\_ rectangles.
15. In a three dimensional shape, diagonal is a line segment that joins two vertices that do not lie on the \_\_\_\_\_.
16. If 4 km on a map is represented by 1 cm, then 16 km is represented by \_\_\_\_\_ cm.
17. A pentagonal prism has \_\_\_\_\_ faces.
18. If a pyramid has a hexagonal base, then the number of vertices is \_\_\_\_\_.
19. Total number of regular polyhedra is \_\_\_\_\_.
20. Faces of a regular polyhedra are \_\_\_\_\_.

**State whether the following statements are True or False :**

21. The other name of cuboid is tetrahedron.
22. Regular octahedron has 8 congruent faces which are isosceles triangles.
23. Every cylinder has 2 opposite faces as congruent circles, so it is also a prism.
24. Euler's formula is true for all three dimensional shapes.
25. The top view of

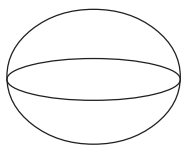


26. The number of edges in a parallelogram is 4.
27. Pyramids do not have a diagonal.
28. A cuboid has atleast 4 diagonals.
29. If the length of 100 m is represented on a map by 1 cm, then the actual distance corresponding to 2 cm is 200 m.

30. The actual width of a store room is 280 cm. If the scale chosen to make the drawing is 1:7, then the width of the room in the drawing will be 40 cm.

**Answer the following questions :**

31. How many faces does a octagonal pyramid have ?  
32. How many vertices does a sphere have ?  
33. How many edges does a triangular prism have ?  
34. Can a polyhedron have  $V = 12$ ,  $E = 6$  and  $F = 8$  ?  
35. What is the minimum number of planes that are required to form a cuboid ?  
36. What is the side view of a cone ?  
37. How many edges does a pyramid with square base have ?  
38. How many vertices does a triangular prism have ?  
39. What is the name of the shape given below ?

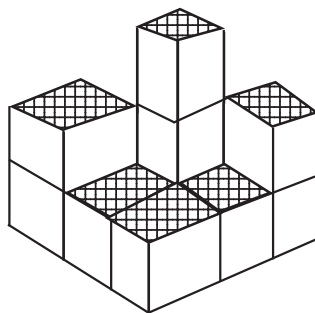


40. If a polyhedron has 6 vertices and 12 edges then, What is the number of faces it has ?

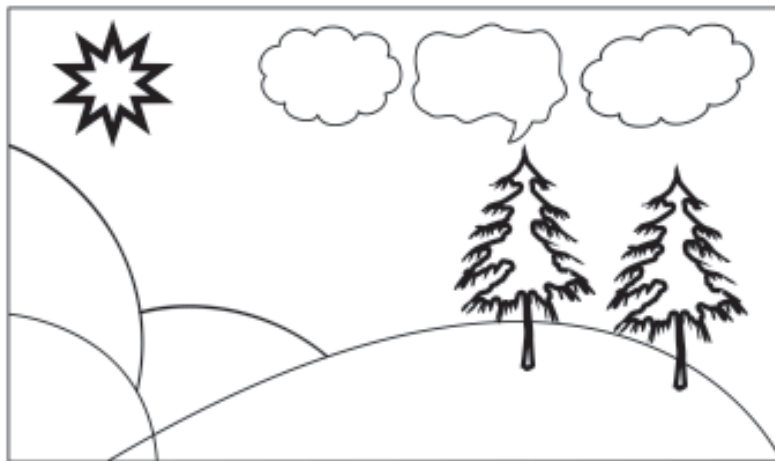
**Group - B**

**Short answer type questions : (2 marks each)**

1. What is Euler's formula for polyhedron ?  
2. Give two examples of 2D and 3D shapes each.  
3. Name the solids that have (i) 8 triangular faces and (ii) 6 rectangular faces and 2 hexagonal faces.  
4. The distance between city A and city B on a map is given as 6 cm. If the scale represents 1 cm = 200 km, then find the actual distance between the two cities.  
5. Find the number of cubes in the base layer of the following figure.



6. What figure is formed if only the height of a cube is increased or decreased ?
7. The side of a square board is 50 cm. A student has to draw its image in her notebook. If the drawing of the square board in the notebook has perimeter of 40 cm, then by which scale the figure has been drawn ?
8. The distance between school and house of a girl is given by 5 cm in a picture, using the scale 1 cm : 5 km . Find the actual distance between the two places.
9. The actual length of a painting was 2 m. What is its length in the photograph if the scale used is 1mm: 20 cm.

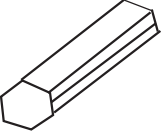

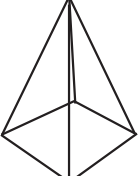


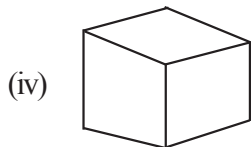
10. In a town, an ice cream parlour has displayed an ice cream sculpture of height 360 cm. The parlour claims that these ice cream and the sculpture are in the scale 1 : 30. What is the height of the ice creams served ?

### Group - C

**Long answer type questions : (3 /4 mrks each)**

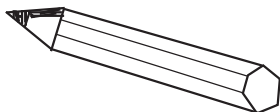
**1. Match the following :**

	<b>Figure</b>	<b>Name</b>
(i)		(a) Hexahedron
(ii)		(b) Hexagonal Prism
(iii)		(c) Square pyramid



(d) Cone

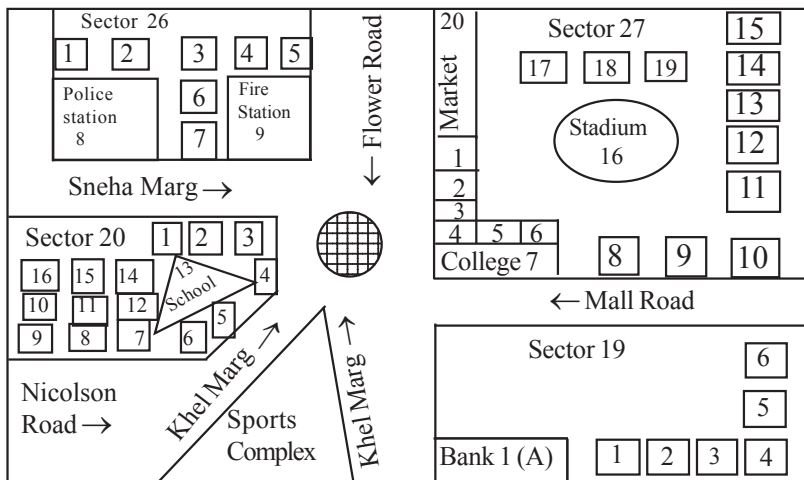
2. In the given figures, identify the different shapes involved.



3. Look at the map given below :

 Houses

B Town, India

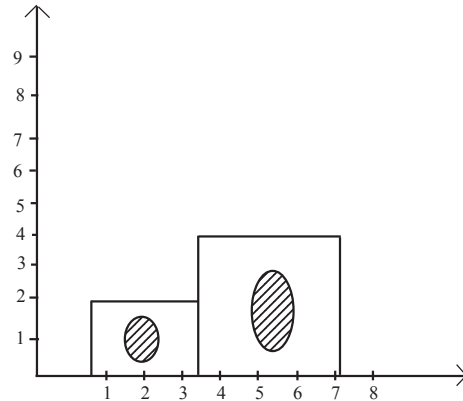


Now answer the following questions :

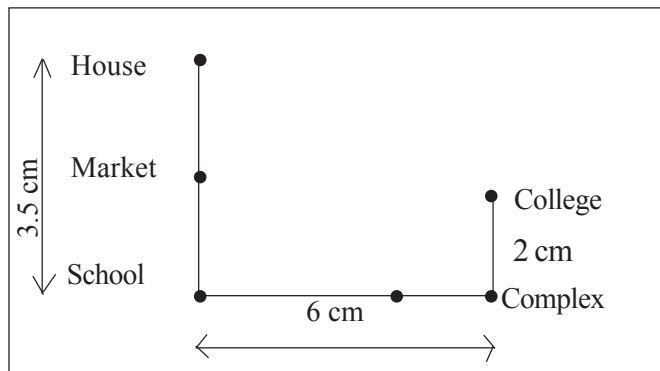
- Name the roads that meet at round about.
- What is the address of the stadium ?
- On which road is the police station situated ?
- If Silpi stays adjacent to bank and you have to send her a card, what address will you write ?
- Which sector has maximum number of houses ?
- In which sector is Fire station located ?
- In the map, how many sectors have been shown ?



4. A photographer uses a computer program to enlarge a photograph. What is the scale according to which the width has enlarged ?



5. Use a ruler to measure the distance in cm between the places joined by dotted lines. If the map has been drawn using the scale 1 cm : 10 km, find the actual distance between
- (1) School and library
  - (2) College and Complex
  - (3) House and School



6. Find the scale of map :
- (a) Actual size 12m, drawing size 3 cm
  - (b) Actual size 45 feet, drawing size 5 inches.

## Answers

### Group - A

- |              |               |             |                        |            |          |
|--------------|---------------|-------------|------------------------|------------|----------|
| 1. (c)       | 2. (c)        | 3. (d)      | 4. (c)                 | 5. (d)     | 6. (a)   |
| 7.(a)        | 8. (c)        | 9. (c)      | 10. (a)                | 11. cuboid | 12. cone |
| 13. 5        | 14. 6         | 15. same    | 16. 4                  | 17. 7      | 18. 7    |
| 19. 5        | 20. congruent | 21. F       | 22. F                  | 23. F      | 24. F    |
| 25. T        | 26. T         | 27. T       | 28. T                  | 29. T      | 30. T    |
| 31. 9        | 32. no vertex | 33. 9 edges | 34. cannot be possible |            | 35. 4    |
| 36. triangle | 37. 8         | 38. 6       | 39. sphere             | 40. 8      |          |

### Group - B

1.  $F + V - E = 2$  2. 2D shapes – circle, square; 3D shapes – pyramid, cone.
3. (i) Regular octahedron (ii) Hexagonal prism 4. 1200 km 5. 6  
6. cuboid 7. 5 : 1 8. 25 km 9. 10 mm 10. 12 cm

### Group - C

1. (i) (b) 2. (i) hemisphere and cylinder  
(ii) (d) (ii) cone and hexagonal prism  
(iii) (c)  
(iv) (a)
3. (a) Flower road, Khel marg, Mall road and Sneha marg meet at round  
(b) Sector 27, B Town, India  
(c) Sneha marg  
(d) H.N - 1, Nr. bank 1 (A) sector 19, B Town, India  
(e) Sector 27  
(f) Sector 26  
(g) 4
4. 1 : 2 5. (a) 60 km (b) 20 km (c) 35 km
6. (a) 1 cm : 4 cm (b) 1 inch : 9 feet

# Mensuration

**Key points and formulae :**

- ◆ Perimeter : Perimeter is the total length of the boundary of two dimensional shape.
- ◆ Area : Area is the amount of space occupied by a two dimensional figure.
- ◆ Rectangle :           (i) Perimeter =  $2 \times (\text{length} + \text{breadth})$   
                                 (ii) Area =  $\text{length} \times \text{breadth}$
- ◆ Square :               (i) Perimeter =  $4 \times \text{side}$   
                                 (ii) Area =  $\text{side} \times \text{side}$
- ◆ Triangle :             (i) Perimeter = Sum of the length of three sides.  
                                 (ii) Area =  $\frac{1}{2} \times \text{base} \times \text{corresponding height}$ .
- ◆ Parallelogram :      (i) Area =  $\text{base} \times \text{corresponding height}$ .
- ◆ Circle :               (i) Circumference =  $2 \pi r$  (where r is the radius of the circle)  
                                 (ii) Area =  $\pi r^2$
- ◆ Area of a Trapezium =  $\frac{1}{2} \times (\text{sum of parallel sides}) \times \text{height}$ .
- ◆ Area of a Rhombus =  $\frac{1}{2} \times \text{product of diagonals}$ .
- ◆ Lateral surface area of a cube =  $4 \times (\text{side})^2$
- ◆ Total surface area of a cube =  $6 \times (\text{side})^2$
- ◆ Lateral surface area of a cuboid =  $2 \times \text{height} \times (\text{length} + \text{breadth})$
- ◆ Total surface area of a cuboid =  $2 \times (\text{lb} + \text{bh} + \text{hl})$   
                                 Where l is the length, b is the breadth and h is the height.
- ◆ Lateral (curved) surface area of a cylinder =  $2\pi rh$   
                                 Where r is the radius and h is the height of the cylinder.
- ◆ Total surface area of a cylinder =  $2\pi r (r + h)$
- ◆ Volume : Volume is the amount of space occupied by a solid.

- ◆ Volume of a cube = (side)<sup>3</sup>
- ◆ Volume of a cuboid = length × breadth × height
- ◆ Volume of a cylinder =  $\pi r^2 h$
- ◆  $1 \text{ cm}^3 = 1 \text{ ml}$   
 $1 \text{ l} = 1000 \text{ cm}^3$   
 $1 \text{ m}^3 = 1000 \text{ l}$

### Exercise : 11

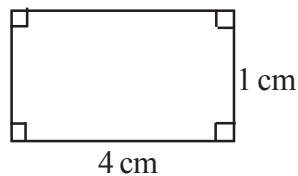
#### Group - A

**Very short answer type questions : (1 mark each)**

**I. Choose the correct option :**

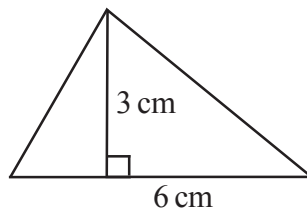
1. The perimeter of the given figure is

- (a) 5 cm            (b) 10 cm  
 (c) 4 cm            (d) 8 cm



2. The area of the given triangle is

- (a)  $9 \text{ cm}^2$             (b)  $18 \text{ cm}^2$   
 (c)  $12 \text{ cm}^2$             (d)  $15 \text{ cm}^2$



3. The volume of a cube is  $64 \text{ cm}^3$ . Its total surface area is

- (a)  $16 \text{ cm}^2$             (b)  $64 \text{ cm}^2$             (c)  $96 \text{ cm}^2$             (d)  $128 \text{ cm}^2$

4. The area of a parallelogram is  $40 \text{ cm}^2$  and one of its altitude is 5 cm. The length of its corresponding side is

- (a) 6 cm            (b) 20 cm            (c) 8 cm            (d) 4 cm

5. The perimeter of a trapezium is 52 cm and its each non-parallel side is equal to 10 cm with its height 8 cm. Its area is

- (a)  $124 \text{ cm}^2$             (b)  $118 \text{ cm}^2$             (c)  $128 \text{ cm}^2$             (d)  $112 \text{ cm}^2$

6. A regular hexagon is inscribed in a circle of radius  $r$ . The perimeter of the regular hexagon is

- (a)  $3r$             (b)  $6r$             (c)  $9r$             (d)  $12r$

7. The volume of a cube whose edge is  $3x$  is  
 (a)  $27x^3$       (b)  $9x^3$       (c)  $6x^3$       (d)  $3x^3$
8. Two cubes have volumes in the ratio  $1 : 64$ . The ratio of the area of a face of first cube to that of the other is  
 (a)  $1 : 8$       (b)  $1 : 4$       (c)  $1 : 32$       (d)  $1 : 16$
9. The volume of a cylinder whose radius  $r$  is equal to its height is  
 (a)  $\frac{1}{4}\pi r^3$       (b)  $\frac{\pi r^3}{32}$       (c)  $\frac{r^3}{8}$       (d)  $\pi r^3$
10. The area of the largest triangle that can be fitted into a rectangle of length  $l$  units and width  $w$  units is  
 (a)  $\frac{lw}{2}$       (b)  $\frac{lw}{3}$       (c)  $\frac{lw}{4}$       (d)  $\frac{lw}{6}$

**II. Fill in the blanks :**

11. The surface area of a cuboid formed by joining two cubes of side  $a$ , face to face is \_\_\_\_\_.
12. The volume of a cylinder which exactly fits in a cube of side  $a$  is \_\_\_\_\_.
13. The perimeter of a rectangle becomes \_\_\_\_\_ times its original perimeters, if its length and breadth are doubled.
14. Total surface area of a cylinder of radius  $r$  and height  $r$  is \_\_\_\_\_.
15. Area of a rhombus =  $\frac{1}{2} \times$  product of \_\_\_\_\_.
16. A trapezium with 3 equal sides and one side double the equal side can be divided into \_\_\_\_\_ equilateral triangles of \_\_\_\_\_ area.
17. Curved surface area of a cylinder of radius  $r$  and height  $2r$  is \_\_\_\_\_.
18. Two cylinders of equal volume have heights in the ratio  $1 : 9$ . The ratio of their radius is \_\_\_\_\_.
19. All six faces of a cuboid are \_\_\_\_\_ in shape.
20. The volume of a cube whose perimeter of one face  $12\text{cm}$  is \_\_\_\_\_.

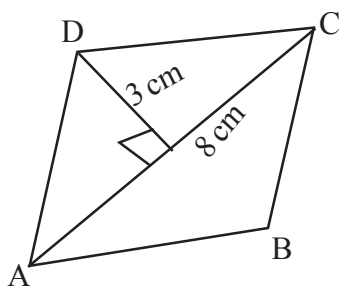
**III. State whether the statements are true (T) or false (F) :**

21. The area of any two equilateral triangles are equal .
22. Area of a trapezium is equal to the half of the product of the height and the sum of any two sides of the trapezium.
23. Two cuboids with equal volumes will always have equal surface areas.

24. The areas of any two faces of a cube are equal.
25. If the perimeter of a square and a rhombus are equal then the area of the square is always greater than or equal to the area of the rhombus.

**IV. Answer the following questions :**

26. If the area of a face of a cube is  $10 \text{ cm}^2$ , then find the total surface area of the cube.
27. Find the area of the given quadrilateral ABCD in which  $AB = CD$  and  $BC = AD$ .



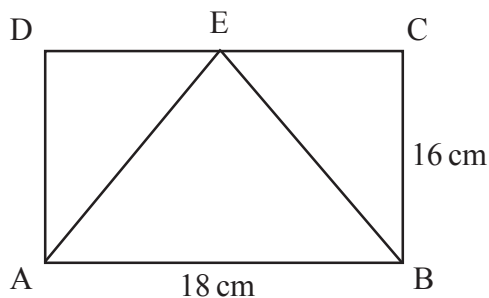
28. What is the area of a rhombus whose length of two diagonals are 6 cm and 4 cm ?
29. What is the perimeter of a regular hexagon of side 8 cm ?
30. What is 1 litre equal to in  $\text{cm}^3$  ?

**Group - B**

**Short answer type questions : (2 marks each)**

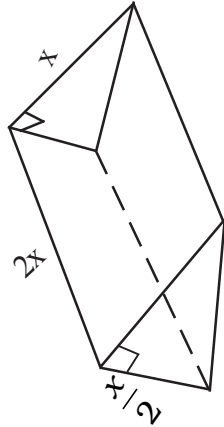
**Answer the following questions :**

1. What is the area of the triangle ABC where ABCD is a rectangle with sides 18 cm and 16 cm ?



2. A cube of side 4 cm is cut into 1 cm cubes. Find the number of cubes formed.
3. If the height of a cylinder becomes  $\frac{1}{4}$  of the original height and the radius is doubled, then find the ratio of the curved surface area of the original cylinder and new formed cylinder.
4. The surface area of the three coterminal faces of a cuboid are  $6 \text{ cm}^2$ ,  $15 \text{ cm}^2$  and  $10 \text{ cm}^2$  respectively. Find the volume of the cuboid.

5. If the length of each edge of a cube is tripled. What will be the change in its volume ?
6. How many cubes each of side 0.5 cm are required to build a cube of volume  $6 \text{ cm}^3$  ?
7. How many cubic meters of earth must be dug to construct a well 14 m deep and radius 1.4 m ?
8. Two cubes each of side 10 cm are joined end to end. Find the surface area of the resultant figure.
9. Find the volume of the given figure if volume = base area  $\times$  height

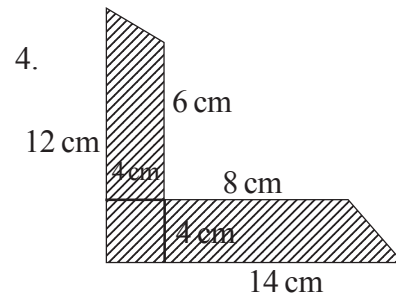
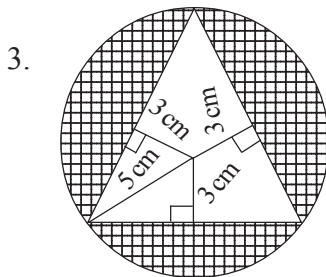
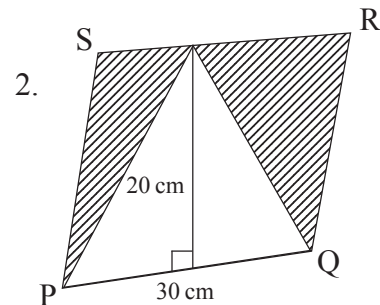
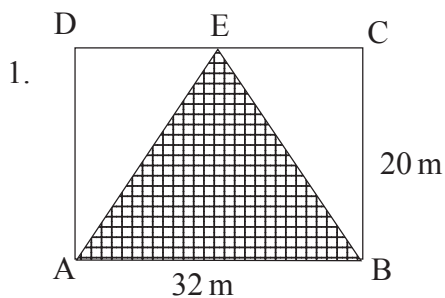


10. The areas of two circles are in the ratio 49 : 64. Find the ratio of their diameter.

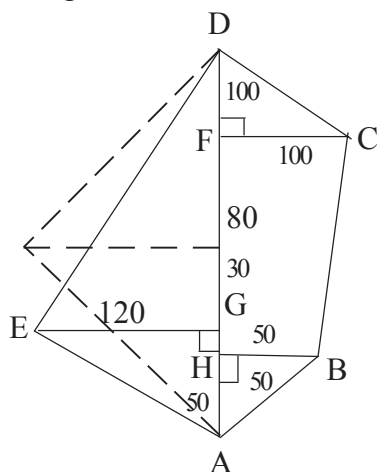
### Group - C

#### Long answer type questions : (3/4 marks each)

Find the area of the shaded portion in the following figures :



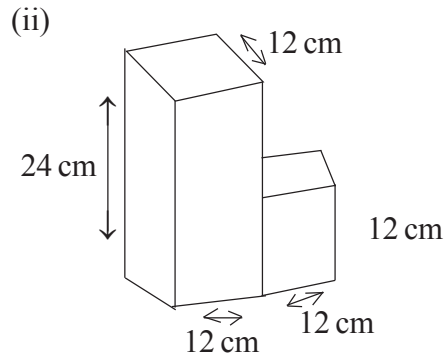
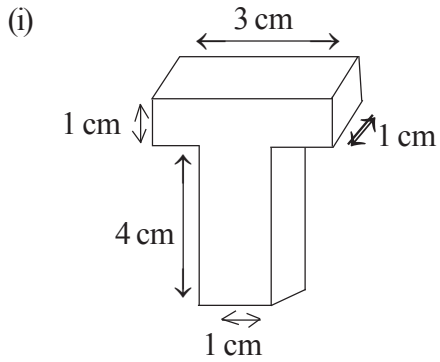
5. Amal walks around a circular track of radius 14 m with a speed of 4 km/hr. If he takes 20 rounds of the track, for how long does he walk ?
6. The walls and ceiling of a room are to be plastered. The length, breadth and height of the room are 4.5 m, 3 m and 350 cm respectively. Find the cost of plastering at the rate of ₹ 8 per  $\text{m}^2$ .
7. The area of a trapezium with equal non-parallel sides is  $168 \text{ m}^2$ . If the lengths of the parallel sides are 36 m and 20 m, find the lengths of the non-parallel sides.
8. Kamal is cycling such that the wheels of the cycle are making 210 revolutions per hour. If the diameter of the wheel is 60 cm, calculate the speed in km/h with which Kamal is cycling.
9. Find the length of the largest pole that can be placed in a room of dimensions  $12\text{m} \times 4\text{m} \times 3\text{m}$ .
10. Find the area of the following field. All dimensions are in meters.



11. A swimming pool is  $200 \text{ m} \times 50 \text{ m}$  and has an average depth of 2 m. By the end of a summer day, the water level drops by 2 cm. How many cubic meters of water is lost on the day ?
12. A river 2 m deep and 45 m wide is flowing at the rate of 3 km per hour. Find the amount of water in cubic meters that runs into the sea per minute.
13. A copper wire of length 44 cm is to be bent separately into a square and a circle. Which will have a larger area and how much ?
14. Three metal cubes of sides 6 cm, 8 cm and 10 cm are melted and recast into a big cube. Find its total surface area.
15. The diameter of a roller is 84 cm and its length is 120 cm. It takes 500 complete revolutions to move once over to level a playground. Find the area of the playground in square meter.
16. A rectangular metal sheet of length 44 cm and breadth 11 cm is folded along its length to form a cylinder. Find its volume.
17. An iron pipe is 21 cm long and its exterior diameter is 8 cm. If the thickness of the pipe is 1 cm and iron weights  $8\text{g}/\text{cm}^3$ , find the weight of the pipe.



18. If radius of cylinder is tripled and height remaining same then (i) how many times will its total surface area increase and (ii) how many times will its volume increase ?
19. Four times the area of the curved surface of a cylinder is equal to 6 times the sum of the areas of its bases. If its height is 12 cm, find its curved surface area.
20. Find the surface area and volume of the following shapes :



## Answers

### Group - A

- I. 1. (b)      2. (a)      3. (b)      4. (c)      5. (c)  
6. (b)      7. (a)      8. (d)      9. (d)      10. (a)
- II. 11.  $10 \text{ a}^2 \text{ sq. units}$     12.  $\frac{\pi \alpha^3}{4}$  cubic units    13. two    14.  $4\pi r^2$  sq. unit  
15. two diameter    16. three, equal    17.  $4\pi r^2$   
18. 3 : 1    19. rectangle    20.  $27 \text{ cm}^3$
- III. 21. F    22. F    23. F    24. T    25. T
- IV. 26.  $60 \text{ cm}^2$     27.  $24 \text{ cm}^2$     28.  $24 \text{ cm}^2$     29. 48 cm    30.  $1000 \text{ cm}^3$

### Group - B

1.  $144 \text{ cm}^2$     2. 64    3. 2 : 1    4.  $30 \text{ cm}^3$     5. 27 times  
6. 48    7.  $86.24 \text{ m}^3$     8.  $1000 \text{ cm}^3$     9.  $\frac{x^3}{2}$  cu. units    10. 7 : 8

### Group - C

1.  $320 \text{ m}^2$     2.  $300 \text{ cm}^2$     3.  $42.57 \text{ cm}^2$     4.  $80 \text{ cm}^2$     5. 26 min 24 sec  
6. ₹ 528    7. 10 m    8. 0.396 km/hr    9. 13 m    10. 30100 sq. units  
11.  $200 \text{ m}^3$     12.  $45000 \text{ m}^3$     13. circle,  $33 \text{ cm}^2$     14.  $864 \text{ cm}^2$     15.  $1584 \text{ cm}^2$   
16.  $423.5 \text{ cm}^3$     17. 3.696 kg  
18. (i) Volume becomes 9 times and (ii) Surface area becomes 3 times.    19.  $603.428 \text{ cm}^2$   
20. (i)  $29 \text{ cm}^2$ ,  $7 \text{ cm}^3$  (ii)  $2016 \text{ cm}^2$ ,  $5184 \text{ cm}^3$

# Exponents and Powers

## Key points and formulae :

- ◆ Concepts of Exponential notation is very useful in mathematics, specially to express repeated multiplication of same numbers or like terms. Using exponential notations we can express very large and very small numbers as a power of 10 and that will make it more convenient to read, write and compare.
- ◆ If we express a number in the form  $a^m$ , then  $a^m$  is called a power of 'a' and 'm' is called its exponent.
- ◆ A large number can be expressed as positive exponents and a small number can be expressed as negative exponents.

for example  $150,000,000,000 = 1.5 \times 10^{11}$  and  $0.000007 = 7 \times 10^{-6}$

- ◆ When we write a number in the form  $c \times 10^n$  where  $c > 1$ ,  $c < 10$  and  $n$  is any integer, then the form is called standard or scientific form.

- ◆ Some important laws :

i)  $a^m \times a^n = a^{m+n}$

ii)  $a^m \div a^n = a^{m-n}$

iii)  $(a^m)^n = a^{mn}$

iv)  $a^m \times b^m = (ab)^m$

v)  $a^0 = 1$  ( $a \neq 0$ )

vi)  $\frac{a^m}{b^m} = \left(\frac{a}{b}\right)^m$

vii) If  $a^m = a^n$  ( $a \neq 0, 1, -1$ ) then  $m = n$

viii) If  $a^m = b^m$  ( $m \neq 0, a, b > 0$ ) then  $a = b$

**Exercise - 12**

**Group - A**

**I. Very short answer type questions : (1 mark each)**

**Choose the correct answer :**

1. The value of  $\frac{1}{4^{-2}}$  is  
(a) 16                      (b) 8                      (c)  $\frac{1}{16}$                       (d)  $\frac{1}{8}$
2. The value of  $(-4)^8 \div 4^5$  is  
(a) - 64                      (b) 64                      (c) 12                      (d)  $\frac{1}{64}$
3. Reciprocal of  $\left(\frac{2}{7}\right)^{-1}$  is  
(a)  $-\frac{7}{2}$                       (b)  $-\frac{2}{7}$                       (c)  $\frac{2}{7}$                       (d)  $\frac{7}{2}$
4. Value of  $\left(\frac{1}{2}\right)^{-2} + \left(\frac{1}{3}\right)^{-2} + \left(\frac{1}{4}\right)^{-2}$  is  
(a) 29                      (b) - 29                      (c)  $\frac{61}{144}$                       (d)  $\left(\frac{13}{12}\right)^{-2}$
5. Simplified value of  $\left[\left(\frac{1}{2}\right)^{-2}\right]^3$  is  
(a)  $\frac{1}{32}$                       (b) 64                      (c)  $\frac{1}{64}$                       (d)  $-\frac{1}{64}$
6. Value of  $(5^4 \div 5^8) \times 125$  is  
(a)  $\frac{1}{5}$                       (b) 5                      (c) 25                      (d)  $\frac{1}{25}$
7. Standard form of 0.0000009 is  
(a)  $9 \times 10^{-6}$                       (b)  $0.9 \times 10^{-8}$                       (c)  $0.9 \times 10^{-6}$                       (d)  $9 \times 10^{-7}$

8. Usual form of  $1.02 \times 10^{-3}$  is  
 (a) 0.00102                      (b) 0.000102                      (c) 0.0102                      (d) None of these
9. Simplified value of the expression  $\left(\frac{7}{8}\right)^{-3} \times \left(\frac{8}{7}\right)^{-5}$  is  
 (a)  $\left(\frac{7}{8}\right)$                       (b)  $\left(\frac{64}{49}\right)$                       (c)  $\frac{49}{64}$                       (d)  $\frac{8}{7}$
10. Value of  $2^{3^2}$  is  
 (a)  $2^6$                       (b)  $2^9$                       (c)  $2^5$                       (d) 128

**II. Fill in the blanks :**

11. The multiplicative inverse of  $5^{-2}$  is \_\_\_\_\_.
12. Value of  $5^4 \times 5^{-4}$  is \_\_\_\_\_.
13.  $8^{-2}$  as a power with respect to base 2 is \_\_\_\_\_.
14. Very small number can be expressed in standard form by using \_\_\_\_\_ exponents.
15. Standard form of 12340000 is \_\_\_\_\_.
16. Value of  $(1^{-2} + 2^{-2} + 3^{-2}) \times 6^2$  is equal to \_\_\_\_\_.
17. Value of  $(6^6 \div 2^4 3^5)$  is equal to \_\_\_\_\_.
18. If  $7^x = 6^{-x}$  then value of x is \_\_\_\_\_.
19. The usual form of  $3.41 \times 10^6$  is \_\_\_\_\_.
20. In multiplying \_\_\_\_\_ by  $2^{-5}$  we get  $2^5$ .

**III. State whether the following statements are True or False.**

21. The number '0' has no multiplicative inverse.
22.  $a^0 = 1$  for all values of a.
23.  $31.8 = 3 \times 10 + 1 \times 1 + 8 \times 10^{-1}$
24. When a number is multiplied by its multiplicative inverse we get 1.
25. If  $\frac{\text{diameter of Sun}}{\text{diameter of Earth}} = 100(\text{approx.})$  then diameter of sun is more than diameter of Earth.

**IV. Answer the following questions :**

26. If  $2^{2x} = \frac{1}{16}$  find value of x.

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

28. Evaluate  $(2^{-1} \times 3^{-1})^0$

29. Evaluate  $x^{a-b} \times x^{b-a}$

30. If  $2^x \cdot 3^x = 1$  then find x.

31. What should be multiplied with  $\left(\frac{2}{3}\right)^{-2}$  to get 1.

32. If thickness of a paper sheet is 0.0016 cm then find the thickness of 100 sheets.

33. If  $a = 2^{-8}$  find  $a^{-\frac{1}{4}}$ .

34. If  $\frac{5^m \times 5^4}{5^{-9}} = 5^{12}$  find m.

35. Evaluate :  $(20)^5 \times \frac{1}{625 \times 4^5}$

**Group - B**

**Short answer type questions : (2 marks each)**

**Answer the following questions :**

1. Express  $4^{-5} \times 4^{-3}$  as a power of 4 with positive exponent.

2. Evaluate :  $16^{-2^{-2}}$  [Hints :  $16^{-2^{-2}} = (16)^{\frac{1}{(-2)^2}}$ ]

3. Find x if  $3^x = \frac{1}{81}$

4. Find x if  $3^{2x} = 4^x$

5. Simplify :  $\left(2^{m+n} \times 2^{m-n}\right)^{\frac{1}{m}}$

6. Divide 293 by 100000
7. If  $5^{3x-1} \div 25 = 125$  find x.
8. Evaluate  $\left[\left(\frac{1}{3}\right)^{-1} \times \left(\frac{1}{2}\right)^{-2}\right]^{-1}$
9. Find the value  $[2^{-1} + 3^{-1} + 4^{-1}]^0$
10. Find the product of cube of  $-2$  and square of  $4$ .

**Group - C**

**Long answer type questions : (3/4 marks each)**

**Answer the following questions :**

1. Simplify :  $\frac{125 \times 3^5}{81 \times 625}$
2. Simplify :  $\frac{(ab)^{x+y} \cdot a^x \cdot b^x}{(ab)^{x-y} \cdot a^y \cdot b^y}$
3. Add  $1.3 \times 10^5$  and  $270000$
4. Simplify :  $\left[\left(\frac{2}{3}\right)^{-2}\right]^3 \times \left(\frac{1}{3}\right)^4 \times 3^{-1} \times \frac{1}{6}$
5. Find the value of x so that  $\left(\frac{5}{3}\right)^{-2} \times \left(\frac{5}{3}\right)^{-14} = \left(\frac{3}{5}\right)^{-8x}$
6. Express  $\frac{1.5 \times 10^6}{2.5 \times 10^{-4}}$  in standard form.
7. Find value of x if  $5^x + 5^{x-1} = 750$
8. Simplify :  $\frac{9^3 \times 27 \times t^4}{3^{-2} \times 3^4 \times t^2}$
9. A particular star is at a distance of about  $8.1 \times 10^{13}$  km from the Earth. If light travels at speed  $9 \times 10^8$  m per second, find how long does light takes from that star to reach the Earth ?
10. Simplify :  $\frac{1}{1+x^{a-b}} + \frac{1}{1+x^{b-a}}$

## Answers

### Group - A

- |      |                         |             |              |              |               |
|------|-------------------------|-------------|--------------|--------------|---------------|
| I.   | 1. a                    | 2. b        | 3. c         | 4. a         | 5. b          |
|      | 6. a                    | 7. d        | 8. a         | 9. c         | 10. b         |
| II.  | 11. 25                  | 12. 1       | 13. $2^{-6}$ | 14. negative |               |
|      | 15. $1.234 \times 10^7$ | 16. 49      | 17. 12       | 18. 0        | 19. 3,410,000 |
|      | 20. $2^{10}$            |             |              |              |               |
| III. | 21. True                | 22. False   | 23. True     | 24. True     | 25. True      |
| IV.  | 26. -2                  | 27. 1       | 28. 1        | 29. 1        | 30. 0         |
|      | 31. $\frac{4}{9}$       | 32. 0.16 cm | 33. 4        | 34. -1       | 35. 5         |

### Group - B

- |                    |      |                   |      |          |
|--------------------|------|-------------------|------|----------|
| 1. $\frac{1}{4^8}$ | 2. 2 | 3. -4             | 4. 0 | 5. 4     |
| 6. 0.00293         | 7. 2 | 8. $\frac{1}{12}$ | 9. 1 | 10. -128 |

### Group - C

- |                       |                 |                    |                        |             |
|-----------------------|-----------------|--------------------|------------------------|-------------|
| 1. $\frac{3}{5}$      | 2. $(ab)^{x+y}$ | 3. $4 \times 10^5$ | 4. $\frac{1}{128}$     | 5. $x = -2$ |
| 6. $6 \times 10^{11}$ | 7. 4            | 8. $3^7 t^2$       | 9. $9 \times 10^7$ sec | 10. 1       |



# Direct and Inverse Proportions

## Key points and formulae :

- ◆ **Variations :** If the values of two quantities depend on each other in such a way that a change in one causes corresponding change in the other, then the two quantities are said to be in variation.
- ◆ **Direct variation or Direct proportion :** Two quantities  $x$  and  $y$  are said to be in direct proportion if they increase or decrease together in such a manner that the ratio of their corresponding values remains constant. That is, if  $\frac{x}{y} = k$  where  $k$  is a positive number, then  $x$  and  $y$  are in direct proportion or vary directly. In case of direct proportion, if  $y_1, y_2$  are the values of  $y$  corresponding to the values  $x_1, x_2$  of  $x$  respectively, then  $\frac{x_1}{y_1} = \frac{x_2}{y_2}$
- ◆ **For example,** if the number of articles purchased increases, the total cost also increases. Or, more money deposited in a bank, more is the interest earned etc.
- ◆ When two quantities  $x$  and  $y$  are in direct proportion (or vary directly), they are written as  $x \propto y$ . Symbol  $\propto$  stands for 'is proportion to'.
- ◆ **Inverse proportion :** Two quantities  $x$  and  $y$  are said to be in inverse proportion if 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, if  $xy = k$ , then  $x$  and  $y$  are said to vary inversely. 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  $\frac{x_1}{x_2} = \frac{y_2}{y_1}$ .
- ◆ **Example :** If the number of workers increases, time taken to finish the job decreases. Or, if the speed will increase the time required to cover a given distance will decrease, etc.
- ◆ When two quantities  $x$  and  $y$  are in inverse proportion (or vary inversely), they are written as  $x \propto \frac{1}{y}$ .

## Exercise – 13

### Group - A

#### Very short answer type questions (1 mark each)

#### Choose the correct answer :

1. If 6 oranges cost Rs. 42, how many oranges can be bought for Rs. 105 ?  
 (a) 17                      (b) 15                      (c) 20                      (d) 21

2. A car is travelling at a uniform speed of 60 km/hr. How much distance will it cover in 15 minutes ?  
 (a) 15 km            (b) 18 km            (c) 14 km            (d) 20 km
3. A photograph of a bacteria enlarged 60000 times attains a length of 6 cm. The actual length of bacteria is  
 (a) 10000 cm        (b)  $10^{-2}$  cm        (c)  $10^{-3}$  cm        (d)  $10^{-4}$  cm
4. A machine fills 460 bottles in 4 hours. How many bottles will it fill in 6 hours ?  
 (a) 500                (b) 550                (c) 590                (d) 600
5. 4 persons can build a wall in 5 days , then 5 persons can build it in  
 (a) 3 days            (b) 4 days            (c)  $4\frac{1}{2}$  days            (d)  $4\frac{1}{3}$  days
6. 9 pipes fill a tank in 140 minutes , then 4 pipes will fill it in  
 (a) 315 min        (b) 350 min        (c) 295 min        (d) 280 min
7. The wight of 15 sheets of a thick paper is 50 grams. How many sheets would weight 2 kg ?  
 (a) 450                (b) 500                (c) 600                (d) 700
8. If 8 kg pulses cost Rs. 656, then the cost of 25 kg pulses is  
 (a) Rs 1800        (b) Rs 1850        (c) Rs 1900        (d) Rs 2050

**Fill in the blanks of the following statements :**

9. Side of a square and its perimeter are in \_\_\_\_\_ proportion.
10. If u and v are inversely proportional then \_\_\_\_\_ = k, where k is positive constant.
11. When the speed remains constant, the distance travelled is \_\_\_\_\_ proportional to the time.
12. On increasing, x , y increases in such a manner that  $\frac{x}{y}$  remains \_\_\_\_\_ and positive, then x and y are said to vary directly each other.
13. The circumference of a circle and its diameter vary \_\_\_\_\_ with each other.
14. If x varies inversely as y and x = 5 when y = 8, then when x = 4 the value of y is \_\_\_\_\_.
15. In case of inverse proportion  $\frac{a_1}{-} = \frac{b_2}{-}$

**State whether the following statements are true (T) or false (F) :**

16. When two quantities are related in such a manner that, if one increases, the other also increases, then they always vary directly.

17. If  $a$  and  $b$  are in inverse proportion, then  $(a + 1)$  and  $(b + 1)$  are also in inverse proportion.
18. If  $p$  varies directly as  $q^2$ , then we can write  $pq^2 = k$ , where  $k$  is some constant.
19. When the distance is kept fixed, speed and time vary directly with each other.
20. The area of cultivated land and the crop harvested is a case of direct proportion.
21. For fixed time period and rate of interest, the simple interest is directly proportional to the principal.

**Answer the following questions :**

22. 8g of sandal wood cost Rs 40. What will 10g cost ?
23. 120 copies of a book cost Rs. 600. What will 400 copies cost ?
24.  $x$  varies inversely as square of  $y$ . Given that  $y = 3$  for  $x = 1$ , then find the value of  $x$  for  $y = 4$ .
25. 36 men can complete a piece of work in 18 days. In how many days will 27 men complete the same work ?
26. 72 books are packed in 4 cartoons of the same size. How many cartoons are required for 360 books?
27. A van covers 432 km with 36 litres of diesel. How much distance would it cover with 25 litres of diesel?
28. A boy runs 1 km in 10 minutes. How long will he take to run 600 m ?
29. The scale of a map is  $1:3 \times 10^7$ . Two cities are 5 cm apart on the map. Find the actual distance between them in kilometers.
30. Saju earns Rs 1440, if he works for 12 days. If he works 30 days, how much money will he earn ?

**Group - B**

**Short answer type questions : (2 marks each)**

**Answer the following questions :**

1. A car can finish a journey in 10 hours at the speed of 48 km/hr. By how much should its speed be increased so that it may take only 8 hours to cover the same distance ?
2. There are 100 students in a hostel. The food provision for them is for 15 days. How long will there provision last if 20 more join the group ?
3. In a library 140 copies of a certain book require a shelf - length 3.8 meter. How many copies of the same book would occupy a shelf-length of 5.7 meters.
4. A car is travelling at the average speed of 80 km/hr. How much distance it would travel in 15 minutes.
5. Sujoy bought 15 registers for Rs 165, find the cost of 9 such registers.

6. 12 men can dig  $6\frac{1}{4}$  meter long trench in one day. How many men should employed for digging 25 meter long trench of the same type in one day ?
7. A worker is paid Rs 2800 for 8 days work. If his total income of the month is Rs 8750, for how many days did he work ?
8. A worker is paid Rs 2100 for 7 days work. If he works for 24 days, how much will he get ?
9. The second class railway fare for 250 km of journey is Rs. 1500. What would be the fare for journey of 402.5 km ?
10. Ankita types 2160 words in two hour . What is her gross words a minute rate (GWAM) ?

### Group - C

#### Long answer type questions : (3/4 marks each)

#### Answer the following questions :

1. A car is travelling at 72 km/hr covers a certain distance in 6 hours. what should be the decrease in speed, if the same distance is to be covered in 8 hours? What time will it take to cover the same distance at the speed of 90 km/hr ?
2. 420 workers take 15 days to complete a piece of work. How many more workers should be employed, if the same work is to be completed in 12 days ? How many days will it take to complete the same work, if 300 workers were employed ?
3. A packing machine can pack 144 boxes of toothpaste in 2.4 minutes. How many boxes of tooth paste will it pack in 4 minutes ? What time will the machine take to pack 360 boxes ?
4. C and D share a certain sum of money in the ratio  $2\frac{1}{4} : 1\frac{3}{4}$  . If D's share is Rs 210, then find the total sum of money shared.
5. (i) If  $x : y = 3:7$ , then find  $(7x + 3y) : (9x - 3y)$   
 (ii) If  $\frac{a}{b-a} = \frac{7}{8}$ , then find the value of  $\frac{a}{b}$
6. If  $x = \frac{4\sqrt{2}}{\sqrt{2}+1}$  then find the value of  $\frac{x+2}{x-2} - \frac{x+2\sqrt{2}}{x-2\sqrt{2}}$
7. In a school there are 650 students. The ratio of the boys to that of the girls is 8:5. How many more girls should join the school so that the ratio becomes 4:3 ?
8. In an office, the ratio of the salary of an officer to that of the clerk is 25 : 9. If the salary of the clerk is

Rs 10000 less than that of the officer, find the salary of the officer and also salary of the clerk.

**Answers**

**Group - A**

- |              |              |               |                    |   |
|--------------|--------------|---------------|--------------------|---|
| 1. (b)       | 2. (a)       | 3. (d)        | 4. (c)             | 5. (b)                                  |
| 6. (a)       | 7. (c)       | 8. (d)        | 9. direct          | 10. uv                                  |
| 11. directly | 12. constant | 13. directly  | 14. 10             | 15. $\frac{a_1}{a_2} = \frac{b_2}{b_1}$ |
| 16. (T)      | 17. (F)      | 18. (F)       | 19. (F)            | 20. (T)                                 |
| 21. (T)      | 22. Rs 50    | 23. Rs 2000   | 24. $\frac{9}{10}$ | 25. 24 days                             |
| 26. 20       | 27. 300 km   | 28. 6 minutes | 29. 1500 km        | 30. Rs 3600                             |

**Group - B**

- |          |                         |            |            |           |
|----------|-------------------------|------------|------------|-----------|
| 1. 12 km | 2. $12\frac{1}{2}$ days | 3. 210     | 4. 20 km   | 5. Rs. 99 |
| 6. 48    | 7. 25 days              | 8. Rs 7200 | 9. Rs 2415 | 10. 18    |

**Group - C**

- |                                |                     |                     |                           |
|--------------------------------|---------------------|---------------------|---------------------------|
| 1. 18 km/hr, 4.8 hrs           | 2. 105, 21 days     | 3. 240 boxes, 6 min | 4. Rs 480                 |
| 5. (i) 7:1 (ii) $\frac{7}{15}$ | 6. $12 + 8\sqrt{2}$ | 7. 50               | 8. Rs. 15, 625, Rs. 5,625 |

# Factorisation

## Key points and formulae :

- Representation of an algebraic expression as the product of two or more than two expressions, is called factorisation. Each such expression is called a factor of given expression.
- Factors may be numbers, algebraic variables or algebraic expressions.
- Prime factor is a factor which can not be expressed further as a product of factors.
- A factor which occurs in each term is called common factor.
- In some cases there may not have common factor in all the terms. Then in such cases we arrange the terms in groups and proceed for factorisation by using appropriate identities.
- In the division of a polynomial by a monomial, we carry out the division by dividing each term of the polynomial by the monomial.
- In the division of a polynomial by a polynomial, we factorise both the polynomials and cancel their common factors.

## Some useful identities for factorisation :

i)  $a^2+2ab+b^2=(a+b)^2$

ii)  $a^2-2ab+b^2=(a-b)^2$

iii)  $a^2-b^2=(a+b)(a-b)$

iv)  $x^2+(a+b)x+ab=(x+a)(x+b)$

## Exercise – 14

### Group - A

#### I. Very Short Answer Type Questions : (1 mark each)

#### Choose the Correct Answer :

1. Common factor of  $12abc$ ,  $16ab^2$ ,  $32a^2b^3$  is  
 a)  $4abc$     (b)  $4a^2b^2c$     (c)  $4ab$     (d)  $4ab^3$
2. Prime factorisation of 30 is of the form –  
 a)  $5 \times b$     (b)  $1 \times 30$     (c)  $2 \times 15$     (d)  $2 \times 3 \times 5$
3. Value of  $24xy^2z^3 \div 6yz^2$  is  
 a)  $4yz$     (b)  $4xyz$     (c)  $4xy^2$     (d)  $xy^2$

4. Factorised form of  $x^2-5x-6$  is –  
 a)  $(x-3)(x-2)$     (b)  $(x-3)(x+2)$     (c)  $(x+6)(x-1)$     (d)  $(x-6)(x+1)$
5. Value of  $(3x^3+9x^2+27x) \div 3x$  will be –  
 a)  $x^2+9+27x$     (b)  $3x^3+3x^2+27x$     (c)  $3x^3+9x^2+9$     (d)  $x^2+3x+9$
6. On dividing  $x(5x^2-20)$  by  $5x(x-2)$  we get –  
 a)  $x+2$     (b)  $x(x+2)$     (c)  $5(x+2)$     (d)  $(x-2)$
7. If all the factors of an algebraic expression are  $x-1$ ,  $x+1$  and  $x^2+1$  then the algebraic expression will be –  
 a)  $x^4+1$     (b)  $x^4-1$     (c)  $(x+1)(x^2+1)(x^2-2)$     (d) None of these
8. If  $m=1$  and  $l=1$ , then Value of expression  $(l+m)^2 - 4/m$  is  
 a) 4    (b) 16    (c) 0    (d) 2
9. Number of factors of  $(a+2b)^2$   
 a) 4    (b) 3    (c) 2    (d) 1
10. If  $(x+a)(x+b) = x^2+5x+6$  then Value of  $(a+b)$  is –  
 a) 6    (b) 5    (c) 1    (d) can not be found.

**II. Fill in the Blanks :**

11. Process in which we express an algebraic expression as a product of prime factors, is called \_\_\_\_\_.
12. Number of prime factors of the number 42 is \_\_\_\_\_.
13. Value of  $(2x^2+4x) \div 2x$  is \_\_\_\_\_.
14. Common factor of  $2x$ ,  $4x^2$ ,  $8x^3$  is \_\_\_\_\_.
15. The common factor method of factorisation for a polynomial is based on \_\_\_\_\_ property.
16.  $ax + bx - ay - by = (a+b) x$  \_\_\_\_\_.
17. Greatest common prime factor of 42, 30, 66 is \_\_\_\_\_.
18.  $(4x + 3y)^2 - (4x - 3y)^2$  \_\_\_\_\_.
19. If  $(x+1)$  is a factor of  $x^2+3x+2$  then other factor is \_\_\_\_\_.
20. If  $x^p = x^5 \times x^3$  then value of  $p$  is \_\_\_\_\_.

**III. State whether the following statements are True or False :**

21. Common factor of  $(x^2y + xy^2)$  and  $xy$  is  $xy$ .
22. Factorised form of  $(-3a^2 + 3ab + 3ac)$  is  $3a(b + c - a)$
23. Prime factor of an expression can not expressed further as a product of factors.
24. An equation is true for all vahus of its variable.
25. If  $x$  and  $y$  are two variables then  $3x + 2y = 5xy$ .

**IV. Answer the following questions :**

26. Factorise :  $16p^2 - 9a^2$
27. Factorise :  $2x^3 + 2x^2y + 4xyz$
28. Simplify :  $(ab - c)^2 + 2abc$
29. Expand by susing suitable identities  $\left(\frac{2}{3}x - \frac{3}{2}y\right)^2$
30. Divide  $5(x^2-1)(x+1)$  by  $(x-1)$
31. Find the common factor of  $x(x + 1)$ ,  $(x^2 - 1)$
32. Find the square of  $\left(x - \frac{1}{x}\right)$  using identity  $(a - b)^2 = a^2 - 2ab + b^2$ .
33. Find  $ab$  if  $(x + 2)(x + 3) = x^2 + x(2 + 3) + ab$ .
34. Write a binomial expression which is not factorisable.
35. Simplify :  $(3x + 6) \div (x + 2)$

**Group - B**

**Short Answer Type Questions : (2 marks each)**

**Answer the following questions :**

1. Evaluate :  $(8.6)^2 - (1.4)^2$  using suitable identity
2. Evaluate :  $5(2x + 1)(3x + 5) \div (2x + 1)$
3. Factorise :  $x^2 - 6x + 9$
4. Factorise :  $18x^2y - 24xyz$
5. Factorise :  $x - 64x^3$



6. Simplify :  $\frac{a^4 - b^4}{(a + b)(a - b)(a^2 + b^2)}$
7. If product of two algebraic expressions is  $(a^5 + a^4 + a^3)$  and one of them is  $(a^2 + a + 1)$ , find the other.
8. If area of a rectangle is  $(x^2 + 7x + 12)$  and its breadth is  $(x + 3)$  then find its length.
9. Find value of 'a' if  $axy = (x - 2y)^2 - (x + 2y)^2$
10. What should be added to  $x^2 + 9$  to make it perfect square.

### Group - C

#### Long Answer Type Questions : (3/4 marks each)

#### Answer the following questions :

1. Factorise :  $a^2 + b^2 - c^2 + 2ab$
2. Factorise :  $a^4 - (b - c)^4$
3. Factorise :  $y^2(y + z) - 9(y + z)$
4. Factorise :  $y^2 - 7y + 12$
5. Divide :  $(ax^2yz + bxy^2z + cxyz^2)$  by  $(ax^2 + bxy + cxz)$
6. Divide :  $[(2x^2 + 3)(x + 2) + (x + 2)(x^2 - 30)]$  by  $(x^2 + 5x + 6)$
7. Factorise :  $a^2 + 17ab - 84b^2$
8. Factorise :  $2(x + y)^2 - 9(x + y) - 5$
9. Factorise :  $(a + b)^3 - a - b$
10. Factorise :  $y^4 - 10y^2 + 9$

## Answers

### Group - A

- I. (1) c (2) d (3) b (4) d (5) d  
(6) a (7) b (8) c (9) c (10) b
- II. (11) factorisation (12) 3 (13)  $x+2$  (14)  $2x$  (15) distributive  
(16)  $x-y$  (17) 3 (18)  $48xy$  (19)  $x+2$  (20) 8
- III. (21) True (22) True (23) True (24) False (25) False
- IV. (26)  $(4p+3a)(4p-3a)$  (27)  $2x(x^2+xy+2yz)$  (28)  $a^2b^2+c^2$  (29)  $\frac{4}{9}x^2 - 2xy + \frac{9}{4}y^2$   
(30)  $5(x+1)^2$  (31)  $x+1$  (32)  $x^2 + \frac{1}{x^2} - 2$  (33) 6 (34)  $ax+b$   
(35) 3

### Group - B

- (1) 72 (2)  $15x+25$  (3)  $(x-3)(x-3)$  (4)  $6xy(3x-4z)$   
(5)  $x(1+8x)(1-8x)$  (6) 1 (7)  $a^3$  (8)  $x+4$   
(9) -4 (10)  $6x$

### Group - C

- (1)  $(a+b+c)(a+b-c)$  (2)  $[a^2+(b-c)^2](a+b-c)(a-b+c)$  (3)  $(y+z)(y+3)(y-3)$   
(4)  $(y-3)(y-4)$  (5)  $yz$  (6)  $3(x-3)$  (7)  $(a+21b)(a-4b)$   
(8)  $(x+y-5)(2x+2y+1)$  (9)  $(a+b)(a+b+1)(a+b-1)$   
(10)  $(y+1)(y-1)(y+3)(y-3)$

# Graphs

## Key points and formulae :

- Graphical representation of data is easier to understand.
- For fixing a point on the graph sheet, we need two mutually perpendicular lines. Among them horizontal line is called x- axis and the vertical line is called y- axis.
- The point at which the x- axis and the y- axis intersect each other, is called the origin
- If the coordinates of a point is  $(x, y)$ , then x is called abscissa and y is called ordinate.
- The coordinates of the origin is  $(0, 0)$ .
- The x- axis and the y- axis divide a plane into four parts. Each part is called a quadrant.
- In a graph paper taking one or more smallest square division as one unit the graphs are drawn.
- To place a point on a graph paper we need to know the x coordinate and y coordinate of the point.
- The coordinates of y- will be zero for all the points on the x- axis and the coordinates of x- will be zero for all the points on the y axis.
- A bar graph is used to show comparison among categories.
- A pie graph is used to compare parts of a whole.
- A Histogram is a bar graph that shows data in intervals.
- A line graph displays data that changes continuously over periods of time.
- A line graph in which all the line segments form a part of a single line is called a linear graph.
- The relation between a dependent variable and an independent variable is shown through a graph.

## Exercise – 15

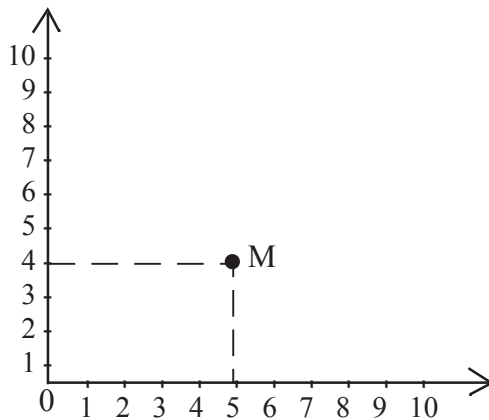
### Group - A

#### I. Very Short Answer Type Questions : (1 mark each)

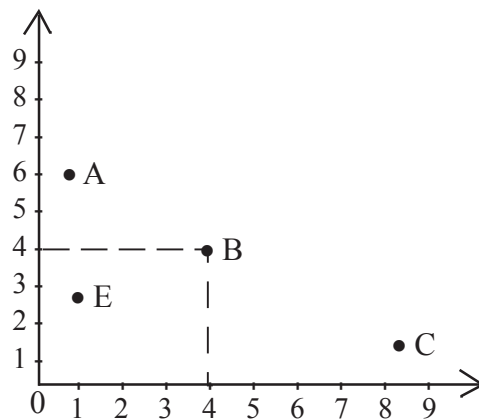
#### Choose the Correct Answer :

1. Every point on the y- axis is of the form —  
(a)  $(x, 0)$       (b)  $(x, y)$       (c)  $(0, y)$       (d)  $(y, 1)$

2. Comparison of parts of a whole may be done by a —  
 (a) line graph (b) pie chart (c) linear graph (d) bar graph
3. In the given graph the coordinates of the point M are —



- (a) (5, 4) (b) (5, 2) (c) (4, 3) (d) (2, 2)
4. A graph that displays data that changes continuously over periods of time is —  
 (a) histogram (b) line graph (c) bar graph (d) pie chart
5. In the given graph the letter that indicates the point (4, 4) is —

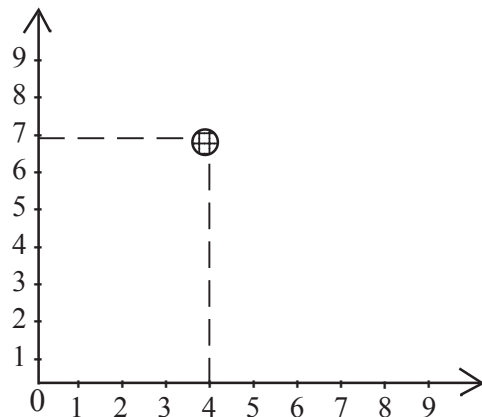


- (a) B (b) E (c) A (d) C
6. The point (5, 1) is at a distance of —  
 (a) 6 from both the axes (b) 2 from both the axes.  
 (c) 5 from the y- axis and 1 from the x- axis.  
 (d) 3 from x- axis and 4 from y- axis.
7. A point which lies on both the axis is —  
 (a) (0, 1) (b) (0, 0) (c) (1, 0) (d) (1, 1)

8. The coordinates of a point at a distance of 5 units from the x-axis and 7 units from the y-axis is —

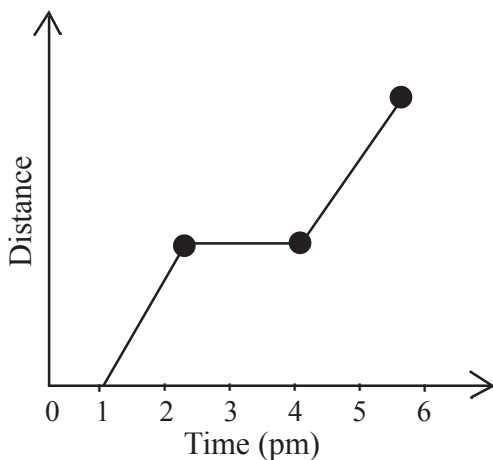
- (a) (7, 5)      (b) (5, 7)      (c) (7, 3)      (d) (5, 4)

9. In the given figure, the position of the ball on the graph may be given by —



- (a) (3, 7)      (b) (7, 5)      (c) (6, 3)      (d) (4, 7)

10. The given graph shows Swapna's trip to a mall by a car. Observe the graph carefully and find what was she doing between 2 pm and 4 pm?



- (a) Driving back home      (b) was not driving  
(c) Driving to the mall      (d) Not enough data to answer

**Fill in the blanks :**

11. The coordinates of the origin are \_\_\_\_\_.  
12. In a \_\_\_\_\_ graph, all the points on the graph lie on the same straight line.  
13. The relation between dependent and independent variables is shown through a \_\_\_\_\_.

14. The distance of any point from the y- axis is the \_\_\_\_\_ coordinate.
15. For the point (4, 7) the distance from the x- axis is \_\_\_\_\_ units.
16. The point where the two axis intersect is called the \_\_\_\_\_.
17. All points with y coordinate as zero lie on the \_\_\_\_\_.
18. A point in which the x- coordinate is zero and y- coordinate is non-zero will lie on the \_\_\_\_\_.
19. \_\_\_\_\_ displays data that changes continuously over periods of time.
20. We need \_\_\_\_\_ coordinates for representing a point on the graph paper.

**State whether the following statements are True or False :**

21. A line graph can also be a whole unbroken line.
22. For fixing a point on the graph paper we need two coordinates.
23. The distance of any point from the y- axis is called the x- coordinate.
24. The distance of the point (4, 9) from the y- axis is 9.
25. The ordinate of a point is its distance from the y- axis.
26. In the point (5, 6), 6 denotes the y- coordinate.
27. The coordinates of the origin are (1, 1)
28. The points (5, 8) and (8, 5) represent the same point.
29. The y- coordinate of any point lying on the x- axis will be zero.
30. A point whose y- coordinates is zero and x- coordinates is 4 will lie on the y- axis.

**Answer the following questions :**

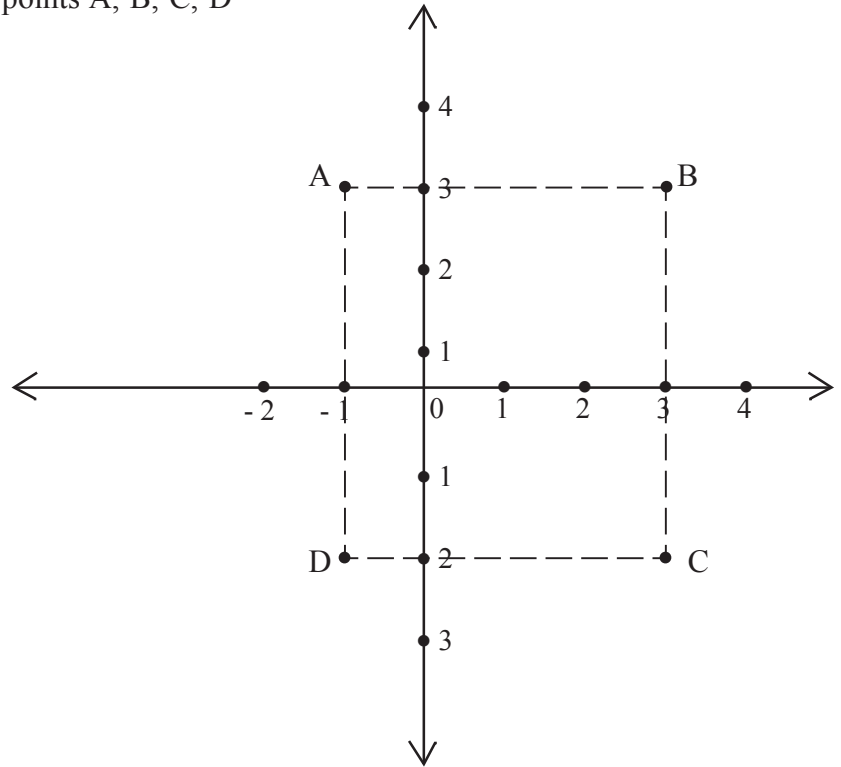
31. In which quadrant does the point (-3, 2) lie?
32. On which axis does the point (0, -6) lie?
33. What is the perpendicular distance of the point (2, 3) from the x- axis?
34. What is the coordinate of the origin?
35. At least how many points are required to draw the graph of a line?
36. What is the y- coordinate of the point (2, 9)?
37. Write the abscissa of the point (7, 3).

38. Write the ordinate of the point (3, 5).

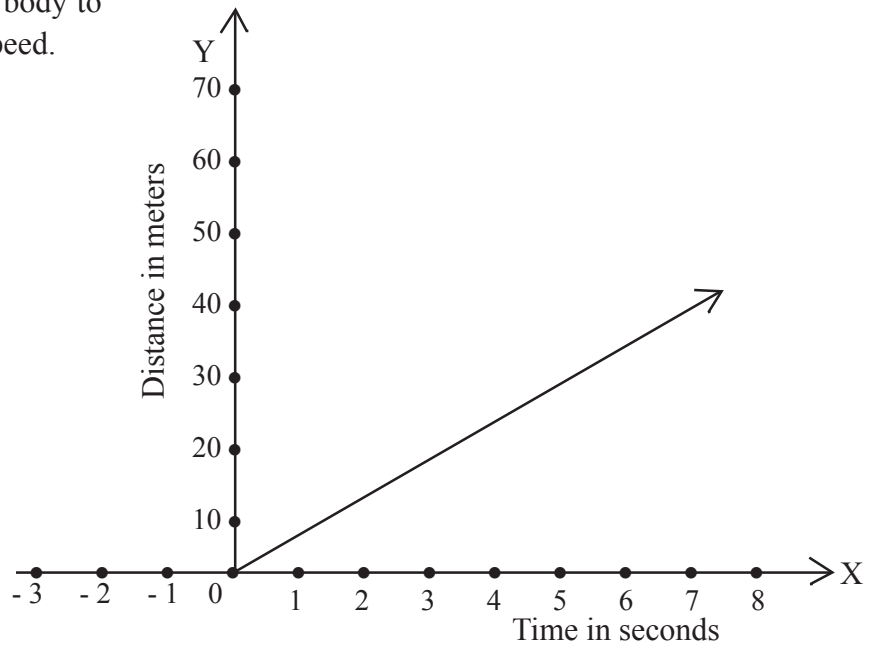
**Group - B**

**Short Answer Type Questions : (2 Marks Each)**

1. Find the coordinates of the points A, B, C, D from the graph.



2. Find the time taken by a body to cover 30m. Hence find speed.



3. Plot the points (1, 3), (2, 3), (3, 3), (4, 3) on a graph paper. Verify, if they lie on a line.
4. Plot the points A(2, 3), B(5, 3), C(5, 5) and D(2, 5) on graph paper. Connect these points in that order. What type of figure do you get?
5. Draw a line passing through (2, 1) and (1, 2). Find the coordinates of the points at which this line meets the x- axis and y- axis.
6. The number of electric bulbs manufactured by a factory during five consecutive years is given below.

Years	2006	2007	2008	2009	2010
Number of electric bulbs	300	800	700	500	100

Draw the line graph representing the above data.

7. The number of students in Pradeep's coaching institute during last 8 years is given below. Represent this data on line graph.

Years	2001	2002	2003	2004	2005	2006	2007
Number of students	100	120	95	130	85	160	100

8. The number of trees planted by Government in different years is given below.

years	2010	2011	2012	2013	2014	2015
Number of trees Planted	150	220	350	400	300	380

Draw the line graph to represent the data.

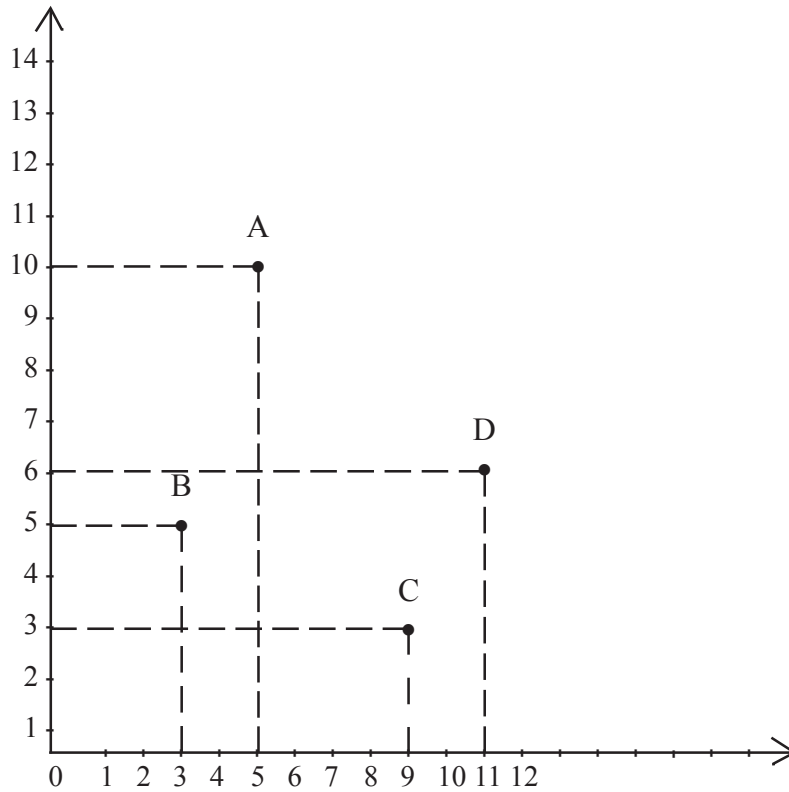
9. Draw the coordinates (2, 2), (2, 4), (4, 2) on a graph paper and Join these to form a triangle.
10. Plot the points (4, 4), (1, 3), (4, 2) and (7, 3) on a graph paper and connect them with line segments. Name the shape formed by these points.



**Group - C**

**Long Answer Type Questions : (3/4 marks each)**

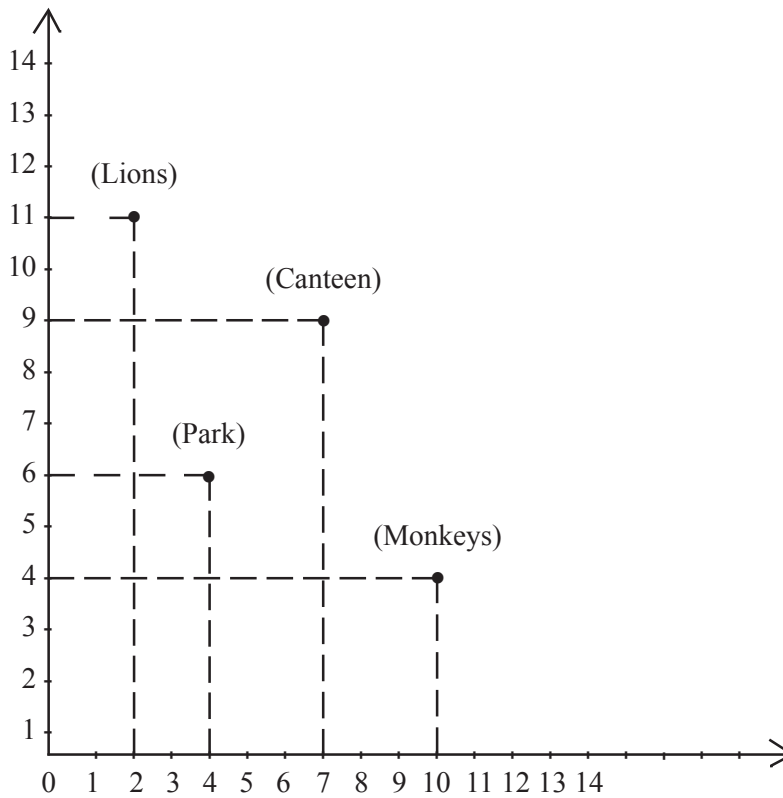
1. Find the coordinates of all letters in the graph given below.



2. Plot the given points on a graph sheet.

- a) (5, 4)
- b) (-3, 7)
- c) (4, -6)
- d) (-8, -2)

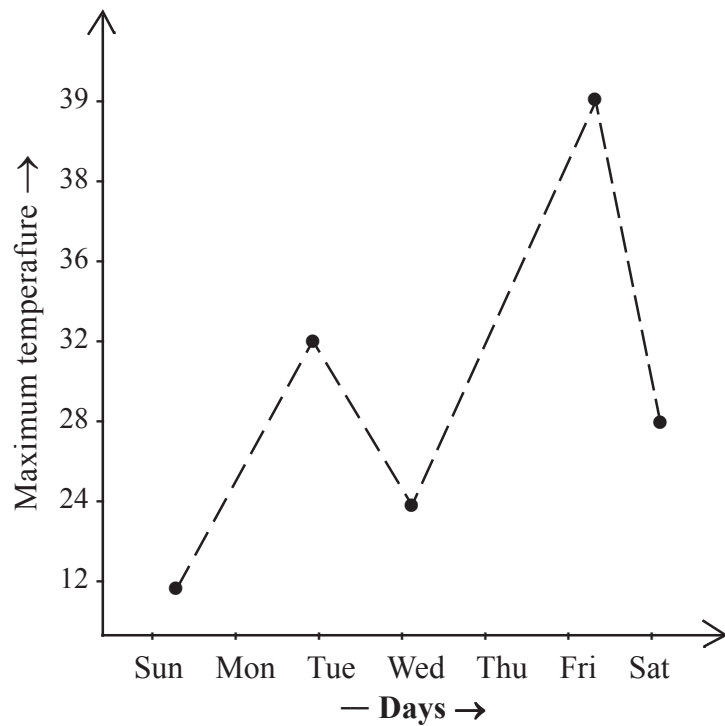
3. Study the given graph of a zoo and answer the following questions.



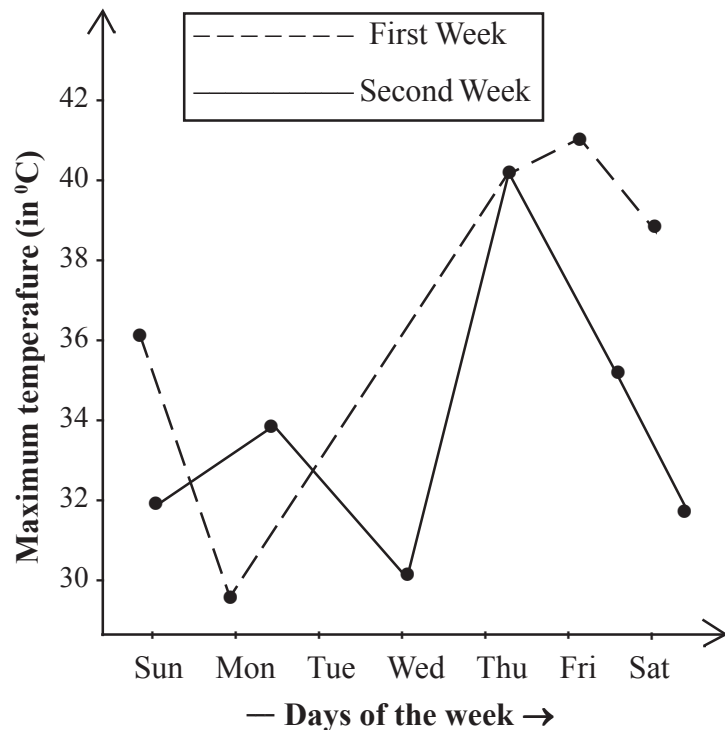
- a. Write the location of lion in the zoo.
  - b. Write the location of canteen.
  - c. Write the location of park.
  - d. Write the location of monkey in the zoo.
4. If y- coordinate is 2 times of x- coordinate, form a table for it and draw a graph.
5. Make a line graph for the area of a square as per the given table.

Side (in cm)	2	3	4	5
Area (in cm <sup>2</sup> )	4	9	16	25

6. Study the graph and answer the questions that follow.



- a) What information does the graph give?      b) On which day was the temperature the least?  
 c) On which day was the temperature  $39^{\circ}\text{C}$ ?      d) Which was the hottest day?
7. The graph shows the maximum temperatures recorded for two consecutive weeks of a town. Study the graph and answer the questions that follow.



- a. What information is given by the two axes?  
 b. In which week was the temperature higher on most of the days?  
 c. On which day was the temperature same in both the weeks?  
 d. What were the temperatures for both the weeks on saturday?  
 e. On which day was the temperature highest for the first week?

8. Locate the points A(1, 2), B(4, 2) and C(1, 4) on a graph paper taking suitable axis. Write the coordinates of the fourth point D to complete the rectangle ABCD.

9. The following table gives the growth chart of a child.

Height (in cm)	75	90	110	120	130
Age (in years)	2	4	6	8	10

Draw a line graph for the table and answer the questions that follow :

- a. What is the height at the age of 4 years?
  - b. How much taller was the child at the age of 10 years than at the age of 6 years?
  - c. Between which two consecutive periods did the child grow more faster?
10. Draw the line graph using suitable scale to show the annual gross profit of a company for a period of five years.

Years	1st	2nd	3rd	4th	5th
Gross profit (in Rs.)	17000	15500	11400	12100	14900

## Answers

### Group - A

- (1) c                      (2) b                      (3) a                      (4) b                      (5) a  
(6) c                      (7) b                      (8) a                      (9) d                      (10) b  
(11) (0, 0)              (12) Linear              (13) graph              (14) x                      (15) 7  
(16) origin              (17) x- axis              (18) y- axis              (19) Line graph      (20) two  
(21) True                (22) True                (23) True                (24) False                (25) False  
(26) True                (27) False                (28) False                (29) True                (30) False  
(31) 2nd quadrant      (32) y- axis              (33) 3                      (34) (0, 0)              (35) Two  
(36) 9                      (37) 7                      (38) 3

### Group - B

- (1) A(-1, 3), B(3, 3), C(3, -2), D(-1, -2)      (2) 5 secs; 6 m/s  
(3) Yes, they lie on a line                              (4) rectangle              (10) rhombus.

### Group - C

- (1) A(5, 10), B(3, 5), C(9, 3), D(11, 6)  
(3) (a) (2, 11), (b) (7, 9), (c) (4, 6), (d) (10, 4)

(4)

x	2	4	5	6
y	4	8	10	12

6. (a) The information obtained from the given graph is that the maximum temperature is  $39^{\circ}\text{C}$  and minimum temperature is  $12^{\circ}\text{C}$  in a week.  
(b) on sunday              (c) on friday              (d) friday.
7. (a) The x- axis represents days of a particular week and the y- axis represents the maximum temperature (in  $^{\circ}\text{C}$ ) recorded.  
(b) first week              (c) thursday              (d)  $39^{\circ}\text{C}$  and  $32^{\circ}\text{C}$               (e) on friday
8. (3, 0)

# Playing with Numbers

**Key points and formula :**

- ◆ Numbers can be written in general form. eg. a two digit number  $ab$  will be written as  $10a + b$  and a three digit number  $abc$  will be written as  $100a + 10b + c$ .
- ◆ The general form of numbers are helpful in solving puzzles or number games.
- ◆ Rational for the divisibility of numbers by 11, 10, 5, 2, 9 or 3 can be explained by writing the numbers in general form.

- ◆ For any two digit number  $ab$

$$ab + ba = (10a + b) + (10b + a) = 11(a + b)$$

So, the sum is always a multiple of 11.

$$\text{Again, } ab - ba = (10a + b) - (10b + a) = 9(a - b) \text{ [if } a > b]$$

$$\text{and also if } a = b \text{ then } ab - ba = 0 = 9(b - a) \text{ [if } b > a]$$

So, the difference is always divisible by 9

- ◆ For any three digit number  $abc$

$$abc - cba = (100a + 10b + c) - (100c + 10b + a)$$

$$= 99a - 99c$$

$$= 99(a - c) \quad \text{[if } a > c]$$

$$= 99(c - a) \quad \text{[if } c > a]$$

and also if  $a = c$  then  $abc - cba = 0$

So, the difference is always divisible by 99.

- ◆ For any three digit number  $abc$ ,

$$\begin{array}{r} 100a + 10b + c \\ + 100b + 10c + a \\ + 100c + 10a + b \\ \hline 111a + 111b + 111c \\ = 111 \times (a + b + c) \\ = 37 \times 3 \times (a + b + c) \end{array}$$

∴ the sum  $(abc + bca + cab)$  is always divisible by 3, 37 and 111.

## Exercise – 16

### Group - A

Very short answer type questions : (1 mark each)

#### I. Choose the correct answer :

- If  $abc$  is a three-digit number, then  $abc - cba$  is divisible by  
(a) 11            (b) 22            (c) 28            (d) 44
- Generalised form of a two-digit number  $pq$  is  
(a)  $p + q$             (b)  $10p - q$             (c)  $10p + q$             (d)  $10q + p$
- A four-digit number  $4ab5$  is divisible by 55. Then the value of  $b - a$  is  
(a) 0            (b) 1            (c) 4            (d) 5
- If  $abc$  is a three-digit number, then  $abc - a - b - c$  is divisible by  
(a) 9            (b) 90            (c) 10            (d) 11
- The usual form of  $1000c + 10a + 100b + d$  is  
(a)  $abcd$             (b)  $cbad$             (c)  $bacd$             (d)  $cabd$
- If  $5 \times A = CA$  then the values of  $A$  and  $C$  are  
(a)  $A = 4, C = 2$     (b)  $A = 5, C = 1$     (c)  $A = 5, C = 2$             (d)  $A = 2, C = 5$
- If the sum of the digits of a number is divisible by three then the number is divisible by  
(a) 6            (b) 5            (c) 4            (d) 3
- If  $abc$  is a three-digit number, then  $abc + bca + cab$  is  
(a) 37            (b) 3            (c) 11            (d)  $a + b + c$
- If  $5A \times A = 399$ , then the value of  $A$  is  
(a) 3            (b) 7            (c) 6            (d) 9
- If  $x + y + z = 9$  and  $z$  is an odd digit, then the three-digit number  $xyz$  is  
(a) an odd multiple of 3            (b) even multiple of 3  
(c) odd multiple of 6            (d) even multiple of 9

**II. Fill in the blanks :**

11. Generalised form of a four-digit number 'pqrs' is \_\_\_\_\_.
12. If  $4A + 7B = 160$  then  $A + B =$  \_\_\_\_\_.
13. If  $24x7$  is a multiple of 3 then  $x$  is \_\_\_\_\_ or \_\_\_\_\_ or \_\_\_\_\_.
14. The difference of a two-digit number and the number obtained by reversing its digits is always divisible by \_\_\_\_\_.
15. If  $2x43$  is divisible by 9 then  $x =$  \_\_\_\_\_.

**III. State whether the statements are true (T) or false (F) :**

16. A three-digit number  $xyz$  is divisible by 4 if  $yz$  is divisible by 4.
17. If  $PQ + 4 = 32$  then  $P + Q = 9$ .
18. If a number  $x$  is divisible by  $y$ , then it must be divisible by each factor of  $y$ .
19. A four-digit number  $abcd$  is divisible by 6 if  $d$  is an even number and  $a+b+c+d$  is a multiple of 3.
20. If  $AB \times 3 = 81$ , then  $B - A = 5$

**IV. Answer the following questions :**

21. If  $6A + A = AB$  then find  $A + B$ .
22. If  $AB \times B = 9B$  then find  $A - B$ .
23. Write the usual form of  $100x + y + 10z$ .
24. A three-digit number  $42x$  is divisible by 9. Find the value of  $x$ .
25. If  $B6 + A = 103$  then find  $A$  and  $B$ .

**Group - B**

**Short answer type questions : (2 marks each)**

Find the value of the letters in each of the following questions :

$$\begin{array}{r} 1. \quad B6 \\ + 8A \\ \hline CA2 \end{array}$$

$$\begin{array}{r} 2. \quad AB \\ - B7 \\ \hline 46 \end{array}$$

$$\begin{array}{r} 3. \quad CBA \\ + CBA \\ \hline 1A30 \end{array}$$



$$\begin{array}{r} 4. \quad A B \\ \times 4 \\ \hline 9A \end{array}$$

$$\begin{array}{r} 5. \quad A B \\ \times B \\ \hline 96 \end{array}$$

6. If  $756x$  is divisible by 11, then find the value of  $x$ .
7. Find the least value that must be given to digit "a" so that the number  $91876a2$  is divisible by 8.
8. If  $1P \times P = Q6$  where  $Q - P = 3$ , then find the value of  $P$  and  $Q$ .

### Group - C

**Long answer type questions : (3/4 marks each)**

**Answer the following questions :**

1. If  $212x5$  is a multiple of 3 and 11, then find the value of  $x$ .
2. Find the values of  $p, q$  and  $r$  in the following multiplication problem :

$$\begin{array}{r} 3P4 \\ \times Q6 \\ \hline 2124 \\ 106r \\ \hline 12744 \end{array}$$

3. The product of two 2-digit numbers is 1431. The product of their tens digits is 10 and the product of their units digits is 21. Find the numbers.
4. A three-digit number  $2a3$  is added to the number 326 to give a three-digit number  $5b9$  which is divisible by 9. Find the value of  $b - a$ .
5. Find the value of the letters in each of the following :

$$\begin{array}{r} \text{(a)} \quad 8A4 \\ + BBA \\ \hline 87B \end{array}$$

$$\begin{array}{r} \text{(b)} \quad AB \\ \times AB \\ \hline B7B \end{array}$$

6. If  $5y41$  is divisible by 7 then find the value of  $y$ .
7. Examine whether the number 58851 is divisible by 13 or not, without doing actual division.
8. If the number  $67P19$  is a multiple of 11 then find the value of  $P$ .

## Answers

### Group - A

- |      |                              |        |             |        |          |
|------|------------------------------|--------|-------------|--------|----------|
| I.   | 1. (a)                       | 2. (c) | 3. (b)      | 4. (a) | 5. (b)   |
|      | 6. (c)                       | 7. (d) | 8. (c)      | 9. (b) | 10. (a)  |
| II.  | 11. $1000p + 100q + 10r + s$ | 12. 14 | 13. 2, 5, 8 | 14. 9  |          |
|      | 15. $x = 0$                  |        |             |        |          |
| III. | 16. T                        | 17. F  | 18. T       | 19. T  | 20. T    |
| IV.  | 21. 11                       | 22. 8  | 23. $xzy$   | 24. 3  | 25. 7, 9 |

### Group - B

- |                          |                        |                          |
|--------------------------|------------------------|--------------------------|
| 1. $A = 6, B = 7, C = 1$ | 2. 7, 3                | 3. $A = 5, B = 6, C = 7$ |
| 4. $A = 2, B = 3$        | 5. $A = 2, B = 4$      | 6. $x = 8$               |
| 7. $a = 3$               | 8. $P = 6$ and $Q = 9$ |                          |

### Group - C

- |            |                          |                    |
|------------|--------------------------|--------------------|
| 1. $x = 8$ | 2. $p = 5, q = 3, r = 2$ | 3. 53 and 27       |
| 4. 2       | 5. (a) $A = 6, B = 0$    | (b) $A = 2, b = 6$ |
| 6. 3       | 7. Divisible             | 8. 4               |

# Note

# Note