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MG-290+175=465

HALF YEARLY EXAMINATION 2024-25

MATHEMATICS

Time : 3 hrs. ]

Class X

[ M.M. : 80

**General Instructions—**

- (i) The question paper has 5 sections A, B, C, D and E.
- (ii) Section A has 20 MCQs carrying 1 mark each.
- (iii) Section B has 5 questions carrying 2 marks each.
- (iv) Section C has 6 questions carrying 3 marks each.
- (v) Section D has 4 questions carrying 5 marks each.
- (vi) Section E has 3 case based integrated units of assessment of 4 marks each with sub parts of values of 1, 1 and 2 marks.
- (vii) All questions are compulsory. However, an internal choice in 2 questions of 5 marks, 2 questions of 3 marks and 2 questions of 2 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E.
- (viii) Draw neat figures wherever required. Take  $\pi = \frac{22}{7}$  wherever required if not stated.

**SECTION-A**

**Section A consists of 20 questions of 1 mark each—**

1. If roots of quadratic equation  $ax^2+bx+c=0$ ,  $a \neq 0$  are real and equal then which of the following relation is correct:

(a)  $a = \frac{b^2}{c}$

(b)  $b^2 = ac$

(c)  $ac = \frac{b^2}{4}$

(d)  $c = \frac{b^2}{a}$

2. ✓ The middle most observation of every data arranged in order is called



- (a) Mode
- (b) Median
- (c) Mean
- (d) Deviation

3. AD is median of  $\triangle ABC$  with vertices  $A(5, -6)$ ,  $B(6, 4)$  and  $C(0, 0)$ . Find AD:

- (a)  $\sqrt{68}$  units
- (b)  $2\sqrt{15}$  units
- (c)  $\sqrt{101}$  units
- (d) 10 units

4. For  $x_1, x_2, \dots, x_n$  with respective frequencies  $f_1, f_2, \dots, f_n$ , the value of  $\sum_{i=1}^n (x_i - \bar{x}) f_i$  is equal to:

- (a)  $n\bar{x}$
- (b) 1
- (c) 0
- (d)  $\sum f_i$

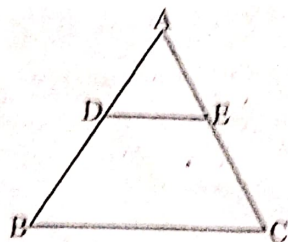
5. Which of the following equations has 2 as a root:

- (a)  $x^2 - 4x + 5 = 0$
- (b)  $x^2 + 3x - 12 = 0$
- (c)  $2x^2 - 7x + 6 = 0$
- (d)  $3x^2 - 6x - 2 = 0$

6. Two AP's have same common difference. The first term of one of these is -1 and that of other is -8. Then the difference between their 4<sup>th</sup> terms is:

- (a) 1
- (b) -7
- (c) 7
- (d) 9

7. In  $\triangle ABC$ ,  $DE \parallel BC$ . If  $AD = 4$  cm,  $AB = 9$  cm and  $AC = 13.5$  cm then length of EC:

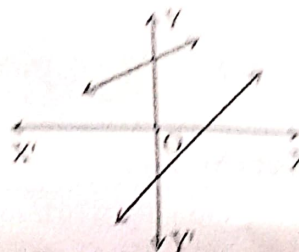


- (a) 6 cm
- (b) 7.5 cm
- (c) 9 cm
- (d) 5.7 cm

8. The pair of linear equations  $x + 2y + 5 = 0$  and  $-3x = 6y - 1$  has:

- (a) unique solution
- (b) two solutions
- (c) infinitely many solutions
- (d) no solution

9. In the given figure graphs of two linear equations are shown. The pair of these linear equations is:



- (a) consistent with unique solution
- (b) consistent with many solutions
- (c) inconsistent
- (d) inconsistent but can be made consistent by extending these lines

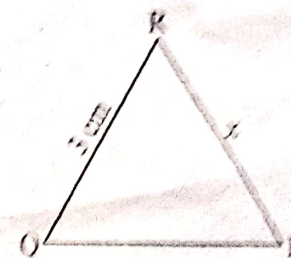
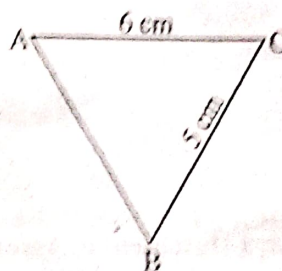
10. If diagonals of a quadrilateral divide each other proportionally then it is:

- (a) Parallelogram
- (b) Rectangle
- (c) Trapezium
- (d) Square

11. Given  $HCF(2520, 6600) = 40$ ,  $LCM(2520, 6600) = 252 \times k$  then value of k is:

- (a) 1650
- (b) 1600
- (c) 165
- (d) 1625

12. In the given figure,  $\triangle ABC \sim \triangle QPR$ . If  $AC = 6$  cm,  $BC = 5$  cm,  $QR = 3$  cm and  $PR = x$ ; then the value of x:



- (a) 3.6 cm
- (b) 2.5 cm
- (c) 10 cm
- (d) 3.2 cm

The roots of quadratic polynomial  $2x^2 - 3x - 9$  are :

- (a)  $\frac{3}{2}, \frac{3}{2}$
- (b)  $-\frac{3}{2}, \frac{3}{2}$
- (c)  $\frac{3}{2}, \frac{3}{2}$
- (d)  $-\frac{3}{2}, \frac{3}{2}$

Two positive integers  $p$  and  $q$  can be expressed as  $p = 18a^2b^4$ ,  $q = 20a^3b^2$  where  $a, b$  are prime numbers then LCM  $(p, q)$  is :

- (a)  $2a^2b^2$
- (b)  $180a^2b^2$
- (c)  $180a^3b^4$
- (d)  $12a^2b^2$

The value of  $k$  for which system of equations  $kx + 2y = 5$ ,  $3x + 4y = 1$  has no solution.

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

The discriminant of the quadratic  $9x^2 + 7x - 2 = 0$  is :

- (a) -121
- (b) 23
- (c) -23
- (d) 121

The roots of the quadratic equation are 3 and -4, then the equation is :

- (a)  $x^2 - x - 12 = 0$
- (b)  $3x^2 + 4x - 12 = 0$
- (c)  $x^2 - x + 12 = 0$
- (d)  $x^2 - x - 12 = 0$

$p$  and  $q$  are zeroes of polynomial  $4y^2 - 4y + 1$ . Find the value of  $\frac{1}{p} + \frac{1}{q} + pq$ .

- (a)  $\frac{-15}{4}$
- (b)  $\frac{-3}{4}$
- (c)  $\frac{5}{4}$
- (d)  $\frac{17}{4}$

Direction : In the question numbers 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.

- (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
  - (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
  - (c) Assertion (A) is true but Reason (R) is false.
  - (d) Assertion (A) is false but Reason (R) is true.
19. Assertion (A) : The point  $(0, -3)$  lies on y axis.  
Reason (R) : The x-coordinate on the point on y axis is zero.
20. Assertion (A) : Sum of  $n$  natural numbers from 1 to 100 is 5050.  
Reason (R) : Sum of  $n$  natural numbers is  $\frac{n(n+1)}{2}$ .

SECTION-B

Section B consists of 5 questions of 2 marks each.

21. If mean and median of a data are 12 and 15. Find its mode.

OR

If median of the series exceeds mean by 3 find by what number mode exceeds mean.

22. For what value of  $k$  the roots of quadratic equation  $(k+4)x^2 + (k+1)x + 1 = 0$  equal

23. Find ratio of sum and product of the roots of quadratic equation  $5x^2 - 6x + 21 = 0$

24. If distance between the points  $(3, -5)$  and  $(x, -5)$  is 15 units. Find  $x$ .

OR

Points  $A(-1, y)$  and  $B(5, 7)$  lie on a circle  $O(2, -3y)$  such that  $AB$  is a diameter of the circle. Find the value of  $y$ .

25. Show that  $12^n$  can not end with the digit 0 or 5 for any natural number  $n$ .

SECTION-C

Section C consists of 6 questions of 3 marks each.

26. Prove that  $\frac{2 - \sqrt{3}}{5}$  is irrational number given  $\sqrt{3}$  is irrational.



OR

In a teacher workshop, the number of teachers teaching French, Hindi and English are 48, 80 and 144 respectively. Find minimum number of room required if in each room the same number of teachers are seated and all of them are of same subject.

27. Find the ratio in which the point  $\left(\frac{8}{5}, y\right)$  divides the line segment joining the points (1, 2) and (2, 3). Also find value of y.
28. If  $ax+by = a^2-b^2$  and  $bx+ay = 0$ . Find value of  $x+y$ .
29. The following table shows the ages of patients admitted in a hospital during a year—

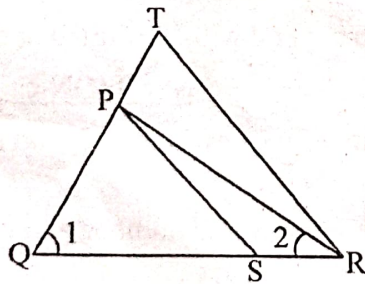
Age (in years)	Number of patients
5-15	6
15-25	11
25-35	21
35-45	23
45-55	14
55-65	5

Find the mode and mean of data.

30. Find the zeroes of polynomial  $4x^2+4x-3$  and verify the relationship between zeroes and its coefficients.

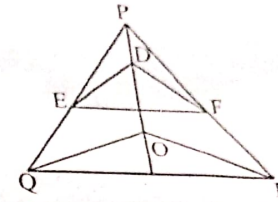
31. In given figure,  $\frac{QR}{QS} = \frac{QT}{PR}$  and  $\angle 1 = \angle 2$

Show that  $\Delta PQS \sim \Delta TQR$



OR

In the given figure  $DE \parallel OQ$  and  $DF \parallel OR$ , show that  $EF \parallel OR$ .



### SECTION-D

Section D consists of 4 questions of 5 marks each.

32. The sum of first and eighth terms of an AP is 32 and their product is 60. Find the first term and common difference of AP.

OR

The sum of four consecutive numbers in AP is 32 and the ratio of the product of first and last terms to the product of two middle terms is 7 : 15. Find the numbers.

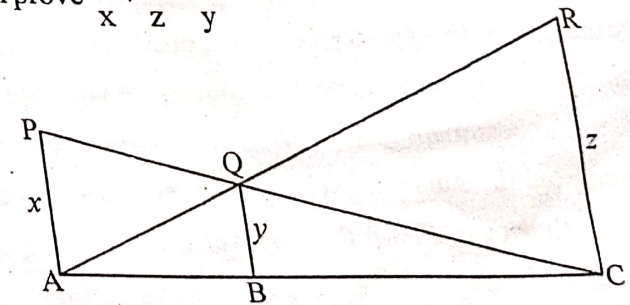
33. The ratio of income of two friends Jasmine and Aman is 9 : 7 and ratio of their expenditure is 4 : 3. If each of them save Rs. 2000 per month find their monthly incomes and savings.

34. State and prove basic proportionality theorem.

OR

In the given figure PA, QB and RC are each perpendicular to AC. If  $AP = x$ ,  $PB = y$  and  $CR = z$  then prove  $\frac{1}{x} + \frac{1}{z} = \frac{1}{y}$ .

and  $CR = z$  then prove  $\frac{1}{x} + \frac{1}{z} = \frac{1}{y}$ .





Class Interval	Frequency
0-10	10
10-20	20
20-30	a
30-40	40
40-50	b
50-60	25
60-70	15

Median = 35,  $\Sigma f_i = 170$

- (i) What is median class of data ?
- (ii) What is sum of missing frequencies ?
- (iii) Find unknown frequencies.

**SECTION-E**

Section E consists of 3 questions of 4 marks each.

36. A rectangular floor area can be completely tiled with 200 square tiles. If side length of each tile is increased by 1 unit, it would take only 128 tiles to cover the floor.

- (i) Assuming the original length of each side of the tile be  $x$  units, make a quadratic equation from above information.
- (ii) Write degree of quadratic equation.
- (iii) Find value of  $x$ , length of side of a tile by factorisation.

OR

Solve the quadratic equation for  $x$  using quadratic formula.

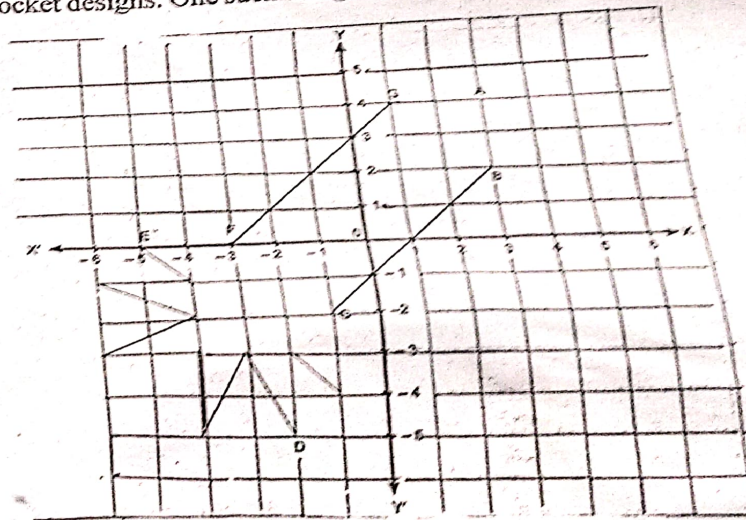
37. Treasure hunt is an exciting and adventurous game where participants follow a series of clues/numbers/maps to discover hidden treasures while playing a treasure hunt game some numbers are hidden in various spots collectively forming an AP. If numbers on  $n$ th spot is  $20+4n$  then answer the following questions to help players in spotting clues :

- (i) Which number is on first spot ?
- (ii) Which spot is numbered as 112 ?

OR

What is the sum of all numbers on the first 10 spots ?

38. Ryan from a very young age, was fascinated by twinkling of stars and vastness of space. He always dreamt of becoming an astronaut one day. So he started to sketch his own rocket designs. One such design is



Based on the above answer the following :

- (i) Find the mid point of line segment joining F and G.
- (ii) What is the distance between A and C.

OR

Find the coordinates which divides the line segment joining A and B in ratio 1 : 3 internally.

- (iii) What are coordinates of D and E ?