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(E)

No. of pages - 24

MID-TERM EXAMINATION (2024-25)
CLASS : X
SUBJECT: MATHEMATICS (STANDARD) (041)

Time Allowed : 3 hours
समय : 3 घंटे

Maximum Marks : 80
अधिकतम अंक : 80

सामान्य निर्देश-

1. इस प्रश्न पत्र में पाँच खंड 'अ', 'ब', 'स', 'द' और 'ई' हैं।
2. खंड 'अ' में 20 बहु-विकल्पीय प्रश्न हैं, जिनमें प्रत्येक 1 अंक का है।
3. खंड 'ब' में 5 प्रश्न हैं, जिनमें प्रत्येक 2 अंक का है।
4. खंड 'स' में 6 प्रश्न हैं, जिनमें प्रत्येक 3 अंक का है।
5. खंड 'द' में 4 प्रश्न हैं, जिनमें प्रत्येक 5 अंक का है।
6. खंड 'ई' में 3 केस आधारित प्रश्न हैं, जिनमें प्रत्येक 4 अंक का है।
7. सभी प्रश्न अनिवार्य हैं। यद्यपि, 5 अंकों वाले 2 प्रश्नों में, 3 अंकों वाले 2 प्रश्नों में तथा 2 अंकों वाले 2 प्रश्नों में आंतरिक विकल्प दिए गए हैं। खंड 'ई' में 2 अंकों वाले प्रश्नों में आंतरिक विकल्प दिए गए हैं।
8. जहाँ भी आवश्यक हो, साफ सुथरी आकृति बनायें। यदि दिया न गया हो, तो आवश्यकता होने पर $\pi = \frac{22}{7}$ प्रयोग कीजिए।
9. कैलकुलेटर का प्रयोग वर्जित है।
10. कृप्या प्रश्न का उत्तर लिखने से पहले, प्रश्न का क्रमांक अवश्य लिखें।

GENERAL INSTRUCTIONS:

1. This question paper has 5 sections 'A', 'B', 'C', 'D' and 'E'.
2. Section A has 20 MCQs carrying 1 mark each.
3. Section B has 5 questions carrying 2 marks each.
4. Section C has 6 questions carrying 3 marks each.
5. Section D has 4 questions carrying 5 marks each.
6. Section E has 3 Case Based questions carrying 4 marks each.
7. 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.
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required, if not stated.
9. Use of calculator is not permitted.
10. Please do write down the serial number of questions before attempting it.

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SECTION-A

Section-A consists of 20 questions of 1 mark each.

1. The median of a set of observations is that value which : 1

(a) occurs most frequently

(b) is the sum of observations

(c) is the average of the observations

(d) which divides the distributions into two equal parts

2. If $\cos A = \frac{4}{5}$, then the value of tan A is : 1

(a) $\frac{3}{5}$

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

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

(d) $\frac{5}{3}$

3. Given that $\sin\alpha = \frac{1}{2}$ and $\cos\beta = \frac{1}{2}$, then the value of $\alpha + \beta$ is : 1

(a) $0°$

(b) $30°$

(c) $60°$

(d) $90°$

4. The zeroes of the quadratic polynomial $x^2 + (m + 3)x + (n - 5)$ are -4 and -5. The values of m and n are : 1

(a) $m = 6, n = 25$

(b) $m = -6, n = 25$

(c) $m = -9, n = 15$

(d) $m = 6, n = -15$

5. For some integer m, every even integer is of the form : 1

(a) m (b) m + 1

(c) 2m (d) 2m + 1

6. All circles are : 1

(a) congruent (b) similar

(c) both similar and congruent (d) equal

7. If the sum of the areas of two circles with radii R_1 and R_2 is equal to the area of the circle of radius R, then : 1

(a) $R_1 + R_2 = R$ (b) $R_1^2 + R_2^2 = R^2$

(c) $R_1 + R_2 > R^2$ (d) $R_1^2 + R_2^2 < R^2$

8. The HCF of the smallest composite number and the smallest prime number is : 1

(a) 1 (b) 2

(c) 3 (d) 4

9. The zero of the linear polynomial $p(x) = ax + b$ is : 1

(a) $\frac{a}{b}$ (b) $\frac{-a}{b}$

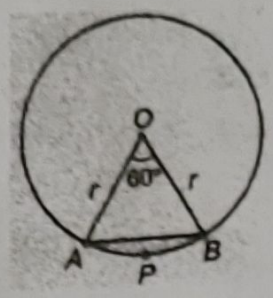
(c) $\frac{b}{a}$ (d) $\frac{-b}{a}$

10. Every rational number is : 1

(a) a natural number (b) an integer

(c) a real number (d) a whole number

11. In the given figure, the area of the segment APB is : 1



(a) $\frac{1}{4}(\pi-\sqrt{3})r^2$

(b) $\left(\frac{\pi}{6}-\frac{\sqrt{3}}{2}\right)r^2$

(c) $\left(\frac{\pi}{6}-\frac{\sqrt{3}}{4}\right)r^2$

(d) $\left(\frac{\pi}{4}-\sqrt{3}\right)r^2$

12. The pair of equations $x = 0$ and $x = 5$ has : 1

(a) no solutions

(b) unique solution

(c) two solutions

(d) infinite solutions

13. If the distance between (4, p) and (1, 0) is 5 units, then p = 1

(a) ±4

(b) 4

(c) –4

(d) 0

14. Graphically, $7x-y=5$ and $21x-3y=10$ represent two lines which are : 1

(a) intersecting at one point

(b) parallel

(c) intersecting at two points

(d) coincident

15. The ratio of corresponding sides of two similar triangles is 4 : 9. What will be the ratio of areas of these triangles? 1

(a) 2:3 (b) 4:9

(c) 81:16 (d) 16:81

16. The perimeter of the triangle formed by (0, 0), (1, 0) and (0, 1) is : 1

(a) $1 \pm \sqrt{2}$ (b) $\sqrt{2}+1$

(c) 3 (d) $2+\sqrt{2}$

17. If one zero of the quadratic polynomial x^2+3x+k is, 2 then the value of k is 1

(a) 10 (b) -10

(c) 5 (d) -5

18. The HCF and LCM of two numbers is 9 and 360 respectively. If one number is 45, then the other number is: 1

(a) 18 (b) 36

(c) 54 (d) 72

Directions for Q.No. 19-20 :

Question No. 19 and 20 have two statements – Assertion (A) and Reason (R). Choose the correct answers of these questions from the options (a), (b), (c) and (d) given below:

(a) Both Assertion (A) and Reason (R) are correct and Reason (R) is the correct explanation of Assertion (A).

(b) Both Assertion (A) and Reason (R) are correct but Reason (R) is not the correct explanation of Assertion (A).

(c) Assertion (A) is correct but Reason (R) is wrong.

(d) Assertion (A) is wrong but Reason (R) is correct.

19. Assertion (A) : The point (–1, 6) divides the line segment joining the points (–3, 10) and (6, –8) in the ratio 2:7 internally. 1

Reason (R) : If three points A, B, C form an equilateral triangle, then AB = BC = AC.

20. Assertion (A) : The HCF of two numbers is 5 and their product is 150. Then their LCM is 40. 1

Reason (R) : For any two positive integers, a and b, HCF (a, b) × LCM (a, b) = a × b.

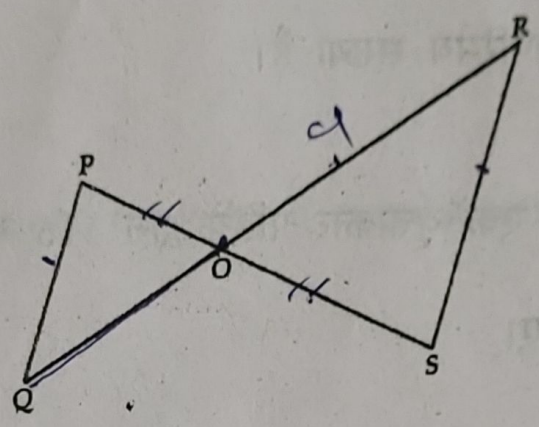
SECTION-B

Section-B consists of 5 questions of 2 marks each.

21. Find the zeroes of the quadratic polynomial $3x^2 - 2$ and verify the relationship between zeroes and their coefficients. 2

22. Find a point on the x-axis which is equidistant from the points (7, 6) and (–3, 4). 2

23. In the given figure PQ||RS, 3PO = 2SO and OR = 9 cm. Find OQ. 2



OR

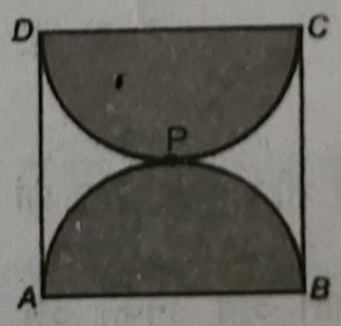
In ΔABC, DE||BC, AB = 10.5 cm, AE = 4.5 cm and AD:DB = 1:4. Find EC and DB.

24. For what value of k the following system of linear equation has no solution: 2

$$x + 2y = 3$$

$$(k - 1)x + (k + 1)y = k + 2$$

25. Find the perimeter of the shaded region in the figure where ABCD is a square of side 14 cm and APB and CPD are semicircles. 2



OR

Find the radius of a circle whose area is equal to the sum of the areas of three circles having radii 3 cm, 4 cm and 12 cm.

SECTION-C

Section-C consists of 6 questions of 3 marks each.

26. Prove that $\frac{1}{\sqrt{3}}$ is irrational. 3

27. Find the number of revolutions made by a circular wheel of area 1.54 m^2 in rolling a distance of 176 m. 3

28. From a point P on the ground, the angles of elevation of a 10 m tall building and of a helicopter hovering at some height over the top of the building are 30° and 60° respectively. Find the height of the helicopter above the ground. 3

29. One zero of the quadratic polynomial $3x^2 - 8x + 2k + 1$ is seven times the other. Find the value of k. 3

OR

If α and β are two zeroes of the polynomial $21y^2 - y - 2$, find a quadratic polynomial whose zeroes are 2α and 2β.

30. Two years ago, Salim was thrice as old as his daughter and 6 years later, he will be four years older than twice her age. How old are they now? 3

31. Find value of x for the following : 3

$$3\tan^2 60° - x\sin^2 45° + \frac{3}{4}\sec^2 30° = 2\,\text{cosec}^2 30°$$

OR

Prove :

$$(\sin A + \text{cosec}A)^2 + (\cos A + \sec A)^2 = 7 + \tan^2 A + \cot^2 A$$

SECTION-D

Section-D consists of 4 questions of 5 marks each.

32. Find the area of the quadrilateral formed by joining the vertices (1, 7), (4, 2), (–1, –1) and (–4, 4). 5

OR

Find the coordinates of the points dividing the line segment joining the points A(–4, –6) and B(–1, 7) into four equal parts.

33. Find the solution of the pair of equations $2x - y = 1$ and $x + 2y = 13$ from the graph. Also, shade the triangular region formed by the lines and y-axis. 5

34. If $\cos\theta + \sin\theta = p$ and $\sec\theta + \text{cosec}\theta = q$ then prove that $q(p^2 - 1) = 2p$. 5

The median of the following data is 525. Find x and y if the sum of all frequencies is 100. 5

Class Interval	200-300	300-400	400-500	500-600	600-700	700-800
Frequency	16	x	17	20	15	y

OR

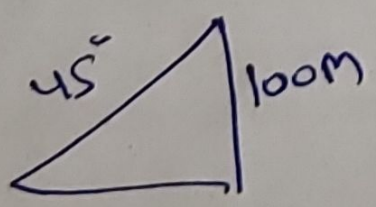
Find the mode of the following distribution of marks obtained by students in an examination. Given the mean of the above distribution is 53, find the value of its median.

Marks obtained	0-20	20-40	40-60	60-80	80-100
Number of students	15	18	21	29	17

SECTION-E

Section-E consists of 3 case based questions of 4 marks each.

6. A boy is standing on top of light house. He observed that boat P and Q are approaching the light house from opposite directions. He finds that angle of depression of boat is 45° and angle of depression of boat Q is 30°. He also knows that the height of light house is 100 m.



Based on the above information, answer the following questions:

(i) Draw a figure for the given situation. 1

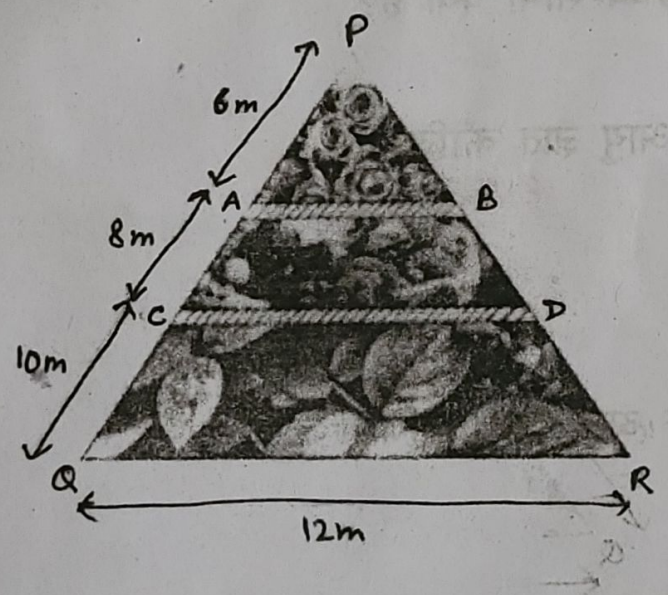
(ii) How far is boat P from light house? 1

(iii) How far is boat Q from light house? 2

OR

Find the length of AP.

37. Sonam has some empty-space in the backyard of her house. She chooses a triangle shaped corner in the backyard for plantation. She divides the triangle into three parts as shown in the figure and grow some flowers in it. The dividing walls are made of bricks and parallel to each other.



Based on the above information, answer the following questions:

(i) Show that $\Delta PQR \sim \Delta PAB$. 2

OR

Find CD, if $\Delta PQR \sim \Delta PCD$.

(ii) Find the ratio between the corresponding sides of ΔPAB and ΔPCD. 1

(iii) If PB = 8 m, then find BR. 1

The following table shows the age distribution of patients admitted during a day in a hospital :

Age (in years)	5-15	15-25	25-35	35-45	45-55	55-65
No.of cases	6	11	21	23	14	5

Based on the above information, answer the following questions:

(i) Find the median class. 1

(ii) What is the upper limit of modal class? 1

(iii) Find the mean age of the patients. 2

OR

Find the modal age of the patients.