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SAHODAYA PRE-BOARD EXAMINATION - 2023-24

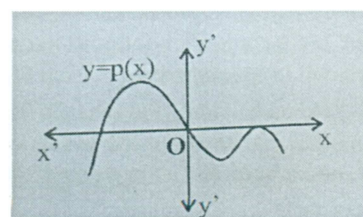
- Please check that this question paper contains **08** printed pages.
- Check that this question paper contains **38** questions.
- Write down the Serial Number of the question in the left side of the margin before attempting it.
- 15 minutes time has been allotted to read this question paper. The students will read the question paper only and will not write any answer on the answer script during this period. Students should not write anything in the question paper.

CLASS- X**SUBJECT :MATHEMATICS (STANDARD-041)****Time: 3 Hours****Maximum Marks : 80****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 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated.

SECTION-A**(Section A consists of 20 questions of 1 mark each)**

1. If 5 is the least prime factor of number 'a' and 7 is the least prime factor of another number 'b', then the least prime factor of $a + b$ is
(a) 2 (b) 3 (c) 5 (d) 10
2. Using the graph of a polynomial $y = p(x)$, given alongside, the number of zeroes of polynomial is
(a) 1 (b) 2 (c) 3 (d) 4
3. The pair of equations $y = 0$ and $y = -7$ has
(a) One solution (b) two solutions (c) infinite solutions (d) no solutions



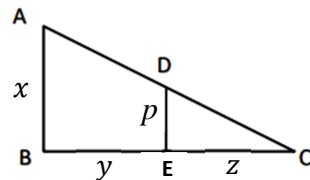
4. $(x^2 + 1)^2 - x^2 = 0$ has
 (a) Four real roots (b) two real roots (c) no real roots (d) one real root

5. The common difference of an AP in which $a_{18} - a_{14} = 32$ is

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

6. In ΔABC , $DE \parallel AB$. If $AB = x$, $DE = p$, $BE = y$ and $EC = z$ then the expression of p in terms of x , y and z is

- (a) $\frac{xz}{y}$ (b) $\frac{xz}{y+z}$
 (c) $\frac{xy}{z}$ (d) $\frac{xy}{y+z}$



7. The coordinates of the fourth vertex of the rectangle formed by the points $(0,0)$, $(2,0)$ and $(0,3)$ are

- (a) $(2,3)$ (b) $(3,0)$ (c) $(3,2)$ (d) $(0,2)$

8. The ratio in which the line segment joining $(-2, 3)$ and $(5, 6)$ is divided by y -axis is

- (a) 1:2 (b) 2:1 (c) 2:5 (d) 5:2

9. If $4\tan\theta = 3$, then $\frac{4\sin\theta - \cos\theta}{4\sin\theta + \cos\theta}$ is equal to

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

10. If $(1 + \cot^2 A) \sin^2 A = k + 1$, then the value of k is

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

11. The length of the shadow of a tower on the play ground is $\sqrt{3}$ times the height of the tower. The angle of elevation of the sun is

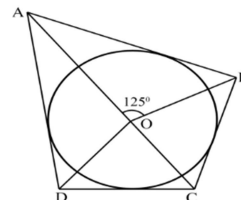
- (a) 45° (b) 30° (c) 60° (d) 90°

12. In a circle, 'O' is the centre. PA and PB are tangents from an exterior point P. If $\angle OAB = 30^\circ$ and $PA = 6\text{cm}$, then the length of the chord AB is

- (a) 6 cm (b) 3 cm (c) 9 cm (d) 12 cm

13. In the given figure, if $\angle AOB = 125^\circ$, then $\angle COD$ is equal to

- (a) 45° (b) 35° (c) 55° (d) 125°



14. If the perimeter of a circle is equal to that of a square, then the ratio of their areas is

- (a) 22:7 (b) 14:11 (c) 7:22 (d) 11:14

15. If the sum of the areas of two circles with radii r_1 and r_2 is equal to the area of a circle of radius r , then

- (a) $r_1^2 + r_2^2 > r^2$ (b) $r_1^2 + r_2^2 = r^2$ (c) $r_1^2 + r_2^2 < r^2$ (d) none of these

16. Consider the following frequency distributions

Class	0-5	5-10	10- 15	15 - 20	20-25
Frequency	13	10	14	8	11

The upper limit of the median class is

- (a) 5 (b) 10 (c) 15 (d) 20

17. The probability of guessing the correct answer to a certain test questions is $\frac{x}{12}$. If the probability of not guessing the correct answer to this question is $\frac{2}{3}$, then x is

- (a) 2 (b) 3 (c) 4 (d) 6

18. A coin is tossed 3 times . The probability of getting at most two heads is

- (a) $\frac{3}{4}$ (b) $\frac{3}{8}$ (c) $\frac{1}{2}$ (d) $\frac{7}{8}$

(ASSERTION-REASON BASED QUESTIONS)

In the following questions, a statement of Assertion(A) is followed by a statement of Reason(R). Choose the correct answer out of the following choices.

- (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 and reason (R) is not the correct explanation of assertion (A).
- (c) Assertion (A) is true and reason (R) is false.
- (d) Assertion (A) is false but reason (R) is true.

19. **Assertion (A):** Two identical solid cubes of side ‘a’ are joined end to end . Then the total surface area of the resulting cuboid is $10 a^2$.

Reason (R): The total surface area of a cube having side ‘a’ = $6a^2$

20. **Assertion (A):** $-3, -\frac{8}{3}, -\frac{13}{5}, -\frac{12}{5}$is in Arithmetic progression .

Reason (R): The terms of an Arithmetic progression cannot have both positive and negative rational numbers .

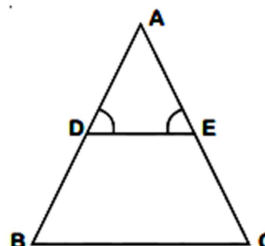
SECTION-B

(Section B consists of 5 questions of 2 marks each)

21. If $\sqrt{3}$ is an irrational number , then show that $5 - 2\sqrt{3}$ is an irrational number .

22. In the givenfig, $\angle D = \angle E$ and $\frac{AD}{DB} = \frac{AE}{EC}$.

Prove that ΔBAC is an isosceles triangle .



23. In a right triangle ABC, right angled at B , if $\tan A = 1$, then prove that $2\sin A \cdot \cos A = 1$

OR

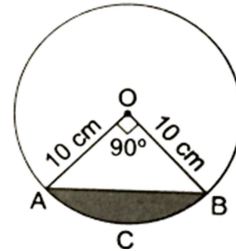
Find the value of x ,

$$\text{If } 2 \operatorname{cosec}^2 30^\circ + x \sin^2 60^\circ - \frac{3}{4} \tan^2 30^\circ = 10$$

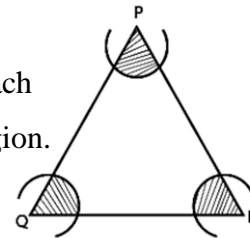
24. If from an external point B of a circle with centre 'O', two tangents BC and BD are drawn such that $\angle DBC = 120^\circ$, Prove that $BC + BD = BO$.

25. A chord of a circle of radius 10 cm subtends a right angle at the centre. Find the area of the segment ACB. (Use $\pi = 3.14$)

OR



In the given figure, arcs have been drawn with radii 14cm each and with centres P, Q and R. Find the area of the shaded region.



SECTION-C

(Section C consists of 6 questions of 3 marks each)

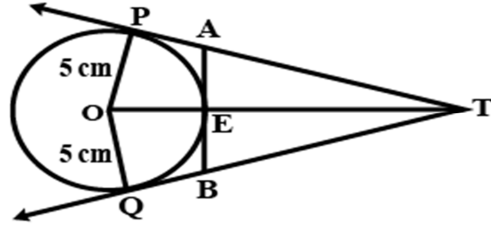
26. Four bells toll together at 10 AM. They toll after 8, 12, 16, 24 seconds respectively. How many times will they toll together again in the next 2 hours?
27. Find the quadratic polynomial whose zeros are reciprocals of the zeros of the polynomial $f(x) = ax^2 + bx + c$, $a \neq 0$, $c \neq 0$
28. Draw the graph of the pair of equations $2x + y = 4$ and $2x - y = 4$. Write the vertices of the triangle formed by these lines and the y-axis.

OR

Places A and B are 100 km apart on a highway One car starts from A and another from B at the same time. If the cars travel in the same direction at different speeds, they meet in 5 hours. If they travel towards each other, they meet in 1 hour. Find the speeds of two cars?

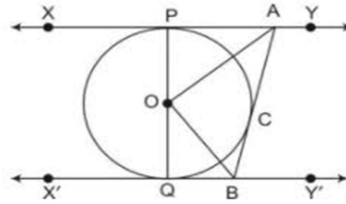
29. Prove that: $\frac{1 + \sec \theta - \tan \theta}{1 + \sec \theta + \tan \theta} = \frac{1 - \sin \theta}{\cos \theta}$

30. In figure, 'O' is the centre of a circle of radius 5 cm. T is a point such that $OT = 13$ cm and OT intersects the circle at E. If AB is the tangent to the circle at E, find the length of AB .



OR

- In fig, XY and $X'Y'$ are two parallel tangents to a circle with centre O and another tangent AB with point of contact C intersecting XY at A and $X'Y'$ at B . Prove that $\angle AOB = 90^\circ$



31. Find the mode of the following distribution.

Class	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70
Frequency	8	10	10	16	12	6	7

SECTION-D

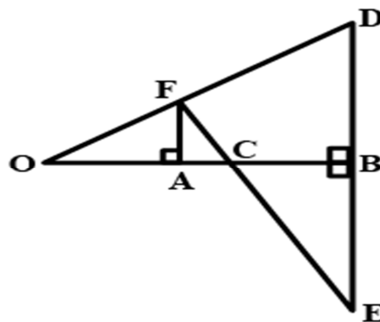
(Section D consists of 4 questions of 5 marks each)

32. Find the roots of the equation: $3\left(\frac{7x+1}{5x-3}\right) - 4\left(\frac{5x-3}{7x+1}\right) = 11, x \neq \frac{3}{5}, -\frac{1}{7}$

OR

A shopkeeper buys a number of books for Rs. 80. If he had bought 4 more books for the same amount, each book would have cost Rs. 1 less. How many books did he buy?

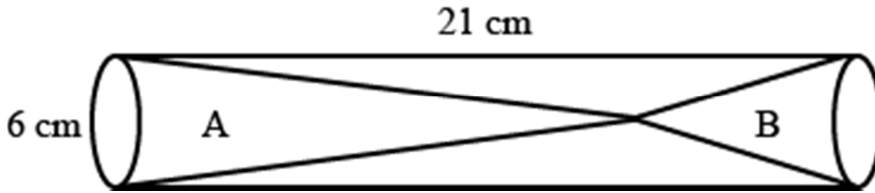
33. In the given figure, OB is the perpendicular bisector of the line segment DE , $FA \perp OB$ and FE intersects OB at the point C . Prove that $\frac{1}{OA} + \frac{1}{OB} = \frac{2}{OC}$.



34. The mean of the following frequency distribution is 50, find f_1 and f_2 , If the sum of all the frequencies is 120 ?

Class	0-20	20-40	40-60	60-80	80-100
Frequency	17	f_1	32	f_2	19

35. Two solid cones A and B are placed in a cylindrical tube as shown in the figure. The ratio of their volumes is 2:1. Find the heights and volumes of the cones. Also, find the volume of the remaining portion of the cylinder.



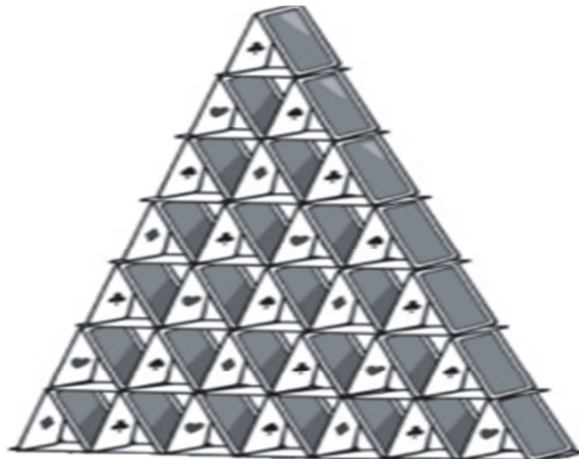
OR

A building is in the form of a cylinder surmounted by hemispherical dome. The base diameter of the dome is equal to $\frac{2}{3}$ of the total height of the building. Find the height of the building, if it contains $67\frac{1}{21}$ m³ of air.

SECTION E

CASE STUDY BASED QUESTIONS ARE COMPULSORY

36. Shown below is a house of cards, a structure created by stacking playing cards on top of each other in the shape of a pyramid. Each small triangle is made using 3 cards and each layer has 1 less triangle than the layer below it.



Ankit and his friends were having a sleepover and wanted to do something fun. One of the friends suggested that they could make a house of cards.

- (i) Ankit and his friends want to use 3 cards in the top layer and 18 cards at the bottom layer. Form an AP showing the number of cards in each layer starting from the top layer. 1
- (ii) Find the total number of cards used by Ankit and his friends to make the pyramid in the above case. 1
- (iii) (a) Ankit is planning to make a pyramid with the top and bottom layer containing 15 and 138 cards respectively. How many layers will such a pyramid have? Show your work. 2

OR

- (b) They have a total of 360 cards with them. Find the maximum number of layers that Ankit and his friends can make using the cards they have, if they want to have 1 triangle (3 cards) at the top layer. Show your work. 2

37. A hockey field is the playing surface for the game of hockey. Historically, the game was played on natural turf (grass) but nowadays it is predominantly played on an artificial turf.

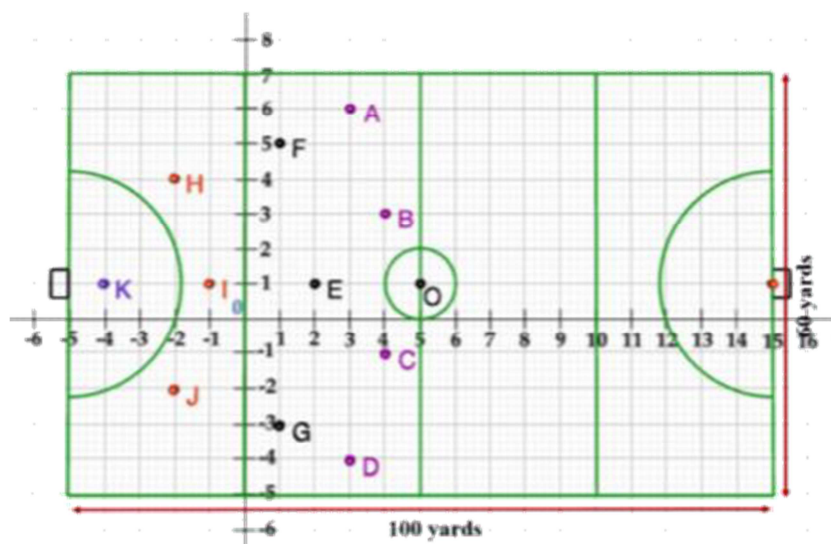
It is rectangular in shape - 100 yards by 60 yards. Goals consist of two upright posts placed equidistant from the centre of the backline, joined at the top by a horizontal crossbar. The inner edges of the posts must be 3.66 metres (4 yards) apart, and the lower edge of the crossbar must be 2.14 metres (7 feet) above the ground.

Each team plays with 11 players on the field during the game including the goalie.

Positions you might play include-

- Forward: As shown by players A, B, C and D.
- Midfielders: As shown by players E, F and G.
- Fullbacks: As shown by players H, I and J.
- Goalie: As shown by player K

Using the picture of a hockey field below, answer the questions that follow:

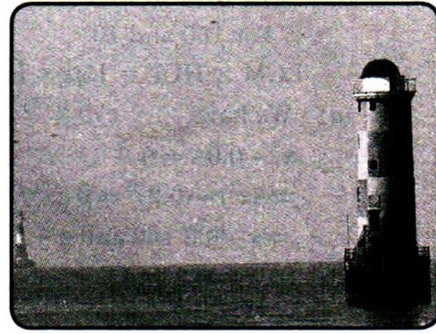


- (i) Find the coordinates of the centroid of $\Delta E H J$. 1
- (ii) If a player P needs to be at equal distances from A and G, such that A, P and G are in straight line, then find the position of P. 1
- (iii) (a) Find the point on x-axis equidistant from K and E. 2

OR

- (b) What are the coordinates of the position of a player Q such that his distance from K is twice his distance from E and K, Q and E are collinear. 2

38. A guard, stationed at the top of a 300 m tower, observed an unidentified boat coming towards it. A clinometer or inclinometer is an instrument used for measuring angles or slopes(tilt). The guard used the clinometer to measure the angle of depression of the boat coming towards the lighthouse and found it to be 30° .



Based on the above information, answer the following questions.

- (i) Make a labelled diagram on the basis of the given information and calculate the distance of the boat from the foot of the observation tower. 1
- (ii) After few seconds, the guard observed that the boat was approaching the tower and its distance from tower is reduced by $300(\sqrt{3}-1)$ m. He immediately raised the alarm. What was the new angle of depression of the boat from the top of the observation tower? 1
- (iii) (a) If the boat takes 20 seconds to reach at the foot of the tower from the point where the angle of depression is 45° . Find the speed of boat in km/hr. 2

OR

- (b) Write the difference of the distance when angle of depression changes from 45° to 60° . 2
