Roll No. | | | | | | |

SET 02

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 & 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 π =22/7 wherever required if not stated.

SECTION-A

(Section A consists of 20 questions of 1 mark each)

1. The LCM of two numbers is 1200. Which of the followings cannot be their HCF?

   (a) 600 (b) 500 (c) 400 (d) 200

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

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

3. Graphically the pair of equations $6x - 3y + 10 = 0$ and $2x - y + 9 = 0$ represents two lines which are

   (a) Intersecting at exactly one point (b)Intersecting at exactly two point
   (c)coincident (d)parallel

4. Value of k for which the quadratic equation $2x^2 - kx + k = 0$ has equal roots is

   (a) 0 only (b)4 (c) 8 only (d) 0, 8

5. If k, $2k-1$ and $2k+1$ are three consecutive terms of an AP, the value of k is

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

6. In a circle, 'O' is the centre. PA and PB are tangents from an exterior point P .
If $\angle OAB = 30^0$ and PA = 6cm , then the length of the chord AB is

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

7. 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

8. 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

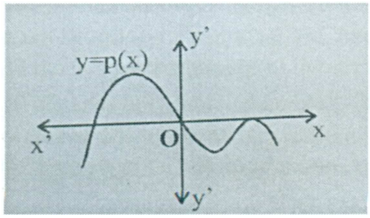
(a) 45^0 (b) 30^0 (c) 60^0 (d) 90^0

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

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

10. 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

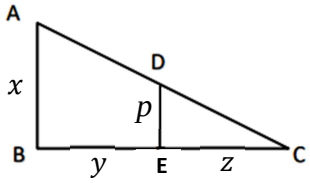


11. If the sum of the areas of two circles with radii r_1 and r_2 is equal to the area of a circle of radius r , then

(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

12. In Δ ABC , DE $\parallel$ AB if AB = x , DE = p , BE = y and EC = z express p in terms of x , y and z

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



13. Consider the following frequency distributions

Classes	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

14. The area of the square that can be inscribed in a circle of radius 8 cm is

(a)256 cm^2 (b) 128 cm^2 (c) $64\sqrt{2}$ cm^2 (d) 64 cm^2

15. 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) $\frac{3}{4}$

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

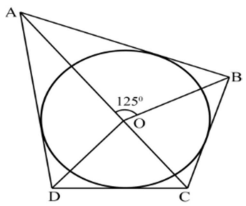
(a) 1:2 (b) 2:1 (c) 2:5 (d) 5:2

17. The perimeter of a triangle with vertices (0,4), (0.0) and (3, 0) is

(a) 5 (b)12 (c) 11 (d) $7+\sqrt{5}$

18. In the given figure if $\angle AOB = 125^0$, then $\angle COD$ is equal to

(a) 45^0 (b) 35^0 (c) 55^0 (d) 125^0



(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):** -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 .

20. **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' = $6a^2$

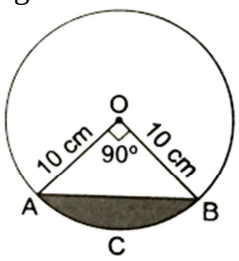
SECTION-B

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

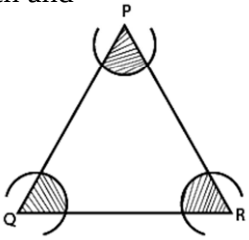
21. the If HCF of 65 and 117 is expressible in the form of 65*m* – 117, then find the value of *m*.

22. A chord of a circle of radius 10 cm subtends a right angle at the centre. Find the area of the segment ACB. (π =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.



23. In a right triangle ABC , right angled at B , if tanA = 1 , then prove that 2sinA.cosA = 1

OR

Find the value of x ,

If $2\,\text{cosec}^2 30^0 + x \sin^2 60^0 - \frac{3}{4}\tan^2 30 = 10$

24. If from an external point B of a circle with centre 'O', two tangents BC and BD are drawn such that $\angle DBC = 120^0$, Prove that BC + BD = BO.

25. In aΔ ABC, D and E are points on sides AB and AC respectively. Such that BD = CE. If $\angle B = \angle C$. Show that DE||BC .

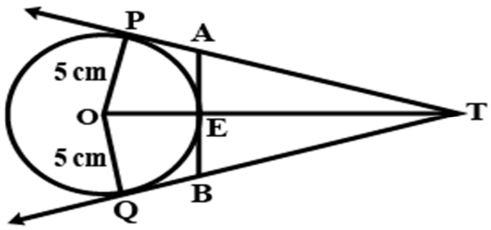
SECTION-C
(Section C consists of 6 questions of 3 marks each)

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 mode of the following distribution.

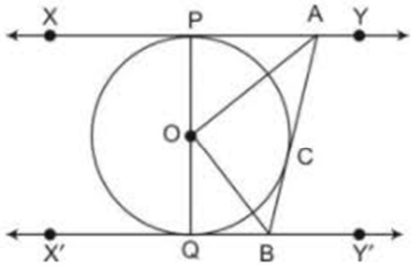
Class	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 – 70
Frequency	8	10	10	16	12	6	7

28. In thefigure '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 $\angle AOB = 90^0$



29. If $1+ \sin^2\theta = 3 \sin\theta\cos\theta$, then prove that $\tan\theta = 1$ or $\frac{1}{2}$.

30. If α and β are the zeros of the quadratic polynomial $f(x) = kx^2 + 4x + 4$, such that $\alpha^2 + \beta^2 = 24$, find the value(s) of k.

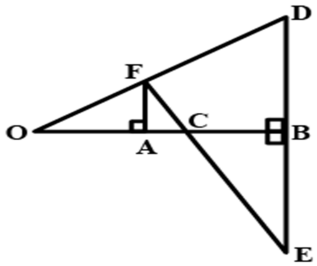
31. Draw the graph of the pair of equations 2x + y = 4 and 2x – y = 4. Write the vertices of the triangle formed by these lines and the y-axis.

OR

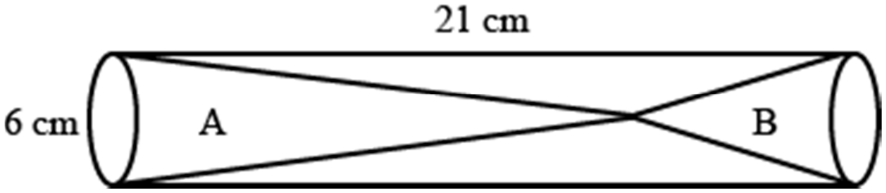
Places A and B are 100 km apart on a highway one car starts from A and another from B at the sametime. If the cars travel in the same direction at different speeds, they meet in 5 hours. If they travel towards each other, they meet in 1 hour. find the speeds of two cars?

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

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



33. Two solid cones A and B are placed in a cylindrical tube as shown in the figure. The ratio of their capacities are 2:1. Find the heights and capacities 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 $67\frac{1}{21}$ m^3 of air.

34. Find the mean marks of students for the following distribution:

Marks	0 and above	10 and above	20 and above	30 and above	40 and above	50 and above	60 and above	70 and above	80 and above	90 and above
No. Of Students	80	77	72	65	55	43	28	16	10	8

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

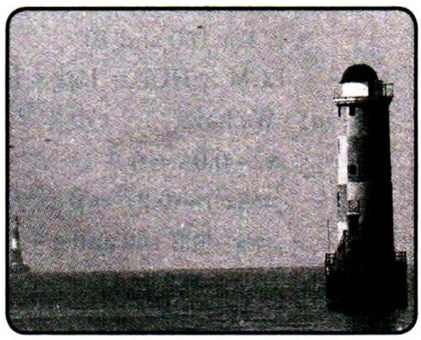
OR

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?

SECTION E

(CASE STUDY BASED QUESTIONS ARE COMPULSORY)

36. 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

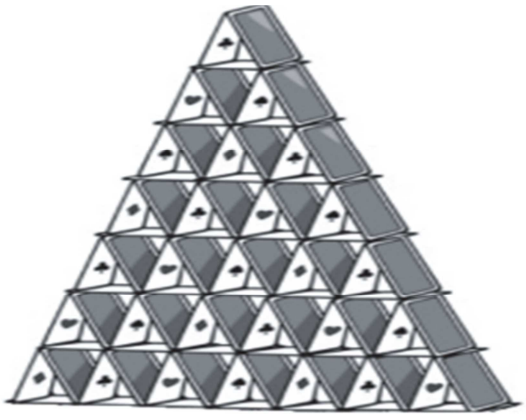
(ii) After few seconds, the guard observed that the boat was approaching the tower and its distance from tower is reduced by $300(\sqrt{3}-1)$ m. He immediately raised the alarm. What was the new angle of depression of the boat from the top of the observation tower? 1

(iii) (a) If the boat takes 20 sec to reach at the foot of the tower from the point where the angle of depression is 45^0. 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

37. 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 in the bottom layer. Form an AP showing the number of cards in each layer starting from the top layer. 1

1

(ii) Find the total number of cards used by Ankit and his friends to make the pyramid in (i)

(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

38. 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-

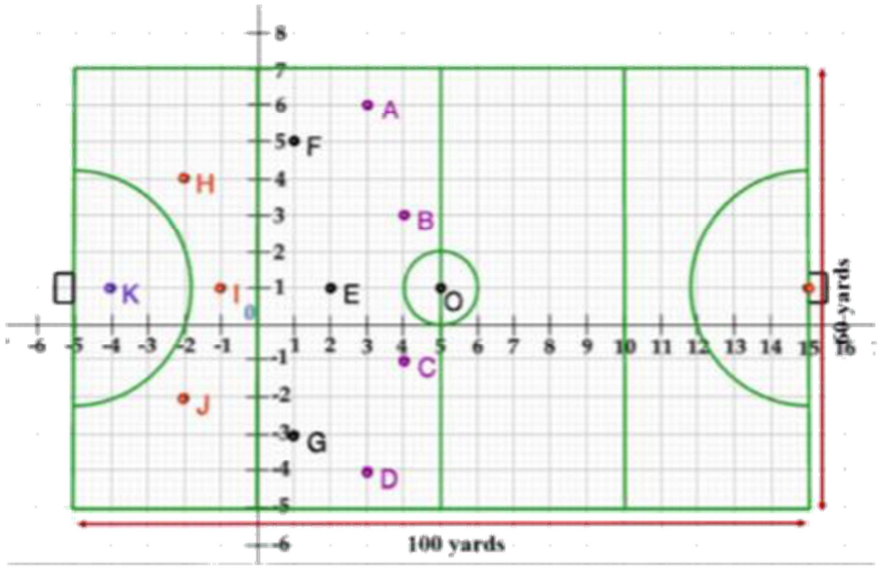
· Forward: As shown by players A, B, C and D.

· 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 Δ EHJ. 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 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

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