



BANGALORE SAHODAYA SCHOOLS COMPLEX ASSOCIATION

QUESTION PAPER (2023-24) MATHEMATICS (Code – 041)

CLASS X –SET 1

Maximum Marks: 80

Time allowed: 3 Hrs

Date : _____

General Instructions:

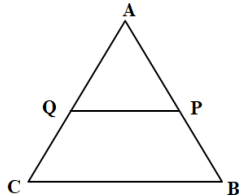
1. This Question Paper has 5 Sections A, B, C, D, and E.
2. Section A has 20 Multiple Choice Questions (MCQs) carrying 1 mark each.
3. Section B has 5 Short Answer-I (SA-I) type questions carrying 2 marks each.
4. Section C has 6 Short Answer-II (SA-II) type questions carrying 3 marks each.
5. Section D has 4 Long Answer (LA) type questions carrying 5 marks each.
6. Section E has 3 sourced based/Case Based/passage based/integrated units of assessment (4 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 2 marks, 2 Qs of 3 marks and 2 Questions of 5 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 $\pi = 22/7$ wherever required if not stated.

SECTION – A

Section A consists of 20 questions of 1 mark each

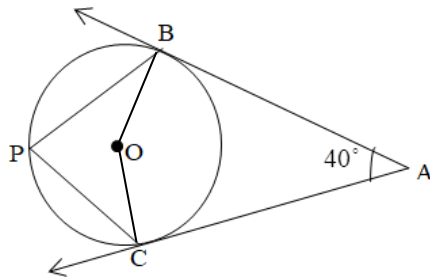
1. 'P' is the LCM (2 , 6); 'Q' is the LCM (3 , 9); 'R' is the LCM of 'P' and 'Q'. Which of the following is true?
(a) $R = 5P$ (b) $R = 3Q$ (c) $R = 2P$ (d) $R = 2Q$
2. If α and β are the zeroes of the quadratic polynomial $p(x) = x^2 + x - 2$, then the value of $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$ is equal to
(a) $\frac{5}{2}$ (b) $\frac{-5}{2}$ (c) $\frac{-3}{2}$ (d) $\frac{3}{2}$
3. The pair of equations $x = -2$ and $x = 5$ has
(a) no solution (b) two solutions (c) one solution (d) infinite solutions
4. The roots of the quadratic equation $4x^2 - 1 = 0$ are
(a) rational and equal (b) rational and unequal
(c) irrational and equal (d) irrational and unequal

5. $2x, x+10, 3x+2$ are consecutive terms of an AP only when x is equal to
 (a) 11 (b) 4 (c) 6 (d) -6
6. $(-2,1)$ is the centroid of the triangle having vertices $(x,2), (1,-6), (-2,y)$ then, x and y are
 (a) $x = 5, y = 7$
 (b) $x = -5, y = -7$
 (c) $x = 5, y = -7$
 (d) $x = -5, y = 7$
7. The point on the x - axis which is equidistant from points $(3, 5)$ and $(7, 1)$ is
 (a) $(2, 0)$ (b) $(3,0)$ (c) $(0,2)$ (d) $(-3,0)$
8. In the given figure $QP \parallel CB$ and $AQ : QC = 1 : 2$. If $PQ = 4.5\text{cm}$, then length of BC is_____.
 (a) 9cm (b) 13.5cm (c) 1.5cm (d) 12.5cm



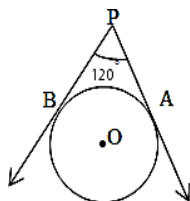
9. In the given figure AB and AC are tangents to the circle with centre 'O'.
 If $\angle BAC = 40^\circ$, then $\angle BPC$ is _____.

- (a) 140° (b) 70° (c) 100° (d) 270°



10. In the figure PA and PB are tangents to the circle with centre 'O'. If $\angle APB = 120^\circ$, then the ratio of OA to OP is

- (a) $2 : \sqrt{3}$ (b) $1 : 2$ (c) $\sqrt{2} : 1$ (d) $\sqrt{3} : 2$



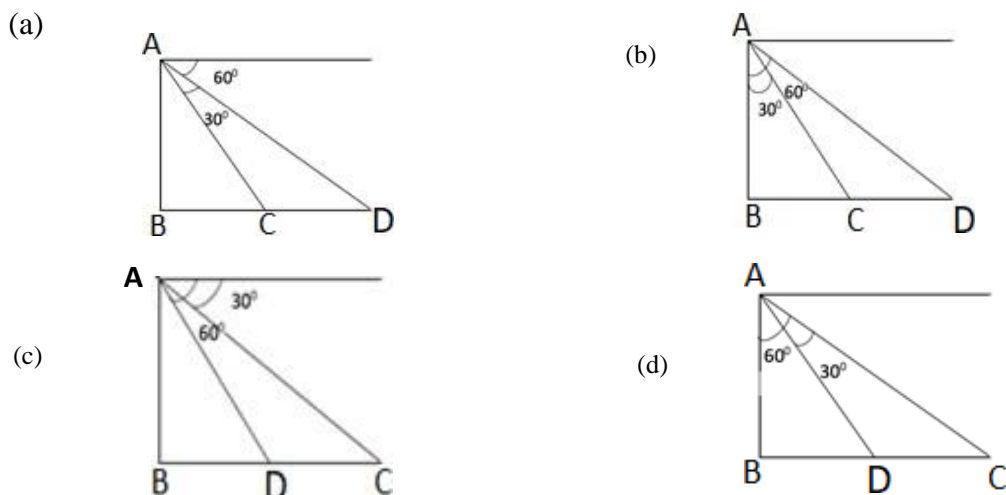
11. A and B are acute angles such that $\sin A < \sin B$. Which of the following is definitely true?

- (a) $\tan A > \tan B$ (b) $\cos A < \cos B$ (c) $\sin A = \cos B$ (d) $\cos A > \cos B$

12. $\frac{\tan \theta \times \operatorname{cosec}^2 \theta}{\sec \theta}$ is equal to

- (a) $\sec \theta$ (b) $\operatorname{cosec} \theta$ (c) $\cot \theta$ (d) $\tan \theta$

13. From the top of a light house AB at sea level, the angles of depression of two ships C and D are 30° and 60° respectively. Which of the following figure represents this situation?



14. The area of the circle that can be inscribed in a square of side 6cm is

- (a) $36\pi \text{ cm}^2$ (b) $18\pi \text{ cm}^2$ (c) $12\pi \text{ cm}^2$ (d) $9\pi \text{ cm}^2$

15. A fan has three wings. If the length of each wing is 21cm then the area of the sector described between two consecutive wings is

- (a) 44cm^2 (b) 462cm^2 (c) 362 cm^2 (d) 241cm^2

16. At a fun fair a person can win a prize if she draws either a spade or an ace from a deck of cards.

The probability of her losing is ----.

- (a) $\frac{9}{13}$ (b) $\frac{4}{13}$ (c) $\frac{17}{52}$ (d) $\frac{35}{52}$

17. A die is rolled. Which of the following statements is correct?

- (i) The probability of getting an even number is an elementary event.
 (ii) The probability of getting an even prime number is an elementary event.
 (iii) The probability of getting an even number and probability of getting a prime number are complementary events,
- (a) i and ii (b) only iii (c) only ii (d) ii and iii

18. The mode and mean of a data is 30.6 and 29.2 respectively, then the median of the data is

- (a) 27.8 (b) 29.6 (c) 59.1 (d) 33.4

19. DIRECTION: In the question number 19 and 20, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct option

Assertion (A) : The 15th term of the AP: 5, 8, 11, 14.... is 47.

Reason (R) : The nth term of the AP: 5, 8, 11, 14 is given by $a_n = 2 - 3n$

- (a) Both (A) and (R) are true and (R) is the correct explanation for (A).
- (b) Both (A) and (R) are true but (R) is not the correct explanation for (A).
- (c) (A) is true but (R) is false.
- (d) (A) is false but (R) is true.

20. Assertion (A) : Three equal cubes are placed side by side in a row. The ratio of the surface area of new cuboid to the sum of the surface areas of three cubes is 7 : 3.

Reason (R) : Surface area of a cuboid = $2(lb + bh + hl)$, Surface area of a cube = $6a^2$

- (a) Both (A) and (R) are true and (R) is the correct explanation for (A).
- (b) Both (A) and (R) are true but (R) is not the correct explanation for (A).
- (c) (A) is true but (R) is false.
- (d) (A) is false but (R) is true.

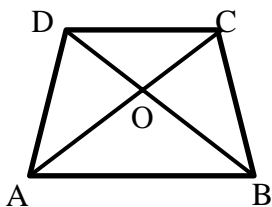
SECTION - B

Section B consists of 5 questions of 2 marks each

21. 108 litres of liquid A and 72 litres of liquid B are to be packed in containers of the same size.

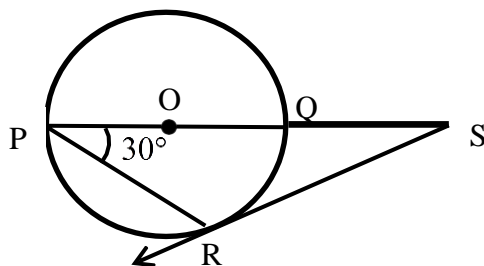
Find the minimum number of containers required.

22. In the trapezium ABCD, $AB \parallel DC$, $AO : OC = 2:1$ then prove that $AB = 2DC$



23. In the given figure, PQ is the diameter of the circle and PR is its chord such that $\angle RPQ = 30^\circ$.

The tangent at R meets PQ produced at S. Find $\angle RSP$



24. Find “x” such that $2\sec^2 60^\circ + x\cos^2 30^\circ - \frac{3}{4}\cot^2 60^\circ = 10$

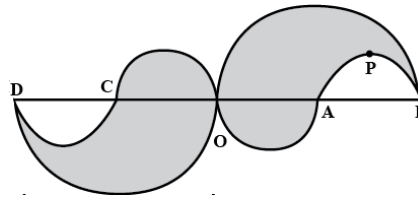
OR

If $9\cos^2\theta + 5\sin^2\theta = 6$, find the value of $\tan\theta$.

25. The minute hand of a clock is 6cm long. Find the length of the arc swept by it between 11.20 am and 11.55 am.

OR

The figure consists of 4 small semicircles of radii 21cm and 2 big semicircles of radii 42cm each. Find the perimeter of the shaded region.



SECTION C

Section C consists of 6 questions of 3 marks each

26. Prove $3 - \sqrt{2}$ is irrational.
27. Find the value of “k” if the sum of the zeroes of the polynomial $p(x) = (k^2 - 10)x^2 - 3kx - 4$ is 1.
28. In a competitive examination two marks are awarded for each correct answer while $\frac{1}{2}$ mark is deducted for each wrong answer. Jayanti answered 120 questions and scored 90 marks. How many questions did she answer wrong?

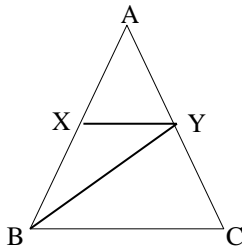
OR

Determine the value of “a” and “b” if the following pair of linear equations has infinite solutions.

$$3x + 4y = 12$$

$$(a + b)x + 2(a - b)y = 5a - 1$$

29. In the figure, $\triangle ABC \sim \triangle AXY$ and $\frac{AB}{AX} = \frac{5}{3}$; If $XY = 4$ cm and BY bisects $\angle XYC$, find AY .



OR

Through the midpoint M of the side CD of a parallelogram ABCD, the line BM is drawn intersecting AC at L and AD produced at E. Prove that $EL = 2BL$.

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

31. The following table shows the weight of students of a class. Calculate the median weight.

Weight (in Kg)	Less than 40	Less than 42	Less than 44	Less than 46	Less than 48	Less than 50	Less than 52
No. of students	3	5	9	14	28	32	35

SECTION D

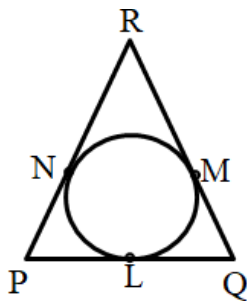
Section D consists of 4 questions of 5 marks each

32. The denominator of a fraction exceeds the numerator by 3. When 1 is added to both the numerator and denominator, the new fraction exceeds the original fraction by $\frac{1}{24}$. Find the new fraction.

OR

500 notebooks were distributed equally among a certain number of students. If there were 25 more students each would have received one notebook less. Find the number of students.

33. (a) Prove that the lengths of tangents drawn from an external point to a circle are equal.
(b) The perimeter of ΔPQR is 28cm, $PL = 7$ cm and $PQ = 10$ cm. Find the lengths of sides QR and PR.



34. (a) A vessel is in the form of an inverted cone. Its height is 16cm and the radius of its top which is open is 5cm. It is filled with water upto the brim. When 75 identical spherical lead shots are dropped into the vessel, three fourths of water flows out. Find the radius of the lead shot dropped into the vessel.
(b) A toy is in the form of a cone surmounted on a hemisphere of the same radius 7cm. If the total height of the toy is 31cm, find the total surface area of the toy.

OR

A toy is in the form of a right circular cylinder with a hemisphere on one end and a cone on the other. The height and radius of the cylinder are 13cm and 5cm respectively. The radius of the hemisphere and base of the conical part are same as that of the cylinder. If the total height of the toy is 30cm, calculate

- (i) Total surface area of the toy.
(ii) Volume of the toy
35. The mean marks scored by 40 students is 69.5. Find the missing frequencies x and y . Also find the mode of the data.

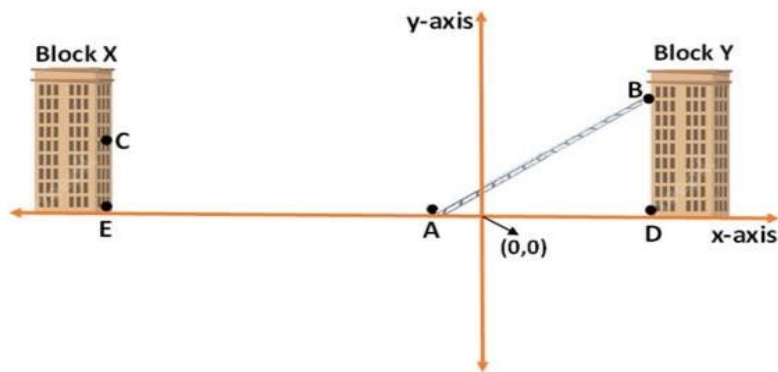
Marks	45 – 55	55 – 65	65 – 75	75 -85	85 - 95
No.of students	4	x	y	9	4

SECTION E

36. The Bangalore Development Authority (BDA) for the first time ventured into a self-sustained modern township by the name 'Innovative City' near Hoskote. This integrated eco-friendly township houses both commercial and residential complexes. It comprises of a tech park, malls, residential flat with pools, community halls and sporting avenues. Two blocks 'X' and 'Y' of the residential building undergo painting works and the painters use a single ladder of a certain length for their work.

The portion of the wall to be painted and the ends of the ladder are represented as points on a coordinate plane.

- The points E, A and D lie on the x-axis and the line segments CE and BD are parallel to y-axis.
- The coordinates of points A, B and D are $(-1, 0)$, $(7, 6)$ and $(7, 0)$ respectively.
- Point A divides ED in the ratio 9:8.



Based on the given information answer the following question:

- (a) Find the coordinates of E. [1]
- (b) The ladder is kept against the wall of block X. The top of the ladder touches point C and the base of the ladder is at point A. What will be the coordinates of point C? [2]

OR

If one end of the ladder is placed at $(-2, 0)$ and leaned against the wall of block X, write the coordinates of the point where the other end of the ladder touches. [2]

- (c) In what ratio will the y-axis divide the line segment AB? [1]

37. Built with granite, Vidhana Soudha is the largest legislative building in India. The architecture includes elements of styles from the medieval Chalukya, Hoysala and Vijayanagara empires of Karnataka. The phrase "Government Work is God's Work" is inscribed on the building. Its east-facing front façade has a porch with 12 granite columns. Leading to the porch is a flight of stairs with 45 steps. The central dome is crowned by a likeness of the State Emblem of India.



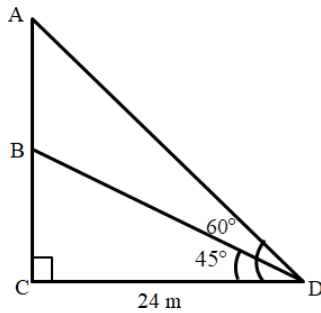
- a) When the altitude of the sun is 30° the length of the shadow of the Vidhana Soudha is $\frac{107\sqrt{3}}{2}$ m .

Find the height of the Vidhana Soudha.

[1]

Maya a class 10 student observes the dome and terrace of the Vidhana Soudha from a point D which is 24metres away from C. The angle of elevation of a point on the dome (point A) and a point on the terrace (point B) is 60° and 45° respectively.

Based on the above information answer the following questions:



- b) Find the height AB

[2]

OR

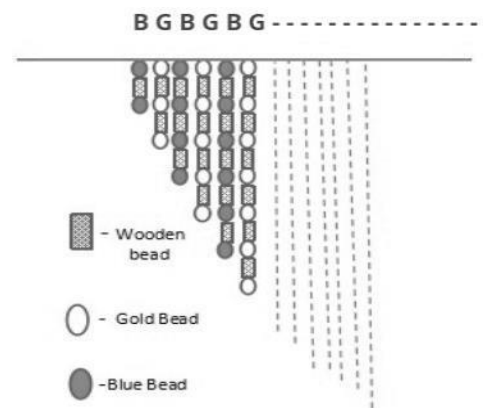
Find lengths AD and BD

[2]

- c) Maya walks from D towards C to a point which is at a distance of $8\sqrt{3}$ m from C. What is the angle of elevation of point B from this point?

[1]

38. An IT professional named Nagananda considers getting a beaded curtain for his work space. He hires a craftsperson to make a simple beaded curtain. The craftsman makes the beaded curtain, as shown in the figure. The curtain is made of alternate strings of blue and gold coloured beads. Between two colored beads, there is a wooden bead.



Based on the above information answer the following questions:

- a) The number of gold beads used in the strings forms an AP. Write the AP formed [1]
- b) If the distance between two consecutive strings is 2cm, what is the distance between the first and the 50th string? [1]
- c) If there are 50 strings in the curtain, how many wooden beads are required? [2]

OR

If there are a total of 50 strings in the curtain and the craft person has only 250 blue beads, how many more blue beads are needed? [2]