



BANGALORE SAHODAYA SCHOOLS COMPLEX ASSOCIATION

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

CLASS X –SET 2

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 HCF ( 21,42) ; 'Q' is the HCF (28,56) ; 'R' is the HCF of 'P' and 'Q', then, which of the following is true?  
(a)  $P = 4R$                       (b)  $P = 3R$                       (c)  $Q = 2R$                       (d)  $Q = 3R$
2. If  $\alpha$  and  $\beta$  are the zeroes of the quadratic polynomial  $p(x) = x^2 + x - 2$  the polynomial whose zeroes are  $\frac{1}{\alpha}$  and  $\frac{1}{\beta}$  is \_\_\_\_\_  
(a)  $2x^2 + x + 1$                       (b)  $2x^2 + x - 1$                       (c)  $2x^2 - x - 1$                       (d)  $2x^2 - x + 1$
3. The pair of equations  $x = 2$  and  $y = 5$  has \_\_\_\_\_  
(a) No solution                      (b) Two solutions                      (c) unique solution                      (d) Infinite solutions
4. The roots of the quadratic equation  $4x^2 - 2 = 0$  are  
(a) rational and equal                      (b) irrational and equal  
(c) irrational and unequal                      (d) rational and unequal.
5. The common difference of an A.P is 3, then  $a_{20} - a_{15}$  is \_\_\_\_\_  
(a) 5                      (b) 3                      (c) 15                      (d) 20

6. If the co-ordinates of the midpoint of the line joining the points  $(2p+1, 4)$  and  $(5, q-1)$  are  $(2p, q)$ , then the values of  $p$  and  $q$  are \_\_\_\_\_

- (a)  $p = 3, q = 3$                       (b)  $p = -3, q = -3$                       (c)  $p = 3, q = -3$                       (d)  $p = -3, q = 3$

7. If the median and mode of the data is 61.6 and 65 respectively then the mean of the data is \_\_\_\_\_

- (a) 29.1                      (b) 58.2                      (c) 34.2                      (d) 59.9

8. Which of the following is equal to the given expression  $\frac{\cot \theta \times \sec^2 \theta}{\operatorname{cosec} \theta}$  ?

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

9. The area of the square that can be inscribed in a circle of radius 8cm is \_\_\_\_\_  $\text{cm}^2$ .

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

10. At a fun fair a person will win a prize if he draws either a hearts or a face card from a deck of cards.

The probability of his winning is \_\_\_\_\_

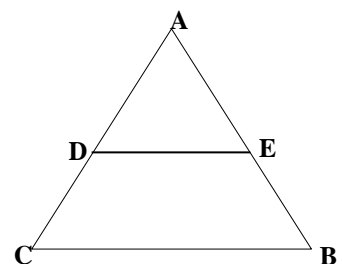
- (a)  $\frac{25}{52}$                       (b)  $\frac{11}{26}$                       (c)  $\frac{17}{52}$                       (d)  $\frac{13}{27}$

11. The point on the  $y$ -axis which is equidistant from  $(3,5)$  and  $(7,1)$  is \_\_\_\_\_

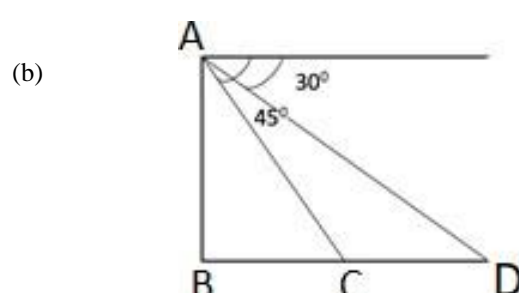
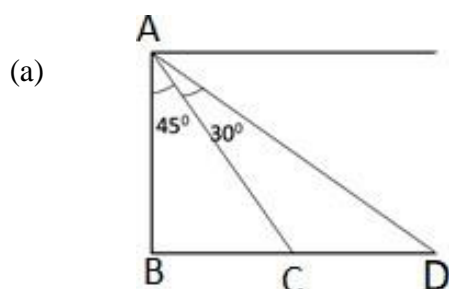
- (a)  $(0,2)$                       (b)  $(3,0)$                       (c)  $(0,-2)$                       (d)  $(-3,0)$

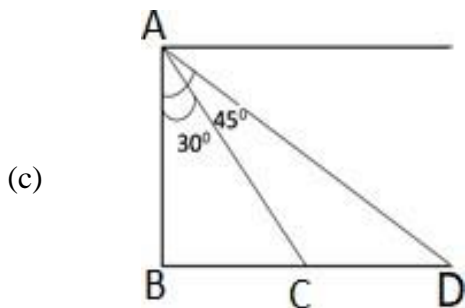
12. In the given figure  $DE \parallel CB$ ; If  $DE = 1.5\text{cm}$  and  $BC = 7.5\text{cm}$  then the ratio of  $AD : DC$  is \_\_\_\_\_.

- (a) 1 : 4                      (b) 1 : 5                      (c) 1 : 2                      (d) 1 : 3

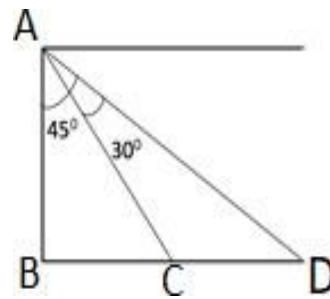


13. From the top of a tower AB the angles of depression of two cars C and D are  $45^\circ$  and  $30^\circ$  respectively. Which of the figures represents this situation?





(d)



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

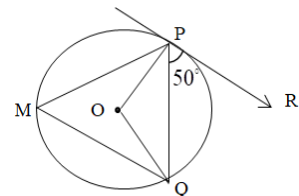
- (a) 44 cm                      (b) 132 cm                      (c) 22 cm                      (d) 66 cm

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

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

16. 'O' is the centre of a circle, PQ is a chord. If the tangent PR at P makes an angle of  $50^\circ$  with PQ then  $\angle PMQ$  is \_\_\_\_\_

- (a)  $50^\circ$                       (b)  $40^\circ$   
 (c)  $100^\circ$                       (d)  $80^\circ$



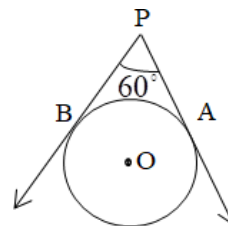
17. A die is rolled. Which of the following statements is incorrect?

- (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 a number greater than 6 is a certain event.

- (a) i and ii                      (b) ii only                      (c) i and iii                      (d) iii only

18. In the given figure angle between the tangents at the point P is  $60^\circ$ . Then the ratio of OB to BP is \_\_\_\_\_.

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



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 : If a right circular cylinder just encloses a sphere of radius 'r', then the ratio of the volume of the cylinder to the volume of the sphere is 3:2

Reason : The height of the cylinder is equal to the radius of the sphere.

- (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 : If  $S_n$  is the sum of first 'n' terms of an A.P there can be an A.P with  $S_6 = S_{13}$  .

Reason : The terms of an A.P can be positive or zero or negative.

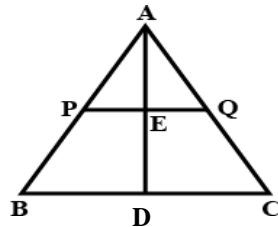
- (a) Both (A) and (R) are true and (R) is the correct explanation for (A).
- (b) Both (A) and (R) are true but (R) is not the correct explanation for (A).
- (c) (A) is true but (R) is false.
- (d) (A) is false but (R) is true.

**SECTION – B**

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

21. Three bulbs are connected in such a manner that they glow every 180 seconds, 72 seconds and 108 seconds respectively. If all of them glow together at 7pm then at what time will they again glow simultaneously?

22. In  $\Delta ABC$  , P and Q are points on AB and AC such that PQ is parallel to BC. Prove that the median AD bisects PQ.

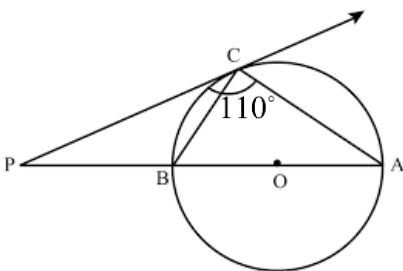


23. Find  $x$  such that  $2\operatorname{cosec}^2 30^\circ + x \sin^2 60^\circ - \frac{3}{4} \tan^2 30^\circ = 10$

**OR**

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

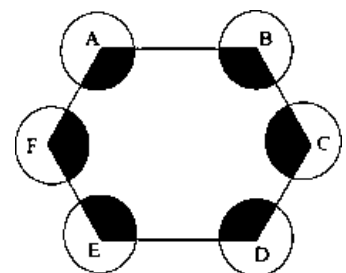
24. In the given figure AB is the diameter of a circle and AC is its chord such that the tangent at C intersects AB produced at P. If  $\angle PCA = 110^\circ$  find  $\angle CBA$



25. If a chord of a circle of radius 28cm makes an angle of  $90^\circ$  at the centre then find the area of its corresponding segment.

**OR**

ABCDEF is a regular hexagon. Vertices A, B, C, D, E and F are centres of circles of same radius 5cm. Find the area of the shaded region shown in the figure. ( $\pi = 3.14$ )



## SECTION – C

### Section C consists of 6 questions of 3 marks each

26. The sum of the present ages of a father and his son is 60 years. Six years ago, father's age was 5 times that of the son. What will be the son's age after six years?

**OR**

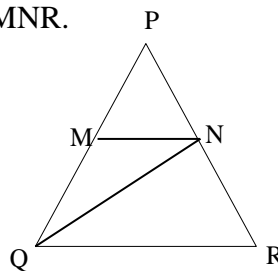
Find the value of 'p' and 'q' for which the following pair of equations has infinite solutions:

$$2x + 3y = 9$$

$$(p + q)x + (2p - q)y = 3(p + q + 1)$$

27. Prove that  $\sqrt{3} - 1$  is an irrational number.

28. In the figure,  $\Delta PQR \sim \Delta PMN$ .  $MN = 5\text{cm}$ ,  $NR = \frac{40}{3}\text{cm}$  and QN bisects  $\angle MNR$ .



Find the ratio of PM : PQ.

**OR**

ABCD is a parallelogram and APQ is a straight line meeting BC at P and DC produced at Q.

Prove that  $BP \times DQ = AB \times BC$ .

29. Prove that

$$\frac{\cos\theta - \sin\theta + 1}{\cos\theta + \sin\theta - 1} = \operatorname{cosec}\theta + \cot\theta$$

30. Find the value of 'm' if one zero of the polynomial  $p(x) = (m^2 - 24)x^2 + 65x + 2m$  is the reciprocal of the other.

31. Find the median age of the following data:

|                |       |       |       |       |       |       |       |
|----------------|-------|-------|-------|-------|-------|-------|-------|
| Age (in years) | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 |
| No. of Persons | 4     | 14    | 22    | 16    | 6     | 5     | 3     |

## SECTION – D

### Section D consists of 4 questions of 5 marks each

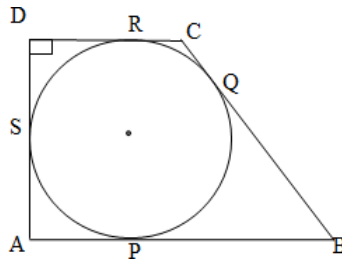
32. The denominator of a fraction is one more than twice the numerator. If the sum of the fraction and its reciprocal is  $2\frac{16}{21}$  find the fraction.

**OR**

Two pipes can fill a tank in  $11\frac{1}{9}$  minutes. If one pipe takes 5 minutes more than the other to fill the tank find the time in which each pipe would fill the tank separately.

33. (a) Prove that the lengths of the tangents drawn from an external point to a circle are equal.

(b) ABCD is a quadrilateral such that  $\angle D = 90^\circ$ . A circle touches the sides AB, BC, CD and DA at P, Q, R and S respectively. If  $BC = 38\text{cm}$ ,  $CD = 25\text{cm}$  and  $BP = 27\text{cm}$  find the radius of the circle.



34. (a) A water tank is cylindrical at the bottom surmounted by a hemisphere of same radius 12m. If the total capacity of the tank is  $1440\pi \text{ m}^3$ , find the height of the cylinder.

(b) A circus tent is in the form of a right circular cylinder surmounted by a right circular cone of same diameter 126m. If the height of the cylindrical part of the tent is 5m and the total height of the tent is 21m, find the total surface area of the tent. (Use  $\frac{22}{7}$ ).

**OR**

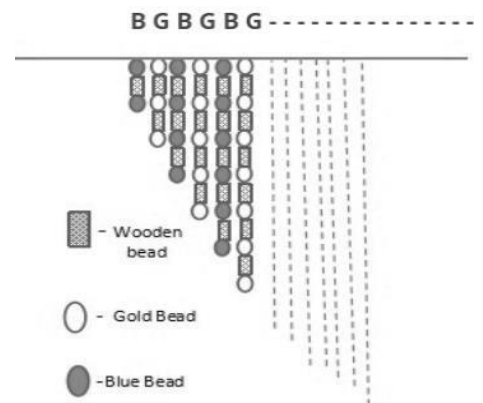
A solid toy consists of a right circular cone of height 60cm and radius 21cm standing on a hemisphere of radius 21cm. This solid toy is placed upright in a right circular cylinder full of water such that it touches the bottom. Find the volume of water left in the cylinder if the radius of the cylinder is 21cm and its height is 90cm.

35. If the mode of the given data is 45, then find the missing frequencies  $x$  and  $y$  where the sum of the frequencies is 40. Also find the mean of the data.

| Marks scored   | 0 - 20 | 20- 40 | 40 - 60 | 60 -80 | 80 - 100 |
|----------------|--------|--------|---------|--------|----------|
| No.of students | 8      | $x$    | $y$     | 6      | 4        |

**SECTION E**

36. An IT professional named Nagananda considers getting a beaded curtain for his work space. He hires a craftsman 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?

**OR**

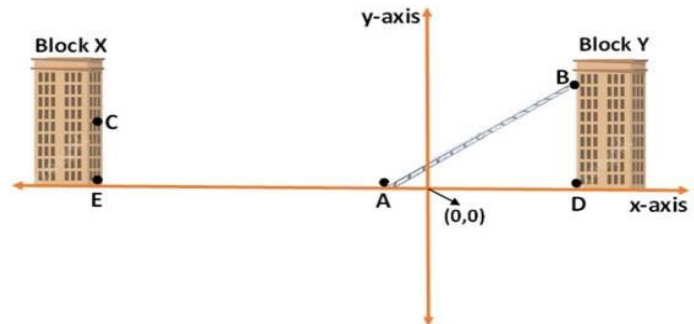
[2]

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?

**37.** 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?

**OR**

[2]

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.

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

**38.** 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.



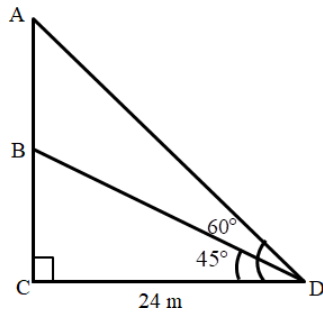
- a) When the altitude of the sun is  $30^\circ$  the length of the shadow of the Vidhana Soudha is  $\frac{107\sqrt{3}}{2}$  m .

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  $60^\circ$  and  $45^\circ$  respectively.

Based on the above information answer the following questions:



- b) Find the height AB

**OR**

[2]

Find lengths AD and BD

- 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]