BOARD QUESTION PAPER MARCH - 2023

Mathematics (Basic)

Time: 3 hours **Maximum Marks: 80**

General Instructions:

Read the following instructions very carefully and strictly follow them:

i. *This question paper contains **38** questions. **All** questions are **compulsory.***

ii. *This question paper is divided into **five** Sections – **A, B, C, D** and **E**.*

iii. *In **Section A,** Questions no. **1** to **18** are multiple choice questions **(MCQs)** and questions number **19** and **20** are Assertion-Reason based questions of **1** mark each.*

iv. *In **Section B,** Questions no. **21** to **25** are very short answer (VSA) type questions, carrying **2** marks each.*

v. *In **Section C,** Questions no. **26** to **31** are short answer (SA) type questions, carrying **3** marks each.*

vi. *In **Section D,** Questions no. **32** to **35** are long answer (LA) type questions carrying **5** marks each.*

vii. *In **Section E,** Questions no. **36** to **38** are case study based questions carrying **4** marks each. Internal choice is provided in **2** marks questions in each case-study.*

viii. *There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 2 questions in Section C, 2 questions in Section D and 3 questions in Section E.*

ix. *Draw neat diagrams wherever required. Take $\pi = \frac{22}{7}$ wherever required, if not stated.*

x. *Use of calculators is **not** allowed.*

SECTION A

This section comprises multiple choice questions (MCQs) of 1 mark each.

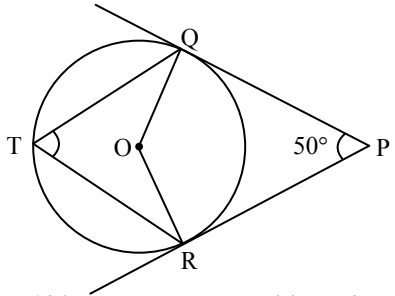
1. How many terms are there in the A.P. given below?
14, 19, 24, 29, ……, 119
(a) 18 (b) 14 (c) 22 (d) 21

2. In what ratio does x-axis divide the line segment joining the points A(2, –3) and B(5, 6)?
(a) 2 : 3 (b) 2 : 1 (c) 3 : 4 (d) 1 : 2

3. $9\sec^2 A - 9\tan^2 A$ is equal to:
(a) 9 (b) 0 (c) 8 (d) $\frac{1}{9}$

4. The string of a kite in air is 50 m long and it makes an angle of 60° with the horizontal. Assuming the string to be straight, the height of the kite from the ground is:
(a) $50\sqrt{3}$ m (b) $\frac{100}{\sqrt{3}}$m (c) $\frac{50}{\sqrt{3}}$m (d) $25\sqrt{3}$ m

5. From a point P, two tangents PQ and PR are drawn to a circle with centre at O. T is a point on the major arc QR of the circle. If ∠QPR = 50°, then ∠QTR equals:



(a) 50° (b) 130° (c) 65° (d) 90°

6. The area of a sector of angle α (in degrees) of a circle with radius R is:

(a) $\frac{\alpha}{180} \times 2\pi R$ (b) $\frac{\alpha}{360} \times 2\pi R$ (c) $\frac{\alpha}{180} \times \pi R^2$ (d) $\frac{\alpha}{360} \times \pi R^2$

7. If the HCF of 360 and 64 is 8, then their LCM is:

(a) 2480 (b) 2780 (c) 512 (d) 2880

8. The curved surface area of a right circular cylinder of height 14 cm is 88 cm^2. The diameter of its circular base is:

(a) 2 cm (b) 1 cm (c) 4 cm (d) 7 cm

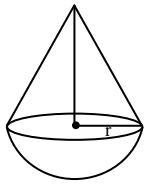
9. A die is rolled once. The probability that a composite number comes up, is:

(a) $\frac{1}{2}$ (b) $\frac{2}{3}$ (c) $\frac{1}{3}$ (d) 0

10. If the quadratic equation $9x^2 + bx + \frac{1}{4} = 0$ has equal roots, then the value of b is:

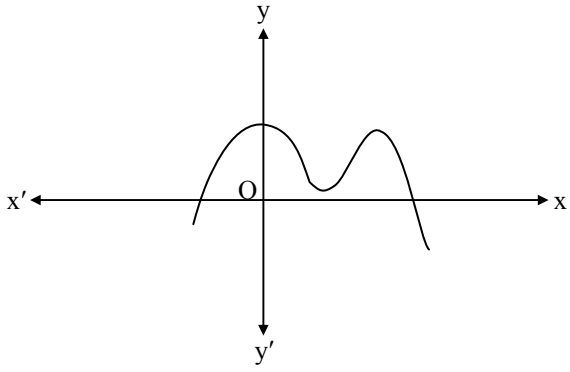
(a) 0 (b) – 3 only (c) 3 only (d) ± 3

11. A solid is of the form of a cone of radius 'r' surmounted on a hemisphere of the same radius. If the height of the cone is the same as the diameter of its base, then the volume of the solid is:



(a) πr^3 (b) $\frac{4}{3}\pi r^3$ (c) $3\pi r^3$ (d) $\frac{2}{3}\pi r^3$

12. Graph of a polynomial p(x) is given in the figure. The number of zeroes of p(x) is:



(a) 2 (b) 3 (c) 4 (d) 5

13. The pair of linear equations $x + 2y - 5 = 0$ and $2x - 4y + 6 = 0$:

(a) is inconsistent (b) is consistent with many solutions
(c) is consistent with a unique solution (d) is consistent with two solutions

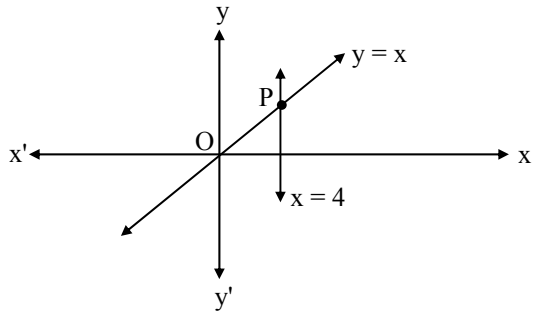
14. Which of the following numbers ***cannot*** be the probability of an event?

(a) 0.5 (b) 5% (c) $\frac{1}{0.5}$ (d) $\frac{0.5}{14}$

15. The value of $2\sin^2 30° + 3\tan^2 60° - \cos^2 45°$ is:

(a) $3\sqrt{3}$ (b) $\frac{19}{2}$ (c) $\frac{9}{4}$ (d) 9

16. The lines represented by the linear equations y = x and x = 4 intersect at P. The coordinates of the point P are:



(a) (4, 0) (b) (4, 4) (c) (0, 4) (d) (– 4, 4)

17. Median and Mode of a distribution are 25 and 21 respectively. Mean of the data using empirical relationship is:

(a) 27 (b) 29 (c) 18 (d) $\frac{29}{3}$

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

(a) $\frac{25}{4}$ (b) $\frac{4}{25}$

(c) $\frac{4}{5}$ (d) $\frac{5}{4}$

*Questions number **19** and **20** are Assertion and Reason based questions carrying 1 mark each. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.*

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is ***not*** the correct explanation of the Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

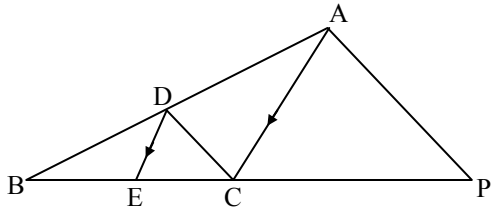
19. *Assertion (A)*: Polynomial $x^2 + 4x$ has two real zeroes.
Reason (R): Zeroes of the polynomial $x^2 + ax$ ($a \neq 0$) are 0 and a.

20. *Assertion (A)*: The probability of getting a prime number, when a die is thrown once, is $\frac{2}{3}$.
Reason (R): On the faces of a die, prime numbers are 2, 3, 5.

SECTION B

This section comprises very short answer (VSA) type questions of 2 marks each.

21. In the given figure, DE || AC and $\frac{BE}{EC} = \frac{BC}{CP}$. Prove that DC || AP.



22. a. Find the HCF of the numbers 540 and 630, using prime factorization method.

OR

b. Show that $(15)^n$ cannot end with the digit 0 for any natural number 'n'.

23. a. Find the value (s) of 'x' so that PQ = QR, where the coordinates of P, Q and R are (6, –1), (1, 3) and (x, 8) respectively.

OR

b. The vertices of a triangle are (–2, 0), (2, 3) and (1, –3). Is the triangle equilateral, isosceles or scalene?

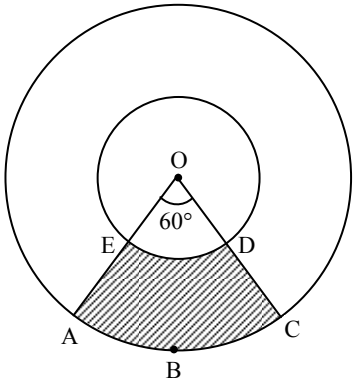
24. Find the value of 'k' such that the polynomial p(x) = $3x^2 + 2kx + x - k - 5$ has the sum of zeroes equal to half of their product.

25. From a well-shuffled deck of 52 playing cards, all diamond cards are removed. Now, a card is drawn from the remaining pack at random. Find the probability that the selected card is a king.

SECTION C

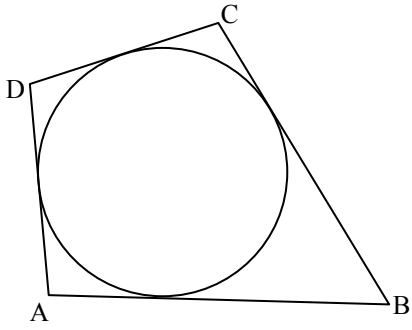
This section comprises short answer (SA) type questions of 3 marks each.

26. In the given figure, two concentric circles with centre O are shown. Radii of the circles are 2 cm and 5 cm respectively. Find the area of the shaded region.



27. Prove that $4 + 2\sqrt{3}$ is an irrational number, given that $\sqrt{3}$ is an irrational number.

28. a. A quadrilateral ABCD is drawn to circumscribe a circle, as shown in the figure. Prove that AB + CD = AD + BC.



OR

b. Prove that the parallelogram circumscribing a circle is a rhombus.

29. a. Prove that : $\frac{1-\cos\theta}{1+\cos\theta} = (\text{cosec}\,\theta - \cot\theta)^2$

OR

b. Prove that: $\left(1+\frac{1}{\tan^2 A}\right)\left(1+\frac{1}{\cot^2 A}\right) = \frac{1}{\sin^2 A - \sin^4 A}$

30. Find the zeroes of the polynomial p(x) = $2x^2 - 7x - 15$ and verify the relationship between its coefficients and zeroes.

31. Prove that the points A(–1, 0), B(3, 1), C(2, 2) and D(–2, 1) are the vertices of a parallelogram ABCD. Is it also a rectangle?

SECTION D

This section comprises long answer (LA) type questions of 5 marks each.

32. a. From the top of a building 60 m high, the angles of depression of the top and bottom of a tower are observed to be 30° and 60° respectively. Find the height of the tower. Also, find the distance between the building and the tower. (Use $\sqrt{3} = 1.732$)

OR

b. The angle of elevation of the top of a building from a point A on the ground is 30°. On moving a distance of 30 m towards its base to the point B, the angle of elevation changes to 45°. Find the height of the building and the distance of its base from point A. (Use $\sqrt{3} = 1.732$)

33. Find the mean and the median of the following data:

Marks	Number of Students
0 – 10	3
10 – 20	5
20 – 30	16
30 – 40	12
40 – 50	13
50 – 60	20
60 – 70	6
70 – 80	5

34. If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then prove that the other two sides are divided in the same ratio.

35. a. If the sum of the first 7 terms of an A.P. is –14 and that of 11 terms is –55, then find the sum of its first 'n' terms.

OR

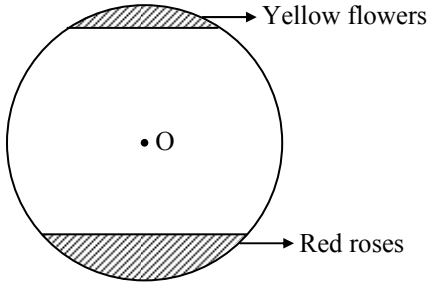
b. In an A.P., the sum of the first 'n' terms is $3n^2 + n$. Find the first term and the common difference of the A.P. Hence, find its 15^{th} term.

SECTION E

This section comprises 3 case study based questions of 4 marks each.

Case Study – 1

36. Flower beds look beautiful growing in gardens. One such circular park of radius 'r' m, has two segments with flowers. One segment which subtends an angle of 90° at the centre is full of red roses, while the other segment with central angle 60° is full of yellow coloured flowers. [See figure]



It is given that the combined area of the two segments (of flowers) is $256\frac{2}{3}$ sq m.

Based on the above, answer the following questions:

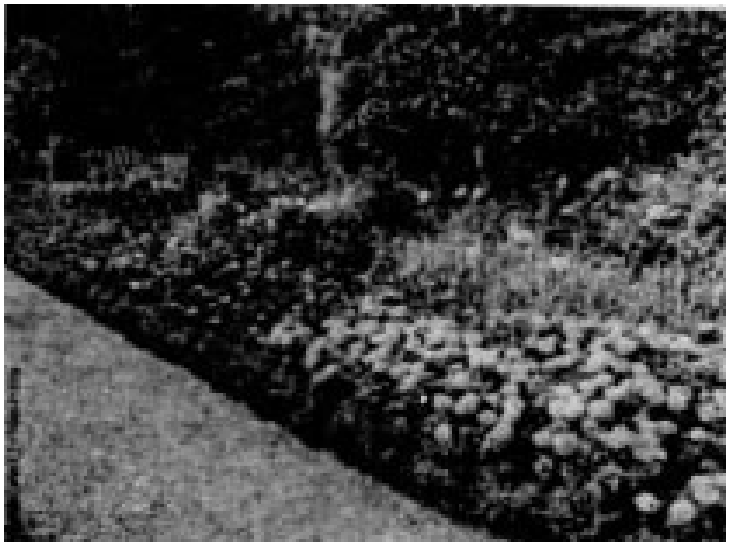
i. Write an equation representing the total area of the two segments in terms of 'r'.

ii. Find the value of 'r'.

iii. a. Find the area of the segment with red roses.

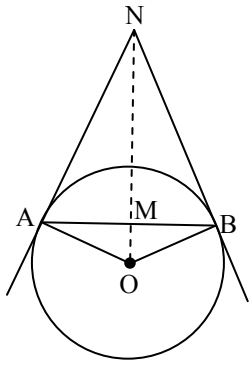
OR

b. Find the area of the segment with yellow flowers.



Case Study – 2

37. Circles play an important part in our life. When a circular object is hung on the wall with a cord at nail N, the cords NA and NB work like tangents. Observe the figure, given that ∠ANO = 30° and OA = 5cm.



Based on the above, answer the following questions:

i. Find the distance AN. 1

ii. Find the measure of ∠AOB. 1

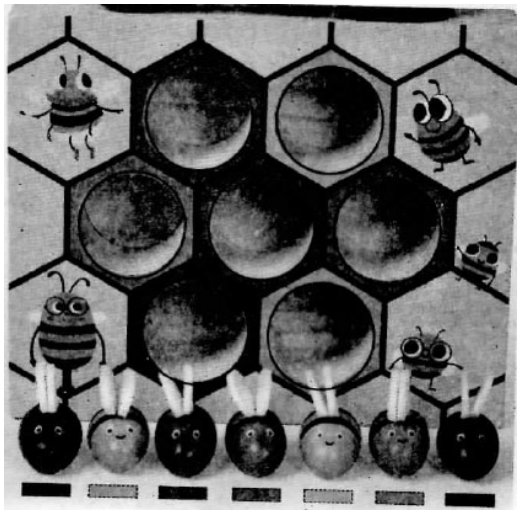
iii. a. Find the total length of cords NA, NB and the chord AB. 2

OR

iii. b. If ∠ANO is 45°, then name the type of quadrilateral OANB.
Justify your answer. 2

Case Study – 3

38. A wooden toy is shown in the picture. This is cuboidal wooden block of dimensions 14 cm × 17 cm × 4 cm. On its top there are seven cylindrical hollows for bees to fit in. Each cylindrical hollow is of height 3 cm and radius 2 cm.



Based on the above, answer the following questions:

i. Find the volume of wood carved out to make one cylindrical hollow. 1

ii. Find the lateral surface area of the cuboid to paint it with green colour. 1

iii. a. Find the volume of wood in the remaining cuboid after carving out seven cylindrical hollows. 2

OR

iii. b. Find the surface area of the top surface of the cuboid to be painted yellow. 2