

PREBOARD

Class: X

Session: 2019-20

Mathematics

Duration: 3 Hours

Max.Marks: 80

All Questions are compulsory.

The question paper comprise of 30 questions divided into four sections A, B, C and D. You have to attempt all the four sections. Question **1 to 6** in section A is one mark questions. Questions **7 to 12** in section B are two marks questions. Questions **13 to 22** in section C are three marks questions. Questions **23 to 30** in section D are four marks questions. There is no overall choice. However, an internal choice has been provided in two questions of 1 mark each, two questions of 2 marks each, four questions of 3 marks each and three questions of 4 marks each. You have to attempt only one of the alternatives in all such questions.

Use of Calculator is not permitted.

SECTION – A (1 Mark each)

1. Find the perimeter of a triangle with vertices (0, 4), (0, 0) and (3, 0).

2. Solve the following equation for x:

$$4x^2 + 4bx - (a^2 - b^2) = 0$$

OR

Find the roots of the following quadratic equation: $15x^2 - 10\sqrt{6}x + 10 = 0$

3. If $\sqrt{2} \sin \theta = 1$, find the value of $\sec^2 \theta - \operatorname{cosec}^2 \theta$.

OR

If $\cos 2A = \sin (A-15)$, find A.

4. Find the 10th term of the sequence $\sqrt{2}, \sqrt{8}, \sqrt{18}, \dots$

5. In an equilateral triangle of side $3\sqrt{3}$ cm, find the length of the altitude.

6. Check whether 15^n can end with digit 0 for any $n \in \mathbb{N}$.

SECTION – B (2 Marks each)

7. If two positive integers p and q are written as $p = a^2b^3$ and $q = a^3b$, where a and b are prime numbers then verify.

$$\operatorname{LCM}(p, q) \times \operatorname{HCF}(p, q) = pq$$

OR

Determine the values of p and q so that the prime factorization of 2520 is expressible as $2^3 \times 3^p \times q \times 7$.

8. If five times the 5th term of an AP is equal to eight times its 8th term, show that its 13th term is zero.

OR

If the sum of the first 7 terms of an AP is 49 and that of the first 17 terms is 289, find the sum of its first n terms.

9. If A (5, 2), B (2,-2) and C (-2, m) are the vertices of a right angled triangle with $\angle B = 90^\circ$, then find the value of m.

10. A letter of English alphabet is chosen at random, find the probability that the letter so chosen is;
(i) a vowel (ii) a consonant.

11. Two dice are thrown together. What is the probability of getting a doublet.

12. Sum of the ages of a father and the son is 40 years. If father's age is three times that of his son, then find their present ages.

SECTION – C (3 Marks each)

13. Use Euclid's division lemma to show that the square of any positive integer cannot be of the form $5m+2$ or $5m+3$ for some integer m.

14. If α and β are the zeroes of a quadratic polynomial such that $\alpha + \beta = 24$ and $\alpha - \beta = 8$. Find the quadratic polynomial having α and β as its zeroes.

15. Solve for x and y: $\frac{2}{3x+2y} + \frac{3}{3x-2y} = \frac{17}{5}$; $\frac{5}{3x+2y} + \frac{1}{3x-2y} = 2$.

16. P and Q are the points on the line segment joining the points A (8, 3) and B (11, 15) such that AP = PQ = QB. Find the coordinates of P and Q.

OR

If the points A (-2, 1), B (a, b) and C(4,1) are collinear and $a - b = 1$, find a and b.

17. Evaluate $\frac{\sin 30^\circ + \tan 45^\circ - \operatorname{cosec} 60^\circ}{\sec 30^\circ + \cos 60^\circ + \cot 45^\circ}$

OR

Prove that $\frac{\cos(90-A)}{1+\sin(90-A)} + \frac{1+\sin(90-A)}{\cos(90-A)} = 2 \sec(90-A)$

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

19. In ΔPQR , $\angle Q = 90^\circ$, S and T trisect the side QR of a right triangle PQR. Prove that $8PT^2 = 3PR^2 + 5PS^2$

OR

In an equilateral triangle ABC, D is a point on side BC such that $4BD = BC$. Prove that $16AD^2 = 13 BC^2$.

20. In figure, $AC = BD = 7$ cm and $AB = CD = 1.75$ cm. Semi-circles are drawn as shown in the figure. Find the area of the shaded region. (Use $\pi = \frac{22}{7}$)

21. A well of diameter 4 m dug 21 m deep. The earth taken out of it has been spread evenly all around it in the shape of a circular ring of width 3 m to form an embankment. Find the height of the embankment.

OR

Water is flowing at the rate of 15 km/hr through a pipe of diameter 14 cm into a cuboidal pond which is 50 m long and 44 m wide. In what time will the level of water in the pond rise by 21 cm?

22. If the mean of the following frequency distribution is 91, find the missing frequencies F_1 and F_2 .

Class	Frequency
0-30	12
30-60	21
60-90	F_1
90-120	52
120-150	F_2
150-180	11
Total	150

SECTION – D (4 Marks each)

23. In a rectangular part of dimensions 50 m x 40 m a rectangular pond is constructed so that the area of the grass strip of uniform breadth surrounding the pond would be 1184 m^2 . Find the length and breadth of the pond.

24. The sum of the first fifteen terms of an AP is 105 and the sum of the next fifteen terms is 780. Find first three terms of an AP. Also find its tenth term.

25. Prove that, “If a line divides any two sides of a triangle in the same ratio, then the line is parallel to third side”

OR

Prove that, “The ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides”

26. ΔABC is a right angled triangle in which $AB = 6$ cm, $BC = 8$ cm and $\angle B = 90^\circ$, BD is the perpendicular from B on AC . The circle passes through B, C and D is drawn. Construct the tangents from A to the circle. Also write the steps of constructions.

27. There is a small island in a 100 m wide river and a tall tree stands on the island. P and Q are points directly opposite to each other on the two banks and in the line with the tree. If the angles of elevation of the top of the tree from P and Q are 30° and 45° respectively, find the height of the tree.

OR

The angle of elevation of the top of a rock, from the top and foot of a 100 m high tower are 30° and 45° . Find the height of the rock.

28. The mileage (km/ litre) of 50 cars of the same variant was tested by a manufacturer and details are tabulated as given below:

Mileage (km/ litre)	10-12	12-104	14-16	16-18
No. of cars	7	12	18	13

Find the mean mileage.

The manufacturer claimed that the modal mileage of the car was 16 km/litre. Do you agree with this claim?

OR

For the following frequency distribution draw a more than cumulative frequency curve.

C.I.	Frequency
30-35	15
35-40	28
40-45	33
45-50	20
50-55	24
55-60	19
60-65	6
65-70	8

Use the above curve to find the median.

29. The barrel of a fountain pen, a cylindrical in shape is 7 cm long and 5 mm in diameter. A full barrel of ink in the pen will be used up when writing 310 words, on an average. How many words would use up a bottle of ink containing one-fifth of a liter? (Given answer correct to the nearest 100 words)

30. Prove that $\frac{\tan\theta}{1-\cot\theta} + \frac{\cot\theta}{1-\tan\theta} = 1 + \sec\theta \cdot \csc\theta$
