AMRITA VIDYALAYAM

AMRITA PRE BOARD EXAMINATION 2019 - 20

Class : X **Marks : 80**

Time : 3 hrs

MATHEMATICS

GENERAL INSTRUCTIONS:

1. ***All questions are compulsory.***
2. ***This question paper consists of 40 questions divided into four sections; A, B, C and D.***
3. ***Section A consists of 20 questions of 1 mark each, Section B consists of 6 questions of 2 marks each, Section C consists of 8 questions of 3 marks each and Section D consists of 6 questions of 4 marks each.***
4. ***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, three 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.***
5. ***Use of calculators is not permitted.***

SECTION - A

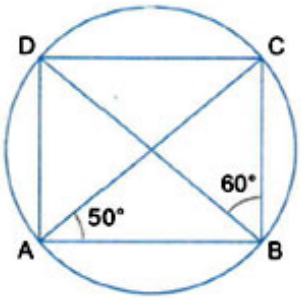
1. The number $3^{13} - 3^{10}$ is divisible by _____.
   a) 2 and 3 b) 3 and 10 c) 2, 3 and 10 d) 2, 3 and 13
2. If the sum of the zeros of the polynomial $f(x) = 2x^3 - 3kx^2 + 4x - 5$ is 6, then the value of k is _____.
   a) 2 b) -2 c) 4 d) -4
3. A fraction becomes 4 when 1 is added to both the numerator and denominator and it becomes 7 when 1 is subtracted from both the numerator and denominator. The numerator of the given fraction is _____.
   a) 2 b) 3 c) 5 d) 15
4. A single letter is selected at random from the word 'PROBABILITY' . The probability that the selected letter is a vowel is _____.
   a) 2/11 b) 3/11 c) 4/11 d) 0
5. If the equation $(m^2 + n^2) x^2 - 2 (mp + nq) x + p^2 + q^2 = 0$ has equal roots then _____.
   a) mp = nq b) mq = np c) mn = pq d) $mq = \sqrt{np}$
6. If the common difference of an AP is 5 then what is $a_{18} - a_{13}$?
   a) 5 b) 20 c) 25 d) 30
7. If $x = p \sec \theta$ and $y = q \tan \theta$, then _____.
   a) $x^2 - y^2 = p^2q^2$ b) $x^2q^2 - y^2p^2 = pq$ c) $x^2q^2 - y^2p^2 = \frac{1}{p^2q^2}$ d) $x^2q^2 - y^2p^2 = p^2q^2$
8. The area of two similar triangles ABC and PQR are in the ratio of 9 : 16. If BC = 4.5 cm, then the length QR is _____.
   a) 4 cm b) 4.5 cm c) 3 cm d) 6 cm
9. Find the ratio in which the point (2, y) divides the join of (-4, 3) and (6, 3) and find the value of y.
   a) 2 : 3, y = 3 b) 3 : 2, y = 4 c) 3 : 2, y = 3 d) 3 : 2, y = 2
10. The present ages of a father and his son are in the ratio 7 : 3 and they will be in the ratio 2 : 1 after 10 years, then the present age of father (in years) is _____.
    a) 42 b) 56 c) 70 d) 77
11. Find the arc length of the sector with radius 14 cm and sector angle 45^0.

12. The total surface area of solid hemisphere having radius r is _____.
13. Points (3, 2), (-2, -3) and (2, 3) form a _____ triangle.

OR

The volume of a cube with d is _____.

14. The volume and surface area of a sphere are numerically equal, then the radius of a sphere is _____ unit.
15. An electric pole is 10 m high. If its shadow is $10\sqrt{3}$ m in length, then the elevation of the sun is ____.
16. If the length of a ladder placed against wall is twice the distance between the foot of the ladder and wall. Find the angle made by the ladder with the horizontal?
17. Find the value of $3 \sin^2 20^0 - 2 \tan^2 45^0 + 3 \sin^2 70^0$?
18. In figure ABCD is a cyclic quadrilateral. If $\angle BAC = 50^0$ and $\angle DBC = 60^0$, then find $\angle BCD$.



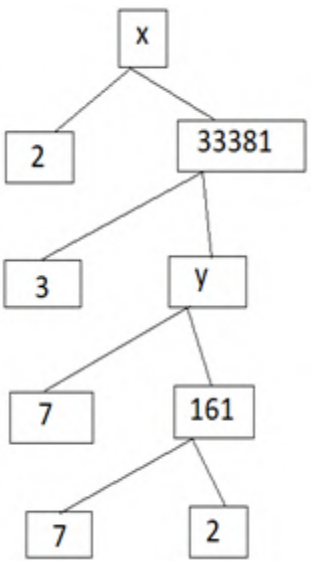
OR

If 18, a, b, -3 are in AP, find the value of a + b.

19. If $\cos 9\alpha = \sin \alpha$ and $9\alpha < 90$, find the value of $\tan 5\alpha$.
20. A chord of a circle of radius 10 cm subtends a right angle at the centre. Find the area of minor segment ($\pi = 3.14$).

SECTION - B

21. Complete the following factor tree and find the composite number x.

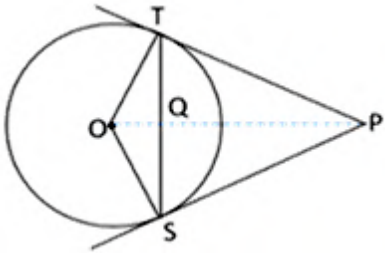


22. Prove that the point (3, 0), (6, 4) and (-1, 3) are the vertices of a right angled isosceles triangle.
23. If the ratio of sum of the first m and n terms of an AP is $m^2 : n^2$, show that ratio of its m^{th} and n^{th} term is (2m - 1) : (2n - 1).

OR

The 4th term of an AP is zero. Prove that the 25th term of the AP is 3 times its 11th term.

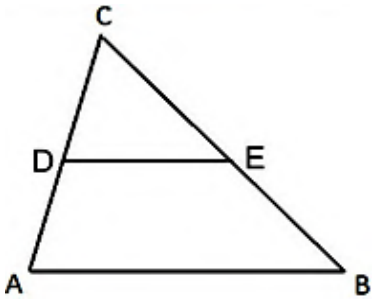
24. In figure, from an external point P, two tangents PT and PS are drawn to the circle with centre O and radius r. If OP = 2r, show that $\angle OTS = \angle OST = 30^0$.



25. The sides AB and AC and the perimeter P_1 of ΔABC are respectively three times the corresponding sides DE and DF and its perimeters P_2 of ΔDEF. Are the two triangles similar? If yes find $\frac{\text{ar}(\Delta ABC)}{\text{ar}(\Delta DEF)}$.

OR

In the given figure, $\angle A = \angle B$ and AD = BE. Show that DE || AB.



26. Find the number of natural numbers between 101 and 999 which are divisible by both 2 and 5?

SECTION - C

27. Show that 1/2 and - 3/2 are the zeros of the polynomial $4x^2 + 4x - 3$ and verify relationship between zeros and coefficient of the polynomial.

OR

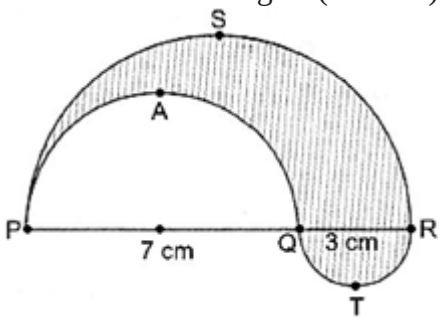
If one of the zeroes of the polynomial $3x^2 - 8x + 2k + 1$ is 7 times the other, find the value of k.

28. Prove that $\sqrt{5}$ is an irrational number and hence show that $2 - \sqrt{5}$ is also an irrational number.
29. Find the co-ordinates of the point P on the line segment joining A (1, 2), B (6, 7) such that AP = 2/5 AB.

. OR

Find the ratio in which the line segment joining the points A (3, -3) and B (-2, 7) is divided by x-axis. Also find the coordinates of point of division?

30. In the given figure PSR, RTQ and PAQ are three semi-circles of diameter 10 cm, 3cm, 7cm respectively. Find the perimeter of the shaded region ($\pi = 3.14$).



31. Cards numbered from 11 to 60 are kept in a box. If a card is drawn at random from the box, find the probability that the number on the drawn card is
    a) an odd number. b) a perfect square number. c) divisible by 5.
32. Prove that $\frac{1 - \sin\theta}{1 + \sin\theta} = (\sec\theta - \tan\theta)^2$.

OR

Prove that $\frac{\cos A}{1 + \sin A} + \frac{1 + \sin A}{\cos A} = 2 \sec A$

33. If the roots of the equation $(c^2 - ab)x^2 - 2(a^2 - bc)x + b^2 - ac = 0$ in x are equal, then show that either $a = 0$ or $a^3 + b^3 + c^3 = 3abc$.
34. ABC is an equilateral triangle of side 2a. Find each of its altitude.

SECTION - D

35. A motorboat whose speed is 24 km / h in still water takes 1 hour more to go 32 km upstream than to return downsream to the same spot. Find the speed of the stream.

. OR

Solve for x and y.
$2x - y + 3 = 0$
$3x - 5y + 1 = 0$

36. If the angle of elevation of cloud from point h metres above lake is α and its angle of depression of its reflection in the lake is β. Prove that the height of the cloud is $\frac{h(\tan\beta + \tan\alpha)}{\tan\beta - \tan\alpha}$.
37. Construct a right triangle in which sides (other than the hypotenuse) are 8 cm and 6 cm. Then construct another triangle whose sides are 3/5 times corresponding sides of right triangle.

OR

Let ABC be a right triangle in which AB = 6 cm, BC = 8 cm and $\angle B = 90^0$. BD is perpendicular from B on AC. The circle through B, D, C is drawn. Construct a tangent from A to this circle.

38. A container, opened from the top and made up of metal sheet is in the form of a frustum of a cone of height 16 cm with radii of its lower and upper ends as 8 cm and 20 cm, respectively. Find the cost of milk which can completely fill the container, at the rate of ₹ 20 per litre. Also find the cost of metal sheet used to make the container if it costs ₹ 8 per 100 cm^2? ($\pi = 3.14$)

. OR

The height of cone is 30 cm. From its top side a small cone is cut by a plane parallel to its base. If the volume of smaller cone is 1/27 of the given cone, then at what height it is cut from its base?

39. A card is drawn at random from a pack of 52 cards. Find the probability the card drawn is
    a) neither an ace nor a king. b) either red or a king.
    c) a face card. d) the queen of diamonds.
40. Find the value of x and y, if the median for the following data is 31.

Class	0-10	10-20	20-30	30-40	40-50	50-60	Total
Frequency	5	x	6	y	6	5	40