MATHEMATICS STANDARD 2020

SECTION - A

20 Marks

Directions Q. (1-10): Select the most appropriate option from those given below each question:

1. The HCF of 135 and 225 is:
(a) 15 (b) 75
(c) 45 (d) 5 1

2. The exponent of 2 in the prime factorisation of 144, is:
(a) 2 (b) 4
(c) 1 (d) 6 1

3. The common difference of an AP, whose n^{th} term is $a_n = (3n + 7)$, is:
(a) 3 (b) 7
(c) 10 (d) 6 1

4. The value of λ for which the $(x^2 + 4x + \lambda)$ is perfect square, is:
(a) 16 (b) 9
(c) 1 (d) 4 1

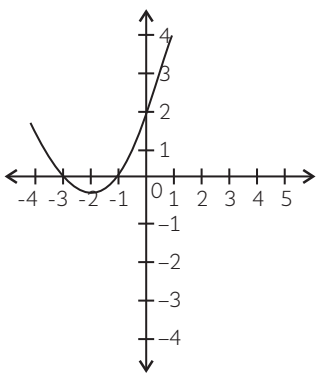
5. The value of k, for which the pair of linear equations $kx + y = k^2$ and $x + ky = 1$ has infinitely many solutions, is:
(a) ±1 (b) 1
(c) –1 (d) 2 1

6. The value of p for which $(2p + 1)$, 10 and $(5p + 5)$ are three consecutive terms of an AP, is:
(a) –1 (b) –2
(c) 1 (d) 2

OR

The number of terms of an AP 5, 9, 13, ..., 185 is:
(a) 31 (b) 51
(c) 41 (d) 40 1

7. In the figure, the graph of the polynomial $p(x)$ is given. The number of zeroes of the polynomial is:



(a) 1 (b) 2
(c) 3 (d) 0 1

8. If (a, b) is the mid-point of the line segment joining the points A(10, –6), B(k, 4) and $a - 2b = 18$, the value of k is:
(a) 30 (b) 22
(c) 4 (d) 40 1

9. The value of k for which the points A(0, 1), B(2, k) and C(4, –5) are collinear is:
(a) 2 (b) –2
(c) 0 (d) 4 1

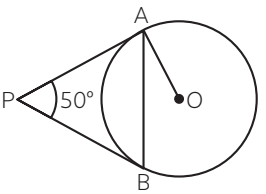
10. If $\triangle ABC$ and $\triangle DEF$ such that AB = 1.2 cm and DE = 1.4 cm, the ratio of the areas of $\triangle ABC$ and $\triangle DEF$ is:**
(a) 49 : 36 (b) 6 : 7
(c) 7 : 6 (d) 36 : 49 1

Directions Q. (11-15): Fill in the blanks

11. $\sqrt{2}$ times the distance between (0, 5) and (– 5, 0) is 1

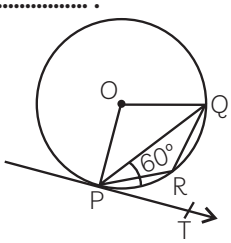
12. The distance between two parallel tangents of a circle of radius 4 cm is 1

13. In the figure, PA and PB are tangents to the circle with centre O such that $\angle APB = 50°$, and the measure of $\angle OAB$ is ..... .



OR

In the figure, PQ is a chord of a circle and PT is a tangent touching the circle at P such that $\angle QPT = 60°$, and the measure of $\angle PRQ$ is ..... .



1

14. $\dfrac{3\cot 40°}{\tan 50°} - \dfrac{1}{2}\left(\dfrac{\cos 35°}{\sin 55°}\right) =$ .....** 1

15. If $\cot\theta = \dfrac{7}{8}$, then the value of

$\dfrac{(1 - \sin\theta)(1 - \sin\theta)}{(1 - \cos\theta)(1 - \cos\theta)} =$ 1

Directions Q. (16-20): Very Short Answer Type Questions

16. What is the value of $\left(\frac{1}{1+\cot^2\theta}+\frac{1}{1+\tan^2\theta}\right)$? 1

17. Two right circular cones have their heights in the ratio 1 : 3 and radii in the ratio 3 : 1, What is the ratio of their volumes? 1

18. Using the empirical formula, find the mode of a distribution whose mean is 8.32 and the median is 8.05. 1

19. The probability that it will rain tomorrow is 0.85. What is the probability that it will not rain tomorrow? 1

20. What is the arithmetic mean of the first '*n*' natural numbers? 1

SECTION - B

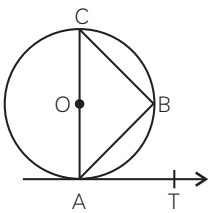
12 Marks

21. Find the 11^{th} term from the last term (towards the first term) of the AP 12, 8, 4, ..., – 84.

OR

Solve the equation: 1 + 5 + 9 + 13 + ... + x = 1326. 2

22. In the figure, AB is a chord of a circle with centre O, AOC is the diameter and AT is a tangent touching the circle at A. Prove that ∠BAT = ∠ACB.



2

23. If $\tan\theta = \frac{3}{4}$, find the value of $\left(\frac{1-\cos^2\theta}{1+\cos^2\theta}\right)$

OR

If $\tan\theta = \sqrt{3}$, find the value of $\left(\frac{2\sec\theta}{1+\tan^2\theta}\right)$ 2

24. Read the following passage and answer the questions given:

Students of Class XII presented a gift to their school in the form of an electric lamp in the shape of a glass hemispherical base surmounted by a metallic cylindrical top of same radius 21 cm and height 3.5 cm. The top was silver coated and the glass surface was painted red.

(A) What is the cost of silver coating the top at the rate of ₹ 5 per 100 cm^2?

(B) What is the surface area of glass to be painted red? 2

25. Find the probability that a leap year selected at random will contain 53 Sundays and 53 Mondays. 2

26. Find the value of *p*, if the mean of the following distribution is 7.5.

Classes	2-4	4-6	6-8	8-10	10-12	12-14
Frequency (f_i)	6	8	15	*p*	8	4

2

SECTION - C

24 Marks

27. Find *a, b* and c if it is given that the numbers *a,* 7, *b,* 23, *c* are in AP.

OR

If *m* times the m^{th} term of an AP is equal to *n* times its n^{th} term, show that the $(m + n)^{th}$ term of the AP is zero. 3

28. Find the value of *k*, for which the quadratic equation $(k + 4)x^2 + (k + 1)x + 1 = 0$ has equal roots. 3

29. On dividing $x^3 - 3x^2 + n + 2$ by a polynomial $g(x)$, the quotient and remainder were $x - 2$ and $-2x + 4$, respectively. Find $g(x)$.**

OR

If the sum of the squares of zeroes of the quadratic polynomial $f(x) = x^2 - 8x + k$ is 40, find the value of *k*. 3

30. In what ratio does the point P(–4, *y*) divide the line segment joining the points A(–6, 10) and B(3, –8) if it lies on AB. Also, find the value of *y*. 3

31. Prove that a tangent to a circle is perpendicular to the radius through the point of contact.

OR

Prove that the angle between the two tangents drawn from an external point

to a circle is supplementary to the angle subtended by the line segment joining the points of contact at the centre. 3

32. In a right triangle, prove that the square of the hypotenuse is equal to the sum of squares of the other two sides.** 3

33. If $\sin\theta + \cos\theta = p$ and $\sec\theta + \text{cosec}\,\theta = q$, show that $q(p^2 - 1) = 2p$. 3

34. 500 persons are taking a dip into a cuboidal pond which is 80 m long and 50 m broad. What is the rise of the water level in the pond, if the average displacement of the water by a person is 0.04 m^3? 3

SECTION - D

24 Marks

35. Show that $(12)^n$ cannot end with digit 0 or 5 for any natural number *n*.

OR

Prove that $\left(\sqrt{2}+\sqrt{5}\right)$ is irrational. 4

36. A train covered a certain distance at a uniform speed. If the train would have been 6 km/hr. faster, it would have taken 4 hours less than the scheduled time and if the train would have slowed down by 6 km/hr, it would have taken 6 hours more than the scheduled time. Find the length of the journey. 4

37. In an equilateral triangle ABC, D is a point on the side BC such that BD = $\frac{1}{3}$. Prove that $9\,AD^2 = 7AB^2$.**

OR

Prove that the sum of squares of the sides of a rhombus is equal to the sum of the squares of its diagonals.** 4

38. If the angle of elevation of a cloud from a point 10 metres above a lake is 30° and the angle of depression of its reflection in the lake is 60°, find the height of the cloud from the surface of lake.

OR

A vertical tower of height 20 m stands on a horizontal plane and is surmounted by a vertical flag staff of height *h*. At a point on the plane, the angle of elevation of the bottom and top of the flag staff are 45° and 60°, respectively. Find the value of *h*. 4

39. A solid iron cuboidal block of dimensions 4.4 m × 2.6 m × 1 m is cast into a hollow cylindrical pipe of internal radius 30 cm and thickness 5 cm. Find the length of the pipe. 4

40. For the following frequency distribution, draw a cumulative frequency curve of 'more that' type and hence, obtain the median value.**

Classes	Frequency
0 – 10	5
10 – 20	15
20 – 30	20
30 – 40	23
40 – 50	17
50 – 60	11
60 – 70	9

4