MATHEMATICS

Section – A

Choose the correct answer from the given alternatives

1. If α and β are the zeros of the polynomial $f(x) = px^2 - 2x + 3p$ and α + β = αβ, then the value of p is **1**

   (i) $\frac{-2}{3}$ (ii) $\frac{2}{3}$ (iii) $\frac{1}{3}$ (iv) $\frac{-1}{3}$

2. The sum & product respectively of zeros of the polynomial $x^2 - 4x + 3$ are **1**

   (i) 3, 3 (ii) 4, 3 (iii) 3, –4 (iv) 4, $\frac{1}{3}$

3. If the pair of equations $3x + 2y = 5k$ and $4x + y = 3$ represent coincident lines, then **1**

   (i) $k = -\frac{5}{6}$ (ii) $k = \frac{6}{5}$ (iii) $k = \frac{5}{6}$ (iv) $k = -\frac{6}{5}$

4. If a pair of linear equations in two variables is consistent then the lines represented by two equations are **1**

   (i) intersecting (ii) parallel
   (iii) always coincident (iv) intersecting or coincident

5. If one root of the equation $2x^2 + ax + 6 = 0$ is 2, then a is equal to **1**

   (i) 8 (ii) 7 (iii) –8 (iv) –4

6. The values of k for which the quadratic equation $16x^2 + 4kx + 9 = 0$ has real and equal roots are **1**

   (i) 6, $-\frac{1}{6}$ (ii)36, –36 (iii) 6, –6 (iv) $\frac{3}{4}, -\frac{3}{4}$

7. If k, $2k - 1$ & $2k + 1$ are three consecutive terms of an A.P., the value of k is **1**

   (i) –2 (ii) –3 (iii) 3 (iv) 6

8. The 50^{th} term of the A.P. 5, 12, 19, … is **1**

   (i) 343 (ii) 348 (iii) 353 (iv) 362

9. A is a point on y-axis at a distance of 4 units from x-axis lying below x-axis. The coordinates of A are **1**

   (i) (4, 0) (ii) (0, 4) (iii) (–4, 0) (iv) (0, –4)

10. The coordinates of the centroid of a triangle whose vertices are (0, 6), (8, 12) and (8, 0) is **1**

    (i) $\left(\frac{16}{3}, 6\right)$ (ii) $\left(\frac{14}{5}, 6\right)$ (iii) $\left(\frac{16}{3}, 5\right)$ (iv) $\left(\frac{22}{3}, 6\right)$

11. If in ΔABC right angled at B, AB = 5 cm and sin C = $\frac{1}{2}$, the length of AC is **1**

    (i) 10 cm (ii) 2.5 cm (iii) 7.5 cm (iv) 6 cm

12. If $\tan 2\theta = \cot(\theta + 15°)$ are acute, the value of θ is **1**

    (i) 22° (ii) 25° (iii) 30° (iv) 35°

13. From a point Q, the length of the tangent to a circle is 24 cm and the distance of Q from the centre is 25 cm. The radius of the circle is **1**

    (i) 7 cm (ii) 12 cm (iii) 15 cm (iv) 24.5 cm

14. If the tangents PA and PB from a point P to a circle with centre O are inclined to each other at an angle of 80°, then $\angle POA$ is equal to **1**

(i) 50° (ii) 60° (iii) 70° (iv) 80°

15. The perimeter of quadrant of a circle whose radius is $\frac{7}{2}$ cm is **1**

(i) 3.5 cm (ii) 5.5 cm (iii) 7.5 cm (iv) 12.5 cm

16. An arc of a circle is of length 5π cm and the sector it bounds has an area of 20π cm^2. The radius of the circle is **1**

(i) 16 cm (ii) 4 cm (iii) 8 cm (iv) 12 cm

17. The ratio of the total surface area to the lateral surface area of a cylinder with base radius 80 cm and height 20 cm is **1**

(i) 2 : 1 (ii) 3 : 1 (iii) 4 : 1 (iv) 5 : 1

18. A frustrum of a right circular cone of height 16 cm with radii of its circular ends as 8 cm and 20 cm has its slant height equal to **1**

(i) 18 cm (ii) 16 cm (iii) 20 cm (iv) 24 cm

19. A card is drawn at random from a well- shuffled deck of playing cards. The probability that the card drawn is neither a king nor a queen is **1**

(i) $\frac{11}{13}$ (ii) $\frac{12}{13}$ (iii) $\frac{2}{13}$ (iv) $\frac{1}{26}$

20. Which of the following cannot be the probability of an event? **1**

(i) $\frac{2}{3}$ (ii) – 1.5 (iii)15% (iv) 0.7

Section – B

1. Prove that $7\sqrt{5}$ is irrational **2**
2. Use Euclid's division algorithm to find the HCF of 135 and 225. **2**
3. Find the roots of the quadratic equation $2x^2 - 7x + 3 = 0$ by applying the quadratic formula **2**
4. Find the roots of the quadratic equation $2x^2 + x - 6 = 0$ by factorisation. **2**
5. In the trapezium ABCD, AB || DC, AB = 9 cm, DC = 6 cm and BD = 12 cm. The diagonals AC and BD intersect at O. Find the length of BO. **2**
6. Let $\Delta ABC \sim \Delta DEF$ and their areas be respectively 64 cm^2 and 121 cm^2. If EF = 15.4 cm , find BC. **2**
7. Find the values of *y* for which the distance between the points P(2, –3) and Q(10, *y*) is 10 units. **2**
8. Find the value of *k* for which the points (7, –2), (5, 10) and (3, *k*) are collinear. **2**
9. The radii of two circles are 19 cm and 9 cm respectively. Find the radius of the circle which has circumference equal to the sum of the circumferences of the two circles. **2**
10. In a circle of radius 21 cm, an arc subtends an angle of 60° at the centre. Find: (i) the length of the arc, (ii) the area of the sector formed by the arc. **2**

Section – C

1. If α and β are the zeros of the quadratic polynomial $2x^2 - 5x + 7$, then find the quadratic polynomial whose zeros are $(3\alpha + 4\beta)$ and $(4\alpha + 3\beta)$. **3**

2. It is given that 1 is a zero of the polynomial $7x - x^3 - 6$. Find the other zeros. **3**

3. Solve the following pair of linear equations by substitution method: **3**

$s - t = 3$ and $\frac{5}{3} + \frac{t}{2} = 6$.

4. Solve the following pair of linear equations by cross-multiplication method: **3**

$x - 3y - 7 = 0$ and $3x - 3y - 15 = 0$.

5. Find the roots of the quadratic equation $2x^2 + x - 4 = 0$ by the method of completing the square. **3**

6. Determine the A. P. whose third term is 16 and the 7^{th} term exceeds the 5^{th} term by 12. **3**

7. The first and the last terms of an A.P. are 17 and 350 respectively. If the common difference is 9, how many terms are there and what is their sum? **3**

8. Find the sum of the odd numbers between 0 and 50. **3**

9. Find the ratio in which the line segment joining the points (–3, 10) and (6, –8) is divided by (–1, 6). **3**

10. Find the area of the quadrilateral whose vertices, taken in order, are (–4, –2), (–3, –5), (3, –2) and (2, 3). **3**

11. If 3 cot A = 4, then prove that $\frac{1-\tan^2 A}{1+\tan^2 A} = \cos^2 A - \sin^2 A$ **3**

12. Prove that : $\frac{1+\sec A}{\sec A} = \frac{\sin^2 A}{1-\cos^2 A}$ **3**

13. Prove that : $\frac{\cos A}{1+\sin A} + \frac{1+\sin A}{\cos A} = 2\sec A$ **3**

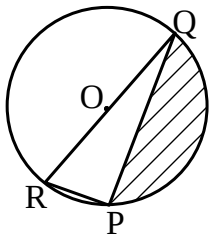
14. Evaluate : $\frac{\sin 30° + \tan 45° - \operatorname{cosec} 60°}{\sec 30° + \cos 60° + \cot 45°}$ **3**

15. Draw a triangle ABC with side BC = 6 cm, AB = 5 cm and $\angle ABC = 60°$. Then construct a triangle whose sides are $\frac{3}{4}$ of the corresponding sides of ΔABC. **3**

16. Draw a circle of radius 6 cm. From a point 10 cm away from its centre, construct the pair of tangents to the circle and measure their lengths. **3**

17. A chord of a circle of radius 15 cm subtends an angle of 60° at the centre. Find the areas of the corresponding minor and major segments of the circle. (Use $\pi = 3.14$ and $\sqrt{3} = 1.73$). **3**

18. Find the area of the shaded region in the adjoining figure, given that PQ = 24 cm, PR = 7 cm and O is the centre of the circle.



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19. Two cubes each of volume 64 cm^3 are joined end to end. Find the surface area of the resulting cuboid. **3**

20. How many silver coins, 1.75 cm in diameter and of thickness 2 mm must be melted to form a cuboid of dimensions 5.5 cm × 10 cm × 3.5 cm? **3**

21. The following data gives the information on the observed lifetimes (in hours) of 225 electrical components: **3**

Lifetimes (in hours)	0-20	20-40	40-60	60-80	80-100	100-120
Frequency	10	35	52	61	38	29

Determine the modal lifetimes of the components.

22. The following frequency distribution gives the monthly consumption of electricity of 68 consumers of a locality. Find the median of the data. **3**

Monthly consumption (in 1 units)	65-85	85-105	105-125	125-145	145-165	165-185	185-205
No. of consumers	4	5	13	20	14	8	4

23. One card is drawn froma well-shuffled deck of 52 cards. Find the probability of getting (i) a face card (ii) a red face card (iii) a spade. **3**

24. A box containing 90 discs which are numbered from 1 to 90. If one disc is drawn at random from the box, find the probability that it bears: (i) a two-digit number (ii) a perfect square number (iii) a number divisible by 5. **3**

25. A die is thrown twice. What is the probability that: (i) 5 will not come up either time? (ii) 5 will come up at least once? **3**

Section – D

1. The sum of the digits of a two-digit number is 9. Also, 9 times this number is twice the number obtained by reversing the order of the digits. Find the number. **5**

2. The area of a rectangle gets reduced by 9 square units if its length is reduced by 5 units and breadth is increased by 3 units. If we increase the length by 3 units and breadth by 2 units, the area increases by 67 square units. Find the dimensions of the rectangle. **5**

3. A train travels 360 km at a uniform speed. If the speed had been 5 km/hr more, it would have taken 1 hour less for the same journey. Find the speed of the train. **5**

4. State and prove Basic Proportionality theorem. **5**

5. State and prove Pythagoras theorem. **5**

6. ABCD is a trapezium in which AB || DC and its diagonals intersect each other at the point O. Show that $\frac{AO}{BO} = \frac{CO}{DO}$ **5**

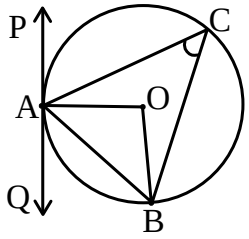
7. In an equilateral triangle ABC, D is a point on the side BC such that BD = $\frac{1}{3}$BC. Prove that $9AD^2 = 7AB^2$ **5**

8. From the top of a 7 m high building, the angle of elevation of the top of a cable tower is 60° and the angle of depression of its foot is 45°. Determine the height of the tower. **5**

9. A statue, 1.6 m tall, stands on the top of a pedestal. From a point on the ground, the angle of elevation of the top of the statue is 60° and from the same point, the angle of elevation of the top of the pedestal is 45°. Find the height of the pedestal. **5**

10. 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. **5**

11. PAQ is a tangent to the circle with centre O at a point A as shown in the adjoining figure. If $\angle OBA = 35°$, find the value of $\angle BAQ$ and $\angle ACB$.



5

12. A toy is in the form of a cone of radius 3.5 cm mounted on a hemisphere of same radius. The total height of the toy is 15.5 cm. Find the total surface area and the volume of the toy. **5**

13. The slant height of a frustrum of a cone is 4 cm and the perimeters of its circular ends are 18 cm and 6 cm. Find the curved surface area of the frustrum. **5**

14. The following table gives the production yield per hectare of wheat of 100 farms of a village.

Production yield (in kg/ha)	50-55	55-60	60-65	65-70	70-75	75-80
Number of farms	2	8	12	24	38	16

Change the distribution to a more than type distribution, and draw its ogive. **5**

15. The following distribution shows the daily pocket allowance of children of a locality. The mean pocket allowance is `18. Find the missing frequency f by the step-deviation method. **5**

Daily pocket allowance (in `)	11-13	13-15	15-17	17-19	19-21	21-23	23-25
Number of children	7	6	9	13	f	5	4

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