QUESTION PAPER- 2
MATHEMATICS

Section-A
Section A consists of 20 questions of 1 mark each

1. The probability of an impossible event is:

    (a) 0   (b) $\dfrac{1}{2}$ (c) 1   (d) None of these

2. A die is thrown once. The probability of getting a number greater than 4 is:

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

3. The value of $\sin^2\theta + \dfrac{1}{1+\tan^2\theta}$ is:

    (a) 2   (b) 1   (c) 4   (d) 0

4. The area of a sector of a circle of radius 5 cm formed by an arc of length 3.5 cm, is:
    (a) 16.5 cm^2 (b) 17.5 cm^2 (c) 19.62 cm^2 (d) 8.75 cm^2

5. If a cylinder is covered by two hemispherical lid of equal shape, then the total curved surface area of the new object will be (where r is the radius and h is the height of cylinder)
    (a) $4\pi r + 2\pi r^2$ (b) $\pi rh - 2\pi r^2$ (c) $2\pi rh + 4\pi r^2$ (d) $2\pi rh + 4\pi r$

6. If radius of circle is 8 cm and tangent is drawn from an external point to the circle is 15 cm, the distance from centre of circle to the external point is:
    (a) $\sqrt{241}$ cm   (b) 17 cm   (c) 10 cm   (d) None of these

7. Class mark of a class is obtained by using:

    (a) Class mark   (b) $\dfrac{1}{2}$ [upper limit – lower limit]

    (c) $\dfrac{1}{2}$ [upper limit + lower limit]   (d) $\dfrac{1}{2}$ [upper limit + lower limit] – 1

8. In ΔABC, right angled at A and AB = 5 cm, AC =12 cm and BC = 13 cm, then the value of sin B and tan B is:

    (a) $\dfrac{12}{5}$ and $\dfrac{5}{13}$ (b) $\dfrac{5}{13}$ and $\dfrac{5}{12}$ (c) $\dfrac{12}{13}$ and $\dfrac{12}{5}$ (d) $\dfrac{13}{5}$ and $\dfrac{12}{13}$

9. The value of $3\sin 30° - 4\sin^3 60°$ is:

    (a) $3 - \sqrt{3}$ (b) $\dfrac{3(1-\sqrt{3})}{2}$ (c) $\dfrac{3\sqrt{3}-1}{2}$ (d) $-\dfrac{3}{2}$

10. The formula used to find mean is:

    (a) $\displaystyle\sum_{i=1}^{n} f_i x_i$ (b) $N\displaystyle\sum_{i=1}^{n} f_i x_i$ (c) $\dfrac{1}{N}\displaystyle\sum_{i=1}^{n} f_i x_i$ (d) $\displaystyle\sum_{i=1}^{n}\left(\dfrac{f_i x_i}{N}\right)$

11. If the lines given by $4x + ky = 1$ and $6x - 10y = 14$ has unique solution, then the value k is:

    (a) $\dfrac{20}{3}$ (b) $-\dfrac{5}{7}$

    (c) -15 (d) all real values except $-\dfrac{20}{3}$

12. Which term of the AP : 21, 18, 15,... is (- 81)?
    (a) 34   (b) 36   (c) 35   (d) 33

13. The distance between the points $A(x_1, y_1)$ and $B(x_2, y_2)$ is:

(a) $\sqrt{(x_1 + x_2) + (y_1 + y_2)}$

(b) $\sqrt{(x_1 + x_2)^2 + (y_1 + y_2)^2}$

(c) $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

(d) $\sqrt{(x_1 - x_2) + (y_1 - y_2)}$

14. If a = 2 and 20th term = 62, then the sum of first 20 terms of an AP is:

(a) 1200   (b) 640   (c) 600   (d) 1280

15. The product of the HCF and LCM of two prime numbers a and b is:

(a) $\dfrac{a}{b}$ (b) a – b   (c) a + b   (d) a × b

16. If the product of the zeroes of the polynomial $mx^2 - 6x - 6$ is (– 3), then the value of m is:

(a) 6   (b) 2   (c) -2   (d) -3

17. The solution of $2x^2 – 5x – 3 = 0$ is:

(a) $-\dfrac{1}{2}, 3$ (b) 1, –3   (c) –1, 3   (d) $-1, \dfrac{1}{2}$

18. If in $\triangle ABC$ and $\triangle DEF$, $\dfrac{AB}{DE} = \dfrac{BC}{FD}$, then they will be similar, when:

(a) $\angle B = \angle E$ (b) $\angle A = \angle D$ (c) $\angle B = \angle D$ (d) $\angle A = \angle F$

Directions In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A)

(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of 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) :** The value of sin 60° cos 30° + sin 30° cos 60° is 1.

Reason (R) : sin 90° = 0 and cos 90° = 1.

20. **Assertion (A) :** The system of equations 2x + 3y + 5 = 0 and 4x + ky + 7 = 0 is inconsistent when k = 6.

Reason (R) : The system of equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ is inconsistent when $\dfrac{a_1}{a_2} = \dfrac{b_1}{b_2} \neq \dfrac{c_1}{c_2}$

Section-B
Section B consists of 5 questions of 2 marks each

21. Prove that the line segment joining the point of contact of two parallel tangents to a circle is a diameter of the circle.

22. What is the probability that a number selected from the numbers 1, 2, 3, ..., 25 is a prime number, when each of the given numbers is equally likely to be selected?

Or

A letter is chosen at random from the letters of word 'ASSASSINATION'. Find the probability that the letter chosen is a

(i) vowel   (ii) consonant.

23. Find the sum of first 15 even natural numbers.

24. If one root of the quadratic equation $2x^2 + kx - 6 = 0$ is 2, find the value of k. Also, find the other root.
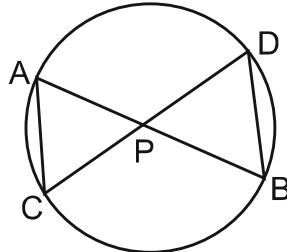
25. Prove that cot A + tan A = sec A cosec A.

Or

Evaluate: $\cos^2 30° + \sin^2 45° - \dfrac{1}{3}\tan^2 60°$.
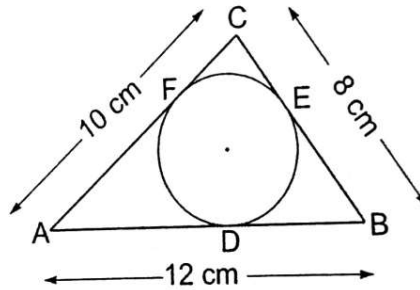
Section-C
Section C consists of 6 questions of 3 marks each

26. In the given figure, two chords AB and CD intersect each other at the point P. Prove that

(i) $\triangle APC \sim \triangle DPB$ (ii) $AP \cdot PB = CP \cdot DP$

27. A circle is inscribed in a $\triangle ABC$ having sides 8 cm, 10 cm and 12 cm as shown in figure. Find AD, BE and CF.
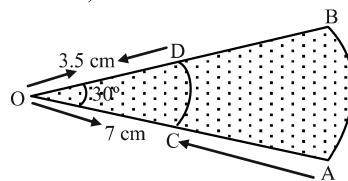

28. Prove that: $\dfrac{\sin A + \cos A}{\sin A - \cos A} + \dfrac{\sin A - \cos A}{\sin A + \cos A} = \dfrac{2}{\sin^2 A - \cos^2 A}$

Or

Prove that $\dfrac{\sin\theta - \cos\theta + 1}{\sin\theta + \cos\theta - 1} = \dfrac{1}{\sec\theta - \tan\theta}$ using the identity $\sec^2\theta = 1 + \tan^2\theta$

29. In Fig. there are shown sectors of two concentric circles of radii 7 cm and 3.5 cm. Find the area of the shaded region. (Use $\pi = 22/7$).

30. Find the roots of the following equation

$\dfrac{1}{x+4} - \dfrac{1}{x-7} = \dfrac{11}{30}$, $x \neq -4,\ 7$.

Or

Solve for x: $2\left(\dfrac{2x+3}{x-3}\right) - 25\left(\dfrac{x-3}{2x+3}\right) = 5$.

31. For what values of a and b, the following system of equations have an infinite number of solutions:

$$2x + 3y = 7;\ (a-b)x + (a+b)y = 3a + b - 2$$

Section-D
Section D consists of 4 questions of 5 marks each

32. Prove that $\sqrt{2}$ is irrational number.

Or

In a seminar, the number of participants, in Hindi, English and Mathematics are 60, 84 and 108 respectively. Find the number of rooms required, if in each room the same number of participants are to be seated and all of them being in the same subject.

33. The median of the distribution given below is 14.4. Find the values of x and y, if the total frequency is 20.

Class interval	0-6	6-12	12-18	18-24	24-30
Frequency	4	x	5	y	1

34. Find the length of the median drawn through A on BC of a ΔABC, whose vertices are A(7, - 3), B(5, 3) and C(3, -1) and also find the distance of the point A(7, -3) from the origin.

Or

Find the coordinates of the centre of a circle passing through the points (6, -6), (3, -7) and (3, 3).

35. A solid toy is in the form of a hemisphere surmounted by a right circular cone. The height of the cone is 2 cm and the diameter of the base is 4 cm. Determine the volume of the toy. If a right circular cylinder circumscribes the toy, find the difference of the volume of the cylinder and the toy. (Take $\pi = 3.14$)
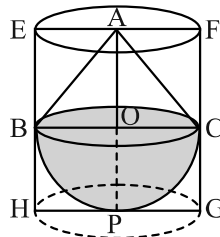
Section-E
Case study based questions are compulsory

36. Priya and her husband Aman, who is an architect by profession, visited France. They went to see Mont Blanc Tunnel which is a highway tunnel between France and Italy, under the Mont Blanc Mountain in the Alps, and has a parabolic cross-section. The mathematical representation of the tunnel is shown in the graph.
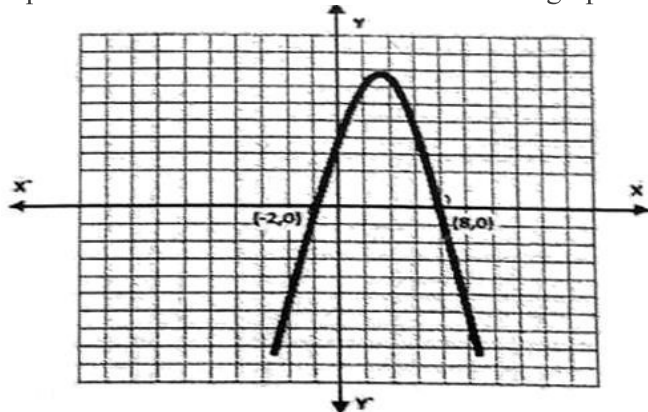
Based on the above information, answer the following questions.

(i)   Find the zeroes of the polynomial whose graph is given?

(ii)   What will be the expression of the polynomial given in diagram?

(iii)   If the tunnel is represented by $p(x) = -x^2+3x-2$, then find its zeroes.

OR

(iii)   Find the representation of tunnel as a polynomial, if one of the zero is 4 and sum of zeroes is (-3).

37.   A group of students of class X visited India Gate on an education trip. The teacher and students had interest in history as well. The teacher narrated that India Gate, official name Delhi Memorial, originally called All-India War Memorial, monumental sandstone arch in New Delhi, dedicated to the troops of British India who died in wars fought between 1914 and 1919. The teacher also said that India Gate, which is located at the eastern end of the Rajpath (formerly called the Kingsway), is about 42 metres in height.

(i)   What is the angle of elevation of the top of India gate if they are standing at a distance of 42m away from it?

(ii)   They want to see the tower at an angle of 60°. So, they want to know the distance where they should stand and hence find the distance.

(iii)   If the altitude of the Sun is at 60°, then find the height of the vertical tower that will cast a shadow of length 20 m.

OR

(iii)   If the ratio of the length of a tower and its shadow is 1:1. Find the angle of elevation of the Sun.

38.   On a Sunday, your Parents took you to a fair. You could see lot of toys displayed, and you wanted them to buy a RUBIK's cube and strawberry ice-cream for you. Observe the figures and answer the questions:
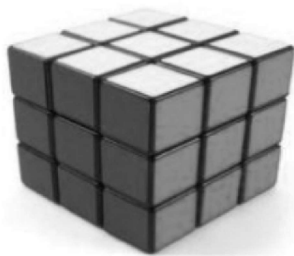
(i)   Find the length of the diagonal if each edge measures 6 cm.

(ii)   What is the curved surface area of hemisphere (ice cream) if the base radius is 7cm?

(iii)   Find the volume of cone whose total height is 14 cm and radius 7 cm with hemispherical top.

OR

(iii)   Find the slant height of the cone if the radius is 7 cm and height is 24 cm (excluding hemispherical top).