2018

MATHEMATICS

Total marks : 80 Time : 3 hours

General Instructions:

i) Approximately 15 minutes is allotted to read the question paper and revise the answers.

ii) The question paper consists of 22 questions.

iii) All questions are compulsory.

iv) Internal choice has been provided in some questions.

v) Marks allocated to every question are indicated against it.

N.B: Check that all pages of the question paper is complete as indicated on the top left side.

SECTION - A

1. Choose the correct answer from the given alternatives.

(a) The zeros of the polynomial $x^2 - 5x$ are **1**

(i) (0, 5) (ii) (5, 0) (iii) (–5, 0) (iv) (0, –5)

(b) Which one of the following pair of equations represents coincident lines? **1**

(i) $2x - 3y + 7 = 0,\ 3x + 7y - 2 = 0$ (ii) $5x + 3y + 7 = 0, 10x - 6y + 3 = 0$

(iii) $3x + 4y + 7 = 0,\ 9x + 12y + 21 = 0$ (iv) $x + 2y = 3, 2x - 5y = 1$

(c) The quadratic equation $2x^2 - \sqrt{5}\,x + 1 = 0$ has **1**

(i) two distinct real roots (ii) two equal real roots

(iii) more than two real roots (iv) no real roots

(d) If the n^{th} term of an A.P. is given by , $a_n = 5n - 3$, then the 10^{th} term is **1**

(i) 37 (ii) 47 (iii) 50 (iv) 53

(e) When a pole 6 m high casts a shadow $2\sqrt{3}$ m long on the ground, then the angle of elevation of the sun is **1**

(i) 30° (ii) 45° (iii) 60° (iv) 90°

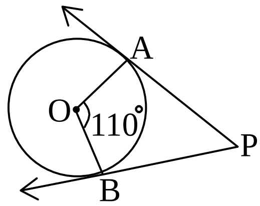
(f) The distance between the origin and the point (0, –6) is **1**

(i) 0 (ii) 6 units (iii) 12 units (iv) 36 units

(g) The length of the longest chord of the circle with radius 7 cm is **1**

(i) 21 cm (ii) 14 cm (iii) 7 cm (iv) 3.5 cm

(h) In the adjoining figure, PA and PB are two tangents to the circle with centre O, such that $\angle AOB = 110°$, then $\angle APB$ is **1**



1

(i) 90° (ii) 70° (iii) 60° (iv) 30°

(i) The maximum volume of a cone that can be carved out of a solid hemisphere of radius 3 cm is **1**
(i) 9π cm^3 (ii) 4π cm^3 (iii) 3π cm^3 (iv) π cm^3

(j) In 'less than type ogive', the x-axis represents **1**
(i) frequency (ii) cumulative frequency
(iii) lower class limit (iv) upper class limit

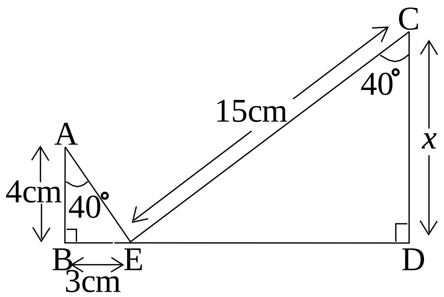
SECTION - B

2. Prove that $3-\sqrt{5}$ is irrational. **2**

3. If α and β are the zeros of the polynomial $2x^2-4x+5$, then find the value of $\frac{1}{\alpha}+\frac{1}{\beta}$ **2**

4. Evaluate: $\left(\sin^2 30° + 4\cot^2 45° - \sec^2 60°\right)\left(\operatorname{cosec}^2 45° + \sec^2 30°\right)$ **2**

5. In the adjoining figure, find the value of x. **2**



6. In a circle of radius 28 cm, an arc subtends an angle 90° at the centre. Find the perimeter of the sector. **2**

SECTION - C

7. If the polynomial $x^4+2x^3+8x^2+12x+18$ is divided by x^2+5 and the remainder is in the form of $px+q$, find the value of p and q. **3**

8. **a.** Solve the following quadratic equation by applying the quadratic formula:
$x^2-4ax+4a^2-b^2=0$

Or **3**

b. Solve the following system of equations by substitution method:

$$\frac{3x}{2} - \frac{5y}{3} = -2,$$

$$\frac{x}{3} + \frac{y}{2} = \frac{13}{6}$$

9. **a.** If the 8^{th} term of an A.P. is 37 and its 12^{th} term is 57, find the A.P.

Or **3**

b. Find the sum of all two digit odd positive numbers.

10. In a right angled triangle, if 3 cot θ = 2, show that : $\frac{2\tan\theta}{1+\tan^2\theta} = 2\sin\theta\cos\theta$ **3**

11. **a.** Prove that: $\frac{1}{\operatorname{cosec}\theta + \cot\theta} - \frac{1}{\sin\theta} = \frac{1}{\sin\theta} - \frac{1}{\operatorname{cosec}\theta - \cot\theta}$

Or **3**

b. Show that: $\frac{\cos(90°-\theta)}{1+\sin(90°-\theta)} + \frac{1+\sin(90°-\theta)}{\cos(90°-\theta)} = 2\operatorname{cosec}\theta$

12. **a.** The horizontal distance between two poles is 15 m. The angle of depression of the top of the first pole as seen from the top of the second pole is 30°. If the height of the second pole is 24 m, find the height of the first pole. [Use $\sqrt{3} = 1.73$]

Or **3**

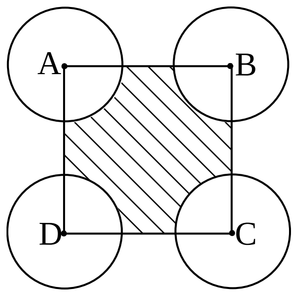
b. From two points P and Q at distances of *a* and *b* respectively from the base of a tower and in the same straight line with it, the angles of elevation of the top of the tower are complementary. Prove that the height of the tower is $\sqrt{ab}$.

13. Construct a pair of tangents to a circle of radius 4.5 cm from an external point P without using the centre. (Traces of construction only is required.) **3**

14. **a.** A rectangle of dimensions 16 cm × 12 cm is inscribed in a circle. Find the area enclosed between the circle and the rectangle.

Or **3**

b. In the adjoining figure, ABCD is a square of side 20 cm. Four circles of equal radii 7 cm are drawn on its four vertices. Find the area of the shaded region.



15. Find the missing frequency 'f' if the mode of the given data is 153.5 **3**

Classes	120-129	130-139	140-149	150-159	160-169	170-179
Frequency	2	8	12	f	8	7

16. Cards marked with 13, 14, 15, ..., 60 are placed in a box and mixed thoroughly. One card is drawn at random from the box. Find the probability that the numbers on the drawn card is : (i) divisible by 5, (ii) a perfect square. **3**

SECTION - D

17. **a.** Solve graphically the system of equations $2x-3y-17=0$, $4x-y-13=0$ and shade the region between the lines and the x-axis.

Or **5**

b. The present age of a woman is 3 years more than three times the age of her daughter. Three years later, the woman's age will be 10 years more than twice the age of her daughter. Find their present ages.

18. **a.** If the points A(1, –2), B(2, 3), C(–3, 2) and D(–4, –3) are the vertices of a parallelogram ABCD, then taking AB as the base, find the height of this parallelogram.

Or **5**

b. Find the coordinates of the centre of a circle passing through the points A(2, 1), B(5, –8) and C(2, –9).

19. **a.** State and prove Basic Proportionality Theorem.

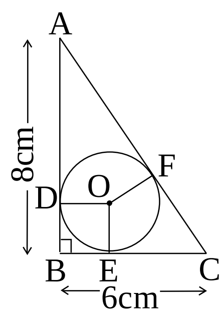
Or **5**

b. OA, OB and OC are three lines segments. L, M, N are points on OA, OB and OC respectively such that LM || AB, MN || BC. Prove that LN || AC.

20. **a.** Two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that $\angle$PTQ = 2 $\angle$OPQ.

Or **5**

b. In the adjoining figure, ΔABC is right-angled at B. If BC = 6cm and AB = 8 cm, find the radius of the incircle.



21. **a.** A toy is in the form of a cone mounted on a hemisphere of common base radius 7 cm. The total height of the toy is 31 cm. Find the total surface area and volume of the toy.

Or **5**

b. A garbage tin is in the shape of a frustrum of a cone. The radii of the open and closed ends of the tin are 28 cm and 14 cm respectively. The height of the tin is 48 cm and it has also a hemispherical lid. Find the outer surface area when the lid is closed.

22. **a.** Calculate the mean of the following data using Assumed Mean method:

Marks	Number of students
Less than 10	5
Less than 20	9
Less than 30	17
Less than 40	29
Less than 50	45
Less than 60	60
Less than 70	70
Less than 80	78
Less than 90	80

Or **5**

b. The expenditure of a municipal corporation of a city in different sectors is given below:

Sector	Expenditure (in ` lakh)
Education	350
Health services	480
Beautification	130
Surface transport	240
Others	600

Draw a pie-chart to represent the above data.

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