

**2016**  
**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.

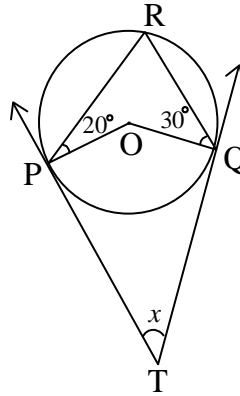
**SECTION - A**

1. Choose the correct answer from the given alternatives.

- (a) A quadratic polynomial with zeros 2 and  $-3$  can be written as **1**  
 (i)  $x^2 + 2x - 3$  (ii)  $x^2 - 3x - 6$   
 (iii)  $x^2 + x - 6$  (iv)  $x^2 - x + 6$
- (b) In the linear equation  $ax + by = c$ , if  $a \neq 0$ ,  $b = 0$  and  $c = 0$ , then the graph of this equation is **1**  
 (i) the  $y$ -axis (ii) the  $x$ -axis  
 (iii) a line parallel to  $x$ -axis (iv) a line parallel to  $y$ -axis
- (c) The discriminant of the quadratic equation  $2x + \frac{4}{x} = 9$  is **1**  
 (i) 113 (ii) 49 (iii) 0 (iv)  $-113$
- (d) The  $n^{\text{th}}$  term of the A.P. 6, 10, 14, 18, ... is **1**  
 (i)  $2 - 4n$  (ii)  $2 + 4n$  (iii)  $4n - 2$  (iv)  $4n + 2$
- (e) In the right  $\triangle ABC$  right angled at B,  $\operatorname{cosec} A$  is equal to **1**  
 (i)  $\frac{AB}{AC}$  (ii)  $\frac{BC}{AC}$  (iii)  $\frac{AC}{BC}$  (iv)  $\frac{AC}{AB}$
- (f) The difference between the abscissa and the ordinate of two points in a plane are  $2a$  and  $2b$  respectively. The distance between these two points is **1**  
 (i)  $\sqrt{a^2 + b^2}$  (ii)  $2\sqrt{a^2 + b^2}$  (iii)  $4a^2 + 4b^2$  (iv)  $a^2 + b^2$

- (g) TP and TQ are tangents to the adjoining circle with centre O.  $\angle RPO = 20^\circ$  and  $\angle RQO = 30^\circ$ . Then the value of  $x$  is

1

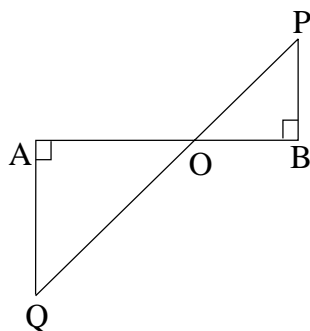


- (i)  $100^\circ$                       (ii)  $80^\circ$                       (iii)  $60^\circ$                       (iv)  $50^\circ$
- (h) The perimeter of a quadrant circle is 50 cm. The radius of the circle is
- (i) 88 cm                      (ii) 28 cm                      (iii) 22 cm                      (iv) 14 cm
- (i) The slant height of a frustrum of a cone of radii 10 cm, 4 cm and height 8 cm is
- (i) 10 cm                      (ii) 12 cm                      (iii) 14 cm                      (iv) 18 cm
- (j) The probability that an ordinary year selected at random will contain 53 Mondays is
- (i)  $\frac{2}{7}$                       (ii)  $\frac{1}{7}$                       (iii)  $\frac{1}{2}$                       (iv) 0

**Section – B**

2. If  $\alpha$  and  $\beta$  be the distinct roots of the quadratic equation  $3x^2 - (m+n)x - 4p - 1 = 0$ , find the value of  $p$  such that  $3\alpha - \frac{4}{\beta} = 0$  **2**
3. Given that  $\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$ , find the value of  $\tan 75^\circ$  **2**
4. Find the value of  $k$ , if the points  $A(2, 3)$ ,  $B(4, k)$  and  $C(6, -3)$  are collinear. **2**

5. In the figure given below, QA and PB are perpendicular to AB. If AO = 10 cm, BO = 6 cm and PB = 9 cm, then find the value of AQ. 2



6. The circumference of a circle is 220 cm. Find the area of the sector of that circle whose central angle is  $36^\circ$  2

### Section – C

7. a. If  $\alpha, \beta$  are the zeros of the quadratic polynomial  $x^2 - 9$ , form the quadratic polynomial whose zeros are  $\frac{3\alpha}{\beta}$  and  $\frac{3\beta}{\alpha}$

**Or** 3

- b. Determine whether the quadratic equation  $\frac{3}{4}x^2 - 8x + 3 = 0$  has real roots and if so, find the roots by using quadratic formula.

8. Solve the following system of linear equation by cross-multiplication method:

$$\frac{5}{x-1} + \frac{1}{y-2} = 2$$

$$\frac{6}{x-1} - \frac{3}{y-2} = 1$$
3

9. The last term of an A.P. is 120. It's first term and common difference are 20 and 5 respectively. Find the sum of the A.P. 3

10. If  $\tan \theta = \frac{2mn}{m^2 - n^2}$ , find the values of  $\sin \theta$  and  $\sec \theta$  with respect to the sides of a right-angled triangle. 3

11. a. Prove that  $(1 + \cot^2 \theta) + \left(1 + \frac{1}{\cot^2 \theta}\right) = \frac{1}{\sin^2 \theta - \sin^4 \theta}$

**Or**

**3**

b. Prove that  $\cos(40^\circ - \theta) - \sin(50^\circ + \theta) + \frac{\cos^2 40^\circ + \cos^2 50^\circ}{\sin^2 40^\circ + \sin^2 50^\circ} = 1$

12. a. A boy is standing on the deck of an anchored ship which is 15 m above the sea level. He observes that the angle of elevation of the top of a hill as  $60^\circ$  and the angle of depression of the base of the hill as  $30^\circ$ . Calculate the distance of the base of the hill from the ship and also the height of the hill. [Use  $\sqrt{3} = 1.732$ ]

**Or**

**3**

b. A pole 5 m high is fixed on the top of a tower. From a point A on the ground, the angle of elevation of the top of the pole is  $60^\circ$  and from the top of the tower, the angle of depression of the point A is  $45^\circ$ . Find the height of the tower.  
[Use  $\sqrt{3} = 1.732$ ]

13. Draw a line AB of length 9 cm. Taking A as centre, draw a circle of radius 4 cm and taking B as centre, draw another circle of radius 3 cm. Construct tangents to each circle from the centre of the other circle. (Traces of construction only is required.)

**3**

14. a. Two circles touch internally. The sum of their areas is  $116\pi \text{ cm}^2$  and the distance between their centres is 6 cm. Find the radii of the circles.

**Or**

**3**

b. A horse is tethered at one corner of a squared-shaped grass field of side 21 m by means of a 7 m long rope. Find:  
(i) the area it can graze,  
(ii) the ungrazed area if the rope were 14 m long.

15. Find the median of the weights of 30 students of a class.

**3**

Weight (in kg)	40-45	45-50	50-55	55-60	60-65	65-70	70-75
No. of students	2	3	8	6	6	3	2

16. a. A box contains 8 dozen oranges out of which 8 are rotten. An orange is selected at random. Find the probability of getting:  
(i) a good orange,  
(ii) a rotten orange

**Or**

**3**

- b. Two dice are rolled simultaneously. Find the probability of getting:  
 (i) a sum greater than 7,  
 (ii) same number on both dice.

**Section – D**

17. a. Draw the graphs of the equations  $x - y + 1 = 0$  and  $3x + 2y - 12 = 0$ . Determine the coordinates of the vertices of the triangle formed by these lines and the  $x$ -axis.

**Or** **5**

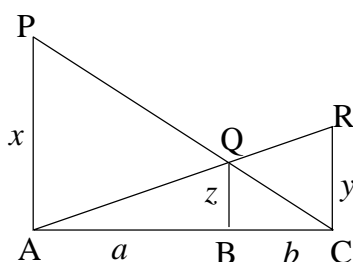
- b. The area of a rectangle gets reduced by 9 square units if its length is reduced by 5 units and the breadth is increased by 3 units. If we increase the length by 3 units and the breadth by 2 units, the area is increased by 67 square units. Find the length and breadth of the rectangle.

18. a. The points  $A(0, -1)$ ,  $B(-2, 3)$ ,  $C(6, 7)$  and  $D(8, 3)$  are the vertices of a quadrilateral. Identify the name of the quadrilateral ABCD with reasons.

**Or** **5**

- b. The line segment joining the points  $P(3, 3)$  and  $Q(6, -6)$  is trisected at the points A and B such that A is nearer to P. If A also lies on the line given by  $2x + y + k = 0$ , find the value of  $k$ .

19. a. In the adjoining figure, PA, QB and RC each is perpendicular to AC such that  $PA = x$ ,  $RC = y$ ,  $QB = z$ ,  $AB = a$  and  $BC = b$ . Prove that:  $\frac{1}{x} + \frac{1}{y} = \frac{1}{z}$



**Or** **5**

- b. State and prove Thales theorem.

20. a. Angle between two tangents PQ and PR from a point P to a circle with centre O is right angle. If  $PQ + PR = 8$  cm, find the diameter of the circle.

**Or** **5**

- b. Prove that the opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle.

21. a. A solid is composed of a cylinder with hemispherical ends. The total height of the solid is 19 cm and the diameter of the cylinder is 7 cm. Find the volume and the surface area of the solid.

**Or**

**5**

- b. A semi-circular metal sheet of diameter 28 cm is bent into an open conical cup. Find the capacity of the cup. [ Use  $\sqrt{147} = 12.12$  ]

22. a. Find the mean of the following data using Step-deviation method:

Marks obtained	No. of students
Less than 30	6
Less than 40	24
Less than 50	49
Less than 60	71
Less than 70	88
Less than 80	100

[ Take assumed mean = 45 ]

**Or**

**5**

- b. The total sales contributed by different counters in a departmental store during a month was:

Counter	Sale (₹)
Electrical	3,50,000
Hardware	2,50,000
Men's wear	2,00,000
Ladies wear	3,00,000
Toys	1,00,000

Represent this information in a pie-chart by rounding-off the values (not on graph paper). Also shade and label the different sectors.

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