

Class: X  
Subject: Mathematics

M.M.: 80  
Duration: 180 Min.

Name \_\_\_\_\_ Sec \_\_\_\_\_ Roll No. \_\_\_\_\_ Adm. No. \_\_\_\_\_

**General Instructions-**

- All questions are compulsory.
- This question paper contains- five sections A, B, C, D and E.

**SECTION-A**

1. The nature of roots of the quadratic equation  $9x^2 - 6x - 2 = 0$  is: 01  
 (a) No real roots (b) 2 equal real roots  
 (c) 2 distinct real roots (d) more than 2 real roots
2. Let the ages of Anjali and Beena be  $a$  and  $b$  such that  $a = p^3q^4$  and  $b = p^2q^3$ , where  $p$  and  $q$  are prime numbers. If  $HCF(a, b) = p^m q^n$  and  $LCM(a, b) = p^r q^s$ , then  $(m + n)(r + s) =$  01  
 (a) 15 (b) 30  
 (c) 35 (d) 72
3. If  $\left(\frac{a}{3}, 4\right)$  is the mid-point of the line segment joining the points  $P(-6, 5)$  and  $R(-2, 3)$ , then the value of 'a' is 01  
 (a) 12 (b) -6  
 (c) -12 (d) -4
4. If  $\sin \theta + \cos \theta = \sqrt{2} \cos \theta$  ( $\theta \neq 90^\circ$ ), then the value of  $\tan \theta$  01  
 (a)  $\sqrt{2} - 1$  (b)  $\sqrt{2} + 1$   
 (c)  $\sqrt{2}$  (d)  $-\sqrt{2}$
5. If  $5 \tan \beta = 4$ , then  $\frac{5 \sin \beta - 2 \cos \beta}{5 \sin \beta + 2 \cos \beta} =$  01  
 (a)  $\frac{1}{3}$  (b)  $\frac{2}{5}$   
 (c)  $\frac{3}{5}$  (d) 6
6. The area of the circle that can be inscribed in a square of side 6cm is 01  
 (a)  $36\pi \text{ cm}^2$  (b)  $18\pi \text{ cm}^2$   
 (c)  $12\pi \text{ cm}^2$  (d)  $9\pi \text{ cm}^2$
7. For the following distribution,

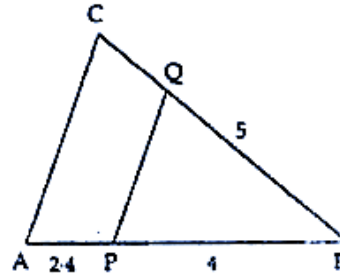
Class	0-5	5-10	10-15	15-20	20-25
Frequency	10	15	12	20	9

The sum of the lower limits of the median and modal class is 01

- (a) 15 (b) 25  
(c) 30 (d) 35

8. In the given figure,  $PQ \parallel AC$ . If  $BP = 4$  cm,  $AP = 2.4$  cm and  $BQ = 5$  cm, then length of BC is 01

- (a) 8 cm (b) 3 cm  
(c) 0.3 cm (d)  $25/3$  cm



9.  $(\sec^2\theta - 1)(\operatorname{cosec}^2\theta - 1)$  is equal to 01

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

10. The distance of the point  $(3, -5)$  from x-axis is 01

- (a) 3 (b) -3  
(c) 5 (d) -5

11. The value of  $k$  for which the pair of equations  $3x + 5y = 8$  and  $kx + 15y = 24$  has infinitely many solutions, is 01

- (a) 3 (b) 5  
(c) 9 (d) 15

12. Which term of the A.P. 21, 18, 15, ..... is zero? 01

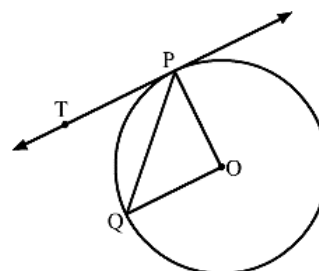
- (a) 11<sup>th</sup> (b) 10<sup>th</sup>  
(c) 9<sup>th</sup> (d) 8<sup>th</sup>

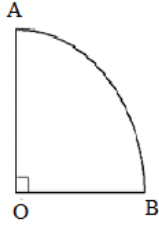
13. If the letters of the word RAMANUJAN are put in a box and one letter is drawn at random. The probability of getting the letter 'A' is 01

- (a)  $\frac{3}{5}$  (b)  $\frac{1}{2}$   
(c)  $\frac{3}{7}$  (d)  $\frac{1}{3}$

14. In the given figure, O is the center of a circle, PQ is a chord and PT is the tangent at P. If  $\angle POQ = 70^\circ$ , then  $\angle TPQ$  is equal to 1

- (a)  $35^\circ$  (b)  $45^\circ$   
(c)  $55^\circ$  (d)  $70^\circ$



15. The vertices of a parallelogram in order are A(1, 2), B(4, y), C(x, 6) and D(3, 5). Then (x, y) is 01
- (a) (6, 3) (b) (3, 6)  
(c) (5, 6) (d) (1, 4)
16. In the figure, the perimeter of a quadrant of a circle of radius 'r' is 01
- (a)  $\frac{1}{10}$  (b)  $\frac{1}{8}$   
(c)  $\frac{7}{8}$  (d)  $\frac{17}{20}$
- 
17. Find the mode of a distribution whose mean is 8.32 and the median is 8.05. 01
- (a) 7.51 (b) 7.15  
(b) 16.64 (d) 8.51
18. If one zero of the polynomial  $3x^2 + 8x + k$  is the reciprocal of the other, then value of k is 01
- (a)  $\frac{1}{3}$  (b)  $-\frac{1}{3}$   
(c) 3 (d) -3

### ASSERTION-REASON BASED QUESTIONS

In the following questions 19 and 20, a statement of assertion(A) is followed by a statement of Reason(R). Choose the correct answer out of the following choices.

- (a) Both (A) and (R) are true and (R) is the correct explanation of (A).  
(b) Both (A) and (R) are true and (R) is not the correct explanation of (A).  
(c) (A) is true but (R) is false.  
(d) (A) is false but (R) is true.

19. **Assertion(A):** The equation  $x^2 + x + 1 = 0$  has both real roots.  
**Reason(R):** The equation  $ax^2 + bx + c = 0$  has both real and different roots if  $b^2 - 4ac > 0$ . 01
20. **Assertion(A):** The probability that a leap year has 53 Sundays is  $\frac{2}{7}$ .  
**Reason(R):** The probability that a non-leap year has 53 Sundays is  $\frac{1}{7}$ . 01

### SECTION-B

21. Find the HCF and LCM of 96 and 404. 02
22. If  $7\sin^2\theta + 3\cos^2\theta = 4$ , find the value of  $\tan\theta$ . 02

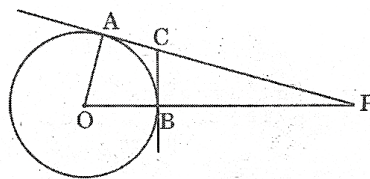
OR

Simplify:  $(1 - \sin A)(\tan A + \sec A)$  02

23. A vertical pole of length 6 m casts a shadow 4 m long on the ground and at the same time a tower casts a shadow 28 m long. Find the height of the tower. 02
24. Find the value of  $k$  for which the roots of the quadratic equation  $5x^2 - 10x + k = 0$  are real and equal. 02
25. A line intersects  $y$ -axis and  $x$ -axis at point  $P$  and  $Q$ , respectively. If  $R(2, 5)$  is the mid-point of line segment  $PQ$ , then find the coordinates of  $P$  and  $Q$ . 02

### SECTION-C

26. Prove that  $\sqrt{5}$  is an irrational number. 03
27. If  $\alpha, \beta$  are zeroes of quadratic polynomial  $5x^2 + 5x + 1$ , find the value of  
 (a)  $\alpha^2 + \beta^2$   
 (b)  $\alpha^{-1} + \beta^{-1}$  03
28. In the given figure,  $O$  is center of a circle of radius 5 cm.  $PA$  and  $BC$  are tangents to the circle at  $A$  and  $B$  respectively. If  $OP = 13$  cm, then find the length of tangents  $PA$  and  $BC$ .



03

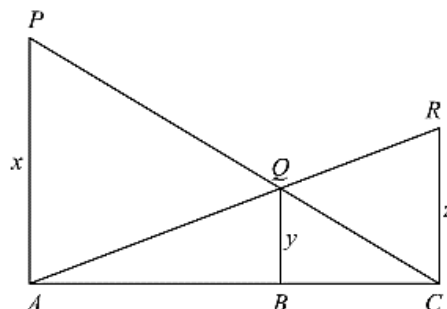
29. Find the co-ordinates of the points of trisection of the line-segment joining the points  $(5, 3)$  and  $(4, 5)$ . 03
30. If the median of the following frequency distribution is 32.5. find the values of  $f_1$  and  $f_2$ . 03

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70	Total
Frequency	$f_1$	5	9	12	$f_2$	3	2	40

31. In the given figure,  $PA$ ,  $QB$  and  $RC$  are each perpendicular to  $AC$ .

Prove that  $\frac{1}{x} + \frac{1}{z} = \frac{1}{y}$ .

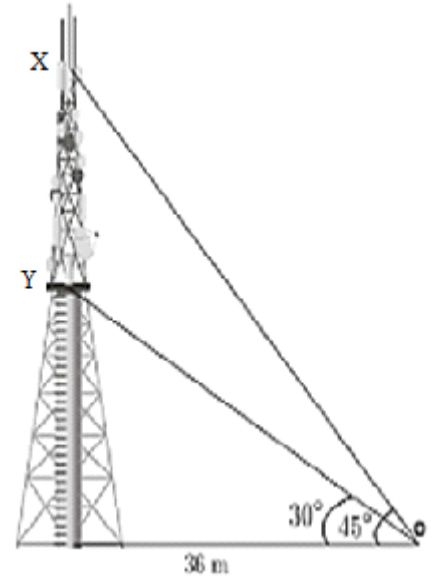
03



### SECTION-D

32 Radio towers are used for transmitting a range of communication services including radio and television. The tower will either act as an antenna itself or support one or more antennas on its structure. On a similar concept, a radio station tower was built in two sections X and Y. Tower is supported by wires from a point O.

Distance between the base of the tower and point O is 36 m. From point O, the angle of elevation of the top of the section Y is  $30^\circ$  and the angle of elevation of the top of section X is  $45^\circ$ .



Based on the above information, answer the following questions:

- (i) Find the length of the wire from the point O to the top of Section Y. 01
- (ii) Find the distance XY. 02

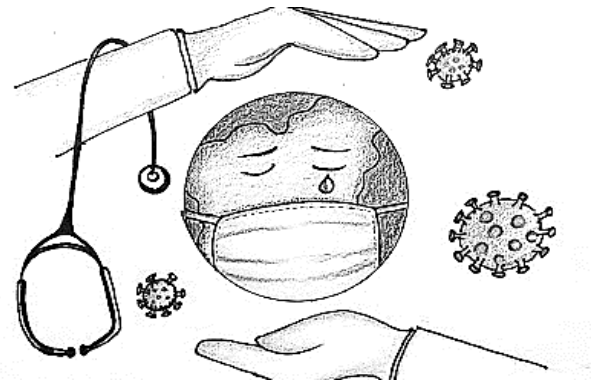
**OR**

Find the area of  $\Delta OPY$ .

02

- (iii) Find the height of the entire tower. 01

33. The COVID-19 pandemic, also known as coronavirus pandemic, is an ongoing pandemic of coronavirus disease caused by the transmission of severe acute respiratory syndrome coronavirus2 (SARS-CoV-2) among humans.



The following table shows the age distribution of cases admitted during a day:

Age (in years)	5-15	15-25	25-35	35-45	45-55	55-65
No. of cases	8	16	10	42	24	12

Based on the given information, answer the following questions:

- (i) Find the modal class and median class of the given data. 01
- (ii) Find the median of the given data. 02
- (iii) Find the mode of the given data. 01

34. Two school's 'P' and 'Q' decided to award prizes to their students for two games of Hockey ₹ x per student and cricket ₹ y per student. School 'P' decided to award a total of ₹ 9500 for the two games to 5 and 4 students respectively; while school 'Q' decided to award ₹ 7370 for the two games to 4 and 3 students respectively.

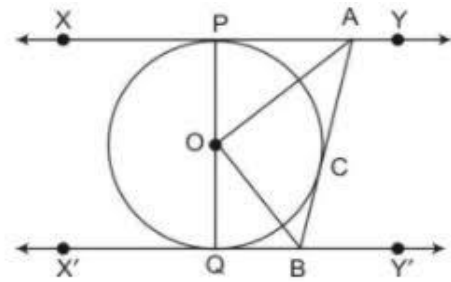


Based on the given information, answer the following questions:

- (i) Represent the following information algebraically (in terms of x and y) 01  
 (ii) What is the prize amount for Hockey? 02  
 (iii) Prize amount on which game is more and by how much? 01

### SECTION-E

35. In the figure XY and X'Y' are two parallel tangents to a circle with centre O and another tangent AB with point of contact C intersecting XY at A and X'Y' at B, what is the measure of  $\angle AOB$ . 5



36. If  $\cot \theta + \cos \theta = m$  and  $\cot \theta - \cos \theta = n$ , show that  $m^2 - n^2 = 4\sqrt{mn}$ . 05

OR

Prove that:  $\frac{\sin \theta - \cos \theta + 1}{\sin \theta + \cos \theta - 1} = \frac{1}{\sec \theta - \tan \theta}$  05

37. (a) Which term of the A.P.  $20, 19\frac{1}{4}, 18\frac{1}{2}, 17\frac{3}{4}, \dots$  is the first negative term. 02  
 (b) If the sum of first 6 terms of an A.P. is 36 and that of the first 16 terms is 256, find the sum of first 10 terms. 03

OR

The sum of four consecutive number in AP is 32 and the ratio of the product of the first and last term to the product of two middle terms is 7 : 15. Find the numbers. 05

38. A solid consisting of a right circular cone of height 120 cm and radius 60 cm standing on a hemisphere of radius 60 cm is placed upright in a right circular cylinder full of water such that it touches the bottom. Find the volume of water left in the cylinder, if the radius of the cylinder is 60 cm and its height is 180 cm. 05



