Board Paper : Class-X

QUESTION PAPER
MATHEMATICS

Max. Marks: 80 **Time Allowed: 3 hours**

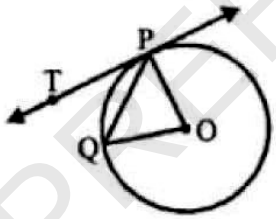
General Instructions:

1. This Question Paper has 5 Sections **A to E**.
2. **Section A** has **20 MCQs** carrying **1 mark** each
3. **Section B** has 5 questions carrying **2 marks** each.
4. **Section C** has 6 questions carrying **3 marks** each.
5. **Section D** has 4 questions carrying **5 marks** each.
6. **Section E** has 3 case based integrated units of assessment (**4 marks each**) with subparts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E.
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated.
9. There is **no negative** marking in the question paper.
10. Duration of test is **3 hours**.**Total marks are 80.**

SECTION-A MARKS : 20

This section contains 20 questions.

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



(1) 45° (2) 70°

(3) 55° (4) 35°

2. The points P(0, 6), Q(-5, 3) and R(3,1) are the vertices of a triangle, which is

(1) Scalene

(2) Equilateral

(3) Only isosceles

(4) Isosceles right angled

3. The distance between $(at^2, 2at)$ and $\left(\frac{a}{t^2}, \frac{-2a}{t}\right)$ is :

(1) $a\left(t^2 + \frac{1}{t^2}\right)$ units (2) $a\left(t - \frac{1}{t}\right)^2$ units

(3) $a\left(t + \frac{1}{t}\right)^2$ (4) $\left(t + \frac{1}{t}\right)^2$ units

4. A number x is chosen at random from the numbers -4, -3, -2, -1, 0, 1, 2, 3, 4, 5. The probability that $x < 3$ is

(1) 1 (2) 0 (3) $\frac{1}{2}$ (4) $\frac{7}{10}$

5. The ratio in which the x-axis divides the segment joining (3, 6) and (12,-3) is

(1) 1 : 3 (2) 2 : 1

(3) 1 : 2 (4) 3 : 1

6. A die is thrown once. The probability of getting an even number is

(1) $\frac{1}{3}$ (2) $\frac{5}{6}$ (3) $\frac{1}{6}$ (4) $\frac{1}{2}$

7. The radii of the base of a cylinder and a cone are in the ratio 3 :4. If they have their heights in the ratio 2 : 3, the ratio between their volumes is

(1) 9 : 8 (2) 3 : 4 (3) 8 : 9 (4) 4 : 3

8. If the system $6x - 2y = 3$, $kx - y = 2$ has a unique solution, then

(1) $k = 3$ (2) $k \neq 4$

(3) $k \neq 3$ (4) $k = 4$

9. If the sum of the roots of the equation $kx^2 + 2x + 3k = 0$ is equal to their product then the value of k is

(1) $\frac{1}{3}$ (2) $\frac{-1}{3}$ (3) $\frac{-2}{3}$ (4) $\frac{2}{3}$

10. If $x = 1$ is a common root of $ax^2 + ax + 2 = 0$ and $x^2 + x + b = 0$ then, ab is

(1) 2 (2) 1 (3) 3 (4) 4

11. A bag contains 3 red balls, 5 white balls and 7 black balls. What is the probability that a ball drawn from the bag at random will be neither red nor black?

(1) $\frac{1}{3}$ (2) $\frac{8}{15}$ (3) $\frac{7}{15}$ (4) $\frac{1}{5}$

12. The HCF of two numbers is 27 and their LCM is 162. If one of the numbers is 54, what is the other number?

(1) 9 (2) 81 (3) 45 (4) 36

13. The point where the perpendicular bisector of the line segment joining the points A(2, 5) and B(4, 7) cuts is:

(1) (3, 6) (2) (0, 0)

(3) (2, 5) (4) (6, 3)

14. $(\cos 0° + \sin 30° + \sin 45°)(\sin 90° + \cos 60° - \cos 45°) = ?$

(1) $\frac{5}{8}$ (2) $\frac{7}{4}$ (3) $\frac{5}{6}$ (4) $\frac{3}{5}$

15. The relationship between mean, median and mode for a moderately skewed distribution is:

(1) Mode = 2 Median - 3 Mean

(2) Mode = 2 Median - Mean

(3) Mode = Median - 2 Mean

(4) Mode = 3 Median - 2 mean

16. If a pole 12 m high casts a shadow $4\sqrt{3}$ m long on the ground then the sun's elevation is

(1) 30° (2) 45° (3) 90° (4) 60°

17. The pair of equations $x = 2$ and $y = -3$ has

(1) no solution

(2) one solution

(3) infinitely many solutions

(4) two solutions

18. The sum of a rational and an irrational number is

(1) Can be Rational or Irrational

(2) Irrational

(3) Always Rational

(4) Rational

19. **Assertion (A) :** 3 is a rational number.

Reason (R) : The square roots of all positive integers are irrationals.

(1) Both A and R are true and R is is the correct explanation of A.

(2) Both A and R are true but R not the correct explanation of A.

(3) A is true but R is false.

(4) A is false but R is true.

20. **Assertion (A) :** If in a ΔABC, a line DE || BC, intersects AD in D and AC in E, then $\frac{AB}{AD} = \frac{AC}{AE}$.

Reason (R) : If a line is drawn parallel to one side of a triangle intersecting the other two sides, then the other two sides are divided in the same ratio.

(1) Both A and R are true and R is is the correct explanation of A.

(2) Both A and R are true but R not the correct explanation of A.

(3) A is true but R is false.

(4) A is false but R is true.

SECTION-B MARKS : 10

This section contains 5 questions.

21. Ten students of class X took part in Mathematics quiz. If the number of girls is 4 more than the number of boys. Represent this situation algebraically and graphically.

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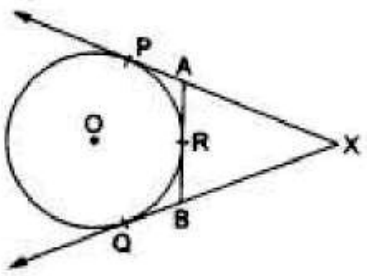
22. In a class of 40 students, there are 13 students who have 100% attendance, 15 students who do social work, 5 students participate in Adult Education and the remaining students participate in an educational cultural program. One student is selected from the class. What is the probability that he participates in a cultural program?

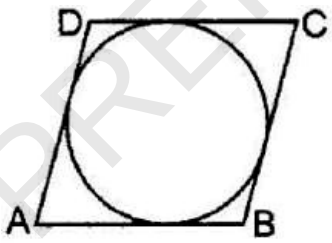
23. Find the zeroes of $x^2 - 2x - 8$ and verify the relationship between the zeros and the coefficients.

24. In the given figure, XP and XQ are two tangents to the circle with centre O, drawn from an external point X. ARB is another tangent, touching the circle at R. Prove that XA +AR = XB + BR.



OR

Prove that the lengths of tangents drawn from an external point to a circle are equal. Using the above prove the following: A quadrilateral ABCD is drawn to circumscribe a circle. Prove that AB + CD = AD + BC.



25. If the mid-point of the line segment joinng $A\left(\frac{x}{2}, \frac{y+1}{2}\right)$ and $(x+1, y-3)$ is C $(5, -2)$, find y.

OR

Find the distance between the points $A(at_1^2, 2at_1)$ and $B(at_2^2, 2at_2)$.

SECTION-C MARKS : 18

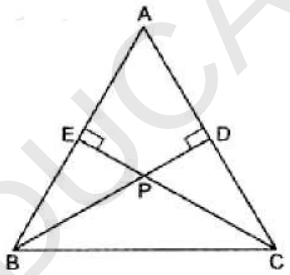
This section contains 06 questions.

26. Form the pair of linear equations in the problem, and find its solution (if it exists) by the elimination method:

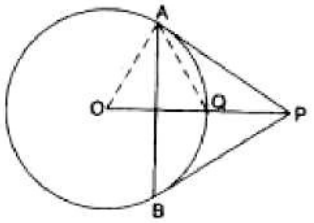
If we add 1 to the numerator and subtract 1 from the denominator, a fraction reduces to 1. It becomes half if we only add 1 to the denominator. What is the fraction?

27. If $\cos ec\theta = \sqrt{10}$, find the value of all T-ratios of θ.

28. In Fig. considering triangles BEP and CPD, prove that BP × PD = EP × PC.

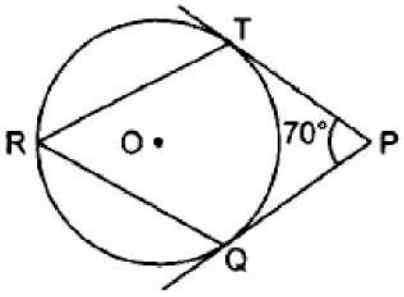


29. From a point P, two tangents PA and PB are drawn to a circle C(O, r). If OP = 2r, show that ΔAPB is equilateral.



OR

In figure, O is the centre of a circle. PT and PQ are tangents to the circle from an external point P. If ∠TPQ = 70°, find ∠TRQ.



30. The angle of elevation of the top Q of a vertical tower PQ from a point X on the ground is 60°. From the point R, 40 m vertically above X, the angle of elevation of the top Q of tower is 45°. Find the height of the tower PQ and the distance PX.

31. Find the values of a and b so that the polynomials P(x) and Q(x) have

$(x^2 - x - 12)$ as their HCF, where

$P(x) = (x^2 - 5x + 4)(x^2 + 5x + a)$

$Q(x) = (x^2 + 5x + 6)(x^2 - 5x - 2b)$

OR

Show that $2 - \sqrt{3}$ is an irrational number.

SECTION-D MARKS : 20

This section contains 04 questions.

32. In the trapezium ABCD, AB || DC and DC = 2AB. EF drawn parallel to AB cuts AD in F and BC in E such that $\frac{BE}{EC} = \frac{3}{4}$. Diagonal DB intersects EF at G.

Prove that 7FE = 10 AB.

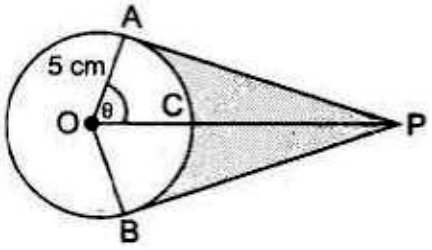
33. Solve the quadratic equation by factorization:

$$\frac{3}{x+1} - \frac{1}{2} = \frac{2}{3x-1}, x \neq -1, \frac{1}{3}$$

OR

If the roots of the quadratic equation $(c^2 - ab)x^2 - 2(a^2 - bc)x + b^2 - ac = 0$ in x are equal then show that either a = 0 or $a^3 + b^3 + c^3 = 3abc$.

34. An elastic belt is placed round the rim of a pulley of radius 5 cm. One point on the belt is pulled directly away from the centre O of the pulley until it is at P, 10 cm from O. Find the length of the belt that is in contact with the rim of the pulley. Also, find the shaded area.



OR

A chord of a circle of radius 10cm subtends a right angle at the center. Find the area of the corresponding: (Use π = 3.14)

i. minor sector ii. major sector

iii. minor segment iv. major segment

35. 100 surnames were randomly picked up from a local telephone directory and the frequency distribution of the number of letters in the English alphabets in the surnames was obtained as follows:

No. of letters	No. of Surnames
1-4	6
4-7	30
7-10	40
10-13	16
13-16	4
16-19	4

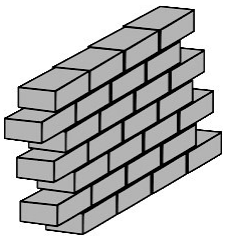
Determine the median number of letters in the surnames. Also, find the modal size of the surnames.

SECTION-E MARKS : 12

This section contains 03 questions.

36. Read the text carefully and answer the questions:

Akshat's father is planning some construction work in his terrace area. He ordered 360 bricks and instructed the supplier to keep the bricks in such as way that the bottom row has 30 bricks and next is one less than that and so on.



The supplier stacked these 360 bricks in the following manner, 30 bricks in the bottom row, 29 bricks in the next row, 28 bricks in the row next to it, and so on.

(i) In how many rows, 360 bricks are placed?

(ii) How many bricks are there in the top row?

OR

If which row 26 bricks are there?

(iii) How many bricks are there in 10^{th} row?

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37. Read the text carefully and answer the questions:

Ashish is a Class IX student. His class teacher Mrs Verma arranged a historical trip to great Stupa of Sanchi. She explained that Stupa of Sanchi is great example of architecture in India. Its base part is cylindrical in shape. The dome of this stupa is hemispherical in shape, known as Anda. It also contains a cubical shape part called Hermika at the top. Path around Anda is known as Pradakshina Path.

(i) Find the volume of the Hermika, if the side of cubical part is 10 m.

(ii) Find the volume of cylindrical base part whose diameter and height 48 m and 14 m.

(iii) If the volume of each brick used is 0.01 m^2, then find the number of bricks used to make the cylindrical base.

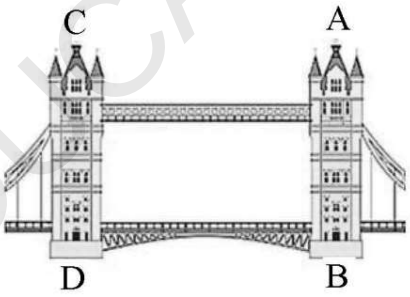
OR

(iii) If the diameter of the Anda is 42 m, then find the volume of the Anda.

38. Read the text carefully and answer the questions:

Tower Bridge is a Grade I listed combined bascule and suspension bridge in London, built between 1886 and 1894, designed by Horace Jones and engineered by John Wolfe Barry. The bridge is 800 feet (240 m) in length and consists of two bridge towers connected at the upper level by two horizontal walkways, and a central pair of bascules that can open to allow shipping.

In this bridge, two towers of equal heights are standing opposite each other on either side of the road, which is 80 m wide. During summer holidays, Neeta visited the tower bridge. She stood at some point on the road between these towers. From that point between the towers on the road, the angles of elevation of the top of the towers was 60° and 30° respectively.



(i) Find the distances of the point from the base of the towers where Neeta was standing while measuring the height.

(ii) Neeta used some applications of trigonometry she learned in her class to find the height of the towers without actually measuring them. What would be the height of the towers she would have calculated?

OR

Find the distance between Neeta and top tower CD?

(iii) Find the distance between Neeta and top of tower AB?