Class 10 - Mathematics
Sample paper

Maximum Marks: 80   **Time Allowed: 3 hours**

General Instructions:

i. All the questions are compulsory.

ii. The question paper consists of 40 questions divided into 4 sections A, B, C, and D.

iii. Section A comprises of 20 questions of 1 mark each. Section B comprises of 6 questions of 2 marks each. Section C comprises of 8 questions of 3 marks each. Section D comprises of 6 questions of 4 marks each.

iv. There is no overall choice. However, an internal choice has been provided in two questions of 1 mark each, two questions of 2 marks each, three questions of 3 marks each, and three questions of 4 marks each. You have to attempt only one of the alternatives in all such questions.

v. Use of calculators is not permitted.

Section A

1. The decimal expansion of number $\frac{441}{2^2 \times 5^3 \times 7}$ has   1

   a) None of these
   b) non-terminating and non-repeating decimal

   c) terminating decimal
   d) non-terminating repeating decimal

2. For every natural number 'n', 6^n always ends with the digit   1

   a) 4   b) 8
   c) 6   d) 0

3. The mode of 4, 5, 6, 8, 5, 4, 6, 5, 6, x, 8 is 6. The value of 'x' is   1

   a) 8   b) 6
   c) 5   d) 4

4. The discriminant of $4x^2 + 3x - 2 = 0$ is   1

   a) – 23   b) 41
   c) 39   d) – 31

5. The angle of elevation of the sun when the shadow of a pole of height 'h' metres is $\sqrt{3}h$ metres long is   1

   a) 60°   b) 45°
   c) None of these   d) 30°

6. Choose the correct option and justify your choice: $\frac{1-\tan^2 45°}{1+\tan^2 45°}$ 1

   a) tan 90°   b) 1
   c) sin 45°   d) 0

7. If $\sin \theta - \cos \theta = 0$, then the value of is   1

   a) 60°   b) 30°
   c) 45°   d) 90°

8. 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

a) 1

b) 0

c) $\frac{1}{2}$

d) $\frac{7}{10}$

9. Three consecutive vertices of a parallelogram ABCD are A(1, 2), B(1, 0) and C(4, 0). The co – ordinates of the   1
fourth vertex D are

   a) (– 4, 2)

   b) (4, – 2)

   c) (4, 2)

   d) (– 4, – 2)

10. If the line segment joining the points $A(x_1, y_1)$ and $B(x_2, y_2)$ is divided by a point P in the ratio 1 : k   1
internally, then the co – ordinates of the point P are

   a) $\left(\frac{x_2 - kx_1}{1+k}, \frac{y_2 - ky_1}{1+k} \right)$

   b) $\left(\frac{x_2 + kx_1}{1+k}, \frac{y_2 + ky_1}{1+k} \right)$

   c) $\left(\frac{x_2 + kx_1}{1-k}, \frac{y_2 + ky_1}{1-k} \right)$

   d) $\left(\frac{x_1 + kx_2}{1+k}, \frac{y_1 + ky_2}{1+k} \right)$

11. Fill in the blanks: 1

The shape of a glass tumbler is usually in the form of _____ .

12. Fill in the blanks: 1

Factors of $3x^3 - x^2 - 3x + 1$ are _____ .

OR

Fill in the blanks:

The remainder when $x^4 + x^3 - 2x^2 + x + 1$ is divided by x - 1 is _____ .

13. Fill in the blanks: 1

A number is chosen from 1 to 100, then the probability that it is a prime number is _____ .

14. Fill in the blanks: 1
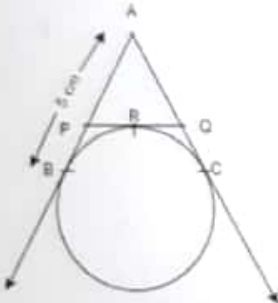
The sum of the AP, 1 + 2 + 3 + 4 + 5 + 6 + — 10 is _____ .

15. Fill in the blanks: 1

A diameter of a circle divides it into _____ equal parts.

16. Find the simplest form of $\frac{1095}{1168}$.   1

17. In the given figure, AB, AC and PQ are tangents. If AB = 5 cm, then find the perimeter of $\triangle APQ$.   1

18. If a line intersects a circle in two distinct points, what is it called?   1

19. Find the 10th term of the AP 2, 7, 12,...   1

OR

Find 11th term of the A.P. 10.0, 10.5, 11.0, 11.5,.....

20. Find the nature of the roots of the quadratic equation: $2x^2 - 8x + 5 = 0$ 1
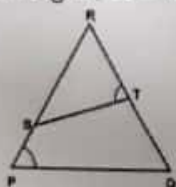
Section B

21. Two different dice are tossed together. Find the probability: 2
   i. of getting a doublet
   ii. of getting a sum 10, of the numbers on the two dice.

22. From a point Q, the length of the tangent to a circle is 24 cm and the distance of Q from the centre is 25 cm.   2
Find the radius of the circle.

23. In Fig. if $\angle P = \angle RTS$, prove that $\triangle RPQ \sim \triangle RTS$.   2

In the given figure, S and T are points on the sides PQ and PR respectively of $\triangle PQR$, such that PT = 2 cm, TR = 4 cm and $ST \parallel QR$. Find the ratio of the areas of $\triangle PST$ and $\triangle PQR$
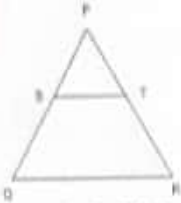
24. A straight highway leads to the foot of a tower. A man standing on its top observes a car at an angle of depression of 30°, which is approaching the foot of the tower with a uniform speed. 6 seconds later, the angle of depression of the car becomes 60°. Find the time taken by the car to reach the foot of tower from this point. **2**

25. Solve the quadratic equations by factorization method: **2**

$x^2 - 4ax + 4a^2 - b^2 = 0$

OR

A natural number, when increased by 12, equals 160 times its reciprocal. Find the number.

26. A metallic sphere of radius 4.2 cm is melted and recast into the shape of a cylinder of radius 6 cm. Find the height of the cylinder. **2**

Section C

27. Prove that $(3 + \sqrt{2})$ is irrational. **3**

OR

Find the HCF of the following polynomials: $2\left(x^4 - y^4\right), 3\left(x^3 + 2x^2y - xy^2 - 2y^3\right)$

28. Show that the points A (2,-2), B(14,10), C (11, 13) and D(-1, 1) are the vertices of a rectangle. **3**

29. Find two numbers such that the sum of twice the first and thrice the second is 92, and four times the first exceeds seven times the second by 2. **3**

OR

Find the values of a and b for which the following system of equations has infinitely many solutions:

$2x - (2a + 5)y = 5$

$(2b + 1)x - 9y = 15$

30. Find the zeros of $f(v) = v^2 + 4\sqrt{3}v - 15$ and verify the relationship between the zeros and their coefficients. **3**

31. If the mth term of an AP be $\frac{1}{n}$ and its nth term be $\frac{1}{m}$, then show that its (mn)th term is 1. **3**

32. Evaluate the following: $\dfrac{\sec^2(90^\circ - \theta) - \cot^2\theta}{2\left(\sin^2 25^\circ + \sin^2 65^\circ\right)} - \dfrac{2\cos^3 60^\circ \tan^2 28^\circ \tan^2 62^\circ}{3\left(\sec^2 43^\circ - \cot^2 47^\circ\right)}$. **3**

OR

If $\sin\theta + \cos\theta = \sqrt{2}$, then evaluate $\tan\theta + \cot\theta$.

33. A chord of a circle of radius 14 cm subtends an angle of 120° at the centre. Find the area of the corresponding minor segment of the circle. [Use $\pi = \frac{22}{7}$ and $\sqrt{3} = 1.73$]. **3**

34. The king, queen and jack of club are removed from a deck of 52 cards. Then the cards are well-shuffled. One card is drawn at random from the remaining cards. Find the probability of getting **3**

 i. a heart

 ii. a king

 iii. a club

 iv. a '10 'of hearts.

Section D

35. Draw a circle of radius 2.5 cm and take a point P outside it, Without using the centre of the circle, draw two tangents to the circle from the point P. **4**

OR

Construct a triangle ABC in which BC = 6 cm, $\angle BAC = 60^\circ$ and median through A is 4.5 cm. Construct a $\triangle A'BC'$ similar to $\triangle ABC$ with BC' = 8 cm. Write steps of construction.

36. If in a triangle, the square on one side is equal to the sum of the squares on the remaining two sides, prove that the angle opposite to the first side is a right angle. **4**

Use the above and prove:

In a $\triangle ABC$, $BD \perp AC$ such that $BD^2 = DC \cdot AD$. Prove that $\triangle ABC$ is a right angled triangle.

37. Draw the graphs of the pair of linear equations: **4**

$x + 2y = 5$ and $2x - 3y = -4$

Also find the points where the lines meet the x-axis.

OR

For Uttarakhand flood victims two sections A and B of class X contributed Rs 1,500. If the contribution of X-A was Rs 100 less than that of X-B, find graphically the amounts contributed by both the sections.

38. How many spherical bullets can be made out of a solid cube of lead whose edge measures 44 cm, each **4** bullet being 4 cm in diameter.

OR

A cone made of paper has height 3h and vertical angle 2α. It contains two other cones of height 2h and h and vertical angles 4α and 6α respectively. Find the ratio of the two volumes in between the cones.

39. From a point on the ground, the angles of elevation of the bottom and the top of a transmission tower fixed **4** at the top of a 20 m high building are 45° and 60° respectively. Find the height of the tower

40. The median of the following data is 16. Find the missing frequencies a and b if the total of frequencies is **4** 70.

Class	0 - 5	5 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40
Frequency	12	a	12	15	b	6	6	4