

MATHEMATICS SAMPLE PAPER

CLASS X

CBSE-2019-2020

Time allowed: 3 Hours

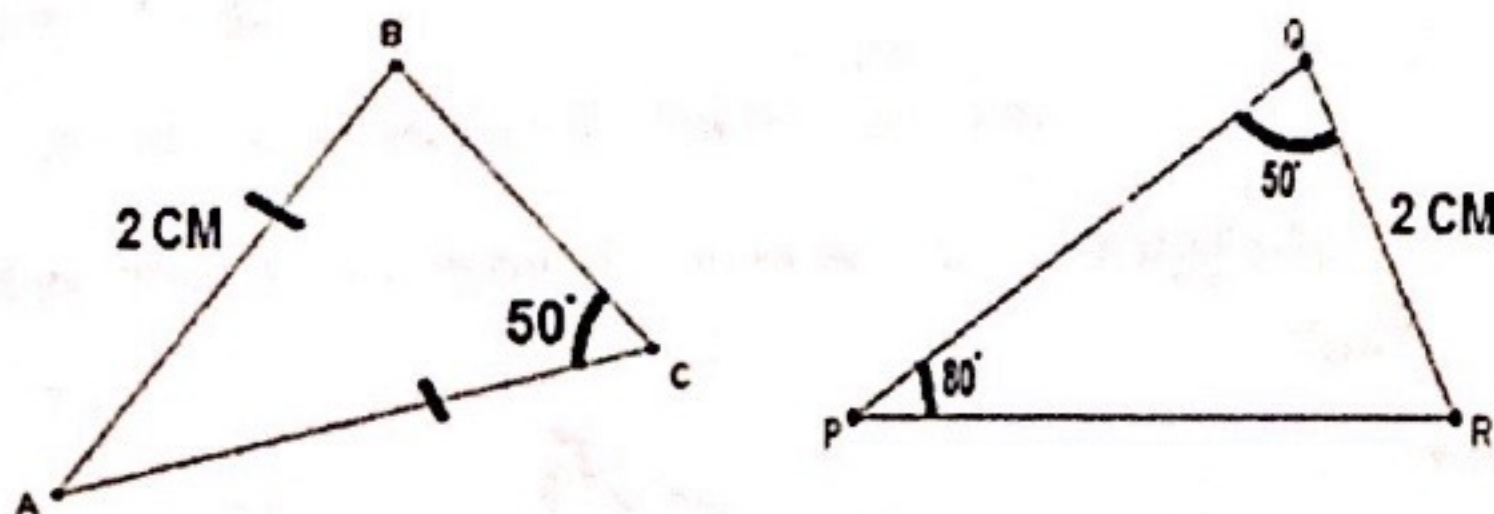
Max. Marks: 80

General Instructions:

- i. All the questions are compulsory.
 - ii. The questions paper consists of 30 questions divided into 4 sections A, B, C and D.
 - iii. Section A comprises 6 questions of 1 mark each. Section B comprises 6 questions of 2 marks each. Section C comprises 10 questions of 3 marks each. Section D comprises 8 questions of 4 marks each.
 - iv. There is no overall choice. However, an internal choice has been provided. You have to attempt only one of the alternatives in all such questions.
 - v. Use of calculators is not permitted.
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SECTION A

1. In the given figure, is $\triangle ABC \sim \triangle PQR$? Give reasons.



2. Evaluate: $(\sqrt{3} + 1) (3 - \cot 30^\circ) (\operatorname{cosec} 45^\circ - \sec 60^\circ)$
3. If the points $A(x, 2)$, $B(-3, -4)$ and $C(7, -5)$ are collinear, find the value of x .
4. If $f_1(x) = x^2 + 11x + n$ and $f_2(x) = x$, then find the largest positive integer n for which the equation $f_1(x) = f_2(x)$ has two distinct real roots.
5. Using fundamental theorem of arithmetic, find LCM (51, 9).
6. If 4th term of an AP is 7, find the sum of its first 7 terms.

SECTION B

7. A bowl contains x black and 8 red balls. After 4 more black balls are added to the bowl, a ball is drawn at random. If the probability of not drawing a red ball is 66.67%, find the value of x .
8. Determine the ratio in which the line $2x + y - 4 = 0$ divides the line segment joining the points $A(2, -2)$ and $B(3, 7)$.
9. If $\sqrt{6}$ is irrational, prove that $\frac{\sqrt{3}}{\sqrt{2} + \sqrt{3}}$ is irrational.
10. If one number is chosen from all two digits numbers, find the probability that it is divisible by 3.
11. If $1 + \sin^2\theta = 3 \sin\theta \cos\theta$, then find $\cos\theta$.
12. If the square of the 7th term of an arithmetic progression with positive common difference equals the product of the 3rd and 17th terms, then find the ratio of the first term to the common difference.

OR

Let t_1, t_2, \dots be real numbers such that $t_1 + t_2 + \dots + t_n = 2n^2 + 9n + 13$, for every positive integer $n \geq 2$.
If $t_k = 103$, then find k .

SECTION C

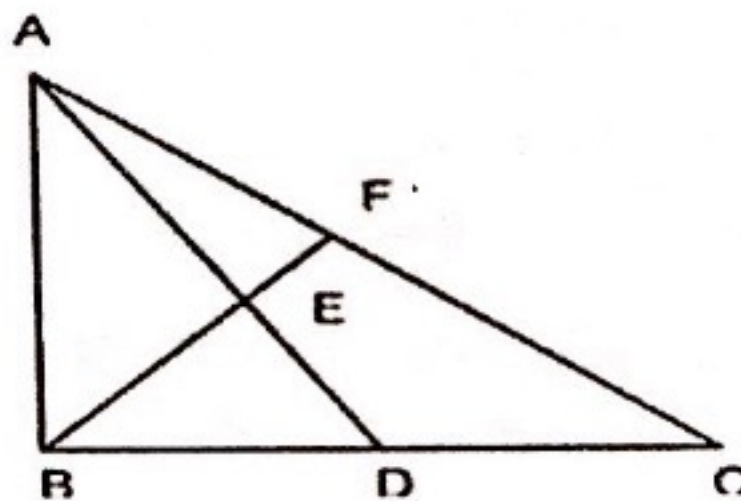
13. Solve the following equation for X :

$$\frac{x-a}{x-b} + \frac{x-b}{x-a} = \frac{a}{b} + \frac{b}{a}$$

OR

If $u^2 + (u-2v-1)^2 = -4v(u+v)$, then what is the value of $u + 3v$?

14. In the figure below, $BD = 8$ cm and $DC = 6$ cm. $AE : ED = 3 : 4$. If $AF = 12$ cm, find AC (in cm).



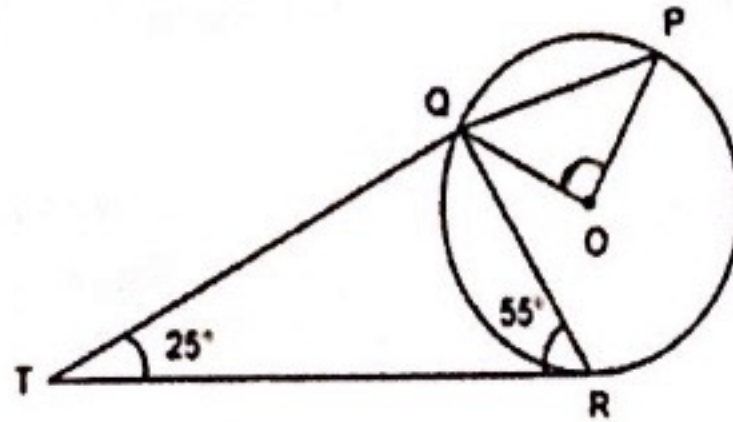
15. A right circular cone, of height 12 ft, stands on its base which has diameter 8 ft. The tip of the cone is cut off with a plane which is parallel to the base and 9 ft from the base. With $\pi = 22/7$, find the volume, in cubic ft, of the remaining part of the cone.

16. If the HCF of 63 and 117 can be written as $63m + 117n$, find the value of $m + n$.

17. If the roots of $2x^2 + 7x + 8$ are α and β , find all polynomials whose roots are $\sqrt{\alpha}$ and $\sqrt{\beta}$.

18. In the figure below, P, Q and R are points on a circle with centre O. The tangent to the circle at R intersects secant PQ at T.

find $\angle POR$.



19. Using trigonometric identities, Prove that: $\frac{\cot A + \operatorname{cosec} A - 1}{\cot A - \operatorname{cosec} A + 1} = \frac{1 + \cos A}{\sin A}$

20. Calculate:

If the median of the following distribution is 28.5, find the values of x and y.

classes	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	Total
frequency	5	x	20	15	y	5	60

21. Let ABC be a right-angled isosceles triangle with hypotenuse BC. Let BQC be a semi-circle, away from A, with diameter BC. Let BPC be an arc of a circle centered at A and lying between BC and BQC. If AB has length 6 cm, then find the area, in sq cm, of the region enclosed by BPC and BQC.

22. Find the equation of set of points P(x, y), the sum of whose distances from A (4, 0) and B (-4, 0) is equal to 10.

OR

If the centroid of an equilateral triangle ABC is T (2, 5) and one of its vertices is A (5, 2), find its altitude. Hence, find its area.

SECTION D

23. Let ABC be a right triangle in which AB = 6 cm, BC = 8 cm and $\angle B = 90^\circ$. BD is the perpendicular from B on AC. The circle through B, C, and D is drawn. Construct the tangents from A to this circle.

24. Let a_1, a_2, \dots, a_{52} be integers in AP. Suppose, their arithmetic mean is one less than the arithmetic mean of a_2, a_3, \dots, a_{52} . If $a_{52} = 100$, then find the value of a_{15} .

25. The angle of elevation of the top of a vertical tower from a point on the ground is 60° . From another point 10 m vertically above the first, its angle of elevation is 45° . Find the height of the tower.

26. A golf ball has a radius of R cm. It has 25 hemispheres carved from its surface such that the total volume of the ball is $1758\pi \text{ cm}^3$. If the diameter of a hemisphere is 2cm, calculate the surface area of the ball.

27. On a triangle ABC, a circle with diameter BC is drawn, intersecting AB and AC at points P and Q, respectively. If the lengths of AB, AC, and CP are 30 cm, 25 cm, and 20 cm respectively, then find the length of BQ in cm.

OR

Let ABC be a right-angled triangle with BC as the hypotenuse. Lengths of AB and AC are 15 km and 20 km, respectively. Find the minimum possible time, in minutes, required to reach the hypotenuse from A at a speed of 30 km per hour.

28. A tank is fitted with pipes, some filling it and the rest draining it. All filling pipes fill at the same rate, and all draining pipes drain at the same rate. The empty tank gets completely filled in 6 hours when 6 filling and 5 draining pipes are on, but this time becomes 60 hours when 5 filling and 6 draining pipes are on. In how many hours will the empty tank get completely filled when one draining and two filling pipes are on.

29. Calculate:

The mean of the following distribution is 18.

Class interval	11-13	13-15	15-17	17-19	19-21	21-23	23-25
Frequencies	3	6	9	13	f	5	4

Find f.

30. Prove that: $\frac{3\sin x - 4\sin^3 x}{4\cos^3 x - 3\cos x} = \frac{3\tan x - \tan^3 x}{1 - 3\tan^2 x}$
