MATHEMATICS SAMPLE PAPER

CLASS X

CBSE-2019-2020

Time allowed: 3 Hours **Max. Marks: 80**

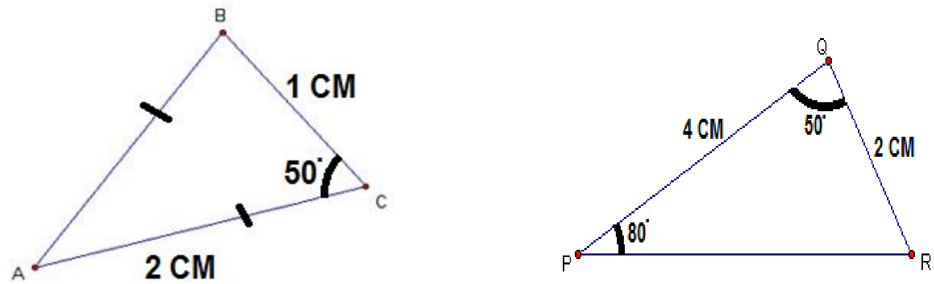
General Instructions:

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.

SPACE FOR ROUGH WORK

SECTION A

1. In the given figure, is $\Delta ABC \sim \Delta PRQ$? Give reasons.



2. If $\sec A - \tan A = \sqrt{3}$, calculate the value of $\sec A + \tan A$.

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 the sum of first four terms of an AP is 8, then find its first term.

SECTION B

7. A bowl contain 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. Without using trigonometric tables,

$$\text{Evaluate: } \sec^2 10 - \cot^2 80 + \frac{\sin 15^\circ \cos 75^\circ + \cos 15^\circ \sin 75^\circ}{\cos\Theta \sin(90^\circ - \Theta) + \sin\Theta \cos(90^\circ - \Theta)}$$

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 $t_1, t_2 \ldots$ be real numbers such that $t_1 + t_2 + \ldots\ldots + t_n = 2n^2 + 9n + 13$, 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. 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.

15. Prove that the tangent drawn at the midpoint of an arc of a circle is parallel to the chord joining the end points of the arc.

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. 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.

OR

A ball of diameter 4 cm is kept on top of a hollow cylinder standing vertically. The height of the cylinder is 3 cm, while its volume is 9π cm^3. Then find the vertical distance, in cm, of the topmost point of the ball from the base of the cylinder.

19. Using trigonometric identities,

Prove that : $\dfrac{\sin A - 2\sin^3 A}{2\cos^3 A - \cos A} = \tan A.$

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 ∠ B = 90°. 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 $a_1, a_2, ..., a_{52}$ be integers in AP. Suppose, their arithmetic mean is one less than the arithmetic mean of $a_2, a_3, ..., a_{52}$. If $a_{52} = 100$, then find the value of a_{15}.

25. 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 using similarity of triangles.

26. 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.

27. A chord of length 5 cm subtends an angle of 60° at the centre of a circle. Find the length, in cm, of a chord that subtends an angle of 120° at the centre of the same circle using trigonometry.

28. A golf ball has a radius of Rcm. It has 25 hemispheres carved from its surface such that the total volume of the ball is $450cm^3$. If the diameter of a hemisphere is 2cm, calculate the surface area of the ball.

OR

From a rectangle ABCD of area 768 sq cm, a semicircular part with diameter AB and area 72π sq cm is removed. Find the perimeter of the leftover portion, in cm.

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

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