BRAINYCHALKS
INSTITUTE FOR CBSE | JEE | NEET | OLYMPIAD

CBSE CLASS X – MATHEMATICS
QUESTION PAPER – 60 MARKS

Chapters: Circles • Areas Related to Circles • Surface Areas and Volumes • Probability

Time Allowed: 2 Hours	Maximum Marks: 60
Student Name: _____	Date: _____

General Instructions

- All questions are compulsory, except where an internal choice is provided.
- Show all necessary working for questions requiring calculations or proofs.
- Use the value of π specified in each question.

SECTION A

MULTIPLE CHOICE QUESTIONS (10 × 1 = 10 marks)

1. A cubical block of side 10 cm is surmounted by a hemisphere of largest diameter. The total surface area of the solid, so formed, is (Use π = 3.14):

(a) 678.5 cm²
(c) 324 cm²
(b) 690 cm²
(d) 587 cm²

2. The curved surface area of a cylinder is 264 m² and its volume is 924 m³. The height of the cylinder is:

(a) 3 m
(c) 6 m
(b) 4 m
(d) 8 m

3. The volume of the greatest sphere that can be cut off from a cylindrical log of wood of base radius 1 cm and height 5 cm is:

(a) $(\frac{4}{3})$π cm³
(c) 5π cm³
(b) $(\frac{10}{3})$π cm³
(d) $(\frac{20}{3})$π cm³

4. Two circles touch internally. The sum of their areas is 116π cm² and the distance between their centres is 6 cm. The radii of the circles are:

(a) 4 cm and 9 cm
(c) 5 cm and 10 cm
(b) 4 cm and 10 cm
(d) 4 cm and 20 cm

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5. The length of an arc of a circle of radius R making a central angle x is:

(a) $\left(\frac{x}{180^\circ}\right)\times 2\pi R$ (c) $\left(\frac{x}{180^\circ}\right) \times \pi R^2$

(b) $\left(\frac{x}{360^\circ}\right) \times 2\pi R$ (d) $\left(\frac{x}{360^\circ}\right) \times \pi R^2$

6. If the area of a sector of a circle is 5/18th of the area of that circle, then the central angle of the sector is:

(a) 110° (c) 120°

(b) 100° (d) 105°

7. A bag contains 3 yellow, 4 brown and 6 grey marbles. If a marble is drawn at random from the bag, then the probability that it will not be grey is:

(a) 3/13 (c) 4/13

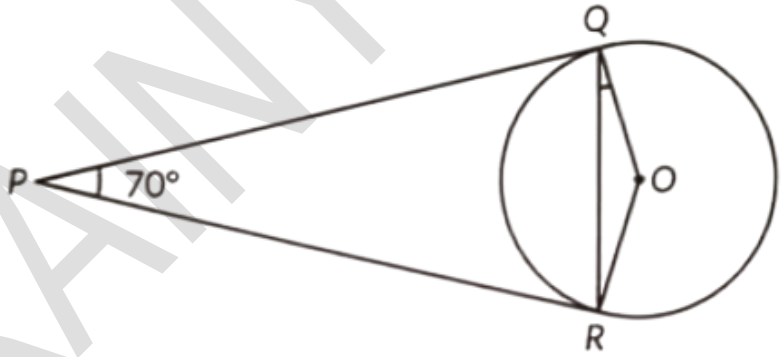
(b) 7/13 (d) 6/13

8. Two dice are thrown at the same time. The probability that the sum of two numbers appearing on the top of the dice is prime is:

(a) 7/18 (c) 5/12

(b) 1/3 (d) 1/2

9. In the given figure, PQ and PR are tangents to the circle with centre O. If ∠QPR = 70°, then ∠OQR is:



(a) 25° (c) 35°

(b) 30° (d) 45°

10. An arc of a circle is of length 12π and the angle subtended at the centre of the circle is 120°. The diameter of the circle is:

(a) 32 cm (c) 36 cm

(b) 18 cm (d) 40 cm

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SECTION B

VERY SHORT ANSWER QUESTIONS (5 × 2 = 10 marks)

11. A farmer connects a pipe of internal diameter 20 cm from a canal into a cylindrical tank which is 10 m in diameter and 2 m deep. If the water flows through the pipe at the rate of 4 km per hour, in how much time will the tank be filled completely?

12. A square dart board is placed in the first quadrant from x = 0 to x = 6 and y = 0 to y = 6. A triangular region on the dart board is enclosed by the lines y = 2, x = 6 and y = x. Find the probability that a dart that randomly hits the dart board will land in the triangular region formed by the three lines.

13. Two dice are thrown once. Find the probability of obtaining: (i) a total of 6; (ii) a total of 10; (iii) the same number on both dice; (iv) a total of more than 9.

14. If PA and PB are two tangents drawn to a circle with centre O from P such that $\angle PBA = 50°$, then find $\angle OAB$.

15. A toy is in the form of a cone mounted on a hemisphere of radius 7 cm. The total height of the toy is 14.5 cm. Find the volume of the toy. (Take $\pi = 22/7$.)

SECTION C

SHORT ANSWER QUESTIONS (6 × 3 = 18 marks)

16. A solid cone with height 24 cm and base radius 7 cm is placed inside a cylindrical vessel. The cylinder has a radius of 7 cm and a height of 30 cm. Find the volume of the empty space left in the cylindrical vessel after placing the cone inside.

17. A right circular cylinder whose diameter is equal to its height, is inscribed in a right circular cone of base diameter 16 cm and height 3 times the base diameter. The axes of both solids coincide. What is the volume (in cm^3) of the solid inside the cone but outside the cylinder?

18. A square of side 5 cm is drawn in the interior of another square of side 10 cm and shaded as shown in the figure. A point is selected at random from the interior of the square ABCD. What is the probability that the point will be chosen from the shaded part?

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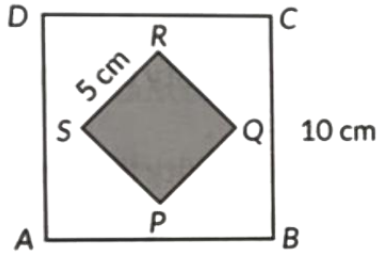
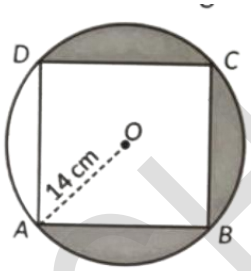


19. A chord AB is a chord of a circle with centre O and radius 4 cm. AB is of length 4 cm and divides the circle into two segments. Find the area of the minor segment and major segment. (Use $\sqrt{3} = 1.73$.)

20. In the given figure, ABCD is a square inscribed in a circle of radius 14 cm. O is the centre of the circle. Find the area of the shaded region.



21. A lead pencil consists of a cylinder of wood with a solid cylinder of graphite filled into it. The diameter of the pencil is 7 mm, the diameter of the graphite is 1 mm and the length of the pencil is 10 cm. Calculate the weight of the whole pencil, if the specific density of wood is 0.7 gm/cm³ and that of graphite is 2.1 gm/cm³.

SECTION D

CASE-BASED QUESTIONS (3 × 4 = 12 marks)

22. Case Study: A municipal corporation is constructing an underground water tank that consists of a cylindrical portion having radius 3.5 m and height 7 m with a conical bottom having the same radius and height 1.2 m for better drainage. Based on the given information, answer the following questions:

(i) Find the curved surface area of the cylindrical portion. (1 mark)

(ii) Find the curved surface area of conical bottom. (1 mark)

(iii) (a) Find the total surface area of the tank if tank is closed. (2 marks)

OR (iii) (b) Find the total volume of the tank. (2 marks)

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23. Case Study: A school organises a lucky draw contest during sports fair. There are 500 students who participated and each student got one ticket. For 1st prize, 1 winner got selected. For 2nd prize, 5 winners got selected. For 3rd prize, 10 winners got selected and next 20 winners got consolation prize. A student is randomly selected from the 500 participants. Based on the given information, answer the following questions:

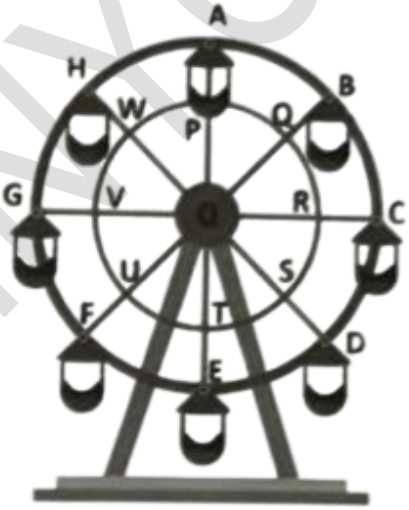
(i) What is the probability that the selected student wins any prize? (1 mark)

(ii) What is the probability that the selected student does not win any prize? (1 mark)

(iii) (a) What is the probability that the selected student wins neither 1st nor 2nd prize? (2 marks)

OR (iii) (b) What is the probability that the selected student wins neither 3rd nor consolation prize? (2 marks)

24. Case Study: At the amusement park, there is a giant Ferris wheel with an outer circle of radius 21 metres and inner circle of radius 14 cm. The Ferris wheel's supporting structure forms a sector of the circular base as shown in the given figure. Based on the given information, answer the following questions:



(i) What is the angle of each sector formed by the supporting structure of the Ferris wheel? (1 mark)

(ii) What is the perimeter of each sector formed by the supporting structure of the Ferris wheel? (1 mark)

(iii) (a) Find the area of HWQB. (2 marks)

OR

(iii) (b) Find the area of UVGF. (2 marks)

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SECTION E

LONG ANSWER QUESTIONS (2 × 5 = 10 marks)

25. AB is a chord of a circle with centre O and radius 28 cm. AB is of length 28 cm and divides the circle into two segments. Find the area of the minor segment and major segment. (Use $\sqrt{3} = 1.73$.)

OR

Find the area of a segment formed by a chord of 7 cm in a circle of radius 7 cm. (Use $\sqrt{3} = 1.73$.)

26. A solid in the form of a cone mounted on a hemisphere is such that the centre of base of cone just coincide with centre of the base of the hemisphere. Slant height of the cone is l and radius of the base of the cone is 1/2 r, where r is the radius of the hemisphere. Prove that the surface area of the solid is $(\pi/4)(11r + 2l)r$ sq. units.

OR

A solid iron pole consists of a cylinder of height 220 cm and base diameter 24 cm, which is surmounted by another cylinder of height 60 cm and radius 8 cm. Find the mass of the pole, given that 1 cm^3 of iron has approximately 8 g mass. (Use $\pi = 3.14$.)

— END OF QUESTION PAPER —

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