CBSE EXAMINATION PAPER-2022

MATHEMATICS

(Solved)

Time allowed : 3 hours | Maximum Marks : 43

General Instructions :

Read the following instructions carefully and follow them :

i. This question paper contains **24 questions.** All questions are **compulsory.**

ii. This question paper is divided into **4 sections.**

iii. **Section A** – questions number **1 to 8** are case based questions

iv. **Section B** – questions number **9 to 16** are very short answer

v. **Section C** – questions number **17 to 21** are short answer

vi. **Section D** – questions number **22 to 24** are long answer

vii. There is no overall choice given in the question paper. However, an internal choice has been provided in few questions.

viii. Use of calculator is NOT allowed.

Section A

Question 1. In the picture given below, one can see a rectangular in-ground swimming pool installed by a family in their backyard. There is a concrete sidewalk around the pool of width x m. The outside edges of the sidewalk measure 7 m and 12 m. The area of the pool is 36 sq. m.



(1) Based on the information given above, form a quadratic equation in terms of x.

[2 Marks]

(2)

Find the width of the sidewalk around the pool.

[2 Marks]

Question 2. John planned a birthday party for his younger sister with his friends. They decided to make some birthday caps by themselves and to buy a cake from a bakery shop. For these two items, they decided the following dimensions : Cake : Cylindrical shape with diameter 24 cm and height 14 cm. Cap: Conical shape with base circumference 44 cm and height 24 cm. Based on the above information, answer the following questions :

Question 3. John planned a birthday party for his younger sister with his friends. They decided to make some birthday caps by themselves and to buy a cake from a bakery shop. For these two items, they decided the following dimensions : Cake : Cylindrical shape with diameter 24 cm and height 14 cm. Cap: Conical shape with base circumference 44 cm and height 24 cm. Based on the above information, answer the following questions :



Question 4. John planned a birthday party for his younger sister with his friends. They decided to make some birthday caps by themselves and to buy a cake from a bakery shop. For these two items, they decided the following dimensions : Cake : Cylindrical shape with diameter 24 cm and height 14 cm. Cap: Conical shape with base circumference 44 cm and height 24 cm. Based on the above information, answer the following questions :

Question 5. John planned a birthday party for his younger sister with his friends. They decided to make some birthday caps by themselves and to buy a cake from a bakery shop. For these two items, they decided the following dimensions : Cake : Cylindrical shape with diameter 24 cm and height 14 cm. Cap: Conical shape with base circumference 44 cm and height 24 cm. Based on the above information, answer the following questions :



Question 6. John planned a birthday party for his younger sister with his friends. They decided to make some birthday caps by themselves and to buy a cake from a bakery shop. For these two items, they decided the following dimensions : Cake : Cylindrical shape with diameter 24 cm and height 14

cm. Cap: Conical shape with base circumference 44 cm and height 24 cm. Based on the above information, answer the following questions :



Question 7. John planned a birthday party for his younger sister with his friends. They decided to make some birthday caps by themselves and to buy a cake from a bakery shop. For these two items, they decided the following dimensions : Cake : Cylindrical shape with diameter 24 cm and height 14 cm. Cap: Conical shape with base circumference 44 cm and height 24 cm. Based on the above information, answer the following questions :



Question 8.

John planned a birthday party for his younger sister with his friends. They decided to make some birthday caps by themselves and to buy a cake from a bakery shop. For these two items, they decided the following dimensions :

Cake : Cylindrical shape with diameter 24 cm and height 14 cm.

Cap : Conical shape with base circumference 44 cm and height 24cm.

Based on the above information, answer the following questions :



(1) How many square cm paper would be used to make 4 such caps ?

[2 Marks]

(2)

The bakery shop sells cakes by weight (0·5 kg, 1 kg, 1·5 kg, etc.). To have the required dimensions, how much cake should they order, if 650 cm3 equals 100 g of cake ?

[2 Marks]

Section B

Question 9. Solve the quadratic equation for x : $x^2 - 2ax + (4b^2 - a^2) = 0$.

[2 Marks]

Question 10. If the quadratic equation $(1 + a^2)\, x^2 + 2abx + (b^2 - c^2) = 0$ has equal and real roots, then prove that $b^2 = c^2(1 + a^2)$.

[2 Marks]

Question 11.

Find the sum of first 20 terms of an AP in which d = 5 and $a_{20} = 135$.

[2 Marks]

Question 12.

Find the mode of the given frequency distribution:

[2 Marks]

Class	*Frequency*
15 – 25	6
25 – 35	11
35 – 45	22
45 – 55	23
55 – 65	14
65 – 75	5

Question 13.

150 spherical marbles, each of diameter 1.4 cm, are dropped in a cylindrical vessel of diameter 7 cm containing some water, and are completely immersed in water. Find the rise in the level of water in the cylindrical vessel.

[2 Marks]

Question 14. Three cubes of side 6 cm each are joined as shown in Figure 1. Find the total surface area of the resulting cuboid.

[2 Marks]

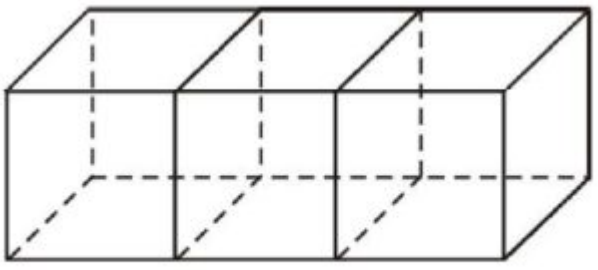


Figure 1

Question 15.

For what value of 'n', are the n^{th} terms of the APs 9, 7, 5, ... and 15, 12, 9, ... the same?

[2 Marks]

Question 16. In Figure 2, PQ and PR are tangents to the circle centred at O. If ∠OPR = 45°, prove that ORPQ is a square.

[2 Marks]

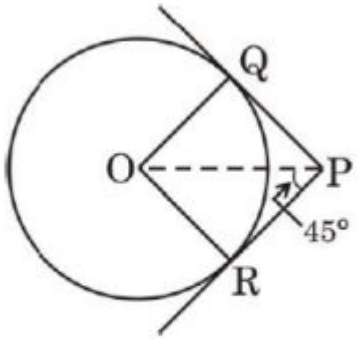


Figure 2

Section C

Question 17. Draw a line segment AB of length 8 cm and locate a point P on AB such that AP : PB = 1 : 5.

[3 Marks]

Question 18. Draw a circle of radius 3 cm. From a point P lying outside the circle at a distance of 6 cm from its centre, construct two tangents PA and PB to the circle.

[3 Marks]

Question 19. The tops of two poles of heights 20 m and 28 m are connected with a wire. The wire is inclined to the horizontal at an angle of 30°. Find the length of the wire and the distance between the two poles.

[3 Marks]

Question 20.

The weights (in kg) of 50 wild animals of a National Park were recorded and the following data was obtained:

Find the mean weight (in kg) using assumed mean method.

[3 Marks]

Weight (in kg)	*Number of animals*
100 – 110	4
110 – 120	12
120 – 130	23
130 – 140	8
140 – 150	3

Question 21.

For the following frequency distribution, find the median:

[3 Marks]

Class	*Frequency*
1400 – 1550	6
1550 – 1700	13
1700 – 1850	25
1850 – 2000	10

Section D

Question 22. In Figure 3, two circles with centres at O and O' of radii 2r and r respectively, touch each other internally at A. A chord AB of the bigger circle meets the smaller circle at C. Show that C bisects AB.

[4 Marks]

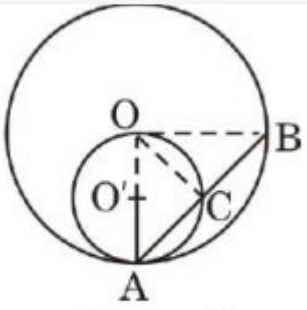


Figure 3

Question 23. In Figure 4, O is centre of a circle of radius 5 cm. PA and BC are tangents to the circle at A and B respectively. If OP = 13 cm, then find the length of tangents PA and BC.

[4 Marks]

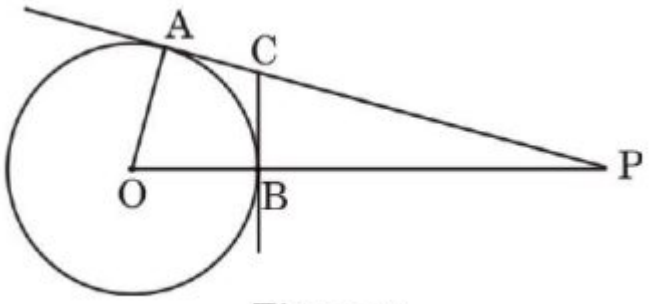


Figure 4

Question 24. A straight highway leads to the foot of a tower. A man standing at the top of the tower observes a car at an angle of depression of 30°, which is approaching the foot of the tower with a uniform speed. Ten seconds later, the angle of depression of the car is found to be 60°. Find the time taken by the car to reach the foot of the tower from this point.

[4 Marks]