Roll Number:_____

THE INDIAN SCHOOL
PRE-BOARD EXAMINATION (2023-24)
MATHEMATICS (041)
X
SET-B

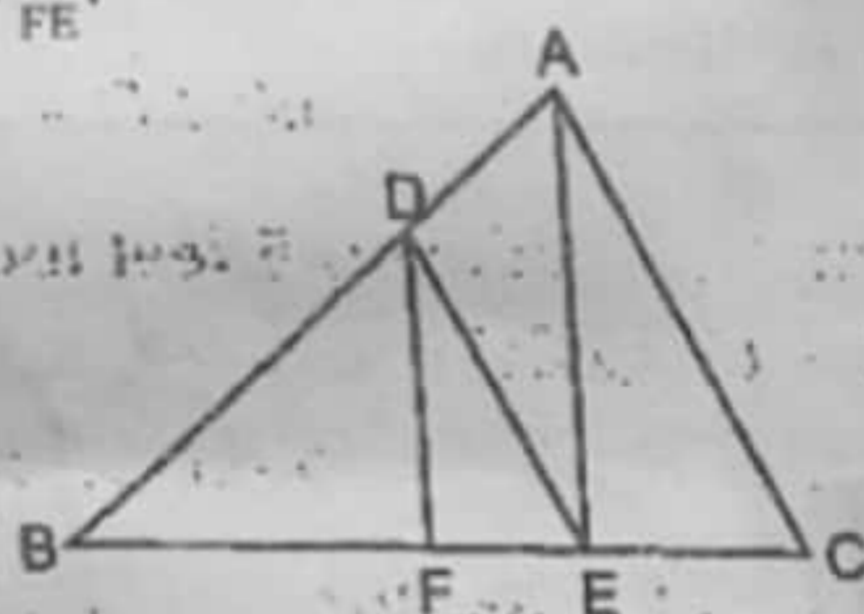Time allowed: 3 hours   Maximum Marks: 80   No. of printed pages: 08
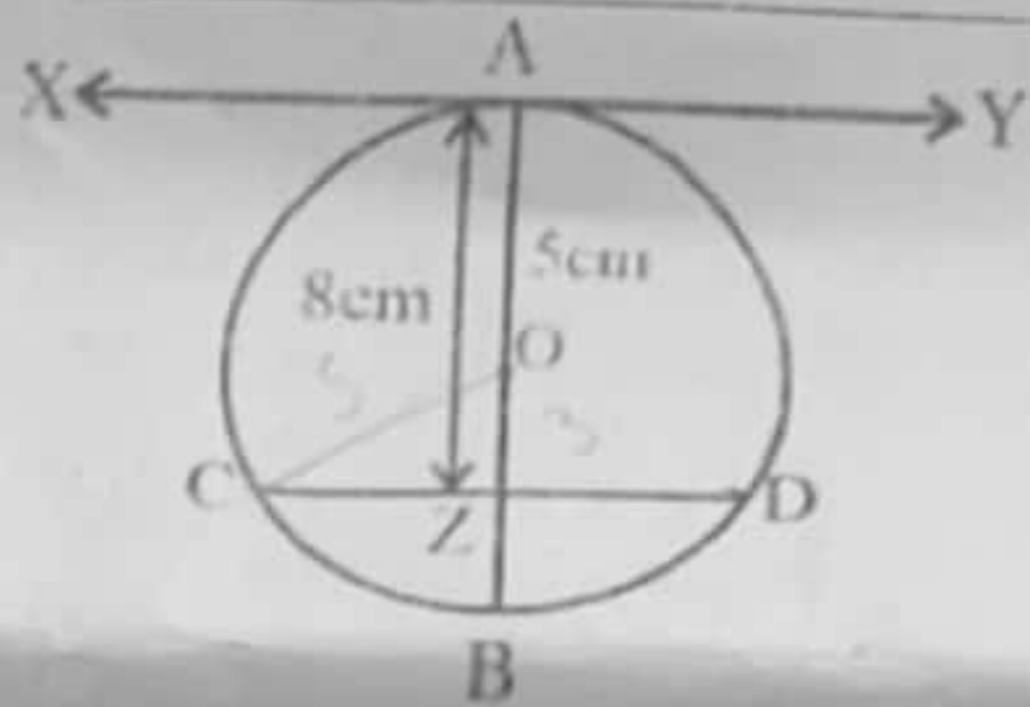
General instructions:

(i)   This question paper consists of 38 questions divided into 5 sections A, B, C, D and E.
(ii)   Section A comprises 20 questions carrying 1 mark each including Multiple Choice questions, Assertion and Reasoning based questions.
(iii)   Section B comprises 5 questions carrying 2 marks each.
(iv)   Section C comprises 6 questions carrying 3 marks each.
(v)   Section D comprises 4 questions carrying 5 marks each.
(vi)   Section E comprises 3 case study-based questions of 4 marks each.
(vii)   All questions are compulsory. However internal choices have been provided in some of the questions.
(viii) Draw neat figures wherever required.

SECTION-A
Multiple Choice Questions (20 Marks)

Q No.	Question	Marks
1	The LCM of two numbers is 9 times their HCF. If the sum of LCM and HCF is 500, then the HCF of two numbers is (a) 10　　　(b) 90　　　(c) 50　　　(d) 45	1
2	If $\sin\theta + \cos\theta = \sqrt{2}\cos\theta, (\theta \neq 90°)$, then the value of $\tan\theta$ is (a) $\sqrt{2} - 1$　　　(b) $\sqrt{2} + 1$　　　(c) $\sqrt{2}$　　　(d) $-\sqrt{2}$	1
3	If a 30 m long ladder is placed against a 15 m high wall such that it just reaches the top of the wall, then the elevation of the wall is equal to (a) 45°　　　(b) 30°　　　(c) 60°　　　(d) 90°	1
4	Cards marked with numbers 3, 4, 5, 50 are placed in a box and mixed thoroughly. A card is drawn at random from the box. The probability that the selected card bears a perfect square number is 3,4,5......50 (a) $\frac{1}{8}$　　　(b) $\frac{6}{50}$　　　(c) $\frac{5}{50}$　　　(d) $\frac{5}{48}$	1

5	The 4th term from the end of the AP $-11, -8, -5, ..., 49$ is	1
	(a) 37 (b) 40 (c) 43 (d) 58	
6	The x-axis divides the line joining the points $(2, -3)$ and $(5, 6)$ in the ratio	1
	(a) $1:2$ (b) $2:1$ (c) $2:5$ (d) $5:2$	
7	In the figure given below, DE ∥ AC and DF ∥ AE. Which of the following is equal to $\frac{BF}{FE}$? (a) $\frac{DF}{AE}$ (b) $\frac{BE}{EC}$ (c) $\frac{BA}{AC}$ (d) $\frac{FE}{EC}$	1
8	What number should be added to the polynomial $x^2 + 7x - 35$ so that 3 is the zero of the polynomial? (a) -35 (b) 7 (c) -5 (d) 5	1
9	The perpendicular bisector of the line segment joining the points A $(1, 5)$ and B $(4, 6)$ cuts the y-axis at (a) $(0, 13)$ (b) $(0, -13)$ (c) $(0, 12)$ (d) $(13, 0)$	1
10	If the angle of depression of a car parked on the road from the top of a 150 m high tower is 30^0, then the distance of the car from the base of the tower (in metres) is (a) $50\sqrt{3}$ (b) $150\sqrt{3}$ (c) $150\sqrt{2}$ (d) 75	1
11	A girl calculates that the probability of her winning the first prize in a lottery as 0.08. If 6000 tickets are sold, how many tickets has she bought? (a) 40 (b) 240 (c) 480 (d) 750	1
12	If the radius of a wheel is 0.25 m, then the number of revolutions it will make to travel a distance of 11 km is (a) 11000 (b) 7000 (c) 10000 (d) 5000	1
13	What is the angle subtended at the centre of a circle with a radius of 10 cm by an arc of length 5π cm? (a) 30^0 (b) 60^0 (c) 45^0 (d) 90^0	1

| 14 | In a circle with a radius of 5 cm, a tangent XAY is drawn from one end A of a diameter AB. What is the length of chord CD, which is parallel to XY and positioned 8 cm away from point A? | 1 |

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

---

15 If $\sum f_i = 18$, $\sum f_i x_i = 2p + 24$, and the mean of the frequency distribution is 2, then the value of p is equal to   **1**

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

---

16 If a number x is chosen from the numbers (1, 2, 3) and a number y is selected from the numbers (1, 4, 9), then $P(xy < 9)$ is   **1**
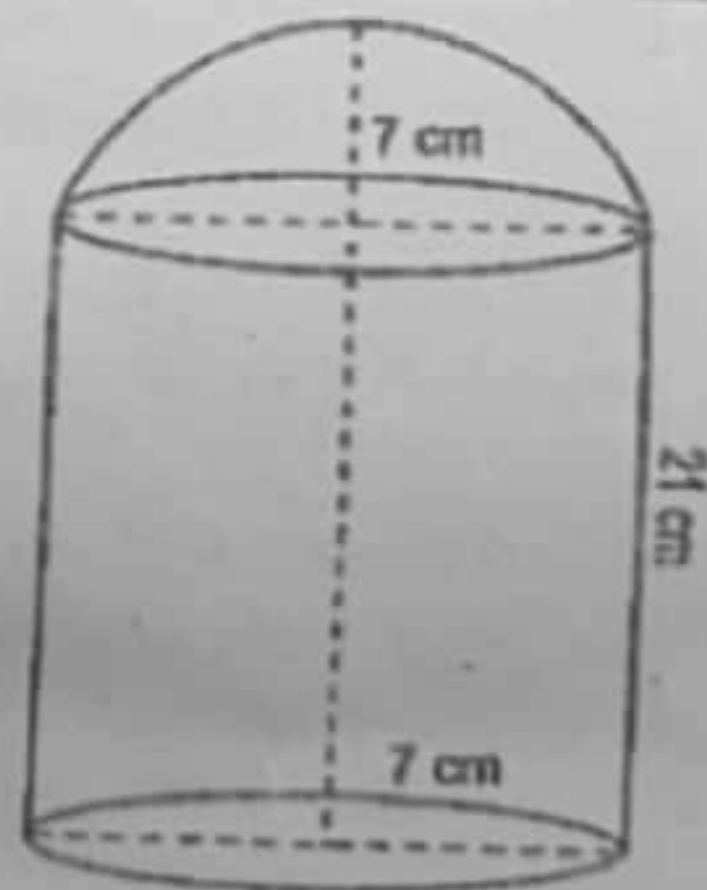
(a) $\frac{3}{9}$ (b) $\frac{4}{9}$ (c) $\frac{1}{9}$ (d) $\frac{5}{9}$

---

17 Water from a river, which is 3 m deep and 40 m wide, is flowing at a rate of 2 km/hour. How much water will flow into the sea in 2 minutes?   **1**

(a) $800 m^3$ (b) $4000 m^3$ (c) $8000 m^3$ (d) $2000 m^3$

---

18 Abhinav created a model for his school project in the shape of a cylinder with radius of 7 cm and a height of 21 cm, with hemisphere surmounted at one end. He wants to cover the entire model with decorative paper. What is the area, in centimetre square, of paper needed to cover the model? $\left(\text{use } \pi = \frac{22}{7}\right)$ **1**

(a) $976 m^2$ (b) $1012 m^2$ (c) $1232 m^2$ (d) $1386 m^2$

In the question number 19 and 20, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**. Choose the correct option.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

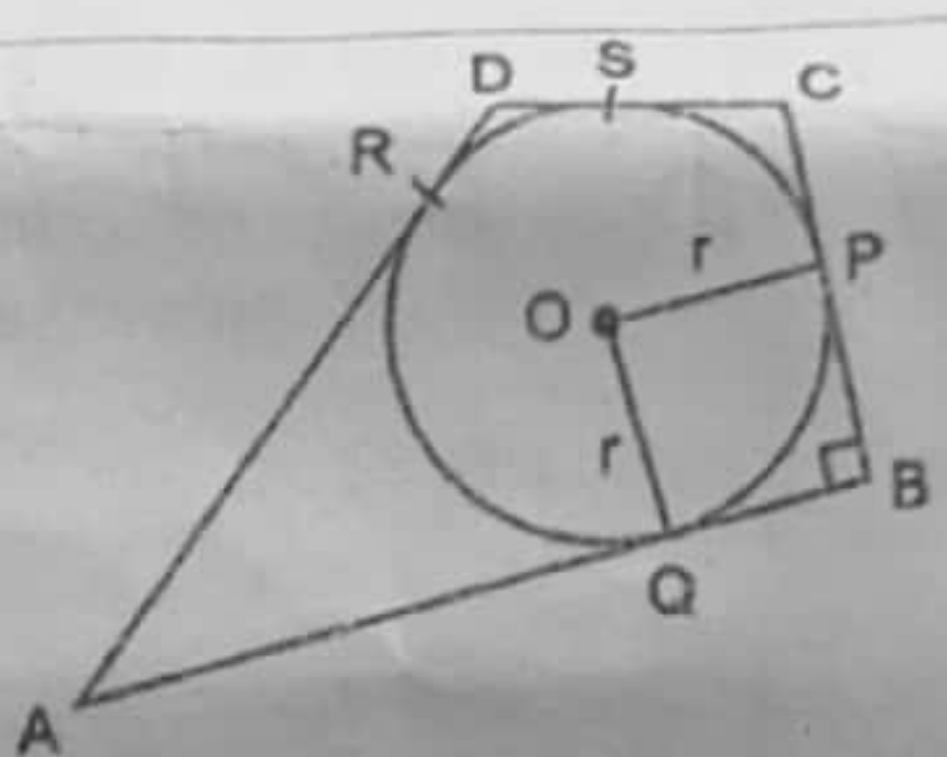| 19	Assertion(A) : The point $(-1, 6)$ divides the line segment joining the points $(-3, 10)$ and $(6, -8)$ in the ratio $2 : 7$ internally. Reason (R) : Three points A, B and C are collinear if $AB + BC = AC$	1
20	Assertion(A) : In $\triangle ABC$, DE $\parallel$ BC such that $AD = (7x - 4)$ cm, $AE = (5x - 2)$ cm, $DB = (3x + 4)$ cm and $EC = 3x$ cm then x equals to 5. Reason (R) : If a line is drawn parallel to one side of a triangle to intersect the other two sides at different points, than the other two sides are divided in the same ratio.	1

SECTION-B
(10 Marks)

Q No.	Question	Marks
21	Find the LCM of $(x^2 - 4)$ and $(x^4 - 16)$.	2
22	There are students in two examination halls, A and B. To equalize the number of students in each hall, 10 students are transferred from A to B. However, if 20 students are sent from B to A, the number of students in A becomes double the number of students in B. Determine the number of students in the two halls. OR The age of the father is twice the sum of the ages of his two children. After 20 years, his age will be equal to the sum of the ages of his children. Find the age of the father.	2
23	The quadratic polynomial $2x^2 - 3x + 1$ has zeros as α and β. Find a quadratic polynomial whose zeros are 3α and 3β.	2
24	Find the area of the minor segment of a circle of radius 14 cm, when the angle of the corresponding sector is $60°$. OR A piece of wire 20 cm long is bent into the form of an arc of a circle subtending an angle of $60°$ at its centre. Find the radius of the circle.	2
25	Two dice are rolled simultaneously, the resulting product of the numbers showing on the dice is observed. Determine the probability of obtaining a prime number as the product.	2

SECTION-C
(18 Marks)

Q No.	Question	Marks

26	Prove that $\sqrt{5}$ is an irrational number and hence show that $3 + \sqrt{5}$ is also an irrational number.	3
27	Using a quadratic formula solve the following quadratic equation: $$p^2x^2 + (p^2 - q^2)x - q^2 = 0$$	3
28	In the given figure, a circle is inscribed in a quadrilateral ABCD in which $\angle B = 90^0$. If AD = 17 cm, AB = 20 cm and DS = 3 cm, then find the radius of the circle.	3
29	Solve the following system of linear equations graphically and shade the region between the two lines and the x-axis. $$3x + 2y - 11 = 0$$ $$2x - 3y + 10 = 0$$	3
30	Point A lies on the line segment XY joining X(6, − 6) and Y(−4, − 1) in such a way that $\frac{XA}{XY} = \frac{2}{5}$. If Point A also lies on the line $3x + k(y + 1) = 0$, then find the value of k. OR In what ratio does the point $\left(\frac{24}{11}, y\right)$ divide the line segment joining the point P (2, −2) and Q (3, 7)? Also find the value of y.	3
31	A man standing on the deck of a ship, which is 10 m above water level, observes the angle of elevation of the top of a hill as 60^0 and the angle of depression of the base of the hill as 30^0. Calculate the distance of the hill from the ship and the height of the hill. OR A bird is perched on the top of a tree, which is 80 m high. The angle of elevation of the bird from a point on the ground is 45^0. The bird then takes off horizontally from that point and maintains a constant height. After 2 seconds, the angle of elevation of the bird from the point of observation becomes 30^0. Find the speed of the bird's flight.	3

SECTION-D
## (20 Marks)

Q No.	Question	Marks

32	A is a point at a distance 10 cm from the centre O of a circle with a radius 6 cm. AP and AQ are tangents drawn to the circle at points P and Q, respectively. A tangent BC is drawn at a point R, lying on the minor arc PQ, intersecting AP at point B and AQ at point C. Find the perimeter of the $\triangle ABC$.	5

OR

In the given figure, O is the centre of the circle and TP is the tangent to the circle from an external point If $\angle PBT = 30^0$, prove that

BA : AT = 2 : 1.
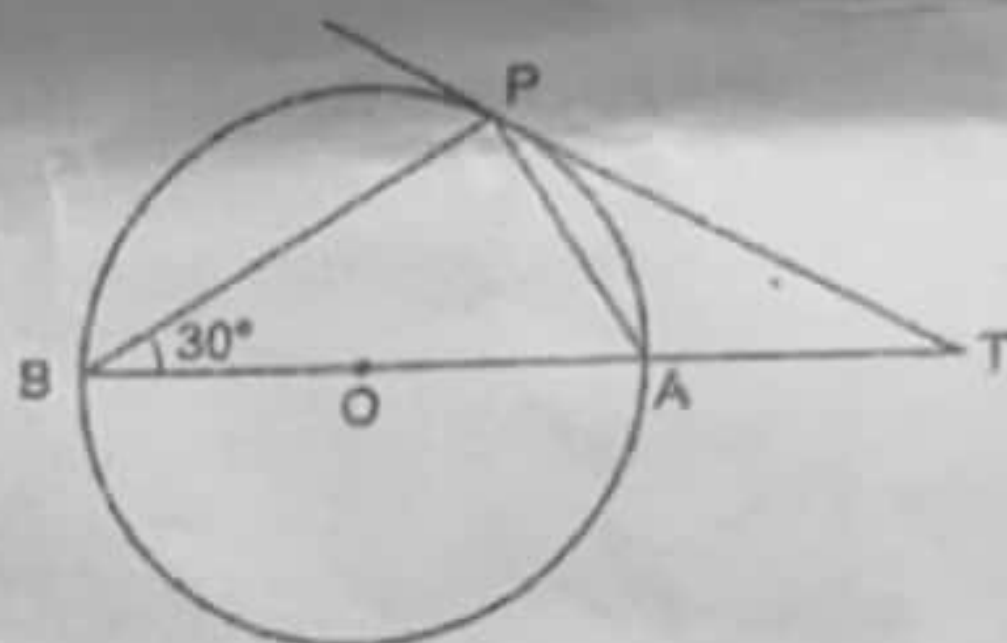
33	One-fourth of a herd of deer was spotted in the forest. Twice the square root of the herd went to the mountains, and the remaining 15 deer were seen on the bank of a river. Determine the total number of deer in the herd.	5

OR

A sum of ₹9000 was divided equally among a certain number of people. If there had been 20 more people, each person would have received ₹160 less. Find the original number of people.

34	(i) If $\cos\theta + \sin\theta = \sqrt{2}\cos\theta$, show that $\cos\theta - \sin\theta = \sqrt{2}\sin\theta$	5

(ii) Evaluate the following:

$$\frac{\cos60^0 - \cot45^0 + \csc30^0}{\sec60^0 + \tan45^0 - \sin30^0}$$

OR

(i) If $x = a\sec\theta + b\tan\theta$ and $y = a\tan\theta + b\sec\theta$, then prove that $x^2 - y^2 = a^2 - b^2$.

(ii) Evaluate the following:

$$\frac{\tan45^0}{\csc30^0} + \frac{\sec60^0}{\cot45^0} - \frac{3}{2}$$
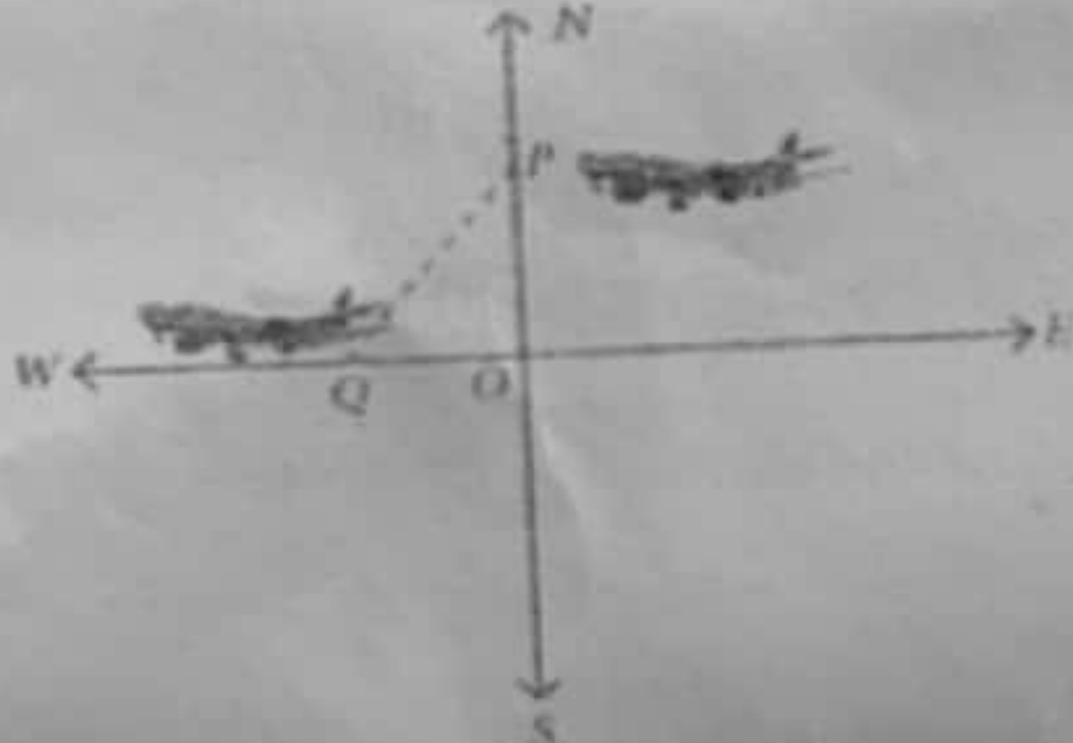
| 35	The monthly expenditure on milk in 200 families of a housing society is given below.	5

Monthly Expenditure (in ₹)	1000-1500	1500-2000	2000-2500	2500-3000	3000-3500	3500-4000	4000-4500	4500-5000
Number of families	24	40	33	x	30	22	16	7

Q No.	Question	Marks
	Find the value of x. Also, find the median and mean expenditure on milk.	

Q No.	Question	Marks
		4

36 | **Case Study**

An aeroplane departs from an airport and flies north at a speed of 1,200 km/hr. At the same time, another aeroplane departs from the same airport and flies west at a speed of 1,500 km/hr as shown below. After $1\frac{1}{2}$ hr both aeroplanes reach points P and Q respectively.

Based on the above information, answer the following questions.

(i) In the given figure, find the area of $\triangle POQ$.

(ii) Find the distance travelled by the aeroplane towards the west after $1\frac{1}{2}$ hr.

OR

(ii) Find the distance travelled by the aeroplane towards the north after $1\frac{1}{2}$ hr.

(iv) Find the distance between the aeroplanes after $1\frac{1}{2}$ hr.

| | | 4 |

37 | **Case Study**

"Makar Sankranti is a joyous and culturally significant occasion. Like numerous other festivals, the kite flying competition also holds historical and cultural importance. The following figure depicts a kite where BCD represents the shape of a quadrant of a circle with a radius of 42 cm. ABCD forms a square, and $\triangle CEF$ is an isosceles right-angled triangle with equal sides measuring 7 cm.
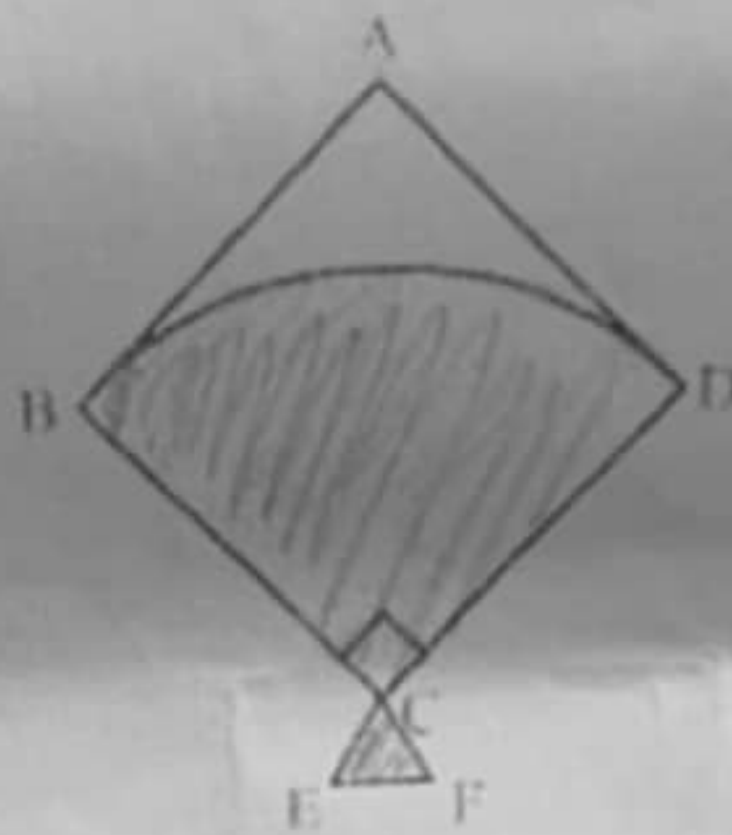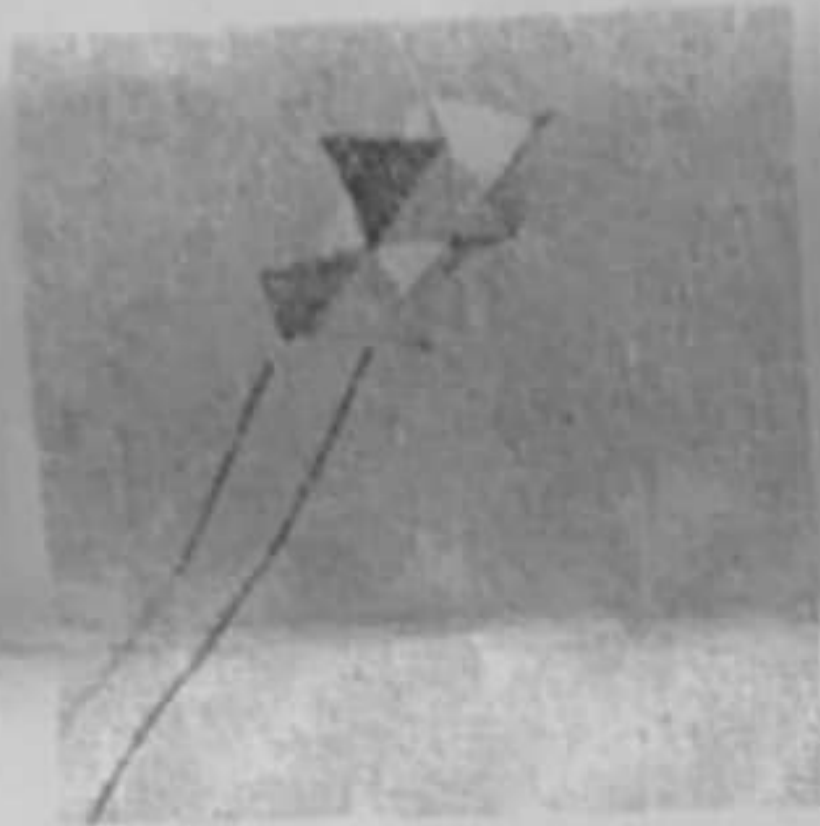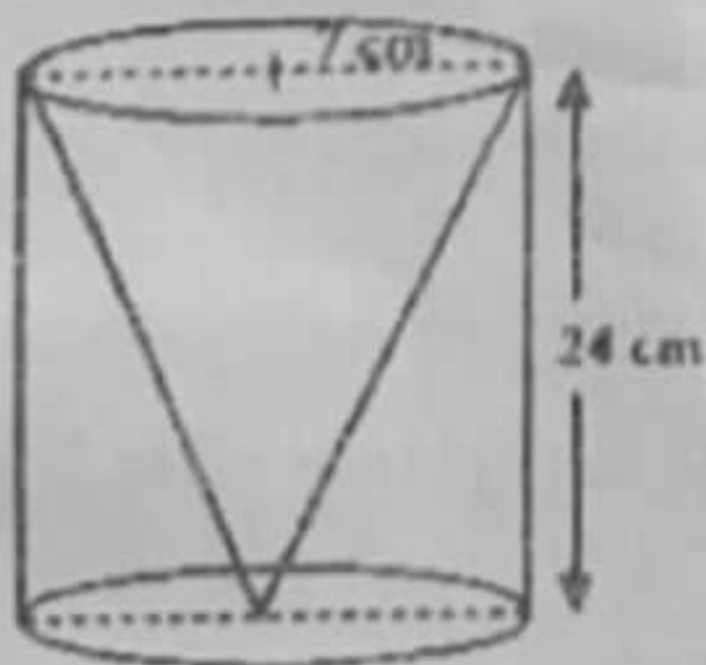
(i) Find the area of the square.

(ii) Find the area of quadrant BCD.

OR

(ii) Find the area of the shaded portion.

(iii) Find the area of the unshaded portion.

| 38 | **Case Study** |

One day, while going home from school, Rinku observed a carpenter working with wood. He noticed that the carpenter was carving out a cone with the same height and diameter as a cylinder. The cylinder has a height of 24 cm and a base radius of 7 cm. While watching, some questions came to Rinku's mind. Help Rinku to find the answer from the following questions.

(i) Find the slant height of the conical cavity so formed.

(ii) Find the curved surface area of the conical cavity so formed.

OR

(ii) Find the external curved surface area of the cylinder so formed.

(iii) Find the volume of the conical cavity.