COMMON PRE-BOARD EXAMINATION 2022-23

CLASS X

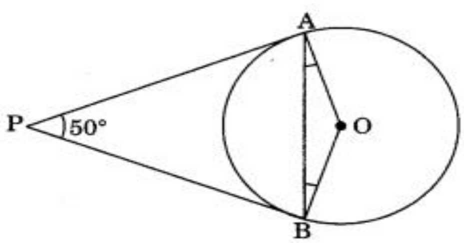
Subject: MATHEMATICS (BASIC) -241

Maximum Marks: 80 | Date:

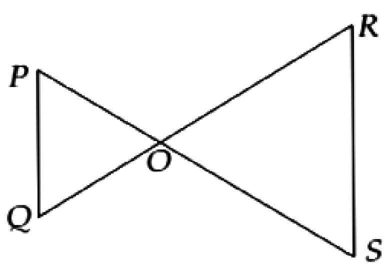
General Instructions: | Time: 3Hours

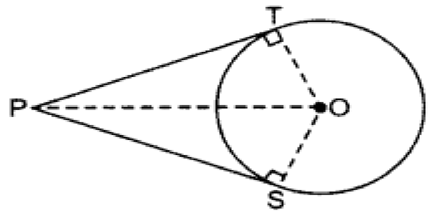
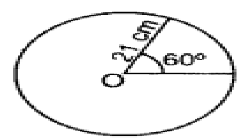
1. This Question Paper has 5 Sections A - E.
2. Section **A** has 20 Multiple Choice Questions (MCQs) carrying 1 mark each.
3. Section **B** has 5 questions carrying 02 marks each.
4. Section **C** has 6 questions carrying 03 marks each.
5. Section **D** has 4 questions carrying 05 marks each.
6. Section **E** has 3 Case Based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E.
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$, wherever required if not stated.

Sl. No.	**Section A** **Section A consists of 20 questions of 1 mark each**	**Marks**
1	The HCF and LCM of two numbers are 9 and 360 respectively. If one number is 45, the other number is (a)72 (b) 16 (c) 9 (d) 360 Ans : (a) 72	1
2	If 2 and 3 are the zeros of a quadratic polynomial, the polynomial is of the form (a) $x^2 + 6x + 5$ (b) $x^2 + 2x + 3$ (c) $x^2 - 5x + 6$ (d) $x^2 - 6x + 5$ Ans : (c) $x^2 - 5x + 6$	1
3	If the sum of zeroes of the quadratic polynomial $3x^2 – kx + 6$ is 3, then the value of k is (a)-9 (b)8 (c)9 (d)6 Ans : (c) 9	1
4	How many solutions does the pair of equations y = 0 and y = -5 have? (a) No solution (b) Unique solution (c) Infinite number of solutions (d) Two solutions Ans : (a) No solution	1
5	If A($\frac{m}{3}$, 5) is the mid-point of the line segment joining the points Q(- 6, 7) and R(-2, 3), then the value of m is (a) -12 (b) – 4 (c) 12 (d) – 6	

	Ans: (a) -12	1
6	If x = ab^2 and y = a^3bc, then the HCF of x and y is (a) ab^2 (b) ab (c) b^2a^3 (d) a^3bc Ans : (b) ab	1
7	What is the value of $\frac{3-\sin^2 60^0}{\tan 30^0 \tan 60^0}$ (a) $2\frac{1}{4}$ (b) $3\frac{1}{4}$ (c) $2\frac{3}{4}$ (d) $3\frac{3}{4}$ Ans : (a) $2\frac{1}{4}$	1
8	If 3sec θ – 5 = 0 then cot θ is equal to (a) $\frac{5}{3}$ (b) $\frac{4}{5}$ (c) $\frac{3}{4}$ (d) $\frac{3}{5}$ Ans : (c) $\frac{3}{4}$	1
9	In ΔPQR , L and M are points on sides PQ and PR respectively such that LM || QR and PL: LQ = 1: 3. If MR = 6.6 cm, then PM is equal to (a)8.8 cm (b) 9.9 cm (c) 3.3 cm (d) 2.2 cm Ans : (d) 2.2 cm	1
10	D and E are the midpoints of side AB and AC of a triangle ABC, respectively and BC = 6 cm. If DE || BC, then the length (in cm) of DE is: (a) 2.5 cm (b) 3 cm (c) 5 cm (d) 6 cm Ans : (b) 3 cm	1
11	In figure, if PA and PB are tangents to the circle with center 0 such that ∠APB = 50°, then ∠AOB is equal to  (a) 25° (b) 130° (c) 100° (d) 50° Ans : (b) 130°	1
12	Perimeter of a sector of a circle whose central angle is 90° and radius 7 cm is (a) 35 cm (b) 25 cm (c) 77 cm (d) 7 cm Ans : 25cm	1
13	Two cubes each of volume 8 cm^3 are joined end to end, then the surface area of the resulting cuboid is: (a) 80 cm^2 (b) 64 cm^2 (c) 40 cm^2 (d) 8 cm^2 Ans: (c) 40 cm^2	1

14	If the arithmetic mean of x, x + 3, x + 6, x + 9 and x + 12 is 10, then x =? (a) 1 (b) 2 (c) 6 (d) 4 Ans : (d) 4	1
15	The area of the sector of a circle with radius 6 cm and of angle 60° is (a) 9.42 cm^2 (b) 37.68 cm^2 (c) 18.84 cm^2 (d) 19.84 cm^2 Ans: (c) 18.84 cm^2	1
16	The relationship between mean, median and mode for a moderately skewed distribution is (a) mode = median – 2 mean (b) mode = 3 median – 2 mean (c) mode = 2 median – 3 mean (d) mode = median – mean Ans : (b) mode = 3 median – 2 mean	1
17	A card is selected from a deck of 52 cards. The probability of its being a red face card is: (a) $\frac{3}{26}$ (b) $\frac{3}{13}$ (c) $\frac{2}{13}$ (d) $\frac{1}{2}$ Ans: $\frac{3}{26}$	1
18	What is the minimum value of sin A, $0 \leq A \leq 90°$ (a) -1 (b) 0 (c) 1 (d) 12 Ans : 0	1
19	**DIRECTION:** In the question number 19 and 20, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**. Choose the correct option ***Statement A (Assertion):*** 2 is an example of a rational number. ***Statement R (Reason)*****:** The square roots of all positive integers are irrational numbers. (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 and 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. Ans : (c) Assertion (A) is true but reason (R) is false.	1
20	***Statement A (Assertion):*** The point (0, 4) lies on y-axis. ***Statement R (Reason):*** The x co-ordinate of the point on y-axis is zero. (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 and 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. Ans: (a)Both A and R are true and R is the correct explanation for A.	1

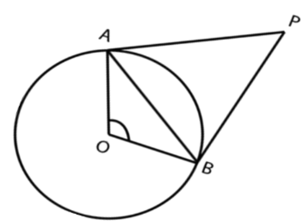
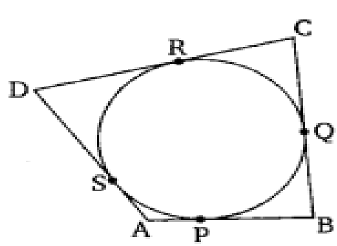
	Section B **Section B consists of 5 questions of 2 marks each**	
21	Solve the following pair of linear equations for x and y: $x + y = 10$ $x - 2y = 4$ Solution: $x + y = 10$ ---------(1) $x - 2y = 4$ ----------(2) (2) – (1) => $-3y = -6$ $y = 2$ Put $y = 2$ in (1) , $x + 2 = 10$ $x = 8$ $x = 8$ and $y = 2$ is the solution.	2 ½ ½ ½ ½
22	In Figure , if PQ || RS, prove that Δ POQ ~ Δ SOR.  Solution: PQ || RS (Given) So, ∠P = ∠S (Alternate angles) and ∠Q = ∠R Also, ∠POQ = ∠SOR (Vertically opposite angles) Therefore, ΔPOQ ~ ΔSOR (AAA similarity criterion)	2 ½ ½ ½ ½

23	Prove that lengths of the tangents drawn from an external point to a circle are equal. Given: PT and PS are tangents from an external point P to the circle with centre O.  To prove: PT = PS Const.: Join O to P, T & S Proof: In ΔOTP and ΔOSP, OT = OS …[radii of same circle] OP = OP …[common] ∠OTP – ∠OSP …[Each 90°] ∴ AOTP = AOSP …[R.H.S] PT = PS …[c.p.c.t]	2 ½ ½ ½ ½
24	In a circle of radius 21 cm, an arc subtends an angle of 60° at the centre. Find: (i) the length of the arc (ii) area of the sector formed by the arc. [Use π = 22/7] Solution: (i) Length of the arc: r = 21 cm, θ = 60° Length of the arc $= \frac{\theta}{360}(2\pi r) = \frac{\theta}{180}\pi r$  $= \frac{60}{180} \times \frac{22}{7} \times 21 = \mathbf{22\ cm}$ **(ii) Area of the sector formed by the arc:** Area of minor sector $= \frac{\theta}{360}\pi r^2$ $= \frac{60}{360} \times \frac{22}{7} \times 21 \times 21 = \mathbf{231\ cm^2}$ OR The length of the minute hand of a clock is 14 cm. Find the area swept by the minute hand in 5 minutes. Solution: Angle described by the minute hand in 60 minutes = 360° Angle described by the minute hand in 5 minutes $= \frac{360° \times 5}{60°} = 30°$ Now, we have θ = 30° and r = 14 cm. ∴ Required area swept by the minute hand in 5 minutes = Area of the sector with r = 14 cm and θ = 30° $= \left(\frac{\pi r^2 \theta}{360°}\right)\text{cm}^2 = \left(\frac{22}{7} \times 14 \times 14 \times \frac{30°}{360°}\right)\text{cm}^2$ $= \mathbf{51.33\ cm^2}$.	2 ½ ½ ½ ½ ½ ½ ½ ½

25	If cos (A + B) = 0 and sin (A – B) = $\frac{1}{2}$, then find the value of A and B where A and B are acute angles. Solution: $\cos(A + B) = 0$ | $\sin(A - B) = \frac{1}{2}$ $\Rightarrow \cos(A + B) = \cos 90°$ | $\sin(A - B) = \sin 30°$ $A + B = 90°$ | $A - B = 30°$ $30° + B + B = 90°$ ...[From (i)] | $\therefore A = 30° + B$ ...(i) $2B = 60° \Rightarrow B = 30°$ Putting the value of B in (i), we get $\Rightarrow A = 30° + 30° = 60°$ $\therefore A = 60°, B = 30°$ OR Evaluate: $4 \cot^2 45^0 - \sec^2 60^0 + \sin^2 60^0 + \cos^2 90^0$ Solution: $4 \cot^2 45^0 - \sec^2 60^0 + \sin^2 60^0 + \cos^2 90^0 = 4 \times 1 - 4 + \frac{3}{4} + 0$ $= \frac{3}{4}$	2 ½ ½ ½ ½ 1 1
	Section C **Section C consists of 6 questions of 3 marks each.**	
26	Prove that $\sqrt{2}$ is irrational. Proof: Assume that $\sqrt{2}$ is rational. Let $\sqrt{2} = \frac{p}{q}$, where p and q are co prime numbers. $q \neq 0$. $\sqrt{2} = \frac{p}{q}$ $\sqrt{2}\, q = p$ Squaring, $(\sqrt{2}\, q)^2 = p^2$ $2q^2 = p^2$ ....(1) $\longrightarrow$ 2 is a factor of p^2 $\longrightarrow$ 2 is a factor of p Let p = 2m. Substitute p = 2m in (1) $2q^2 = (2m)^2$	3 ½ ½ ½ ½

	$2q^2 = 4m^2$ $\cancel{2}q^2 = 2\cancel{4}m^2$ $q^2 = 2m^2$ $\longrightarrow$ 2 is a factor of q^2 $\longrightarrow$ 2 is a factor of q $\longrightarrow$ 2 is a common factor for p and q which is a contradiction to our assumption. Therefore $\sqrt{2}$ is irrational. Hence proved.	½ ½
27	Find the zeroes of $p(x) = 2x^2 - x - 6$ and verify the relationship of zeroes with these co-efficient. Solution: $p(x) = 2x^2 - x - 6$ …[Given] $= 2x^2 - 4x + 3x - 6$ $= 2x(x - 2) + 3(x - 2)$ $= (x - 2)(2x + 3)$ Zeroes are: $x - 2 = 0$ or $2x + 3 = 0$ $x = 2$ or $x = -3/2$ Verification: Here a = 2, b = -1, c = -6 Sum of zeroes $= 2 + \left(\frac{-3}{2}\right) = \frac{4-3}{2} = \frac{1}{2}$ $= \frac{1}{2} = \frac{-\text{Coefficient of } x}{\text{Coefficient of } x^2} = \frac{-b}{a}$ Product of zeroes $= 2 \times \left(\frac{-3}{2}\right) = \frac{-6}{2}$ $= \frac{-6}{2} = \frac{\text{Constant term}}{\text{Coefficient of } x^2} = \frac{c}{a}$ ∴ **Relationship holds.**	3 ½ ½ 1 1
28	Find the values of k for the quadratic equation $2x^2 + kx + 3 = 0$, so that they have two equal roots. Solution :	3

	Comparing the given equation with $ax^2 + bx + c = 0$, we get, $a = 2$, $b = k$ and $c = 3$ As we know, Discriminant $= b^2 - 4ac$ $= (k)^2 - 4(2)(3)$ $= k^2 - 24$ For equal roots, we know, Discriminant = 0 $k^2 - 24 = 0$ $k^2 = 24$ $k = \pm\sqrt{24} = \pm 2\sqrt{6}$	½ ½ ½ ½ ½ ½
	OR	
	Find the roots of the equation $\frac{1}{x} - \frac{1}{x-2} = 3$, $x \neq 0, 2$. $\frac{1}{x} - \frac{1}{x-2} = 3$ $\frac{x-2-x}{x(x-2)} = 3$ $-2 = 3x(x-2)$ $3x^2 - 6x + 2 = 0$ $X = \frac{6 \pm \sqrt{36-24}}{6}$ $= \frac{6 \pm \sqrt{12}}{6} = \frac{6 \pm 2\sqrt{3}}{6}$ $= \frac{3 \pm \sqrt{3}}{3}$	½ ½ ½ ½ ½ ½

29	Prove that $\frac{\sin\theta}{1+\cos\theta}+\frac{1+\cos\theta}{\sin\theta}=2\operatorname{cosec}\theta$ $LHS=\frac{\sin\theta}{1+\cos\theta}+\frac{1+\cos\theta}{\sin\theta}=\frac{\sin^2\theta+(1+\cos\theta)^2}{\sin\theta(1+\cos\theta)}$ $=\frac{\sin^2\theta+1+\cos^2\theta+2\cos\theta}{\sin\theta(1+\cos\theta)}$ $[\because(a+b)^2=a^2+b^2+2ab]$ $=\frac{1+1+2\cos\theta}{\sin\theta(1+\cos\theta)}$ $[\because\sin^2\theta+\cos^2\theta=1]$ $=\frac{2(1+\cos\theta)}{\sin\theta(1+\cos\theta)}=\frac{2}{\sin\theta}$ $=2\operatorname{cosec}\theta=RHS$ $\left[\because\operatorname{cosec}\theta=\frac{1}{\sin\theta}\right]$	3 ½ ½ ½ ½ ½ 1/2
30	Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line-segment joining the points of contact at the centre. Proof: Draw a circle with center O and take a external point P. PA and PB are the tangents. As radius of the circle is perpendicular to the tangent. OA⊥PA Similarly, OB⊥PB $\angle OBP=90^0$ $\angle OAP=90^0$  In Quadrilateral OAPB, sum of all interior angles $=360^0$ $\Rightarrow\angle OAP+\angle OBP+\angle BOA+\angle APB=360^0$ $\Rightarrow 90^0+90^0+\angle BOA+\angle APB=360^0$ $\angle BOA+\angle APB=180^0$ It proves the angle between the two tangents drawn from an external point to a circle supplementary to the angle subtended by the line segment **OR** A quadrilateral ABCD is drawn to circumscribe a circle. Prove that AB + CD = AD + BC  	3 ½ ½ ½ ½ ½ ½

<table>
<tr><td></td><td>Solution:
As we know, Length of the tangents from an external point to a circle is always equal.
Hence from the given diagram we can easily say
Length of the tangents from the point A: AP = AS..........(i)
Length of the tangents from the point B: BP = BQ.........(ii)
Length of the tangents from the point C: CR = CQ.........(iii)
Length of the tangents from the point D: DR = DS..........(iv)
Adding the above four equations, we get
AP + BP + CR + DR = AS + BQ + CQ + DS
(DR + CR) + (BP + AP) = (DS + AS) + (CQ + BQ)
⇒ CD + AB = AD + BC</td><td>

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½</td></tr>
<tr><td>31</td><td>Two coins are tossed simultaneously. What is the probability of getting
(i) At least one head?
(ii) At most one tail?
(iii) A head and a tail? 3
Solution:
(i) P(at least one head) = $\frac{3}{4}$
(ii) P(at most one tail) = $\frac{3}{4}$
(iii) P(a head and a tail) = $\frac{2}{4} = \frac{1}{2}$</td><td>3

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<tr><td></td><td>Section D
Section D consists of 4 questions of 5 marks each</td><td></td></tr>
<tr><td>32</td><td>The sum of the areas of two squares is 468 m^2. If the difference of their perimeters is 24 m, find the sides of the two squares.

Solution:

Let x be the length of the side of first square and y be the length of side of the second square.
Then, $x^2 + y^2 = 468$ ...(i)
Let x be the length of the side of the bigger square.
$4x - 4y = 24$
$\Rightarrow x - y = 6$ or $x = y + 6$ ...(ii)
Putting the value of x in terms of y from equation (ii), in equation (i), we get
$(y + 6)^2 + y^2 = 468$
$\Rightarrow y^2 + 12y + 36 + y^2 = 468$ or $2y^2 + 12y - 432 = 0$
$\Rightarrow y^2 + 6y - 216 = 0$
$\Rightarrow y^2 + 18y - 12y - 216 = 0$
$\Rightarrow y(y + 18) - 12(y + 18) = 0$
$\Rightarrow (y + 18)(y - 12) = 0$
Either $y + 18 = 0$ or $y - 12 = 0$
$\Rightarrow y = -18$ or $y = 12$
But, sides cannot be negative, so y = 12
Therefore, x = 12 + 6 = 18
Hence, sides of two squares are 18 m and 12 m.

OR</td><td>5

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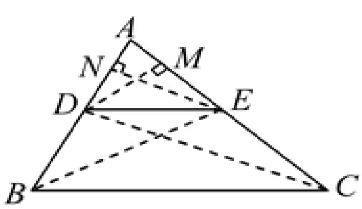
	A train travels 360 km at a uniform speed. If the speed had been 5 km/h more, it would have taken 1 hour less for the same journey. Find the speed of the train. Solution: Given distance=360 km. Let the speed of the train be x km/hr. Speed when increased by 5 km/hr =(x+5) km/hr $\frac{360}{x} - \frac{360}{x+5} = 1$ $\frac{[360x+1800-360x]}{x(x+5)} = 1$ $x^2+5x-1800=0$ $x^2+45x-40x-1800=0$ $x(x+45)-40(x+45)=0$ $(x-40)(x+45)=0$ $x=40,-45$ The speed of the train is 40 km/hr	½ ½ ½ ½ ½ ½ ½ ½ ½ ½
33	State and prove Thales Theorem Basic Proportionality Theorem (Thales Theorem) If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio. Given: A triangle ABC in which a line parallel to side BC intersects other two sides AB and AC at D and E respectively.  To prove: $\frac{AD}{DB} = \frac{AE}{EC}$. **Construction:** Join BE and CD and draw DM ⊥ AC and EN ⊥ AB. Proof: area of Δ ADE $(= \frac{1}{2} \text{base} \times \text{height}) = \frac{1}{2} AD \times EN.$ (Taking AD as base)	5 ½ ½ ½

So, $\mathrm{ar(BDE)} = \frac{1}{2}\mathrm{DB} \times \mathrm{EN},$ [The area of Δ ADE is denoted as ar (ADE)]. ½

Similarly, $\mathrm{ar(BDE)} = \frac{1}{2}\mathrm{DB} \times \mathrm{EN},$ ½

$\mathrm{ar(ADE)} = \frac{1}{2}\mathrm{AE} \times \mathrm{DM}$ and $\mathrm{ar(DEC)} = \frac{1}{2}\mathrm{EC} \times \mathrm{DM}.$ (Taking AE as base) 1/2

$$\therefore \frac{\mathrm{ar(ADE)}}{\mathrm{ar(BDE)}} = \frac{\frac{1}{2}\mathrm{AD} \times \mathrm{EN}}{\frac{1}{2}\mathrm{DB} \times \mathrm{EN}} = \frac{\mathrm{AD}}{\mathrm{DB}} \quad \ldots \text{(i)}$$ ½

and $$\frac{\mathrm{ar(ADE)}}{\mathrm{ar(DEC)}} = \frac{\frac{1}{2}\mathrm{AE} \times \mathrm{DM}}{\frac{1}{2}\mathrm{EC} \times \mathrm{DM}} = \frac{\mathrm{AE}}{\mathrm{EC}} \quad \ldots \text{(ii)}$$ ½

$\mathrm{ar(BDE)} = \mathrm{ar(DEC)}$ . ... (iii) ½

[Δ BDE and DEC are on the same base DE and between the same parallels BC and DE.]

Therefore, from (i), (ii) and (iii), we have:

$$\frac{\mathrm{AD}}{\mathrm{DB}} = \frac{\mathrm{AE}}{\mathrm{EC}}.$$ ½

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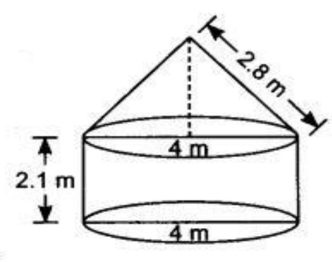
34 A tent is in the shape of a cylinder surmounted by a conical top. If the height and diameter of the cylindrical part are 2.1 m and 4 m respectively, and the slant height of the top is 2.8 m, find the area of the canvas used for making the tent. Also, find the cost of the canvas of the tent at the rate of Rs 500 per m^2. (Note that the base of the tent will not be covered with canvas.) 5

Solution:

Radius of the cylindrical part $= \frac{4}{2} = 2$ **m** 1

Height of the cylindrical part $= 2.1$ **m**

Curved surface area of the cylindrical part $= 2\pi rh$ ½



$= 2 \times \frac{22}{7} \times 2 \times 2.1\ \mathrm{m}^2$

$= 4 \times 22 \times 0.3\ \mathrm{m}^2$ ½

$= 22 \times 1.2 = 26.4\ \mathrm{m}^2$ ½

Curved surface area of the top $= \pi rl$

$= \frac{22}{7} \times 2 \times 2.8\ \mathrm{m}^2 = 44 \times 0.4\ \mathrm{m}^2 = 17.6\ \mathrm{m}^2$ ½

Total area of the canvas $= 26.4 + 17.6 = 44\ \mathrm{m}^2$ 1

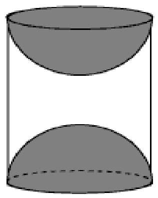
Cost of the canvas $=$ ₹ $500/\mathrm{m}^2$

Total cost $=$ Cost of canvas per m^2 × Total surface area of the canvas ½

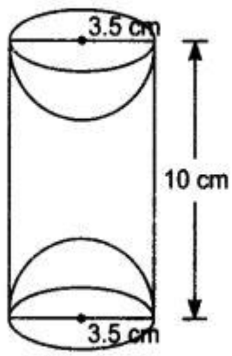
Total cost $= 44 \times 500 =$ ₹ 22,000 ½

OR

A wooden article was made by scooping out a hemisphere from each end of a solid cylinder, as shown in figure. If the height of the cylinder is 10 cm, and its base is of radius 3.5 cm, find the total surface area of the article.



Solution:



½

Solution:

Given: height of the cylinder = 10 cm,

base radius = 3.5 cm ½

Curved surface area of the cylinder $= 2\pi rh$

$$= \frac{2 \times 22 \times 35 \times 10}{7 \times 10} \text{ cm}^2 = 220 \text{ cm}^2$$ 1

Inner surface area of a hemispherical cavity

$$= 2\pi r^2 = 2 \times \frac{22}{7} \times \frac{35 \times 35}{10 \times 10} \text{ cm}^2 = 77 \text{ cm}^2$$ 1 1

Inner surface area of both hemispherical cavity $= 77 \text{ cm}^2 + 77 \text{ cm}^2 = 154 \text{ cm}^2$

Total surface area of the solid = Curved surface area of the solid + Inner surface area of both hemispherical ends 1

$$= 220 \text{ cm}^2 + 154 \text{ cm}^2 = 374 \text{ cm}^2$$

35 If the mean of the following distribution is 50, find the value of p: 5

Class	Frequency
0 – 20	17
20 – 40	P
40 – 60	32
60 – 80	24
80 – 100	19

	Solution:	

Class	Frequency (f_i)	X_i	f_iX_i
0–20	17	10	170
20–40	p	30	$30p$
40–60	32	50	1600
60–80	24	70	1680
80–100	19	90	1710
	$\Sigma f_i = 92+p$		$\Sigma f_iX_i = 5160 + 30p$

3

$\therefore$ Mean $= \dfrac{\Sigma f_iX_i}{\Sigma f_i}$ ½

$50 = \dfrac{5160 + 30p}{92 + p}$ ½

$\Rightarrow 4600 + 50p = 5160 + 30p$

$\Rightarrow 50p - 30p = 5160 - 4600$ ½

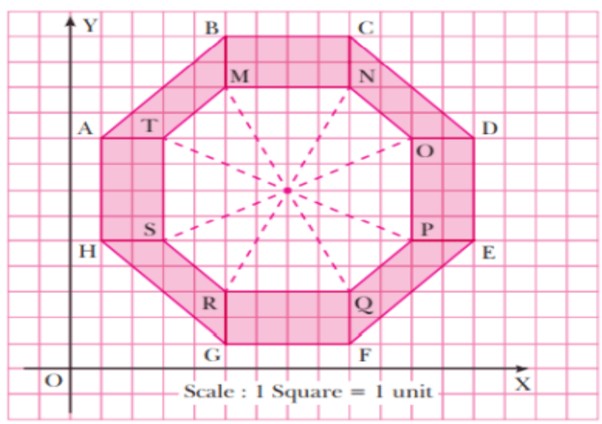
$\Rightarrow 20p = 560$

$\Rightarrow p = \dfrac{560}{20} = 28 \quad \therefore \quad p = 28$ ½

Section E

Section E consists of 3 case study questions of 4 marks each

36 The top of a table is shown in the figure given below: 4



(i) Find the coordinates of the points H and G.

(ii) Find the coordinates of the midpoint of line segment joining points M and Q.

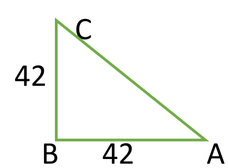
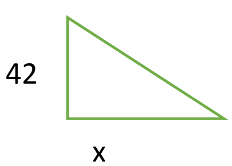
(iii) Find the distance between the points A and B.

OR

If G is taken as the origin, and x, y axis is put along GF and GB, then find the point denoted by the coordinate (4, 2).

Solution:

	(*i*) Coordinate of $H = (1, 5)$ and $G = (5, 1)$	1
	(*ii*) Mid point of line segment joining $M(5, 11)$ and $Q(9, 3)$ is given by $\left(\frac{5+9}{2}, \frac{11+3}{2}\right) = \left(\frac{14}{2}, \frac{14}{2}\right) = (7, 7)$	1
	(*iii*) Distance between $A(1, 9)$ and $B(5, 13)$ is $\sqrt{(5-1)^2 + (13-9)^2} = \sqrt{4^2 + 4^2} = \sqrt{16+16} = \sqrt{32} = 4\sqrt{2}$ unit	2
	(OR) If G is $(0, 0)$, then $Q = (4, 2)$.	
37	India is competitive manufacturing location due to the low cost of manpower and strong technical and engineering capabilities contributing to higher quality production runs. The production of TV sets in a factory increases uniformly by 2200 every year. It produced 5000 TV sets in the 1st year.  **Based on the above information, answer the following questions:** (i) Find the production during second year. (ii) Find the production during 8th year. (iii) Find the production during first 3 years. **OR** In which year, the production is Rs 29,200.	4
	Solution: (i) Production during second year = a + d = 5000 + 2200 = 7200	1
	(ii) Production during 8th year = a+7d = 5000 + 2(2200) = 20400	1

	(iii) Production during 3rd year = 5000 + 2x 2200 = 5000 + 4400 = 9400 Production during first 3 years = 5000 + 7200 + 9400 = 21600 **OR** a_n = 5000 + (n – 1) 2200 = 29200 n = 12	2
38	A group of students of class X visited India Gate on an education trip. The teacher and students had interest in history as well. The teacher narrated that India Gate, official name Delhi Memorial, originally called All-India War Memorial, monumental sandstone arch in New Delhi, dedicated to the troops of British India who died in wars fought between 1914 and 1919. The teacher also said that India Gate, which is located at the eastern end of the Raj path (formerly called the Kingsway), is about 138 feet (42 meters) in height.  (i) What is the angle of elevation if they are standing at a distance of 42m away from the monument? (ii) They want to see the tower at an angle of 60°. So, they want to know the distance where they should stand and hence find the distance. (iii) If the altitude of the Sun is at 60°, then find the height of the vertical tower that will cast a shadow of length 20 m. OR The ratio of the length of a rod and its shadow is 1:1. Find the angle of elevation of the Sun. Solution: (i) tan A = $\frac{42}{42}$ = 1 Tan A = tan 45^0 Angle = 45°  (ii)  tan 60^0 = $\frac{42}{x}$ $\sqrt{3} = \frac{42}{x}$	4 1

	$x = \frac{42}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = 25.24$ m (iii) $\tan 60^0 = \frac{h}{20}$ $h = 20\sqrt{3}$ m **OR** $\tan \theta = \frac{1}{1} = \tan 45^0$ $\theta = 45^0$	1 2