CCE RF/PF/RR/PR/NSR/NSPR
FULL SYLLABUS

A

ಕರ್ನಾಟಕ ಶಾಲಾ ಪರೀಕ್ಷೆ ಮತ್ತು ಮೌಲ್ಯನಿರ್ಣಯ ಮಂಡಲಿ, ಮಲ್ಲೇಶ್ವರಂ, ಬೆಂಗಳೂರು – 560 003

KARNATAKA SCHOOL EXAMINATION AND ASSESSMENT BOARD,
MALLESHWARAM, BENGALURU – 560 003

ಮಾರ್ಚ್/ಏಪ್ರಿಲ್ 2024 ರ ಪರೀಕ್ಷೆ - 1

MARCH/APRIL 2024 EXAMINATION - 1

ಮಾದರಿ ಉತ್ತರಗಳು

MODEL ANSWERS

ಸಂಕೇತ ಸಂಖ್ಯೆ : 81-E **CODE NO. : 81-E**

ವಿಷಯ : ಗಣಿತ

Subject : MATHEMATICS

(ಶಾಲಾ ಅಭ್ಯರ್ಥಿ / ಖಾಸಗಿ ಅಭ್ಯರ್ಥಿ / ಶಾಲಾ ಪುನರಾವರ್ತಿತ ಅಭ್ಯರ್ಥಿ / ಖಾಸಗಿ ಪುನರಾವರ್ತಿತ ಅಭ್ಯರ್ಥಿ / ಎನ್.ಎಸ್.ಆರ್. / ಎನ್.ಎಸ್.ಪಿ.ಆರ್.)

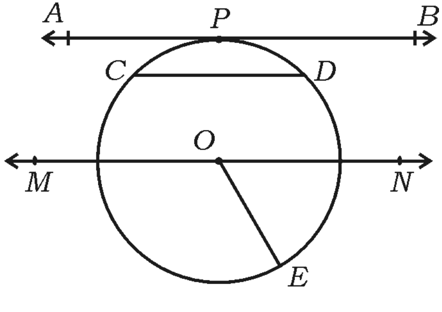
(Regular Fresh / Private Fresh / Regular Repeater / Private Repeater / NSR / NSPR)

(ಆಂಗ್ಲ ಮಾಧ್ಯಮ / English Medium)

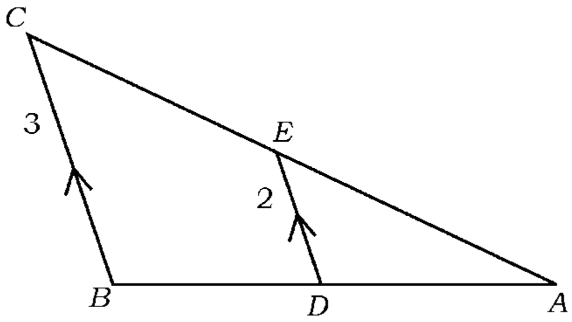
ದಿನಾಂಕ : 02. 04. 2024] **[ಗರಿಷ್ಠ ಅಂಕಗಳು : 80**

Date : 02. 04. 2024] **[Max. Marks : 80**

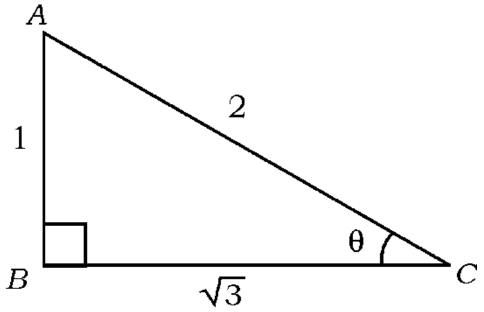
Qn. Nos.	Ans. Key	Value Points	Marks allotted
I.		**Multiple choice questions : $8 \times 1 = 8$**	
1.		The product of HCF and LCM of two numbers 15 and 20 is (A) 15 (B) 20 (C) 300 (D) 35 *Ans.* :	
	(C)	300	1

Qn. Nos.	Ans. Key	Value Points	Marks allotted
2.		If α and β are the zeroes of the quadratic polynomial $p(x) = ax^2 + bx + c$, then $\alpha\beta$ is (A) $\frac{b}{a}$ (B) $\frac{-b}{a}$ (C) $\frac{-c}{a}$ (D) $\frac{c}{a}$ *Ans.* :	
	(D)	$\frac{c}{a}$	1
3.		If $\sin\theta = \frac{4}{5}$, then the value of $\sqrt{1-\cos^2\theta}$ is (A) $\frac{16}{25}$ (B) $\frac{4}{5}$ (C) $\frac{5}{4}$ (D) $\frac{9}{25}$ *Ans.* :	
	(B)	$\frac{4}{5}$	1
4.		The probability of a sure event is (A) 1 (B) 0 (C) – 1 (D) 1·5 *Ans.* :	
	(A)	1	1
5.		The secant of circle in the figure, is  (A) MN (B) OE (C) CD (D) AB *Ans.* :	
	(A)	MN	1

Qn. Nos.	**Ans. Key**	**Value Points**	**Marks allotted**
6.		The volume of the frustum of a cone whose base radii are r_1 and r_2 and height *'h'*, is (A) $\frac{1}{3}\pi\,(r_1 + r_2 + r_1 . r_2)\,h$ (B) $\frac{1}{3}\pi\,(r_1^2 + r_2^2 - r_1 . r_2)\,h$ (C) $\frac{1}{3}\pi\,(r_1^2 + r_2^2 + r_1 . r_2)\,h$ (D) $\frac{1}{3}\pi\,(r_1^2 - r_2^2 - r_1 . r_2)\,h$ *Ans.* :	
	(C)	$\frac{1}{3}\pi\left(r_1^2 + r_2^2 + r_1 . r_2\right)h$	1
7.		If 2, *x*, 26 are in Arithmetic progression, then the value of *x* is (A) 12 (B) 14 (C) 28 (D) 24 *Ans.* :	
	(B)	14	1
8.		If tan (90° – θ) = $\sqrt{3}$, then the value of cot θ is (A) $\frac{1}{\sqrt{3}}$ (B) 1 (C) 0 (D) $\sqrt{3}$ *Ans.* :	
	(D)	$\sqrt{3}$	1

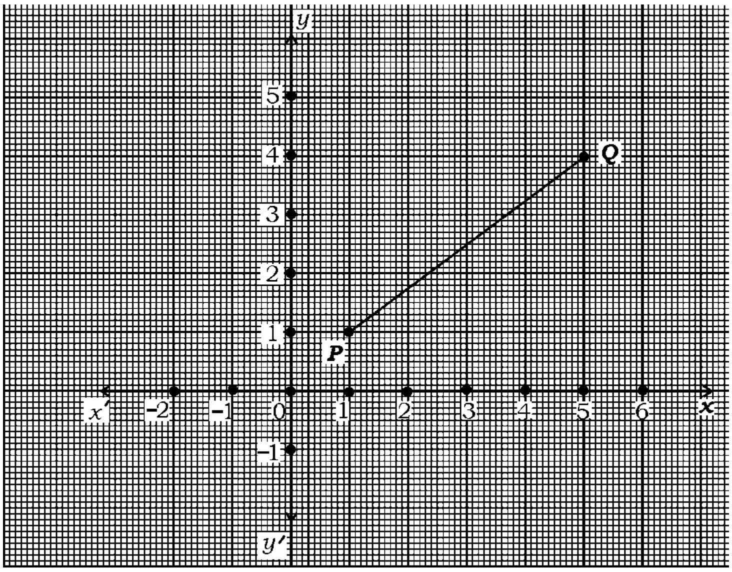
<table>
<tr><th>Qn. Nos.</th><th>Value Points</th><th>Marks allotted</th></tr>
<tr><td>II.</td><td>Answer the following questions : 8 × 1 = 8
(Direct answers from Q. Nos. 9 to 16 full marks should be given)</td><td></td></tr>
<tr><td>9.</td><td>In the figure, Δ ADE ~ Δ ABC and DE : BC = 2 : 3. Find $\frac{\text{Area of } \Delta ADE}{\text{Area of } \Delta ABC}$.

<i>Ans.</i> :
$\frac{\Delta ADE}{\Delta ABC}=\frac{2^2}{3^2}$ ½
$\frac{\Delta ADE}{\Delta ABC}=\frac{4}{9}$ ½</td><td>1</td></tr>
<tr><td>10.</td><td>The radius of the base and the height of a cylinder and a cone are same. If the volume of the cylinder is 27 cubic units, then find the volume of cone.
<i>Ans.</i> :
Volume of cone = $\frac{1}{3}$ volume of cylinder
$= \frac{1}{\cancel{3}} \times \cancel{27}$ ½
= 9 Cubic Units ½</td><td>1</td></tr>
<tr><td>11.</td><td>If $200 = 2^m \times 5^n$, then find the values of <i>m</i> and <i>n</i>.
<i>Ans.</i> :
$200=2^m \times 5^n$
$200=2^3 \times 5^2$ $\begin{array}{r|l} 2 & 200 \\ \hline 2 & 100 \\ \hline 2 & 50 \\ \hline 5 & 25 \\ \hline & 5 \end{array}$ ½
$m = 3$ and $n = 2$ ½</td><td>1</td></tr>
</table>

Qn. Nos.	Value Points	Marks allotted
12.	Find the number of solutions of the pair of linear equations $2x - 3y + 4 = 0$ and $3x + 5y + 8 = 0$. *Ans.* : $2x - 3y + 4 = 0$ $3x + 5y + 8 = 0$ $\frac{a_1}{a_2} = \frac{2}{3}$ and $\frac{b_1}{b_2} = \frac{-3}{5}$ and $\frac{c_1}{c_2} = \frac{4}{8}$ ½ $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ $\therefore$ Exactly one or unique solution ½	1
13.	In an Arithmetic progression, sum of the first six terms and sum of the first five terms are 78 and 55 respectively. Then find the sixth term of the progression. *Ans.* : $S_6 = 78$ $S_5 = 55$ $a_n = S_n - S_{n-1}$ ½ $a_6 = s_6 - S_5 = 78 - 55$ $\therefore \ a_6 = 23$ ½	1
14.	Write the degree of the polynomial $p(x) = x(x^2 + 3) + 5x^2 + 7$. *Ans.* : $p(x) = x(x^2 + 3) + 5x^2 + 7$ $p(x) = x^3 + 3x + 5x^2 + 7$ ½ $\therefore$ Degree of the polynomial = 3 ½	1
15.	If the value of discriminant of a quadratic equation is zero, then write the nature of roots of the quadratic equation. *Ans.* : $\therefore \ \Delta = b^2 - \Delta ac = 0$ Roots are equal and real	1

Qn. Nos.	Value Points	Marks allotted
16.	Find the value of θ in the figure.	
		
	Ans. :	
	$\tan\theta = \frac{1}{\sqrt{3}}$ ½	
	$\tan 30° = \frac{1}{\sqrt{3}}$	
	$\therefore\ \theta = 30°$ ½	
	Note : Any trigonometric ratio can be taken to calculate θ.	1
III.	**Answer the following questions : $8 \times 2 = 16$**	
17.	Prove that $3 + \sqrt{2}$ is an irrational number.	
	Ans. :	
	Let us assume that $3+\sqrt{2}$ is rational number.	
	Then we can find coprimes a and b $(b \neq 0)$ such that	
	$3+\sqrt{2} = \frac{a}{b}$ ½	
	Rearranging the equation, we get	
	$\sqrt{2} = \frac{a}{b} - 3$	
	$\sqrt{2} = \frac{a-3b}{b}$ ½	
	Since a and b are integers, we get $\frac{a-3b}{b}$ is rational and so $\sqrt{2}$ is rational. ½	
	But this contradicts the fact that $\sqrt{2}$ is rational.	
	$\therefore$ Our assumption $3+\sqrt{2}$ is a rational number becomes wrong.	
	So we conclude that $3+\sqrt{2}$ is irrational. ½	2

Qn. Nos.	**Value Points**	**Marks allotted**
18.	Solve the given pair of linear equations by Elimination method : $2x + y = 8$ $3x - y = 7$ *Ans.* : $2x + \cancel{y} = 8$ $3x - \cancel{y} = 7$ Adding $5x = 15$ ½ $x = \frac{15}{5}$ $\boxed{x = 3}$ ½ Substituting the value of $x = 3$ in $2x + y = 8$ $2\ (3) + y = 8$ ½ $y = 8 - 6$ $\boxed{y = 2}$ ½	2
19.	Find the sum of first 20 terms of the Arithmetic progression 1, 5, 9, ... using formula. *Ans.* : 1, 5, 9 ....$S_{20} = ?$ $a = 1, \quad d = 5 - 1 = 4, \quad n = 20$ ½ $S_n = \frac{n}{2}[2a + (n-1)\ d\ ]$ ½ $S_{20} = \frac{20}{2}[\ 2 \times 1 + (20-1)\ 4\ ]$ ½ $= 10\ [\ 2 + 19 \times 4\ ]$ $= 10\ [\ 2 + 76\ ]$ $= 10 \times 78$ $= 780$ ½	2
20.	Find the roots of the quadratic equation $2x^2 - 3x - 1 = 0$ using quadratic formula. *Ans.* : $2x^2 - 3x - 1 = 0$ a = 2, b = – 3, c = – 1	

Qn. Nos.	**Value Points**	**Marks allotted**
	$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ ½	
	$x=\frac{-(-3)\pm\sqrt{(-3)^2-4\times2\times-1}}{2\times2}$ ½	
	$x=\frac{3\pm\sqrt{9+8}}{4}$ ½	
	$x=\frac{3\pm\sqrt{17}}{4}$ ½	2
	$x=\frac{3+\sqrt{17}}{4}$ or $x=\frac{3-\sqrt{17}}{4}$	
21.	Prove that : $\frac{\cos\theta-\sin\theta\,.\cos\theta}{\cos\theta+\sin\theta\,.\cos\theta}=\frac{\operatorname{cosec}\theta-1}{\operatorname{cosec}\theta+1}$.	
	OR	
	Prove that : $\frac{\sin 30^\circ+\cos 60^\circ}{\operatorname{cosec} 30^\circ-\cot 45^\circ}=\sin 90^\circ$.	
	Ans. :	
	LHS = $\frac{\cos\theta-\sin\theta\,.\cos\theta}{\cos\theta+\sin\theta\,.\cos\theta}$	
	$=\frac{\cancel{\cos\theta}(1-\sin\theta)}{\cancel{\cos\theta}(1+\sin\theta)}$ ½	
	$=\frac{1-\sin\theta}{1+\sin\theta}$	
	$=\frac{1-\frac{1}{\operatorname{cosec}\theta}}{1+\frac{1}{\operatorname{cosec}\theta}}$ ½	
	$=\frac{\frac{\operatorname{cosec}\theta-1}{\cancel{\operatorname{cosec}\theta}}}{\frac{\operatorname{cosec}\theta+1}{\cancel{\operatorname{cosec}\theta}}}$ ½	
	$=\frac{\operatorname{cosec}\theta-1}{\operatorname{cosec}\theta+1}$ = RHS ½	2
	OR	

Qn. Nos.	Value Points		Marks allotted
	LHS = $\frac{\sin 30° + \cos 60°}{\text{cosec}\, 30° - \cot 45°}$		
	$= \frac{\frac{1}{2}+\frac{1}{2}}{2-1}$	1	
	$= \frac{\frac{1+1}{2}}{1}$	½	
	$= \frac{2}{2} = 1$ .... (1)		
	RHS = sin90° = 1 .... (2)	½	
	From (1) & (2) ∴ LHS = RHS		2
22.	Find the coordinates of the point *P* and *Q* in the given graph and hence find the length of *PQ* using distance formula.		
			
	OR		
	Find the coordinates of the point which divides the line segment joining the points (4, – 3) and (8, 5) in the ratio 3 : 1 internally.		
	Ans. :		
	$P(1, 1)$ and $Q(5, 4)$		
	$PQ = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$	½	
	$PQ = \sqrt{(5-1)^2 + (4-1)^2}$	½	
	$PQ = \sqrt{4^2 + 3^2}$	½	

Qn. Nos.	**Value Points**	**Marks allotted**
	$PQ = \sqrt{16+9}$	
	$PQ = \sqrt{25}$	
	$PQ = 5$ units ½	2
	OR	
	$p(x, y) = \left(\frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}, \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2} \right)$ ½	
	$A(4, -3)$, $B(8, 5)$, $m_1 : m_2 = 3 : 1$	
	(x_1, y_1) (x_2, y_2)	
	$x = \frac{3(8)+1(4)}{3+1}$, $y = \frac{3(5)+1(-3)}{3+1}$ ½	
	$x = \frac{24+4}{4}$, $y = \frac{15-3}{4}$ ½	
	$x = \frac{28}{4}$, $y = \frac{12}{4}$	
	$x = 7$, $y = 3$	
	The co-ordinates of the required point $P(x, y)$ is $(7, 3)$ ½	2
23.	A basket contains 36 mangoes. $\frac{1}{4}$th of them are rotten and others are good. If one mango is drawn at random from the basket, then find the probability of getting a good mango.	
	Ans. :	
	$n(S) = 36$	
	$n(A) =$ Good Mangoes $= \frac{3}{4} \times 36 = 27$ 1	
	$\therefore \; p(A) = \frac{n(A)}{n(S)}$ ½	
	$p(A) = \frac{27}{36}$ ½	
	$p(A) = \frac{3}{4}$	2
	Note : Any alternate method is used to get the correct answer marks should be given	

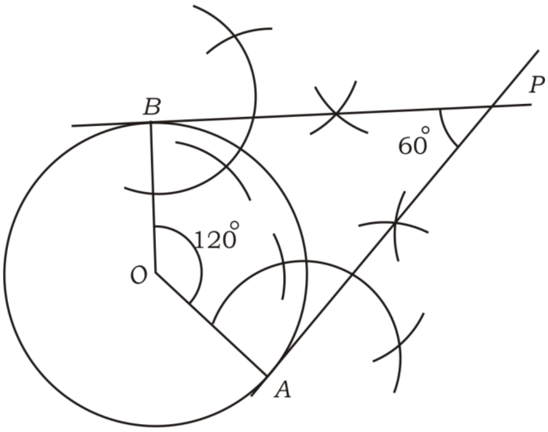
Qn. Nos. **Value Points** **Marks allotted**

24. Draw a circle of radius 3·5 cm and construct a pair of tangents to the circle such that the angle between the tangents is 60°.

Ans. :

r = 3·5 cm

Angle between the radii = 180° – 60° = 120° ½



Construction of circle of radius 3·5 cm ½

Construction of two arcs ½

Construction of two tangents ½ 2

IV. **Answer the following questions :** **9 × 3 = 27**

25. Divide $p(x) = x^3 + 3x^2 + 4x + 5$ by $g(x) = x^2 - x + 1$ and find the quotient [$q(x)$] and remainder [$r(x)$].

OR

When the polynomial $p(x) = x^3 + 4x^2 + 5x - 2$ is divided by the polynomial $g(x)$, the quotient [$q(x)$] and remainder [$r(x)$] are $x^2 - x + 2$ and 4 respectively. Find $g(x)$.

Ans. :

$p(x) = x^3 + 3x^2 + 4x + 5$

$g(x) = x^2 - x + 1$

$q(x) = ?$

$r(x) = ?$

Qn. Nos.	Value Points		Marks allotted
	$x+4$		
	$x^2-x+1 \overline{)\cancel{x^3}+3x^2+4x+5}$	1	
	$\cancel{x^3}-x^2+x$		
	$(-) \quad (+) \quad (-)$		
	$\cancel{4x^2}+3x+5$		
	$\cancel{4x^2}-4x+4$		
	$(-) \quad (+) \quad (-)$	1	
	$7x+1$		
	$\therefore \boxed{q(x)=x+4}$	½	3
	$\boxed{r(x)=7x+1}$	½	
	OR		
	$p(x)=x^3+4x^2+5x-2$		
	$q(x)=x^2-x+2$		
	$r(x)=4$		
	$g(x)=?$		
	$p(x) = g(x) \times q(x) + r(x)$	1	
	$g(x) \times q(x) = p(x) - r(x)$	½	
	$\therefore g(x)=\frac{p(x)-r(x)}{q(x)}$	½	
	$g(x) = \frac{x^3+4x^2+5x-2-4}{x^2-x+2}$	½	
	$= \frac{x^3+4x^2+5x-6}{x^2-x+2}$	½	3

Qn. Nos.	**Value Points**	**Marks allotted**

26. Find the mean for the following data :

Class-interval	*Frequency*
2 – 6	2
7 – 11	4
12 – 16	5
17 – 21	3
22 – 26	1

OR

Find the mode for the following data :

Class-interval	*Frequency*
1 – 5	1
5 – 9	3
9 – 13	7
13 – 17	10
17 – 21	9

Ans. :

Class interval	frequency (f_i)	Mid point x_i	$x_i f_i$
2–6	2	4	08
7-11	4	9	36
12-16	5	14	70
17-21	3	19	57
22-26	1	24	24
	$\Sigma f_i = 15$		$\Sigma f_i x_i = 195$

2

Mean = $\overline{X} = \dfrac{\sum f_i x_i}{\sum f_i}$ ½

$= \dfrac{195}{15}$

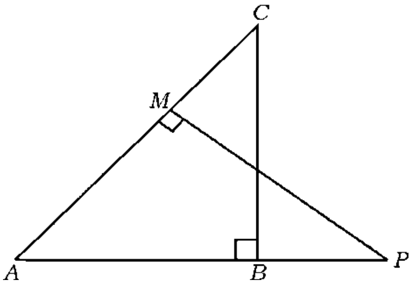
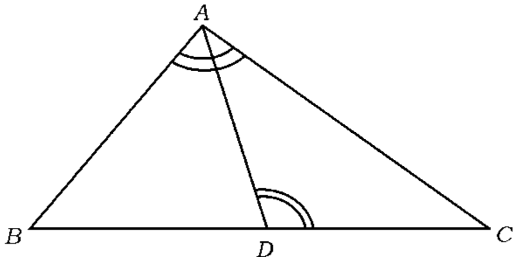
Mean $(\overline{X}) = 13$ ½ 3

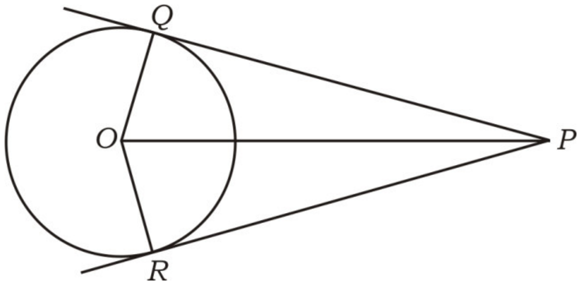
OR

In the given frequency distribution

$f_0 = 7, \quad f_1 = 10, \quad f_2 = 9, \quad h = 4, \quad l = 13$ ½

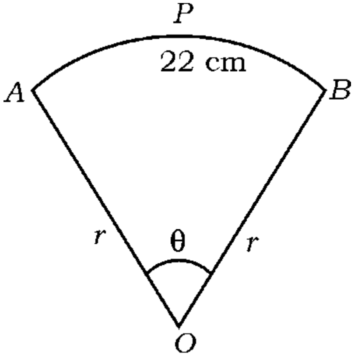
$Mode = l + \left[\dfrac{f_1 - f_0}{2f_1 - f_0 - f_2} \right] \times h$ ½

Qn. Nos.	**Value Points**	**Marks allotted**
	$= 13 + \left[\frac{10-7}{2\times10-7-9}\right]\times 4$ ½	
	$= 13+\left[\frac{3}{20-16}\right]\times 4$ ½	
	$= 13+\left[\frac{3}{\cancel{4}}\times\cancel{4}\right]$ ½	
	$= 13 + 3$	
	$= 16$ ½	3
27.	*'D'* is a point on the side *BC* of a Δ *ABC* such that $\underline{\lfloor ADC} = \underline{\lfloor BAC}$. Then prove that $AC^2 = BC . CD$.	
	OR	
	In the figure, Δ *ABC* and Δ *AMP* are right angled triangles, right angled at *B* and *M* respectively. Then prove that $\frac{CA}{PA} = \frac{BC}{MP}$.	
		
	Ans. :	
	 ½	
	In ΔABC and ΔADC	
	$\angle BAC = \angle ADC$ [Given] ½	
	$\angle ACB = \angle ACD$ [common angle]	
	$\therefore$ $\angle ABC = \angle DAC$ ½	
	$\therefore$ $\Delta ABC \sim \Delta DAC$ [*AAA* criterion] ½	
	$\therefore$ $\frac{AC}{CD} = \frac{BC}{AC}$ ½	
	$\therefore$ $AC^2 = BC.CD$ ½	3
	OR	

Qn. Nos.	**Value Points**	**Marks allotted**
	In ΔABC and ΔAMP ½	
	$\angle ABC = \angle AMP = 90°$ [Given] ½	
	$\angle BAC = \angle MAP$ [common angle] ½	
	$\therefore$ $\angle ACB = \angle APM$ ½	
	$\therefore$ $\Delta ABC \sim \Delta AMP$ [AAA similarity criteria] ½	
	$\therefore$ $\frac{CA}{PA} = \frac{BC}{MP}$ ½	3
28.	Prove that "The lengths of tangents drawn from an external point to a circle are equal".	
	Ans. :	
	 ½	
	Given : PQ and PR are tangents drawn from an external point P to a circle of centre O. ½	
	To prove that : $PQ = PR$ ½	
	Construction : Join OP, OQ and OR ½	
	Proof : In the figure	
	$\angle OQP = \angle ORP = 90°$ [$OP \perp PQ$ $OR \perp PR$]	
	$OQ = OR$ [Radii of same circle]	
	$\therefore$ $OP = OP$ [common side] ½	
	$\therefore$ $\Delta OQP \cong \Delta ORP$ [RHS – Postdated]	
	$\therefore PQ = PR$ [CPCT } ½	3
	[Full marks will be given ,If proof is done according to the text book]	

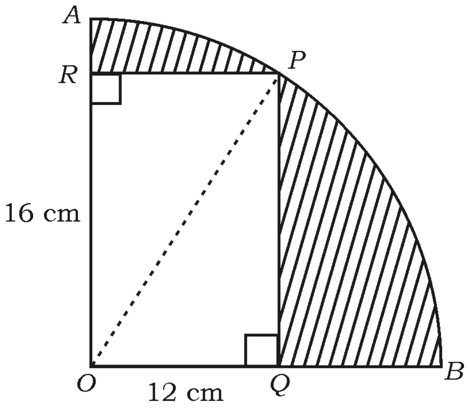
Qn. Nos.	Value Points	Marks allotted

29. In the figure area of sector *AOBPA* of radius *'r'* is 231 cm^2 and the length of the arc *APB* is 22 cm. Find the radius of the sector and angle θ.



OR

In the figure a rectangle *ROQP* is inscribed in the quadrant of a circle. If the length and breadth of rectangle are 16 cm and 12 cm respectively. Find the area of the shaded region.



Ans. :

Length of an arc of a sector of angle θ

$$= \frac{\theta}{360^\circ} \times 2\pi r$$ ½

$$\therefore \quad \frac{\theta}{360^\circ} \times \cancel{2}\pi r = \overset{11}{\cancel{22}}$$

$$\frac{\theta}{360^\circ} \times \pi r = 11 \ldots\ldots\ldots\ldots(1)$$ ½

Area of the sector of angle θ

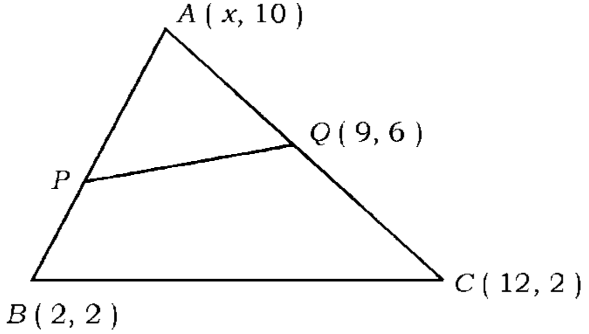
$$= \frac{\theta}{360^\circ} \times 2\pi r^2$$ ½

$$\therefore \quad \frac{\theta}{360^\circ} \times \pi r \times r = 231 \qquad [\text{ From (1) }]$$

$$\therefore \quad 11r = 231$$

Qn. Nos.	Value Points		Marks allotted
	$r = \frac{\cancelto{21}{231}}{\cancel{11}} = 21$	½	
	$\boxed{r = 21 \text{ cm}}$		
	$\frac{\theta}{360°} \times 2\pi r = 22$		
	$\frac{\theta}{360°} \times 2 \times \frac{\cancel{22}}{\cancel{7}} \times \cancelto{3}{21} = \cancel{22}$	½	
	$6\theta = 360$		
	$\theta = \frac{360}{6} = 60°$	½	3
	$\boxed{\theta = 60°}$		
	Alternate method :		
	$\frac{\frac{\cancel{\theta}}{\cancel{360°}} \times 2\cancel{\pi} r}{\frac{\cancel{\theta}}{\cancel{360°}} \times \cancel{\pi} r^2} = \frac{22}{231}$	1	
	$\frac{\cancel{r}}{\cancel{r^2}} = \frac{22}{231}$	½	
	$r = \frac{231}{22}$	½	
	$\boxed{r = 21 \text{ cm}}$		
	$\frac{\theta}{360°} \times 2\pi r = 22$		
	$\frac{\theta}{360°} \times 2 \times \frac{\cancel{22}}{\cancel{7}} \times \cancelto{3}{21} = 2\cancel{2}$	½	
	$6\theta = 360°$	½	3
	$\theta = \frac{360°}{6}$		
	$\boxed{\theta = 60°}$		
	OR		
	In the figure *ROQP* is a rectangle.		
	$\therefore$ *OQP* is a right angle triangle, right angled at *Q*.		
	$\therefore OP^2 = OQ^2 + PQ^2$ [Pythagoras theorem]	½	
	$= 12^2 + 16^2$		
	$= 144 + 256$		
	$= 400$		
	$\therefore OP = \sqrt{400} = 20 \text{ cm}$	½	
	$r = 20$ cm		
	Area of shaded region =		

Qn. Nos.	**Value Points**	**Marks allotted**
	Area of quadrant – Area of rectangle	
	$= \frac{1}{4}\times \pi r^2$ – (length × breadth) ½	
	$= \frac{1}{4}\times \pi\times 20^2-(16\times 12)$	
	$=\frac{1}{4}\times \pi\times \overset{100}{400}-192$ ½	
	$= 100\ \pi - 192$	
	$= 100\times\frac{22}{7}-192$ ½	
	$= \frac{2200}{7}-192$	
	$= 314{\cdot}28 - 192$	
	$= 122{\cdot}28$ square cms ½	3
30.	Age of mother is twice the square of age of her son. After 8 years mother's age is 4 years more than the thrice of age of her son. Find their present ages.	
	Ans. :	
	Let the present age of mother be x years	
	and age of son be y years	
	Then $x = 2y^2$ .... (1) ½	
	After 8 years,	
	Age of mother is (x + 8) years	
	Age of son is (y + 8) years	
	According to given problem,	
	$x + 8 = 3 (y + 8) + 4$	
	$2y^2+8 =3y+24+4$ [From (1)] ½	
	$2y^2+8 =3y +28$	
	$2y^2-3y+8-28=0$	
	$2y^2-3y-20 = 0$ ½	
	$2y^2-8y+5y-20 =0$	
	$2y (y - 4) + 5 (y - 4) = 0$	
	$\therefore$ $(y - 4) (2y + 5) = 0$	
	$y - 4 = 0$ or $2y + 5 = 0$ ½	
	$y = 4$ or $y=-\frac{5}{2}$	

Qn. Nos.	**Value Points**	**Marks allotted**
	Since the age of a person cannot be negative, ignore the value of $y=-\frac{5}{2}$. ½ $\therefore$ Present age of son = y = 4 years Present age of mother = $x=2y^2$ $= 2\times4^2$ = 32 years ½	3
31.	In the figure, *ABC* is a triangle whose vertices are *A* (*x*, 10), *B* (2, 2) and *C* (12, 2). If *Q* (9, 6) is the mid-point of *AC* and area of Δ *APQ* is 12 cm ^{2}, then find the area of quadrilateral *PBCQ*.  *Ans.* : $A(x,10)$, B (2, 2), C (12, 2) and Q (9, 6) (x_1, y_1) (x_2, y_2) (x_3, y_3) *Q* is the mid-point of *AC*, $\frac{x_1+x_2}{2}=9$ $\therefore \frac{x+12}{2}=9$ ½ $x + 12 = 9 \times 2$ $x + 12 = 18$ $x = 18 - 12$ $\boxed{x = 6}$ ½ Area of triangle ABC = $\frac{1}{2}[x_1(y_2-y_3)+x_2(y_3-y_1)+x_3(y_1-y_2)]$ ½ $= \frac{1}{2}[6(2-2)+2(2-10)+12(10-2)]$ $=\frac{1}{2}[6(0)+2(-8)+12(8)]$ ½ $= \frac{1}{2}[\ 0 - 16 + 96\ ]$	

Qn. Nos.	**Value Points**	**Marks allotted**

$= \frac{1}{2} \times 80$ ½

= 40 sq.cm

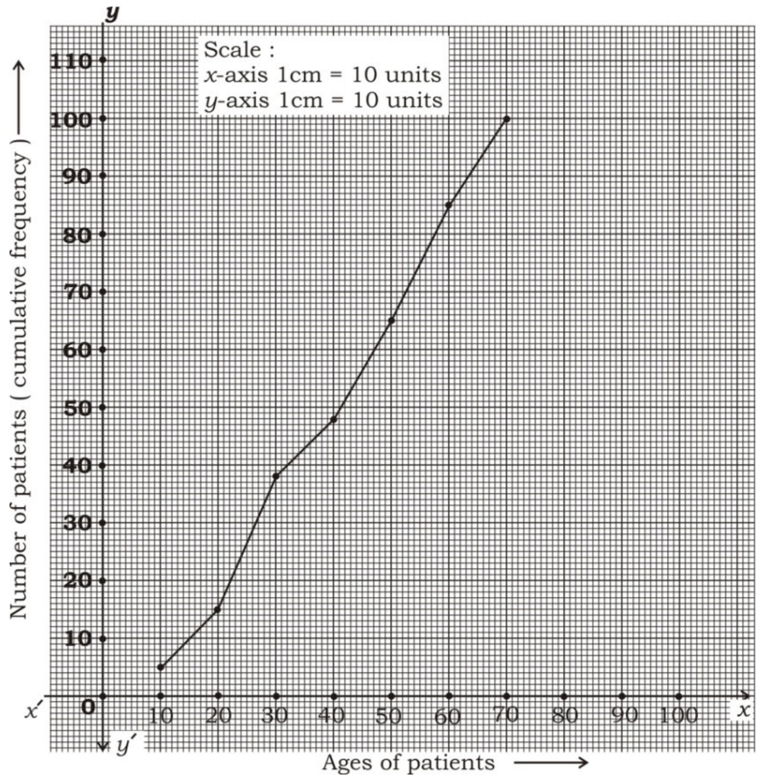
Area of quadrilateral *PBCQ* = Area of ΔABC – Area of ΔAPQ

= 40 – 12 = 28 sq. cm ½ 3

32. The ages of 100 patients admitted in an hospital are as follows. Draw a "less than type ogive" for the given data :

Age (in years)	*Number of patients* (*cumulative frequency*)
Less than 10	6
Less than 20	15
Less than 30	38
Less than 40	46
Less than 50	65
Less than 60	84
Less than 70	100

Ans. :



Drawing axes and writing scale 1

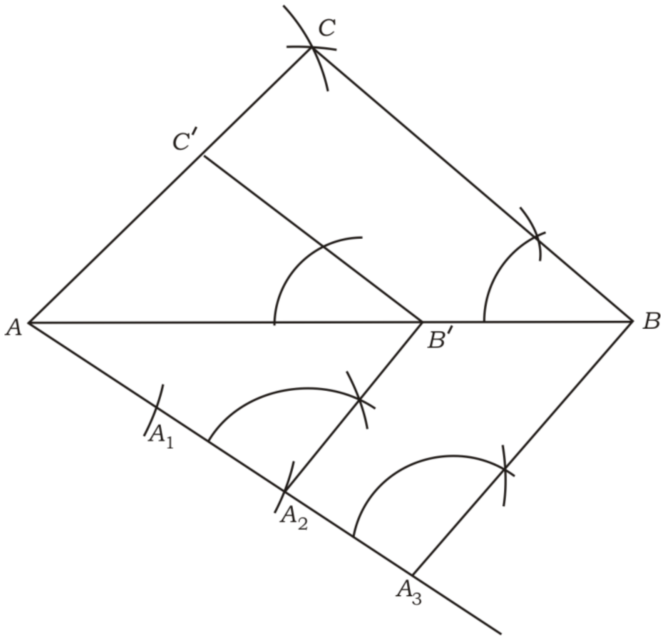
Marking points 1

Drawing ogive 1 3

Qn. Nos.	**Value Points**	**Marks allotted**

33. Construct a triangle with sides 6 cm, 8 cm and 9 cm and then construct another triangle whose sides are $\frac{2}{3}$ of the corresponding sides of the first triangle.

Ans.



Construction of given triangle	1	
Construction of acute angle with division	½	
Drawing parallel lines	1	
Obtiaing of required triangle	½	3

V. Answer the following questions : 4 × 4 = 16

34. Find the solution of the given pair of linear equations by graphical method :

$$2x + y = 8$$
$$x + y = 5$$

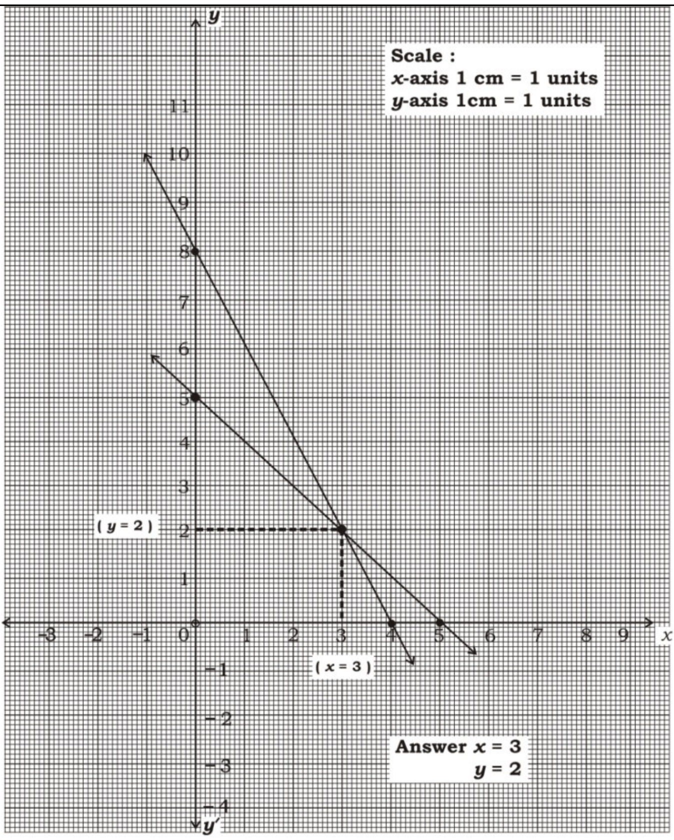
Ans. :

$2x + y = 8$

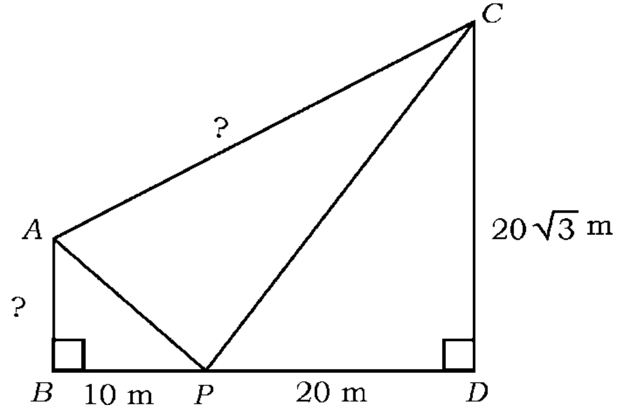
x	0	4	3
y	8	0	2

$x + y = 5$

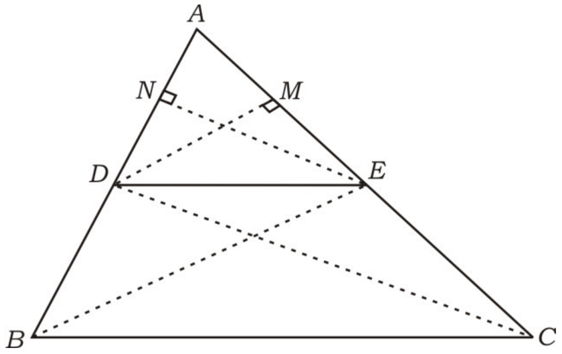
x	0	5	3
y	5	0	2

Qn. Nos.	Value Points	Marks allotted
		
	For table construction 2	
	Drawing two lines 1	
	Marking point of intersection and writing values of x and y 1	4
35.	In an Arithmetic progression the sum of first n terms is 210 and the sum of first ($n - 1$) terms is 171. If the first term of the Arithmetic progression is 3, then find the Arithmetic progression and find its 20^{th} term.	
	OR	
	The sum of interior angles of a polygon of 'n' sides is ($n - 2$) 180°. If the interior angles of a pentagon are in Arithmetic progression and its least angle is 72°, then find all the interior angles of the pentagon.	
	Ans. :	
	$S_n = 210$, $S_{n-1} = 171$ $a_n = ?$	
	$a_n = S_n - S_{n-1}$	
	$= 210 - 171$	
	$\boxed{a_n = 39}$ ½	

Qn. Nos.	Value Points	Marks allotted
	$S_n = 210, \quad a = 3, \quad a_n = 39, \quad n = ?$	
	$S_n = \frac{n}{2}(a + a_n)$	
	$210 = \frac{n}{2}(3+39)$ ½	
	$210 = \frac{n}{\cancel{2}} \times \overset{21}{\cancel{42}}$	
	$21n = 210$	
	$n = \frac{210}{21}$	
	$\boxed{n = 10}$ ½	
	$a = 3, \; n = 10, \; a_n = 39, \; d = ?$	
	$a_n = a + (n-1)\, d$ ½	
	$39 = 3 + (10 - 1)\, d$	
	$39 - 3 = 9d$	
	$9d = 36$ ½	
	$\boxed{d = 4}$	
	Required A.P. is $a, \; a + d, \; a + 2d$	
	$3, \; 3 + 4, \; 3 + 8$............	
	$3, \; 7, \; 11, \; 15$ .... ½	
	$a = 3, \; d = 4, \; n = 20, \; a_{20} = ?$	
	$a_n = a + (n-1)\, d$ ½	
	$a_{20} = 3 + (20 - 1)\, 4$	
	$= 3 + 19 \times 4$	
	$= 3 + 76 = 79$ ½	4
	OR	
	The sum of interior angles of a polygon of n sides $= (n-2)\, 180°$	
	The sum of interior angles of a pentagon $= (5 - 2)\, 180°$	
	$= 3 \times 180° = 540°$ ½	
	$a = 72, \; n = 5, \; S_n = 540, \; d = ?$	
	$S_n = \frac{n}{2}[2a + (n-1)\, d]$ ½	
	$540 = \frac{5}{2}[2 \times 72 + (5 - 1)\, d]$ ½	
	$540 = \frac{5}{2}[144 + 4d]$	

Qn. Nos.	**Value Points**	**Marks allotted**
	$\overset{108}{\cancel{540}} = \frac{\overset{1}{\cancel{5}}}{2} \times \cancel{2}\,[\,72 + 2d\,]$ ½	
	$108 = 72 + 2d$ ½	
	$2d = 108 - 72$	
	$2d = 36$	
	$d = \frac{36}{2} = 18$ ½	
	$\boxed{d = 18}$	
	The interior angles of the pentagon are ½	4
	a, $a + d$, $a + 2d$, $a + 3d$, $a + 4d$	
	72, 72 +18, 72 + 2 ×18, 72 + 3 × 18, 72 + 4 × 18 ½	
	72°, 90°, 108°, 126°, 144°	
36.	In the figure the poles *AB* and *CD* of different heights are standing vertically on a level ground. From a point *P* on the line joining the foots of the poles on the level ground, the angles of elevation to the tops of the poles are found to be complementary. The height of *CD* and the distance *PD* are $20\sqrt{3}$ m and 20 m respectively. If *BP* is 10 m, then find the length of the pole *AB* and the distance AC between the tops of the poles.	
		
	Ans. :	
	Let angle *CPD* be θ	
	Then $\tan\theta = \frac{CD}{PD} = \frac{20\sqrt{3}}{20} = \sqrt{3}$	
	$\therefore\ \theta = 60°$ ½	
	$\therefore\ \angle APB = 90° - \theta = 90° - 60° = 30°$ ½	
	In right ΔABP	
	$\tan 30° = \frac{AB}{BP}$	

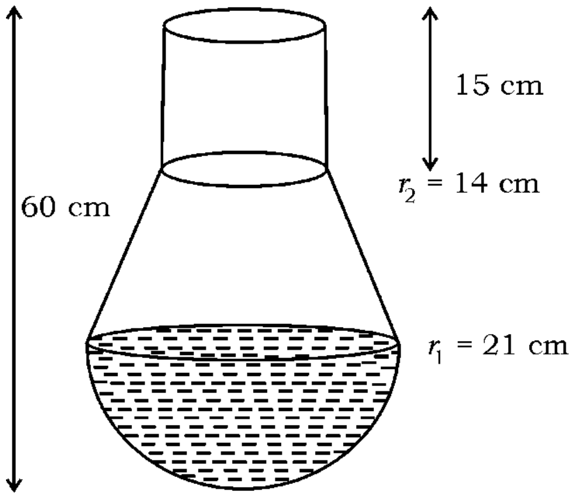
Qn. Nos.	**Value Points**		**Marks allotted**
	$\frac{1}{\sqrt{3}} = \frac{AB}{10}$		
	$AB \,.\sqrt{3} = 10$		
	$AB = \frac{10}{\sqrt{3}}$ m	½	
	In right ΔPDC, $PC^2 = PD^2 + DC^2$		
	$= 20^2 + (20\sqrt{3})^2$		
	$= 400 + (400 \times 3)$		
	$= 400 + 1200$	½	
	$PC^2 = 1600$ .... (1)		
	In right $\Delta\ ABP$, $AP^2 = AB^2 + BP^2$		
	$= \left(\frac{10}{\sqrt{3}}\right)^2 + 10^2$		
	$= \frac{100}{3} + 100$	½	
	$= \frac{100+300}{3}$		
	$AP^2 = \frac{400}{3}$ .... (2)	½	
	In right ΔAPC		
	$AC^2 = AP^2 + PC^2$		
	$= \frac{400}{3} + 1600$	½	
	$= \frac{400\ + 4800}{3}$		
	$= \frac{5200}{3}$		
	$= \frac{400 \times 13}{3}$		
	$\therefore\ AC = \sqrt{\frac{400 \times 13}{3}}$	½	
	$AC = \frac{20 \times \sqrt{13}}{\sqrt{3}} = \frac{20}{3}\sqrt{39}$ m		4
37.	State and prove "Basic proportionality theorem" or "Thales theorem". *Ans.* :		

Qn. Nos.	Value Points	Marks allotted
	 ½	
	Given : ABC is a triangle, $DE\|\|BC$ DE intersects AB and AC at D and E respectiely. ½	
	To prove that : $\frac{AD}{DB}=\frac{AE}{EC}$ ½	
	Construction : Draw $DM \perp AC$ and $EN \perp AB$ and join BE and CD. ½	
	Proof : Area of $\Delta ADE = \frac{1}{2}\times AD\times EN$ Area of $\Delta BDE = \frac{1}{2}\times DB\times EN$ Aea of $\Delta ADE = \frac{1}{2}\times AE\times DM$	
	$\therefore\ \frac{\Delta ADE}{\Delta BDE} = \frac{\frac{1}{\cancel{2}}\times AD\times \cancel{EN}}{\frac{1}{\cancel{2}}\times DB\times \cancel{EN}} = \frac{AD}{DB}$ .... (1) ½	
	and $\frac{\Delta ADE}{\Delta ECD} = \frac{\frac{1}{\cancel{2}}\times AE\times \cancel{DM}}{\frac{1}{\cancel{2}}\times EC\times \cancel{DM}} = \frac{AE}{EC}$ ....(2) ½	
	But ΔBDE and ΔDEC are on the same base DE between the same parallels BC and DE. ½	
	$\therefore\ \Delta BDE = \Delta DEC$...............(3)	
	From (1), (2) and (3) $\frac{AD}{DB}=\frac{AE}{EC}$ ½	4
VI.	**Answer the following question : 1 × 5 = 5**	
38.	An insect control device made of a cylinder, a frustum of a cone and a hemisphere attached to each other is as shown in the figure. Sticky liquid is completely filled in	

Qn. Nos.	**Value Points**	**Marks allotted**

the hemispherical part.

If the radii of hemisphere and cylinder are 21 cm and 14 cm respectively and total height of the device is 60 cm and height of the cylinder is 15 cm, then calculate the curved surface area of the device and also find the quantity of the sticky liquid in the hemisphere.



Ans. :

Outer surface area of the device =

CSA of cylinder + CSA of frustum of cone + CSA of hemisphere.

r = 14 cm, h = 15 cm

CSA of cylinder = $2\pi rh = 2\times\frac{22}{7}\times\cancel{14}^{2}\times 15$ ½

$= 88 \times 15$

$= 1320\ \text{cm}^2$ ½

Height of frustum = 60 – (15 + 21) = 24 cm

$r_1=21,\ r_2=14,\ h=24,\ l=?$

$\therefore\ l=\sqrt{h^2+(r_1-r_2)^2} = \sqrt{24^2+(21-14)^2}$ ½

$l=\sqrt{576+49}=\sqrt{625}$

l = 25 cm ½

CSA of frustum = $\pi\,(r_1+r_2)\,l$ ½

$= \frac{22}{7}\times(21+14)\times 25$

$= \frac{22}{7}\times 35\times 25$

$= 2750\ \text{cm}^2$ ½

Qn. Nos.	**Value Points**	**Marks allotted**
	CSA of hemisphere = $2\pi r^2$ ½	
	$= 2 \times \frac{22}{7} \times 21 \times 21$	
	$= 44 \times 63$	
	$= 2772 \text{ cm}^2$ ½	
	$\therefore$ Outer surface area of the device	
	= CSA of (Cylinder + frustum + hemisphere)	
	$= 1320 + 2750 + 2772$	
	$= 6842 \text{ cm}^2$	
	Quantity of the liquid in hemisphere	
	= Volume of hemisphere	
	$= \frac{2}{3}\pi r^3$ ½	
	$= \frac{2}{\cancel{3}} \times \frac{22}{\cancel{7}} \times 21 \times 21 \times \overset{3}{\cancel{21}}$	
	$= 44 \times 441$	
	$= 19404 \text{ cm}^3$ ½	5