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

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

ಎಸ್.ಎಸ್.ಎಲ್.ಸಿ. ಪರೀಕ್ಷೆ, ಮಾರ್ಚ್ / ಏಪ್ರಿಲ್ — 2023

S. S. L. C. EXAMINATION, MARCH/APRIL, 2023

ಮಾದರಿ ಉತ್ತರಗಳು

MODEL ANSWERS

ದಿನಾಂಕ : 03. 04. 2023] ಸಂಕೇತ ಸಂಖ್ಯೆ : **81-E**

Date : 03. 04. 2023] **CODE NO. : 81-E**

ವಿಷಯ : ಗಣಿತ

Subject : MATHEMATICS

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

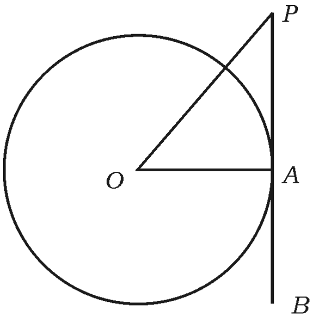
(Private Repeater / NSR & NSPR)

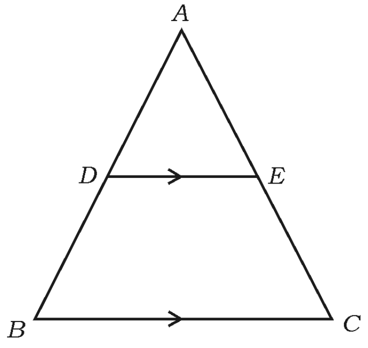
(ಇಂಗ್ಲಿಷ್ ಮಾಧ್ಯಮ / English Medium)

[ಗರಿಷ್ಠ ಅಂಕಗಳು : **100**

[Max. Marks : 100

Qn. Nos.	Ans. Key	Value Points	Marks allotted
I.		**Multiple choice questions :** **8 × 1 = 8**	
1.		The common difference of the Arithmetic progression $-3, -1, 1, 3 \ldots$ is (A) 3 (B) 2 (C) -1 (D) -2 *Ans.* :	
	(B)	2	1
2.		The median of the scores 6, 4, 2, 10 and 7 is (A) 6 (B) 10 (C) 4 (D) 2 *Ans.* :	
	(A)	6	1

Qn. Nos.	Ans. Key	Value Points	Marks allotted
3.		The total surface area of a right circular cylinder having radius *'r'* and height *'h'* is (A) $\pi r(r+h)$ (B) $2\pi rh$ (C) $2\pi r(r-h)$ (D) $2\pi r(r+h)$ *Ans.* :	
	(D)	$2\pi r(r+h)$	1
4.		Which of the following are the sides of a right angled triangle ? (A) 2, 3, 4 (B) 4, 5, 6 (C) 3, 4, 5 (D) 6, 8, 12 *Ans.* :	
	(C)	3, 4, 5	1
5.		In the given figure, *PB* is a tangent drawn at the point *A* to the circle with centre *'O'*. If $\angle AOP = 45°$, then the measure of $\angle OPA$ is  (A) 45° (B) 90° (C) 35° (D) 65° *Ans.* :	
	(A)	45°	1

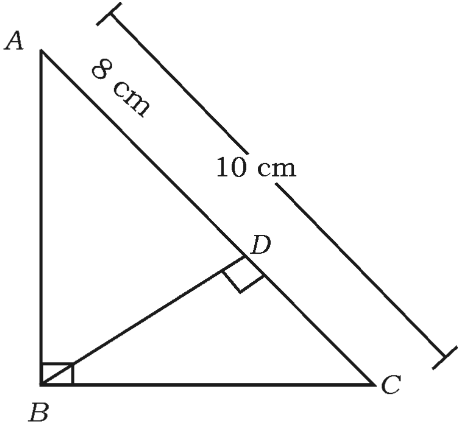
Qn. Nos.	Ans. Key	Value Points	Marks allotted
6.		In the figure, if $DE \parallel BC$, then the correct relation among the following is  (A) $\frac{AD}{AB} = \frac{AE}{EC}$ (B) $\frac{AD}{DB} = \frac{EC}{AE}$ (C) $\frac{AD}{DB} = \frac{AE}{EC}$ (D) $\frac{DB}{AD} = \frac{AE}{EC}$ *Ans.* :	
	(C)	$\frac{AD}{DB}=\frac{AE}{EC}$	1
7.		The lines represented by the equations $4x + 5y - 10 = 0$ and $8x + 10y + 20 = 0$ are (A) intersecting lines (B) perpendicular lines to each other (C) coincident lines (D) parallel lines *Ans.* :	
	(D)	parallel lines	1
8.		The distance of the point $(-8, 3)$ from the x-axis is (A) – 8 units (B) 3 units (C) – 3 units (D) 8 units *Ans.* :	
	(B)	3 units	1

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

II. **Answer the following questions :** **$8 \times 1 = 8$**

(Direct answers from Q. Nos. 9 to 16 full marks should be given)

9. In Δ *ABC*, $\underline{|\,ABC}$ = 90° and $BD \perp AC$. If AC = 10 cm and AD = 8 cm, find the length of *BD*.



Ans. :

$AC = AD + DC$

$10 = 8 + DC$

$DC = 10 - 8 = 2$

$BD^2 = AD \times DC$ $\qquad BD^2 = 8 \times 2$ ½

$BD = \sqrt{8 \times 2}$

$BD = \sqrt{16}$

$BD = 4$ cm. ½ 1

10. If the pair of lines represented by the linear equations $x + 2y - 4 = 0$ and $ax + by - 12 = 0$ are coincident lines, then find the values of '*a*' and '*b*'.

Ans. :

$x + 2y - 4 = 0 \qquad ax + by - 12 = 0$

coincident lines $\quad \dfrac{a_1}{a_2} = \dfrac{b_1}{b_2} = \dfrac{c_1}{c_2}$ ½

$$\frac{1}{a} = \frac{2}{b} = \frac{-4}{-12}$$

Qn. Nos.	**Value Points**		**Marks allotted**
	$\frac{1}{a}=\frac{1}{3}$ $\frac{2}{b}=\frac{1}{3}$		
	$\therefore$ $\boxed{a = 3}$ $\boxed{b = 6}$	½	1
11.	Δ *ABC* ~ Δ *PQR*. Area of the Δ *ABC* is 64 cm^2 and the area of the Δ *PQR* is 100 cm^2. If *AB* = 8 cm, then find the length of *PQ*.		
	Ans. :		
	$\left.\begin{array}{l}\frac{ar(ABC)}{ar(PQR)}=\frac{AB^2}{PQ^2}\\ \frac{\cancel{64}}{100}=\frac{\cancel{8}^2}{PQ^2}\end{array}\right\}$	½	
	$\left.\begin{array}{l}PQ^2=100\\ PQ=\sqrt{100}\\ \boxed{PQ = 10\text{ cm}}\end{array}\right\}$	½	1
12.	Express the equation $x(2+x)=3$ in the standard form of a quadratic equation.		
	Ans. :		
	$x(2+x)=3$	½	
	$2x+x^2=3$		
	Standard form : $x^2+2x-3=0$	½	1
13.	Find the discriminant of the quadratic equation $2x^2-4x+3=0$.		
	Ans. :		
	$2x^2-4x+3=0$		
	$\Delta=b^2-4ac$	½	
	$\Delta=(-4)^2-4\times2\times3$		
	$= 16 - 24$		
	$\Delta = -8$		
	$\therefore$ Discriminant = – 8	½	1

Qn. Nos.	Value Points	Marks allotted

14. Find the coordinates of the mid-point of the line segment joining the points (6, 3) and (4, 7).

Ans. :

(6, 3) (4, 7)

(x_1 , y_1) (x_2 , y_2)

Co-ordinates of Mid-point = $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$ ½

$= \left(\frac{6+4}{2}, \frac{3+7}{2} \right)$

= (5, 5) ½ 1

15. If one root of the quadratic equation ($2x$ + 1) (x – 3) = 0 is $-\frac{1}{2}$ then find the other root.

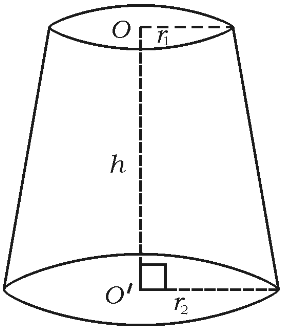
Ans. :

($2x + 1$) ($x - 3$) = 0 One root is – ½

$x - 3 = 0$ ½

$x = 3$ ½ 1

16. Write the formula to find the volume of the frustum of a cone given in the figure.

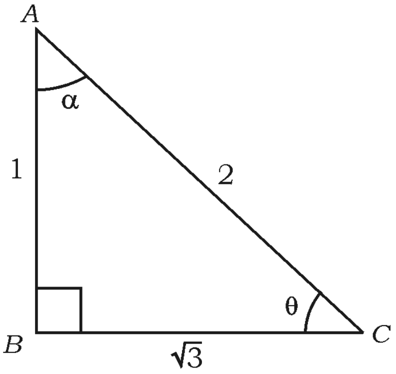
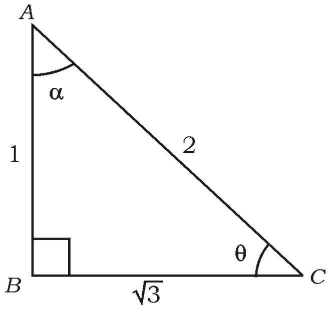


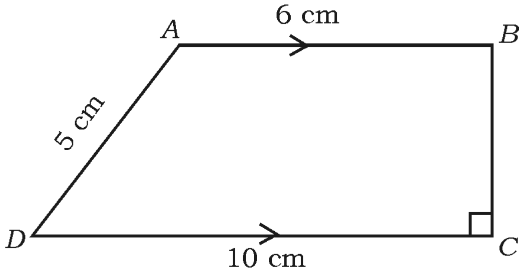
Ans. :

Volume of the frustum of the cone $\Big\}$ $(V) = \frac{1}{3} \pi h (r_1^2 + r_2^2 + r_1 r_2)$ 1

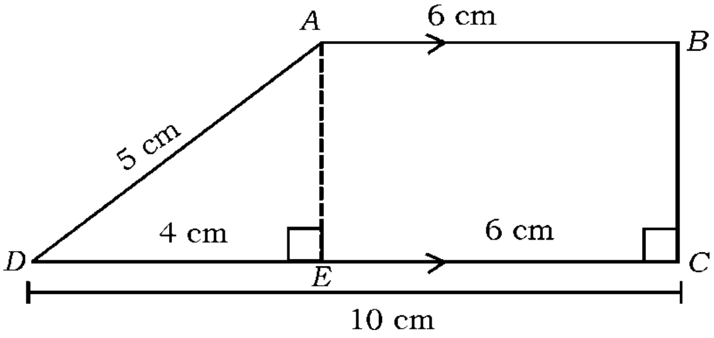
Qn. Nos.	Value Points	Marks allotted
III.	**Answer the following questions : 18 × 2 = 36**	
17.	Find the distance between the origin and the point (6, 8).	
	Ans. :	
	(6, 8)	
	$x, \; y$	
	$d = \sqrt{x^2 + y^2}$ ½	
	$= \sqrt{6^2 + 8^2}$ ½	
	$= \sqrt{36 + 64} = \sqrt{100}$ ½	
	$d = 10$ units. ½	2
18.	Solve the given pair of linear equations :	
	$3x + y = 12$	
	$x + y = 6$	
	Ans. :	
	$3x + y = 12$	
	$x + y = 6$	
	$\underline{(-) \; (-) \quad (-)}$ subtracting	
	$2x = 6$ ½	
	$x = \frac{6}{2}$	
	$\boxed{x = 3}$ ½	
	$x + y = 6$	
	$3 + y = 6$ ½	
	$y = 6 - 3$	
	$\boxed{y = 3}$ ½	2

Qn. Nos.	Value Points	Marks allotted
19.	Find the 20^{th} term of the Arithmetic progression 4, 7, 10, ... by using formula.	
	Ans. :	
	4, 7, 10 .... $a_{20} = ?$	
	$a = 4$, $d = 7 - 4 = 3$ $n = 20$ ½	
	$a_n = a + (n-1)d$ ½	
	$a_{20} = 4 + (20-1) \times 3$	
	$= 4 + 19 \times 3$ ½	
	$= 4 + 57$	
	$\therefore \boxed{a_{20} = 61}$ ½	2
20.	Find the roots of the equation $2x^2 - 5x + 3 = 0$ by using 'quadratic formula'.	
	OR	
	Find the roots of the equation $x^2 - 3x - 10 = 0$ by factorisation method.	
	Ans. :	
	$2x^2 - 5x + 3 = 0$	
	$a = 2$ $b = -5$ $c = 3$	
	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ ½	
	$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4 \times 2 \times 3}}{2 \times 2}$ ½	
	$x = \frac{5 \pm \sqrt{25 - 24}}{4}$ ½	
	$x = \frac{5 \pm \sqrt{1}}{4}$ ½	2
	$x = \frac{5 \pm 1}{4}$	
	$x = \frac{5+1}{4}$, $x = \frac{5-1}{4}$	
	$x = \frac{6}{4}$, $x = \frac{4}{4}$	
	$\boxed{x = \frac{3}{2}}$ $\boxed{x = 1}$	
	OR	

Qn. Nos.	Value Points	Marks allotted
	$x^2 - 3x - 10 = 0$	
	$x^2 - 5x + 2x - 10 = 0$ ½	
	$x(x-5) + 2(x-5) = 0$	
	$(x+2)(x-5) = 0,$ ½	
	$(x+2) = 0$ $\boxed{x = -2}$ ½	
	$x - 5 = 0$ $\boxed{x = 5}$ ½	2
21.	In the given figure, if $\underline{\lvert\, ABC}$ = 90°, then find the values of sin θ and cos α.	
		
	Ans. :	
		
	$\sin\theta = \frac{AB}{AC} = \frac{1}{2}$ 1	
	$\cos\alpha = \frac{AB}{AC} = \frac{1}{2}$ 1	2
22.	If cos θ = sin 60° . cos 30° – sin 30° . cos 60°, then find the value of ‘θ’.	
	OR	
	If sin 3*A* = cos (*A* – 26°), where 3*A* is an acute angle then find the value of *A*.	

Qn. Nos.	Value Points	Marks allotted
	Ans. :	
	$\cos\theta = \sin 60° \,.\, \cos 30° - \sin 30° \,.\, \cos 60°$	
	$\cos\theta = \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2} - \frac{1}{2} \times \frac{1}{2}$ 1	
	$= \frac{3}{4} - \frac{1}{4}$	
	$\cos\theta = \frac{1}{2}$	
	$\cos\theta = \cos 60°$. ½	
	∴ $\boxed{\theta = 60°}$ ½	2
	OR	
	$\sin 3A = \cos (A - 26°)$	
	$\cos (90° - 3A) = \cos (A - 26°)$ ½	
	$90° - 3A = A - 26°$ ½	
	$90° + 26° = A + 3A$	
	$116° = 4A$ ½	
	$A = \frac{116°}{4}$	
	$A = 29°$ ½	2
23.	In the given figure, *ABCD* is a trapezium in which *AB* || *DC*, and *BC* ⊥ *DC*. If *AB* = 6 cm, *CD* = 10 cm and *AD* = 5 cm, then find the distance between the parallel lines. 	

Qn. Nos.	Value Points	Marks allotted
	Ans. :	



Draw $AE \perp DC$ ½

$\therefore$ *ABCE* is a rectangle

$\therefore$ $EC = AB = 6$ cm

$DC = DE + EC$

$10 = DE + EC$

$10 = DE + 6$

$DE = 10 - 6 = 4$ cm ½

In $\Delta\ ADE$ $\quad AD^2 = AE^2 + DE^2$ ½

$5^2 = AE^2 + 4^2$

$25 = AE^2 + 16$

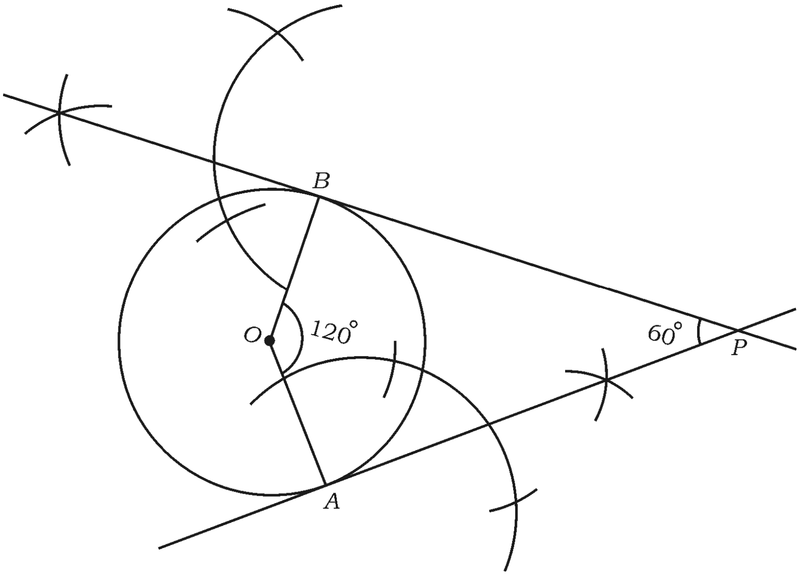
$AE^2 = 25 - 16$

$AE^2 = 9$

$AE = \sqrt{9}$

$$\left.\begin{array}{l} AE = 3 \text{ cm} \\ \therefore \text{Distance between the parallel lines} = 3 \text{ cm.} \end{array}\right\}$$ ½

2

Qn. Nos.	Value Points	Marks allotted
24.	Draw a circle of radius 4 cm and construct a pair of tangents to the circle such that the angle between them is 60°.	
	Ans. :	
	Angle between the Radii = 180° – 60° = 120° ½	
		
	Drawing a circle of radius 4 cm ½	
	Drawing 2 arcs ½	
	Drawing a pair of tangents to circle ½	2
25.	Prove that tan 48° . tan 23° . tan 42° . tan 67° = 1.	
	Ans. :	
	LHS = tan 48° . tan 23° . tan 42° . tan 67°	
	= tan 48° . tan (90° – 67°) . tan (90° – 48°) . tan 67° ½	
	= tan 48° × cot 67° . cot 48° . tan 67° ½	
	$= \cancel{\tan} 48^\circ \times \frac{1}{\cancel{\tan} 67^\circ} . \frac{1}{\cancel{\tan} 48^\circ} . \cancel{\tan} 67^\circ$ ½	
	= 1 = RHS ½	
	Note : Any other alternate method is followed to get the correct answer full marks should be given.	2

Qn. Nos.	Value Points		Marks allotted
26.	The sum of the first three terms in an arithmetic progression is 180 and the common difference is 5. Find these three terms of the progression.		
	Ans. :		
	Let the three terms of A.P. are		
	$a - d, \quad a, \quad a + d$	½	
	Sum of three terms = 180		
	$a - \cancel{d} + a + a + \cancel{d} = 180$	½	
	$3a = 180$		
	$a = \frac{180}{3}$		
	$\boxed{a = 60}$	½	
	$c . d \; \boxed{(d) = 5}$		
	$\therefore$ The three terms of A.P. are		
	$a - d, \quad a \quad a + d$		
	$60 - 5, \quad 60, \quad 60 + 5$		
	$55, \quad 60, \quad 65$	½	2
27.	Show that $\cot\theta \times \cos\theta + \sin\theta = \operatorname{cosec}\theta$.		
	Ans. :		
	$\cot\theta \times \cos\theta + \sin\theta = \operatorname{cosec}\theta$		
	L.H.S. = $\cot\theta \times \cos\theta + \sin\theta$		
	$= \frac{\cos\theta}{\sin\theta} \times \cos\theta + \sin\theta$	½	
	$= \frac{\cos^2\theta}{\sin\theta} + \frac{\sin\theta}{1}$		
	$= \frac{\cos^2\theta + \sin^2\theta}{\sin\theta}$	½	
	$= \frac{1}{\sin\theta}$	½	
	$= \operatorname{cosec}\theta$ (R. H. S.)	½	2

Qn. Nos.	Value Points	Marks allotted

28. Find the distance between the points $A(4, 3)$ and $B(10, 11)$ by using 'distance formula'.

Ans. :

$A(4, 3)$ $B(10, 11)$

(x_1, y_1) (x_2, y_2)

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ ½

$d = \sqrt{(10-4)^2 + (11-3)^2}$ ½

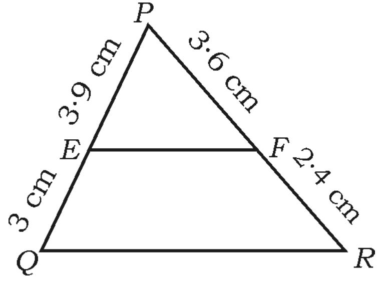
$d = \sqrt{6^2 + 8^2}$

$d = \sqrt{36 + 64}$ ½

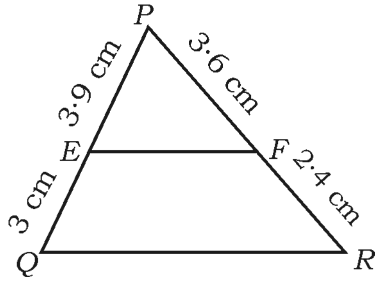
$d = \sqrt{100}$

d = 10 units ½ 2

29. In the given figure, PE = 3·9 cm, EQ = 3 cm, PF = 3·6 cm and FR = 2·4 cm. Verify whether $EF \parallel QR$.

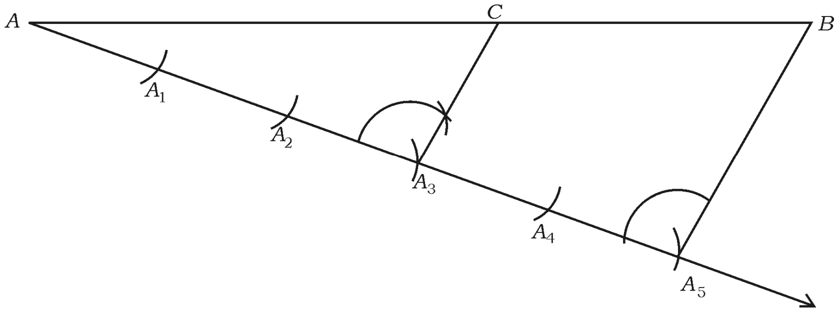


Ans. :



$\frac{PE}{EQ}, \frac{PF}{FR}$ ½

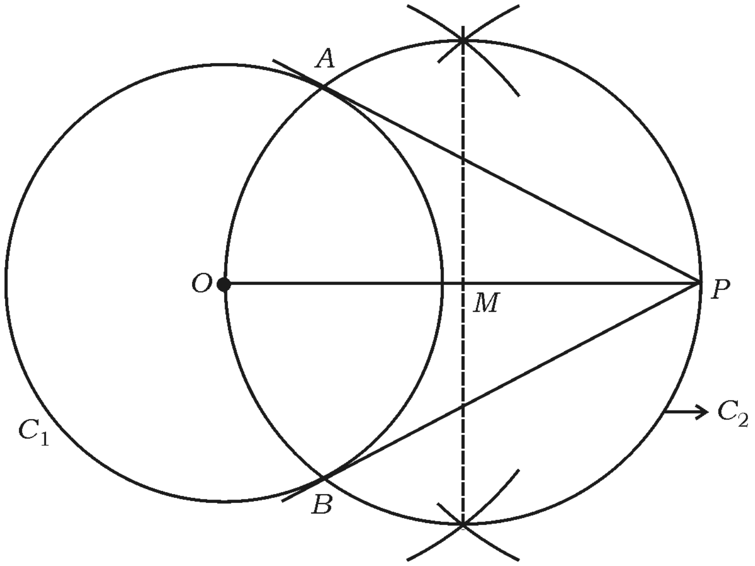
$\frac{3\cdot9}{3}, \frac{3\cdot6}{2\cdot4}$ ½

Qn. Nos.	Value Points		Marks allotted
	$\frac{39}{30}$, $\frac{36}{24}$	½	
	$\frac{13}{10} \neq \frac{12}{8}$		
	$\therefore \quad EF \neq QR.$	½	2
30.	Draw a line segment of length 10 cm and divide it in the ratio 3 : 2 by geometric construction.		
	Ans. :		
			
	$AC : CB = 3 : 2$		
	Drawing line segment (10 cm)	½	
	Constructing acute angle at *A*	½	
	Marking 5 arcs	½	
	Constructing $A_3C \,\|\|\, A_5B$	½	2
	Note : Any other suitable method is followed, full marks should be given.		

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

31. Construct two tangents to a circle of radius 3·5 cm from a point 9 cm away from its centre.

Ans. :



Drawing a circle of radius 3·5 cm ½

Drawing *OP* = 8 cm and constructing
perpendicular bisector ½

Drawing C_2 circle ½

Joining *PA* and *PB* ½ 2

32. The slant height of the frustum of a cone is 4 cm and the radii of its circular ends are 6 cm and 8 cm. Find the curved surface area of the frustum of the cone.

Ans. :

$l = 4$ cm, $r_1 = 6$ cm, $r_2 = 8$ cm

C.S.A. of the frustum of the cone (A) = $\pi(r_1 + r_2)l$ ½

$= \frac{22}{7} \times (6+8) \times 4$ ½

$= \frac{22}{\cancel{7}} \times \cancel{14}^{2} \times 4$ ½

$A = 176 \text{ cm}^2$ ½ 2

Qn. Nos.	Value Points	Marks allotted
33.	Find the surface area of a sphere whose radius is 7 cm.	
	Ans. :	
	$r = 7$ cm	
	S. A. of sphere = $4\pi r^2$ ½	
	$A = 4 \times \frac{22}{7} \times 7^2$ ½	
	$= 4 \times \frac{22}{\cancel{7}} \times 7 \times \cancel{7}$ ½	
	$= 616$ cm^2 ½	2
34.	Write the linear equation $3x - 4y = 5$ in the form of $ax + by + c = 0$ and write the values of a, b and c.	
	Ans. :	
	$3x - 4y = 5$	
	$3x - 4y - 5 = 0$ ½	
	$ax + by + c = 0$	
	$\boxed{a = 3}$ $\boxed{b = -4}$ $\boxed{c = -5}$ 1½	2
IV.	**Answer the following questions : $9 \times 3 = 27$**	
35.	Find the roots of the equation $\frac{1}{x+4} - \frac{1}{x-7} = \frac{11}{30}$, $x \neq -4, 7$.	
	OR	
	Examine whether the equation $(x-2)(x+1) = (x-1)(x+3)$ is a quadratic equation.	
	Ans. :	
	$\frac{1}{x+4} - \frac{1}{x-7} = \frac{11}{30}$	
	$\frac{x-7-(x+4)}{(x+4)(x-7)} = \frac{11}{30}$ ½	
	$\frac{\cancel{x}-7-\cancel{x}-4}{x^2-7x+4x-28} = \frac{11}{30}$ ½	
	$\frac{-\cancel{11}}{x^2-3x-28} = \frac{\cancel{11}}{30}$	

Qn. Nos.	Value Points		Marks allotted
	$\frac{-1}{x^2 - 3x - 28} = \frac{1}{30}$	½	3
	$-30 = x^2 - 3x - 28$		
	$x^2 - 3x - 28 + 30 = 0$	½	
	$x^2 - 3x + 2 = 0$		
	$x^2 - 2x - 1x + 2 = 0$		
	$x(x-2) - 1(x-2) = 0$		
	$(x-1)(x-2) = 0$	½	
	$x - 1 = 0$ $\qquad$ $x - 2 = 0$		
	$\boxed{x = 1}$ $\qquad$ $\boxed{x = 2}$	½	
	OR		
	$(x-2)(x+1) = (x-1)(x+3)$		
	$x(x+1) - 2(x+1) = x(x+3) - 1(x+3)$	½	
	$\cancel{x^2} + x - 2x - 2 = \cancel{x^2} + 3x - x - 3$	½	
	$-x - 2 = 2x - 3$	½	
	$2x - 3 + x + 2 = 0$		
	$3x - 1 = 0$	½	
	This is not of the form $ax^2 + bx + c = 0$	½	
	∴ This is not a quadratic equation.	½	3
36.	Prove that $\sqrt{\frac{1+\cos A}{1-\cos A}} = \operatorname{cosec} A + \cot A$		
	OR		
	Prove that $\frac{\sin A}{1+\cos A} + \frac{1+\cos A}{\sin A} = 2 \operatorname{cosec} A.$		

Qn. Nos.	**Value Points**	**Marks allotted**
	Ans. :	
	$\sqrt{\frac{1+\cos A}{1-\cos A}} = \operatorname{cosec} A + \cot A$	
	L.H.S. = $\sqrt{\frac{(1+\cos A)\,(1+\cos A)}{(1-\cos A)\,(1+\cos A)}}$ ½	
	$= \sqrt{\frac{(1+\cos A)^2}{1^2-\cos^2 A}}$ ½	
	$= \sqrt{\frac{(1+\cos A)^2}{1-\cos^2 A}}$	
	$= \sqrt{\frac{(1+\cos A)^2}{\sin^2 A}}$ ½	
	$= \frac{1+\cos A}{\sin A}$ ½	
	$= \frac{1}{\sin A} + \frac{\cos A}{\sin A}$ ½	
	$\sqrt{\frac{1+\cos A}{1-\cos A}} = \operatorname{cosec} A + \cot A =$ R.H.S. ½	3
	OR	
	$\frac{\sin A}{1+\cos A} + \frac{1+\cos A}{\sin A} = 2 \operatorname{cosec} A$	
	L.H.S. = $\frac{\sin A}{1+\cos A} + \frac{1+\cos A}{\sin A}$	
	$= \frac{\sin^2 A + (1+\cos A)^2}{(1+\cos A)\,\sin A}$ ½	
	$= \frac{\sin^2 A + 1^2 + \cos^2 A + 2.(1)\cos A}{(1+\cos A)\,\sin A}$ ½	
	$= \frac{\sin^2 A + \cos^2 A + 1 + 2\cos A}{(1+\cos A)\,\sin A}$ ½	
	$= \frac{1 \; + \; 1 \; + 2\cos A}{(1+\cos A)\,\sin A}$	

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

$$= \frac{2 + 2\cos A}{(1+\cos A)\ \sin A}$$

$$= \frac{2(1+\cancel{\cos A})}{(1+\cancel{\cos A})\ \sin A}$$ ½

$$= \frac{2}{\sin A}$$

$$= 2 \ .\ \frac{1}{\sin A}$$ ½

= 2 cosec A R.H.S ½

$$\therefore \quad \frac{\sin A}{1+\cos A} + \frac{1+\cos A}{\sin A} = 2 \text{ cosec } A$$ 3

37. Find the mean for the following data :

Class-interval	*Frequency*
1 – 5	4
6 – 10	3
11 – 15	2
16 – 20	1
21 – 25	5

OR

Find the mode for the following data :

Class-interval	*Frequency*
1 – 3	6
3 – 5	9
5 – 7	15
7 – 9	9
9 – 11	1

Qn. Nos.	Value Points	Marks allotted

Ans. :

C.I.	frequency f_i	Mid point x_i	$x_i f_i$
1-5	4	3	12
6-10	3	8	24
11-15	2	13	26
16-20	1	18	18
21-25	5	23	115
	$\sum f_i 15$		$\sum f_i x_i = 195$

2

$\therefore$ mean $\bar{x} = \dfrac{\Sigma f_i x_i}{\sum f_i} = \dfrac{195}{15}$ ½

$\boxed{\text{Mean } (\bar{x}) = 13}$ ½ 3

OR

From the frequency distribution table, we find that

$f_0 = 9$, $f_1 = 15$, $f_2 = 9$, $h = 2$, $l = 5$, ½

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) \times h$$ ½

$$= 5 + \left(\frac{15 - 9}{2 \times 15 - 9 - 9} \right) \times 2$$ ½

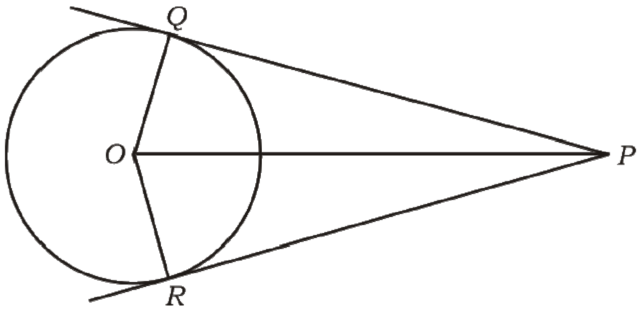
$$= 5 + \left(\frac{6}{30 - 18} \right) \times 2$$ ½

$$= 5 + \left(\frac{\cancel{6}^{1}}{\cancel{12}_{\cancel{2}}} \right) \times \cancel{2}$$ ½

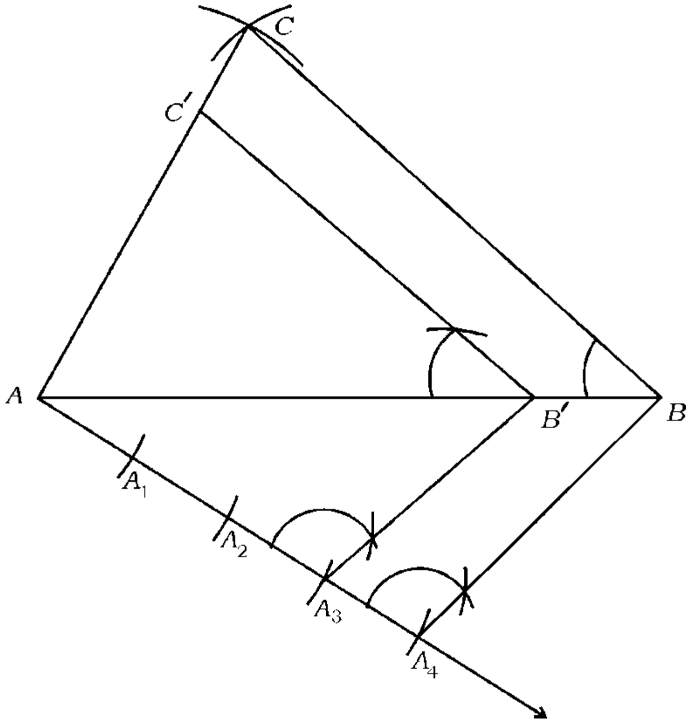
$= 5 + 1$

$\boxed{\text{Mode} = 6}$ ½ 3

Qn. Nos.	Value Points		Marks allotted
38.	Find the ratio in which the line segment joining the points $A(-6,\ 10)$ and $B(3,\ -8)$ is divided by the point $(-4,\ 6)$.		
	OR		
	Find the area of a triangle whose vertices are $A(1,\ -1)$, $B(-4,\ 6)$ and $C(-3,\ -5)$		
	Ans. :		
	$A(-6, 10)$ $B(3, -8)$ $P = (-4, 6)$ (x_1, y_1) (x_2, y_2) (x, y)	½	
	$m_1 : m_2 = ?$		
	$\frac{m_1}{m_2} = \frac{x - x_1}{x_2 - x}$ or $\frac{y - y_1}{y_2 - y}$	½	
	$\frac{m_1}{m_2} = \frac{-4-(-6)}{3-(-4)}$ or $\frac{6-10}{-8-6}$	½	
	$\frac{m_1}{m_2} = \frac{-4+6}{3+4}$ or $\frac{-4}{-14}$	½	
	$\frac{m_1}{m_2} = \frac{2}{7}$ or $\frac{2}{7}$	½	
	$\therefore\ m_1 : m_2 = 2 : 7$	½	3
	Note : Alternate formula is used to find $m_1 : m_2$. Give full marks.		
	OR		
	$A(1, -1)$ $B(-4, 6)$ $c\ (-3, -5)$ (x_1, y_1) (x_2, y_2) (x_3, y_3)	½	
	Area of triangle		
	$(A) = \frac{1}{2}[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$	1	

Qn. Nos.	**Value Points**	**Marks allotted**
	$=\frac{1}{2}[1(6-(-5))+(-4)(-5-(-1)]+(-3)(-1-6)]$ ½	
	$=\frac{1}{2}[1(6+5)+(-4)(-5+1)+(-3)(-7)]$	
	$=\frac{1}{2}[1\times 11+(-4)\times(-4)+(-3)\times(-7)]$	
	$=\frac{1}{2}[11+16+21]$ ½	
	$=\frac{1}{2}\times 48$	
	$\boxed{A = 24 \text{ sq.cm}}$ ½	3
39.	Prove that “The lengths of tangents drawn from an external point to a circle are equal”.	
	Ans. :	
	 ½	
	Data : '*O*' is the centre of the circle *PQ* and *PR* are tangents drawn from external point *P*. ½	
	To prove : $PQ = PR$ ½	
	Construction ; Join *OP*, *OQ* and O*R* ½	
	Proof : In the firgure	
	$\angle OQP = \angle ORP = 90°$ $\left[\begin{array}{l} OQ \perp PQ \\ OR \perp PR \end{array}\right]$ ½	
	$OQ = OR$ (radii of same circle)	

Qn. Nos.	**Value Points**	**Marks allotted**
	$OP = OP$ (common side)	
	$\Delta OQP \cong \Delta ORP$ [RHS]	
	$\therefore$ $PQ = PR$ (C.P.CT) ½	3
	Note : If the theorem is proved as given in the test-book, give full marks.	
40.	The volume of a solid metallic cylinder is 4851 cm^3. It is fully melted and recast into a solid sphere. Find the radius of the sphere.	
	Ans. :	
	Volume of metallic cylinder (v) = 4851 cm^3	
	Volume of cylinder = Volume of sphere ½	
	$= \frac{4}{3}\pi r^3$ ½	
	$4851 = \frac{4}{3} \times \frac{22}{7} \times r^3$ ½	
	$r^3 = \frac{\overset{441}{\cancel{4851}} \times 3 \times 7}{4 \times \cancel{22}^{\,2}}$ ½	
	$r^3 = \frac{9261}{8}$	
	$r = \sqrt[3]{\frac{9261}{8}}$ ½	
	$\therefore \quad r = \frac{21}{2}$	
	$\therefore \quad r = 10{\cdot}5$ cm ½	3
41.	Construct a triangle with sides 5 cm, 6 cm and 8 cm and then construct another triangle whose sides are $\frac{3}{4}$ of the corresponding sides of the first triangle.	

Qn. Nos.	Value Points		Marks allotted
	Ans. : 		
	Construction of given triangle	1	
	Construction of acute angle with division	½	
	Drawing parallel lines	1	
	Obtaining of required triangle	½	3
42.	The distance between two cities *'A'* and *'B'* is 132 km. Flyovers are built to avoid the traffic in the intermediate towns between these cities. Because of this, the average speed of a car travelling in this route through flyovers increases by 11 km/h and hence, the car takes 1 hour less time to travel the same distance than earlier. Find the current average speed of the car. *Ans.* :		
	Let the average speed of the car = x km/hr		
	Distance between two cities = 132 km		
	Time taken = $\left(\frac{D}{S}\right) = \frac{132}{x}$ Hours	½	
	If the speed increases by 11 km/hr		
	Then the speed of the Car = (x + 11) km/hr		

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

Time taken = $\frac{132}{x+11}$ Hours ½

According to the data

$\frac{132}{x} - \frac{132}{x+11} = 1$ ½

$\frac{132(x+11) - 132x}{x(x+11)} = 1$

$1\cancel{32}x + 1452 - 1\cancel{32}x = 1x(x+11)$

$1452 = x^2 + 11x$ ½

$x^2 + 11x - 1452 = 0$

$x^2 + 44x - 33x - 1452 = 0$

$x(x+44) - 33(x+44) = 0$

$(x-33)(x+44) = 0$

$x - 33 = 0$ $\quad$ $x + 44 = 0$

$x = 33$ $\quad$ $x = -44$ ½

$\therefore$ Average speed of the car (x) = 33 km/hr

$\therefore$ Current Average speed is (x + 11) km/hr

= 33 + 11

= 44 km/hr ½

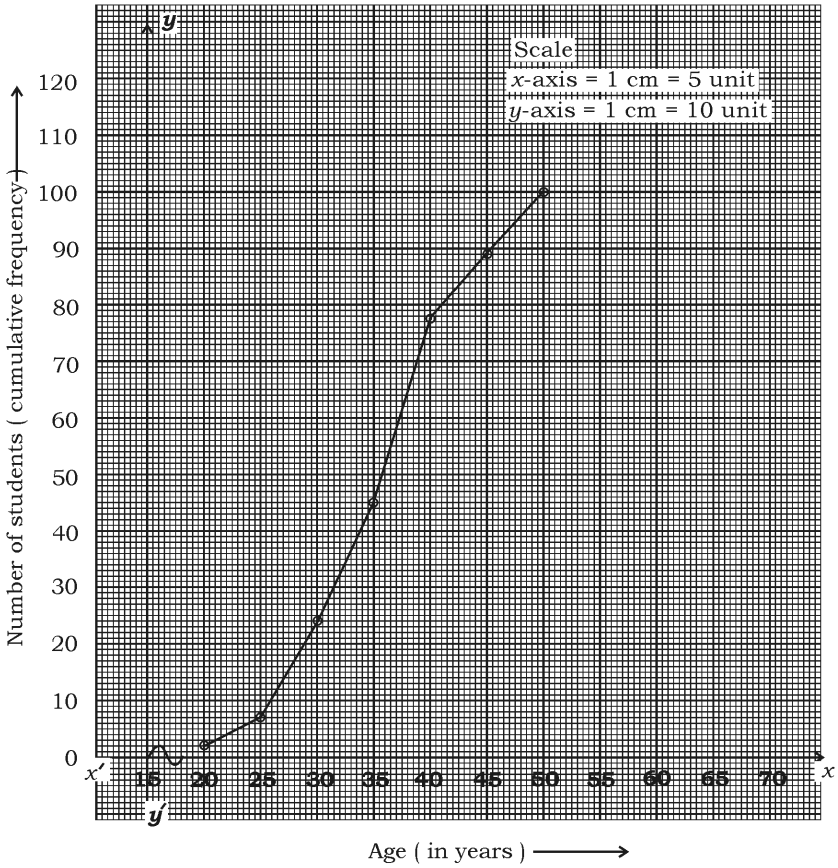
3

43. A life insurance agent found the following data for distribution of ages of 100 policy holders. Draw a "Less than type ogive" for the given data :

Age (in years)	*Number of policy holders (cumulative frequency)*
Below 20	2
Below 25	6
Below 30	24
Below 35	45
Below 40	78
Below 45	89
Below 50	100

Qn. Nos.	Value Points	Marks allotted

Ans. :



Drawing axes and writing scale (½ + ½) = 1

Marking points 1

Drawing ogive 1 3

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

44. The sum of 2nd and 4th terms of an arithmetic progression is 54 and the sum of its first 11 terms is 693. Find the arithmetic progression. Which term of this progression is 132 more than its 54th term ?

OR

The first and the last terms of an arithmetic progression are 3 and 253 respectively. If the 20th term of the progression is 98, then find the arithmetic progression. Also find the sum of the last 10 terms of this progression.

Qn. Nos.	**Value Points**	**Marks allotted**
	Ans. :	
	$a_2 + a_4 = 54$	
	$a + d + a + 3d = 54$	
	$2a + 4d = 54 \div 2$	
	$a + 2d = 27$ .... (i)	½
	$S_{11} = 693$	
	$693 = \frac{11}{2} [\ 2a + (11-1)\ d\ ]$	
	$693 = \frac{11}{2} [2a + 10\text{d}\ ]$	
	$693 = \frac{11}{\cancel{2}} \times \cancel{2} [\ a + 5d\ ]$	
	$a + 5d = \frac{693}{11}$	
	$a + 5d = 63$ .... (ii)	½
	(ii) – (i)	
	$\cancel{a} + 5d = 63$	
	$\cancel{a} + 2d = 27$	
	$(-) \quad (-) \quad (-)$	
	$3d = 36$	
	$d = \frac{36}{3}$	
	$\boxed{d = 12}$	½
	$a + 2d = 27$	
	$a + 2 \times (\ 12\ ) = 27$	
	$a + 24 = 27$	
	$a = 27 - 24$	
	$\boxed{a = 3}$	½
	∴ required A.P. $a, \quad a + d, \quad a + 2d$	
	$3, \quad 3 + 12, \quad 3 + 2 \times 12$	
	$3, \quad 15, \quad 27$	½
	$a_n = a_{54} + 132$	½
	$\cancel{a} + (n-1)d = \cancel{a} + 53d + 132$	

Qn. Nos.	Value Points	Marks allotted
	$(n-1)\times 12 = 53\times 12 + 132$	
	$(n-1)\,12 = 12\,[\,53+11\,]$ ½	
	$n-1=64$	
	$n=64+1$	
	$\boxed{n=65}$ ½	4
	OR	
	$a=3$ $a_n = l = 253$	
	$a_{20}=98$	
	$a+19d=98$ ½	
	$3+19d=98$	
	$19\,d=98-3$	
	$19\,d=95$	
	$d=\frac{95}{19}$	
	$\boxed{d=5}$ ½	
	Required A.P. a, a + d, a + 2d	
	3, 3 + 5, 3 + 2 × 5	
	3, 8, 13 .... ½	
	A.P. which starts from last term is	
	a_n, a_n-d a_n-2d	
	253, 253 – 5 253 – 2 × 5	
	253 248, 243 .... ½	
	$a=253$ $d=-5$ $n=10$ ½	
	$S_n = \frac{n}{2}[2a+(n-1)\,d\,]$ ½	
	$S_{10} = \frac{\cancel{10}^{5}}{\cancel{2}}[2\times 253 + (10-1)\times(-5)\,]$ ½	
	$= 5\,[\,506 + (-45)\,]$	
	$= 5\,[\,506-45\,]$	
	$= 5\times 461$	
	$\boxed{S_{10} = 2305}$ ½	
	Note : Any other correct alternate method is followed give full marks.	4

Qn. Nos.	**Value Points**	**Marks allotted**
45.	Find the solution of the given pair of linear equations by graphical method :	

$$2x + y = 8$$

$$x - y = 1$$

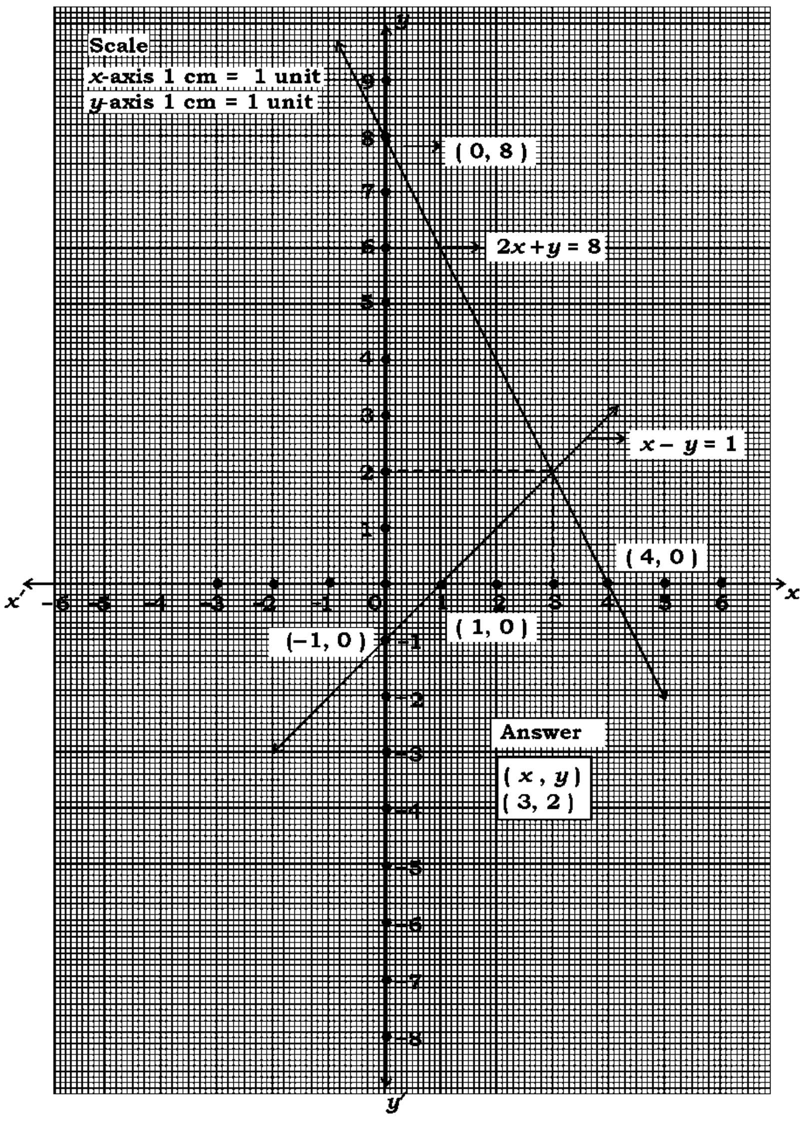
Ans. :

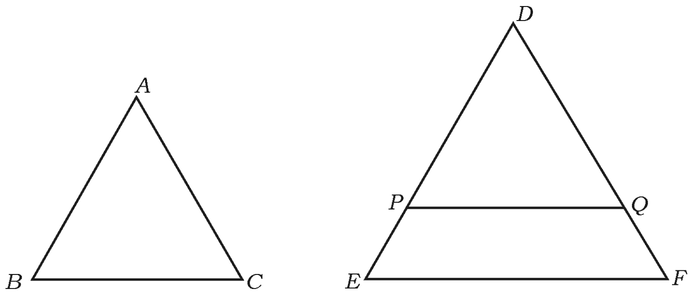
$2x + y = 8$

x	0	4
y	8	0

$x - y = 1$

x	0	1
y	− 1	0



Qn. Nos.	Value Points	Marks allotted
	For table construction 1 + 1	
	Drawing two lines by marking points 1	
	Marking point of intersection and writing values of x and y 1	
	Note : Any other points can be considered to get straight lines	4
46.	Prove that "If in two triangles, corresponding angles are equal, then their corresponding sides are in the same ratio (or proportion) and hence the two triangles are similar". *Ans.* :	
	 ½	
	Data : In ΔABC and ΔDEF ½	
	$\angle A = \angle D$	
	$\angle B = \angle E$	
	$\angle C = \angle F$	
	To prove : $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$ ½	
	Construction : Cut $DP = AB$ and $DQ = AC$ and join PQ ½	
	Proof : In ΔABC and ΔDPQ	
	$AB = DP$ (const.)	
	$AC = DQ$ (const.)	
	$\angle A = \angle D$ (Data) (S.A.S postulate)	
	$\therefore \Delta ABC \cong \Delta DPQ$ ½	
	$\therefore BC = PQ$	

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

$\angle B = \angle P$

But $\angle B = \angle E$ (Data)

$\therefore\ \angle P = \angle E$ ½

But these are corresponding angles

$\therefore\ PQ \,||\, EF$ ½

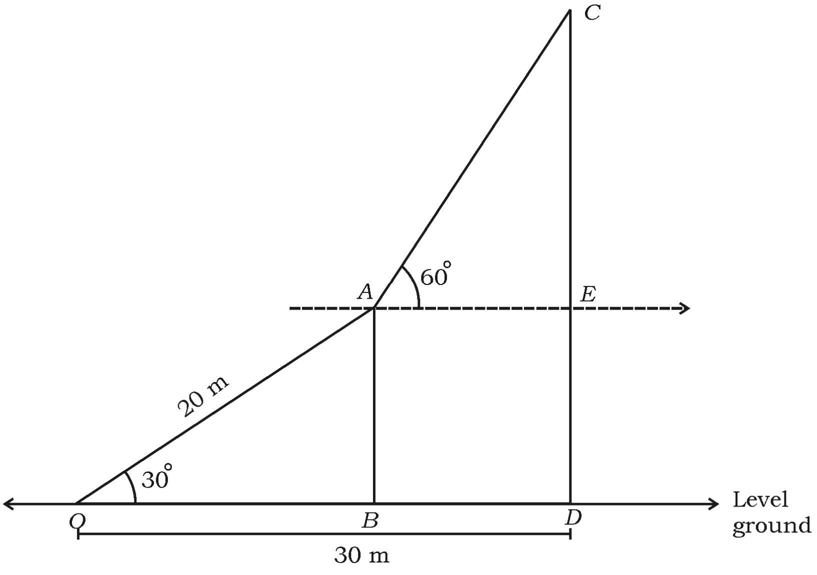
$\frac{DP}{DE}-\frac{DQ}{DF}=\frac{PQ}{EF}$ (C. B. P. T.)

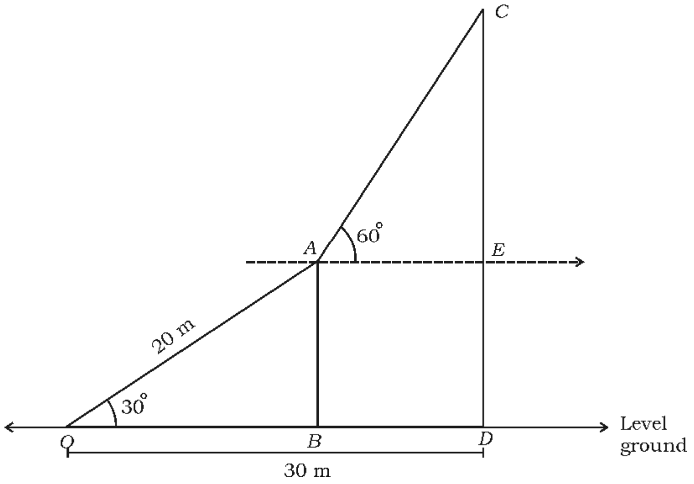
$\frac{AB}{DE}=\frac{AC}{DF}=\frac{BC}{EF}$, $\Delta\, ABC \sim \Delta\, DEF$ ½

Hence proved 4

Note : Proving this theorem as mentioned in the textbook, marks should be given

47. In the given figure, a rope is tightly stretched and tied from the top of a vertical pole to a peg on the same level ground such that the length of the rope is 20 m and the angle made by it with the ground is 30°. A circus artist climbs the rope, reaches the top of the pole and from there he observes that the angle of elevation of the top of another pole on the same ground is found to be 60°. If the distance of the foot of the longer pole from the peg is 30 m, then find the height of this pole. (Take $\sqrt{3}$ = 1·73)

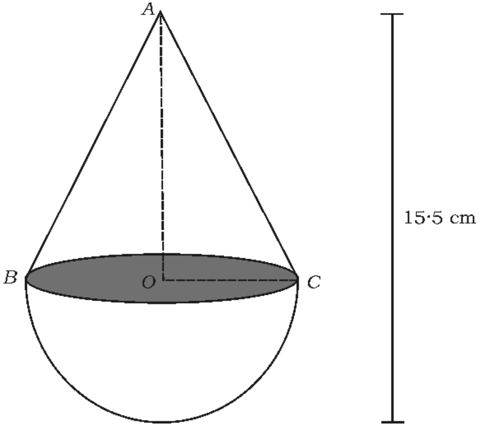


Qn. Nos.	**Value Points**		**Marks allotted**
	Ans. :		
			
	In ΔOAB		
	$\sin 30° = \frac{AB}{AO}$	½	
	$\frac{1}{2} = \frac{AB}{20}$		
	$\boxed{AB = 10 \text{ m}}$	½	
	$\tan 30° = \frac{AB}{OB}$	½	
	$\frac{1}{\sqrt{3}} = \frac{10}{OB}$		
	$\boxed{OB = 10\sqrt{3}}$	½	
	$BD = OD - OB$		
	$\boxed{30 - 10\sqrt{3} = AE}$	½	
	In ΔAEC		
	$\tan 60° = \frac{CE}{AE}$	½	
	$\sqrt{3} = \frac{CE}{30 - 10\sqrt{3}}$		
	$CE = 30\sqrt{3} - 30$		
	$\boxed{CD = CE + ED}$	½	
	$30\sqrt{3} - 30 + 10$		
	$= 30\sqrt{3} - 20$		
	$= 30 \times 1\cdot73 - 20$		
	$= 51\cdot90 - 20$		
	$\boxed{CD = 31\cdot90 \text{ m}}$	½	4

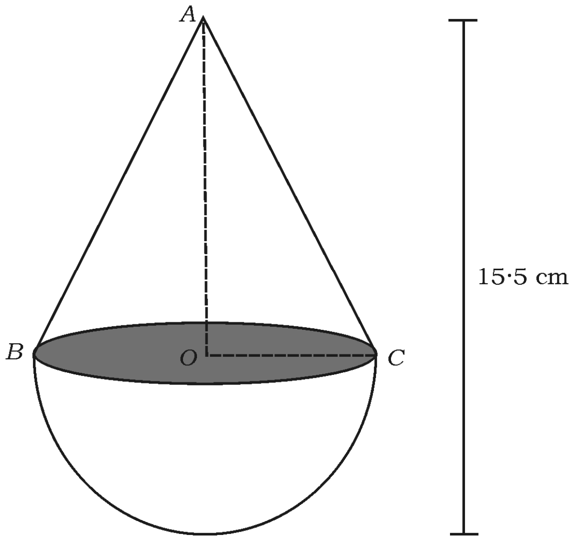
Qn. Nos.	Value Points	Marks allotted

VI. **Answer the following question :** **1 × 5 = 5**

48. A wooden solid toy is made by mounting a cone on the circular base of a hemisphere as shown in the figure. If the area of base of the cone is 38·5 cm^2 and the total height of the toy is 15·5 cm, then find the total surface area and volume of the toy.



Ans. :



Area of the base of the cone = 38·5 cm^2

$$\pi r^2 = 38 \cdot 5 \text{ cm}^2$$

$$\frac{22}{7} \times r^2 = 38 \cdot 5$$

$$r^2 = \frac{38 \cdot 5 \times 7}{22}$$

$$\boxed{r = 3 \cdot 5 \text{ cm}}$$ ½

Qn. Nos.	Value Points	Marks allotted
	Height of the cone (h) = height of the toy – Height of hemisphere	
	$= 15{\cdot}5 - 3{\cdot}5$	
	$\boxed{h = 12 \text{ cm}}$	½
	Slant height of the cone $\Rightarrow\ l^2 = h^2 + r^2$	½
	$= 12^2 + (3 \cdot 5)^2$	
	$= 144 + 12{\cdot}25$	
	$= 156{\cdot}25$	
	$l = \sqrt{156 \cdot 25}$	
	$\boxed{l = 12{\cdot}5 \text{ cm}}$	½
	T. S. A of the toy = C.S.A. of cone + C.S.A of hemisphere	½
	$= \pi r l + 2\pi r^2$	
	$= \pi r\,[\,l + 2r\,]$	
	$= \frac{22}{\underset{1}{\cancel{7}}} \times \cancel{3{\cdot}5}^{0{\cdot}5}\ (125 + 2 \times 3 \cdot 5)$	
	$= 11(\ 12{\cdot}5 + 7\ )$	½
	$= 11 \times 19{\cdot}5$	
	T.S.A of the toy = $214{\cdot}5 \text{ cm}^2$	½
	Volume of the toy = Volume of cone + volume of hemisphere	
	$= \frac{1}{3}\pi r^2 h + \frac{2}{3}\pi r^3$	½
	$= \frac{1}{3}\pi r^2 \left(h + 2r\right)$	
	$= \frac{1}{3} \times \frac{22}{\cancel{7}} \times \cancel{3{\cdot}5}^{0{\cdot}5} \times 3 \cdot 5(12 + 2 \times 3 \cdot 5\ )$	

Qn. Nos.	**Value Points**		**Marks allotted**
	$= \frac{38 \cdot 5}{3}(12+7)$ $= \frac{38 \cdot 5 \times 19}{3}$ $= \frac{731 \cdot 5}{3}$ $= 243{\cdot}8$ $\boxed{\text{Volume of the toy} = 243{\cdot}8 \text{ cm}^3}$	½	5