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ಕರ್ನಾಟಕ ಪ್ರೌಢ ಶಿಕ್ಷಣ ಪರೀಕ್ಷಾ ಮಂಡಳಿ, ಮಲ್ಲೇಶ್ವರಂ, ಬೆಂಗಳೂರು – 560 003

KARNATAKA SECONDARY EDUCATION EXAMINATION BOARD, MALLESWARAM, BANGALORE – 560 003

ಎಸ್.ಎಸ್.ಎಲ್.ಸಿ. ಪರೀಕ್ಷೆ, ಸೆಪ್ಟೆಂಬರ್, 2020

S.S.L.C. EXAMINATION, SEPTEMBER, 2020

ಮಾದರಿ ಉತ್ತರಗಳು

MODEL ANSWERS

ದಿನಾಂಕ : 21. 09. 2020] ಸಂಕೇತ ಸಂಖ್ಯೆ : **81-E**

Date : 21. 09. 2020] CODE NO. : **81-E**

ವಿಷಯ : ಗಣಿತ

Subject : MATHEMATICS

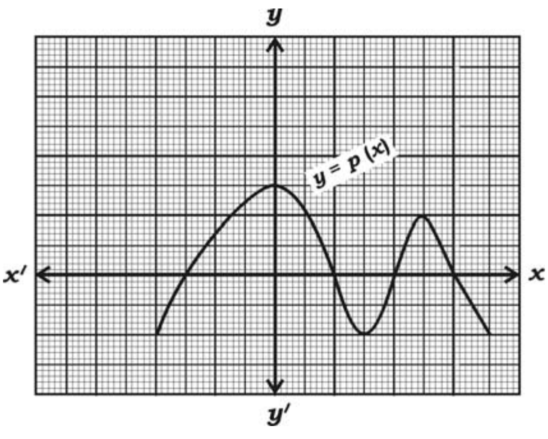
(ಹೊಸ ಪಠ್ಯಕ್ರಮ / New Syllabus)

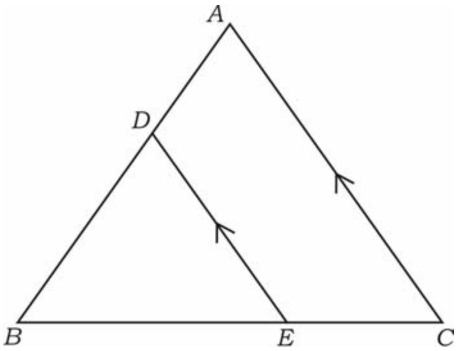
(ಪುನರಾವರ್ತಿತ ಶಾಲಾ ಅಭ್ಯರ್ಥಿ / Regular Repeater)

(ಇಂಗ್ಲಿಷ್ ಭಾಷಾಂತರ / English Version)

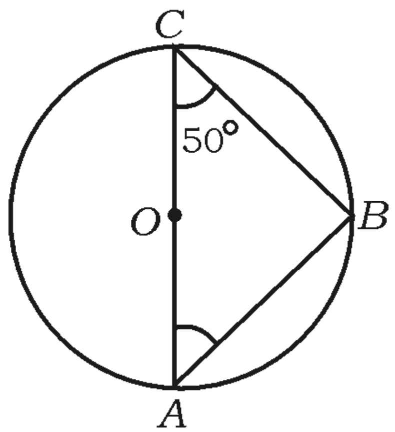
[ಗರಿಷ್ಠ ಅಂಕಗಳು : **80**

[Max. Marks : 80

Qn. Nos.	Ans. Key	Value Points	Marks allotted
I. 1.		In the given graph, the number of zeros of the polynomial $y = p(x)$ is 	

Qn. Nos.	Ans. Key	Value Points	Marks allotted
		(A) 3 (B) 5	
		(C) 4 (D) 2.	
		Ans. :	
	(C)	4	1
2.		The value of $\sec^2 26^\circ - \tan^2 26^\circ$ is	
		(A) $\frac{1}{2}$ (B) 0	
		(C) 2 (D) 1.	
		Ans. :	
	(D)	1	1
3.		In the ΔABC, if $DE \parallel AC$, then the correct relation is	
			
		(A) $\frac{BD}{AB} = \frac{AC}{DE} = \frac{BC}{BE}$ (B) $\frac{BD}{AB} = \frac{DE}{AC} = \frac{BE}{BC}$	
		(C) $\frac{AB}{BD} = \frac{AC}{DE} = \frac{BE}{EC}$ (D) $\frac{AD}{BD} = \frac{DE}{AC} = \frac{BE}{EC}$.	
		Ans. :	
	(B)	$\frac{BD}{AB} = \frac{DE}{AC} = \frac{BE}{BC}$	1
4.		The base radius and height of a right circular cylinder and a right circular cone are equal and if the volume of the cylinder is 360 cm^3, then the volume of cone is	
		(A) 120 cm^3 (B) 180 cm^3	
		(C) 90 cm^3 (D) 360 cm^3.	
		Ans. :	
	(A)	120 cm^3	1

Qn. Nos.	Ans. Key	Value Points	Marks allotted
5.		The lines represented by $x + 2y - 4 = 0$ and $2x + 4y - 12 = 0$ are, (A) intersecting lines (B) parallel lines (C) coincident lines (D) perpendicular lines to each other. *Ans.* :	
	(B)	parallel lines	1
6.		If the n^{th} term of an arithmetic progression $a_n = 3n - 2$, then its 9^{th} term is (A) -25 (B) 5 (C) -5 (D) 25. *Ans.* :	
	(D)	25	1
7.		If $P(A) = \frac{2}{3}$, then $P(\overline{A})$ is (A) $\frac{1}{3}$ (B) 3 (C) 1 (D) $\frac{3}{2}$. *Ans.* :	
	(A)	$\frac{1}{3}$	1
8.		The surface area of a sphere of radius 7 cm is (A) 154 cm^2 (B) 616 cm^3 (C) 616 cm^2 (D) 308 cm^2. *Ans.* :	
	(C)	616 cm^2	1

Qn. Nos.	Value Points	Marks allotted
II.	Answer the following : $8 \times 1 = 8$	
9.	In two linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$, if $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$, then write the number of solutions these pair of equations have.	
	Ans. :	
	Exactly one solution	1
	Alternative answer :	
	Unique	
10.	If $\cos\theta = \frac{24}{25}$, then write the value of $\sec\theta$.	
	Ans. :	
	$\sec\theta = \frac{25}{24}$	1
11.	In the figure, O is the centre of a circle, AC is a diameter. If $\angle ACB = 50°$, then find the measure of $\angle BAC$.	
		
	Ans. :	
	AC is diameter $\therefore \angle ABC = 90°$ ½	
	$\therefore \angle ACB + \angle ABC + \angle BAC = 180°$	
	$50° + 90° + \angle BAC = 180°$	
	$\angle BAC = 180° - 140° = 40°$ ½	1

Qn. Nos.	Value Points		Marks allotted
12.	Write the formula to find the total surface area of a right-circular cone whose circular base radius is 'r' and slant height is 'l'.		
	Ans. :		
	Total surface area of cone $= \pi r (r + l)$		1
13.	Find the H.C.F. of the smallest prime number and the smallest composite number.		
	Ans. :		
	Smallest prime number = 2 }		
	Smallest composite number = 4 }	½	
	∴ H.C.F. of (2, 4) is 2	½	1
14.	If $P (x) = 2x^3 + 3x^2 - 11x + 6$, then find the value of $P (1)$.		
	Ans. :		
	$P (x) = 2x^3 + 3x^2 - 11x + 6$		
	$P (1) = 2 (1)^3 + 3 (1)^2 - 11 (1) + 6$	½	
	$P (1) = 2 + 3 - 11 + 6$		
	$P (1) = 0$	½	1
15.	If one root of the equation $(x + 4) (x + 3) = 0$ is -4, then find the another root of the equation.		
	Ans. :		
	$(x + 4) (x + 3) = 0$		
	If one root is -4		
	∴ Another root is $x + 3 = 0$	½	
	$x = -3$	½	1

Qn. Nos.	Value Points	Marks allotted
16.	If $\sin^2 A = 0$, then find the value of cos A.	
	Ans. :	
	$\sin^2 A + \cos^2 A = 1$	
	$\therefore \quad \cos^2 A = 1 - \sin^2 A$ ½	
	$\cos A = \sqrt{1 - \sin^2 A}$	
	$\cos A = \sqrt{1 - 0}$	
	$\cos A = \sqrt{1} = 1.$ ½	1
III.	Answer the following questions : $8 \times 2 = 16$	
17.	Solve the following pair of linear equations :	
	$2x + 3y = 11$	
	$2x - 4y = -24$	
	Ans. :	
	Elimination method :	
	$2x + 3y = 11$ ... (i) (i) — (ii)	
	$2x - 4y = -24$ ... (ii)	
	(–) (+) (+)	
	$7y = 35$ ½	
	$y = \frac{35}{7}$	
	$y = 5$ ½	
	Substitute $y = 5$ in (i)	
	$2x + 3y = 11$	
	$2x + 3(5) = 11$ ½	
	$2x = 11 - 15$	
	$2x = -4$	
	$x = -\frac{4}{2}$	
	$x = -2$ ½	2

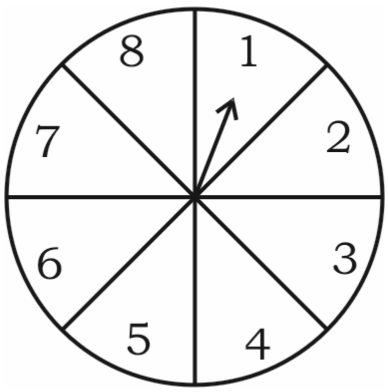
Qn. Nos.	Value Points		Marks allotted
	Alternate method :		
	Substitution method :		
	$2x + 3y = 11$ ... (i)		
	$2x - 4y = -24$ ... (ii)		
	$2x + 3y = 11$		
	$y = \frac{11-2x}{3}$ ... (iii)	½	
	Substitute equation (iii) in equation (ii)		
	$2x - 4y = -24$		
	$2x - 4\left(\frac{11-2x}{3}\right) = -24$	½	
	$6x - 44 + 8x = -72$		
	$14x - 44 = -72$		
	$14x = -28$		
	$x = -\frac{28}{14}$		
	$x = -2$	½	
	Substitute $x = -2$ in equation (iii)		
	$y = \frac{11-2(-2)}{3}$		
	$y = \frac{11+4}{3}$		
	$y = \frac{15}{3} \Rightarrow y = 5$	½	2
	Alternate method :		
	Cross multiplication method :		
	x y 1		
	3 -11 2 3	½	
	-4 24 2 -4		

Qn. Nos.	Value Points		Marks allotted
	$\frac{x}{72-44} = \frac{y}{-22-48} = \frac{1}{-8-6}$		
	$\frac{x}{28} = \frac{y}{-70} = \frac{1}{-14}$	½	
	$\frac{x}{28} = \frac{1}{-14}$ $\qquad$ $\frac{y}{-70} = \frac{1}{-14}$		
	$-14x = 28$ $\qquad$ $-14y = -70$	½	
	$x = \frac{28}{-14}$ $\qquad$ $y = \frac{-70}{-14}$		
	$x = -2$ $\qquad$ $y = 5$	½	2
18.	Find the sum of first 20 terms of arithmetic series 5 + 10 + 15 + ... using suitable formula.		
	Ans. :		
	5 + 10 + 15 + ...		
	Sum of 20 terms $S_{20} = ?$		
	$a = 5$ $\qquad$ $d = 5$ $\qquad$ $S_n = \frac{n}{2}[2a + (n-1)d]$	½	
	$n = 20$ $\qquad$ $S_{20} = \frac{20}{2}[2 \times 5 + (20-1)5]$	½	
	$S_{20} = 10[10 + (19)5]$		
	$S_{20} = 10[10 + 95]$	½	
	$S_{20} = 10 \times 105$		
	$S_{20} = 1050$	½	2
19.	Find the value of k of the polynomial $P(x) = 2x^2 - 6x + k$, such that the sum of zeros of it is equal to half of the product of their zeros.		
	Ans. :		
	$P(x) = 2x^2 - 6x + k$		
	Let the Quadratic Polynomial be $P(x) = ax^2 + bx + c$ and its zeros are α and β, we have $a = 2$ $\quad b = -6$ $\quad c = k$.		

Qn. Nos.	Value Points		Marks allotted
	$\alpha + \beta = -\dfrac{b}{a}$		
	$\alpha + \beta = \dfrac{-(-6)}{2} \Rightarrow \alpha + \beta = 3$	½	
	$\alpha \times \beta = \dfrac{c}{a} \Rightarrow \dfrac{k}{2}$	½	
	$\therefore \quad (\alpha + \beta) = \dfrac{1}{2} \times (\alpha \times \beta)$	½	
	$3 = \dfrac{1}{2} \times \dfrac{k}{2}$		
	$3 \times 2 \times 2 = k$		
	$\therefore \quad k = 12$	½	2
20.	Find the value of the discriminant of the quadratic equation $2x^2 - 5x - 1 = 0$, and hence write the nature of its roots.		
	Ans. :		
	$2x^2 - 5x - 1 = 0$		
	$ax^2 + bx + c = 0 \qquad a = 2 \qquad b = -5 \qquad c = -1$	½	
	Discriminant $\Delta = b^2 - 4ac$		
	$\Delta = (-5)^2 - 4(2)(-1)$	½	
	$\Delta = 25 + 8$		
	$\Delta = 33$		
	$\therefore \quad \Delta > 0$	½	
	$\therefore$ The given equation has two distinct real roots.	½	2
21.	Prove that cosec A (1 – cos A) (cosec A + cot A) = 1.		
	OR		
	Prove that $\dfrac{\tan A - \sin A}{\tan A + \sin A} = \dfrac{\sec A - 1}{\sec A + 1}$.		
	Ans. :		
	cosec A (1 – cos A) (cosec A + cot A) = 1		
	(LHS) (RHS)		

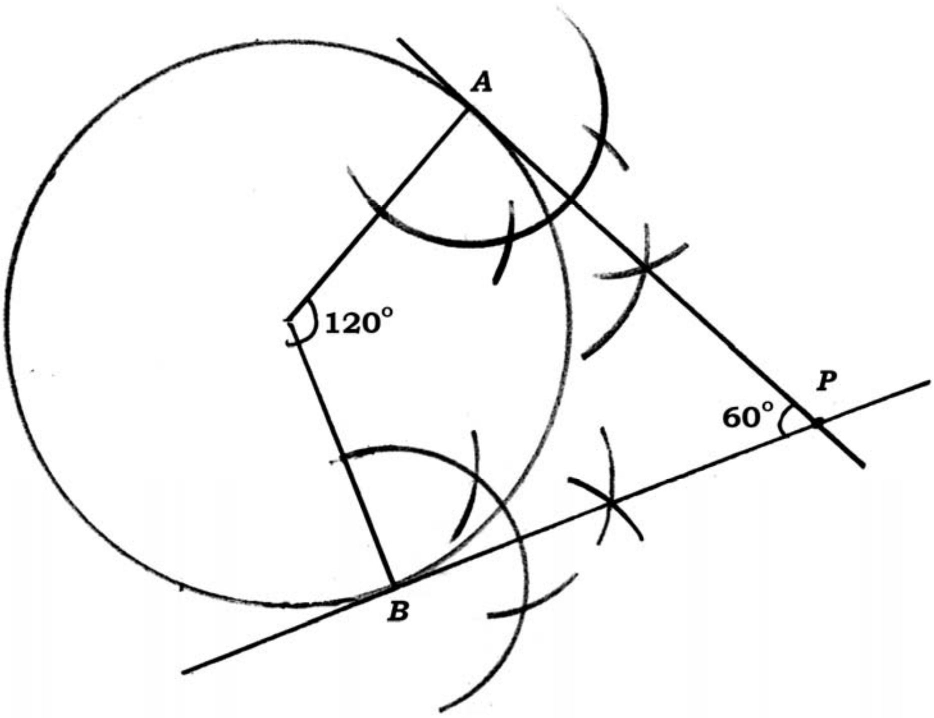
Qn. Nos.	Value Points	Marks allotted
	LHS $= \dfrac{1}{\sin A}(1-\cos A)\left(\dfrac{1}{\sin A}+\dfrac{\cos A}{\sin A}\right)$ ½	
	$= \dfrac{1-\cos A}{\sin A}\left(\dfrac{1+\cos A}{\sin A}\right)$ ½	
	$= \dfrac{1-\cos^2 A}{\sin^2 A}$ ½	
	$= \dfrac{\sin^2 A}{\sin^2 A} = 1$ ½	
	$\therefore$ LHS = RHS.	2
	OR	
	$\dfrac{\tan A-\sin A}{\tan A+\sin A} = \dfrac{\sec A-1}{\sec A+1}$	
	LHS RHS	
	LHS $= \dfrac{\tan A-\sin A}{\tan A+\sin A}$ ½	
	$= \dfrac{\dfrac{\sin A}{\cos A} - \sin A}{\dfrac{\sin A}{\cos A} + \sin A}$ ½	
	$= \dfrac{\sin A\left[\dfrac{1}{\cos A} - 1\right]}{\sin A\left[\dfrac{1}{\cos A} + 1\right]}$ ½	
	$= \dfrac{\sec A-1}{\sec A+1}$ ½	
	$\therefore$ LHS = RHS.	2
22.	Find the coordinates of the mid-point of the line segment joining the points (2, 3) and (4, 7).	
	Ans. :	
	(2, 3) (4, 7)	
	(x_1, y_1) (x_2, y_2)	

Qn. Nos.	Value Points	Marks allotted
	$\therefore$ Co-ordinates of mid-point is	
	$= \left[\dfrac{x_1 + x_2}{2}, \dfrac{y_1 + y_2}{2} \right]$ ½	
	$= \left[\dfrac{2+4}{2}, \dfrac{3+7}{2} \right]$ ½	
	$= \left[\dfrac{6}{2}, \dfrac{10}{2} \right]$ ½	
	$= [3, 5]$ ½	2
23.	Letters of English alphabets A B C D E I are marked on the faces of a cubical die. If this die is rolled once, then find the probability of getting a vowel on its top face.	
	OR	
	A game of chance consists of rotating an arrow which comes to rest pointing at one of the numbers 1, 2, 3, 4, 5, 6, 7, 8 and these are equally possible outcomes. Find the probability that it will point at an odd number.	



	Ans. :	
	$n(S) = 6$ $S = \{A, B, C, D, E, I\}$ ½	
	$n(A) = 3$ $A = \{A, E, I\}$ ½	
	$\therefore P(A) = \dfrac{n(A)}{n(S)}$ ½	
	$P(A) = \dfrac{3}{6} = \dfrac{1}{2}$ ½	2
	OR	

Qn. Nos.	Value Points		Marks allotted
	$n(S) = 8$ $S = \{1, 2, 3, 4, 5, 6, 7, 8\}$	½	
	$n(A) = 4$ $A = \{1, 3, 5, 7\}$	½	
	$\therefore \quad P(A) = \frac{n(A)}{n(S)} = \frac{4}{8}$	½	
	$\therefore \quad P(A) = \frac{1}{2}$	½	2
24.	Draw a circle of radius 4 cm, and construct a pair of tangents to the circle, such that the angle between the tangents is 60°.		
	Ans. :		
	Angle between the radius = 180° – 60° = 120°		



	Circle —	½	
	Radii —	½	
	Tangents —	1	2

Qn. Nos.	Value Points	Marks allotted
25.	Prove that $\sqrt{3}$ is an irrational number.	
	OR	
	Find L.C.M. of H.C.F. (306, 657) and 12.	
	Ans. :	
	Let us assume, to the contrary that $\sqrt{3}$ is rational.	
	We can find integers a and b ($b \neq 0$) such that $\sqrt{3} = \frac{a}{b}$ ½	
	Suppose a and b have a common factor other than 1, then we can divide by the common factor and assume that a and b are co-prime.	
	So, $b\sqrt{3} = a$ ½	
	Squaring on both sides, and rearranging we get $3b^2 = a^2$	
	$\therefore$ a^2 is devisible by 3	
	$\therefore$ a is also devisible by 3	
	$\therefore$ $a = 3c$ c is integer ½	
	Substituting for a, we get	
	$3b^2 = 9c^2$	
	i.e. $b^2 = 3c^2$ ½	
	Means b^2 is devisible by 3	
	$\therefore$ b is also devisible by 3	
	$\therefore$ a and b have at least 3 as a common factor. ½	
	But this contradicts the fact that a and b are co-prime	
	This contradiction has arisen because of our incorrect assumption that $\sqrt{3}$ is rational. ½	3
	So, we conclude that $\sqrt{3}$ is rational.	
	Note : If they prove by any method give marks.	
	OR	

Qn. Nos.	Value Points	Marks allotted

i) H.C.F. of (306, 657)

3 | 306
2 | 102
3 | 51
17 | 17
  1

306 = 3 × 3 × 2 × 17 1½

3 | 657
3 | 219
73 | 73
  1

306 = 3 × 3 × 73

H.C.F. (306, 657) = 9 ½

ii) LCM of 9 and 12 ½

3 | 9, 12
3 | 3, 4
4 | 1, 4
  1, 1

∴ LCM of 9 and 12 is 36 ½ 3

Alternate method :

i) H.C.F. of (306, 657)

306) 657 (2
612
45

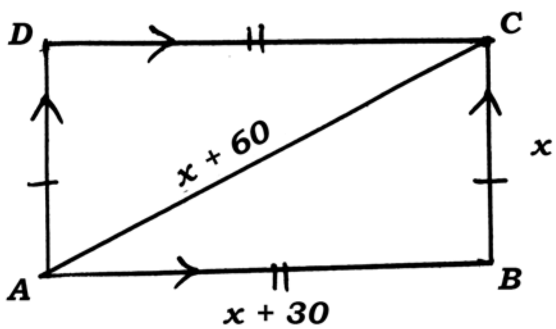
657 = (306 × 2) + 45 ½

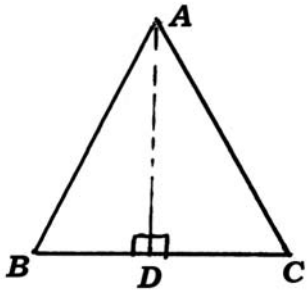
45) 306 (6
270
36

306 = (45 × 6) + 36 ½

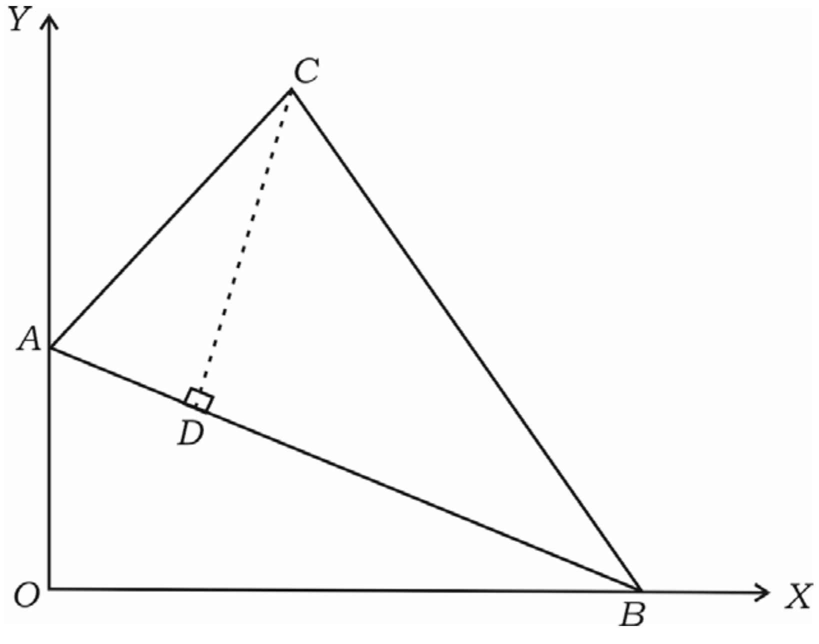
36) 45 (1
36
9

45 = (36 × 1) + 9 ½

Qn. Nos.	Value Points	Marks allotted
	$$9\overline{\smash{)}36}\ \ 4$$ 36, 0 $36 = (9 \times 4) + 0$ ½	
	$\therefore$ H.C.F. of (306, 657) is 9. ½	
	ii) LCM of 9 and 12	
	3 | 9, 12 ; 3 | 3, 4 ; 4 | 1, 4 ; 1, 1 $\therefore$ LCM of 9 and 12 is $3 \times 3 \times 4$ ½	3
	$\therefore$ LCM (9, 12) is 36	
26.	The diagonal of a rectangular playground is 60 m more than the smaller side of the rectangle. If the longer side is 30 m more than the smaller side, find the sides of the playground.	
	OR	
	The altitude of a triangle is 6 cm more than its base. If its area is 108 cm^2, find the base and height of the triangle.	
	Ans. :	
	 ½	
	Let the smaller side $BC = x$	
	Diagonal is 60 m more than smaller side	
	Diagonal $AC = x + 60$ ½	

Qn. Nos.	Value Points	Marks allotted
	Longer side is 30 m more than the smaller side,	
	$\therefore \quad AB = x + 30$	
	In $\triangle ABC$, $\angle B = 90°$	
	$AC^2 = AB^2 + BC^2$	
	$(x + 60)^2 = (x + 30)^2 + x^2$ ½	
	$x^2 + 120x + 3600 = x^2 + 60x + 900 + x^2$	
	$x^2 + 120x + 3600 = 2x^2 + 60x + 900$	
	$\therefore \quad 2x^2 - x^2 + 60x - 120x + 900 - 3600 = 0$ ½	
	$x^2 - 60x - 2700 = 0$	
	$x^2 - 90x + 30x - 2700 = 0$	
	$x(x - 90) + 30(x - 90) = 0$	
	$x - 90 = 0 \qquad x + 30 = 0$	
	$x = 90$ m $\qquad x = -30$ m ½	
	$\therefore \quad BC = x = 90$ m	
	$AB = x + 30 = 90 + 30 = 120$ m ½	
	Diagonal $AC = x + 60 = 90 + 60 = 150$ m	3
	OR	
	 ½	
	Let base $BC = x$	
	$\therefore$ Altitude is 6 more than its base.	
	$\therefore \quad AD = x + 6$	

Qn. Nos.	Value Points		Marks allotted
	Area of triangle = 108 cm^2	½	
	$A = \frac{1}{2} \times b \times h$		
	$108 = \frac{1}{2} \times x \times (x + 6)$	½	
	$108 \times 2 = x^2 + 6x$		
	$216 = x^2 + 6x$		
	$\therefore \quad x^2 + 6x - 216 = 0$	½	
	$x^2 + 18x - 12x - 216 = 0$		
	$x(x + 18) - 12(x + 18) = 0$		
	$x + 18 = 0 \qquad x - 12 = 0$	½	
	$x = -18 \qquad x = 12$		
	$\therefore$ Base of triangle $BC = x = 12$ cm Altitude of triangle $AD = x + 6$ $AD = 12 + 6 = 18$ cm.	½	3
27.	In the figure, the vertices of ΔABC are $A(0, 6)$, $B(8, 0)$ and $C(5, 8)$. If $CD \perp AB$, then find the length of altitude CD.		



OR

Qn. Nos.	Value Points	Marks allotted

Show that the triangle whose vertices are $A(8, -4)$, $B(9, 5)$ and $C(0, 4)$ is an isosceles triangle.

Ans. :

$A(0, 6)$ $(x_1\ y_1)$ $B(8, 0)$ $(x_2\ y_2)$ $C(5, 8)$ $(x_3\ y_3)$

Area of $\Delta ABC = \frac{1}{2}\left[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)\right]$ ½

$= \frac{1}{2}[0(0-8) + 8(8-6) + 5(6-0)]$

$= \frac{1}{2}[0 + 16 + 30]$

$= \frac{1}{2} \times 46.$ ½

Area of $\Delta ABC = 23\ \text{cm}^2$

$A(0, 6)$ (x_1, y_1) $B(8, 0)$ (x_2, y_2)

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

$d = \sqrt{(8-0)^2 + (0-6)^2}$

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

$d = \sqrt{64 + 36}$

$d = \sqrt{100}$ ½

$AB = d = 10$ cm

$\therefore$ Area of $\Delta ABC = \frac{1}{2} \times b \times h$ ½

$23 = \frac{1}{2} \times AB \times CD$

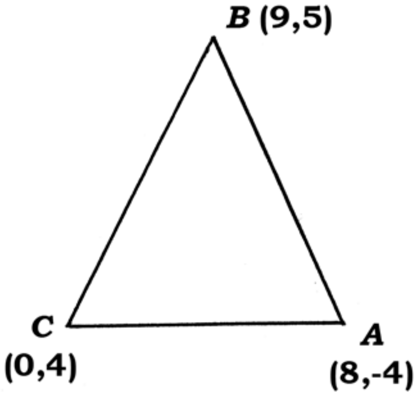
$23 = \frac{1}{2} \times 10 \times CD$

$46 = 10\ CD$ ½

Height $CD = \frac{46}{10} = 4{\cdot}6$ cm 3

OR

Qn. Nos.	Value Points	Marks allotted



½

$A(8, -4)$, $B(9, 5)$, $C(0, 4)$

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

$AB = \sqrt{(9-8)^2 + (5-(-4))^2} = \sqrt{1^2 + 9^2} = \sqrt{1+81} = \sqrt{82}$ ½

$BC = \sqrt{(9-0)^2 + (4-5)^2} = \sqrt{9^2 + (-1)^2} = \sqrt{81+1} = \sqrt{82}$ ½

$CA = \sqrt{(0-8)^2 + (4-(-4))^2} = \sqrt{(-8)^2 + 8^2} = \sqrt{64+64} = \sqrt{128}$

½

We observed that $\overline{AB} = \overline{BC}$ ½

$\sqrt{82}$ cm $= \sqrt{82}$ cm

$\therefore$ $\Delta\ ABC$ is a isosceles triangle. ½ 3

28. Calculate the mode for the following frequency distribution table :

Class-interval	*Frequency* (f_i)
0 — 5	8
5 — 10	9
10 — 15	5
15 — 20	3
20 — 25	1
	$\Sigma f_i = 26$

Qn. Nos.	Value Points		Marks allotted
	Ans. :		

C.I.	Frequency (f_i)
0 — 5	8
5 — 10	9
10 — 15	5
15 — 20	3
20 — 25	1

Lower limit $l = 5$

Frequency of modal class $f_1 = 9$

Frequency of preceding modal class $f_0 = 8$ 1

Succeeding modal class $f_2 = 5$

Class size $h = 5$

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

$= 5 + \left[\dfrac{9 - 8}{2 \times 9 - 8 - 5} \right] \times 5$

$= 5 + \left[\dfrac{1}{18 - 8 - 5} \right] \times 5$ ½

$= 5 + \left[\dfrac{1}{18 - 13} \right] \times 5$

$= 5 + \left[\dfrac{1}{5} \right] \times 5$ ½

$= 5 + 1$

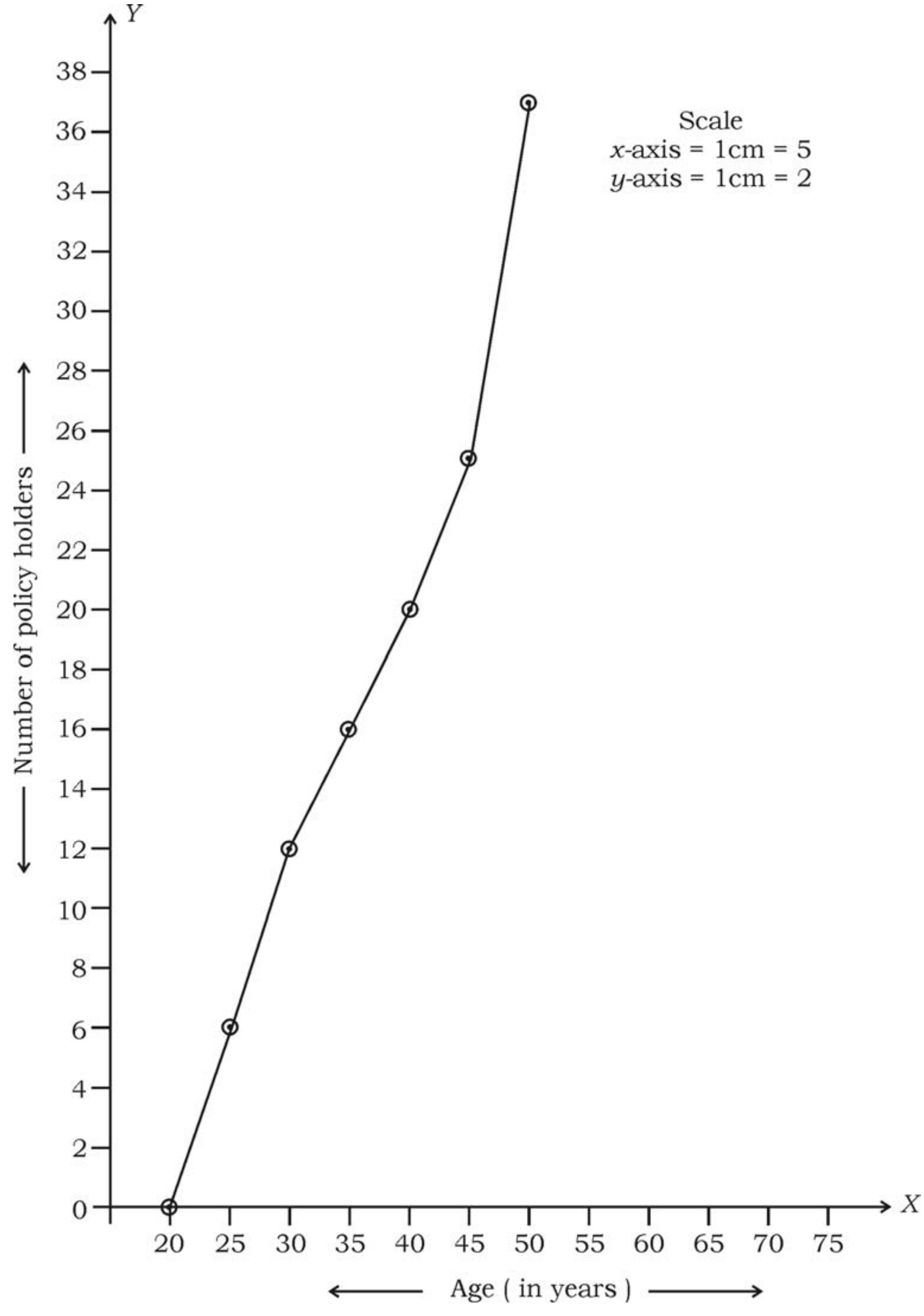
Mode $= 6$ ½ 3

Qn. Nos.	Value Points	Marks allotted
29.	An insurance policy agent found the following data for distribution of ages of 35 policy holders. Draw a "less than type" (below) of ogive for the given data :	

Age (in years)	*Number of policy holders*
Below 20	2
Below 25	6
Below 30	12
Below 35	16
Below 40	20
Below 45	25
Below 50	35

Ans. :

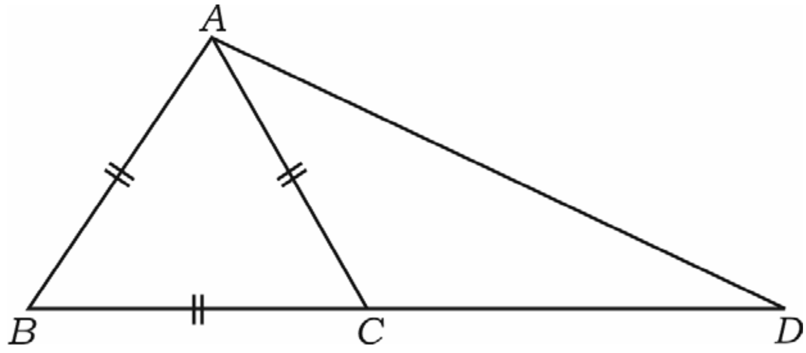
Qn. Nos.	Value Points	Marks allotted



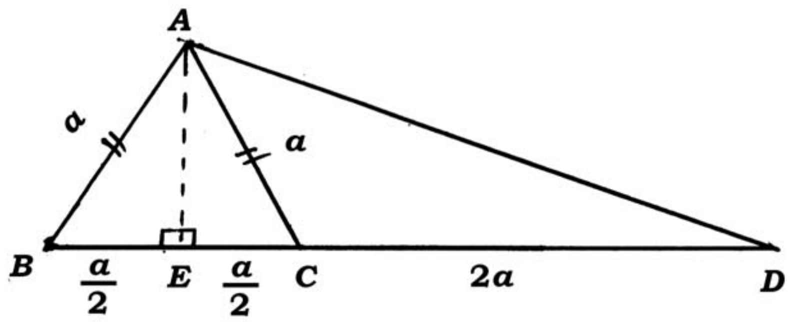
i)	X and Y-axis scale —	½	
ii)	Plotting points —	1½	
iii)	Drawing graph —	1	3

Qn. Nos.	Value Points	Marks allotted

30. In the ΔABD, C is a point on BD such that $BC : CD = 1 : 2$, and ΔABC is an equilateral triangle. Then prove that $AD^2 = 7AC^2$.



Ans. :



Data : In ΔABD $BC : CD = 1 : 2$

In ΔABC $AB = BC = AC$

To Prove : $AD^2 = 7AC^2$

Construction : Draw $AE \perp BC$ — 1

Proof : In ΔABC

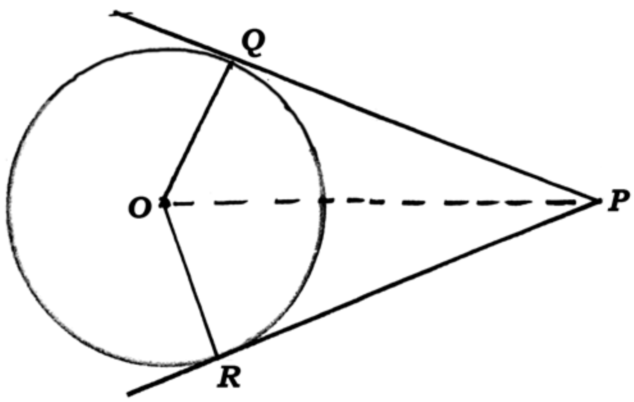
$$BE = EC = \frac{a}{2} \text{ and } AE = \frac{a\sqrt{3}}{2}$$

In ΔADE, $\angle AED = 90°$

$$AD^2 = AE^2 + ED^2$$

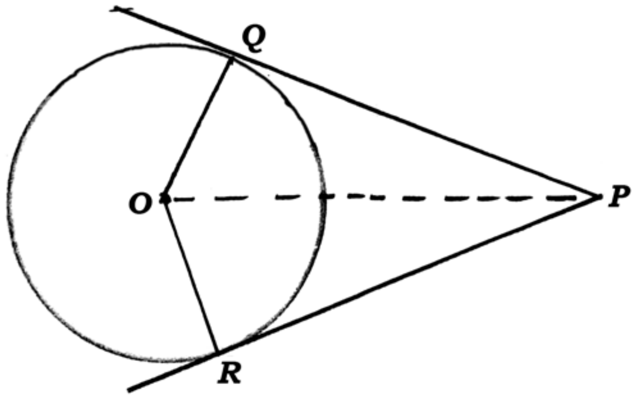
$$AD^2 = \left(\frac{a\sqrt{3}}{2}\right)^2 + \left(2a + \frac{a}{2}\right)^2$$ — ½

$$AD^2 = \frac{3a^2}{4} + \left(\frac{5a}{2}\right)^2$$ — ½

Qn. Nos.	Value Points		Marks allotted
	$AD^2 = \frac{3a^2}{4} + \frac{25a^2}{4}$		
	$AD^2 = \frac{28a^2}{4}$	½	
	$AD^2 = 7a^2$		
	$AD^2 = 7AC^2$ $\quad \because \; AC = a$	½	
	Note : Any alternate method can be given marks.		3
31.	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 P is an external point PQ and PR are the tangents	½	
	To prove : $PQ = PR$	½	
	Construction : OQ, OR and OP are joined	½	
	Proof : In $\Delta\, POQ$ and $\Delta\, POR$		
	$\angle PQO = \angle PRO$ (Radius drawn at the point of contact is perpendicular to the tangent)		
	$hyp\ OP = hyp\ OP$ (Common side)		
	$OQ = OR$ (Radii of same circle)		
	$\therefore$ $\Delta\, POQ \cong \Delta\, POR$ (R.H.S. theorem)	½	
	$\therefore$ $PQ = PR$	½	3

Qn. Nos.	Value Points	Marks allotted

Alternate method :



½

Proof : We are given a circle with centre *O*, a point *P* lying outside the circle and two tangents *PQ* and *PR* on the circle from *P*. ½

We are required to prove that $PQ = PR$ ½

For this we join *OP, OQ* and *OR*.

Then $\angle OQP$ and $\angle ORP$ are right angles because these are angles between the radii and tangents. ½

Now right angles $\angle OQP = \angle ORP$

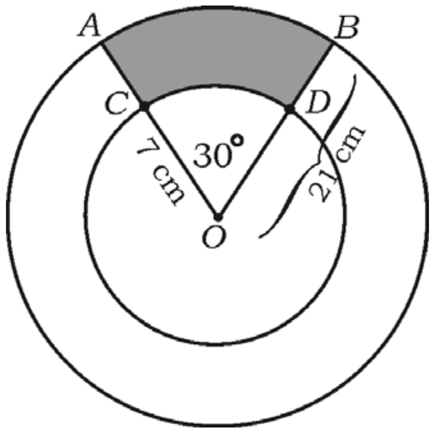
$OQ = OR$ (Radii) ½

$OP = OP$ (Common side)

$\therefore \quad \Delta\, OQP \cong \Delta\, ORP$ (R.H.S.)

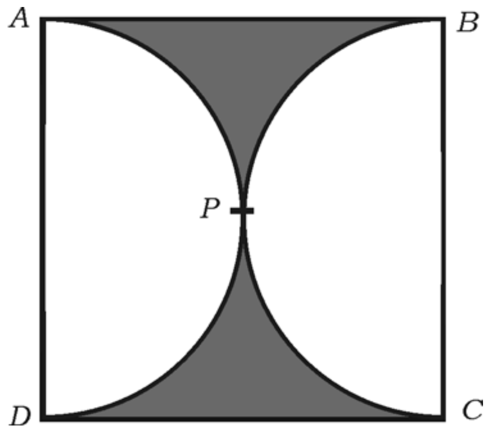
This gives $PQ = PR$. ½ 3

Qn. Nos.	Value Points	Marks allotted
32.	*AB* and *CD* are the arcs of two concentric circles with centre *O* of radius 21 cm and 7 cm respectively. If $\angle AOB$ = 30° as shown in the figure, find the area of the shaded region.	



OR

In the figure, *ABCD* is a square, and two semicircles touch each other externally at *P*. The length of each semicircular arc is equal to 11 cm. Find the area of the shaded region.



Ans. :

Area of sector $\overset{\frown}{OAB} = \frac{\theta}{360} \times \pi r^2$

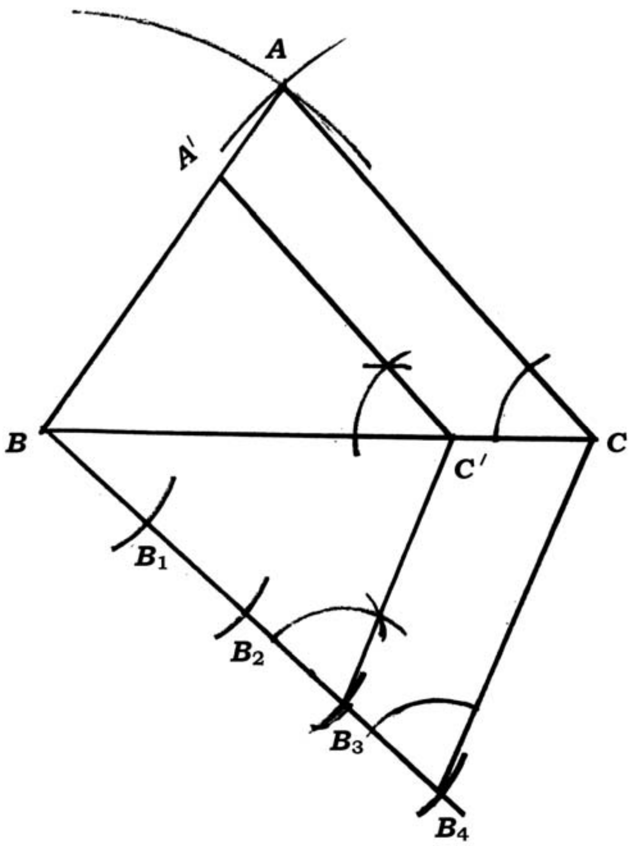
$= \frac{30}{360} \times \frac{22}{7} \times 21 \times 21$

$= \frac{11 \times 21}{2}$ 1

$= \frac{231}{2}$ cm^2

Qn. Nos.	Value Points		Marks allotted
	Area of sector $\widehat{OCD} = \frac{\theta}{360} \times \pi r^2$		
	$= \frac{30}{360} \times \frac{22}{7} \times 7 \times 7$		
	$= \frac{11 \times 7}{6}$	1	
	$= \frac{77}{6}$ cm^2		
	$\therefore$ Area of shaded region = area of sector $\widehat{OAB}$ — area of sector $\widehat{OCD}$		
	$= \frac{231}{2} - \frac{77}{6}$	½	
	$= \frac{693 - 77}{6}$		
	$= \frac{616}{6} = \frac{308}{3}$		
	$\therefore$ Area of shaded region = 102·6 cm^2	½	3
	OR		
	Perimeter of semicircle = πr		
	$11 = \pi r$		
	$11 = \frac{22}{7} \times r \quad \Rightarrow \quad r = \frac{7}{2} = 3{\cdot}5$ cm.	½	
	Area of two seimicircle $= \pi r^2$		
	$= \frac{22}{7} \times 3{\cdot}5 \times 3{\cdot}5$		
	$= 11 \times 3{\cdot}5$		
	$= 38{\cdot}5$ cm^2	½	
	The diameter of circle is equal to side of the square *ABCD*		
	$\therefore$ Side $AB = 2 \times$ radius		
	$= 2 \times 3{\cdot}5$		
	$AB = 7$ cm	½	
	$\therefore$ Area of square $ABCD$ = Side × Side		
	$= 7 \times 7$		
	$= 49$ cm^2	½	

Qn. Nos.	Value Points		Marks allotted
	∴ Area of shaded region = Area of $ABCD$ — Area of two semi-circles		
	$= 49 - 38{\cdot}5$	½	
	Area of shaded region $= 10{\cdot}5 \text{ cm}^2$	½	3
33.	Construct a triangle with sides 6 cm, 7 cm and 8 cm and then construct another triangle whose sides are $\frac{3}{4}$ of the corresponding sides of the constructed triangle.		
	Ans. :		



	Constructing given triangle	1	
	Drawing acute angle line and dividing into 4 parts	½	
	Drawing parallel lines (two pairs)	½ + ½	
	Triangle $A^{\prime}BC^{\prime}$	½	3

Qn. Nos.	Value Points	Marks allotted
34.	Find the solution of the following pair of linear equations by the graphical method.	
	$2x + y = 8$	
	$x + y = 5$	
	Ans. :	
	$2x + y = 8$	
	$y = 8 - 2x$	

x	0	1	2	3	4
y	8	6	4	2	0

$x + y = 5$

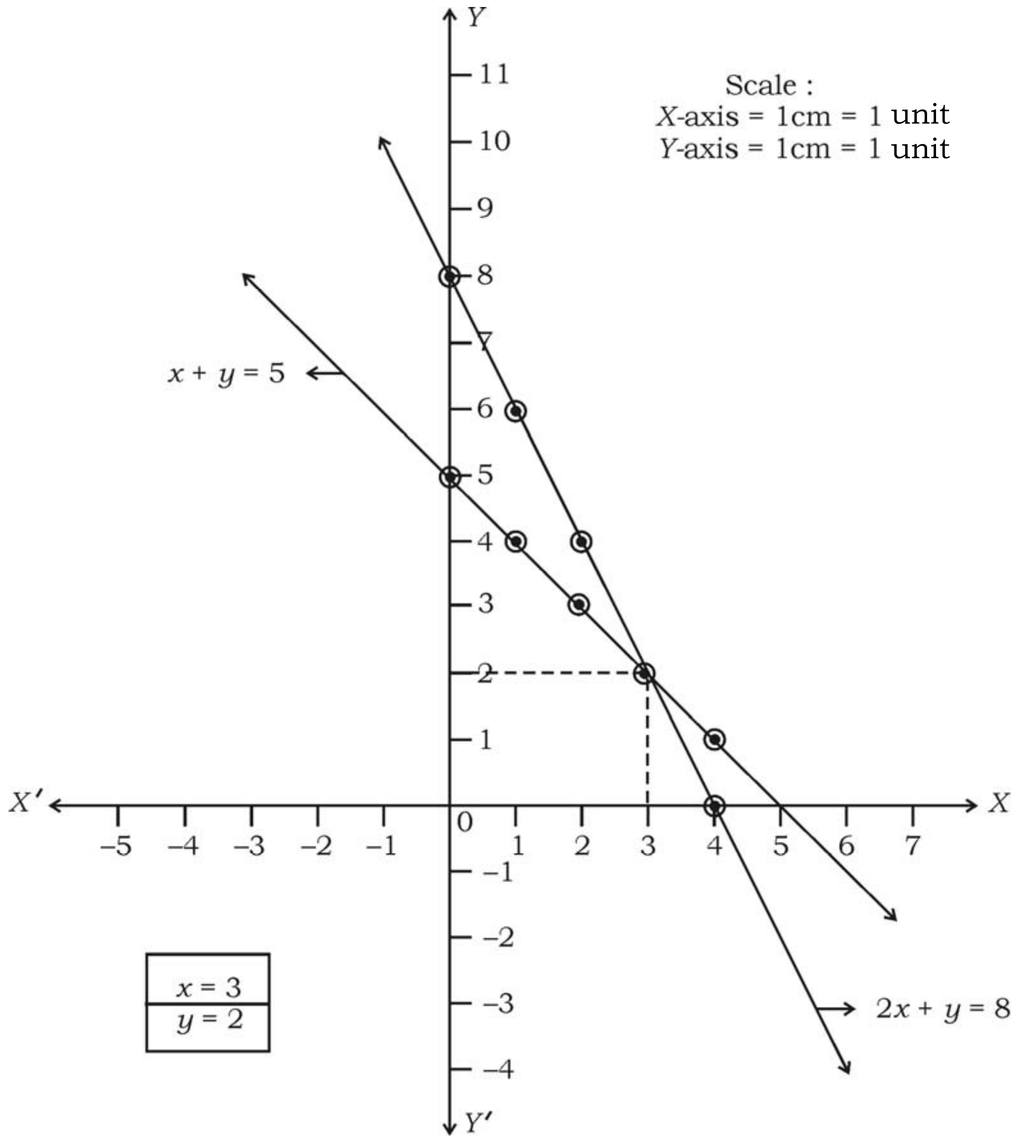
$y = 5 - x$

x	0	1	2	3	4
y	5	4	3	2	1

Tables —	2	
Drawing or Plotting 2 straight lines —	1	
Identifying Intersecting straight line points and answer —	1	4

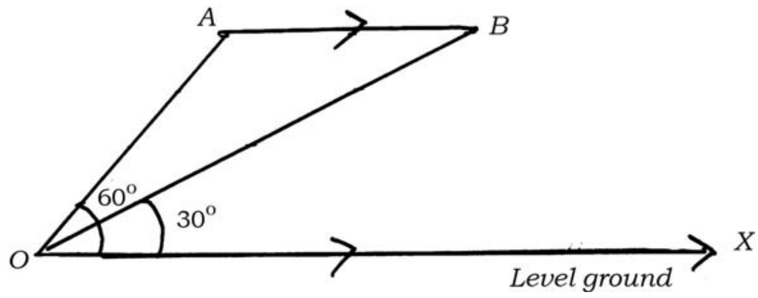
Note : For each line any two suitable points may be taken.

Qn. Nos.	Value Points	Marks allotted

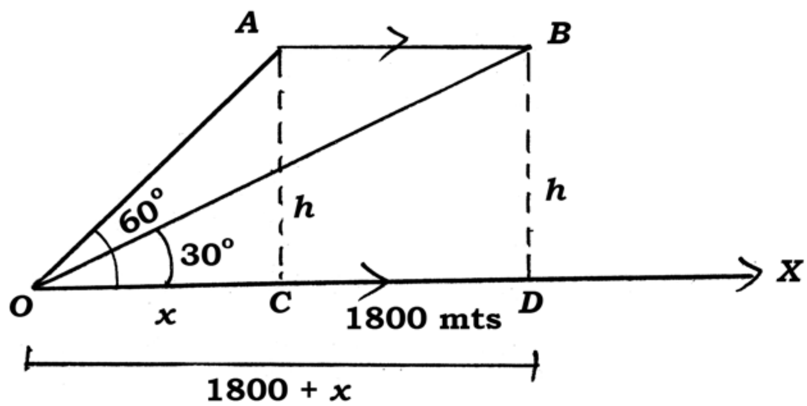


35. An aircraft flying parallel to the ground in the sky from the point *A* through the point *B* is observed, the angle of elevation of aircraft at *A* from a point on the level ground is 60°, after 10 seconds it is observed that the angle of elevation of aircraft at *B* is found to be 30° from the same point. Find at what height the aircraft is flying, if the velocity of

Qn. Nos.	Value Points	Marks allotted
	aircraft is 648 km/hr. (Use $\sqrt{3}$ = 1·73)	



Ans. :



½

Velocity → 648 km/h ⇒ $\frac{648 \times 1000}{3600}$

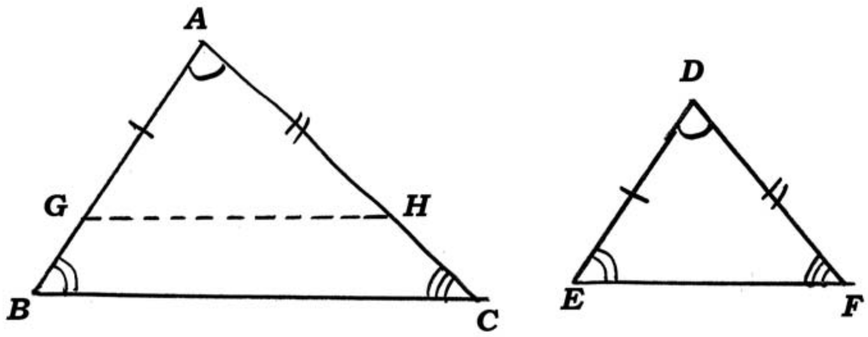
⇒ 180 m/sec. ½

After 10 sec velocity of air craft = 180 × 10

= 1800 m

In the diagram $OC = x$ CD = 1800 m $OD = 1800 + x$

Qn. Nos.	Value Points	Marks allotted
	$\triangle OAC$ $\quad \angle C = 90°$ $\quad \tan\theta = \frac{AC}{OC}$	
	$\tan 60° = \frac{h}{x}$	
	$\sqrt{3} = \frac{h}{x}$ 1	
	$h = x\sqrt{3}$ ... (i)	
	$\triangle ODB$ $\quad \angle D = 90°$ $\quad \tan\theta = \frac{BD}{OD}$	
	$\tan 30° = \frac{h}{1800 + x}$	
	$\frac{1}{\sqrt{3}} = \frac{h}{1800 + x}$ 1	
	$h\sqrt{3} = 1800 + x$ ... (ii)	
	Substitute (i) in (ii)	
	$x\sqrt{3} \times \sqrt{3} = 1800 + x$	
	$x + 3 = 1800 + x$	
	$3x = 1800 + x$	
	$3x - x = 1800$	
	$2x = 1800$	
	$x = \frac{1800}{2} = 900$ ½	
	$\therefore \quad h = x\sqrt{3}$	
	$h = 900 \times \sqrt{3} \quad \Rightarrow \quad 900 \times 1{\cdot}73$	
	$\therefore \quad h = 1557$ m. ½	4

Qn. Nos.	Value Points	Marks allotted
36.	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 $\Delta\ ABC$ and $\Delta\ DEF$	
	$\angle BAC = \angle EDF$	½
	$\angle ABC = \angle DEF$	
	To prove : $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$	½
	Construction : Mark points G and H on AB and AC such that $AG = DE$ and $AH = DF$, join G and H.	½

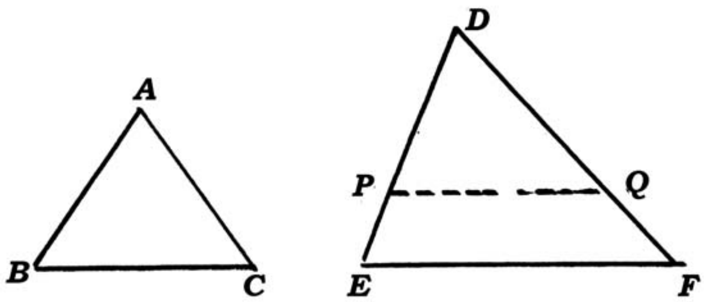
Qn. Nos.	Value Points	Marks allotted

Proof :

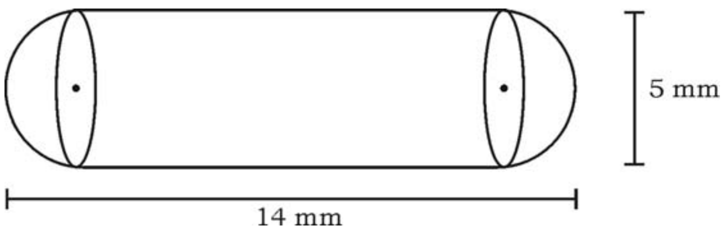
Statement	*Reason*	
Compare $\Delta\, AGH$ and $\Delta\, DEF$		
$AG = DE$	Construction	
$\underline{\lfloor GAH} = \underline{\lfloor EDF}$	Data	
$AH = DF$	Construction	½
$\Delta\, AGH \cong \Delta\, DEF$	SAS	
$\underline{\lfloor AGH} = \underline{\lfloor DEF}$	CPCT	
But $\underline{\lfloor ABC} = \underline{\lfloor DEF}$	Data	
$\Rightarrow \underline{\lfloor AGH} = \underline{\lfloor ABC}$	Axiom - 1	½
$\therefore\ GH \,\vert\vert\, BC$	If corresponding angles are equal then lines are parallel.	
$\therefore$ In triangle ABC $\frac{AB}{AG} = \frac{BC}{GH} = \frac{AC}{HA}$	Corrollary of Thales theorem	½

Hence $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{FD}$ $\quad \Delta\, AGH \cong \Delta\, DEF.$ ½ 4

Alternate method :

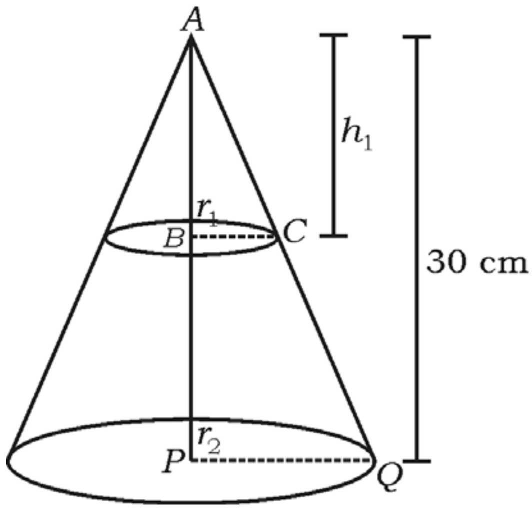


½

Qn. Nos.	Value Points	Marks allotted
	This theorem can be proved by taking two triangles *ABC* and *DEF* such that $\angle A = \angle D$, $\angle B = \angle E$ and $\angle C = \angle F$ ½	
	Cut $DP = AB$ and $DQ = AC$ and join *PQ*, So, $\Delta ABC \cong \Delta DPQ$. 1	
	This gives $\angle B = \angle P = \angle E$ and $PQ \parallel EF$	
	$\therefore \quad \frac{DP}{PE} = \frac{DQ}{QF}$	
	i.e., $\frac{AB}{DE} = \frac{AC}{DF}$ 1	
	Similarly, $\frac{AB}{DE} = \frac{BC}{EF}$	
	and so $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$ 1	4
37.	A medicine capsule is in the shape of a cylinder with hemispheres stuck to each of its ends. The length of the entire capsule is 14 mm and the diameter of the capsule is 5 mm. Find its surface area. 	
	OR	
	A right circular cone of height 30 cm is cut and removed by a plane parallel to its base from the vertex. If the volume of smaller cone obtained is $\frac{1}{27}$ of the volume of the given cone, calculate the height of	

Qn. Nos.	Value Points	Marks allotted

the remaining part of the cone.



Ans. :

Diameter of hemisphere = 5 mm

∴ Radius = 2·5 mm

Length of entire capsule = 14 mm ½

∴ Height of cylinder $h = 14 - 5$

$h = 9$ mm ½

∴ Surface area of the capsule $= 2\pi rh + 2\,(2\pi r^2)$ ½+½

$= 2\pi r\,[\,h + 2r\,]$

$= 2 \times \dfrac{22}{7} \times 2{\cdot}5\,[\,9 + 2 \times 2{\cdot}5\,]$ ½

$= 2 \times \dfrac{22}{7} \times 2{\cdot}5 \times 14$ ½

$= 2 \times \dfrac{22}{7} \times 2{\cdot}5 \times 2$ ½

$= 88 \times 2{\cdot}5$

∴ Surface area of capsule = 220 mm^2 ½ 4

OR

Qn. Nos.	Value Points		Marks allotted
	$\frac{r_1}{r_2} = \frac{h_1}{30}$ ... (i)	½	
	Volume of cone $= \frac{1}{27} \times$ volume of given cone		
	$\frac{1}{3}\pi r_1^2 \times h_1 = \frac{1}{27} \times \frac{1}{3} \times \pi \times r_2^2 \times h_2$	½	
	$r_1^2 \times h_1 = \frac{1}{27} \times r_2^2 \times h_2$		
	$r_1^2 \times h_1 = \frac{1}{27} \times r_2^2 \times 30$	½	
	$\frac{r_1^2}{r_2^2} \times h_1 = \frac{10}{9}$ ... (ii)	½	
	Substitute (i) in (ii)		
	$\left(\frac{h_1}{30}\right)^2 \times h_1 = \frac{10}{9}$	½	
	$\frac{h_1^3}{900} = \frac{10}{9}$		
	$h_1^3 = 1000$	½	
	$h_1 = \sqrt[3]{1000}$		
	$AB = h_1 = 10$ cm	½	
	$\therefore$ Height of the remaining part of the cone is		
	$BP = AP - AB$		
	$= 30 - 10$		
	$BP = 20$ cm	½	4

Qn. Nos.	Value Points	Marks allotted
38.	The common difference of two different arithmetic progressions are equal. The first term of the first progression is 3 more than the first term of second progression. If the 7th term of first progression is 28 and 8th term of second progression is 29, then find the both different arithmetic progressions.	
	Ans. :	
	$a = b + 3$ ... (i)	½
	$a_7 = 28$	
	$a + 6d = 28$ ... (ii)	½
	$b_8 = 29$	
	$b + 7d = 29$ ... (iii)	½
	Substitute (i) in (ii)	
	$a + 6d = 28$	
	$b + 3 + 6d = 28$	½
	$b + 6d = 25$ ... (iv)	½
	Substract (iv) from (iii)	
	$b + 7d = 29$	
	$b + 6d = 25$	
	(–) (–) (–)	
	$d = 4$ $\Rightarrow$ $d = 4$	½
	Substitute $d = 4$ in (ii)	
	$a + 6d = 28$	
	$a + 6(4) = 28$	
	$a + 24 = 28$	
	$a = 28 - 24$	
	$a = 4$	½

Qn. Nos.	Value Points		Marks allotted
	Substitute $d = 4$ in (iii)		
	$b + 7d = 29$		
	$b + 7(4) = 29$		
	$b + 28 = 29$		
	$b = 1$	½	
	$\therefore$ Ist arithmetic progression is,		
	$a,\ a + d,\ a + 2d,\ \ldots\ldots\ldots\ldots.$		
	$4,\ 4 + 4,\ 4 + 2\,(4),\ \ldots\ldots\ldots\ldots$		
	$4,\ 8,\ 12,\ \ldots\ldots\ldots..$	½	
	$\therefore$ IInd arithmetic progression is,		
	$b,\ b + d,\ b + 2d,\ \ldots\ldots\ldots\ldots.$		
	$1,\ 1 + 4,\ 1 + 2\,(4),\ \ldots\ldots\ldots\ldots$		
	$1,\ 5,\ 9,\ \ldots\ldots\ldots..$	½	5