CCE RR/PR **B**

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

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

ಮಾರ್ಚ್/ಏಪ್ರಿಲ್ 2025 ರ ಪರೀಕ್ಷೆ - 1

MARCH/APRIL 2025 EXAMINATION - 1

ಮಾದರಿ ಉತ್ತರಗಳು

MODEL ANSWERS

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

ವಿಷಯ : ಗಣಿತ

Subject : MATHEMATICS

(ಶಾಲಾ ಪುನರಾವರ್ತಿತ ಅಭ್ಯರ್ಥಿ / ಖಾಸಗಿ ಪುನರಾವರ್ತಿತ ಅಭ್ಯರ್ಥಿ)

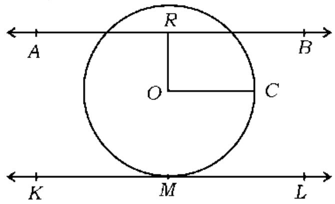
(Regular Repeater / Private Repeater)

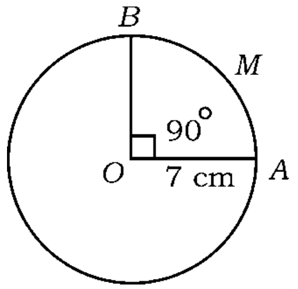
(ಆಂಗ್ಲ ಮಾಧ್ಯಮ / English Medium)

ದಿನಾಂಕ : 24. 03. 2025] [ಗರಿಷ್ಠ ಅಂಕಗಳು : 80

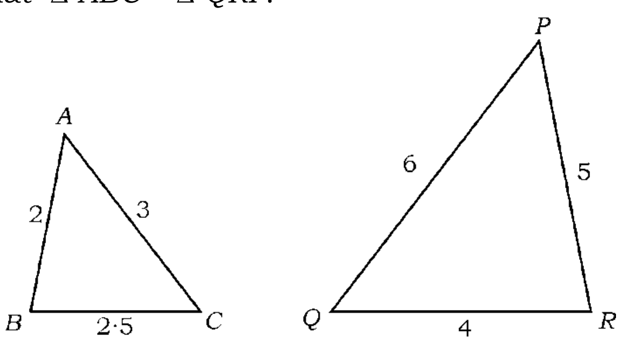
Date : 24. 03. 2025] [Max. Marks : 80

Qn. Nos.	Ans. Key	Value Points	Marks allotted
I.		**Multiple choice questions :** $8 \times 1 = 8$	
1.		If the lines represented by the equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ are coincident, then the correct relation is (A) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ (B) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ (C) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ (D) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2} = \frac{c_1}{c_2}$ *Ans.* :	
	(A)	$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$	1

Qn. Nos.	Ans. Key	Value Points	Marks allotted
2.		The quadratic equation in the following is (A) $x^3 - 6x$ (B) $p(x) = x^2 + 7x$ (C) $3x = 9$ (D) $x^2 + 3x + 4 = 0$ *Ans.* :	
	(D)	$x^2 + 3x + 4 = 0$	1
3.		In the following, the shapes which are always similar are, (A) any two equilateral triangles (B) square and rectangle (C) square and rhombus (D) any two trapeziums *Ans.* :	
	(A)	any two equilateral triangles	1
4.		In the given figure, the secant of the circle is  (A) *KL* (B) *OC* (C) *AB* (D) *OR* *Ans.* :	
	(C)	*AB*	1
5.		The volume of a sphere of radius '*r*' units is (A) $\frac{2}{3}\pi r^3$ cubic units (B) $\frac{4}{3}\pi r^3$ cubic units (C) $\frac{1}{3}\pi r^3$ cubic units (D) $\frac{3}{2}\pi r^3$ cubic units *Ans.* :	
	(B)	$\frac{4}{3}\pi r^3$ cubic units	1
6.		The common difference of the arithmetic progression $-1, -3, -5, \ldots$ is (A) -1 (B) 2 (C) -2 (D) 3 *Ans.* :	
	(C)	-2	1

Qn. Nos.	Ans. Key	Value Points	Marks allotted
7.		In the given figure *'O'* is the centre of the circle. If $\underline{\lfloor AOB}$ = 90° and OA = 7 cm, then the length of the arc AMB is	
			
		(A) 7 cm (B) 8 cm	
		(C) 10 cm (D) 11 cm	
		Ans. :	
	(D)	11 cm	1
8.		If $P(E) = 0{\cdot}05$, then $P(\overline{E})$ is equal to	
		(A) 0·5 (B) 0·95	
		(C) 0·4 (D) 1·05	
		Ans. :	
	(B)	0·95	1

Qn. Nos.	Value Points	Marks allotted
II.	**Answer the following questions : 8 × 1 = 8**	
	(For Direct answers from Q. Nos. 9 to 16 full marks should be given)	
9.	Write the degree of a linear polynomial.	
	Ans. :	
	1 (one)	1

Qn. Nos.	Value Points		Marks allotted
10.	If $\sin\theta = \frac{12}{15}$, then write the value of cosec θ.		
	Ans. :		
	$\text{cosec}\,\theta = \frac{15}{12}$		1
11.	Write the formula to find the total surface area of a cube of edge *'a'* units.		
	Ans. :		
	$6a^2$ sq. units		1
12.	How many solutions do the pair of linear equations $2x + 3y - 9 = 0$ and $3x + 2y - 6 = 0$ has ?		
	Ans. :		
	One solution | unique solution		1
13.	Write the roots of the quadratic equation $x(x+2) = 0$.		
	Ans. :		
	0 and – 2	½ + ½	1
14.	In the given figure, write the similarity criterion used to show that $\Delta ABC \sim \Delta QRP$.		
			
	Ans. :		
	SSS or side –side -side		1

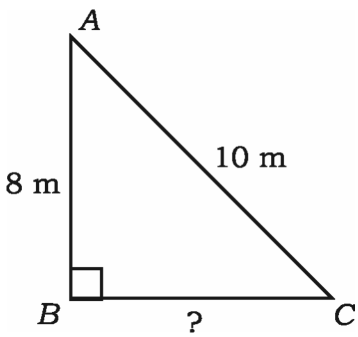
Qn. Nos.	Value Points	Marks allotted
15.	In the given frequency distribution table, write the mid-point of the modal class :	

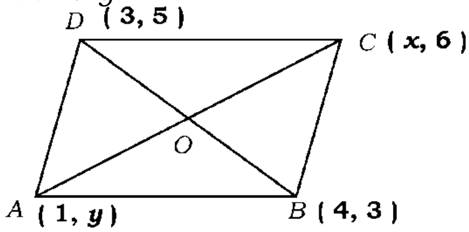
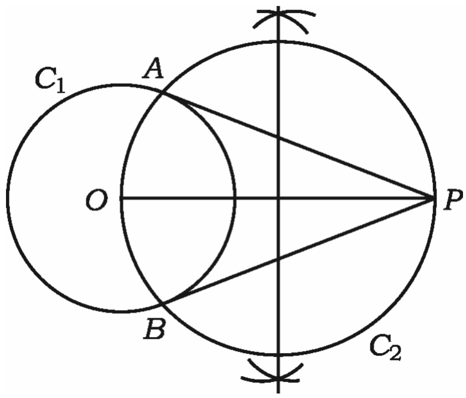
Class-interval	*Frequency*
1 – 3	4
3 – 5	8
5 – 7	2
7 – 9	2

Qn. Nos.	Value Points	Marks allotted
	Ans. :	
	4	1
16.	If two fair coins are tossed simultaneously, then what is the probability of getting two heads ?	
	Ans. :	
	$\frac{1}{4}$	1
	Note : Q. No. from 9 to 16 give full marks for direct answer.	
III.	**Answer the following questions : $8 \times 2 = 16$**	
17.	Prove that $6 + \sqrt{2}$ is an irrational number.	
	OR	
	The HCF and LCM of two positive integers are respectively 4 and 60. If one of the integers is 20, then find the other integer.	
	Ans. :	
	Let us assume to the contrary that $6+\sqrt{2}$ is rational.	
	$6+\sqrt{2}=\frac{a}{b}$ ' a ' and ' b ' are coprimes ($b \neq 0$) ½	

Qn. Nos.	Value Points	Marks allotted
	$\left.\begin{array}{l}\sqrt{2}=\frac{a}{b}-6 \\ \sqrt{2}=\frac{a-6b}{b}\end{array}\right\}$ ½	
	This shows that $\sqrt{2}$ is rational.	
	But this contradicts the fact that $\sqrt{2}$ is irrational. ½	
	This contradiction has arisen because of our wrong assumption.	
	$\therefore\ 6+\sqrt{2}$ is an irrational number. ½	2
	OR	
	Let 'a' and 'b' be two positive integers	
	HCF (a, b) = 4	
	LCM (a, b) = 60	
	$a = 20$	
	$b = ?$	
	$a \times b$ = HCF (a, b) $\times$ LCM (a, b) ½	
	$20 \times b = 4 \times 60$ ½	
	$b=\frac{4\times\cancel{60}^{3}}{\cancel{20}_{1}}$ ½	
	$\boxed{b = 12}$ ½	2
18.	Solve the given pair of linear equations by elimination method :	
	$2x + y = 10$	
	$x - y = 2$	
	Ans. :	
	$2x + \cancel{y} = 10$ .... (1)	
	$x - \cancel{y} = 2$ ....(2)	
	Adding $3x = 12$ ½	
	$x = \frac{12}{3}$	
	$\boxed{x = 4}$ ½	
	Substitute $x = 4$ in equation (1)	
	$2 (4) + y = 10$ ½	
	$8 + y = 10$	
	$y = 10 - 8$	
	$\boxed{y = 2}$ ½	
	Note : Marks should be given if the value of 'x' is substituted in equation (2)	2

Qn. Nos.	Value Points		Marks allotted
19.	Find the roots of the quadratic equation $x^2 + 8x + 12 = 0$.		
	OR		
	Find the discriminant of the quadratic equation $x^2 + 4x + 5 = 0$ and hence write the nature of the roots.		
	Ans. :		
	$x^2 + 8x + 12 = 0$		
	$x^2 + 6x + 2x + 12 = 0$	½	
	$x(x+6) + 2(x+6) = 0$		
	$(x+6)(x+2) = 0$	½	
	$x + 6 = 0$ or $x + 2 = 0$	½	
	$\boxed{x = -6}$ or $\boxed{x = -2}$	½	2
	Note: If alternate method is followed to get correct answer, then give full marks.		
	OR		
	$x^2 + 4x + 5 = 0$		
	$ax^2 + bx + c = 0$		
	$a = 1$, $b = 4$, $c = 5$		
	Discriminant $= b^2 - 4ac$	½	
	$= (4)^2 - 4(1)(5)$	½	
	$= 16 - 20$		
	$= -4 < 0$	½	
	Nature of roots : No real roots.	½	2
20.	Find the sum of first 20 terms of the arithmetic progression 5, 9, 13, ... using formula.		
	Ans. :		
	$a = 5$ $d = 9 - 5 = 4$ $n = 20$		
	$S_n = \frac{n}{2}[2a + (n-1)d]$	½	
	$S_{20} = \frac{20}{2}[2(5) + (20-1)4]$	½	

Qn. Nos.	Value Points	Marks allotted
	$= 10 [10 + 76]$ $= 10 (86)$ ½ $S_{20} = 860$ ½ Note : If alternate method is used to get the correct answer, then give full marks.	2
21.	A ladder 10 m long reaches a window 8 m above the ground. Find the distance of the foot of the ladder from the base of the wall. *Ans.* :  ½ $AB^2 + BC^2 = AC^2$ ½ $8^2 + BC^2 = 10^2$ $64 + BC^2 = 100$ $BC^2 = 100 - 64$ ½ $BC = \sqrt{36}$ BC = 6m ½	2
22.	According to Fundamental Theorem of Arithmetic, if $40 = x^y . z$, then find the values of x, y and z. *Ans.* : $\begin{array}{r\|l} 2 & 40 \\ \hline 2 & 20 \\ \hline 2 & 10 \\ \hline & 5 \end{array}$ $40 = 2^3 \times 5^1$ ½ Given $40 = x^y \times z$ $\therefore$ $\boxed{x = 2}$ $\boxed{y = 3}$ $\boxed{z = 5}$ ½ + ½ + ½	2

Qn. Nos.	Value Points	Marks allotted
23.	If $A(1, y)$, $B(4, 3)$, $C(x, 6)$ and $D(3, 5)$ are the vertices of a parallelogram taken in an order, then find the values of x and y. 	
	Ans. :	
	Mid-point of AC = Mid-point of BD (the diagonals of a parallelogram bisect each other)	
	$\left(\frac{x+1}{2}, \frac{6+y}{2}\right) = \left(\frac{4+3}{2}, \frac{3+5}{2}\right)$ ½	
	$\left(\frac{x+1}{2}, \frac{6+y}{2}\right) = \left(\frac{7}{2}, 4\right)$ ½	
	$\frac{x+1}{2} = \frac{7}{2}$ $\quad$ $\frac{6+y}{2} = 4$	
	$x + 1 = 7$ $\quad$ $6 + y = 8$	
	$x = 7 - 1$ $\quad$ $y = 8 - 6$	
	$\boxed{x = 6}$ $\quad$ $\boxed{y = 2}$	
	Finding x ½	
	Finding y ½	2
	Note : If alternate method is used to get the correct answer, give full marks.	
24.	Draw a circle of radius 4 cm. From a point 9 cm away from its centre, construct two tangents to the circle.	
	Ans. 	
	Drawing circle C_1 } ½ Drawing OP = 9 cm }	

Qn. Nos.	Value Points		Marks allotted
	Drawing $\perp$ bisector & Drawing circle C_2	½ + ½	
	Joining AP and BP	½	2
IV.	**Answer the following questions :**	**9 × 3 = 27**	

25. Find the zeroes of the quadratic polynomial $p(x) = x^2 + 7x + 10$ and verify the relationship between the zeroes and the coefficients.

Ans. :

$p(x) = x^2 + 7x + 10$

$= x^2 + 5x + 2x + 10$

$= x(x+5) + 2(x+5)$

$p(x) = (x+5)(x+2)$ ½

$(x+5)(x+2) = 0$

$x + 5 = 0$ or $x + 2 = 0$

$x = -5$ or $x = -2$ ½

-5 and -2 are the zeroes of given polynomial.

Sum of zeroes $= -2 + (-5) = -7 = \frac{-(7)}{1}$

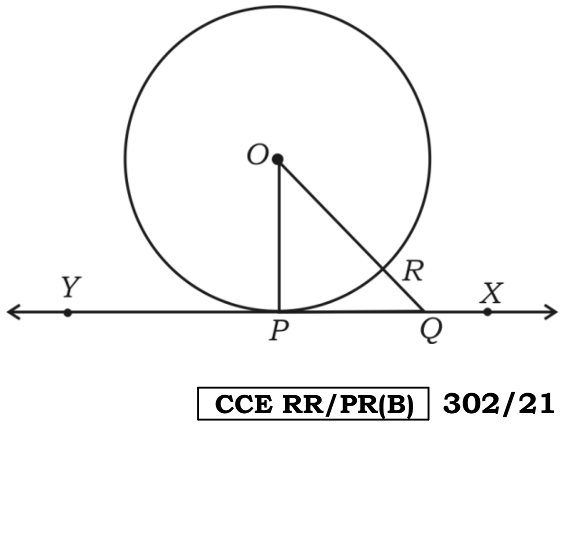
$= \frac{-\text{coefficient of } x}{\text{coefficient of } x^2} \left(\frac{-b}{a} \right)$ 1

Product of zeroes $= (-2) \times (-5) = 10 = \frac{10}{1}$

$= \frac{\text{constant term}}{\text{coefficient of } x^2} \left(\frac{c}{a} \right)$ 1 — 3

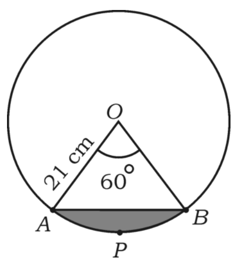
26. Prove that "The tangent at any point of a circle is perpendicular to the radius through the point of contact".

Ans. :

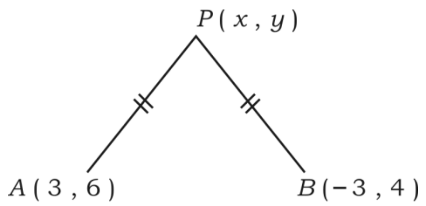


½

Qn. Nos.	Value Points	Marks allotted
	Data : 'O' is the centre of the circle. XY is the tangent at 'P'. OP is the radius. ½	
	To prove : $OP \perp XY$. ½	
	Construction : Take a point 'Q' on XY other than 'P' and join OQ. Let it intersect the circle at 'R'. ½	
	Proof : From the figure, $OQ > OR$.	
	But $OR = OP$ (radii of the same circle) ½	
	$OQ > OP$.	
	This happens for every point on the line XY except the point P.	
	$\therefore$ OP is the shortest distance from O to the points on XY. ½	3
	$\therefore$ $OP \perp XY$	
	Note : If the theorem is proved as in the text book give full marks.	
27.	Prove that : $$\frac{\cos A}{1+\sin A} + \frac{1+\sin A}{\cos A} = 2 \sec A.$$	
	OR	
	Find the value of : $$\left(\frac{5\cos^2 60^\circ + 4\sec^2 30^\circ - \tan^2 45^\circ}{\sin^2 30^\circ + \cos^2 30^\circ} \right)$$	
	Ans. :	
	LHS $= \frac{\cos A}{1+\sin A} + \frac{1+\sin A}{\cos A}$	
	$= \frac{\cos^2 A + (1+\sin A)^2}{\cos A(1+\sin A)}$ ½	
	$= \frac{\cos^2 A + 1 + \sin^2 A + 2\sin A}{\cos A(1+\sin A)}$ ½	
	$= \frac{1+1+2\sin A}{\cos A(1+\sin A)}$ [$\because \sin^2 A + \cos^2 A = 1$] ½	
	$= \frac{2+2\sin A}{\cos A(1+\sin A)}$ ½	
	$= \frac{2\cancel{(1+\sin A)}}{\cos A\cancel{(1+\sin A)}}$ ½	

Qn. Nos.	Value Points		Marks allotted
	$= \dfrac{2}{\cos A}$		
	$= 2 \sec A$ $\quad\left[\because \dfrac{1}{\cos A} = \sec A \right]$	½	3
	LHS = RHS		
	OR		
	$\cos 60° = \dfrac{1}{2}$, $\sec 30° = \dfrac{2}{\sqrt{3}}$, $\tan 45° = 1$	½ + ½ + ½	
	$\sin 30° = \dfrac{1}{2}$, $\cos 30° = \dfrac{\sqrt{3}}{2}$		
	$= \dfrac{5\left(\dfrac{1}{2}\right)^2 + 4\left(\dfrac{2}{\sqrt{3}}\right)^2 - (1)^2}{\left(\dfrac{1}{2}\right)^2 + \left(\dfrac{\sqrt{3}}{2}\right)^2}$	½	
	$= \dfrac{5\left(\dfrac{1}{4}\right) + 4\left(\dfrac{4}{3}\right) - 1}{\dfrac{1}{4} + \dfrac{3}{4}}$	½	
	$= \dfrac{\dfrac{5}{4} + \dfrac{16}{3} - 1}{1}$		
	$= \dfrac{15 + 64 - 12}{12}$		
	$= \dfrac{67}{12}$	½	3
	Note : If directly taken as $\sin^2 30° + \cos^2 30° = 1$, then also give full marks.		
28.	In the given figure *'O'* is the centre of the circle of radius 21 cm. If $\underline{\lfloor AOB}$ = 60°, then find the area of the segment *APB*. [Take $\sqrt{3}$ = 1·73] 		

Qn. Nos.	Value Points	Marks allotted
	Ans. :	
	Area of the sector $OAPB = \frac{\theta}{360^\circ} \times \pi r^2$	½
	$= \frac{\cancel{60^\circ}}{\cancel{360^\circ}\,\cancel{6}\,2} \times \frac{\cancel{22}\,11}{\cancel{7}} \times \cancel{21}\,3 \times 21$	
	$= 11 \times 21$	
	$= 231 \text{ cm}^2$	½
	ΔOAB is equilateral.	
	Area of equilateral $\Delta OAB = \frac{\sqrt{3}}{4} a^2$	½
	$= \frac{1 \cdot 73}{4} \times 21 \times 21$	
	$= \frac{762 \cdot 93}{4}$	
	$= 190{\cdot}73 \text{ cm}^2$	½
	$\left.\begin{array}{c}\text{Area of the segment}\\ APB\end{array}\right\} = \left\{\begin{array}{c}\text{Area of sector}\\ OAPB\end{array}\right\} - \left\{\begin{array}{c}\text{area of}\\ \Delta OAB\end{array}\right\}$	½
	$= 231 - 190{\cdot}73$	
	$= 40{\cdot}27 \text{ cm}^2$	½
	Note : If the final answer is upto 4 decimal places (40.2675 cm^2) then also give full marks.	3
29.	Find the coordinates of a point which divides the line segment joining the points (– 1, 7) and (4, – 3) internally in the ratio 2 : 3.	
	OR	
	Find a relation between x and y such that the point (x, y) is equidistant from the points (3, 6) and (– 3, 4)	
	Ans. :	
	(– 1, 7) x_1, y_1 (4, – 3) x_2, y_2 2 : 3 $m_1 = 2,\ m_2 = 3$	
	$P(x, y) = \left(\frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}, \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2} \right)$	1
	$= \left(\frac{2(4) + 3(-1)}{2+3}, \frac{2(-3) + 3(7)}{2+3} \right)$	½

Qn. Nos.	Value Points		Marks allotted
	$= \left(\dfrac{8-3}{5}, \dfrac{-6+21}{5} \right)$	½	
	$= \left(\dfrac{5}{5}, \dfrac{15}{5} \right)$	½	
	$P(x, y) = (1, 3)$	½	3
	OR		
			
	$PA = PB$		
	$\sqrt{(x-3)^2+(y-6)^2} = \sqrt{(x+3)^2+(y-4)^2}$	½	
	Squaring on both sides		
	$(x-3)^2+(y-6)^2 = (x+3)^2+(y-4)^2$	½	
	$\cancel{x^2}+\cancel{9}-6x+\cancel{y^2}+36-12y = \cancel{x^2}+\cancel{9}+6x+\cancel{y^2}+16-8y$	1	
	$-6x-6x-12y+8y+36-16=0$	½	
	$-12x-4y+20=0$		
	$\div\ -4$		
	$3x+y-5=0$	½	3
30.	Find the mean for the following data :		

Class-interval	*Frequency*
10 – 20	2
20 – 30	3
30 – 40	6
40 – 50	5
50 – 60	4

OR

Find the median for the following data :

Class-interval	*Frequency*
15 – 20	4
20 – 25	5
25 – 30	10
30 – 35	5
35 – 40	6

Qn. Nos.	Value Points	Marks allotted

Ans. :

Class interval	frequency (f_i)	Mid-point x_i	$x_i f_i$
10 – 20	2	15	30
20 – 30	3	25	75
30 – 40	6	35	210
40 – 50	5	45	225
50 – 60	4	55	220
	$\sum f_i = 20$		$\sum f_i x_i = 760$

2

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

$= \dfrac{76\cancel{0}}{2\cancel{0}}$

Mean $(\overline{X}) = 38$ ½ 3

OR

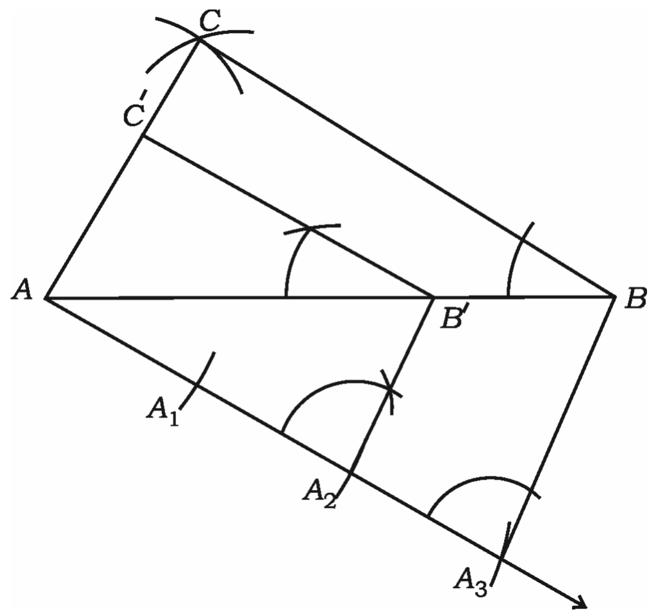
Class interval	frequency	Cumulative frequency
15 – 20	4	4
20 – 25	5	9
25 – 30	10	19
30 – 35	5	24
35 – 40	6	30
	$n = 30$	

1

$\dfrac{n}{2} = \dfrac{30}{2} = 15$, $l = 25$, $c_f = 9$, $f = 10$, $h = 5$ ½

Median = $l + \left[\dfrac{\dfrac{n}{2} - c_f}{f} \right] \times h$ ½

Qn. Nos.	Value Points		Marks allotted
	$= 25 + \left[\frac{15-9}{10}\right] \times 5$		
	$= 25 + \frac{6}{10} \times 5$	½	
	$= 25 + 3$	½	3
	Median = 28		
31.	The difference between the altitude and base of a right angled triangle is 5 cm. If the area of the triangle is 150 cm^2, then find the base and altitude of the triangle.		
	OR		
	The sum of the squares of two consecutive even positive integers is 164. Find the integers.		
	Ans. :		
	Let altitude = x cm, then		
	base = (x – 5) cm	½	
	Area of triangle = 150 cm^2		
	$\frac{1}{2}.\ x.\ (x-5) = 150$	½	
	$x^2 - 5x = 300$		
	$x^2 - 5x - 300 = 0$	½	
	$x^2 - 20x + 15x - 300 = 0$		
	$x(x-20) + 15(x-20) = 0$		
	$(x-20)\ (x+15) = 0$	½	
	$x - 20 = 0$ or $x + 15 = 0$		
	$x = 20$ or $x = -15$	½	
	Since the length can't be negative, x = 20 cm		
	∴ Altitude = x = 20 cm Base = x – 5 = 20 – 5 = 15 cm	½	
	Note : If x and x + 5 are considered to solve the problem and gets correct answer, then give full marks.		3
	OR		
	Let the two consecutive even positive integers be x and (x + 2)		
	By data $x^2 + (x+2)^2 = 164$	½	
	$x^2 + x^2 + 2^2 + 4x = 164$		

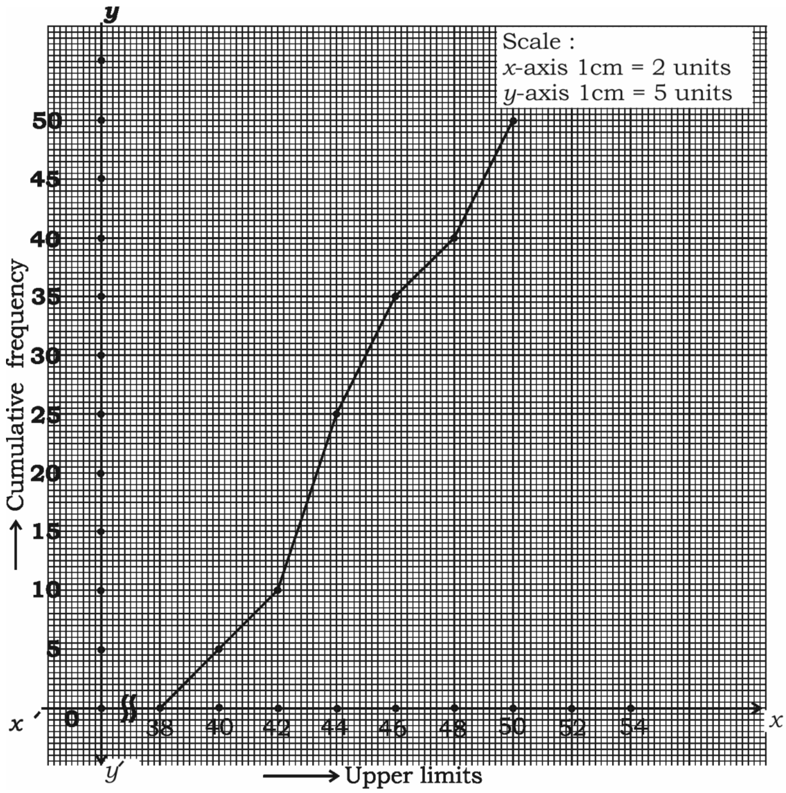
Qn. Nos.	Value Points		Marks allotted
	$2x^2+4x+4-164=0$	½	
	$2x^2+4x-160=0$		
	$\div 2$		
	$x^2+2x-80=0$	½	
	$x^2+10x-8x-80=0$		
	$x(x+10)-8(x+10)=0$		
	$(x+10)(x-8)=0$		
	$x+10=0$ or $x-8=0$	½	
	$x=-10$ or $x=8$		
	x is positive integer $\therefore$ $x=8$	½	
	$x+2=8+2=10$		
	Two consecutive even positive integers are 8 and 10.	½	3
32.	Construct a triangle with sides 6 cm, 7·5 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	
	Obtaining required triangle	½	3

Qn. Nos.	Value Points	Marks allotted

33. The following data gives the weights of 50 students of a class during their medical check-up. Draw a "less than type ogive" for the given data.

Weight (in kg)	*Number of students (Cumulative frequency)*
Less than 38	0
Less than 40	5
Less than 42	10
Less than 44	25
Less than 46	35
Less than 48	40
Less than 50	50

Ans.



Drawing axes & writing scale 1

Marking points 1

Drawing ogive 1 | 3

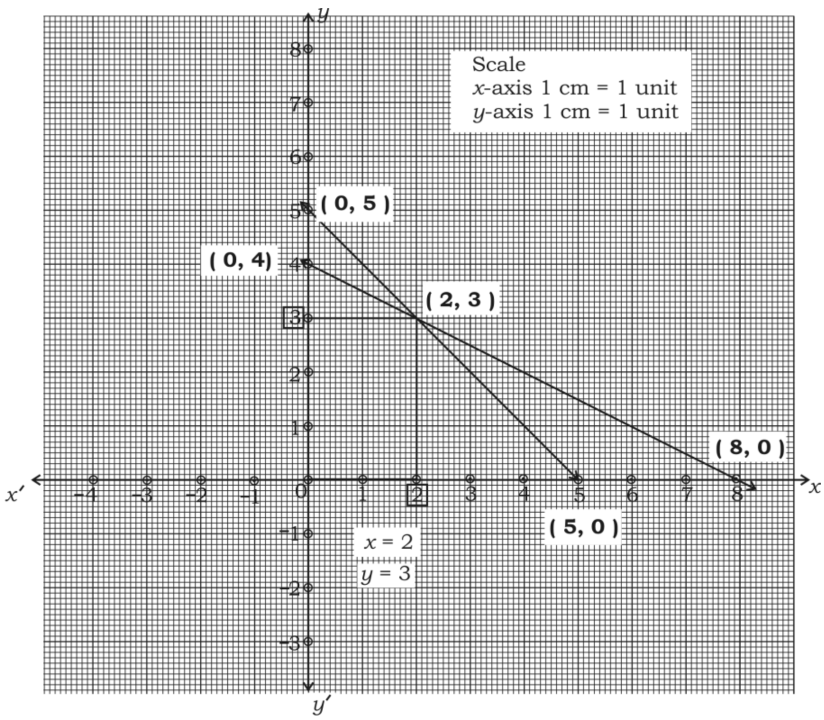
Qn. Nos.	Value Points	Marks allotted

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

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

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

Ans. :



$x + 2y = 8$ — For table construction 1 + 1

x	0	8
y	4	0

$x + y = 5$ — Drawing two lines by marking points 1

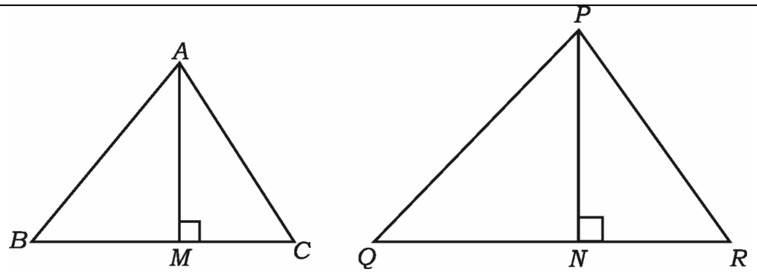
x	0	5
y	5	0

Writing the values of x and y 1 — **4**

35. Prove that "The ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides".

Ans. :

Qn. Nos.	Value Points	Marks allotted



½

Data $\Delta ABC \sim \Delta PQR$

$$\therefore \frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}$$ ½

To prove : $\dfrac{ar\ (\Delta ABC)}{ar\ (\Delta PQR)} = \dfrac{BC^2}{QR^2}$ ½

Construction : Draw $AM \perp BC$ and $PN \perp QR$ ½

Proof : $$\frac{ar(\Delta ABC)}{ar(\Delta PQR)} = \frac{\frac{1}{2} \times BC \times AM}{\frac{1}{2} \times QR \times PN}$$

$$\frac{ar(\Delta ABC)}{ar(\Delta PQR)} = \frac{BC}{QR} \times \frac{AM}{PN} \text{ .... } (1)$$ ½

In ΔABM and $\Delta\ PQN$

$\angle B = \angle\ Q$ [Data]

$\angle AMB = \angle\ PNQ = 90°$ [construction]

$\Delta ABM \sim \Delta\ PQN$

$$\frac{AM}{PN} = \frac{AB}{PQ}$$ ½

But $\dfrac{AB}{PQ} = \dfrac{BC}{QR}$

$$\therefore \frac{AM}{PN} = \frac{BC}{QR} \text{ .... } (2)$$ ½

Substitute (2) in (1) we get $\dfrac{ar(\Delta ABC)}{ar(\Delta PQR)} = \dfrac{BC}{QR} \times \dfrac{BC}{QR}$

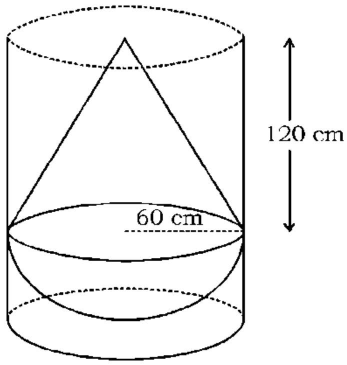
$$= \frac{BC^2}{QR^2}$$ ½

Note : If the theorem is proved as given in text book, then also give full marks. 4

36. A solid consisting of a right circular cone of height 120 cm and radius 60 cm standing on a hemisphere of radius 60 cm is placed upright in a right circular cylinder

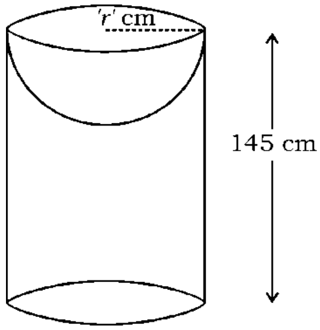
Qn. Nos.	Value Points	Marks allotted

full of water such that it touches the bottom as shown in the figure. If the radius of the cylinder is 60 cm and height is 180 cm, then find the volume of water left in the cylinder in terms of π.



OR

A solid is made of a cylinder with a hemispherical depression having the same radius ('r' cm) as that of cylinder, at the top end as shown in the figure. The volume of the hemispherical depression is 18000 π cm^3. If the height of the cylinder is 145 cm, then find the total surface area of the solid



Ans. :

Volume of cylinder = $\pi r^2 h$ ½

$= \pi(60)^2 \times 180$

$= \pi(3600) \times 180$

$= 6{,}48{,}000\ \pi\ \text{cm}^3$ ½

Volume of the solid = $\begin{Bmatrix} \text{Volume of} \\ \text{cone} \end{Bmatrix} + \begin{Bmatrix} \text{Volume of} \\ \text{Hemisphere} \end{Bmatrix}$ ½

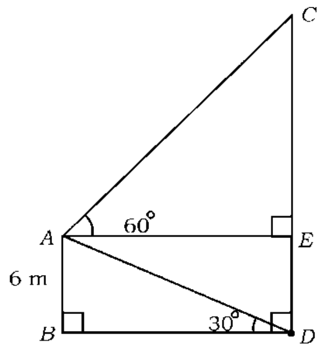
$= \frac{1}{3}\pi r^2 h + \frac{2}{3}\pi r^3$ ½

$= \frac{1}{3}\pi r^2 [\, h + 2r \,]$

Qn. Nos.	Value Points	Marks allotted
	$= \frac{1}{3}\pi\times 60^2\ [120+2(60)]$ ½ $= \frac{1}{\cancel{3}}\times \pi \times 60^2 \times \cancel{240}^{80}$ $= 2{,}88{,}000\ \pi\ \text{cm}^3$ ½ $\left.\begin{array}{l}\text{Volume of water}\\ \text{left in the cylinder}\end{array}\right\} = \left\{\begin{array}{l}\text{Volume of}\\ \text{Cylinder}\end{array}\right\} - \left\{\begin{array}{l}\text{Volume of}\\ \text{Solid}\end{array}\right\}$ ½ $= 648000\pi - 288000\ \pi$ $= 3{,}60{,}000\pi\ \text{cm}^3$ ½	4
	OR	
	Volume of Hemisphere = $\frac{2}{3}\pi r^3$ ½ $18000\ \pi = \frac{2}{3}\times\pi\times r^3$ $r^3 = \frac{18000\times 3}{2}$ ½ $r^3 = 27000$ $r = 30$ cm ½ TSA of solid = $\left\{\begin{array}{c}\text{CSA of}\\ \text{Hemisphere}\end{array}\right\} + \left\{\begin{array}{c}\text{CSA of}\\ \text{cylinder}\end{array}\right\} + \left\{\begin{array}{c}\text{Area of}\\ \text{circular base}\end{array}\right\}$ ½ $= 2\pi r^2 + 2\pi rh + \pi r^2$ ½ $= \pi r[2r+2h+r]$ $= \frac{22}{7}\times 30\ [2\times 30 + 2\times 145 + 30]$ ½ $= \frac{22}{7}\times 30\times [60 + 290 + 30]$ ½ $= \frac{22}{7}\times 30\times 380$ $= \frac{250800}{7}\ \text{cm}^2$ ½ $\approx 35828{\cdot}5\ \text{cm}^2$	4
37.	An arithmetic progression consists of 16 terms. The sum of all its terms is 768. If the last term of the progression is 93, then find the arithmetic progression. Also show that the sum of all the terms of this progression is equal to	

Qn. Nos.	Value Points	Marks allotted
	3 times the sum of first 16 odd natural numbers using formula. *Ans.* : $n = 16$ $S_{16} = 768$ $a_n = l = 93$ $S_n = \frac{n}{2}[a + a_n]$ ½ $768 = \frac{\cancel{16}^{8}}{\cancel{2}}[a + 93]$ ½ $a + 93 = \frac{768}{8}$ $a + 93 = 96$ $a = 96 - 93$ $\boxed{a = 3}$ ½ $a_n = a + (n-1)d$ $93 = 3 + (16 - 1)d$ ½ $93 = 3 + 15d$ $15d = 90$ $d = \frac{90}{15}$ $\boxed{d = 6}$ ½ AP is 3, 9, 15, 21, 27 .... ½ $S_{16} = 3+9+15+21+$........ up to 16 terms $= 3[1 + 3 + 5 + 7 +$ .... up to 16 terms] ½ $= 3 \times 16^2$ $[S_n = n^2]$ ↓ sum of first n odd natural nos. ½ $= 3 \times 256$ $\therefore$ $768 = 768$ Note : If alternate method is used to get the correct answer give full marks. If $S_n = \frac{n}{2}[2a + (n-1)d]$ formula is used to get the correct answer, then give full marks.	4
VI.	**Answer the following question : $1 \times 5 = 5$**	
38.	A pole and a tower are standing vertically on a level ground. The height of the pole is 6 m and the angle of elevation to the top of the pole from the bottom of the tower is 30°. The angle of elevation to the top of the tower from the top of the pole is 60° as shown in the figure.	

Qn. Nos.	Value Points	Marks allotted
	Find the height of the tower (*CD*). Also find the distance (*AC*) between the top of the pole and the top of the tower.	



Ans. :

In ΔABD, $\tan 30° = \frac{AB}{BD}$ ½

$\frac{1}{\sqrt{3}} = \frac{6}{BD}$

$BD = 6\sqrt{3}$ m ½

$BD = AE = 6\sqrt{3}$ m

In ΔAEC, $\tan 60° = \frac{CE}{AE}$ ½

$\sqrt{3} = \frac{CE}{6\sqrt{3}}$ ½

$6\sqrt{3}.\sqrt{3} = CE$

$\therefore$ $CE = 6\ (\ 3\ ) = 18$ m ½

In ΔAEC, $\sin 60° = \frac{CE}{AC}$ ½

$\frac{\sqrt{3}}{2} = \frac{18}{AC}$

$AC = \frac{18 \times 2}{\sqrt{3}}$ ½

$= \frac{36}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$ ½

$= \frac{36\sqrt{3}}{3}$ ½

$AC = 12\sqrt{3}$ m

$CD = CE + DE = 18 + 6 = 24$ m ½   5

Note : If alternate method is used to get correct answer, then give full marks.