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

KARNATAKA SECONDARY EDUCATION EXAMINATION BOARD, MALLESHWARAM, BENGALURU, 560 003

ಎಸ್.ಎಸ್.ಎಲ್.ಸಿ. ಪರೀಕ್ಷೆ, ಜೂನ್ / ಜುಲೈ, 2022

S.S.L.C. EXAMINATION, JUNE / JULY, 2022

ಮಾದರಿ ಉತ್ತರಗಳು

MODEL ANSWERS

ದಿನಾಂಕ : 04. 07. 2022] **ಸಂಕೇತ ಸಂಖ್ಯೆ : 81-E**

Date : 04. 07. 2022] **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)

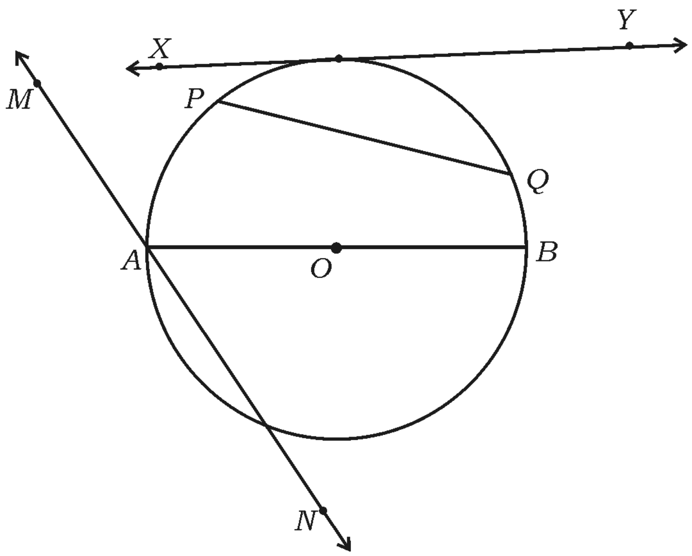
[ಗರಿಷ್ಠ ಅಂಕಗಳು : **100**

[Max. Marks : 100

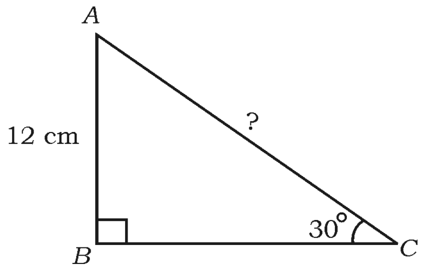
Qn. Nos.	Ans. Key	Value Points	Marks allotted
I.		Multiple choice : $8 \times 1 = 8$	
1.		Lines represented by the pair of linear equations $x - y = 8$ and $3x - 3y = 16$ are (A) intersecting lines (B) parallel lines (C) perpendicular lines (D) coincident lines. *Ans.* :	
	(B)	parallel lines	1

Qn. Nos.	Ans. Key	Value Points	Marks allotted
2.		In an arithmetic progression 5, 3, 1, – 1, ... the common difference is	
		(A) – 2 (B) 2	
		(C) – 3 (D) 5.	
		Ans. :	
	(A)	– 2	1
3.		$x(x+1) = 5$ is a	
		(A) linear equation (B) quadratic equation	
		(C) cubic equation (D) quadratic polynomial.	
		Ans. :	
	(B)	Quadratic equation	1
4.		$1 + \tan^2\theta$ is equal to	
		(A) $\operatorname{cosec}^2\theta$ (B) $\frac{1}{\operatorname{cosec}^2\theta}$	
		(C) $\sec^2\theta$ (D) $-\sec^2\theta$	
		Ans. :	
	(C)	$\sec^2\theta$	1
5.		Value of $\cot 90°$ is	
		(A) $\frac{1}{\sqrt{3}}$ (B) 1	
		(C) $\sqrt{3}$ (D) 0.	
		Ans. :	
	(D)	0	1
6.		Distance of the point $P(a, b)$ from the origin is	
		(A) $\sqrt{a^2+b^2}$ units (B) $\sqrt{a^2-b^2}$ units	
		(C) $\sqrt{a+b}$ units (D) $\sqrt{a-b}$ units.	
		Ans. :	
	(A)	$\sqrt{a^2+b^2}$ units	1

Qn. Nos.	Ans. Key	Value Points	Marks allotted
7.		In the figure, secant is	



		(A) *AB* (B) *PQ*	
		(C) *XY* (D) *MN*.	
		Ans. :	
	(D)	*MN*	1
8.		Volume of a sphere of radius '*r*' unit is	
		(A) $\frac{2}{3}\pi r^2$ cubic units	
		(B) $\frac{2}{3}\pi r^3$ cubic units	
		(C) $\frac{4}{3}\pi r^3$ cubic units	
		(D) $\frac{4}{3}\pi r^2$ cubic units.	
		Ans. :	
	(C)	$\frac{4}{3}\pi r^3$ cubic units	1

Qn. Nos.	Value Points		Marks allotted
II.	Answer the following questions :	$8 \times 1 = 8$	
9.	How many solutions does the pair of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ have if they are inconsistent ?		
	ns. :		
	No solution		1
10.	What is an Arithmetic progression ?		
	Ans. :		
	An arithmetic progression is a list of numbers in which each term is obtained by adding a fixed number to the preceding term, except the first term.		
	[**Note** : Any other correct definition carries marks.]		1
11.	Write the standard form of a quadratic equation.		
	Ans. :		
	$ax^2 + bx + c = 0$		1
12.	In the figure, *ABC* is a right angled triangle. If $\angle C = 30°$ and $AB = 12$ cm then find the length of *AC*.		
			
	Ans. :		
	$\sin 30° = \frac{AB}{AC}$	½	
	$\frac{1}{2} = \frac{12}{AC}$		
	$AC = 24\text{ cm}$	½	1

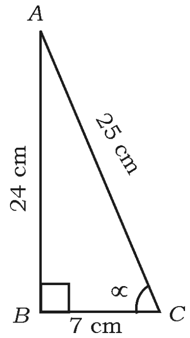
Qn. Nos.	Value Points	Marks allotted
13.	Write the coordinates of point P if it divides the line segment joining the points $A(x_1, y_1)$ and $B(x_2, y_2)$ internally in the ratio $m_1 : m_2$.	
	Ans. :	
	$P(x,y) = \left(\dfrac{m_1x_2 + m_2x_1}{m_1 + m_2}, \dfrac{m_1y_2 + m_2y_1}{m_1 + m_2} \right)$	1
14.	Find the mode of the following scores :	
	4, 5, 5, 6, 7, 7, 6, 7, 5, 5	
	Ans. :	
	5	1
15.	State "Basic proportionality theorem" (Thales theorem).	
	Ans. :	
	If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.	
	[Note : Any other correct alternative statement may be given marks]	1
16.	Write the formula to find the volume (V) of the frustum of a cone of height h and radii of two circular ends r_1 and r_2.	
	Ans. :	
	$V = \dfrac{1}{3}\pi h [r_1^2 + r_2^2 + r_1r_2]$ cubic units	1
III.	Answer the following questions : $18 \times 2 = 36$	
17.	Solve the given equations by elimination method :	
	$2x + 3y = 7$	
	$2x + y = 5$	

Qn. Nos.	Value Points		Marks allotted
	Ans. :		
	$2x + 3y = 7$ .... (1)		
	$2x + y = 5$ .... (2)		
	Subtract equation (2) from equation (1)		
	$2x + 3y = 7$ $2x + y = 5$ (–) (–) (–)	½	
	$2y = 2$		
	$y = \frac{2}{2}$		
	$y = 1$	½	
	Substitute $y = 1$ in equation (2)		
	$2x + 1 = 5$	½	
	$2x = 5 - 1$		
	$2x = 4$		
	$x = \frac{4}{2}$		
	$x = 2$	½	
	$\therefore x = 2,\ y = 1$		2
18.	Find the 12th term of the Arithmetic progression 2, 5, 8, ... using formula.		
	Ans. :		
	In the AP 2, 5, 8 .... $a = 2$ $d = 3$ $a_{12} = ?$		
	$n = 12$		
	$a_n = a + (n-1)d$	½	
	$a_{12} = 2 + (12-1)(3)$	½	
	$= 2 + 11(3)$	½	
	$= 2 + 33$		
	$a_{12} = 35$	½	2

Qn. Nos.	Value Points	Marks allotted
19.	Find the sum of arithmetic progression 7, 11, 15, ... to 16 terms using formula.	
	OR	
	Find how many terms of the arithmetic progression 3, 6, 9, ... must be added to get the sum 165.	
	Ans. :	
	7 + 11 + 15 + ... up to 16 terms	
	$\therefore a = 7$	
	$d = 4$	
	$n = 16$	
	$S_n = \frac{n}{2}[2a + (n-1)d]$ ½	
	$= \frac{16}{2}[2(7) + (16-1)(4)]$ ½	
	$S_{16} = 8[14 + 60]$ ½	
	$= 8(74)$	
	$S_{16} = 592$ ½	2
	OR	
	In the A.P. 3, 6, 9, ...	
	$a = 3$	
	$d = 3$	
	Given that $S_n = 165$	
	$n = ?$	
	So, 165 = 3 + 6 + 9 + ... 'n' terms	
	165 = 3 [1 + 2 + 3 + ... n terms] ½	
	$\frac{165}{3} = \frac{n(n+1)}{2}$ ½	
	$55 = \frac{n(n+1)}{2}$	
	$\therefore \quad n(n+1) = 55 \times 2$ ½	
	$n(n+1) = 110$	

Qn. Nos.	Value Points		Marks allotted
	$n(n+1) = 10 \times 11$		
	$\Rightarrow n = 10$	½	
	∴ The sum of first 10 terms of the A.P. is 165.		2
	[**Note** : Any other correct method carries marks]		
20.	Find the value of the discriminant of the equation $4x^2 - 12x + 9 = 0$ and hence write the nature of the roots.		
	Ans. :		
	$4x^2 - 12x + 9 = 0$		
	$a = 4, \; b = -12, \; c = 9$		
	Discriminant = $b^2 - 4ac$	½	
	$D = (-12)^2 - 4(4)(9)$	½	
	$= 144 - 144$		
	$D = 0$	½	
	∴ The roots are real and equal.	½	2
21.	Find the roots of the equation $x^2 - 3x + 1 = 0$ using quadratic formula.		
	Ans. :		
	$x^2 - 3x + 1 = 0$		
	$a = 1, \; b = -3, \; c = 1$		
	$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	½	
	$= \dfrac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(1)}}{2(1)}$	½	
	$= \dfrac{3 \pm \sqrt{9-4}}{2}$	½	
	$x = \dfrac{3 \pm \sqrt{5}}{2}$	½	
	$x = \dfrac{3+\sqrt{5}}{2}$ or $\dfrac{3-\sqrt{5}}{2}$		2

Qn. Nos.	Value Points	Marks allotted
22.	In the figure ABC is a right angled triangle. If AB = 24 cm, BC = 7 cm and AC = 25 cm, then write the value of $\sin \alpha$ and $\cos \alpha$.	



Ans. :

$\sin \alpha = \frac{AB}{AC}$ ½

$\sin \alpha = \frac{24}{25}$ ½

$\cos \alpha = \frac{BC}{AC}$ ½

$\cos \alpha = \frac{7}{25}$ ½ — **2**

23. Find the distance between the points P (2, 3) and Q (4, 1) using distance formula.

OR

Find in what ratio does the point P (– 4, 6) divide the line segment joining the points A (– 6, 10) and B (3, – 8) ?

Ans. :

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

$= \sqrt{(4-2)^2 + (1-3)^2}$ ½

$= \sqrt{2^2 + (-2)^2}$ ½

$= \sqrt{4+4}$ ½

$= \sqrt{8}$

$= 2\sqrt{2}$ units — **2**

OR

Qn. Nos.	Value Points	Marks allotted

Using section formula,

$$P(x, y) = \left(\frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}, \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2} \right)$$ ½

$$(-4, 6) = \left(\frac{3m_1 - 6m_2}{m_1 + m_2}, \frac{-8m_1 + 10m_2}{m_1 + m_2} \right)$$

Equation 'x' coordinates , we get,

$$-4 = \frac{3m_1 - 6m_2}{m_1 + m_2}$$ ½

$$-4m_1 - 4m_2 = 3m_1 - 6m_2$$

$$6m_2 - 4m_2 = 3m_1 + 4m_1$$ ½

$$2m_2 = 7m_1$$

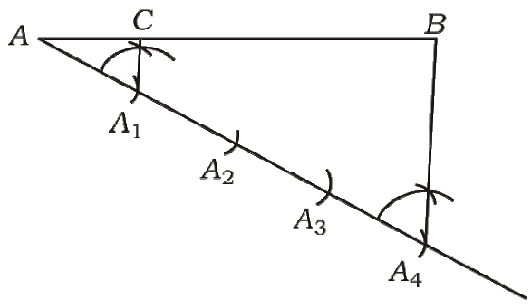
$$\frac{m_1}{m_2} = \frac{2}{7}$$

$$\therefore \quad m_1 : m_2 = 2 : 7$$ ½

[**Note** : We get the same result by equating ' y ' coordinates. Any other correct alternate answer carries marks.] — 2

24. Draw a line segment of length 8·4 cm and divide it in the ratio 1 : 3 by geometric construction.

Ans. :



$AC : CB$ = 1 : 3

To draw line segment AB = 8·46 m ½

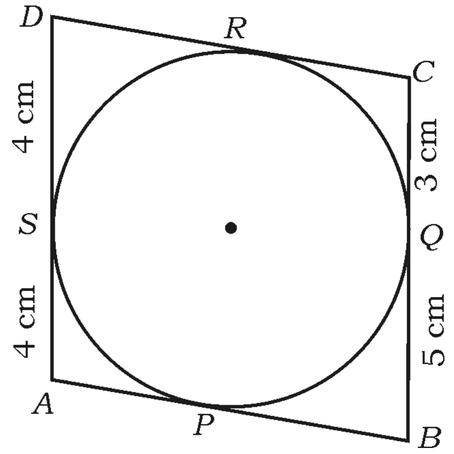
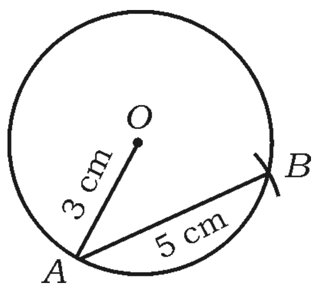
Acute angle and 4 equal parts ½

To draw $A_1C \,||\, A_4B$. 1

[**Note** : Any other correct alternate method carries marks] — 2

Qn. Nos.	Value Points		Marks allotted
25.	The sum of two numbers is 30, and their difference is 20. Find the numbers.		
	Ans. :		
	Let the two numbers be x and y.		
	According to the condition		
	$x + y = 30$		
	$x - y = 20$	½	
	$2x = 50$		
	$x = \frac{50}{2}$		
	$x = 25$	½	
	substitute $x = 25$ in $x + y = 30$.		
	$25 + y = 30$	½	
	$y = 30 - 25$		
	$y = 5$	½	
	∴ The numbers are 25 and 5.		2
26.	Find the sum of first 10 positive odd integers.		
	Ans. :		
	1 + 3 + 5 + ... up to 10 terms.		
	$a = 1$		
	$d = 2$		
	$n = 10$		
	$s_n = \frac{n}{2}[2a + (n-1)\text{d}]$	½	
	$S_{10} = \frac{10}{2}[2(1) + (10-1)(2)]$	½	
	$= 5[2 + (9)2]$	½	
	$= 5[2 + 18]$		
	$S_{10} = 100$	½	
	[Note : Any other correct method carries marks]		2

Qn. Nos.	Value Points		Marks allotted
27.	Find the positive root of $(x-3)(x+5)=0$.		
	Ans. :		
	$(x-3)\ (x+5)=0$		
	$x-3=0$ or $x+5=0$	1	
	$x=3$ or $x=-5$	½	
	$\therefore$ positive root is 3.	½	2
28.	Show that $2\tan 48^\circ . \tan 42^\circ = 2$.		
	Ans. :		
	LHS $= 2\tan 48^\circ . \tan 42^\circ$	½	
	$= 2 . \tan 48^\circ . \cot(90^\circ - 42^\circ)$	½	
	$= 2\tan 48^\circ . \cot 48^\circ$	½	
	$= 2\times \cancel{\tan} 48^\circ \times \frac{1}{\cancel{\tan} 48^\circ}$		
	$= 2 =$ RHS	½	2
29.	Name any two measures of central tendencies of statistical data.		
	Ans. :		
	Measures of central tendencies are		
	1) Mean		
	2) Median		
	3) Mode	Any *two*	2
30.	State the conditions for the similarity of two triangles.		
	Ans. :		
	Two triangles are similar, if		
	(i) their corresponding angles are equal	1	
	(ii) their corresponding sides are in the same ratio (or proportional).	1	2

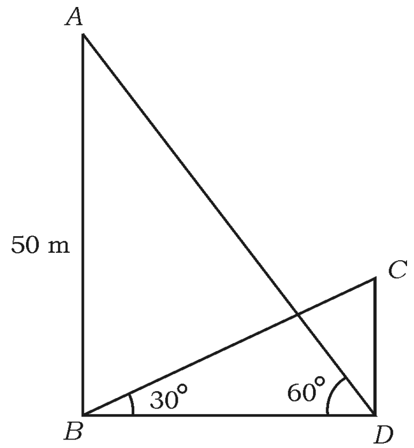
Qn. Nos.	Value Points		Marks allotted
31.	A quadrilateral *ABCD* is drawn to circumscribe a circle. If $DS = 4$ cm, $AS = 4$ cm, $CQ = 3$ cm and $BQ = 5$ cm then find $AB + CD$.		
			
	Ans. :		
	$AB + CD = AP + PB + CR + RD$	½	
	$= AS + BQ + CQ + DS$ ∵ tangents drawn from an external point to a circle are equal.	1	
	$= 4 + 5 + 3 + 4$		
	$AB + CD = 16$ cm	½	2
32.	Construct a chord of length 5 cm in a circle of radius 3 cm.		
	Ans. :		
			
	AB is chord.		
	To		
	Draw circle	1	
	Draw chord	1	2
33.	Find the length of the arc of a circle of radius 21 cm if the angle subtended by the arc at the centre is 60°.		

Qn. Nos.	Value Points		Marks allotted
	Ans. :		
	$r = 21$ cm		
	$\theta = 60°$		
	Length of the arc = $\frac{\theta}{360°} \times 2\pi r$	½	
	$= \frac{60°}{360°} \times 2 \times \frac{22}{7} \times 21$	1	
	= 22 cm	½	2
34.	Find the curved surface area of the right circular cylinder of height 10 cm and radius 7 cm.		
	Ans. :		
	CSA of cylinder = $2\pi rh$	½	
	$= 2 \times \frac{22}{7} \times 7 \times 10$	½	
	= 44 × 10	½	
	= 440 cm^2	½	2
IV.	Answer the following questions :	9 × 3 = 27	
35.	Find the arithmetic progression whose third term is 16 and its 7th term exceeds the 5th term by 12.		
	Ans. :		
	$a_3 = 16$		
	and $a_7 = a_5 + 12$	½	
	$a_3 = 16$		
	$\therefore$ $a + 2d = 16$ .... (1)	½	
	$a_7 = a_5 + 12$		
	$a + 6d = a + 4d + 12$	½	
	$2d = 12$		
	$d = \frac{12}{2}$		
	$d = 6$ .... (2)	½	
	Substitute $d = 6$ in equation (1)		
	$a + 2d = 16$		
	$a + 2(6) = 16$		

Qn. Nos.	Value Points		Marks allotted
	$a + 12 = 16$	½	
	$a = 16 - 12$		
	$a = 4$		
	∴ Arithmetic progression is $a, a + d, a + 2d$, ...		
	4, 10, 16, ...	½	3
36.	The sum of the reciprocals of Rehman's age (in years), 3 years ago and his age 5 years from now is $\frac{1}{3}$. Find his present age.		
	OR		
	A train travels 360 km at a uniform speed. If the speed had been 5 km/h more, it would have taken 1 hour less for the same journey. Find the speed of the train.		
	Ans. :		
	Let the present age of Rehman be ' x ' years.		
	3 years ago, his age was ($x - 3$) years.		
	After 5 years from now, his age will be ($x + 5$) years.		
	According to the condition,	½	
	$\frac{1}{x-3} + \frac{1}{x+5} = \frac{1}{3}$	½	
	$\frac{x+5+x-3}{x^2+2x-15} = \frac{1}{3}$	½	
	$\frac{2x+2}{x^2+2x-15} = \frac{1}{3}$		
	$3(2x+2) = 1(x^2+2x-15)$	½	
	$x^2+2x-15-6x-6=0$		
	$x^2-4x-21=0$		
	$x^2-7x+3x-21=0$	½	
	$x(x-7)+3(x-7)=0$		
	$(x-7)\ (x+3) = 0$		
	$x - 7 = 0$ or $x + 3 = 0$		
	$x = 7$ or $x = -3$	½	3
	∴ Present age of Rehman is 7 years.		
	OR		

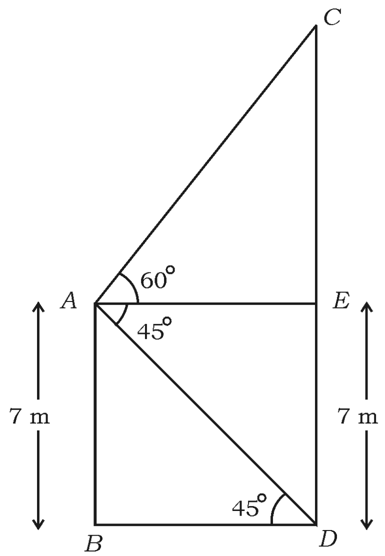
Qn. Nos.	Value Points		Marks allotted
	Let the speed of the train be x km /h		
	Distance travelled is 360 km		
	We know that		
	$\text{time} = \frac{\text{distance}}{\text{speed}}$		
	$\therefore$ time taken by the train is $\frac{360}{x}$ hours.	½	
	If the speed had been 5 km/hr more then its speed would be $(x + 5)$ km/hr. In that case time taken = $\frac{360}{x+5}$ hours.	½	
	According to the given condition,		
	$\frac{360}{x} - \frac{360}{x+5} = 1$	½	
	$\frac{360(x+5) - 360x}{x(x+5)} = 1$	½	
	$\frac{\cancel{360}x + 1800 - \cancel{360}x}{x(x+5)} = 1$		
	$1800 = x^2 + 5x$		
	$x^2 + 5x - 1800 = 0$		
	$x^2 + 45x - 40x - 1800 = 0$	½	
	$x(x+45) - 40(x+45) = 0$		
	$(x+45)(x-40) = 0$		
	$\therefore\ x + 45 = 0$ or $x - 40 = 0$		
	$x = -45$ or $x = 40$	½	
	$\therefore$ Speed of the train cannot be negative		
	$\therefore$ Speed of the train is 40 km/hr.		3
37.	Evaluate :		
	$\frac{2\cos(90^\circ - 30^\circ) + \tan 45^\circ - \sqrt{3}\,.\,\text{cosec}\,60^\circ}{\sqrt{3}\sec 30^\circ + 2\cos 60^\circ + \cot 45^\circ}$		

Qn. Nos.	Value Points	Marks allotted
	Ans. :	
	$\dfrac{2\cos(90°-30°)+\tan 45°-\sqrt{3}\,.\,\text{cosec}\,60°}{\sqrt{3}\,.\sec 30°+2\cos 60°+\cot 45°}$	
	$= \dfrac{2\sin 30° + \tan 45°-\sqrt{3}\,.\,\text{cosec}\,60°}{\sqrt{3}\,.\sec 30°+2\cos 60°+\cot 45°}$ ½	
	$= \dfrac{2\left(\frac{1}{2}\right)+1-\sqrt{3}\left(\frac{2}{\sqrt{3}}\right)}{\sqrt{3}\left(\frac{2}{\sqrt{3}}\right)+2\left(\frac{1}{2}\right)+1}$ 1½	
	$= \dfrac{1+1-2}{2+1+1}$ ½	
	$= \dfrac{0}{4}$ ½	
	$= 0$	
	$\therefore \dfrac{2\cos(90°-30°)+\tan 45°-\sqrt{3}\,.\,\text{cosec}\,60°}{\sqrt{3}\,.\sec 30°+2\cos 60°+\cot 45°}=0$	3
38.	A tower and a building are standing vertically on the same level ground. The angle of elevation of the top of a building from the foot of the tower is 30° and the angle of elevation of the top of the tower from the foot of the building is 60°. If the tower is 50 m high, find the height of the building.	



OR

Qn. Nos.	Value Points	Marks allotted
	A cable tower and a building are standing vertically on the same level ground. From the top of the building which is 7 m high, the angle of elevation of the cable tower is 60° and the angle of depression of its foot is 45°. Find the height of the tower. (Use $\sqrt{3}$ = 1·73)	



Ans. :

Height of the tower = *AB* = 50 m

Height of the building = *CD* = *h* = ?

In ΔABD,

$$\tan 60° = \frac{AB}{BD}$$ ½

$$\sqrt{3} = \frac{50}{BD}$$ ½

$$BD = \frac{50}{\sqrt{3}}$$ .... (1)

In ΔBCD,

$$\tan 30° = \frac{CD}{BD}$$ ½

$$\frac{1}{\sqrt{3}} = \frac{h}{BD}$$ ½

$$h = BD \times \frac{1}{\sqrt{3}}$$ ½

Qn. Nos.	Value Points		Marks allotted
	$= \frac{50}{\sqrt{3}} \times \frac{1}{\sqrt{3}}$ $\because$ From equation ..... (1)	½	
	$= \frac{50}{3} = 16\frac{2}{3}$ meters.		
	$\therefore$ Height of the building is $16\frac{2}{3}$ m		3
	OR		
	Height of the building is 7 cm.		
	Height of the tower = $CD = CE + DE$ = ?		
	AB and CD are perpendicular to the ground $\therefore AB \parallel CD$.		
	$AB = DE = 7$ m		
	and $AE = BD$.		
	In ΔABD,		
	$\tan 45° = \frac{AB}{BD}$	½	
	$1 = \frac{AB}{BD}$	½	
	$\therefore AB = BD$		
	$\therefore BD = 7$ m .... (1)	½	
	In ΔACE,		
	$\tan 60° = \frac{CE}{AE}$	½	
	$\sqrt{3} = \frac{CE}{7}$		
	$\therefore CE = 7\sqrt{3}$	½	
	$\therefore$ Height of the tower = $CE + DE$		
	$= 7\sqrt{3} + 7$		
	$= 7(\sqrt{3} + 1)$	½	
	$= 7(1 \cdot 73 + 1)$		
	$= 7(2 \cdot 73)$		
	$= 19 \cdot 11$ metres		3
	$\therefore$ Height of the tower is $19 \cdot 11$ metses.		

Qn. Nos.	Value Points	Marks allotted

39. Find the value of 'k' if the points $P((2, 3)$, $Q(4, k)$ and $R(6, -3)$ are collinear.

OR

A circle whose centre is at $P(2, 3)$ passes through the points $A(4, 3)$ and $B(x, 5)$. Then find the value of 'x'.

Ans. :

$P(2, 3)$, $Q(4, k)$ and $R(6, -3)$

If these points are collinear, then the area of the triangle formed by them must be '0'. ½

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

$0 = \frac{1}{2}[2(k - (-3)) + 4(-3 - 3) + 6(3 - k)]$ ½

$0 = 2(k + 3) + 4(-6) + 6(3 - k)$ ½

$0 = 2k + 6 - 24 + 18 - 6k$ ½

$-4k = 0$ ½

$\therefore \quad k = 0$ — 3

OR

$PA = PB$ ½

$\sqrt{(4-2)^2 + 0^2} = \sqrt{(x-2)^2 + (5-3)^2}$ ½

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

$(x-2)^2 = 0$ ½

$x = 2$ ½ — 3

40. Find the mean of the following scores by direct method :

Class-interval	*Frequency*
5 — 15	1
15 — 25	3
25 — 35	5
35 — 45	4
45 — 55	2

OR

Qn. Nos.	Value Points	Marks allotted

Find the median of the following scores :

Class-interval	*Frequency*
0 — 20	6
20 — 40	9
40 — 60	10
60 — 80	8
80 — 100	7

Ans. :

C-I	f_i	x_i	$f_i x_i$
5-15	1	10	10
15-25	3	20	60
25-35	5	30	150
35-45	4	40	160
45-55	2	50	100
	$\sum f_i = 15$		$\sum f_i x_i = 480$

Arithmetic mean = $\dfrac{\sum f_i x_i}{\sum f_i}$ ½

$\bar{x} = \dfrac{480}{15}$ ½

$\boxed{\bar{x} = 32}$ ½

To find $\sum f_i$ ½

To find x_i ½

To find $f_i x_i$ and

$\sum f_i x_i$ ½ 3

OR

Qn. Nos.	Value Points	Marks allotted

Class-interval	Frequency	Cumulative frequency
0-20	6	6
20-40	9	15
40-60	10	25
60-80	8	33
80-100	7	40

½

$n = 40, \quad \therefore \frac{n}{2} = \frac{40}{2} = 20$ ½

20 lies in the class-interval 40-60

$\therefore \; l = 40$

$cf = 15$

$f = 10$

$h = 20$ ½

$$\text{Median} = l + \left[\frac{\frac{n}{2} - cf}{f} \right] \times h$$ ½

$$= 40 + \left[\frac{20 - 15}{10} \right] \times 20$$ ½

$= 40 + (5)\ (2)$

$= 40 + 10$

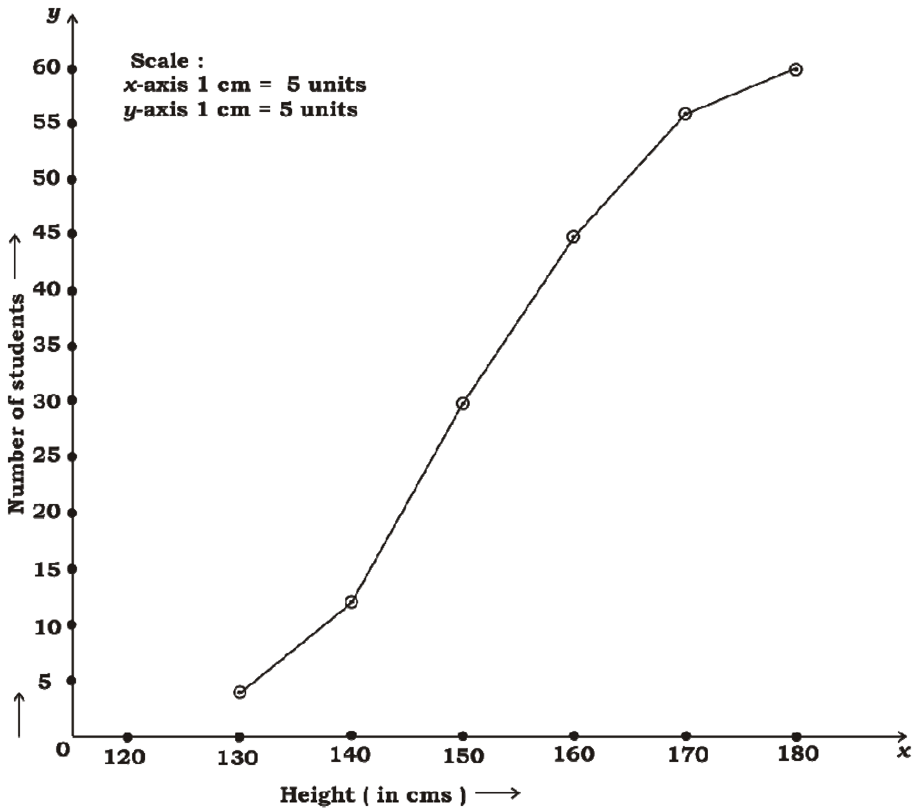
$= 50$

$\therefore$ Median = 50 ½ 3

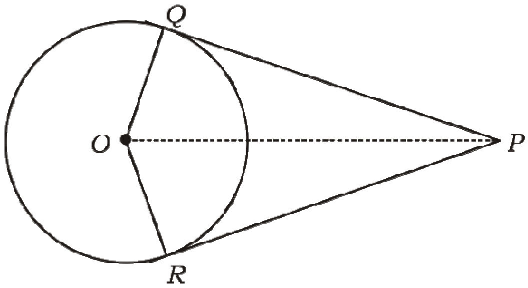
Qn. Nos.	Value Points	Marks allotted
41.	The following table gives the information of heights of 60 students of class *X* of a school. Draw a 'less than type' ogive for the given data :	

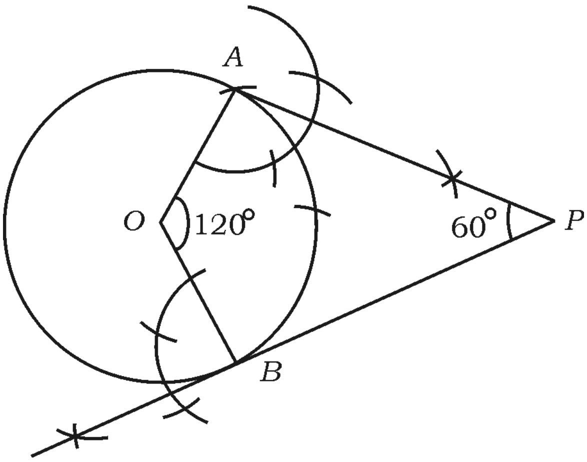
Height of students (in cms)	*Number of students (Cumulative frequency)*
Less than 130	04
Less than 140	12
Less than 150	30
Less than 160	45
Less than 170	56
Less than 180	60

Ans. :



Scale x & y axis	½	
Plotting 6 points	1½	
Drawing graph	1	3

Qn. Nos.	Value Points	Marks allotted
42.	Prove that "the lengths of tangents drawn from an external point to a circle are equal".	
	Ans. :	
		½
	Data : PQ and PR are the tangents drawn from an external point 'P' to the circle with centre 'O'.	½
	To prove : $PQ = PR$	½
	Construction : Join OP, OQ and OR	½
	Proof : In ΔPOQ and ΔPOR	
	$\angle OQP = \angle ORP$ $\because$ Radius is perpendicular to the tangent at the point of contact	
	$OQ = OR$ $\because$ Radii of the same circle	
	$OP = OP$ $\because$ Common side	
	$\therefore \Delta POQ \cong \Delta POR$ $\because$ RHS criteria	½
	$\therefore PQ = PR$ $\because$ C.P.C.T.	½
	Hence proved.	
	[**Note** : Any other alternate method carries marks]	3

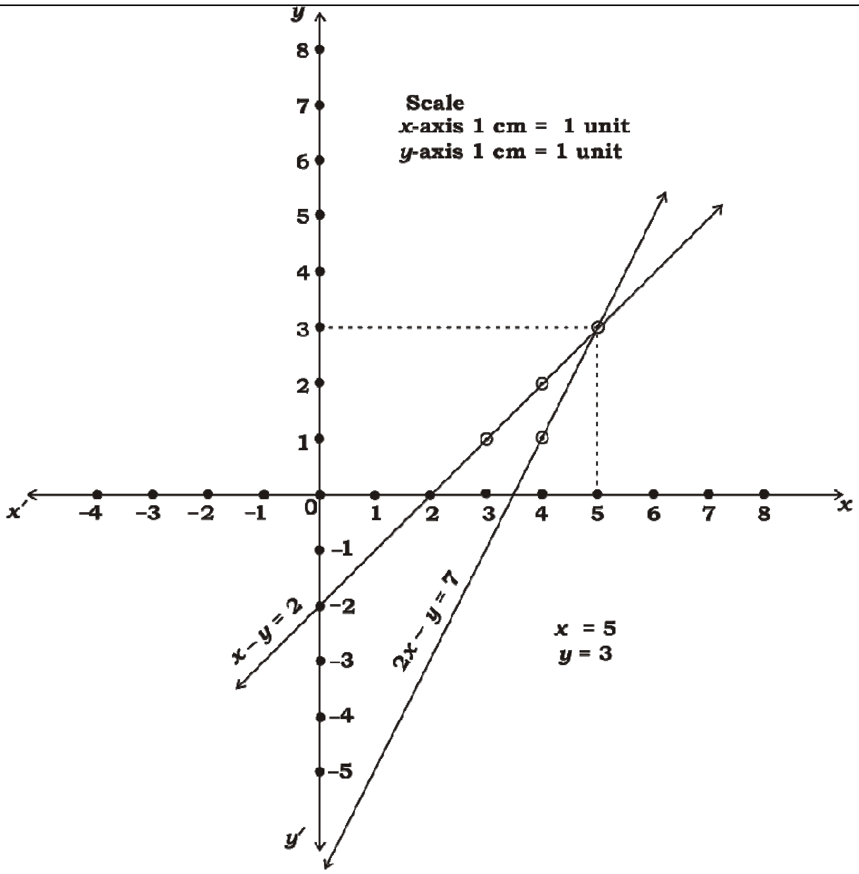
Qn. Nos.	Value Points		Marks allotted
43.	Draw a pair of tangents to a circle of radius 3 cm which are inclined to each other at an angle of 60°.		
	Ans. :		
	Angle between the radii = 180° – 60° = 120°	½	
			
	Circle	½	
	Radii	½	
	Tangents	1½	3
V.	Answer the following questions :	4 × 4 = 16	
44.	Find the solution of the pair of linear equations by graphical method :		
	$2x - y = 7$		
	$x - y = 2$		
	Ans. :		
	$2x - y = 7$ and $x - y = 2$		
	$\therefore\ y = 2x - 7$		

x	3	4	5
y	–1	1	3

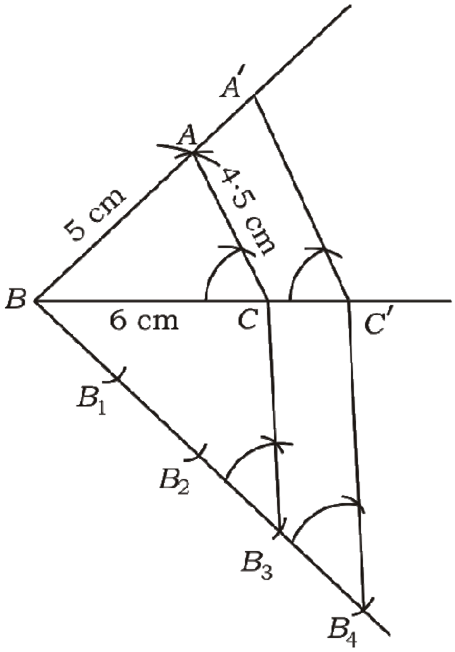
$x - y = 2$ or

$y = x - 2$

x	3	4	5
y	1	2	3

Qn. Nos.	Value Points	Marks allotted
		4
	Table 2	
	Two straight lines 1	
	To mark point of intersection and answer 1	
45.	Construct a triangle *ABC* with sides *BC* = 6 cm, *AB* = 5 cm and *AC* = 4·5 cm. Then construct a triangle whose sides are $\frac{4}{3}$ of the corresponding sides of the triangle *ABC*.	
	Ans. :	

Qn. Nos.	Value Points	Marks allotted



$\Delta ABC \sim \Delta A^{/} BC^{/}$

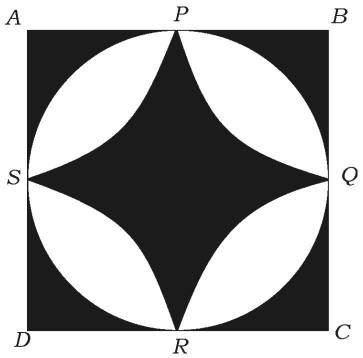
→ Construction of given triangle 1

→ Acute angle and 4 parts ½

→ To draw 2 parallel lines 2

$\Delta A^{/} BC^{/}$ ½ **4**

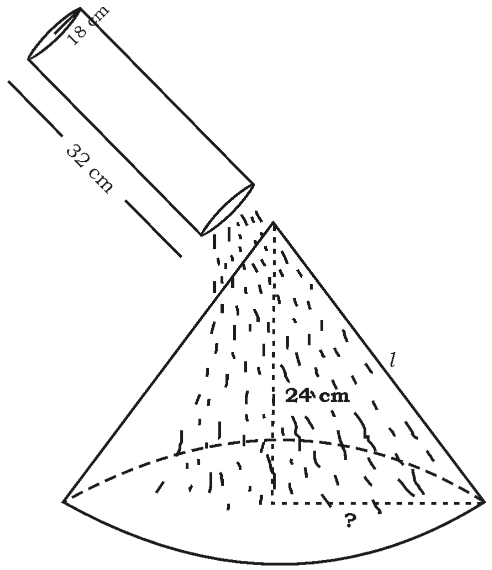
46. *ABCD* is a square of side 14 cm. A circle is drawn inside it which just touches the mid-points of sides of the square, as shown in the figure. If *P, Q, R* and *S* are the mid-points of the sides of the square, and *PQ, QR, RS* and *SP* are the arcs of the circle, then find the area of the shaded region.



Ans. :

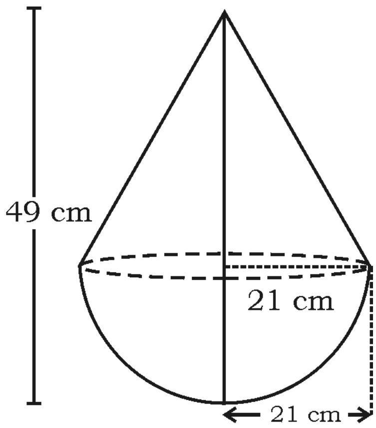
a = 14 cm

Radius of circle = radius of quadrant

Qn. Nos.	Value Points	Marks allotted
	$r = \frac{14}{2}$	
	$r = 7$ cm ½	
	Area of shaded region =	
	[Area of square – Area of circle] + [Area of square – 4 × area of quadrant] 1	
	$= \left[a^2 - \pi r^2\right] + \left[a^2 - 4 \times \frac{1}{4}\pi r^2\right]$ 1	
	$= \left[a^2 - \pi r^2\right] + \left[a^2 - \pi r^2\right]$	
	$= 2\left[a^2 - \pi r^2\right]$	
	$= 2\left[14^2 - \frac{22}{\cancel{7}_1} \times 7 \times \cancel{7}^1\right]$ ½	
	$= 2\left[196 - 154\right]$ ½	
	= 2 [42]	
	= 84 cm^2 ½	
	Area of shaded region = 84 cm^2	4
47.	Sand is filled in a cylindrical vessel of height 32 cm and radius of its base is 18 cm. This sand is completely poured on the level ground to form a conical shaped heap of sand. If the height of the conical heap is 24 cm. Find the base radius and slant height of the conical heap.	
		
	OR	

Qn. Nos.	Value Points	Marks allotted

A toy is in the form of a cone of radius 21 cm, mounted on a hemisphere of same radius, as shown in the figure. The total height of the toy is 49 cm. Find the surface area of the toy.



Ans. :

Height of cylinder = h_1 = 32 cm

Radius of cylinder = r_1 = 18 cm

Height of conical heap = h_2 = 24 cm

Radius of conical heap = r_2 = ?

Slant height of the heap = l = ?

Volume of sand in the cylinder = Volume of sand in the conical heap

$$\cancel{\pi} r_1^2 h_1 = \frac{1}{3} \cancel{\pi} r_2^2 h_2$$

$$18^2 \times 32 = \frac{r_2^2 \times 24}{3}$$

$$r_2^2 = \frac{18 \times 18 \times \cancel{32}^4 \times \cancel{3}^1}{\cancel{24}\,\cancel{8}_1}$$

$$r_2^2 = 18 \times 18 \times 2 \times 2$$

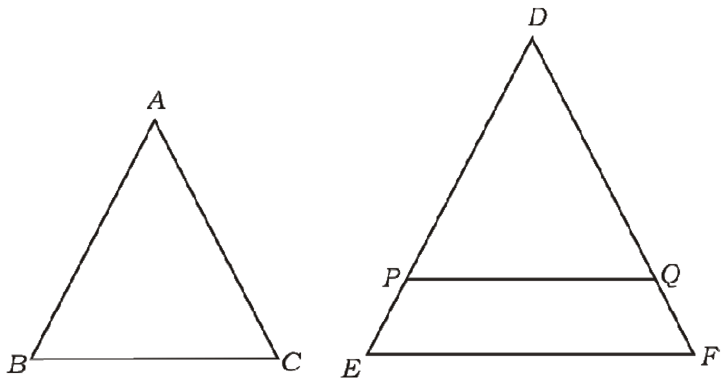
$$r_2^2 = 18^2 \times 2^2$$

$$\therefore r_2 = 18 \times 2$$

$$\therefore r_2 = 36$$

Radius of the base of conical heap is 36 cm.

Qn. Nos.	Value Points	Marks allotted
	Slant height = $l = \sqrt{r_2^2 + h_2^2}$	
	$= \sqrt{36^2 + 24^2}$	
	$= \sqrt{1296 + 576}$	
	$= \sqrt{1872}$	
	$= \sqrt{3^2 \times 4^2 \times 13}$	
	$l = 12\sqrt{13}$ cm	
	Slant height is $12\sqrt{13}$ cm	4
	OR	
	Radius of cone = Radius of hemisphere = r = 21 cm	
	Total height of the toy = 49 cm	
	Height of the cone = (49 – 21) cm	
	= h = 28 cm ½	
	Slant height of the cone =	
	$l = \sqrt{r^2 + h^2}$ ½	
	$= \sqrt{21^2 + 28^2}$	
	$= \sqrt{441 + 784}$	
	$= \sqrt{1225}$	
	$= \sqrt{25 \times 49}$	
	l = 35 cm ½	
	Total surface area of the toy =	
	Curved surface area of cone +	
	curved surface area of the hemisphere ½	
	Area = $\pi r l + 2\pi r^2$	
	$= \pi r (l + 2r)$	
	$= \frac{22}{\not{7}_1} \times \not{21}^3 (35 + 2(21))$	
	= 66 (35 + 42)	
	= 66 (77)	
	= 5082 cm^2	
	$\therefore$ Total surface area of the toy is 5082 cm^2.	

Qn. Nos.	Value Points	Marks allotted
VI.	Answer the following question : $1 \times 5 = 5$	
48.	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 : ΔABC and ΔDEF	
	$\angle A = \angle D, \ \angle B = \angle E, \ \angle C = \angle F$	½
	To prove : $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$	½
	Construction : Mark 'P' on DE and Q on DF such that $DP = AB$ and $DQ = AC$. Join PQ.	½
	Proof : In ΔABC and ΔDPQ	
	$AB = DP$ ∵ construction	
	$\angle A = \angle D$ ∵ Given	
	$AC = DQ$ ∵ construction	
	∴ $\Delta ABC \cong \Delta DPQ$ ∵ SAS congruency rule	1
	∴ $BC = PQ$ and $\angle ABC = \angle DPQ$ } C.P.C.T	½
	But $\angle ABC = \angle DEF$	½

Qn. Nos.	Value Points		Marks allotted
	$\Rightarrow \angle DPQ = \angle DEF$		
	$\Rightarrow PQ \,\|\|\, EF$	$\because$ corresponding angles are equal ½	
	$\therefore \quad \frac{DP}{DE} = \frac{DQ}{DF} = \frac{PQ}{EF}$	$\because$ corollary of *BPT*	
	$\frac{AB}{DE} = \frac{AC}{DF} = \frac{BC}{EF}$	$\because DP = AB$ $DQ = AC$ $PQ = BC$ ½	
	$\therefore \Delta ABC \sim \Delta DEF$ Hence proved		5
	[**Note** : Any other method, that is correct can be considered for evaluation]		