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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, ಮಾರ್ಚ್ / ಏಪ್ರಿಲ್ — 2019

S. S. L. C. EXAMINATION, MARCH/APRIL, 2019

ಮಾದರಿ ಉತ್ತರಗಳು

MODEL ANSWERS

ದಿನಾಂಕ : 25. 03. 2019] **ಸಂಕೇತ ಸಂಖ್ಯೆ : 81-E**

Date : 25. 03. 2019] **CODE NO. : 81-E**

ವಿಷಯ : ಗಣಿತ

Subject : MATHEMATICS

(ಹಳೆ ಪಠ್ಯಕ್ರಮ / Old Syllabus)

(ಪುನರಾವರ್ತಿತ ಖಾಸಗಿ ಅಭ್ಯರ್ಥಿ / Private Repeater)

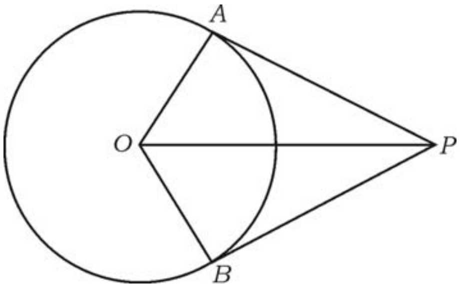
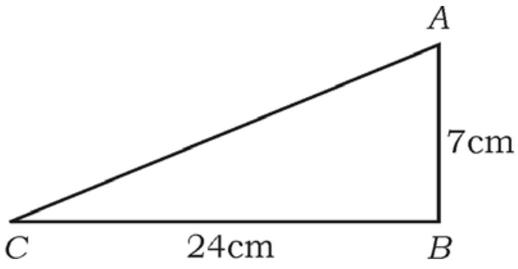
(ಇಂಗ್ಲಿಷ್ ಭಾಷಾಂತರ / English Version)

[ಗರಿಷ್ಠ ಅಂಕಗಳು : **100**

[Max. Marks : 100

Qn. Nos.	**Ans. Key**	**Value Points**	**Marks allotted**
I. 1.		If $A = \{ 4, 8, 12, 16, 20, 24 \}$ and $B = \{ 4, 20, 28 \}$ then $A \cap B$ is (A) $\{ 4, 8, 12, 16, 20, 24, 28 \}$ (B) $\{ 4, 20 \}$ (C) $\{ 28 \}$ (D) $\{ \}$ *Ans.* :	
	(B)	$\{ 4, 20 \}$	1

Qn. Nos.	**Ans. Key**	**Value Points**	**Marks allotted**
2.	(A)	The sum to infinite terms of a Geometric progression whose first term is a and common ratio r is given by the formula. (A) $S_{\infty} = \frac{a}{1-r}$ (B) $S_{\infty} = \frac{1-r}{a}$ (C) $S_{\infty} = \frac{a}{1+r}$ (D) $S_{\infty} = a(1-r)$ *Ans.* : $S_{\infty} = \frac{a}{1-r}$	1
3.	(B)	If H and L are the HCF and LCM of two numbers A and B respectively then (A) $A \times H = L \times B$ (B) $A \times B = L \times H$ (C) $A + B = L + H$ (D) $A + B = L - H$ *Ans.* : $A \times B = L \times H$	1
4.	(C)	The degree of the polynomial $P(x) = 2x^3 + 3x^2 - 11x + 6$ is (A) 2 (B) 6 (C) 3 (D) 4 *Ans.* : 3	1
5.	(D)	The standard form of a quadratic equation is (A) $ax^2 = 0$ (B) $ax^2 + bx = 0$ (C) $ax^2 + c = 0$ (D) $ax^2 + bx + c = 0$ *Ans.* : $ax^2 + bx + c = 0$	1

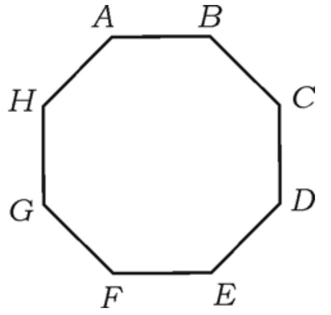
Qn. Nos.	**Ans. Key**	**Value Points**	**Marks allotted**
6.		In the given figure, $\overline{PA}$ and $\overline{PB}$ are the tangents to the circle with centre *O*. If $\underline{\lvert AOB}$ = 100°, then $\underline{\lvert APO}$ is  (A) 50° (B) 80° (C) 90° (D) 40° *Ans.* :	
	(D)	40°	1
7.		The value of $\tan^2 60° + 2\tan^2 45°$ is (A) 5 (B) $\sqrt{3}+1$ (C) 4 (D) $\sqrt{3}+2$ *Ans.* :	
	(A)	5	1
8.		In ⊿ *ABC* right angled at *B*, $\overline{AB}$ = 7 cm, $\overline{BC}$ = 24 cm. Then length of $\overline{AC}$ is  (A) 30 cm (B) 17 cm (C) 25 cm (D) 19 cm *Ans.* :	
	(C)	25 cm	1

Qn. Nos.	Value Points	Marks allotted
II.	Answer the following : 6 × 1 = 6	
	(Question Numbers 9 to 14, give full marks to direct answers)	
9.	Find the arithmetic mean of 16 and 20.	
	Ans. :	
	A,M. $= \frac{a+c}{2}$ ½	
	$= \frac{16+20}{2}$	
	$= \frac{36}{2}$ ½	
	$= 18$	1
10.	Find the value of ${}^{5}P_{3}$. ½	
	Ans. :	
	${}^{n}P_{r} = \frac{n\,!}{(n-r)\,!}$	
	${}^{5}P_{3} = \frac{5\,!}{(5-3)\,!}$	
	$= \frac{5 \times 4 \times 3 \times 2\,!}{2\,!}$	
	$= 60$ ½	1
11.	The probability of winning a game is 0·8. What is the probability of losing the same game ?	
	Ans. :	
	$P(\overline{A}) = 1 - P(A)$ ½	
	$= 1 - 0{\cdot}8$	
	$= 0{\cdot}2$ ½	1

Qn. Nos.	Value Points		Marks allotted
12.	The Mean ($\overline{x}$) of certain scores is 60 and the standard deviation (σ) of the same scores is 3. Find the coefficient of variation of the scores.		
	Ans. :		
	$C.V. = \frac{\sigma}{\overline{X}} \times 100$	½	
	$= \frac{3}{60} \times 100$		
	$= 5$	½	1
13.	Find the remainder obtained when $P(x) = 4x^2 - 7x + 9$ is divided by $(x - 2)$.		
	Ans. :		
	$\begin{array}{r\|l} & \quad 4x + 1 \\ \hline x-2 & \cancel{4x^2} - 7x + 9 \\ & \cancel{4x^2} - 8x \\ & (-) \quad (+) \\ \hline & \qquad \cancel{x} + 9 \\ & \qquad \cancel{x} - 2 \\ & \qquad (-) \quad (+) \\ \hline & \qquad\quad + 11 \end{array}$	1	1
	Remainder is + 11		
	Alternate method :		
	$f(x) = 4x^2 - 7x + 9$		
	$f(2) = 4(2)^2 - 7(2) + 9$	½	
	$= 4(4) - 14 + 9$		
	$= 16 - 14 + 9 = 11$	½	1

Qn. Nos.	Value Points	Marks allotted
	Alternate method :	
	$x - 2 = 0 \Rightarrow x = 2$	
	$\begin{array}{c\|ccc} 2 & 4 & -7 & 9 \\ & & 8 & 2 \\ \hline & 4 & 1 & \boxed{11} \end{array}$ 1	1
	Remainder is 11.	
14.	Write the discriminant of the quadratic equation $ax^2 + c = 0$.	
	Ans. :	
	$\Delta = -4ac$	1
III. 15.	In a group of 60 people, 40 people like to read newspapers, 35 people like to read magazines and 26 people like to read both. Find the number of people who read neither newspapers nor magazines. 2	
	Ans. :	
	$n(\cup) = 60, \quad n(N) = 40, \quad n(M) = 35, \quad n(N \cap M) = 26.$	
	$n(M) + n(N) = n(M \cup N) + n(M \cap N)$ ½	
	$35 + 40 = n(M \cup N) + 26$ ½	
	$n(M \cup N) = 75 - 26 = 49$ ½	
	$M \cup N$ = Set of people who read either newspaper or magazine	
	$(M \cup N)^{l}$ = Set of people who read neither newspaper nor magazine	
	$\therefore \quad n(M \cup N)^{l} = n(\cup) - n(M \cup N)$	
	$= 60 - 49$	
	$= 11$ ½	2

Qn. Nos.	Value Points	Marks allotted
16.	Find the tenth term of the progression $\frac{1}{5}$, $\frac{1}{3}$, 1, – 1 , …. . 2	
	Ans. :	
	Given $HP = \frac{1}{5}, \frac{1}{3}, 1, -1, \ldots$	
	In AP 5, 3, 1, – 1, … ½	
	$a = 5, \quad d = 3 - 5 = \; 2, \quad n = 10$	
	$T_n = a + (n - 1) d$ ½	
	$T_{10} = 5 + (10 - 1) (- 2)$	
	$= 5 + 9 (- 2)$	
	$= 5 - 18$ ½	
	$= - 13.$	
	In HP, $T_{10} = - \frac{1}{13}$ ½	2
	Any other alternate method, give full marks.	
17.	Prove that $3 + \sqrt{5}$ is an irrational number. 2	
	Ans. :	
	Let us assume $3 + \sqrt{5}$ is a rational number	
	$\Rightarrow \quad 3 + \sqrt{5} = \frac{p}{q}$ where $p, q \in z$ and $q \neq 0$ ½	
	$\Rightarrow \quad \sqrt{5} = \frac{p}{q} - 3$	
	$\Rightarrow \quad \sqrt{5} = \frac{p - 3q}{q}$	
	$\sqrt{5}$ is a rational number	
	$\because \quad \frac{p - 3q}{q}$ is rational ½	
	But $\sqrt{5}$ is not a rational number	
	This leads to a contradiction, ½	
	$\therefore$ Out assumption that $3 + \sqrt{5}$ is a rational number is wrong.	
	$\therefore$ $3 + \sqrt{5}$ is an irrational number. ½	2

Qn. Nos.	Value Points	Marks allotted
18.	a) State the fundamental principle of counting. b) Write the value of 0 ! 2 *Ans.* : a) If one activity can be done in m different ways and for these m different ways a second activity can be done in n different ways then two activities one after the other can be done in $m \times n$ number of ways. 1 b) $0! = 1$ 1	2
19.	Using a suitable formula calculate the number of diagonals that can be drawn in the given polygon. 2  *Ans.* : Polygon is an octagon $\therefore \quad n = 8$ ½ Total number of sides and diagonals $= {}^{8}C_{2}$ ½ ${}^{n}C_{r} = \frac{n!}{(n-r)!\,r!}$ ${}^{n}C_{2} = \frac{8!}{(8-2)!\,2!}$ ½ $= \frac{8 \times 7 \times \cancel{6!}}{\cancel{6!} \times 2!} = \frac{56}{2} = 28$ Number of diagonals $= 28 - 8 = 20$ ½	2

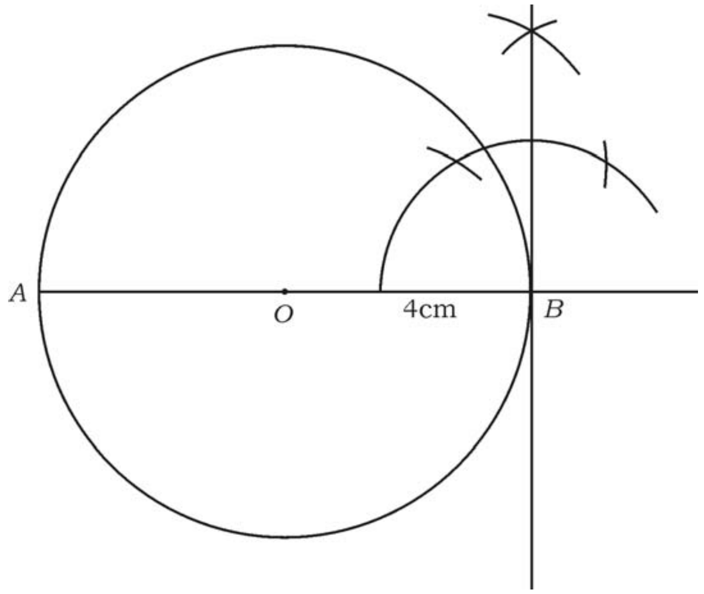
Qn. Nos.	Value Points		Marks allotted
	Alternate method :		
	Polygon is an octagon $\therefore \quad n = 8$	½	
	Number of diagonals $= \dfrac{n(n-3)}{2}$	½	
	$= \dfrac{8(8-3)}{2}$	½	
	$= \dfrac{8 \times 5}{2}$		
	$= 20$	½	2
20.	In an experiment of tossing a fair coin twice, find the probability of getting a) two heads b) exactly one tail.	2	
	Ans. :		
	Sample space : $S = \{(HT), (HH), (TT), (TH)\}$		
	$n(S) = 4$	½	
	$A =$ Event of getting two heads		
	$= \{(HH)\}$		
	$\therefore \quad n(A) = 1$		
	$P(A) = \dfrac{n(A)}{n(S)} = \dfrac{1}{4}$	½	
	$B =$ Event of getting exactly one tail		
	$= \{(HT), (TH)\}$	½	
	$\therefore \quad n(B) = 2$		
	$P(B) = \dfrac{n(B)}{n(S)} = \dfrac{2}{4}$	½	2

Qn. Nos.	Value Points	Marks allotted
21.	Find the product of $\sqrt[3]{2}$ and $\sqrt{3}$. 2 *Ans.* : LCM of order of surds : 6 ½ ∴ $\sqrt[3]{2} = \sqrt[3 \times 2]{2^2} = \sqrt[6]{4}$ ½ $\sqrt{3} = \sqrt[2 \times 3]{3^3} = \sqrt[6]{27}$ ½ ∴ $\sqrt[3]{2} \times \sqrt{3} = \sqrt[6]{4} \times \sqrt[6]{27} = \sqrt[6]{108}$ ½ For any other suitable alternative method give marks.	2
22.	Rationalise the denominator and simplify : 2 $\dfrac{\sqrt{3}}{\sqrt{3}+\sqrt{2}}$ *Ans.* : Rationalising factor of $\sqrt{3}+\sqrt{2}$ is $\sqrt{3}-\sqrt{2}$ ½ $\dfrac{\sqrt{3}}{\sqrt{3}+\sqrt{2}} = \dfrac{\sqrt{3}}{\sqrt{3}+\sqrt{2}} \times \dfrac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}}$ ½ $= \dfrac{\sqrt{3}\,(\sqrt{3}-\sqrt{2})}{(\sqrt{3})^2-(\sqrt{2})^2}$ ½ $= \dfrac{\sqrt{9}-\sqrt{6}}{3-2} = \dfrac{3-\sqrt{6}}{1} = 3-\sqrt{6}$ ½	2
23.	Find the quotient and the remainder using synthetic division : $(x^3+x^2-3x+5) \div (x-1)$. 2 OR If one of the zeros of the polynomial $x^2-x-(2k+2)$ is -4, find the value of k. *Ans.* :	

Qn. Nos.	Value Points		Marks allotted
	$x - 1 = 0 \Rightarrow x = 1$		
	$\begin{array}{c\|cccc} 1 & 1 & 1 & -3 & 5 \\ & & 1 & 2 & -1 \\ \hline & 1 & 2 & -1 & 4 \end{array}$	1	
	Quotient, $Q(x) = x^2 + 2x - 1$	½	
	Remainder, $R(x) = 4$	½	2
	OR		
	Let $p(x) = x^2 - x - (2k + 2)$		
	Given -4 is a zero of $p(x)$		
	$\therefore \quad p(-4) = 0$	½	
	$p(x) = x^2 - x - (2k + 2)$		
	$0 = (-4)^2 - (-4) - (2k + 2)$	½	
	$0 = 16 + 4 - 2k - 2$	½	
	$0 = 18 - 2k$		
	$\Rightarrow \quad 2k = 18 \quad$ or $\quad k = \frac{18}{2} = 9$	½	2

Qn. Nos.	Value Points	Marks allotted
24.	Draw a circle of radius 4 cm and construct a tangent at one end of its diameter. 2	

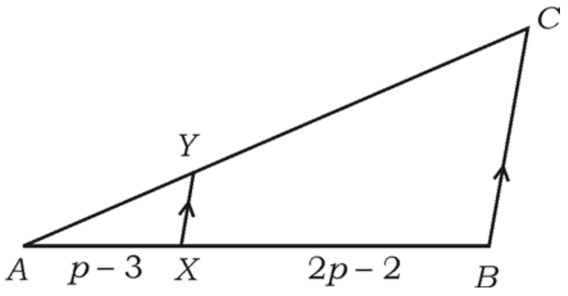
Ans. :



Circle —	½	
Diameter —	½	
Tangent —	1	2

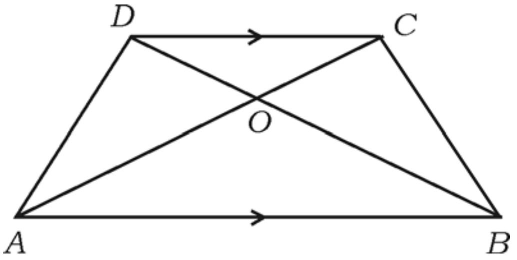
Note : Tangent can be constructed at *A* also.

25. In the following figure, $\overline{AX} = p - 3$, $\overline{BX} = 2p - 2$, $\frac{AY}{YC} = \frac{1}{4}$. Find *p*. 2

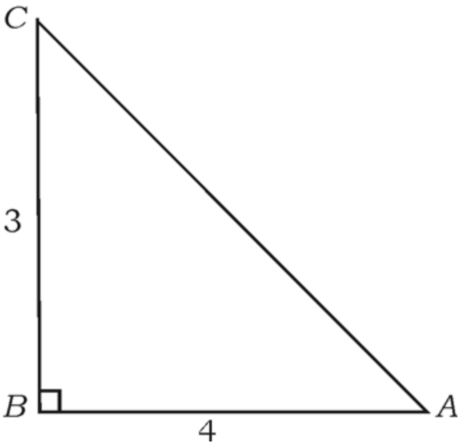


OR

Qn. Nos.	Value Points		Marks allotted
	In the trapezium *ABCD*, $\overline{AB} \parallel \overline{CD}$, $\overline{AB} = 2\overline{CD}$ and area of $\Delta\ AOB$ is 84 cm^2. Find the area of $\Delta\ COD$.		



	Ans. :		
	In $\Delta\ ABC$, $\overline{XY} \parallel \overline{BC}$		
	By Thale's theorem, $\frac{AX}{XB} = \frac{AY}{YC}$	½	
	$\frac{p-3}{2p-2} = \frac{1}{4}$	½	
	Cross multiplying, we get,		
	$4(p-3) = 2p-2$		
	$4p-12 = 2p-2$	½	
	Rearranging,		
	$4p-2p = 12-2$		
	$2p = 10$; $p = \frac{10}{2} = 5$	½	2
	OR		
	In $\Delta\ AOB$ and $\Delta\ COD$,		
	$\underline{\lvert AOB} = \underline{\lvert COD}$ (vertically opposite angles)		
	$\underline{\lvert CDO} = \underline{\lvert OBA}$ (alternate angles)		

Qn. Nos.	Value Points		Marks allotted
	$\therefore$ By AA criteria,		
	$\Delta\, AOB \sim \Delta\, COD$	1	
	$\frac{\text{Area of } \Delta\, AOB}{\text{Area of } \Delta\, COD} = \frac{AB^2}{CD^2}$	½	
	$\frac{84}{\text{Area of } \Delta\, COD} = \frac{(2DC)^2}{CD^2} = \frac{4\cancel{CD^2}}{1\cancel{CD^2}} = \frac{4}{1}$		
	$\Rightarrow$ 4 × Area of $\Delta\, COD = 84$		
	Or Area of $\Delta\, COD = \frac{84}{4} = 21 \text{ cm}^2$.	½	2
26.	Given $\tan A = \frac{3}{4}$, find $\sin A$ and $\cos A$.	2	
	Ans. :		
		1	
	$\tan A = \frac{3}{4}$		
	By Pythagorus theorem,		
	$BC^2 + BA^2 = AC^2$		
	$3^2 + 4^2 = AC^2$		
	$\Rightarrow AC^2 = 25 \Rightarrow AC = 5$	½	
	$\sin A = \frac{opp}{hyp} = \frac{3}{5}$		
	$\cos A = \frac{adj}{hyp} = \frac{4}{5}$	½	2

Qn. Nos.	Value Points	Marks allotted

27. Find the equation of a line having angle of inclination 45° and y-intercept is 2. 2

Ans. :

$\theta = 45°$, $m = \tan\theta$ $c = 2$ ½

$m = \tan 45° = 1$ ½

$y = mx + c$ ½

$y = (1)x + 2 \Rightarrow y = x + 2$ or $x - y + 2 = 0$ ½ 2

28. Find the distance between the points $A(6, 5)$ and $B(4, 4)$. 2

Ans. :

(x_1, y_1) (x_2, y_2)

$A(6, 5)$ $B(4, 4)$

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

$= \sqrt{(4-6)^2 + (4-5)^2}$ ½

$= \sqrt{(-2)^2 + (-1)^2}$ ½

$= \sqrt{4+1} = \sqrt{5}$ ½ 2

29. The curved surface area of a right circular cone is 4070 cm^2 and its slant height is 37 cm. Find the radius of the base of the cone. 2

Ans. :

Curved Surface Area (CSA) = 4070

Slant height, $l = 37$ cm

$r = ?$

$\text{CSA} = \pi r l$ ½

$4070 = \frac{22}{7} \times r \times 37$ ½

Rearranging, $r = \frac{\overset{110}{\cancel{4070}} \times 7}{22 \times \underset{1}{\cancel{37}}} = \frac{110 \times 7}{22}$ ½

$r = 35$ cm ½ 2

Qn. Nos.	Value Points	Marks allotted
30.	Draw a plan of a level ground using the information given below : 2	

(Scale 20 m = 1 cm)

	Metre To C	
	220	
To D 100	160	
	120	80 to B
To E 60	80	
	From A	

Ans. :

$80 \text{ m} = \frac{80}{20} = 4 \text{ cm}$

$120 \text{ m} = \frac{120}{20} = 6 \text{ cm}$

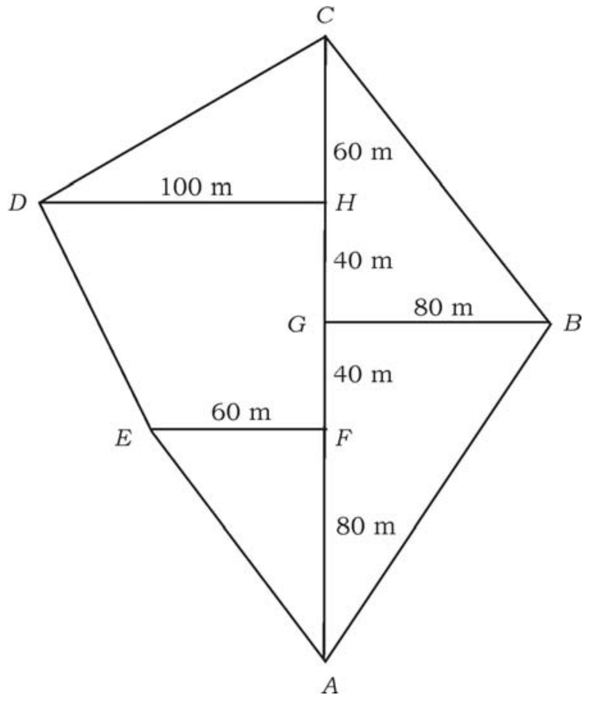
$160 \text{ m} = \frac{160}{20} = 8 \text{ cm}$ ½

$220 \text{ m} = \frac{220}{20} = 11 \text{ cm}$

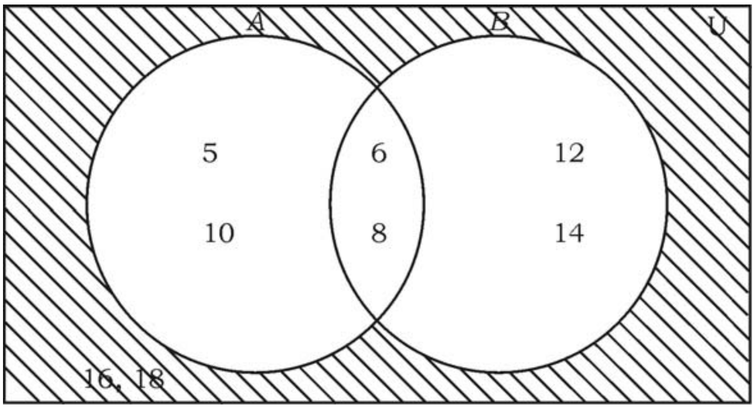
$60 \text{ m} = \frac{60}{20} = 3 \text{ cm}$

$100 \text{ m} = \frac{100}{20} = 5 \text{ cm}$

2



1½

Qn. Nos.	Value Points		Marks allotted
31.	Given $U = \{ 5, 6, 8, 10, 12, 14, 16, 18 \}$, $A = \{ 5, 6, 8, 10 \}$ and $B = \{ 6, 8, 12, 14 \}$. Represent $(A \cup B)'$ by a Venn diagram.	2	
	Ans. :		
			
	Rectangle —	½	
	2 circles —	1	
	Shading —	½	2
32.	If $T_n = n^2 + 4$ and $T_n = 200$, find the value of n.	2	
	Ans. :		
	$T_n = n^2 + 4$		
	$200 = n^2 + 4$	½	
	$\Rightarrow \quad n^2 + 4 = 200$	½	
	$n^2 = 200 - 4 = 196$	½	
	$n = \sqrt{196} \quad \Rightarrow \quad n = 14$	½	2
33.	Find the sum of $\left(4\sqrt{x} + 6\sqrt{y} \right)$ and $\left(5\sqrt{x} - 3\sqrt{y} \right)$.	2	
	Ans. :		
	$(4\sqrt{x} + 6\sqrt{y}) + (5\sqrt{x} - 3\sqrt{y})$	½	
	$= \quad 4\sqrt{x} + 5\sqrt{x} + 6\sqrt{y} - 3\sqrt{y}$	½	
	$= \quad (4 + 5) \sqrt{x} + (6 - 3) \sqrt{y}$	½	
	$= \quad 9\sqrt{x} + 3\sqrt{y}$	½	2

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

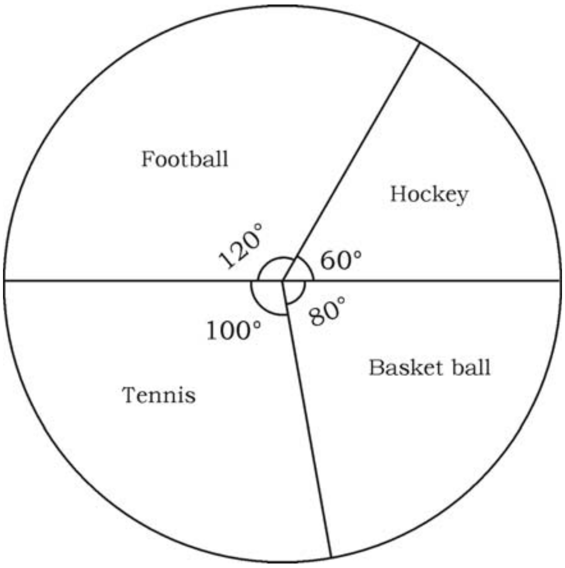
34. The number of students who are willing to join their favourite sports is given below. Draw a pie chart to represent the data : 2

Name of the sport	*Number of students*
Hockey	3
Football	6
Tennis	5
Basket Ball	4

Ans. :

Name of the sport	*Number of students*	*Angle*
Hockey	3	$\frac{3}{18} \times 3\cancel{60}^{\circ}\ ^{20}$ $= 3 \times 20^{\circ} = 60^{\circ}$
Football	6	120°
Tennis	5	100°
Basketball	4	80°

Total = 18



Calculation — ½

Pi-chart — 1½ 2

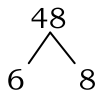
Qn. Nos.	**Value Points**	**Marks allotted**

35. Find the zeros of the polynomial $p(x) = x^2 + 14x + 48$. 2

Ans. :

$p(x) = x^2 + 14x + 48$

$x^2 + 14x + 48 = 0$ ½



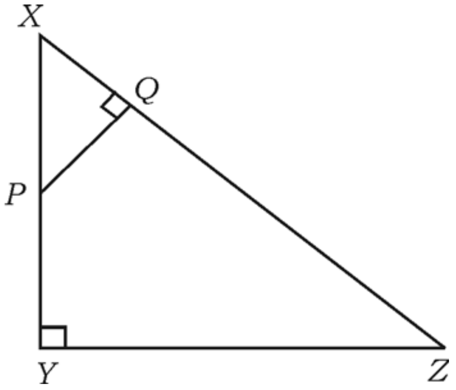
$(x+6)(x+8) = 0$ ½

$x + 6 = 0 \Rightarrow x = -6$ ½

$x + 8 = 0 \Rightarrow x = -8$

$-6, -8$ are the zeros of the given polynomial ½ — 2

36. In $\triangle XYZ$, P is a point on $\overline{XY}$ as shown in the figure. If $\overline{PQ} \perp \overline{XZ}$, $\overline{XP} = 4$ cm, $\overline{XY} = 16$ cm and $\overline{XZ} = 24$ cm, find the length of $\overline{XQ}$. 2



Ans. :

In $\triangle XYZ$ and $\triangle PQX$

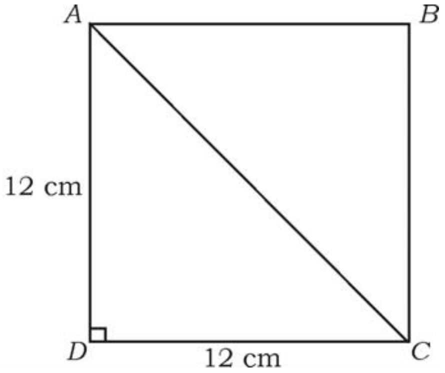
$\angle XYZ = \angle PQX = 90°$

$\angle X$ is common ½

By AA criteria

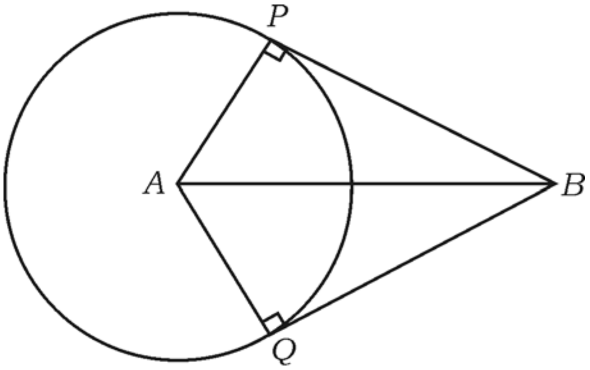
$\triangle XYZ \sim \triangle PQX$

$$\frac{\overline{XY}}{\overline{XQ}} = \frac{\overline{XZ}}{\overline{XP}}$$ ½

Qn. Nos.	Value Points		Marks allotted
	$\Rightarrow \quad \frac{16}{\overline{XQ}} = \frac{24}{4} \qquad \Rightarrow \quad \overline{XQ} = \frac{16 \times 4}{24} = \frac{8}{3}$	½	
	$= 2\frac{2}{3}$ cm	½	2
37.	Find the length of the diagonal of a square of side 12 cm.	2	
	Ans. :		
		½	
	AC is a diagonal		
	In Δ^{le} ADC,		
	By Pythagorus theorem,		
	$AC^2 = AD^2 + DC^2$	½	
	$= 12^2 + 12^2 = 144 + 144$		
	$= 2 \times 144$	½	
	$AC = \sqrt{2 \times 144}$		
	$\therefore \quad AC = 12\sqrt{2}$ cm	½	2
38.	Form the quadratic equation whose roots are 3 and 5.	2	
	Ans. :		
	$m = 3, \quad n = 5$	½	
	$x^2 - (m + n)x + mn = 0$	½	
	$x^2 - (3 + 5)x + (3)(5) = 0$	½	
	$x^2 - 8x + 15 = 0$	½	2

Qn. Nos.	Value Points	Marks allotted
39.	Find the co-ordinates of the mid-point of the line joining the points (5, 6) and (– 3, 8). 2	
	Ans. :	
	$(x_1 , y_1) = (5, 6)$ $(x_2 , y_2) = (-3, 8)$	
	$P (x, y) = \left[\frac{x_1 + x_2}{2} , \frac{y_1 + y_2}{2} \right]$ ½	
	$= \left[\frac{5-3}{2}, \frac{6+8}{2} \right]$ ½	
	$= \left[\frac{2}{2}, \frac{14}{2} \right]$ ½	
	$= [1, 7]$ ½	2
40.	If $\tan 2A = \cot (A - 18°)$, where $2A$ is an acute angle, then find the value of A. 2	
	Ans. :	
	$\tan 2A = \cot (A - 18°)$	
	$\cot (90° - 2A) = \cot (A - 18°)$ ½	
	$\Rightarrow$ $90° - 2A = A - 18°$ ½	
	$\Rightarrow$ Rearranging the terms, $3A = 90° + 18° = 108°$ ½	
	$A = \frac{108°}{3} = 36°$ ½	2
IV. 41.	Prove that the tangents drawn from an external point to a circle a) are equal b) subtend equal angles at the centre c) are equally inclined to the line joining the centre and the external point. 3	
	Ans. :	

Qn. Nos.	Value Points	Marks allotted



½

Data : A is the centre of the circle. B is an external point.

$\overline{BP}$ and $\overline{BQ}$ are the tangents ½

AP, AQ, AB are joined.

To prove :

a) $\overline{BP} = \overline{BQ}$

b) $\angle PAB = \angle QAB$ ½

c) $\angle PBA = \angle QBA$

Proof :

Statement	*Reason*
In ΔAPB and ΔAQB $\angle APB = \angle AQB = 90°$	Radius drawn at the point of contact is perpendicular to the tangent
$hyp\ AB = hyp\ AB$	Common side 1½

3

$\therefore$ $AP = AQ$ Radii of the same circle

$\therefore$ $\Delta APB \cong \Delta AQB$ RHS theorem

$\therefore$ a) $BP = BQ$

b) $\angle PAB = \angle QAB$ CPCT

c) $\angle PBA = \angle QBA$

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

42. The circumference of the circular base of a right cylindrical vessel is 132 cm and its height is 25 cm. Calculate the maximum quantity of water it can hold. (Use $\pi = \frac{22}{7}$). 3

OR

A solid metallic right circular cone is of height 20 cm and its base radius is 5 cm. This cone is melted and recast into a solid sphere. Find the radius of the sphere. (Use $\pi = \frac{22}{7}$).

Ans. :

$C = 132$ cm, $h = 25$ cm, $r = ?$ $V = ?$

$C = 2\pi r$ ½

$132 = 2 \times \frac{22}{7} \times r$ ½

Rearranging the terms,

$r = \frac{132 \times 7}{22 \times 2} = \frac{\cancel{132} \times 7}{\cancel{44}} = 21$ cm ½

Volume, $V = \pi r^2 h$ ½

$= \frac{22}{7} \times (21)^2 \times 25$

$= \frac{22}{7} \times 21 \times 21 \times 25$ ½

$= 34650 \text{ cm}^3$ ½ 3

OR

Cone, $h = 20$ cm, $r = 5$ cm ½

$V_{cone} = \frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \frac{22}{7} \times 5^2 \times 20$

Sphere, $r = ?$

Qn. Nos.	Value Points		Marks allotted
	$V_{sphere} = \frac{4}{3}\pi r^3$	½	
	Volume of cone is equal to volume of sphere		
	$V_{cone} = V_{sphere}$	½	
	$\frac{1}{3} \times \frac{22}{7} \times 5^2 \times 20 = \frac{4}{3} \times \frac{22}{7} \times r^3$	½	
	Rearranging, we get		
	$r^3 = \frac{5^2 \times 20}{4} = 5^2 \times 5 = 5^3$	½	
	$r = 5$ cm.	½	3
43.	Find the standard deviation for the following data :	3	

Marks (x)	*Number of students (f)*
35	2
40	4
45	8
50	4
55	2

Ans. :

Actual Means method :

x	f	fx	$d = x - \overline{x}$	d^2	fd^2
35	2	70	– 10	100	200
40	4	160	– 5	25	100
45	8	360	0	0	0
50	4	200	5	25	100
55	2	110	10	100	200

1½

$N = \sum f = 20$ $\sum fx = 900$ $\sum fd^2 = 600$

Qn. Nos.	Value Points		Marks allotted
	Mean, $\bar{x} = \dfrac{\Sigma f x}{N}$		
	$= \dfrac{900}{20}$	½	
	$= 45$		
	S.D. $= \sigma = \sqrt{\dfrac{\Sigma f d^2}{N}}$	½	
	$= \sqrt{\dfrac{600}{20}}$		
	$= \sqrt{30}$	½	
	$= 5{\cdot}5$		3

Step deviation method : $C = 5$

Let $A = 45$

x	f	*Step deviation* $d = \dfrac{X - A}{C}$	$f d$	d^2	$f d^2$
35	2	-2	-4	4	8
40	4	-1	-4	1	4
45	8	0	0	0	0
50	4	$+1$	4	1	4
55	2	$+2$	4	4	8

1½

$N = 20$ $\Sigma f d = 0$ $\Sigma f d^2 = 24$

Qn. Nos.	Value Points	Marks allotted
	Standard deviation $\sigma = \sqrt{\frac{\sum f d^2}{N} - \left(\frac{\sum f d}{N}\right)^2} \times C$ ½	
	$= \sqrt{\frac{24}{20} - \left(\frac{0}{20}\right)^2} \times 5$ ½	
	$= \sqrt{1 \cdot 2} \times 5$	
	$= 1{\cdot}1 \times 5$ ½	
	$= 5{\cdot}5$	3

Direct method :

x	f	fx	x^2	fx^2
35	2	70	1225	2450
40	4	160	1600	6400
45	8	360	2025	16200
50	4	200	2500	10000
55	2	110	3025	6050

1½

$\sum f x = 900$ $\sum f x^2 = 41{,}100$

Standard deviation $\sigma = \sqrt{\frac{\sum f x^2}{N} - \left(\frac{\sum f x}{N}\right)^2}$ ½

$= \sqrt{\frac{41100}{20} - \left(\frac{900}{20}\right)^2}$ ½

$= \sqrt{2055 - (45)^2}$

$= \sqrt{2055 - 2025}$

$= \sqrt{30}$

$= 5{\cdot}5$ ½ 3

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

Assumed mean method :

Let assumed mean, $A = 45$

x	f	$d = x - A$	fd	d^2	fd^2
35	2	– 10	– 20	100	200
40	4	– 5	– 20	25	100
45	8	0	0	0	0
50	4	5	20	25	100
55	2	10	20	100	200

1½

$N = 20$ $\sum fd = 0$ $\sum fd^2 = 600$

Standard deviation $\sigma = \sqrt{\frac{\sum fd^2}{N} - \left(\frac{\sum fd}{N}\right)^2}$ ½

$= \sqrt{\frac{600}{20} - \left(\frac{0}{20}\right)^2}$ ½

$= \sqrt{30 - 0}$

$= \sqrt{30}$

$= 5 \cdot 5$ ½ 3

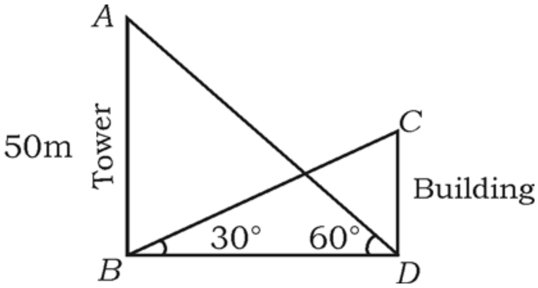
44. A building and a tower are on the same level ground. The angle of elevation of the top of the building from the foot of the tower is 30°. The angle of elevation of the top of the tower from the foot of the building is 60°. If the height of the tower is 50 m, then find the height of the building. 3

OR

Prove that $\sqrt{\frac{1 + \sin A}{1 - \sin A}} = \sec A + \tan A$.

Ans. :

Qn. Nos.	Value Points	Marks allotted



$CD = ?$ ½

In $\Delta\ ABD$,

$$\tan 60° = \frac{AB}{BD}$$

$$\sqrt{3} = \frac{50}{BD}$$ ½

$$\Rightarrow \quad BD = \frac{50}{\sqrt{3}} \text{ m}$$

In $\Delta\ BDC$,

$$\tan 30° = \frac{CD}{BD}$$ ½

$$\frac{1}{\sqrt{3}} = \frac{CD}{\frac{50}{\sqrt{3}}}$$ ½

$$\Rightarrow \quad CD = \frac{50}{\sqrt{3}} \times \frac{1}{\sqrt{3}}$$ ½

$$= \frac{50}{3} = 16\frac{2}{3}$$ ½ 3

The height of the building is $16\frac{2}{3}$ m

OR

$$\text{LHS} = \sqrt{\frac{1+\sin A}{1-\sin A}}$$

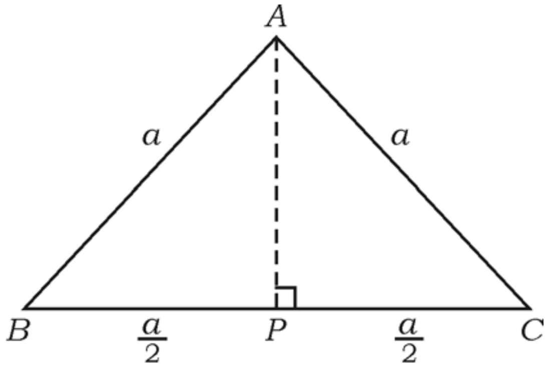
$$= \frac{\sqrt{1+\sin A}}{\sqrt{1-\sin A}} \times \frac{\sqrt{1+\sin A}}{\sqrt{1+\sin A}}$$ ½

Multiplying and dividing by $\sqrt{1+\sin A}$

Qn. Nos.	**Value Points**		**Marks allotted**
	$= \frac{\sqrt{(1+\sin A)^2}}{\sqrt{1-\sin^2 A}}$	½	
	$= \frac{1+\sin A}{\sqrt{\cos^2 A}}$	½	
	$= \frac{1+\sin A}{\cos A}$	½	
	$= \frac{1}{\cos A} + \frac{\sin A}{\cos A}$	½	
	$= \sec A + \tan A.$	½	3
45.	Solve by using formula :	3	
	$x^2 - 2x + 3 = 3x + 1.$		
	OR		
	If m and n are the roots of the quadratic equation $x^2 - 6x + 2 = 0$, then find the value of		
	a) $\frac{1}{m} + \frac{1}{n}$		
	b) $(m+n)(mn)$.		
	Ans. :		
	$x^2 - 2x + 3 = 3x + 1$		
	$x^2 - 2x + 3 - 3x - 1 = 0$	½	
	$x^2 - 5x + 2 = 0$	½	
	When compared with $ax^2 + bx + c = 0$, $a = 1$, $b = -5$, $c = 2$		
	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	½	

Qn. Nos.	Value Points		Marks allotted
	$= \dfrac{-(-5) \pm \sqrt{(-5)^2 - 4(1)(2)}}{2(1)}$	½	
	$= \dfrac{5 \pm \sqrt{25-8}}{2}$	½	
	$= \dfrac{5 \pm \sqrt{17}}{2}$	½	
	$x = \dfrac{5+\sqrt{17}}{2}$ or $x = \dfrac{5-\sqrt{17}}{2}$		3
	OR		
	$x^2 - 6x + 2 = 0$		
	When compared with $ax^2 + bx + c = 0$, $a = 1$, $b = -6$, $c = 2$		
	Sum of the roots, $m + n = \dfrac{-b}{a} = \dfrac{-(-6)}{1} = 6$	½	
	Product of the roots, $mn = \dfrac{c}{a} = \dfrac{2}{1} = 2$	½	
	a) $\dfrac{1}{m} + \dfrac{1}{n} = \dfrac{m+n}{mn} = \dfrac{6}{2} = 3$	1	
	b) $(m+n)(mn) = (6)(2) = 12$	1	3
46.	Prove that the area of an equilateral triangle of side '*a*' units is $\dfrac{a^2\sqrt{3}}{4}$ square units.	3	
	OR		
	ΔABC is right angled triangle right angled at *C*. *D* is a point on the side $\overline{AC}$ and *E* is a point on the side $\overline{BC}$. Show that $AB^2 + DE^2 = AE^2 + BD^2$.		
	Ans. :		

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



½

In equilateral triangle ABC, $\overline{AB} = \overline{BC} = \overline{AC} = a$

AP is perpendicular to BC drawn from A

$\therefore \quad \overline{BP} = \overline{PC} = \frac{BC}{2} = \frac{a}{2}$ units

In ⊿ ABP, ½

$AB^2 = AP^2 + BP^2$

$a^2 = AP^2 + \left(\frac{a}{2}\right)^2$

$a^2 - \frac{a^2}{4} = AP^2$

$AP^2 = \frac{4a^2 - a^2}{4} = \frac{3a^2}{4}$ ½

$AP = \sqrt{\frac{3a^2}{4}} = \frac{a\sqrt{3}}{2}$ units ½

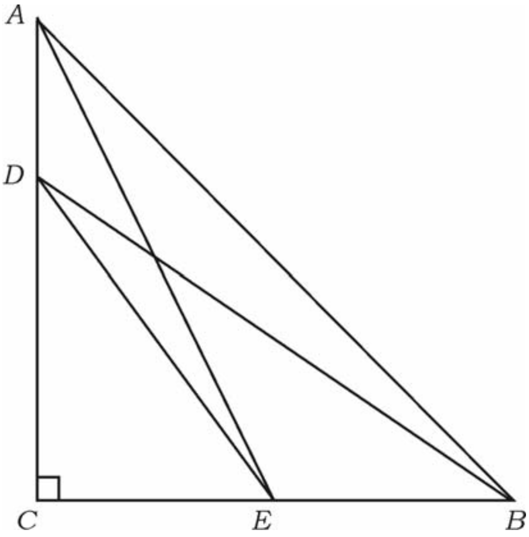
Area of $\Delta\, ABC = \frac{1}{2} \times$ base × height ½

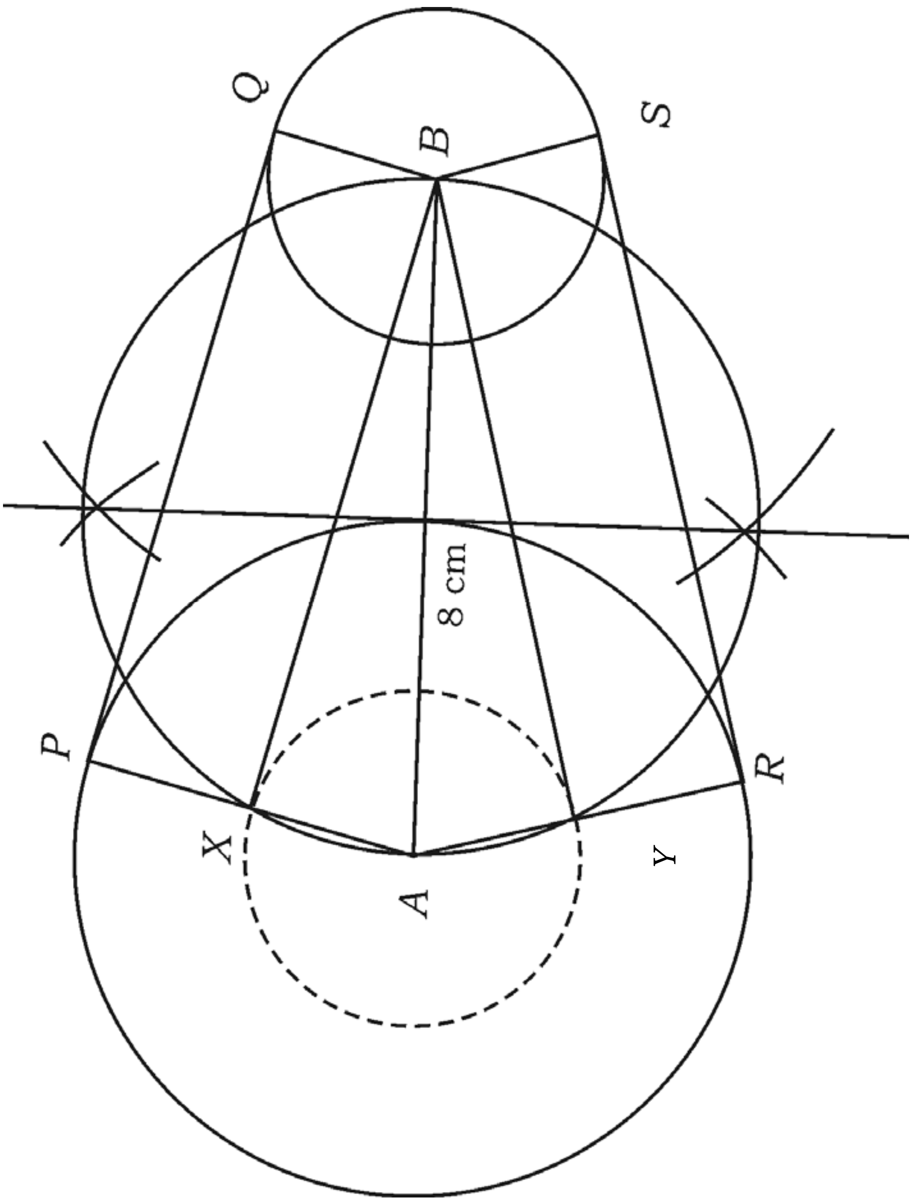
$= \frac{1}{2} \times \overline{BC} \times \overline{AP}$

$= \frac{1}{2} \times a \times \frac{a\sqrt{3}}{2}$

$= \frac{a^2\sqrt{3}}{4}$ square units. ½ 3

OR

Qn. Nos.	**Value Points**	**Marks allotted**
	 ½	
	In $\triangle$ ABC, $AB^2 = AC^2 + BC^2$ ½	
	(using Pythagorus theorem)	
	In $\triangle$ CDE, $DE^2 = CD^2 + CE^2$ ½	
	In $\triangle$ DCB, $DB^2 = DC^2 + CB^2$	
	In $\triangle$ ACE, $AE^2 = AC^2 + CE^2$ ½	
	LHS = $AB^2 + DE^2$	
	= $AC^2 + BC^2 + CD^2 + CE^2$ ½	
	= $(AC^2 + CE^2) + (BC^2 + CD^2)$ (rearranging terms)	
	= $AE^2 + DB^2$ ½	
	= RHS	3

Qn. Nos.	Value Points	Marks allotted
V. 47.	Construct direct common tangents to two circles of radii 4 cm and 2 cm whose centres are 8 cm apart. 4 *Ans.* : Drawing circles — 2 Marking points — 1 Drawing tangents — 1  *PQ* and *RS* are the required tangents	4

Qn. Nos.	Value Points	Marks allotted

48. Find the sum of first ten terms of an Arithmetic progression whose fourth term is 13 and eighth term is 29. 4

OR

Find the three consecutive terms of a Geometric progression whose sum is 14 and their product is 64.

Ans. :

Fourth term, $T_4 = a + 3d$

$13 = a + 3d$ ... (i) ½

Eighth term, $T_8 = a + 7d$

$29 = a + 7d$ ... (ii) ½

Equ. (ii) — Eqn. (i) $\Rightarrow$

$$\begin{array}{rcrcl} 29 & = & a & + & 7d \\ 23 & = & a & + & 3d \\ (-) & & (-) & & (-) \\ \hline 16 & = & & & 4d \end{array}$$ ½

$4d = 16 \; ; \quad d = \frac{16}{4} = 4$ ½

$a + 7d = 29$

$a + 7(4) = 29$

$a + 28 = 29$

$a = 29 - 28 = 1$ $a = 1, \quad d = 4$ ½

$S_n = \frac{n}{2}\{2a + (n-1)d\}$ ½

$S_{10} = \frac{10}{2}\{2(1) + (10-1)(4)\}$ ½

$= 5\{2 + 9(4)\}$

$= 5[38] = 190$ $S_{10} = 190$ ½ 4

OR

Qn. Nos.	Value Points	Marks allotted

Let the Geometric progression be

$\frac{a}{r}$, a , ar ... (i) ½

Sum of the terms, $\frac{a}{r} + a + ar = 14$ ... (ii) ½

Product of the terms, $\left(\frac{a}{r}\right) a\,(ar) = 64$ ½

$\Rightarrow \quad a^3 = 64, \quad a = \sqrt[3]{64}$

$\Rightarrow \quad a = 4$ ½

Eq. (ii) $\Rightarrow \frac{4}{r} + 4 + 4r = 14$

$\frac{4 + 4r + 4r^2}{r} = 14$ ½

$\Rightarrow \quad 4 + 4r + 4r^2 = 14r$

$\Rightarrow \quad 4r^2 - 10r + 4 = 0$ (rearranging) ½

$2r^2 - 5r + 2 = 0$ (dividing by 2)

$2r^2 - 4r - r + 2 = 0$

$2r(r - 2) - 1(r - 2) = 0$

$(2r - 1)(r - 2) = 0$

$r = \frac{1}{2}$ or $r = 2$ ½

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

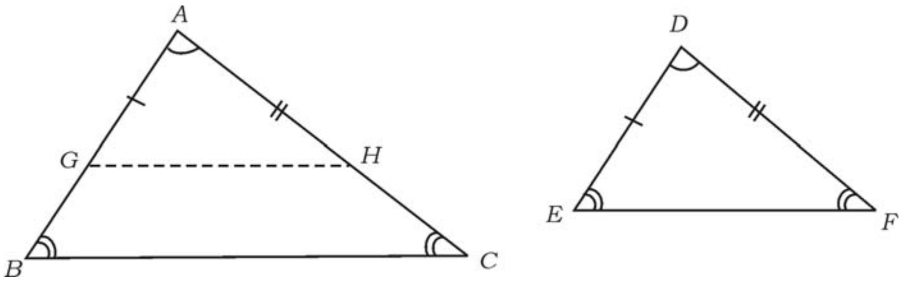
When $r = \frac{1}{2}$,	When $r = 2$
$\frac{a}{r} = \frac{4}{\frac{1}{2}} = 8$	$\frac{a}{r} = \frac{4}{2} = 2$
$a = 4$	$a = 4$
$ar = 4\left(\frac{1}{2}\right) = 2$	$ar = 4(2)$
	$h = 8$ ½

4

any other alternate method should given full marks

49. Prove that "if two triangles are equiangular, then their corresponding sides are in proportion". 4

Ans. :



½

Data : In ΔABC and ΔDEF,

$$\underline{|DEF} = \underline{|ABC}$$ ½

$$\underline{|ACB} = \underline{|DFE}$$

To prove : $\frac{AB}{DE} = \frac{AC}{DF} = \frac{BC}{EF}$ ½

Construction : Mark points G and H on $\overline{AB}$ and $\overline{AC}$ such that

$\overline{AG} = \overline{DE}$, $\overline{AH} = \overline{DF}$, join G and H. ½

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

Proof :

Statement	*Reason*
In $\Delta\ AGH$ and $\Delta\ DEF$,	
$\overline{AG} = \overline{DE}$	Construction
$\underline{\lvert GAH} = \underline{\lvert EDF}$	Data
$\overline{AH} = \overline{DF}$	Construction
$\therefore\ \Delta\ AGH \cong \Delta\ DEF$	SAS
$\underline{\lvert AGH} = \underline{\lvert DEF}$	CPCT
But $\underline{\lvert ABC} = \underline{\lvert DEF}$	Data 2
$\Rightarrow\ \underline{\lvert AGH} = \underline{\lvert ABC}$	Axiom-1
$\therefore\ \overline{GH} \parallel \overline{BC}$	If the corresponding angles, are equal, then lines are parallel

$\therefore$ In $\Delta\ ABC$, $\frac{AB}{AG} = \frac{BC}{GH} = \frac{AC}{AH}$ Corollary of Thale's theorem 4

Hence, $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$ $\Delta\ AGH \cong \Delta\ DEF$

50. Solve graphically : $x^2 - x - 2 = 0$. 4

Ans. :

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

$y = x^2$ and $y = x + 2$

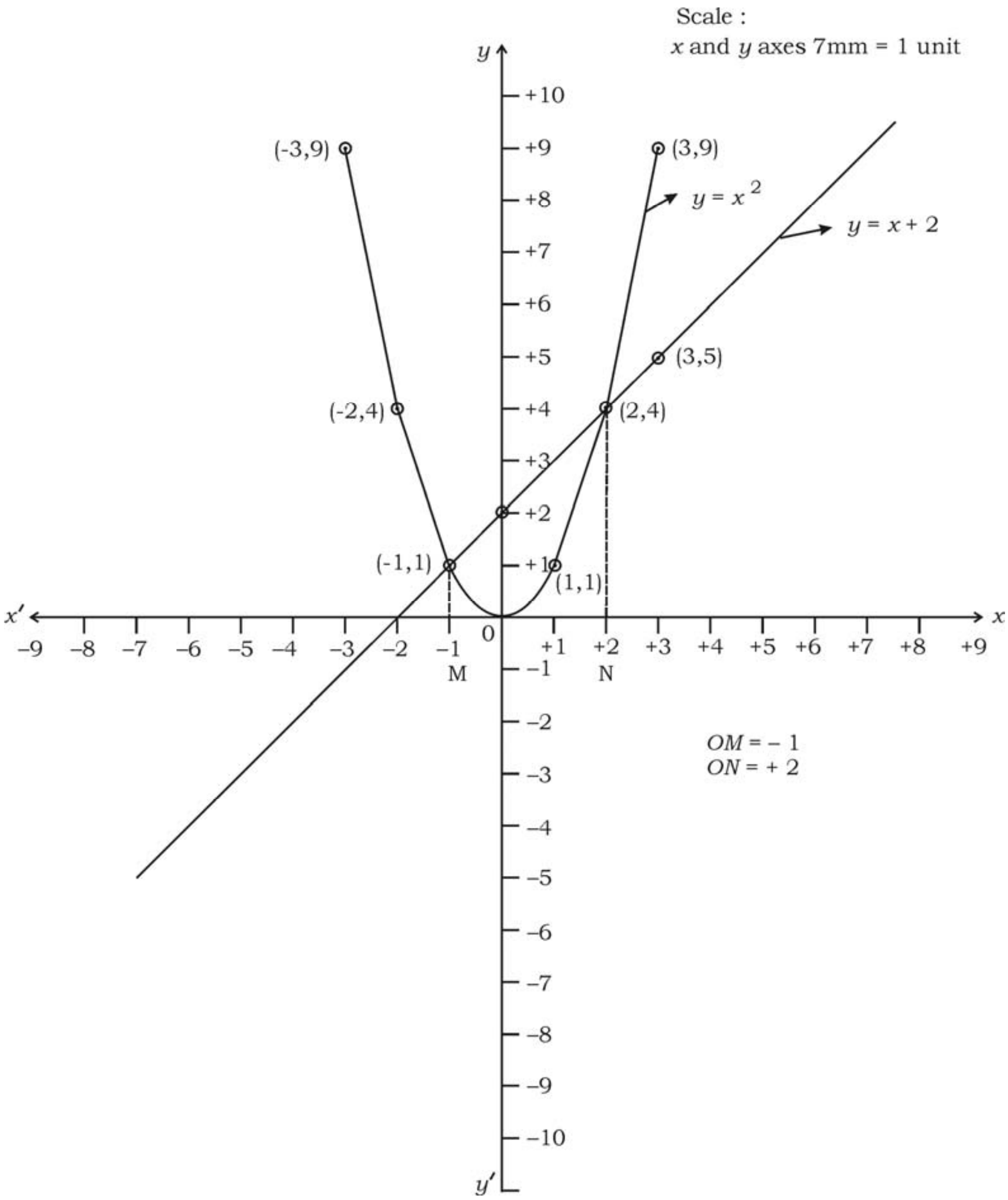
$y = x^2$

x	0	1	– 1	2	– 2	3	– 3
y	0	1	1	4	4	9	9

$y = x + 2$

x	0	2	3
y	2	4	5

Qn. Nos.	**Value Points**	**Marks allotted**
	Tables — 2 Drawing parabola — 1 Drawing line — ½ Identifying roots — ½	4



Qn. Nos.	Value Points	Marks allotted

Alternate method :

$$x^2 - x - 2 = 0$$

$$y = x^2 - x - 2$$

x	0	1	– 1	2	– 2	3	– 3	4
y	– 2	– 2	0	0	4	4	10	10

XY table — 2

Parabola — 1

Identifying roots — 1 4