BAL BHARATI PUBLIC SCHOOL

PRE-BOARD EXAMINATION (2023-24)

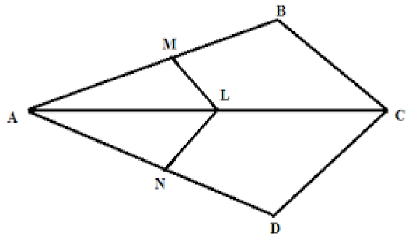
Subject –Mathematics Basic(241)

Class - X

Answer Key for Set – A

Marking scheme		
Section - A		
Q1.	c) x^2y^2	1
Q2.	a)2	1
Q3.	b)2/3	1
Q4.	d)(0, -3)	1
Q5.	a)2	1
Q6.	d) $1/6$	1
Q7.	b)12.5	1
Q8.	d) ΔPQR ~ ΔNSM	1
Q9	a)10	1
Q10.	c) 15°	1
Q11.	a)0	1
Q12.	b) 60°	1
Q13.	c) 75°	1
Q14.	c)4	1
Q15.	a)10	1
Q16.	c)550 cm^2	1
Q17.	c) 30 – 40	1
Q18.	b) 17.5	1
Q19.	a) Both A and R are true and R is the correct explanation for A.	1
Q20.	c) A is true but R is false.	1
Section – B		
Q21.	2x + 3y = 7 (k – 1)x + (k + 2)y = 3k So for infinite many solutions $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ $\frac{2}{k-1} = \frac{3}{k+2} = \frac{7}{3k}$ $\Rightarrow \frac{2}{k-1} = \frac{3}{k+2}$ ⇒2k + 4 = 3k – 3 ⇒ k = 7 Hence the value of k is 7.	1 1

Q22.



In ΔABC, ML ∥ BC

So by BPT, $\frac{AM}{AB} = \frac{AL}{AC}$ ……………………(i) ½

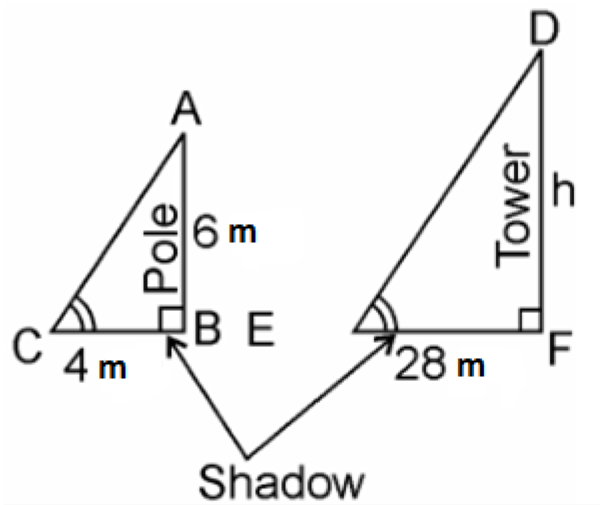
In ΔADC, NL ∥ DC ½

So by BPT, $\frac{AN}{AD} = \frac{AL}{AC}$ ……………………(ii)

From (i) and (ii) 1

$$\frac{AM}{AB} = \frac{AN}{AD}$$

Or



Length of the vertical pole = 6m (Given)

Length of the shadow of the pole = 4 m (Given)

Let Height of tower = h m

Length of shadow of the tower = 28 m (Given) 1

In ΔABC and ΔDEF,

∠C = ∠E (angular elevation)

∠B = ∠F= 90°

∴ΔABC ~ ΔDFE (By AA similarity criterion)

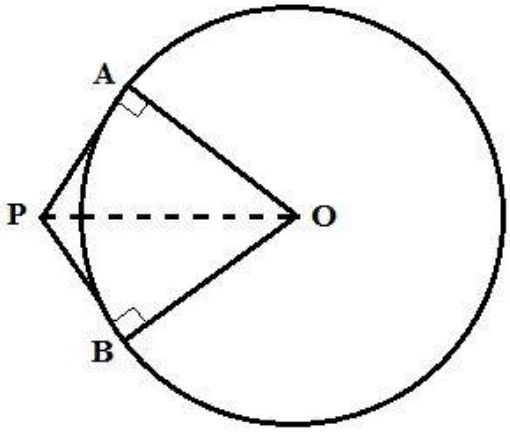
∴ $\frac{AB}{DF} = \frac{BC}{EF}$ (If two triangles are similar then their corresponding sides are proportional.)

∴ $\frac{6}{h} = \frac{4}{28}$

⇒h = $\frac{\mathbf{6\times28}}{4}$

⇒h = 6×7 1

⇒h = 42m

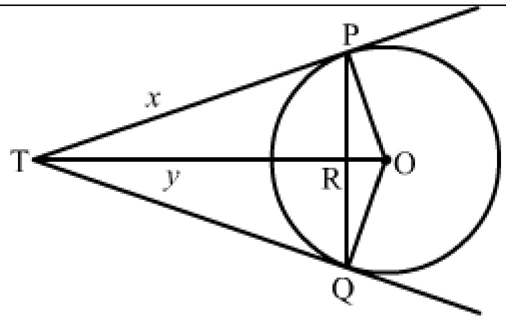
Q23.	 Triangles PAO and PBO can be proved congruent using RHS criterion. Thus, ∠APO = ∠BPO (CPCT) Given that ∠APB = 120° ∠APB = ∠APO + ∠BPO = 2∠APO = ∠120° ∠APO = 60° In triangle APO cos 60° = $\frac{1}{2} = \frac{AP}{PO}$ Thus, OP = 2AP Hence Proved	1 1
Q24.	sin (A + B) = 1 so sin(A + B) = sin 90° ⇒ A + B = 90°…………………………(i) cos(A – B) = $\frac{\sqrt{3}}{2}$ so cos(A – B) = cos 30° ⇒ A – B = 30° ……..…………………(ii) From (i) and (ii) A = 60° and B = 30° **Or** cos A + $\cos^2$A = 1 ⇒ cos A = 1 - $\cos^2$A ⇒ cos A = $\sin^2$ A ……………………(i) so $\sin^2$A + $\sin^4$A = $\sin^2$A + $(\sin^2 A)^2$ = cos A + $\cos^2$ A (By using (i)) = 1	½ ½ 1 1 1
Q25.	Length of minute hand = 7 cm Central angle in 30 minutes = 180° So area swept by minute hand = $\frac{\theta}{360}\pi r^2$ $= \frac{180°}{360} \times \frac{22}{7} \times 7 \times 7$ = 77 cm^2	½ ½ 1

Section – C

Q26.	To prove that √2 is an irrational number, we will use the contradiction method. Let us assume that √2 is a rational number with p and q as co-prime integers and $q \neq 0$ $\Rightarrow \sqrt{2} = p/q$ On squaring both sides we get, $\Rightarrow 2q^2 = p^2$ $\Rightarrow p^2$ is divisible by 2. Therefore, p is also divisible by 2. So we can assume that p = 2x where x is an integer. By substituting this value of p in $2q^2 = p^2$, $\Rightarrow 2q^2 = (2x)^2$ $\Rightarrow 2q^2 = 4x^2$ $\Rightarrow q^2 = 2x^2$ $\Rightarrow q^2$ is divisible by 2. Therefore, q is also divisible by 2. Since p and q both are divisible by 2, which gives contradiction that root 2 is a rational number in the form of p/q with "p and q both co-prime numbers" and $q \neq 0$. Thus, √2 is an irrational number by the contradiction method. Now $6 + \sqrt{2}$ is an irrational number because rational + irrational are always irrational. So $6 + \sqrt{2}$ is an irrational number.	½ ½ ½ ½ 1
Q27.	Let $25x^2 - 15x + 2 = 0$ $\Rightarrow 25x^2 - 10x - 5x + 2 = 0$ $5x(5x - 2) - 1(5x - 2) = 0$ $(5x - 2)(5x - 1) = 0$ Either $5x - 2 = 0$ or $5x - 1 = 0$ $x = 2/5$ or $x = 1/5$ Verification: Sum of zeroes = - b/a RHS $= \frac{-b}{a}$ LHS = Sum of zeroes $= \frac{2}{5} + \frac{1}{5}$ $= -(\frac{-15}{25})$ $= \frac{3}{5}$ $= \frac{3}{5}$ Product of zeroes $= \frac{c}{a}$ LHS = Product of zeroes $= \frac{2}{5} \times \frac{1}{5}$ RHS $= \frac{c}{a}$ $= \frac{2}{25}$ $= \frac{2}{25}$	1 1 ½ ½

Q28.	Let the numerator = x and the denominator = y So, the fraction = $\frac{x}{y}$ According to the question, Condition I: $\frac{x-1}{y} = \frac{1}{3}$ ⇒3(x−1) = y ⇒3x − 3 = y ⇒3x − y = 3 …………….…..(i) Condition II: $\frac{x}{y+8} = \frac{1}{4}$ ⇒ 4x = y + 8 ⇒ 4x – y = 8 ⇒ 4x – y = 8 ………….....(ii) By using elimination method in equation (i) and (ii) x = 5 and y = 12 Hence, the fraction is $\frac{5}{12}$. Or Let the speed of Milkha Singh is x km/h. Let the time taken by him to cover certain distance is y hours. So distance cover by Milkha Singh is xy km. ATQ: Condition I: (x + 1)(y – 1) = xy xy + y – x – 1 = xy -x + y = 1 ………………….(i) Condition II: (x – 2)(y + 5) = xy xy – 2y + 5x – 10 = xy 5x – 2y = 10 ……………….(ii) From equation (i) and (ii) So x = 4 km/ h and y = 5 h ⇒ Distance cover by Milkha Singh is 20 km	1 1 1 1 1 1

Q29.	$\frac{\tan\theta}{1-\cot\theta}+\frac{\cot\theta}{1-\tan\theta}$ = 1 + sec θ cosec θ L.H.S. = $\frac{\tan\theta}{1-\cot\theta}+\frac{\cot\theta}{1-\tan\theta}$ We know that tan θ = $\frac{\sin\theta}{\cos\theta}$ cot θ = $\frac{\cos\theta}{\sin\theta}$ Now, substitute it in the given equation, to convert it in a simplified form = [(sin θ/cos θ)/1-(cos θ/sin θ)] + [(cos θ/sin θ)/1-(sin θ/cos θ)] = [(sin θ/cos θ)/(sin θ-cos θ)/sin θ] + [(cos θ/sin θ)/(cos θ-sin θ)/cos θ] = $\sin^2\theta$/[cos θ(sin θ-cos θ)] + $\cos^2\theta$/[sin θ(cos θ-sin θ)] = $\sin^2\theta$/[cos θ(sin θ-cos θ)] – $\cos^2\theta$/[sin θ(sin θ-cos θ)] = 1/(sin θ-cos θ) [($\sin^2\theta$/cos θ) – ($\cos^2\theta$/sin θ)] = 1/(sin θ-cos θ) × [($\sin^3\theta$ – $\cos^3\theta$)/sin θ cos θ] = [(sin θ-cos θ)($\sin^2\theta$+$\cos^2\theta$+sin θ cos θ)]/[(sin θ-cos θ)sin θ cos θ] = (1 + sin θ cos θ)/sin θ cos θ = 1/sin θ cos θ + 1 = 1 + sec θ cosec θ = R.H.S. Therefore, L.H.S. = R.H.S. Or (cos A + sin A+1)/(cos A– sin A + 1) Divide the numerator and denominator by cos A, we get = (cos A + sin A + 1)/cos A/(cos A – sin A+1)/cos A We know that sin A/cos A = tan A and 1/cos A = sec A = (1 + tan A + sec A)/(1 – tan A + sec A)	1 1 1 1

	$= ((\sec^2 A - \tan^2 A) + \tan A + \sec A)/(1 - \tan A + \sec A)$ $= ((\sec A - \tan A)(\sec A + \tan A) + (\tan A + \sec A))/(1 - \tan A + \sec A)$ $= (\sec A + \tan A)$ (~~sec A – tan A + 1~~))/(~~1 – tan A + sec A~~) $= \sec A + \tan A$ $= 1/\cos A + \sin A/\cos A$ $= (1 + \sin A)/\cos A$ = R.H.S. Therefore, $\dfrac{1+\cos\theta+\sin\theta}{1+\cos\theta-\sin\theta} = \dfrac{1+\sin\theta}{\cos\theta}$. Hence Proved	1 1
Q30.	 Let TR = y and TP = x We know that the perpendicular drawn from the centre to the chord bisects it. ∴ PR = RQ Now, PR + RQ = 16 ⇒ PR + PR = 16 ⇒ PR = 8 Now, in right triangle POR By Using Pythagoras theorem, we have $PO^2 = OR^2 + PR^2$ $\Rightarrow 10^2 = OR^2 + (8)^2$ $\Rightarrow OR^2 = 36$ ⇒ OR = 6 Now, in right triangle TPR By Using Pythagoras theorem, we have $TP^2 = TR^2 + PR^2$ $\Rightarrow x^2 = y^2 + (8)^2$ $\Rightarrow x^2 = y^2 + 64$ ....(i) Again, in right triangle TPO By Using Pythagoras theorem, we have	1 1

	$TO^2 = TP^2 + PO^2$ $\Rightarrow (y + 6)^2 = x^2 + 10^2$ $\Rightarrow y^2 + 12y + 36 = x^2 + 100$ $\Rightarrow y^2 + 12y = x^2 + 64$ ....(ii) $\cancel{y^2} + 12y = \cancel{y^2} + 64 + 64$ $12y = 128$ $y = \frac{\cancel{128}}{\cancel{12}} = \frac{32}{3}$ …………………..(ii) using $y = \frac{32}{3}$ in equation (i) $x^2 = \left(\frac{32}{3}\right)^2 + 64$ $= 64(\frac{16}{9} + 1)$ $= 64(\frac{25}{9})$ $x = \frac{40}{3} = 13.34$ cm	1
Q31.	The two digits numbers are 10, 11, 12, …………….., 99. Total number of two digit numbers = 99 – 9 = 90 (i) Multiples of 10 are 10, 20, 30, 40, 50, 60, 70, 80, 90. So total multiples of 10 is 9 P(Multiples of 10) = $\frac{Number\ of\ favourable\ outcomes}{Total\ nuber\ out\ comes}$ $= \frac{9}{90} = \frac{1}{10}$ (ii) Prefect square numbers from 10 to 99 are 16, 25, 36, 49, 64 and 81. So number of favourable outcomes = 6 P(two digits perfect square) = $\frac{6}{90} = \frac{1}{15}$ (iii) Prime numbers less than 25 are 11, 13, 17, 19 and 23. So number of favourable outcomes = 5 P(prime number less than 25) = $\frac{5}{90} = \frac{1}{18}$	1 1 1
	Section – D	
Q32.	Let the original average speed of train be x km/h. Time taken by train to cover 63 km with original speed = $\frac{63}{x}$ Time taken by train to cover 72 km with increased speed = $\frac{72}{x+6}$ It is given that ; $\frac{63}{x} + \frac{72}{x+6} = 3$ $\frac{63(x+6)+72x}{x(x+6)} = 3$ $\frac{63x+378+72x}{x(x+6)} = 3$ $135x + 378 = 3(x^2 + 6x)$ $135x + 378 = 3x^2 + 18x$ $3x^2 - 117x - 378 = 0$ $x^2 - 39x - 126 = 0$	1 1 1 1

$x^2 - 42x + 3x - 126 = 0$

$x(x - 42) + 3(x - 42) = 0$

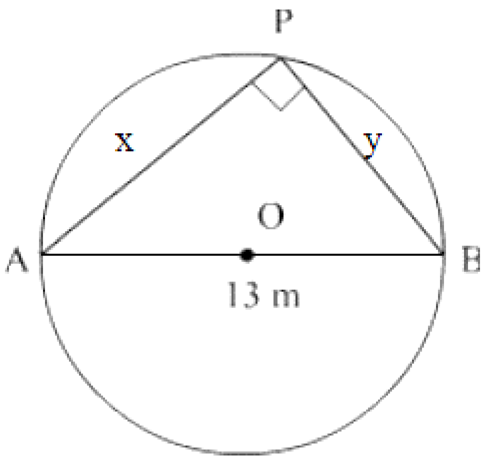
$(x - 42)(x + 3) = 0$

$x - 42 = 0, x + 3 = 0$

$x = 42, x = -3$(rejected) 1

Speed cannot be negative, so the original average speed is 42km/hr.

Or



The pole should be erected at 12 m and 5 m from the two gates.

Let A and B be the opposing fixed gates and P be the pole that needs to be built.

1

Given that PA – PB = 7

Let PA = x, PB = y

Hence $x - y = 7$

$\Rightarrow x = 7 + y$ ..(1)

1

In right triangle PAB

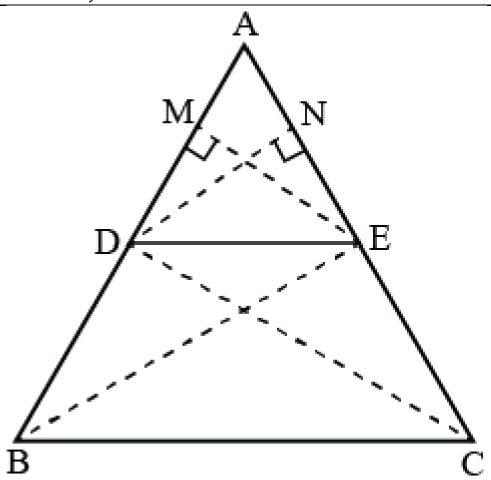
1

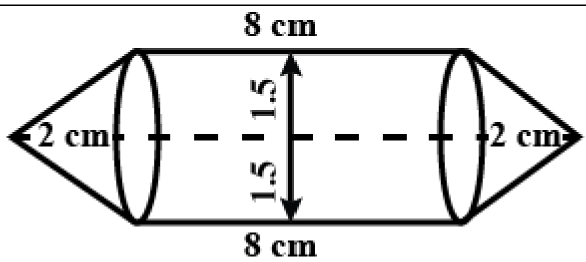
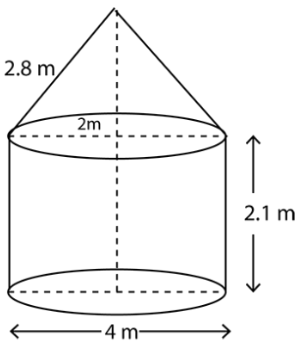
$AB^2 = AP^2 - BP^2$ (By Pythagoras Theorem)

Substituting the values we get

$13^2 = x^2 - y^2$

$169 = (7 + y)^2 + y^2$

	$169 = 49 + 14y + 2y^2$	1
	$2y^2 + 14y - 120 = 0$	
	Taking common from above equation we get	
	$y^2 + 7y - 60 = 0$	
	$y^2 + 12y - 5y - 60 = 0$	
	Taking common we get	
	$y(y + 12) - 5(y + 12) = 0$	
	$(y + 12)(y - 5) = 0$	1
	$y = 5$ or $y = -12$	
	As y cannot be negative	
	Therefore, $y = 5$, $x = 7 + 5 = 12$	
	Hence, PA = 12 m and PB = 5 m	
Q33.		½
	Given: In ΔABC, DE‖BC	½
	To prove: $\frac{AD}{DB} = \frac{AE}{EC}$	½
	Construction : Draw EM⊥AB and DN⊥AC. Join B to E and C to D.	½
	Proof: In ΔADE and ΔBDE	
	$\frac{ar(\Delta ADE)}{ar(\Delta BDE)} = \frac{\frac{1}{2} \times AD \times ME}{\frac{1}{2} \times BD \times ME} = \frac{AD}{BD}$……… . . . (i)	1
	[Area of $\Delta = \frac{1}{2}$ ×base×corresponding altitude]	
	In ΔADE and ΔCDE	
	$\frac{ar(\Delta ADE)}{ar(\Delta CDE)} = \frac{\frac{1}{2} \times AE \times DN}{\frac{1}{2} \times CE \times DN} = \frac{AE}{EC}$……….. . . . (ii)	1
	Since, DE‖BC [Given]	

	$\therefore$ ar(ΔBDE) = ar(ΔCDE) . . . (iii) [Δs on the same base and between the same parallel sides are equal in area] From eq. (i), (ii) and (iii) $\frac{AD}{BD} = \frac{AE}{EC}$	1
Q34.	 Finding the radius and height of cone and cylinder Radius of the conical and cylindrical part (r)= $\frac{3}{2}$ cm Height of the cylindrical part (H)=8cm Height of the conical part (h)=2cm Step 2: Finding the volume of air in the model Volume of air in the model=Volume of cylinder +2×Volume of cone Volume of cylinder = $\pi r^2 H$ $= \frac{22}{7} \times \frac{3}{2} \times \frac{3}{2} \times 8$ Volume of cone = $\frac{1}{3} \pi r^2 h$ $= \frac{1}{3} \times \frac{22}{7} \times \frac{3}{2} \times \frac{3}{2} \times 2$ Volume of air $= \frac{22}{7} \times \frac{3}{2} \times \frac{3}{2} \times 8 + 2 \times \frac{1}{3} \times \frac{22}{7} \times \frac{3}{2} \times \frac{3}{2} \times 2$ $= \frac{22}{7} \times \frac{3}{2} \times \frac{3}{2} \times \left(8 + 2 \times \frac{1}{3} \times 2\right)$ $= \frac{22}{7} \times \frac{3}{2} \times \frac{3}{2} \times \left(8 + \frac{4}{3}\right)$ $= \frac{22}{7} \times \frac{3}{2} \times \frac{3}{2} \times \frac{28}{3}$ $= 66 \text{ cm}^3$ Hence, the volume of air in the model is 66 cm^3 Or  Given:	1 1 1 1 1

Height (h) of the cylindrical part = 2.1 m
Diameter of the cylindrical part = 4 m
Radius of the cylindrical part = 2 m
Slant height (l) of conical part = 2.8 m

Area of canvas used = CSA of conical part + CSA of cylindrical part

$= \pi rl + 2\pi rh$

$= \pi \times 2 \times 2.8 + 2\pi \times 2 \times 2.1$

$= 2\pi [2.8 + 4.2]$

$= 2 \times \frac{22}{7} \times 7$ — 1

$= 44\ m^2$ — 1

Cost of 1 m^2 canvas = 500 rupees

Cost of 44 m^2 canvas = 44 × 500 = 22000 rupees. — 2

Therefore, it will cost 22000 rupees for making such a tent. — 1

Q35.

Class	Frequency(f)	Class Mark (x)	fx
0 - 20	5	10	50
20 - 40	f1	30	30f1
40 - 60	10	50	500
60 - 80	f2	70	70f2
80 - 100	7	90	630
100 - 120	8	110	880
Total	30 + f1 + f2		2060 + 30f1 + 70 f2

2

Given 30+f1+f2 = 50

$\Rightarrow$ f1 + f2 = 20 -- (i) — 1

Given, Mean = $\frac{\sum fx}{\sum f}$ =62.8

$\Rightarrow \frac{2060+30f1+70f2}{30+f1+f2} = 62.8$ — 1

$\Rightarrow$ 2060 + 30f1 + 70f2 = 1884 + 62.8f1 + 62.8f2

$\Rightarrow$ 32.8f1 − 7.2f2 = 176

$\Rightarrow$ 8.2f1 − 1.8f2 = 44

$\Rightarrow$ 4.1f1 − 0.9f2 = 22

$\Rightarrow$ 41f1 − 9f2 = 220 -- (ii)

Solving both equations 1, 2, we get

f1 = 8, f2 = 12 — 1

Section – E		
Q36.	Coordinates from the given figure are: A(3, 0), B(5, 0), C(7, 2), D(7, 3), E(5, 5), F(3, 5), G(1, 3) and H(1, 2). (i) Abscissas of point B – Abscissas of point F = 5 – 3 = 2 (ii) Ordinates of point E – Ordinates of point H = 5 – 2 = 3 (iii) GD = $\sqrt{(7-1)^2 + (3-3)^2}$ $= \sqrt{(6)^2 + (0)^2} = 6$ AF = $\sqrt{(3-3)^2 + (5-0)^2}$ $= \sqrt{(0)^2 + (5-0)^2} = 5$ Difference of distance GD and distance FA = 6 – 5 = 1 Or GC = $\sqrt{(7-1)^2 + (2-3)^2}$ $= \sqrt{(6)^2 + (-1)^2} = \sqrt{36+1} = \sqrt{37}$	 1 1 2
Q37.	(i) So AP from the given situation will be: 51, 49, 47,…………… (ii) a = 51, d = 49 – 51= - 2, $a_n = 31$ 31 = 51 + (n – 1)(- 2) 11 = n (iii) $a_n = 2n + 3$, $a_{n-1} = 2(n-1) + 3$ 2x, , d = $2n + 3$ – $2n$ + 2 – 3 =2 Or x + 10 – 2x = 3x + 2 – x – 10 - x + 10 = 2x – 8 18 = 3x x = 6	1 1 2
Q38.	(i) y = 300 m (ii) x = 173.2 m (iii) QR = 300 + 173.2 = 473.2 m Or PR = 346.2 m	1 1 2