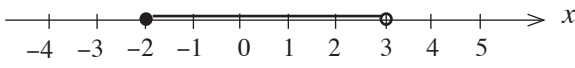
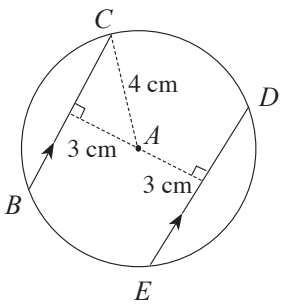


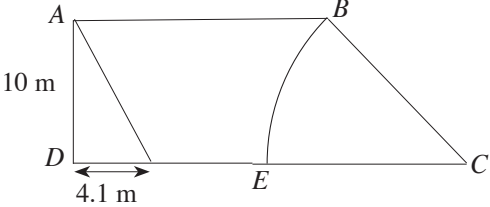
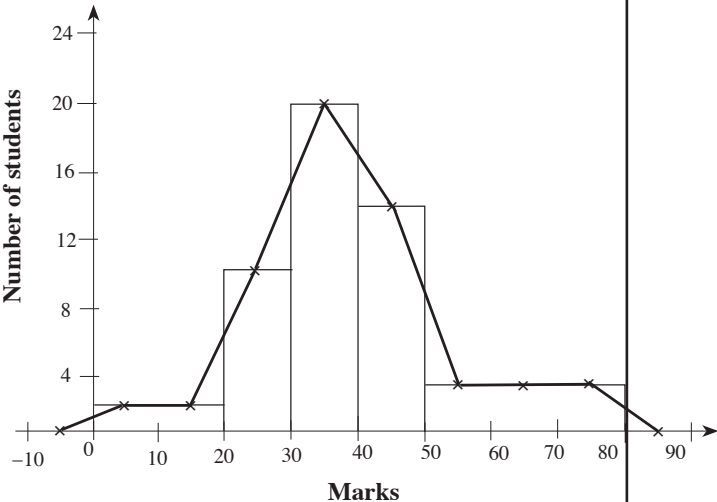
G.C.E. (O.L.) Support Seminar – 2016
Mathematics I (Part A)
Answer Guide

Question Number	Answer	Marks	Other facts
1.	$8^2 = 64$	(2)	
2.	$x = 50^\circ$ $x + 90^\circ + 40^\circ = 180^\circ$ or $x + 40^\circ = 90^\circ$	1 (2)	
3.	Rs. 64 800 Rs. 540 000 $\times \frac{2}{100} \times 6$	1 (2)	
4.	$(x + 4)(x + 1)$ $x^2 + 4x + x + 4$	1 (2)	
5.	The two equal sides are WY and YZ . $\hat{Y}WZ = 20^\circ$	1 (2)	
6.	$L' \cap M$	(2)	
7.	60°	(2)	
8.	40 $\frac{1}{5} = \frac{8}{n(S)}$	1 (2)	
9.	$Q_3 - Q_1 = 6$ $Q_1 = 3, Q_3 = 9$	1 (2)	
10.	ΔPTS and ΔQTR Condition - A.A.S.	1 1 (2)	
11.	$x^2(x + 1)$	(2)	
12.	$r = 7$ cm $2 \times \frac{22}{7} \times r = 44$	1 (2)	
13.	$x + y = 90^\circ$ $2x + 2y = 180^\circ$	1 (2)	By considering the angle in a semicircle and taking 90°
14.	$\frac{2}{3x}$ $\frac{3}{3x} - \frac{1}{3x}$	1 (2)	

Question Number	Answer	Marks	Other facts
15.	9	2	
16.	$\hat{ADB} = 40^\circ$ $\hat{OAD} = 40^\circ$ or $\hat{ACB} = 40^\circ$	1	
17.	$B = \begin{pmatrix} -5 & 4 \\ 2 & 1 \end{pmatrix}_{2 \times 2}$ $\begin{pmatrix} 6 & -4 \\ -2 & 0 \end{pmatrix}_{2 \times 2} + B = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}_{2 \times 2}$	1	
18.	$y = 70^\circ$ Observing that $DE \parallel CB$. (Midpoint theorem)	1	
19.	$y = -x + 3$ $m = -1$ or $c = 3$	1	
20.	$x = 120^\circ$ $x + 60^\circ = 180^\circ$ (opposite angles of a cyclic quadrilateral are supplementary)	1	
21.		2	
22.	$r = 2$ $24 = 3 \times r^{4-1}$	1	
23.	9 Number of man days needed for the task = $8 \times 9 = 72$	1	
24.	 <p style="margin-left: 200px;">Drawing the line parallel to BC and marking 3cm from A Marking the points D and E</p>	2	Marking 6 cm from BC to DE
25.	60 km h^{-1} $\frac{360 \text{ km}}{6 \text{ h}}$ or $\frac{240 \text{ km}}{4 \text{ h}}$ or $\frac{120 \text{ km}}{2 \text{ h}}$	1	

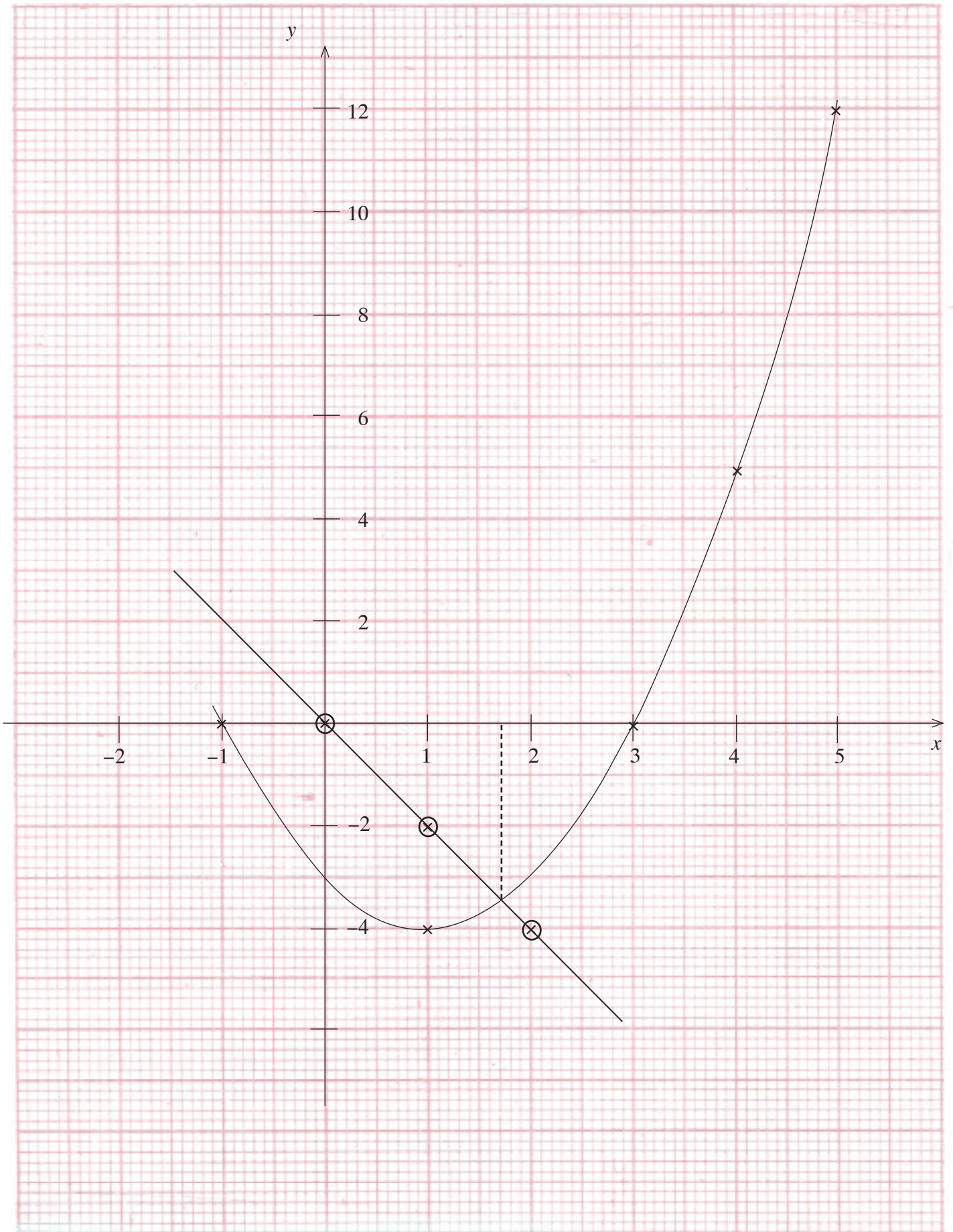
**Mathematics I (Part B)
Answer Guide**

Question Number	Answer	Marks				Other facts
1.	<p>(i) $\frac{1}{8} + \frac{2}{3}$ $= \frac{19}{24}$</p> <p>(ii) Remaining letters as a fraction $= \frac{5}{24}$ Express letters as a fraction $= \frac{5}{24} \times \frac{1}{5}$ $= \frac{1}{24}$</p> <p>(iii) Foreign letters as a fraction $= \frac{4}{24}$ $\frac{4}{24}$ of the letters $= 520$ Total number of letters $= \frac{520}{4} \times 24$ $= 3120$ Registered letters $= 3120 \times \frac{1}{8}$ $= 390$</p> <p>(iv) Ordinary letters: Express letters $= \frac{2}{3} : \frac{1}{24}$ $= 16 : 1$</p>	1 1 1 1 1 1 1 1		<p>(2)</p> <p>(3)</p> <p>(3)</p> <p>(2)</p>	<p>10</p>	<p>The answer can be obtained by finding the number of letters as well</p>
2.	<p>(i) Length of BE $= \frac{1}{8} \times 2\pi r$ $= \frac{1}{8} \times 2 \times \frac{22}{7} \times 14$ $= 11$ m</p> <p>Perimeter of $ABED$ $= (11 + 15 + 10 + 11)$ m $= 47$ m</p> <p>(ii) Area of the section where sand is spread $= \frac{1}{8} \pi r^2$ $= \frac{1}{8} \times \frac{22}{7} \times 14 \times 14$ $= 77$ m²</p> <p>(iii) Area of the section without sand $= \frac{(25 + 15)}{2} \times 10 - 77$ $= 200 - 77$ $= 123$ m²</p>	1 1 1 1 1 1		<p>(3)</p> <p>(2)</p> <p>(3)</p>		

Question Number	Answer	Marks			Other facts				
(iv)	 <p>Drawing the triangle Marking 4.1 m</p>	1 1	(2)	10					
3.	<p>(a) (i) Rates for a year = 1500×4 = Rs. 6000</p> <p>Annual rates percentage = $\frac{6000}{75000} \times 100\%$ = 8%</p> <p>(ii) Discount = $6000 \times \frac{10}{100}$ Amount saved = Rs. 600</p> <p>(b) (i) Number of shares = $\frac{270000}{9}$ = 30 000 Income = Rs. 30 000 \times 2 = Rs. 60 000</p> <p>(ii) Gain per share = Rs. 1.50 Capital gain = Rs. 1.50 \times 30 000 = Rs. 45 000</p>	1 1 1 1 1 1 1 1 1 1	(3) (2) (2) (3)	5 5	$(30\ 000 \times 10.50) - 270\ 000$ $= 315\ 000 - 270\ 000$ $= 45\ 000$				
4.	<table border="1" data-bbox="308 1249 580 1341"> <tr> <td>40 - 50</td> <td>14</td> </tr> <tr> <td>50 - 80</td> <td>12</td> </tr> </table>  <p>Completing the histogram Marking the endpoints of the frequency polygon Marking the midpoints Completing the frequency polygon</p> <p>(iv) Percentage = $\frac{12}{60} \times 100\%$ = 20%</p>	40 - 50	14	50 - 80	12	1 1 2 1 1 1 2 1	(2) (2) (3) (3)	10	
40 - 50	14								
50 - 80	12								

Question Number			Answer	Marks			Other facts
5.	(a)	(i)	<p style="text-align: center;">Second picking (play an instrument)</p> <p>First picking (sing)</p>	2	②		For $\frac{4}{6}$ and $\frac{2}{6}$
		(ii)	<p>Extending the tree diagram</p> <p>Probability of a boy performing on one occasion and a girl performing on the other occasion. } = $\frac{4}{6} \times \frac{2}{6} + \frac{2}{6} \times \frac{4}{6}$</p> <p style="text-align: center;">= $\frac{16}{36}$</p>	1			
				1 + 1			
	(b)	(i)		1	④	△ 6	
			Representing on the grid	1	①		
		(ii)	<p>Marking the event on the grid</p> <p>Probability = $\frac{20}{25}$ or $\frac{4}{5}$</p>	1			
			2	③	△ 4	□ 10	

2. (a) (ii)



Question Number	Answer	Marks	Other facts																																				
3.	<p>(i) 2</p> <p>(ii)</p> <table border="1" data-bbox="280 342 927 781"> <thead> <tr> <th>Class interval</th> <th>Mid value (x)</th> <th>Frequency (f)</th> <th>fx</th> </tr> </thead> <tbody> <tr><td>4 - 8</td><td>6</td><td>2</td><td>12</td></tr> <tr><td>9 - 13</td><td>11</td><td>3</td><td>33</td></tr> <tr><td>14 - 18</td><td>16</td><td>5</td><td>80</td></tr> <tr><td>19 - 23</td><td>21</td><td>8</td><td>168</td></tr> <tr><td>24 - 28</td><td>26</td><td>15</td><td>390</td></tr> <tr><td>29 - 33</td><td>31</td><td>5</td><td>155</td></tr> <tr><td>34 - 38</td><td>36</td><td>2</td><td>72</td></tr> <tr> <td></td> <td></td> <td>$\Sigma f = 40$</td> <td>$\Sigma fx = 910$</td> </tr> </tbody> </table> <p>For the mid value column</p> <p>For the fx column</p> <p>$\Sigma fx = 910$</p> <p>Mean number of trips = $\frac{910}{40}$</p> <p style="padding-left: 40px;">$= 22.75$</p> <p style="padding-left: 40px;">$= 23$ (to the nearest whole number)</p> <p>(iii) Cost of the soil = Rs. $23 \times 4 \times 2000$</p> <p style="padding-left: 40px;">$= \text{Rs. } 184\,000$</p> <p>(iv) Expected cost for 2 days = Rs. $184\,000 \times 2 \times 40$</p> <p style="padding-left: 40px;">$= \text{Rs. } 14\,720\,000$</p> <p>Since $14\,000\,000 < 14\,720\,000$, the engineer's statement could be true.</p>	Class interval	Mid value (x)	Frequency (f)	fx	4 - 8	6	2	12	9 - 13	11	3	33	14 - 18	16	5	80	19 - 23	21	8	168	24 - 28	26	15	390	29 - 33	31	5	155	34 - 38	36	2	72			$\Sigma f = 40$	$\Sigma fx = 910$	<p>1</p> <p style="text-align: center;">①</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p style="text-align: center;">⑤</p> <p>1</p> <p style="text-align: center;">①</p> <p>1</p> <p>1</p> <p>1</p> <p style="text-align: center;">③</p>	<p>For the fd column - 1</p> <p>Σfd - 1</p> <p>$A + \frac{\Sigma fd}{40}$ - 1</p> <div style="border: 1px solid black; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin: 10px auto;">10</div>
Class interval	Mid value (x)	Frequency (f)	fx																																				
4 - 8	6	2	12																																				
9 - 13	11	3	33																																				
14 - 18	16	5	80																																				
19 - 23	21	8	168																																				
24 - 28	26	15	390																																				
29 - 33	31	5	155																																				
34 - 38	36	2	72																																				
		$\Sigma f = 40$	$\Sigma fx = 910$																																				
4.	<p>Number of children = x or any other unknown term</p> <p>Number of adults = y or any other unknown term</p> <p>$3x + 2y = 186$ _____ ①</p> <p>$2x + y = 114$ _____ ②</p> <p>② $\times 2$ $4x + 2y = 228$ _____ ③</p> <p>③ - ① $x = 42$</p> <p>By substituting $x = 42$ in ②</p> <p style="padding-left: 40px;">$2 \times 42 + y = 114$</p> <p style="padding-left: 80px;">$y = 114 - 84$</p> <p style="padding-left: 80px;">$y = 30$</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>																																					

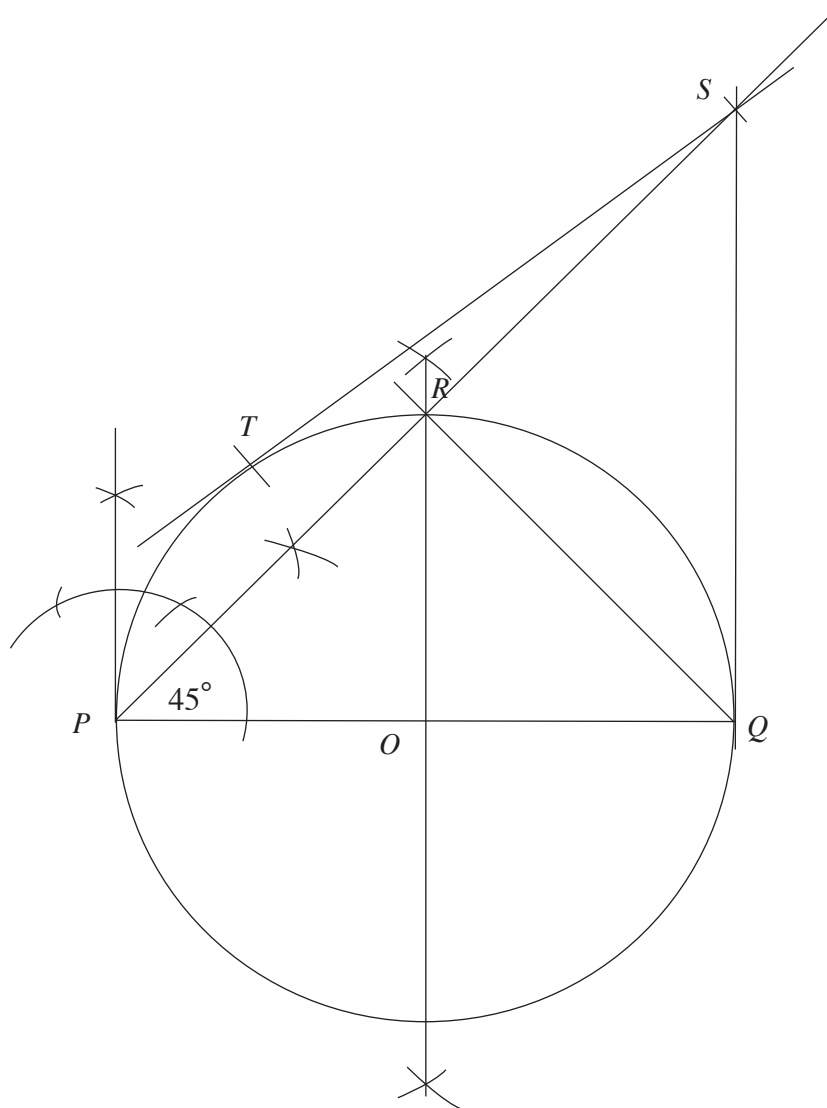
Question Number		Answer	Marks			Other facts
		Number of children = 42, Number of adults = 30 Total amount for a day = $42 \times 100 + 30 \times 150$ Total amount for a week = $(42 \times 100 + 30 \times 150) \times 7$ = Rs. 60 900	1 1 1 1	(10)		10
5.	(i)	Length of the hypotenuse = $2x - 1$ cm	1	(1)		
	(ii)	Length of the remaining side = $x + 3$ cm	1			
	(iii)	$(2x - 1)^2 = x^2 + (x + 3)^2$ $4x^2 - 4x + 1 = x^2 + x^2 + 6x + 9$ $2x^2 - 10x - 8 = 0$ $x^2 - 5x = 4$	1 1 1	(2) (2)		For squaring one of the two expressions from $2x - 1$ and $x + 3$
	(iv)	$x^2 - 5x + \frac{25}{4} = 4 + \frac{25}{4}$ $(x - \frac{5}{2})^2 = \frac{41}{4}$ $x = \frac{\pm \sqrt{41} + 5}{2}$ $x = \frac{6.4 + 5}{2} / x = \frac{-6.4 + 5}{2}$ $x = 5.7 / x = -0.7$ x cannot be negative $\therefore x = 5.7$ cm Length of the hypotenuse = $2 \times 5.7 - 1$ = $11.4 - 1$ = 10.4 cm	1 1 1 1			For the formula -1 For substituting -1
			1	(5)		10
6.	(i)		1	(1)		
	(ii)	$\sin 40^\circ = \frac{CE}{20}$ $0.6428 = \frac{CE}{20}$ $CE = 12.856$ $\therefore CE = 13$ m (to the nearest metre)	1 1 1	(3)		

Question Number	Answer	Marks	Other facts
(iii)	$\tan \hat{EAD} = \frac{13 + 25}{12 + 15}$ $= \frac{38}{27}$ $= 1.4074$ $\hat{EAD} = 54^\circ 36'$ $\sin 54^\circ 36' = \frac{38}{AD}$ $0.8151 = \frac{38}{AD}$ $AD = 46.62 \text{ m}$	 1 1 1 1 1 1 1	 <div style="border: 1px solid black; display: inline-block; padding: 2px;">6</div> <div style="border: 1px solid black; display: inline-block; padding: 2px;">10</div>

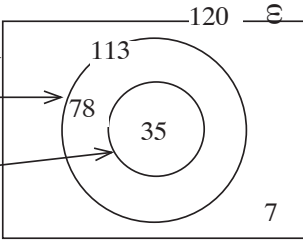
Part B

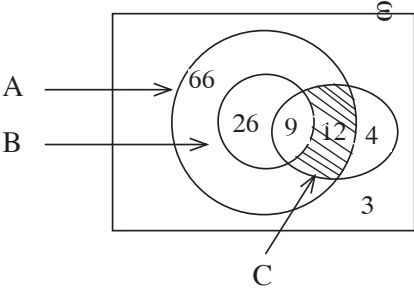
Question Number	Answer	Marks	Other facts
7. (i)	$T_n = a + (n - 1) d$ $a = 50, d = 25, n = 12$ $T_{12} = 50 + (12 - 1) \times 25$ $= 50 + 275$ $= \text{Rs. } 325$	 1 1	 <div style="border: 1px solid black; display: inline-block; padding: 2px;">2</div>
(ii)	$T_n + T_{n+1} = 425$ $a + (n - 1) d + a + nd = 425$ $2a + 2nd - d = 425$ $2 \times 50 + 2n \times 25 - 25 = 425$ $50n = 350$ $n = 7$ Question numbers 7 and 8	 1 1 1 1 1	 $50 + (n-1) 25 + 50 (n + 1 - 1) 25 = 425$
(iii)	$S_n = \frac{n}{2} \{2a + (n - 1) d\}$ $1300 \times 2 = \frac{n}{2} \{2 \times 50 + (n - 1) 25\}$ $5200 = n (75 + 25n)$ $208 = n^2 + 3n$ $n^2 + 3n - 208 = 0$ $(n + 16) (n - 13) = 0$ $n = -16 / n = 13$ \therefore Number of questions $13 + 1 = 14$	 1 1 1 1 1 1 1	 <div style="border: 1px solid black; display: inline-block; padding: 2px;">4</div> <div style="border: 1px solid black; display: inline-block; padding: 2px;">10</div>

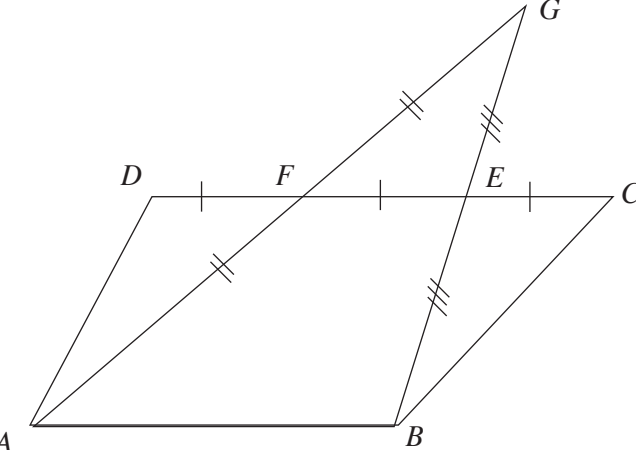
8.



Question Number		Answer	Marks			Other facts
8.	(i)	Constructing $PQ = 8$ cm	1	(1)		
	(ii)	Constructing $\hat{QPR} = 45^\circ$,	1			
		Constructing the perpendicular bisector of PQ ,	1			
		Marking R	1	(3)		
	(iii)	Marking the centre	1			
		Constructing the circle	1	(2)		
	(iv)	Obtaining S	1	(1)		
	(v)	Obtaining T	1			
		Since $\hat{PRQ} = 90^\circ$, $\hat{QRS} = 90^\circ$. \therefore Since				
		$PR = RS = RQ$, $\hat{PQR} = \hat{QRS} = 45^\circ$. $\therefore \hat{OQS} = 90^\circ$				
		and hence QS is a tangent.	1			
		Since $QS = ST$, ST is also a tangent.	1	(3)		
						10

Question Number	Answer	Marks			Other facts	
9.	<p>Volume of the prism = $\frac{1}{2} \times 2a \times 3a \times 8a$</p> <p>Volume of the cone = $\frac{1}{3} \times \pi(2r)^2 \times h$</p> <p>$\frac{1}{2} \times 2a \times 3a \times 8a = \frac{1}{3} \times \pi \times 4r^2 \times 15$</p> <p>$\frac{4}{3} \pi r^2 \times 15 = 24a^3$</p> <p>$20\pi r^2 = 24a^3$</p> <p>$r^2 = \frac{24a^3}{20\pi}$</p> <p>$r^2 = \frac{6a^3}{5\pi}$</p> <p>$\lg r^2 = \lg 6 + 3 \lg 4.55 - (\lg 5 + \lg 3.14)$</p> <p>$= 0.7782 + 3 \times 0.6580 - (0.6990 + 0.4969)$</p> <p>$= 0.7782 + 1.9740 - 1.1959$</p> <p>$\lg r^2 = 1.5563$</p> <p>$r^2 = \text{antilog } 1.5563$</p> <p>$r^2 = 36.0$</p> <p>$r = 6 \text{ cm}$</p> <p>Radius of the cone = 2×6</p> <p>$= 12 \text{ cm}$</p>	1				1 mark for 2 logarithms
		1				
		1				
		1				
		1				
		2				
		1				
		1				
		1				
		1				
		1				
		1				
		1				
		1				
		1				
		1				
		1				
		1				
		1				
		1				
		1				
		1				
		1				
		1				
		1				
		1				
		1				
10. (i)	<p>Houses in the village Ranala → </p> <p>Naming A and B</p> <p>Marking 78 and 35</p>	1	1 + 1	③		
(ii)	35	1		①		
(iii)	$\frac{85}{120}$	1		①		

Question Number	Answer	Marks				Other facts
(iv)	 <p>Drawing C Obtaining 9, 12, 4, 66, 26 and 3 (1 mark for each pair of correct values)</p>	1	3	④		
(v)	Shading	1	①		10	
11.	<p>(i) $\hat{PQX} = 20^\circ$ The angle subtended by an arc at the centre of a circle is twice the angle subtended on the circumference.</p> <p>(ii) $RT = TQ$ Since the straight line joining the centre of a circle to the midpoint of a chord is perpendicular to the chord, $\hat{OTQ} = 90^\circ$ Since a tangent is perpendicular to the radius at the point of contact, $\hat{OXY} = 90^\circ$ $\hat{OTQ} + \hat{OXY} = 180^\circ$ $OTYX$ is a cyclic quadrilateral since a pair of opposite angles is supplementary.</p> <p>(iii) $\hat{XOT} = 140^\circ$ (the angles on a straight line are supplementary) $\hat{XYZ} = 140^\circ$ (the exterior angle of a cyclic quadrilateral is equal to the interior opposite angle)</p> <p>(iv) Diameter is OY. $\therefore \hat{OTY} = 90^\circ$ (the angle in a semicircle is 90°)</p>	1	1	②		
		1	1	④		
		1	1	②	10	

Question Number	Answer	Marks	Other facts
12. (i)			
(ii)	<p>For drawing the figure</p> <p>$CE = EF$ (data) $BE = EG$ (data) \therefore Quadrilateral $BCGF$ is a parallelogram since its diagonals bisect each other. $AF = FG$ (data) $BE = EG$ (data) According to the midpoint theorem, $FE \parallel AB$ $\therefore AB \parallel FC$ $BC \parallel FG$ (opposite sides of a parallelogram) $\therefore BC \parallel AF$ \therefore Quadrilateral $ABCF$ is a parallelogram since pairs of opposite sides are parallel. $BC \parallel AG$ Since parallelograms on the same base (base BC) and between the same pair of parallel lines ($BC \parallel AG$) are equal in area, $BCGF$ and $ABCF$ are of equal area.</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>(1)</p> <p>9</p> <p>10</p>