Question			Answer	Marks	Part Marks and Guidance	
1	(a)		300 cos 30	2	allow **2** for 259.807611 rot to 1dp or more **M1** for cos 30 = AD/300	or complete method using sin to find DB, then Pythag.
	(b)		300 sin 30 or $\frac{BD}{300} = \sin 30$ DB = 149.6 to 150.1... DC = 329.6 to 330.1...	M1 A1 A1	or 260 × tan 30 or $\sqrt{300^2 - 260^2}$ oe FT their DB, only if **M1** earned	or using unrounded AD DB may have been found in (a), but allow credit for this in (b) only if it is clear that they know it is DB [image dim to include diagram and (a) below (b)]
	(c)		308(.2...)	4	Obtained from correct calculations **M1** for attempt at using tan with *their* DC and 260 or their AD (or attempt at using cos with *their* BC and DC, following cos rule attempt) **and M1** for inverse trig function seen or used **A1** for ACD = 38.2(...)° or CAD = 51.7...to 51.8°, with angle clearly identified; accept 38 or 52 for A1 if method seen allow **B2** for 38.2(...)° or 51.7...to 51.8°, with angle **not** clearly identified correctly; accept 38 or 52 with method seen	**M0** for scale drawing or other correct trig fn following Pythagoras used

2	**(a)**		567.5 to 567.6 or 568 or 570	3	nfww **M2** for $\sqrt{466^2 + 324^2}$ oe or equivalent complete method using trig (condone poor notation) Or **M1** for $466^2 \pm 324^2$ or for 322 132 or any attempt at Pythagoras (eg 217 156 + 104 976)	570 from scale drawing scores **0**
	(b)		More than 90 since diagonal should be less than 572 oe	1FT	FT only if at least **M1** gained in (a)	

3			Correct perpendicular line	1	Within tolerance 88 to 92° of AB and within 1mm of D; line to reach at least from D to within 2mm of AB	
			Arcs showing compasses used correctly	1	As well as standard two pairs of two arcs, condone arc touching line drawn and radius drawn, condone 'kite construction'	'Kite construction' arcs through D, centre A, above and below AB intersecting with similar arcs centre B Also condone 'half kite' with just the intersecting arcs below AB but with radii AD and BD Ignore perp. bisector if also drawn NB **0** for spurious arcs drawn after the line – watch for these
			14.8 to 15.2	2	**M1** for 7.4 to 7.6 [cm] or 1480 to 1520 [cm]	

4	(a)		$a^2 + 294^2 = 343^2$ $\sqrt{343^2 \pm 294^2}$ 176.6 to 177	**M1** **M1** **A1**	oe; for correct Pythagoras statement or **B3** nfww; allow **A1** for 180 if correct method seen	allow M1 for $a^2 = 31\,213$
	(b)		e.g. $\cos PLS = \frac{294}{343}$ use of inverse trig function bearing = 148.9 to 149.1	**M1** **M1** **A2**	for a correct trig statement with clearly identified angle; may use their answer in (a); may find either angle in the triangle allow even if wrong trig function used A1 for LPS = 58.9 to 59.1 or for PLS = 30.9 to 31.1	Condone poor notation [S here is 3rd vertex of triangle; candidates will use other refs, e.g. o, a and h marked on the triangle.] if e.g. 31 appears with no identification, allow this to imply the second M1 allow 148.0 to 149.1 to imply the correct angle used

Question			Answer	Mark	Answer
5			179.8 to 180 with commentary (may be using letters)	**6**	e.g. : TG = 30/sin28 = 63.9 to 64 : TM = $\sqrt{(112^2 + 30^2)}$ =115.9 to 116 *Allow fully correct alternative methods for TG and TM*
			179.8 to 180 with no commentary	**5-4**	30/sin28 soi **and** $\sqrt{(112^2 + 30^2)}$ soi
			30/sin28 soi OR $\sqrt{(112^2 + 30^2)}$ soi OR sin 28 = 30/x **and** $112^2 + 30^2$ soi	**3-2**	sin 28 = 30/x OR $112^2 + 30^2$ soi
			sin identified as the trig ratio required for TG oe OR some use of Pythagoras for TM oe	**1-0**	No worthy work

6			2×10^5 or 2.0×10^5 or 1.96×10^5 nfww	4	**B3** for 195765 rot or 1.95765×10^5 rot seen Or **M2** for $\sqrt{[(2.1 \times 10^5)^2 - (7.6 \times 10^4)^2]}$ oe Or **M1** for $\pm(2.1 \times 10^5)^2 \pm (7.6 \times 10^4)^2$ soi	

7			$(x + 2)^2 = 3^2 + x^2$ oe soi $x^2 + 4x + 4$ oe $4x + 4 = 9$ oe 1.25 or 1¼ or $\frac{5}{4}$	M2 B1 B1 B1	**M1** for any combination of $(x + 2)^2$, 3^2 and x^2 in an equation	Condone omission of brackets for **M2** or **M1**

8			5.39	5	nfw **B4** for other rot versions of 5.38516... nfww to at least 2dp OR **M1** for 5 and 2 used or seen in right-angled triangle **M1** for an attempt at Pythagoras **M1** for square root of (*their* $5^2 \pm$ *their* 2^2) (may be implied by answer) Allow **A1** for 5.3 or 5.4 (dep on **M3**) Following attempt at Pythagoras, allow **B1** for *their* answer correctly rounded to 2dp if answer with more dp seen	NB **0** for 5.4 without correct method seen – no marks for measuring eg 2 and 5 in relevant places on diagram or ½ × 5 × 2 or 5 + 2 = 7 or 5 across, 2 up seen eg *their* 5^2 and *their* 2^2 seen; second and third **M1**s may be earned for an attempt at Pythag with a wrong triangle (possibly not right-angled)

9			9.5(...)	4	nfww **M1** for $42^2 = 20.4^2 + w^2$ or other correct Pythagoras statement **M1** for $\sqrt{42^2 \pm 20.4^2}$ If at least **M1** earned, allow **B1** for final answer FT *their* width – 27.2 Allow **B3** for 36.7(...)	**0** for scale drawing

10			3.2(.....)	3	nfww **M1** for $2.57^2 + 1.93^2$ or 10.3(298) **M1** for $\sqrt{2.57^2 \pm 1.93^2}$ oe	Or 6.6049 + 3.7249 Or **M2** for equivalent complete method using trig (condone poor notation) 3.2 from scale drawing scores 0

11	**(a)**	**(i)**	Using right-angled triangle with hyp 48 and side 42 $\sqrt{48^2 - 42^2}$ or 23.2(...) 11.76(...) or 11.8	M1 M2 A1	Just seeing marked on diagram is not sufficient **M1** for $48^2 - 42^2$ or for $\sqrt{48^2 + 42^2}$	For a scale drawing, only this first mark is available
		(ii)	sin C = 42/48 Inv trig fn seen or used 61 to 61.1	M1 M1 A1	Or equiv trig fns using *their* (a) Not dep on first M1	**0** for scale drawing
	(b)		[*d* =] 31/cos 25 34.2(...)	M2 A1	**M1** for cos 25 = 31/*d* or *d* × cos 25 = 31 Accept 34 with clear evidence of method	may use sine with 65 or their (180 − 90 − 25) or tan and Pythagoras **M0** for scale drawing

12	**(a)**	(i) 221 to 4	**1**		
		(ii) At lea ne side of AB, BC, CA measured accurately (11 cm, 9 cm, 8 cm with tolerance ±1 mm)	**M1**	May be implied by conversion to actual distances in cm, m or km (e.g. figs 275, 225, 2)	Often seen by diagram; may be implied by 28 e.g. 2.75 [km] seen by diagram earns first and third **M1**s If only 8 seen must be clearly identified as AC
		Total distance found e.g. 28 cm on map or 700 000 cm soi	**M1**	FT *their* measurements; may be done after conversion	Figs 7 imply this second **M1**
		100 cm = 1 m **and** 1000 m = 1 km or 4 cm to 1 km soi	**M1**	May be earned earlier; need not be explicit **M0** for e.g. 10 000 m = 1 km stated	May be implied by correct answer
		7 [km] and appropriate comment	**B1**	Accept 6.9 to 7.1 km and 'so OK', 'no, paths may be not straight so they have to go further' etc	E.g. if measurements or 28 not seen, may earn **M0 M1 M1 B1**
	(b)	1.41(4...)	**2**	**M1** for $1^2 + 1^2$ or $\sqrt{2}$ oe soi Allow **A1** for 1.4 if **M1** earned Allow **SC1** for $1.5^2 - 1^2 = 1.25$ followed by $\sqrt{1.25}$ = 1.1(18...) rot [can also earn comment mark following this]	Condone trigonometry used if correct answer obtained **M0** for just 1 + 1 [= 2] with no evidence of squaring or square root Mark equivalently for other squares used e.g. **M1** for $2^2 + 2^2$ and **A1** for 2.82(8...) and **B1** for comparison with 3
		Suitable comment e.g. '1.4 would be more accurate' or 'not too far out for a rough guide' or '1.5 is near and is easier for an estimate' or 'they have rounded wrongly it should be 1.4 not 1.5'	**1**	Dependent on answer 1.4 to 1.42 or Pythagoras attempted	

	(c)	$\tan x = \frac{400}{600}$ Inverse trig function seen or used	**M1** **M1**	<u>Alternative method</u> **M2** for vertical = 600 × tan40 Or **M1** for $\tan 40 = \frac{\text{vertical}}{600}$ or equivalents with horizontal distance AND **A1** for vertical = 503(.45...) or horizontal = 476(.7...) and appropriate comment	Second **M1** is independent of first – is earned for some indication that an inverse trig fn is needed to find an angle – even if done wrongly Comparison of tan 40 with tan *x*, both evaluated with appropriate comment earns full marks
		33.6 to 33.823 **and** appropriate comment e.g. not as steep as Mike thought	**A1**	Allow **B3** for 33.6 to 33.823 or better **and** appropriate comment	Allow **A1** for any of the following oe: “Good estimate - only 6° out“ “Not a good estimate as it is 6° out “ “Not far off, but 30° would have been closer“ Condone ‘so OK’ etc

13	**(a)**		16.2 to 16.3	3	nfww **M2** for $\text{AP} = \frac{50}{\tan 72}$ or $50 \times \tan(90 - 72)$ Or **M1** for $\tan 72 = \frac{50}{\text{AP}}$ or $\tan(90 - 72) = \frac{AP}{50}$ **SC1** only for 16.2 or 16.3 from scale drawing	Or **M2** for $AP = \frac{50 \sin 18}{\sin 72}$ or for complete correct method using sin or cos and Pythagoras Or **M1** for $\frac{50}{\sin 72} = \frac{AP}{\sin 18}$
	(b)		[0]77.7 to [0]77.82	3	nfww **M1** for $\tan \text{APC} = \frac{75}{\textit{their}\ \text{AP}}$ **M1** for inverse trig fn soi If **M2** earned, allow **A1** for [0]78	Allow **M1** for $\tan \text{ACP} = \frac{\textit{their}\text{AP}}{75}$ provided angle is clearly indicated eg invsin seen earns **M0M1** **0** for scale drawing