

1	(a)		130	P1	start to process eg draw a labelled triangle or use of sine rule $\frac{\sin Q}{8.7} = \frac{\sin 32}{5.2}$
	(b)			P1	process to find of Q eg $Q = \sin^{-1} \left[\frac{\sin 32}{5.2} \times 8.7 \right]$
				P1	process to find area of triangle PRQ .
				A1	22.5 – 22.6
				C1	angle PRQ is obtuse so need to find area of two triangles.

2		Proof		B1	(indep) for stating $\cos 30 = \frac{\sqrt{3}}{2}$
				M1	for $PQ^2 = 10^2 + 10^2 - 2 \times 10 \times 10 \times \cos PBQ$ or $AC^2 = x^2 + x^2 - 2 \times x \times x \times \cos 30 (=x^2(2-\sqrt{3}))$ oe
				M1	for $\cos PBQ = \frac{10^2 + 10^2 - PQ^2}{2 \times 10 \times 10}$ (implies previous M1)
				M1	for $\cos PBQ = \frac{10^2 + 10^2 - (x^2 + x^2 - 2 \times x \times x \times \cos 30)}{2 \times 10 \times 10}$
				A1	conclusion of proof with all working seen
					$\cos PBQ = \frac{10^2 + 10^2 - x^2(2-\sqrt{3})}{200}$ $= \frac{200 - x^2(2-\sqrt{3})}{200}$

3			2.63	P1	for setting up the expression $\frac{1}{2}(x+3)(2x-1) \sin 45$ (may be seen in an equation)
				P1	(dep) for expanding the brackets in the expression or for the equation $\frac{1}{2}(x+3)(2x-1) \sin 45 = 6\sqrt{2}$ oe
				P1	(dep) for the process to set up the equation and rearrange to the form $ax^2 + bx + c = d$ e.g. to $2x^2 + 5x - 27 = 0$ or $24 = 2x^2 + 5x - 3$
				P1	(dep) for substitution into the quadratic formula e.g. $\frac{-5 \pm \sqrt{5^2 - 4 \times 2 \times -27}}{4}$
				A1	for 2.63(10436...)

4			14.4	P1	for start of process, eg $0.5 \times 11 \times CD \times \sin 105 = 56$
				P1	for complete process to find CD , eg $(CD =) \frac{56}{0.5 \times 11 \times \sin 105}$ oe (= 10.54)
				P1	for process to find AC , eg $(AC^2 =) 11^2 + [CD]^2 - 2 \times 11 \times [CD] \times \cos 105$ ($AC = 17.09$)
				P1	for process to find AB , eg $\frac{AB}{\sin 48} = \frac{[AC]}{\sin 118}$
				A1	answer in range 14.3 to 14.4

5	13.1	P1	for start of process to find the length of BD , eg $\frac{BD}{\sin 34^\circ} = \frac{12.5}{\sin 109^\circ}$	Accept 7.4 for the award of the first two P marks
		P1	for complete process to find the length of BD , eg $BD = \frac{12.5}{\sin 109^\circ} \times \sin 34^\circ$ (= 7.39...)	
		P1	for process to find the length of AD , eg $AD^2 = 11.4^2 + "7.39^2" - 2 \times 11.4 \times "7.39" \times \cos 86^\circ$	
		P1	for process to use correct order of operations, eg $129.96 + 54.6(5...) - 11.7(5...) (= 172.85...)$	
		A1	for answer in the range 13.1 to 13.2	
				<p>If an answer is given within the range and then incorrectly rounded to 3 sig figs award full marks.</p>

6	36	P1	for process to find an expression for the area of triangle eg $\frac{1}{2} \times 24 \times AE \times \sin 30 (= 6AE)$	Accept any correct expression, eg $\frac{1}{2} \times 24 \times y \times \sin 30$ May be shown on the diagram by labelling AE and AB with, for example, $3x$, x or x , $\frac{1}{3}x$ or $\frac{3}{4}x$, $\frac{1}{4}x$ Do not accept 3, 1 or $1, \frac{1}{3}$ or $\frac{3}{4}, \frac{1}{4}$ for this mark.
		P1	(dep P1) for process to link the area of rectangle with the area of the triangle eg $2 \times \frac{1}{2} \times 24 \times AE \times \sin 30 (= 12AE)$ or for $AB = 12$	
		P1	(indep) for use of given ratio eg $AE = 3AB$ oe, eg area of rectangle = $AE \times AB = 3x \times x$	
		A1	cao	

7	098.6	P1	for using bearings to determine ABC as 67°	Accept 67 written on the diagram. Accept correct substitution into RHS of equation Accept AC in the range 9.41 to 9.42 Accept any equivalent form with values substituted If the correct answer is given without supportive evidence award 0 marks. Condone missing "0" at the front. If an answer within the range is seen in working and rounded incorrectly award full marks.
		P1	for using the cosine rule to find AC eg $(AC^2 =) 9^2 + 8^2 - 2 \times 9 \times 8 \times \cos[67]$ oe or $AC = 9.4199\dots$	
		P1	(dep P1) for using the sine rule to find angle BAC eg $\frac{9}{\sin BAC} = \frac{9.42}{\sin[67]}$ oe OR for using the cosine rule to find angle BAC eg $9^2 = "9.42^{2"} + 8^2 - 2 \times "9.42" \times 8 \times \cos BAC$ oe	
		P1	for rearranging eg $\sin BAC = 9 \times \frac{\sin[67]}{9.42}$ oe OR eg $\cos BAC = ("9.42^{2"} + 8^2 - 9^2) \div (2 \times "9.42" \times 8)$ oe OR for angle $BAC = 61.57\dots$	
		A1	for angle in the range 98.5 to 98.6	

8	(a)	Shown	C1	for a method to find the area of half of the parallelogram or of the whole parallelogram, eg $\frac{1}{2}(2x-1)(10-x) \sin 150$ or $\frac{1}{2}(2x-1)(10-x) \times \frac{1}{2}$ oe or $(2x-1)(10-x) \sin 150$ or $(2x-1)(10-x) \times \frac{1}{2}$ oe	Could use the formula Need not be given as an inequality statement
			C1	for a correct expansion of the whole area eg $\frac{1}{2}(20x-10-2x^2+x)$ or $\frac{1}{2}(-2x^2+21x-10)$ or $-x^2+10.5x-5$	
			C1	complete chain of reasoning with fully correct algebra dealing with the inequality eg $x^2-10.5x+5 < -15$ or $x^2-10.5x+20 < 0$ or $2x^2-21x+10 < -30$ which lead to $2x^2-21x+40 < 0$	
	(b)	$2.5 < x < 8$	M1	for factorising, $(2x-5)(x-8)$	
	A1		for critical values, 2.5, 8		
A1	for any statement that x is greater than 2.5 and x is less than 8				

9	1.95	P1	for correct substitution into the cosine rule, eg $3.4^2 = 6.1^2 + 6.2^2 - 2 \times 6.1 \times 6.2 \times \cos BCA$	Can be any angle within triangle ABC P2 can be awarded for $BCA = 32(.08046913\dots)$ Must not come from incorrect processing
		P1	for a full process to find BCA eg $(\cos BCA =) \frac{6.1^2 + 6.2^2 - 3.4^2}{2 \times 6.1 \times 6.2}$ or $(BCA =) 32(.08046913\dots)$	
		P1	correct substitution into the sine rule, eg $\frac{DC}{\sin("32.08\dots" \times \frac{5}{2})} = \frac{6.2}{\sin(180 - "32.08\dots" - ("32.08\dots" \times \frac{5}{2})}$	
		P1	for complete process to find DC eg $(DC =) \frac{6.2 \times \sin "12.832"}{\sin "135.088"$	
		A1	Answer in the range 1.94 to 1.951	

10	15.4	M1	for $\frac{AB}{\sin 34} = \frac{23.8}{\sin 120}$ or $\frac{\sin 34}{AB} = \frac{\sin 120}{23.8}$	"120" comes from $180 - 26 - 34$ If an answer in the range 15.36 to 15.4 is given in the working space then incorrectly rounded, award full marks
		M1	for $(AB =) \frac{23.8}{\sin 120} \times \sin 34$	
		A1	for answer in range 15.36 to 15.4	
11	(a) 11.4	M1	for start to method to find the length of BC eg. $8^2 + 11^2 - 2 \times 8 \times 11 \times \cos 72$	If an answer within the given range is seen in working and rounded incorrectly award full marks. Any alternative method must be complete If an answer within the given range is seen in working and rounded incorrectly award full marks.
		M1	(dep on M1) for method to use correct order of operations, eg. $64 + 121 - 54.38 \dots$ (= 130.61...)	
		A1	for answer in the range 11.4 to 11.5	
	(b) 41.8	M1	for $0.5 \times 8 \times 11 \times \sin 72$ (= 41.8...)	
		A1	for answer in the range 41.5 to 41.9	