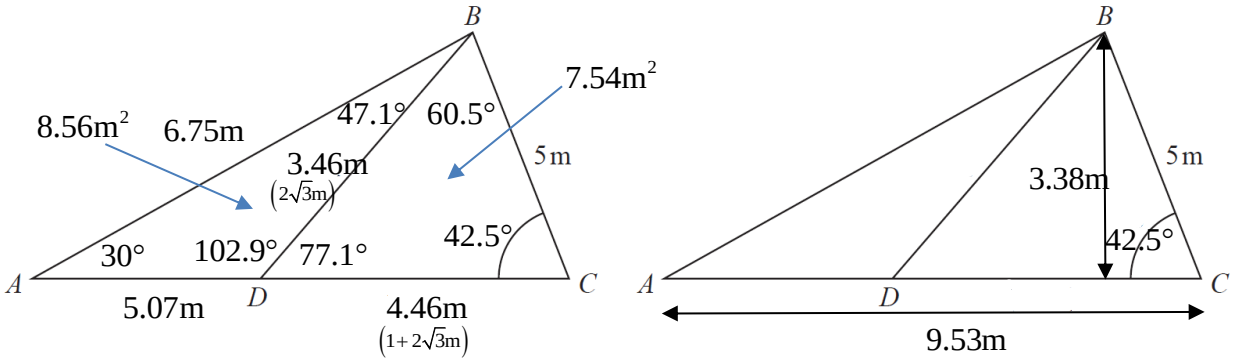
Question Number	Scheme	Marks
5a	e.g. $\left(\cos\theta =\right)\ \dfrac{5^2+(1+x)^2-x^2}{2\times5(1+x)}\ \left(=\dfrac{25+1+2x+x^2-x^2}{2\times5(1+x)}\right)$ or e.g. $x^2=5^2+(1+x)^2-2\times5(1+x)\cos\theta$	M1
	$\cos\theta=\dfrac{13+x}{5+5x}$ *	A1*
		(2)
b	$\theta=$ awrt $42°$ (42.470747….)	B1
	--- Attempts to find *AB*, *AD* or *AC*: e.g. $\dfrac{AB}{\sin"42"}=\dfrac{5}{\sin30}\Rightarrow AB=...$ or e.g. $\angle ABC=180-30-"42.5"="107.6"$ $\dfrac{\sin DBC}{1+2\sqrt{3}}=\dfrac{\sin"42.5"}{2\sqrt{3}}\Rightarrow\angle DBC="60.5",\ \angle ABD="107.6"-"60.5"="47.1"$ $\dfrac{AD}{\sin("47.1")}=\dfrac{2\sqrt{3}}{\sin30}\Rightarrow AD=...$ or e.g. $\dfrac{AC}{\sin"108"}=\dfrac{5}{\sin30}\Rightarrow AC=...$ ---	M1
	$AB=6.75...$ or $AD=5.07...$ or $AC=9.53...$	A1
	Area $=\dfrac{1}{2}\times5\times"6.75"\times\sin(180-30-"42.5")$ or $=\dfrac{1}{2}\times5\times"9.54"\times\sin("42.5")$	dM1
	$=$ awrt 16.1 (m^2)	A1
		(5)
		(7 marks)

(a)

M1: Uses the cosine rule to form an equation for $\cos\theta$. Condone just an expression for $\cos\theta$. (You may not see $\cos\theta=$)
Condone invisible brackets for this mark.
Be aware of longer versions which may involve splitting triangle *BCD* into two right angled triangles. They would still need to proceed to an equation involving $\cos\theta$ to score this mark.

A1*: Achieves the given answer with no errors seen including invisible brackets. There must be at least one stage of intermediate working between their starting equation and achieving the given answer. Condone $\cos\theta$ not appearing in the answer line, provided it is seen correctly as the subject on an earlier line.

(b) Note there are a variety of different methods to finding the area of triangle *ABC*



B1: $\theta = \text{awrt } 42°$ seen or implied. Accept 42.5. May work in radians (awrt 0.73/0.74 radians)

M1: Attempts to find *AB*, *AD* or *AC* using a correct method. Angles and lengths must be in the correct positions in the relevant formula or formulae. Condone slips in any rearrangement, calculations and substituting in $x = 2\sqrt{3}$ provided the method is correct. Condone working in radians provided the angles are consistently in degrees or radians within the expression or formula.

A1: awrt 6.75/6.76 or awrt 9.53/9.54 or awrt 5.07/5.08 (may be implied by further work).

dM1: Correct full method to find the total area (the expression is sufficient. It is dependent on the previous method mark. Condone use of incorrectly rounded angles/slips and may work in radians.

e.g. $\text{Area} = \frac{1}{2} \times 5 \times \text{"6.75"} \times \sin\left(\pi - \frac{\pi}{6} - \text{"0.74"}\right)$

May find the areas of the two separate triangles *ABD* and *BDC* and add them together.

e.g. $\text{Area} = \frac{1}{2} \times \text{"5.07"} \times \text{"6.75"} \times \sin 30 + \frac{1}{2} \times \text{"4.46"} \times 5 \times \sin \text{"42.5"}$

Use the diagrams above to help with the various methods. Invisible brackets may be implied by further work or their answer.

Note that if, as part of their method to find the total area, they find angle *ADB* but incorrectly deduce this as an acute angle then this is dM0

A1: awrt 16.1 m^2 (condone lack of units)

Question Number	Scheme	Marks
6a	$4(p-2x)=\dfrac{12+15p}{x+p}$ $8x^2+4px+12+15p-4p^2 \quad (=0)$	M1
	e.g. $a=8,\ b=4p,\ c=12+15p-4p^2$ $(4p)^2-4\times8\times(12+15p-4p^2) \quad (>0)$	dM1
	$3p^2-10p-8>0$ *	A1*
		(3)
b	e.g. $(p-4)(3p+2)\ (=0)\Rightarrow 4,\ -\dfrac{2}{3}$	M1
	$p<-\dfrac{2}{3}$ or $p>4$	M1A1
		(3)
		(6 marks)

Allow part (b) to follow on from (a) without any labelling of specific parts

(a)

M1: Multiplies by $(x+p)$, multiplies out the brackets and collects terms on one side.
Condone slips and the omission of = 0, but there must be an $...x^2$ term.
May be implied by further work e.g. their attempt at the discriminant.

dM1: Attempts b^2-4ac for their quadratic in *x* with their *b* and their *c* both being in terms of *p*.
The values/expressions for *a*, *b* and *c* for their quadratic in *x* must be embedded in the correct positions in the expression but condone invisible brackets and sign slips miscopying.
It is dependent on the previous method mark.

Condone for this mark if they work in terms of *x* instead of *p* provided the coefficients were actually those in terms of *p* from their original quadratic. i.e.

$8x^2+4px+12+15p-4p^2=0\Rightarrow a=8,\ b=4p,\ c=12+15p-4p^2$

$\Rightarrow(4x)^2-4\times8\times(12+15x-4x^2)\ (>0)$ (they have just written *x* instead of *p* which is fine)

A1*: Achieves $3p^2-10p-8>0$ with all stages of working shown:

- Multiplying out $(p-2x)(x+p)$
- Collecting terms on one side of an equation (=0 may be implied)
- Finding the discriminant
- At least one intermediate stage of working between the discriminant and the final answer

There must be no errors seen including invisible brackets but condone a missing trailing bracket if it does not alter the processing. e.g. $(4p)^2-4\times8\times(12+15p-4p^2$

Condone the > 0 appearing for the first time in their final answer, provided an incorrect inequality has not been used in earlier working.
Do not withhold this mark if they state e.g. "$b^2-4ac=0$" as part of their working.