Question Number	Scheme	Marks
7.(a)	Attempts $\frac{\sin\angle ACB}{6.5}=\frac{\sin 35}{4.7}$	M1
	$\angle ACB=$ awrt(52 or 53)° or awrt(127or128)°	A1
	$\angle ACB=127.5°$	A1
(b)	Eg $\frac{(AC)}{\sin"17.5°"}=\frac{6.5}{\sin"127.5°"}$ or $=\frac{4.7}{\sin 35°}$	M1 **(3)**
	$\left[\frac{(CD)}{\sin"75°"}=\frac{4.7}{\sin"127.5°"}\Rightarrow(CD)=...\Rightarrow(AC)+(CD)\right]$=awrt 8.2	A1
	Total length of wood $=8.1+6.5+4.7+4.7=$ awrt24.1	A1
		(3) **(6 marks)**
Alt1(a)	$\cos 35=\frac{AC^2+6.5^2-4.7^2}{2\times 6.5\times AC}\Rightarrow AC^2-13\cos(35)AC+20.16=0\Rightarrow AC=...$	
	$\cos\angle ACB=\frac{"AC"^2+4.7^2-6.5^2}{2\times"AC"\times 4.7}$ oe	M1

(a)

M1 Uses the sine rule with the angles and sides in the correct positions.

Alternatively they may use the cosine rule on ACB and then solve the subsequent quadratic to find AC and then use the cosine rule again

A1 $\angle ACB=$ awrt(52 or 53)° or awrt(127or128)°

A1 $\angle ACB=127.5°$ only

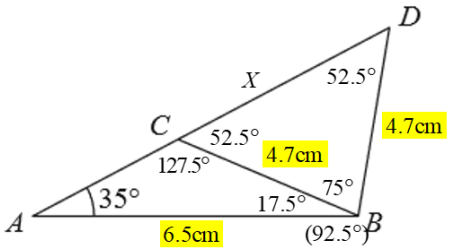
(b) Working for (b) may be found in (a) which is acceptable

M1 Uses a formula that finds **part or all of the length *AD* (eg *AC, CD , AX, XD, AD)***.

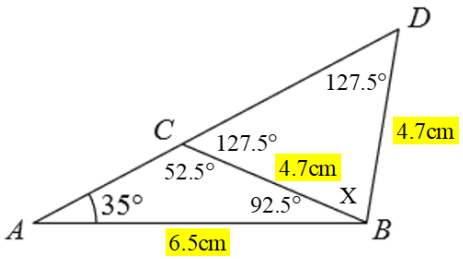
The minimum required for this mark is the use of angle(s) and lengths in the correct places in the formula (which may have been rearranged to an alternative form). Condone mislabelling of the unknown length. This is usually the sine or cosine rule but they could split the triangle into two right angled triangles. See WAYS for additional guidance on methods. Sight of awrt8.2, awrt2.46 or awrt5.72 would imply this mark.

Condone angles in their triangles which do not add up to $180°$ and condone angles found with no working shown. For reference below these are the angles that would be found with $\angle ACB = 127.5°$ and $\angle ACB = 52.5°$ although they may "restart" so check their diagram as this may help.

$\angle ACB = 127.5°$



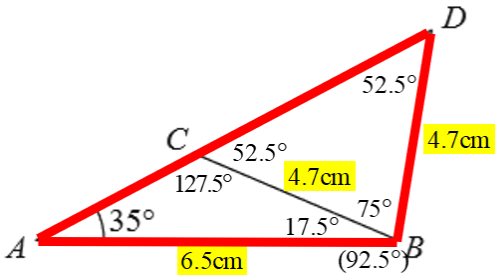
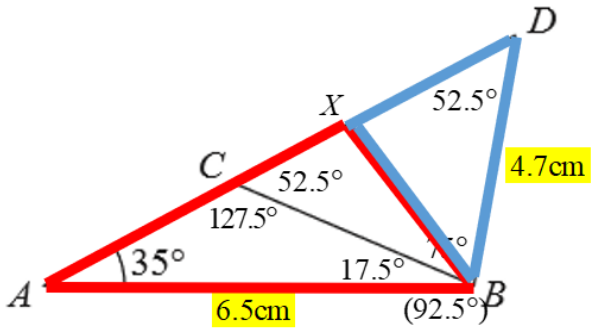
$\angle ACB = 52.5°$

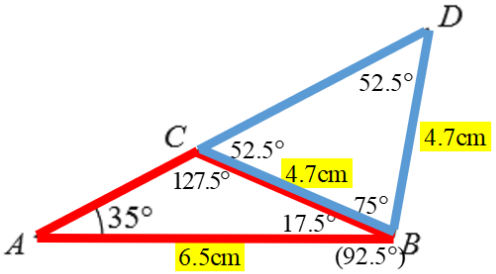


A1 awrt 8.2 Sight of awrt8.2 implies the length *AD* has been found. Ignore any labelling of lengths in their intermediate working and ignore any reference to *AC* (Accept "..." $= 8.2$). May be implied by a sum that totals awrt8.2 (eg awrt2.46+awrt5.72)

A1 awrt 24.1 ISW. Do not accept 24 or 25 (the length to the nearest metre) without seeing awrt24.1 or a calculation that totals awrt24.1 (eg $4.7 + 4.7 + 6.5 + 8.2$ $(= 24.1) \Rightarrow 24$)

Candidates who assumed $\angle ACB = 52.5°$ (acute) in (a):
Full marks can still be achieved as candidates may have restarted in (b) or not used the acute angle in their calculation which is often unclear. We are condoning any reference to $AC = 8.2$ so ignore any labelling of the lengths they are finding.

WAY 1 **(b)**	Uses triangle *ABD*:  **Option 1**: Cosine rule $4.7^2+6.5^2-2\times4.7\times6.5\cos(180°-35°-"52.5°")$ **Option 2**: Sine rule $\frac{(AD)}{\sin"92.5°"}=\frac{4.7}{\sin 35°}$ or $=\frac{6.5}{\sin"52.5°"}$ **Option 3**: Cosine rule using $35°$ to form a quadratic Eg. $\cos 35°=\frac{6.5^2+(AD)^2-4.7^2}{2\times6.5\times(AD)}$	M1 M1 M1
WAY 2 **(b)**	Forms two right angled triangles *ABX* and *BDX* :  Either of $6.5\cos 35°$ or $4.7\cos"52.5°"$	M1

WAY 3 (b)	Uses the triangles *ABC* and *BCD:*  **Length *AC*** **Option 1:** Cosine rule $(AC)^2 = 4.7^2 + 6.5^2 - 2\times 4.7\times 6.5\cos(180° - 35° - "127.5°")$ **Option 2:** Sine rule $\frac{(AC)}{\sin"17.5°"} = \frac{6.5}{\sin"127.5°"}$ or $\frac{4.7}{\sin 35°}$ **Option 3:** Cosine rule using $35°$ to form a quadratic in AC $\cos 35° = \frac{6.5^2 + (AC)^2 - 4.7^2}{2\times 6.5\times (AC)}$ **Length *CD*** **Option 1:** Cosine rule $(CD)^2 = 4.7^2 + 4.7^2 - 2\times 4.7\times 4.7\cos(180° - 2\times "52.5°")$ **Option 2:** Sine rule $\frac{(CD)}{\sin"75°"} = \frac{4.7}{\sin"127.5°"}$ **Option 3**: Cosine rule using $52.5°$ to produce a quadratic in CD $\cos"52.5°" = \frac{4.7^2 + (CD)^2 - 4.7^2}{2\times 4.7\times (CD)}$ **Option 4**: Using isosceles triangle property on *BCD* to find half of *CD* $4.7\cos"52.5°"$ (they do not have to double to find *CD* for M1)	M1 M1 M1 M1 M1 M1

Question Number	Scheme	Marks
8 (a)	States $y=4$	B1 (1)
(b)	States $(16,9)$ only	B1 (1)
(c)	$k \leqslant 4, k=9$	B1, B1 (2)
(d) (i)	$a=6$	B1
(ii)	$y=\mathrm{f}(x-3)$	B1 (2)
		(6 marks)

(a)

B1 $y=4$ only. May be written on a new graph

(b)

B1 $(16,9)$ condone lack of brackets and must be the only answer (or clearly their final answer). May be written on a graph again.

(c)

B1 Sight of either one of $k \leqslant 4, k=9$ Must be in terms of *k.* Ignore any others for this mark

B1 Both of $k \leqslant 4, k=9$ ONLY Where several inequalities or equations are given only mark what appears to be their final answer for the $k=...$ and their final answer for $k \leqslant ...$ Ignore any inequalities which are within $k \leqslant 4$

SC $y \leqslant 4, y=9$ (They never write in terms of k so score B1B0)

(d)(i)

B1 $a=6$ (6 on its own is sufficient). Also allow $(\mathrm{y}=)\ \mathrm{f}(x)-6$ and isw if they proceed to state $a=-6$

B1 $y=\mathrm{f}(x-3)$ Also accept $y=-\mathrm{f}(x)+6,\quad y=\mathrm{f}(x+4)-9$ or even rearrangements such as $\mathrm{f}(x)=6-y$ Do not accept combinations of different transformations as the question asked for a single transformation.