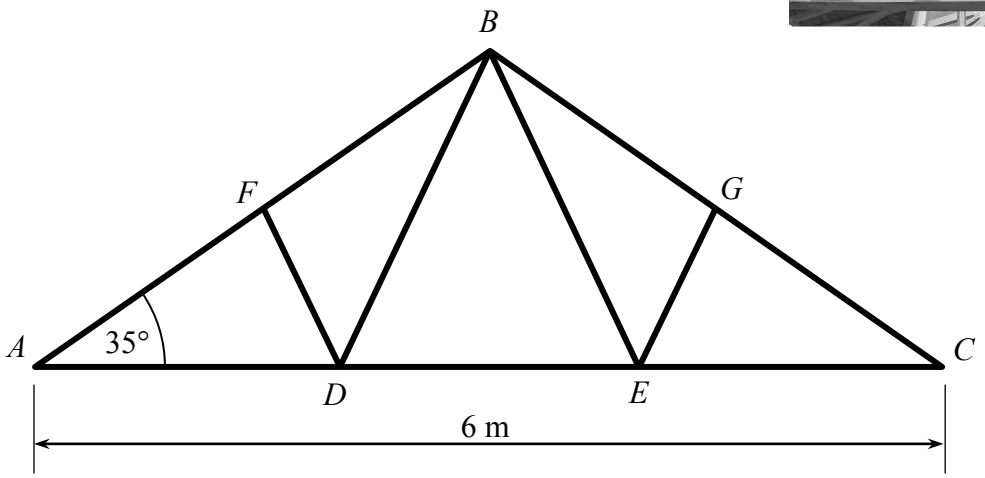
(b) Roofs of buildings are often supported by frameworks of timber called *roof trusses*.

A quantity surveyor needs to find the total length of timber needed in order to make the triangular truss shown below.



The length of $[AC]$ is 6 metres, and the pitch of the roof is 35°, as shown.
$|AD| = |DE| = |EC|$ and $|AF| = |FB| = |BG| = |GC|$.

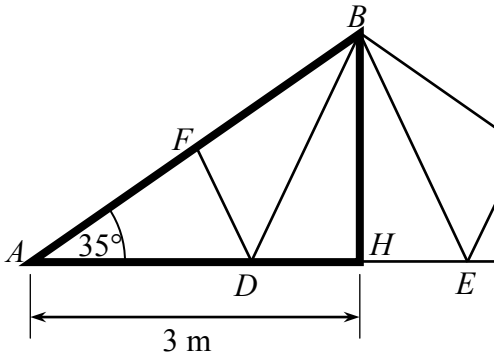
(i) Calculate the length of $[AB]$, in metres, correct to two decimal places.

$|AH| = 3$ m

$$\cos 35° = \frac{3}{|AB|}$$

$$|AB| = \frac{3}{\cos 35°} \approx 3{\cdot}66232$$

$|AB| = 3{\cdot}66$ m (to 2 decimal places)



(ii) Calculate the total length of timber required to make the truss.

$|FD|^2 = 1{\cdot}83^2 + 2^2 - 2(1{\cdot}83)(2)\cos 35°$
$= 1{\cdot}352707.$
$|FD| = 1{\cdot}163$ m

$|BD|^2 = 2^2 + 3{\cdot}66^2 - 2(2)(3{\cdot}66)\cos 35°$
$= 5{\cdot}403214.$
$|BD| = 2{\cdot}325$ m.

OR Similar triangles $\Rightarrow |BE| = 2|FD|$

Total length required $= 6 + 2(3{\cdot}662) + 2(1{\cdot}163) + 2(2{\cdot}325) = 20{\cdot}296 = 20{\cdot}3$ m.