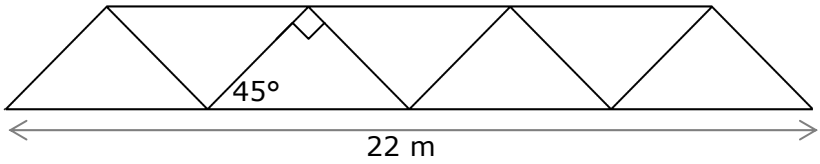
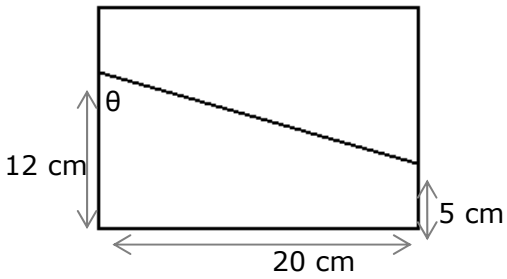
Extension Trigonometry Practice #3

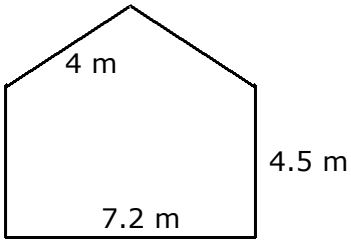
1. An engineer wants to build a bridge using a series of equal right angle isosceles triangles, as shown below. The river is 22 metres wide. What length of steel is rquired for a structure like the one shown?



2. A woodworker wants to make a box where the lid is cut on a slope. The dimensions he wants are shown below. What is angle, θ, he needs to set his saw at?



3. A symmetrical house frame is 7.2 metres wide across the base, the walls are 4.5 metres high and the roof beams are 4 metres long. How tall is the highest point?



4. A plane wishes to fly from one airport to another. The second airport is 60 km South and 35 km West of the first. How far is it, and what bearing does he need to take?

Answers: Extension Trigonometry Practice #3

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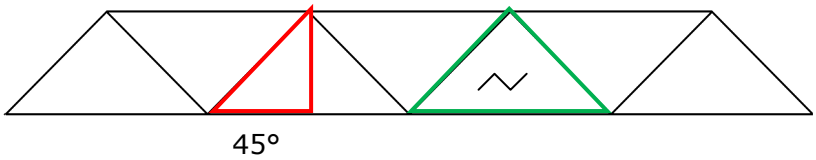

8 equal triangles, where strut is the hypotenuse and bottom side is ⅛th of the 22 metres
For marked triangle: strut length, *s* = H, bottom side = 2.75 m = A
s = A ÷ Cos = 2.75 ÷ Cos(45°) = 3.8891 **length of one strut = 3.89 m**
Or, using Pythagoras: strut^2 + strut^2 = (¼ of 22)^2. $2s^2 = 5.5^2$. s = $\sqrt{(5.5^2 \div 2)}$ = **3.89**
There are 8 such struts, plus 22 m along the bottom and ¾ of that along the to
= 8 × 3.89 + 22 + 0.75 × 22 = **69.62 metres**

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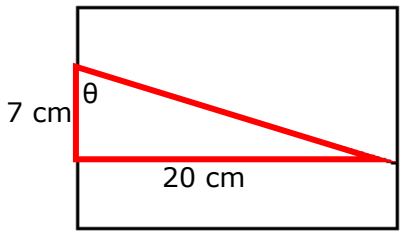

Make triangle by removing rectangle from the bottom of the trapezium
Base = O = 20, side = A = 12 – 5 = 7
Tan θ = O ÷ A = 20 ÷ 7
θ = Tan^{-1}(20 ÷ 7) = 70.70995
θ = **70.7°**

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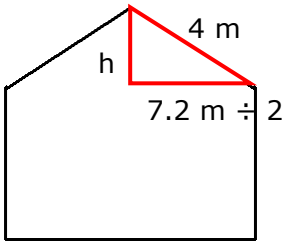
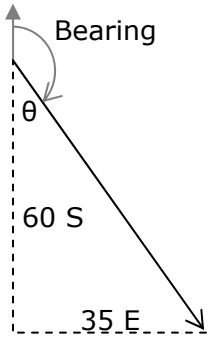


divide roof into two equal back to back triangles
make height of roof bit , our unknown = h
length of beam is hypotenuse = 4
base of triangle is half house width = 7.2 ÷ 2 = 3.6
$h^2 = 4^2 - 3.6^2 = 3.04$
h = $\sqrt{3.04}$ = 1.74356
now add in 4.5 metres for the wall height to the roof height
total height = 1.74 + 4.5 **height to top of building = 6.24 m**

4. A plane wishes to fly from one airport to another. The second airport is 60 km South and 35 km East of the first. How far is it, and what bearing does he need to take?



Distance^2 = $60^2 + 35^2$ = 4825
Distance = $\sqrt{4285}$ = **69.5 km**

We have O = 35 and A = 60, so we use TOA
θ = tan^{-1}(O ÷ A) = tan^{-1}(35 ÷ 60) = 30.26°
Bearing is 180 – θ round from North
Bearing to fly = 149.7