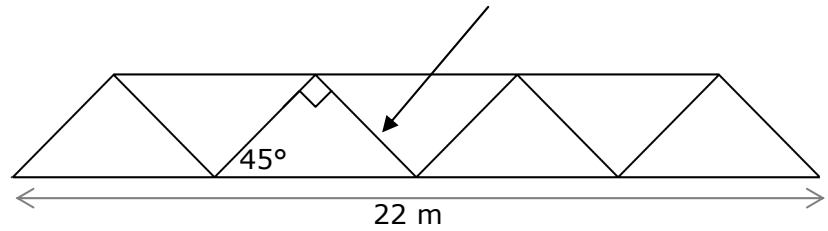
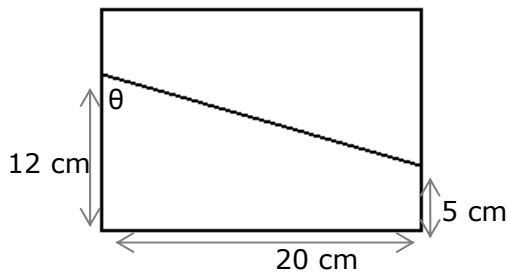


Extension Trigonometry Practice #3

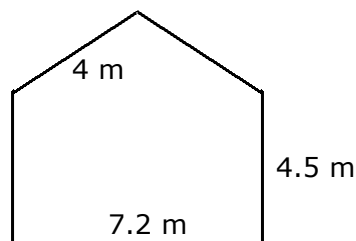
1. An engineer wants to build a bridge using a series of equal right angle isosceles triangles, shown below. The river is 22 metres wide. How long do the diagonal struts need to be?



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?



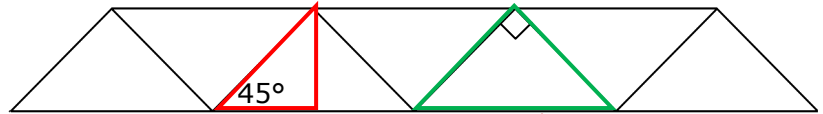
3. A symmetrical house frame is 7.2 metres wide across the base, the walls are 4.5 metres high and the roof beams are 4 metres long. How tall is the highest point?



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

1. An engineer wants to build a bridge using a series of equal right angle isosceles triangles, shown below. The river is 22 metres wide. How long do the diagonal struts need to be?



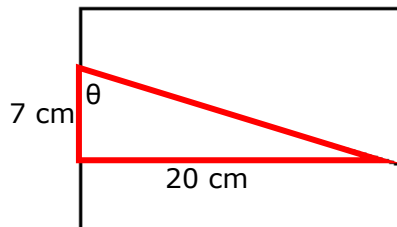
8 equal triangles, where strut is the hypotenuse and bottom side is $\frac{1}{8}$ th of the 22 metres

For marked triangle: strut length, $s = H$, bottom side = 2.75 m = A

$$s = A \div \cos = 2.75 \div \cos(45^\circ) = 3.8891 \quad \text{length of one strut} = \mathbf{3.89 \text{ m}}$$

Or, using Pythagoras: $\text{strut}^2 + \text{strut}^2 = (\frac{1}{4} \text{ of } 22)^2$. $2s^2 = 5.5^2$. $s = \sqrt{(5.5^2 \div 2)} = \mathbf{3.89}$

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?



Make triangle by removing rectangle from the bottom of the trapezium

Base = O = 20, side = A = 12 - 5 = 7

$\tan \theta = O \div A = 20 \div 7$

$\theta = \tan^{-1}(20 \div 7) = 70.70995$

$\theta = \mathbf{70.7^\circ}$

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?

divide roof into two equal back to back triangles

make height of roof bit, our unknown = h

length of beam is hypotenuse = 4

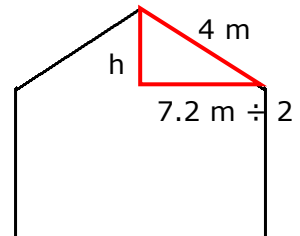
base of triangle is half house width = $7.2 \div 2 = 3.6$

$h^2 = 4^2 - 3.6^2 = 3.04$

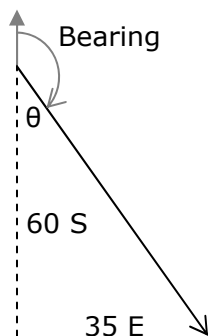
$h = \sqrt{3.04} = 1.74356$

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?



$$\text{Distance}^2 = 60^2 + 35^2 = 4285$$

$$\text{Distance} = \sqrt{4285} = \mathbf{69.5 \text{ km}}$$

We have O = 35 and A = 60, so we use TOA

$$\theta = \tan^{-1}(O \div A) = \tan^{-1}(35 \div 60) = 30.26^\circ$$

Bearing is $180 - \theta$ round from North

Bearing to fly = 149.7