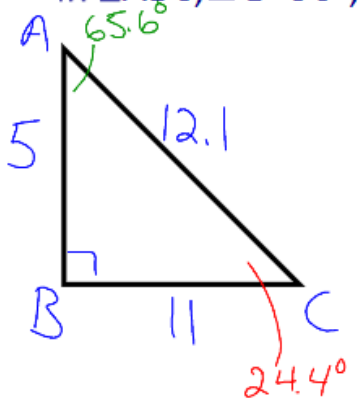
Solve the triangles!

In ΔABC, ∠B=90°, c = 5cm and a = 11 cm.



$b^2 = a^2 + c^2$

$b^2 = 5^2 + 11^2$

$b \doteq 12.1$

$\tan A = \frac{11}{5}$

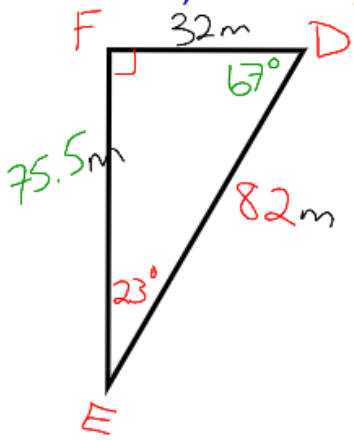
$A = \tan^{-1}\left(\frac{11}{5}\right)$

$\doteq 65.6°$

$C = 180 - 65.6 - 90$

$\doteq 24.4°$

In ΔDEF, ∠F = 90°, ∠E=23° and f= 82 m.



$D = 180 - 23 - 90$

$= 67°$

$\sin 67° = \frac{d}{82}$

$82(\sin 67°) = d$

$d \doteq 75.5\text{ m}$

$\frac{e}{\cos 67° = \frac{e}{82}}$

$82(\cos 67°) = e$

$e \doteq 32\text{m}$

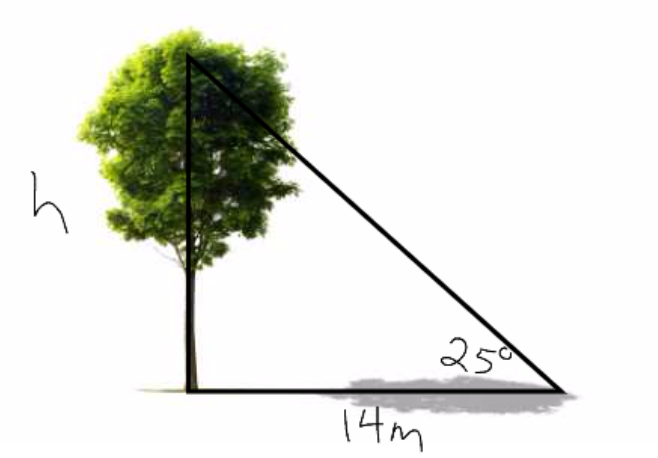
OR

$75.5^2 + e^2 = 82^2$

$e^2 = 82^2 - 75.5^2$

$e \doteq 32\text{m}$

Find the height of a tree to the nearest metre given the tree's shadow is 14m and the angle to the top of the tree from the ground is 25^0.

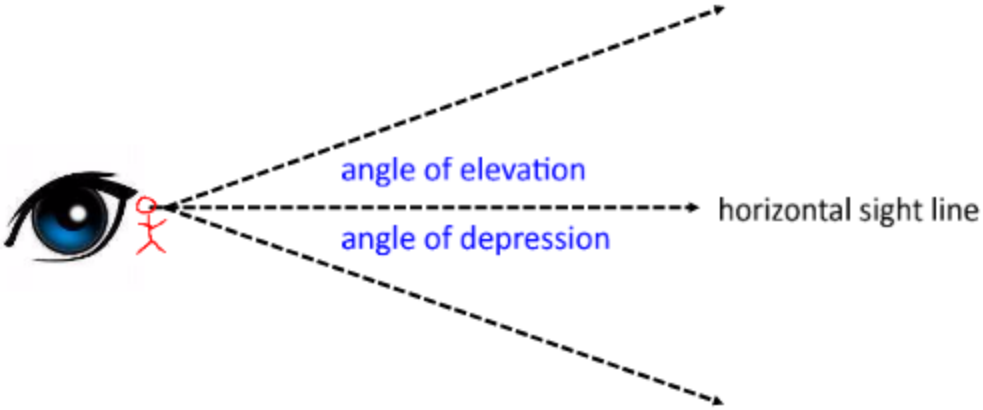


$\tan 25^\circ = \frac{h}{14}$

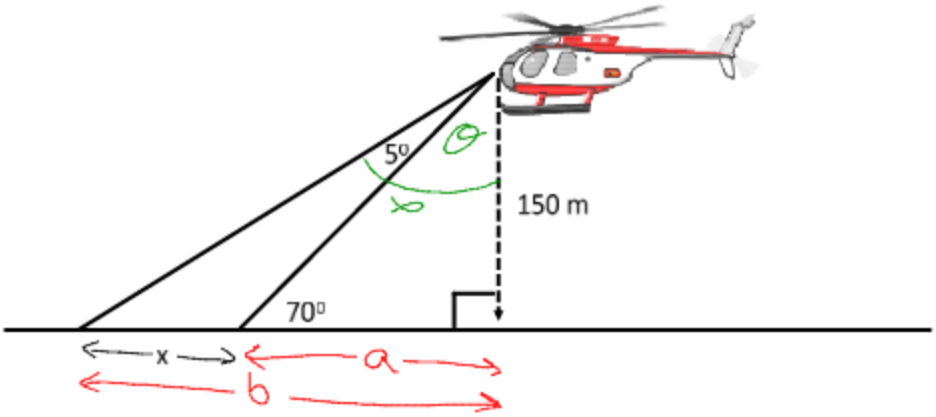
$14 \cdot \tan 25^\circ = h$

$h \doteq 6.5$

$\therefore$ The tree is approx. 7m tall



Ex. 1 A searchlight is mounted at the front of a search and rescue helicopter. The pilot is flying the helicopter 150 m above the ground and the beam hits the ground at 70^0 from the horizontal. The beam spreads out at an angle of 5^0. How wide is the beam when it hits the ground?



① $\tan 70^\circ = \frac{150}{a}$

$a = \frac{150}{\tan 70^\circ}$

$a \doteq 54.6\text{m}$

② $\theta = 180 - 70 - 90$

$= 20^\circ$

$\alpha = \theta + 5^\circ$

$= 25^\circ$

③ $\tan 25^\circ = \frac{b}{150}$

$150 \cdot \tan 25^\circ = b$

$b \doteq 69.9$

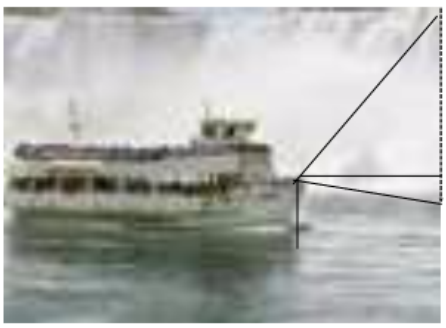
④ $x = b - a$

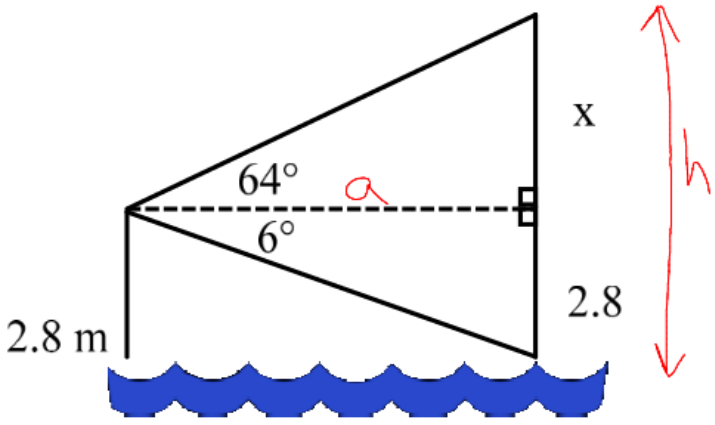
$= 69.9 - 54.6$

$= 15.3$

∴ The search light is approx. 15.3m wide when it hits the ground.

Ex 3 From the bridge of a boat on the Niagara River, the angle of elevation of the top of the Horseshoe Falls is 64°. The angle of depression of the bottom of the Falls is 6°. If the bridge of the boat is 2.8 m above the water, calculate the height of the Horseshoe Falls, to the nearest tenth of a metre.





① $\tan 6^\circ = \frac{2.8}{a}$

$a = \frac{2.8}{\tan 6^\circ}$

$\doteq 26.6$

② $\tan 64^\circ = \frac{x}{26.6}$

$26.6 \cdot \tan 64^\circ = x$

$x \doteq 54.6$

③ height $= 54.6 + 2.8$

$= 57.4$

∴ Height of the falls is approx 57.4m high