Find the missing sides and angles for the following triangles.

a)

Triangle with sides: 8 (vertical left), 12 (hypotenuse), angle z at top, angle x at bottom, side y at bottom. Right angle at bottom left.
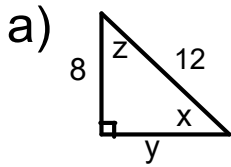
$\cos \theta = \dfrac{adj}{hyp}$

$\cos z = \dfrac{8}{12}$

$z = \cos^{-1}(8/12)$

$\boxed{z = 48^\circ}$

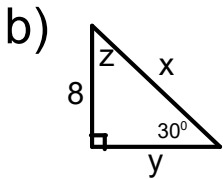$x = 180 - 90 - 48$

$\boxed{x = 42^\circ}$

$a^2 = c^2 - b^2$

$y^2 = 12^2 - 8^2$

$\qquad = 144 - 64$

$\qquad = 80$

$y = \sqrt{80}$

$\boxed{y = 8.9}$

b)

Triangle with side 8 (vertical left), x (hypotenuse top), angle z at top, 30° at bottom, side y at bottom. Right angle at bottom left.

$z = 180 - 90 - 30$

$\boxed{z = 60^\circ}$

$\tan 30^\circ = \dfrac{8}{y}$

$\dfrac{y \tan 30}{\tan 30} = \dfrac{8}{\tan 30}$

$\boxed{y = 13.9}$

$\sin \theta = \dfrac{opp}{hyp}$

$\sin 30^\circ = \dfrac{8}{x}$

$\dfrac{x \sin 30}{\sin 30} = \dfrac{8}{\sin 30}$
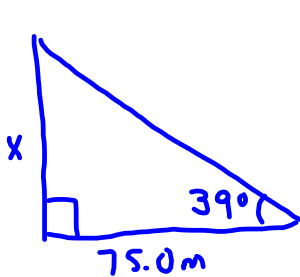
$\boxed{x = 16}$

Angle of depression - look down

x - angle of depression
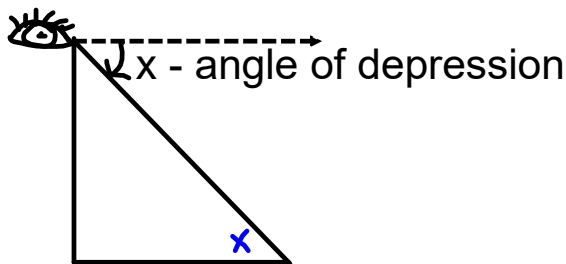
Angle of elevation - look up

x
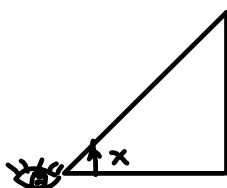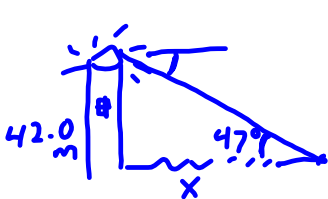
1. A television antenna casts a shadow that is 75.0m long. If the angle of elevation of the sun is 39^0, calculate the height of the antenna.

$$\tan \theta = \frac{opp}{adj}$$

$$\tan 39° = \frac{x}{75}$$

$$x = 75 \tan 39°$$

$$= 60.7 m$$

From the top of a lighthouse, a hovercraft is sighted at an angle of depression of 47^0. If the lighthouse is 42.0m high, how far is the vessel from the lighthouse?

$$\tan \theta = \frac{opp}{adj}$$

$$\tan 47° = \frac{42.0}{x}$$

$$x = \frac{42.0}{\tan 47°}$$

$$= 39.2 m$$