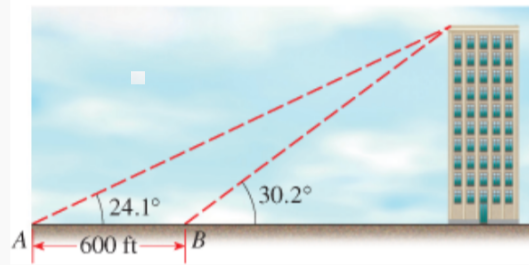
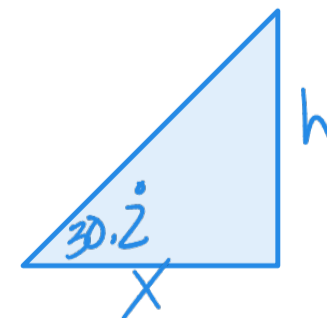
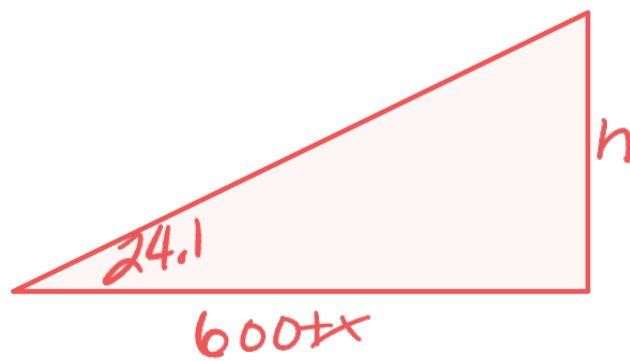
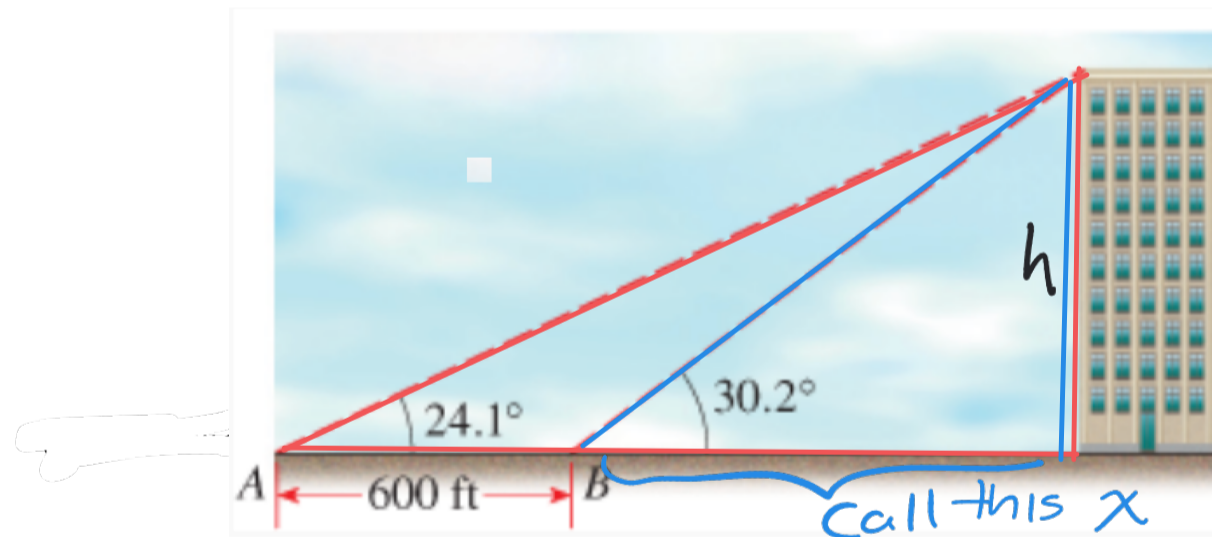


80. **Height of a Building** From a point A on the ground, the angle of elevation to the top of a tall building is 24.1° . From a point B , which is 600 ft closer to the building, the angle of elevation is measured to be 30.2° . Find the height of the building.



Do this problem in two different ways. Exact and approximate answers should be given (to 3 decimal point accuracy):

(1) Right triangle approach



$$\frac{h}{600+x} = \tan 24.1^\circ$$

$$h = (600+x) \tan 24.1^\circ$$

$$\tan 30.2^\circ = \frac{h}{x}$$

$$h = 600 \tan 24.1^\circ + x \tan 24.1^\circ \quad h = x \tan 30.2^\circ$$

This our system of equations

$$h = 600 \tan 24.1^\circ + x \tan 24.1^\circ \quad h = x \tan 30.2^\circ$$

substitute

$$x \tan 30.2^\circ = 600 \tan 24.1^\circ + x \tan 24.1^\circ$$

Get all the terms with x on one side

$$x \tan 30.2^\circ - x \tan 24.1^\circ = 600 \tan 24.1^\circ$$

Factor out x

$$x (\tan 30.2^\circ - \tan 24.1^\circ) = 600 \tan 24.1^\circ$$

divide

$$\frac{x (\tan 30.2^\circ - \tan 24.1^\circ)}{(\tan 30.2^\circ - \tan 24.1^\circ)} = \frac{600 \tan 24.1^\circ}{(\tan 30.2^\circ - \tan 24.1^\circ)}$$

$$\Rightarrow x = \frac{600 \tan 24.1^\circ}{\tan 30.2^\circ - \tan 24.1^\circ}$$

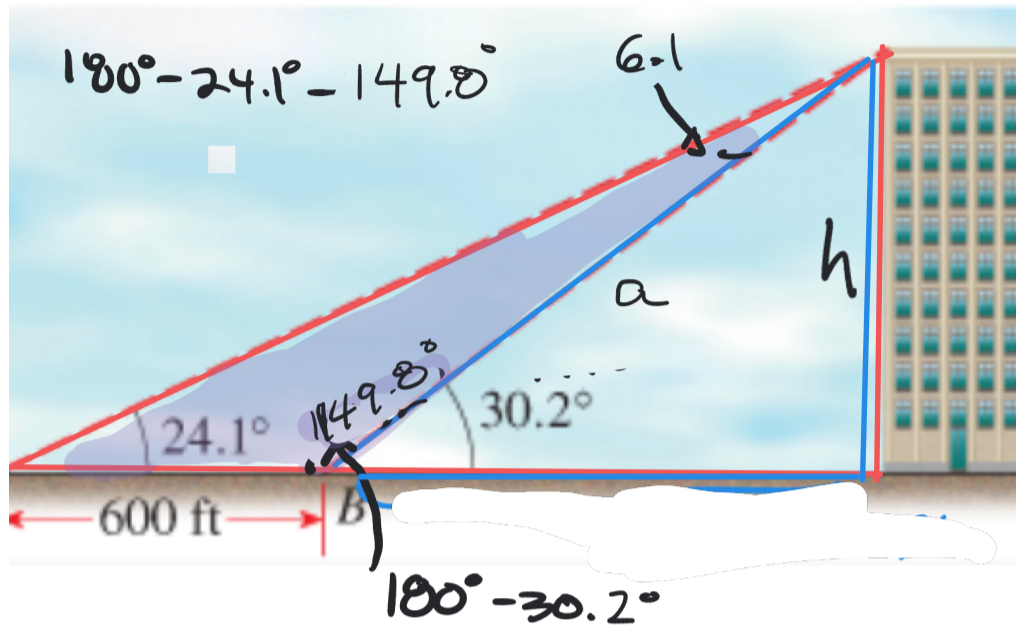
Our goal is to find h

Substitute this x back into one of the original equations

$$h = x \tan 30.2^\circ = \left(\frac{600 \tan 24.1^\circ}{\tan 30.2^\circ - \tan 24.1^\circ} \right) \tan 30.2^\circ$$

$$\approx 1159.7 \text{ ft}$$

Law of Sines



Can also do this using law of sines by considering the purple Δ , which is not a right Δ . First, find the missing angles using geometry

Find a : $\frac{a}{\sin 24.1^\circ} = \frac{600}{\sin 6.1^\circ} \Rightarrow a = \frac{600 \sin 24.1^\circ}{\sin 6.1^\circ}$

Now use the blue right Δ :

$$\frac{h}{a} = \sin 30.2^\circ$$

$$h = a \sin 30.2^\circ = \frac{600 \sin 24.1^\circ \sin 30.2^\circ}{\sin 6.1^\circ}$$

