Right Triangle Trigonometric Applications

Section 4.8

Precalculus PreAP/Dual, Revised ©2017

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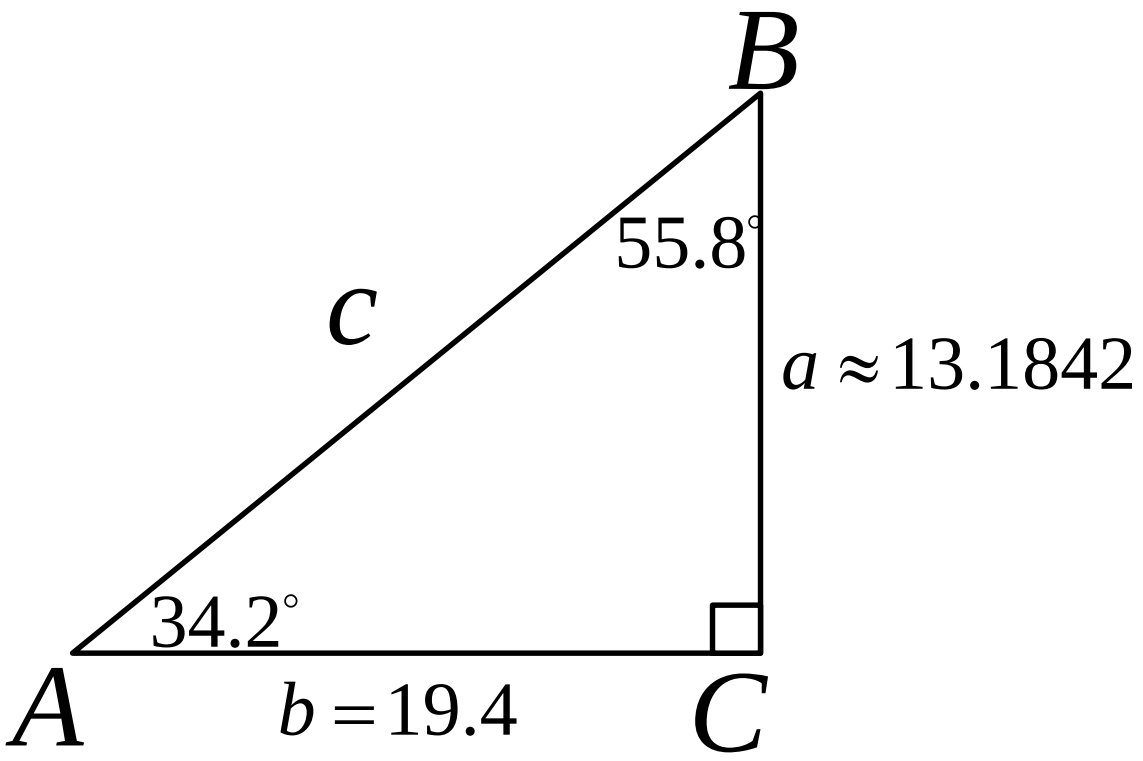
Steps in Application Problems

A. Draw a picture
B. Label the sides of the triangle and the missing side as x
C. Determine which of the 3 basic trig functions to use
D. Write the equation in calculator-ready form

EXAMPLE 1

Solve for all unknown sides and angles where $\angle A = 34.2°$, $b = 19.4$, and $\angle C = 90°$.



$$B = 180^\circ - \left(90^\circ + 54^\circ\right) = 55.8^\circ$$

$$\tan A = \frac{a}{b}$$

$$\tan 34.2^\circ = \frac{a}{19.4}$$

$$a = 19.4 \tan 34.2^\circ$$

$$a \approx 13.1842$$

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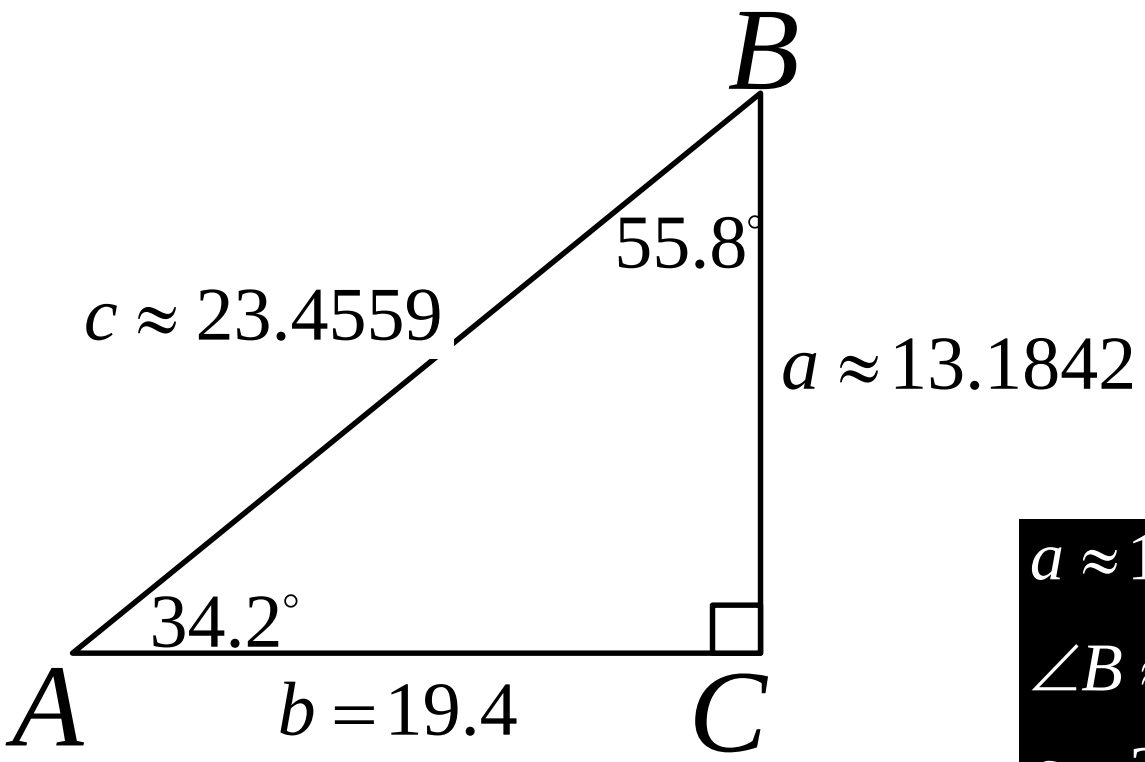


$$a^2 + b^2 = c^2$$

$$(13.1842)^2 + (19.4)^2 = c^2$$

$$550.1838 \approx c^2$$

$$c \approx 23.4559$$

$a \approx 13.1842$

$\angle B \approx 55.8°$

$c \approx 23.4559$

EXAMPLE 2

Solve for all unknown sides and angles where $B \approx 65°12'$, $a = 14.2$, and $\angle C = 90°$.

$\angle A = 24°48'$

$\angle B \approx 30.7316°$

$c \approx 35.8536$

YOUR TURN

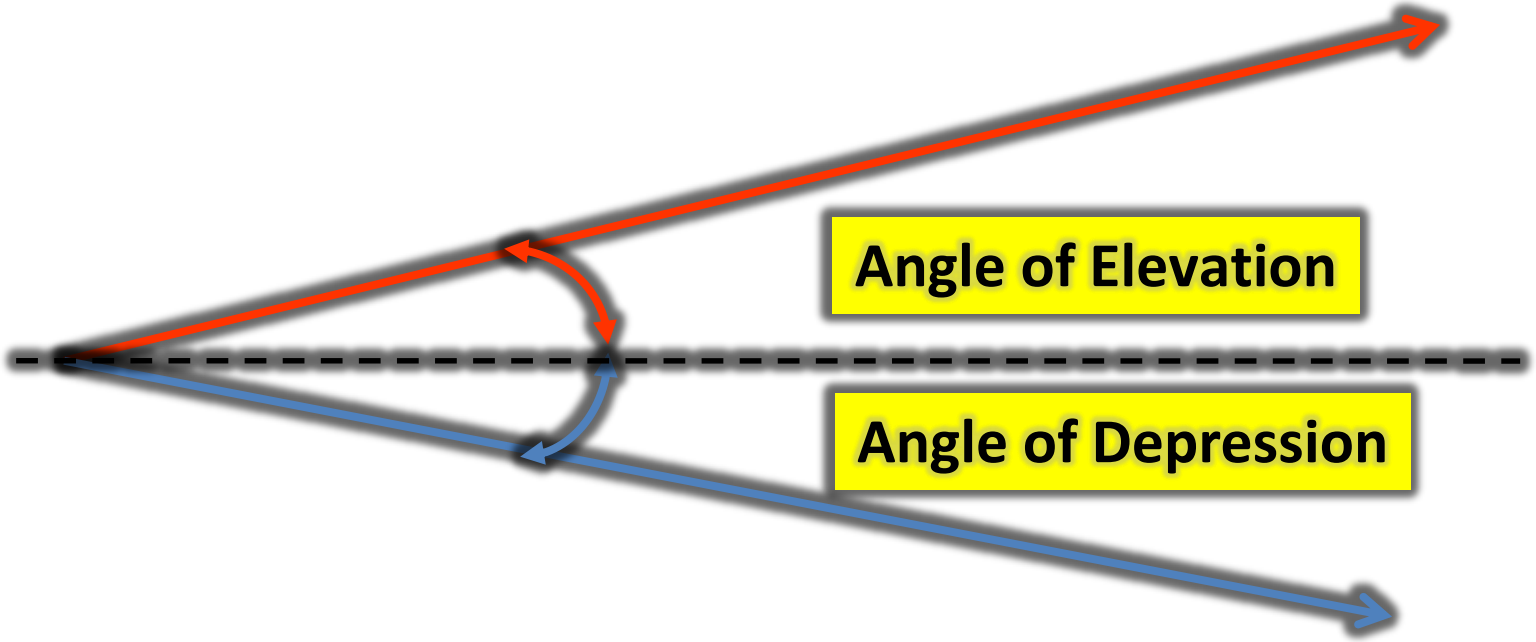
Solve for all unknown sides and angles where $A = 40°$, $b = 27$, and $\angle C = 90°$.

$$a \approx 22.6557$$
$$c \approx 35.6557$$
$$B = 50^\circ$$

Angle of Elevation & Angle of Depression

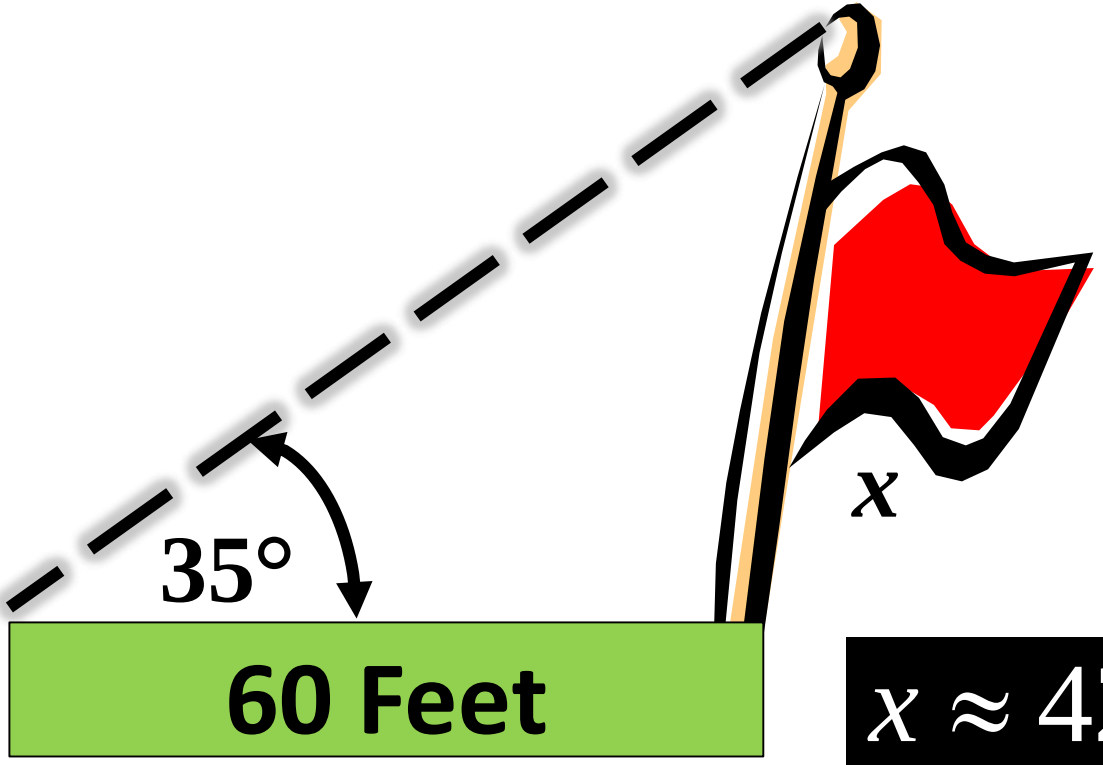
A. <u>Angle of Elevation</u> is a measurement above the horizontal line

B. <u>Angle of Depression</u> is a measurement below the horizontal line



EXAMPLE 3

A flagpole casts a 60-foot shadow when the angle of elevation is 35°. Find the height of the flagpole.



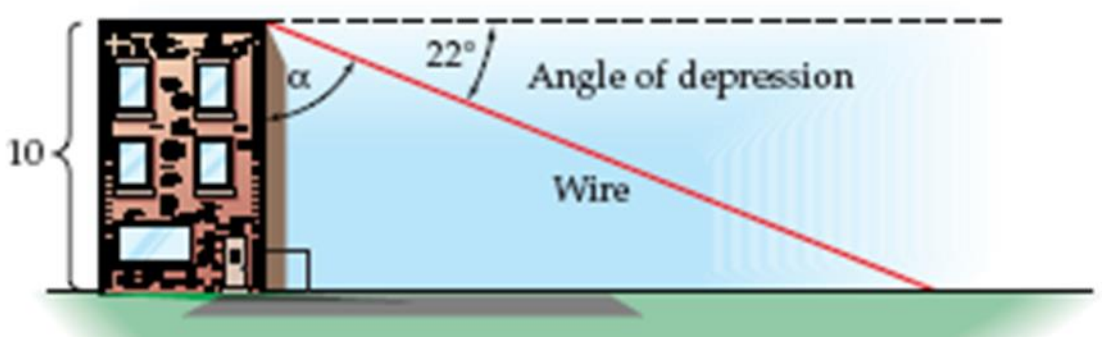
$$\tan 35^\circ = \frac{x}{60}$$

$$x = 60 \tan 35^\circ$$

$$x \approx 42.0125\ ft.$$

EXAMPLE 4

A wire needs to reach from the top of a building to the point on the ground. The building is 10 meters tall and the angle of depression from the top of the building to the point on the ground is 22°. How long should the wire be?



$$\sin 22^\circ = \frac{10}{x}$$

$$x = \frac{10}{\sin 22^\circ}$$

$$x \approx 26.6947 \text{ ft.}$$

EXAMPLE 5

A person on the edge of a canal observes a lamp post on the other side with an angle of elevation of $12°$ to the top of the lamp post and an angle of depression of $7°$ to the bottom of the lamp post from eye level. The person's eye level is 152 cm. Find the height of the lamp post.

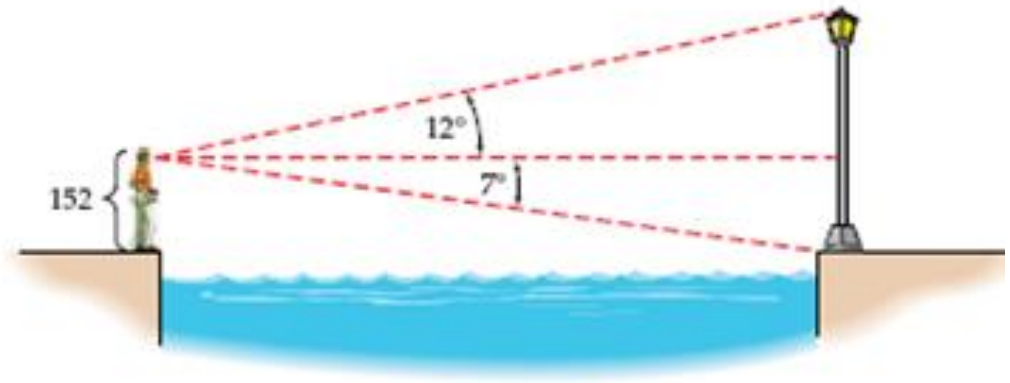


Figure 6.2-12

Width of the canal:

$$\tan 7^\circ = \frac{152}{AC} \qquad AC = \frac{152}{\tan 7^\circ}$$

$$AC = 1237.9406\ cm.$$

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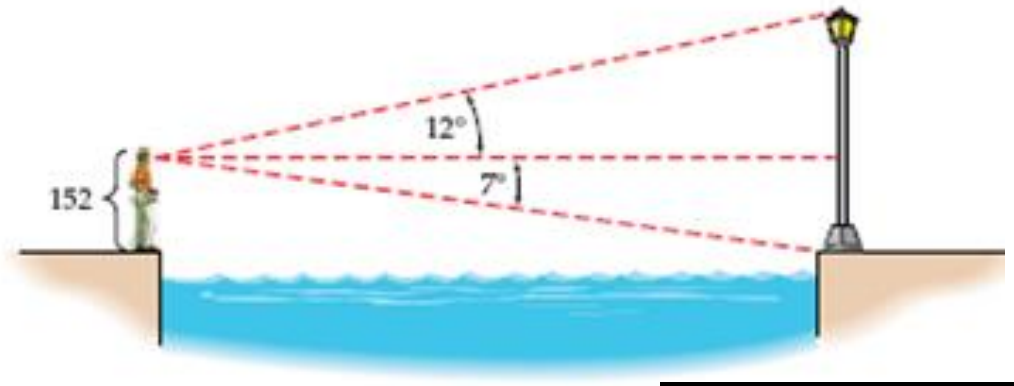

Figure 6.2-12

Height of Lamp post:

$$\tan 12^\circ \approx \frac{BC}{1237.9406}$$

$$BC \approx 1237.9407 \tan 12^\circ$$

$$BC \approx 263.13\ cm.$$

$$BC + CD = 415.13\ cm.$$

YOUR TURN

A boat is observed from the top of a 30 foot tower. The angle of depression from the tower to the boat is $15°$. How far is the boat from the tower? Round to 4 decimal places.

$111.9615\ ft.$

ASSIGNMENT

Page 336

5-13 odd, 19-25 all, 35