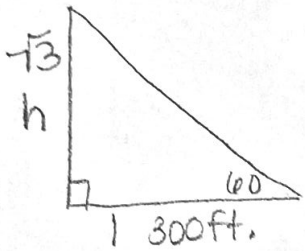
Precalculus Name: Kuz

PRACTICE (6.0) --Solving Problems with Trigonometry

1) The angle of elevation of the top of a cathedral from a point 300 ft away from the base is 60°. Find the height of the cathedral.



$\tan 60^\circ = \frac{h}{300}$

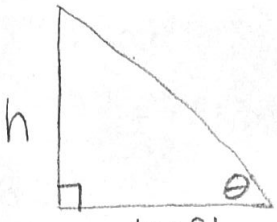
$\frac{\sqrt{3}}{1} = \frac{h}{300}$

$300\sqrt{3} = h$

$300\sqrt{3}$ ft ≈ 519.62 ft.

2) From a point 100 ft from its base, the angle of elevation to the top of the Arch of Septimus Severus, in Rome, Italy, is 34°13'12". How tall is this monument?

$\theta = 34^\circ + \frac{13'}{60} + \frac{12''}{3600}$

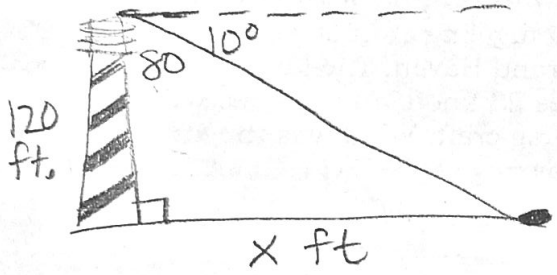


$\tan\theta = \frac{h}{100}$

$100\tan\left(34+\frac{13}{60}+\frac{12}{3600}\right) = h$

$\approx$ 68.01 ft

3) The angle of depression from the top of a lighthouse 120 ft above the surface of the water to a buoy is 10°. How far is the buoy from the lighthouse?

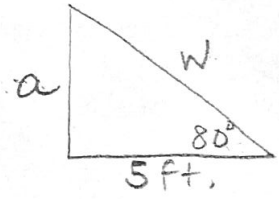


$\tan 80^\circ = \frac{x}{120}$ or $\tan 10^\circ = \frac{120}{x}$

$120\tan 80^\circ = x$ $\quad x = 120 \div \tan 10^\circ$

$x \approx 680.55$ ft

4) A guy wire connects the top of an antenna to a point on level ground 5 ft from the base of the antenna. The angle of elevation formed by this wire is 80°. What are the length of the wire and the height of the antenna?



$\tan 80^\circ = \frac{a}{5}$ $\quad \cos 80 = \frac{5}{w}$

$5\tan 80^\circ = a$ $\quad w = \frac{5}{\cos 80^\circ}$

$a \approx 28.36$ ft $\quad w \approx 28.79$ ft

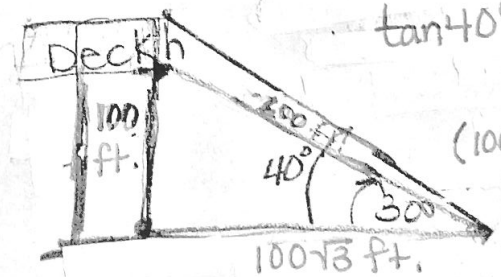
5) A boat, is located at point *P*, and *L* is the nearest point on the shore. Point *Q* is located 4.25 mi down the shoreline from *L* & the line segments formed by PL & LQ are perpendicular. Determine the distance that the boat is from the shore if $\angle PQL = 35°$.

$\tan 35^\circ = \frac{d}{4.25}$

$4.25\tan 35^\circ = d$

$d \approx 2.98$ miles

6) The angle of elevation from an observer to the bottom edge of an observation deck 200 ft from the observer is 30°. The angle of elevation from the observer to the top of the observation deck is 40°. What is the height of the observation deck?



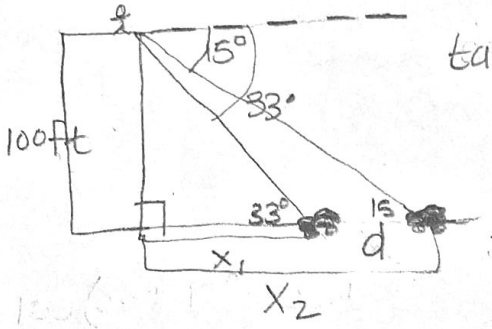
$\tan 40^\circ = \frac{h+100}{100\sqrt{3}}$

$(100\sqrt{3})\tan 40^\circ = h + 100$

$-100 \quad -100$

$h \approx 45.3$ ft

7) From the top of a 100-ft building a man observes a car moving toward him. If the angle of depression of the car changes from 15° to 33° during the period of observation, how far does the car travel?



$\tan 15° = \frac{100}{x_2}$

$x_2 = \frac{100}{\tan 15°}$

$\tan 33° = \frac{100}{x_1}$

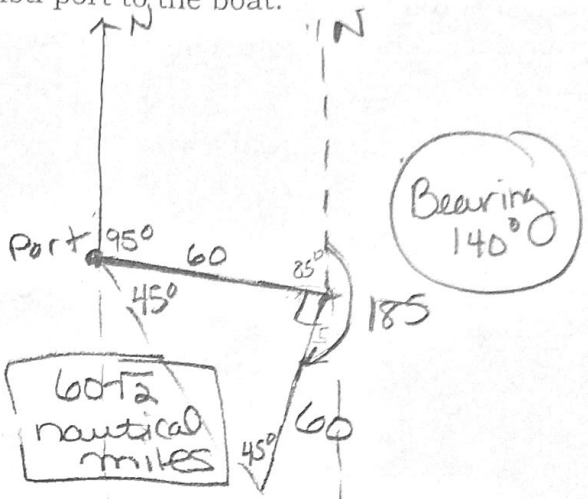
$x_1 = \frac{100}{\tan 33°}$

$d = x_2 - x_1$

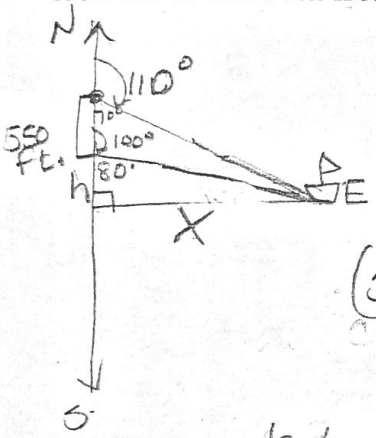
$= \frac{100}{\tan 15°} - \frac{100}{\tan 33°}$

219 ft.

8) A Coast Guard cutter travels at 30 knots from its home port of Corpus Christi on a course with bearing 95° for 2 hours. Then, it changes to a course of 185° for 2 hours. Find the distance and the bearing from the Corpus Christi port to the boat.



9) A shoreline runs north-south, and a boat is due east of the shoreline. The bearings of the boat from two points on the shore are 110° & 100°. Assume the two points are 550 ft apart. How far is the boat from the shore?



$\tan 80° = \frac{x}{h}$

$h \tan 80 = x$

$\tan 70° = \frac{x}{550+h}$

$(550+h)(\tan 70°) = x$

$h \tan 80° = (550+h)\tan 70°$

$h \tan 80° = 550 \tan 70° + h \tan 70°$

$h \tan 80° - h \tan 70° = 550 \tan 70°$

$h(\tan 80° - \tan 70°) = 550 \tan 70°$

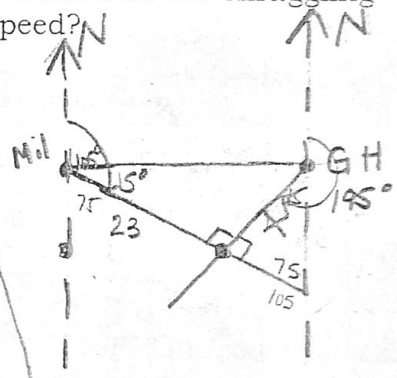
$h = \frac{550 \tan 70°}{(\tan 80° - \tan 70°)}$

$h \approx 516.83$

$h \tan 80 = x$

$x \approx 2931$ ft.

*10) Milwaukee, Wisconsin, is directly west of Grand Haven, Michigan, on opposite sides of Lake Michigan. On a foggy night, a law enforcement boat leaves from Milwaukee on a course with bearing of 105°, at the same time small smuggling craft steers a course of 195° from Grand Haven. The law enforcement boat averages 23 knots and collides with the smuggling craft. What was the smuggling boat's average speed?



$\tan 15° = \frac{x}{23}$

$23 \tan 15° = x$

$x \approx$ 6.2 Knots