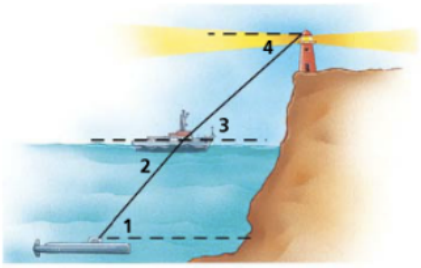
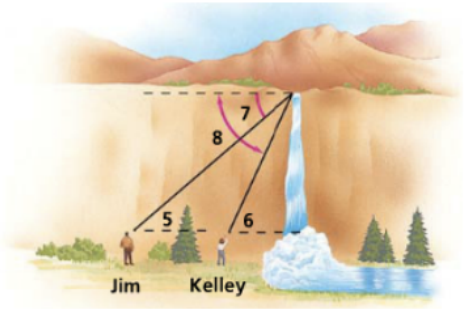
Lesson 6 Homework – Applications of Trigonometry

1. Using the diagrams below, match each angle number with the description below.





Angle 2 is the angle of depression from the boat to the submarine

Angle 3 is the angle of elevation from the boat to the lighthouse

Angle 1 is the angle of elevation from the submarine to the boat

Angle 4 is the angle of depression from the lighthouse to the boat

Angle 5 is the angle of elevation from Jim to the waterfall

Angle 8 is the angle of depression from the waterfall to Kelley

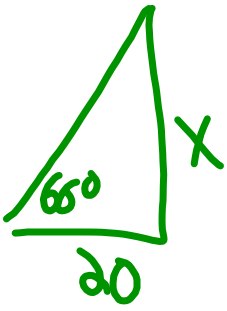
Angle 6 is the angle of elevation from Kelley to the waterfall

Angle 7 is the angle of depression from the waterfall to Jim

2. A tree casts a shadow that is 20 feet long. The angle of elevation from the end of the shadow to the top of the tree is 66°. Determine the height of the tree, to the *nearest foot.*

$\tan 66 = \frac{x}{20}$

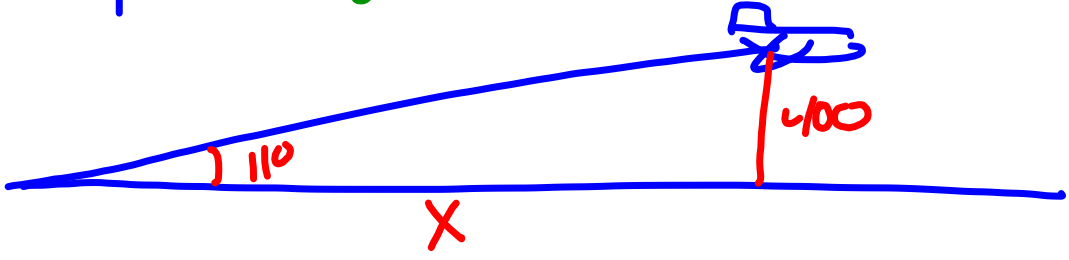
$x \approx 45 ft$



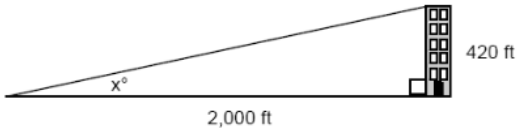
3. Draw and label a diagram of the path of an airplane climbing at an angle of 11° with the ground. Find, to the *nearest foot,* the ground distance the airplane has traveled when it has attained an altitude of 400 feet.

$\tan 11 = \frac{400}{a}$

$a \approx 2058 ft$



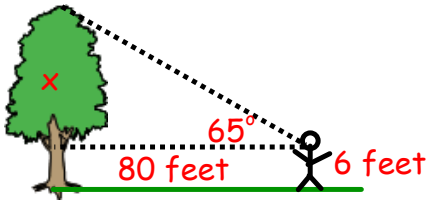
4. A person standing on level ground is 2,000 feet away from the foot of a 420-foot-tall building, as shown in the accompanying diagram. To the *nearest degree*, what is angle of elevation to the top of the building (*x*) ?



$\tan x = \frac{420}{2000}$ $x \approx 12°$

Draw a Picture!

5. At a point 80 ft from a tree a 6-foot forest ranger measures the angle of elevation to the top of the tree as 65°. How tall is the tree, to the nearest tenth of a foot?

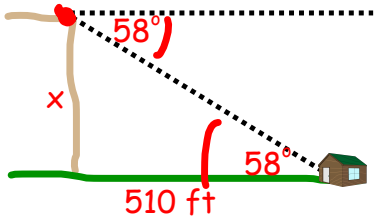


$\tan 65 = \frac{x}{80}$

$x \approx 171.5605536$

$x + 6 \approx$ 177.6 ft

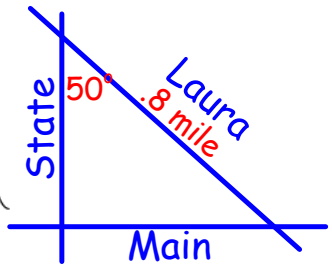
6. You look down from the top of a vertical cliff to a cabin on the floor of a canyon. The angle of depression is 58°. The cabin is 510 ft from the base of the canyon wall. How high is the canyon wall, to the nearest foot?



$\tan 58 = \frac{x}{510}$

$x \approx$ 816 feet

7. Three city streets form a right triangle. Main Street and State Street are perpendicular. Laura Street and State Street intersect at a **50°** angle. The distance along Laura Street from State Street to Main Street is **0.8** mile. If Laura Street is closed between Main Street and State Street for a festival, approximately how far (to the nearest tenth) will someone have to travel to get around the festival if they take only Main Street and State Street?



$\sin 50 = \frac{x}{.8}$ $\cos 50 = \frac{y}{.8}$

$x \approx .6128$ mile $y \approx .5142$ mile

total ≈ 1.1 miles

Lesson 7: More Applications with Rate, Area, and Density

Warm Up:

$$Speed = \frac{Distance}{Time} \qquad Rate = \frac{Change\ in\ one\ variable}{Change\ in\ other\ variable} \qquad Density = \frac{Amount}{Area}$$

1. Todd has 5 gallons of gasoline in his motorbike. After driving 100 miles, he had 3 gallons left. What is his average rate, in miles per gallon?

2. A rectangular garden, measuring 4 ft by 6 ft, is being used to plant tulips. If tulips require an average of 9 square *inches* of space, how many can you plant in this garden?

3. If gasoline costs $3.76 per gallon at one station and $3.98 at a second station, how much money will you save if you are buying 11 gallons at the first station?

$Speed = \frac{Distance}{Time}$ $Rate = \frac{Change\ in\ one\ variable}{Change\ in\ other\ variable}$ $Density = \frac{Amount}{Area}$

1. Todd has 5 gallons of gasoline in his motorbike. After driving 100 miles, he had 3 gallons left. What is his average rate, in miles per gallon?

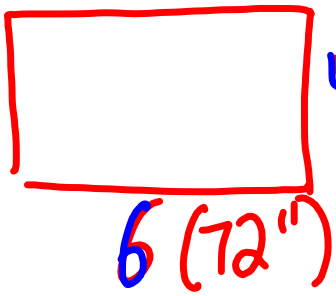
2 gallons 100 miles

$\frac{100 \text{ miles}}{2 \text{ gallons}}$

50 mpg

$Speed = \frac{Distance}{Time}$ $Rate = \frac{Change\ in\ one\ variable}{Change\ in\ other\ variable}$ $Density = \frac{Amount}{Area}$

2. A rectangular garden, measuring 4 ft by 6 ft, is being used to plant tulips. If tulips require an average of 9 square *inches* of space, how many can you plant in this garden?



4' (48")

6 (72")

1 tulip = 9 in²

A = 72 · 48

A = 3456 in²

$\frac{3456\ in^2}{9\ in^2}$

= 384 Tulips!

$Speed = \frac{Distance}{Time}$ $Rate = \frac{Change\ in\ one\ variable}{Change\ in\ other\ variable}$ $Density = \frac{Amount}{Area}$

3. If gasoline costs \$3.76 per gallon at one station and \$3.98 at a second station, how much money will you save if you are buying 11 gallons at the first station?

3.98
x 11
\$ 43.78

3.76
x 11
\$ 41.36

43.78
- 41.36
2.42

\$2.42

7000 mi 20 mi / gal

1. The shape of the state of New Hampshire can be roughly modeled by a right triangle, as shown in the map to the right. The population density if 147.8 people per square mile. Given the dimensions in the diagram, what is the total population of New Hampshire?

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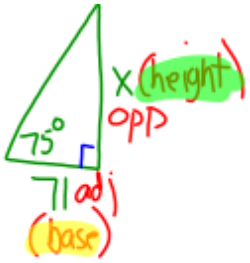
$A = \frac{bh}{2}$



$\frac{(\tan 75)}{1} = \frac{x}{71}$

$x = 71(\tan 75)$

$x = 265 \text{ mi.}$

$A_{state} = \frac{265(71)}{2}$

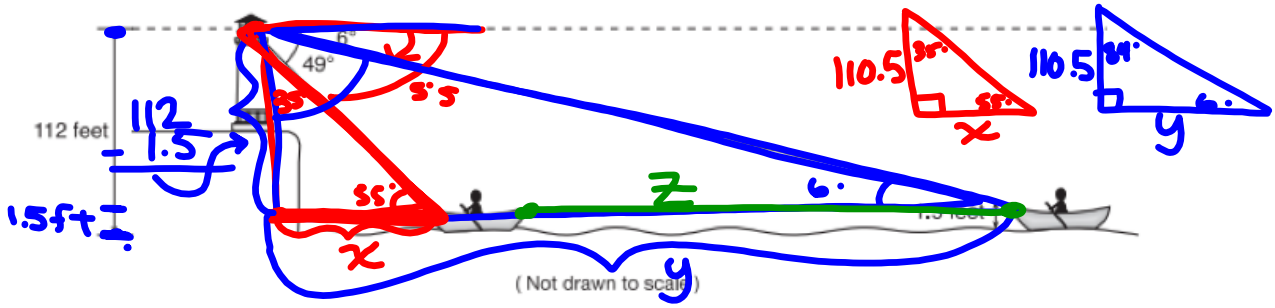
$A = 9407.5 \text{ mi}^2$

$147 \frac{\text{people}}{\text{mi}^2}$

$9407.5 \text{ mi}^2 \cdot 147.8 \frac{\text{people}}{\text{mi}^2}$

1,390,428.5 Peeps!

2. As shown below, a canoe is approaching a lighthouse on the coastline of a lake. The front of the canoe is 1.5 feet above the water and an observer in the lighthouse is 112 feet above the water.



At 5:00, the observer in the lighthouse measured the angle of depression to the front of the canoe to be 6°. Five minutes later, the observer measured and saw the angle of depression to the front of the canoe had increased by 49°. Determine and state, to the nearest foot per minute, the average speed at which the canoe traveled toward the lighthouse.

$\tan 35 = \frac{x}{110.5}$

$x = 77.3729$ ft

$\tan 6^\circ = \frac{110.5}{y}$

$y = 1051.3373$ ft

$z = y - x$

$z = 1051.3373 - 77.3729$

$= 973.9643$ ft

$\frac{}{5 \text{ min}}$

$= \frac{195 \text{ ft}}{\text{min}}$

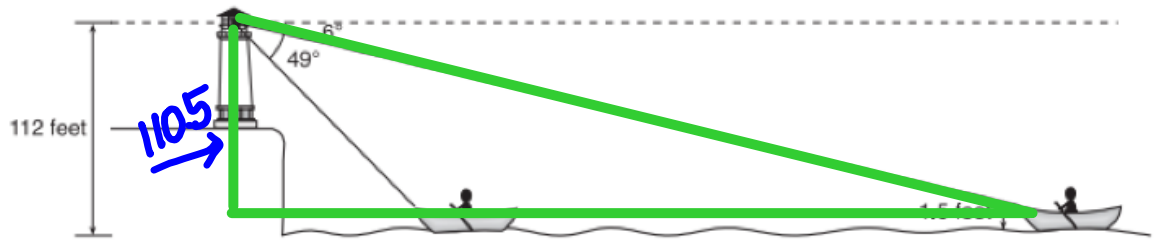
$5280 \text{ ft} = 1 \text{ mi}$

$60 \text{ min} = 1 \text{ hr}$

$\frac{195 \text{ ft}}{1 \text{ min}} \cdot \frac{1 \text{ mi}}{5280 \text{ ft}} \cdot \frac{60 \text{ min}}{1 \text{ hr}}$

$= 2.2 \text{ mi/hr}$

2. As shown below, a canoe is approaching a lighthouse on the coastline of a lake. The front of the canoe is 1.5 feet above the water and an observer in the lighthouse is 112 feet above the water.



(Not drawn to scale)

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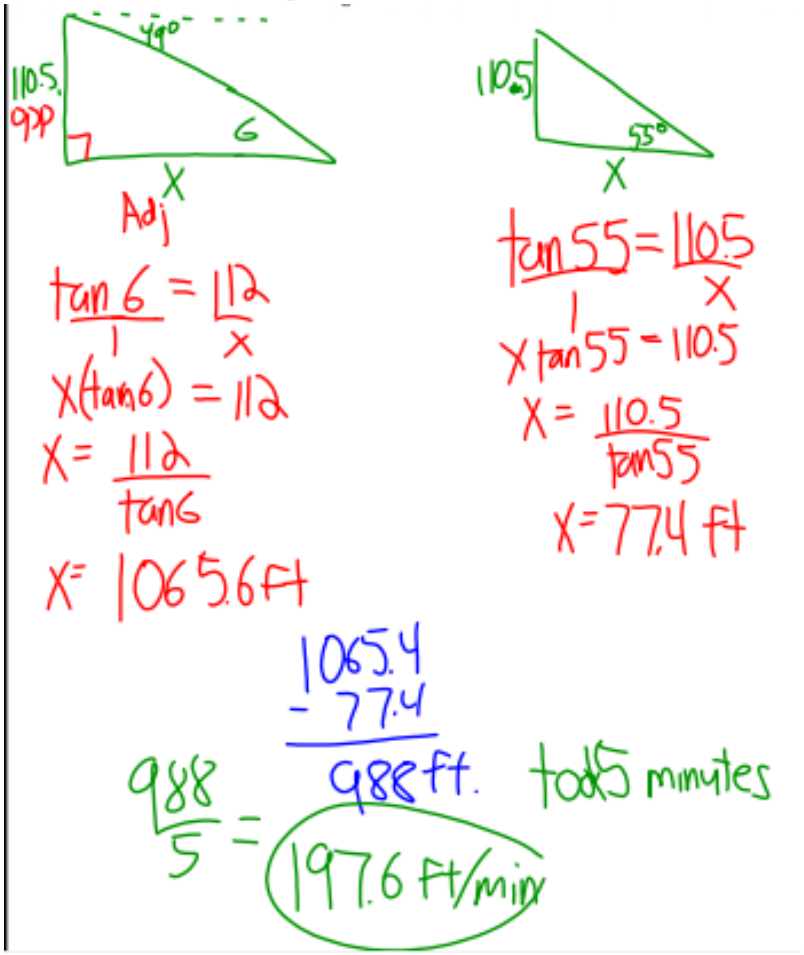
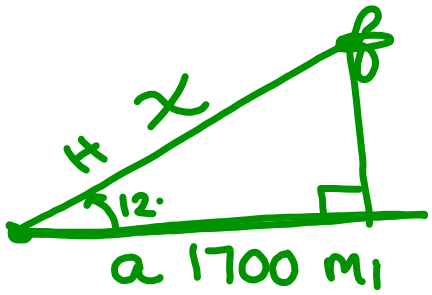


3. An airplane rises at an angle of elevation of 12° with the ground. If it takes 4 hours and 15 minutes to cover a *horizontal* ground distance of 1700 miles, what is the plane's average speed, to the nearest mile per hour?



$$\frac{\cos 12^\circ}{1} = \frac{1700}{x}$$

$$x \cdot \frac{\cos 12}{\cos 12} = \frac{1700}{\cos 12}$$

$$x = 1737.9790 \text{ mi}$$

HW 7
#'s 1-4

$$= \frac{1737.9790 \text{ mi}}{4.25 \text{ hrs}}$$

$$= 409 \text{ mph}$$

Another Quiz tomorrow!

HW 8-7

HW Packet 8-7