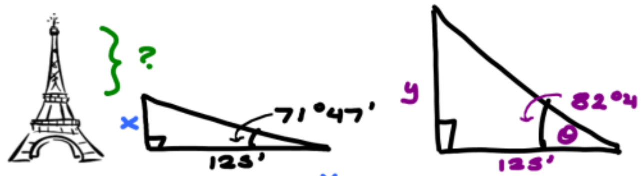
Wednesday, January 17, 2018
7:30 PM

Name: KEY Date: ______________ Period: ____________

4.8 - Applications Involving Right Triangles

DO NOW:

On Ms. Wong's most recent trip to Paris, she took one of the tourist boat rides down the Seine and paused 125 feet away from the base of the Eiffel Tower. From her vantage point on the boat, the angle of elevation to the Jules Verne Restaurant on the second floor of the tower was 71°47'. The angle of elevation to the top was 82°45'. How far is this famous restaurant from the top of the tower? Round to the nearest foot.



$\tan 71°47' = \frac{x}{125}$

$125 \tan 71°47' = x$

$x = 379.817'$

$\tan 82°45' = \frac{y}{125}$

$125 \tan 82°45' = y$

$y = 982.580'$

Distance from restaurant to top of tower:

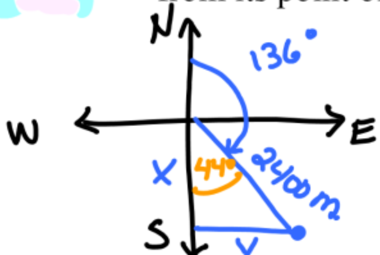
$982.580' - 379.817' = \boxed{603 \text{ feet}}$

Solve each of the following. Round all answers to the nearest TENTH. Be sure to indicate units.

1. An airplane flying 600 miles per hour has a bearing of 136°. After flying 4 hours, how far south and how far east has the plane traveled from its point of departure?

$600 \times 4 = 2400$ miles

$180° - 136° = 44°$



$\sin 44° = \frac{y}{2400}$

$2400 \sin 44° = y$

$y = \boxed{1667.2 \text{ miles east}}$

$\cos 44° = \frac{x}{2400}$

$2400 \cos 44° = x$

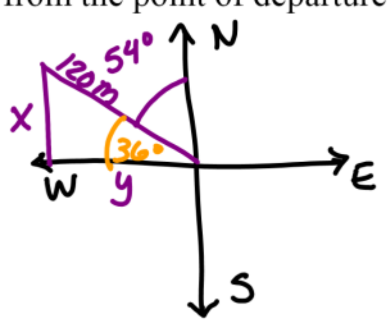
$\boxed{x = 1726.4 \text{ miles south}}$

2. A ship leaves port A at noon, travelling at a speed of 15 knots (15 nautical miles per hour) on a bearing of N 54° W. How far north and how far west is the ship from the point of departure at 8pm?

* Shortest TRIP TO N-S Axis

8 hrs × 15 mph = 120 miles

$90° - 54° = 36°$



$\sin 36° = \frac{x}{120}$

$120 \sin 36° = x$

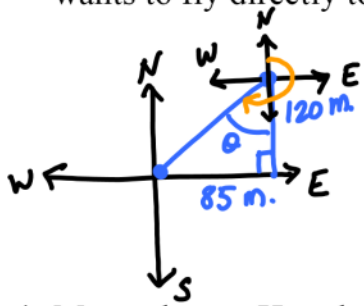
$\boxed{x = 70.5 \text{ miles north}}$

$\cos 36° = \frac{y}{120}$

$120 \cos 36° = y$

$\boxed{y = 97.1 \text{ miles west}}$

3. An airplane is 120 miles north and 85 miles east of an airport. The pilot wants to fly directly to the airport. What bearing should be taken?



$\tan\theta = \frac{85}{120}$

$\tan^{-1}\frac{85}{120} = \theta$

$\theta = 35.3°$

* Airplane bearings: Clockwise from due north

$180° + 35.3° =$

$\boxed{215.3°}$

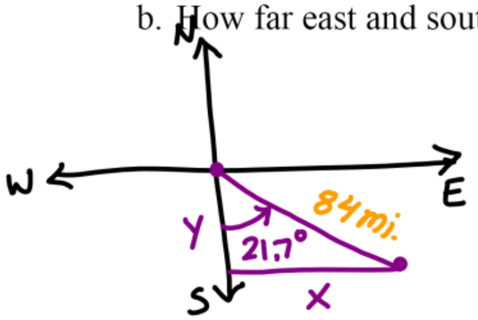
4. Moana leaves Honolulu in a canoe and heads towards the island of Maui at a bearing of S 21.7° E. The canoe averages a speed of 7 knots over the 116 nautical-mile trip.

   a. How long will it take Moana to make the trip?

116 nautical miles ÷

7 nautical miles per hour = 16.57 hR

   b. How far east and south is Moana after 12 hours?



12 hrs × 7 nautical mph = 84 mi.

$\sin 21.7° = \frac{x}{84}$

$84 \sin 21.7 = 31.1$

$\boxed{31.1 \text{ miles east}}$

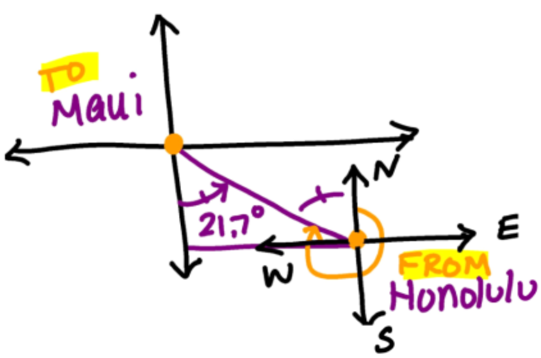
$\cos 21.7° = \frac{y}{84}$

$84 \cos 21.7° = 78$

$\boxed{78 \text{ miles south}}$

   c. If the demigod Maui wants to fly Moana back to Honolulu from the island of Maui, what bearing should they take?

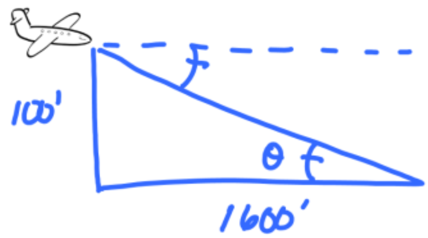
* Clockwise from due north



$360° - 21.7° =$

$= \boxed{338.3°}$

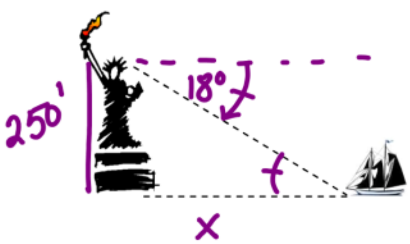
5. From the time a small airplane is 100 feet high and 1600 ground feet from its landing runway, the plane descends in a straight line. Determine the angle of descent. (depression)



$\tan\theta = \frac{100}{1600}$

$\tan^{-1}\frac{100}{1600} = \boxed{3.6°}$

6. On the observation platform in the crown of the Statue of Liberty, Danielle is approximately 250 ft above ground. She sees a ship in New York Harbor and measures the angle of depression as 18º. How far is the ship from the base of the statue?



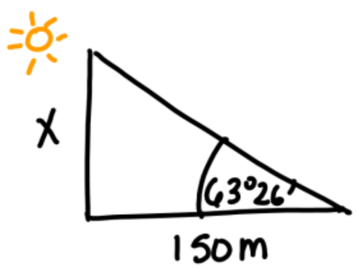
$\tan 18° = \frac{250}{x}$

$x \tan 18° = 250$

$x = \frac{250}{\tan 18°}$

$\boxed{x = 769.4 \text{ feet}}$

7. The Eiffel Tower in Paris casts a shadow 150m long when the angle of elevation of the sun is 63°26'. Find the height of the famous tower.

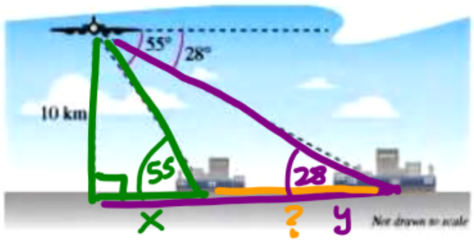


$\tan 63°26' = \frac{x}{150}$

$150 \tan 63°26' = x$

$\boxed{x = 300 \text{ m.}}$

8. A passenger in an airplane at an altitude of 10 km sees two towns directly to the east of the plane. The angles of depression to the towns are 28° and 55°. How far apart are the towns?



$\tan 55° = \frac{10}{x}$

$x \tan 55° = 10$

$x = \frac{10}{\tan 55°}$

$x = 7$ km

$\tan 28° = \frac{10}{y}$

$y \tan 28° = 10$

$y = \frac{10}{\tan 28°}$

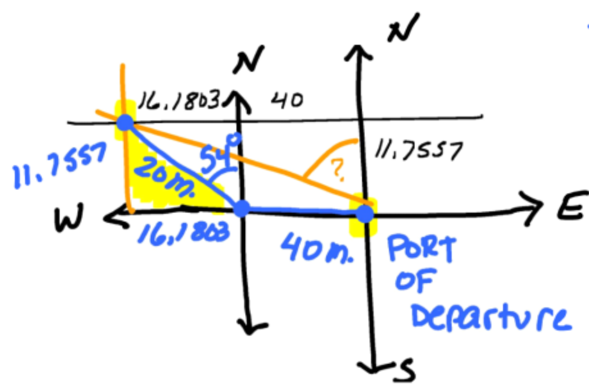
$y = 18.8$ km

18.8 km
− 7 km

$\boxed{11.8 \text{ km}}$

CHALLENGE: A ship leaves port at noon and heads due west at 20 knots (nautical miles/hour). At 2 PM, the ship changes course to N 54° W. Find the ship's bearing and distance from the port of departure at 3 PM.

N ? W



2hrs · 20 mph = 40 miles

1hr · 20 mph = 20 miles

$90° - 54° = 36°$

$\sin 36° = \frac{N}{20}$

$20 \sin 36° = N$

$N = 11.7557$ miles

$\cos 36° = \frac{W}{20}$

$20 \cos 36° = W$

$W = 16.1803$ miles

$\tan \theta = \frac{16.1803 + 40}{11.7557}$

$\tan^{-1} \frac{16.1803 + 40}{11.7557}$

$\theta = 78.2°$

$\boxed{N\ 78.2°\ W}$