Trig: Applied Problems

Section 1.8

1 October 2013

Instructions: Read the problems carefully, then solve. If you don't have a calculator, leave your answer in an appropriate exact form.
Please work together and feel free to ask questions.

Hint: Draw a lot of pictures.

1. An observer in a lighthouse 350 ft above sea level observes two ships directly off shore. The angles of depression to the ships are 4° and 6.5°, respectively. How far apart are the ships?

2. The sun is 20° above the horizon. Find the length of the shadow cast by a park statue that is 12 feet tall.

3. A global positioning system (GPS) orbits 12,500 miles above Earth's surface. Find the angle of depression from the satellite to the horizon. Assume the radius of Earth is 4000 miles.

4. A ship is 45 miles east and 30 miles south of port. The captain wants to sail directly to port. What bearing should be taken?

5. A point on the end of a tuning fork moves in simple harmonic motion described by the equation

$$d = a\sin(\omega t).$$

Find ω given that the tuning fork for middle C has a frequency of 264 vibrations per second.
[Hint: here frequency $= \frac{\omega}{2\pi}$]

6. True or false? Justify your answer.

The Leaning Tower of Pisa is not vertical, but when you know the angle of elevation to the top of the tower as you stand d feet away from it, you can find the height using the formula $h = d\tan(\theta)$.

7. Fire tower A is 30 km due west of fire tower B. A fire is spotted from the towers, and the bearings from A and B are **N** 76° **E** and **N** 56° **W**, respectively. Find the distance d from the fire to the "line" connecting the towers. [Draw a picture]

And now some problems more of my ilk:

8. Determine the angle between the diagonal of a cube and the diagonal of its base. [Draw a picture]

9. Determine the angle between the diagonal of a cube and an adjacent edge.

10. Find the length of the sides of a regular pentagon inscribed in a circle of radius 25 inches.

11. Do the same for a regular hexagon inscribed in the same circle.

And one more... because there is room left on the paper...

12. A guy wire runs from the ground to the top of a 25-ft telephone pole. The angle formed between the wire and the ground is 52°. How far from the base of the pole is the wire attached to the ground? [Assume the pole is perpendicular to the ground.]