Northern Arizona University

College of Engineering, Forestry, and Natural Sciences

CENE 270

Homework # 2

48 Points (3 points each)

Homework # 2: Fundamentals Review

Answer the following questions on a separate sheet of paper. All questions must be rewritten, figures redrawn, and all work must be shown.

1. How many centimeters are there in 565.7inches?

2. Suppose that an artillery piece has a range R=1.296×10^4 yards. Find its range in miles.

3. What is the speed of a car traveling at v=1mph in SI units (m/s)?

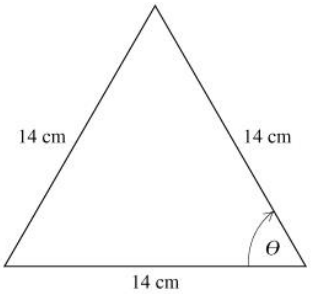
4. What is the area measurement, 377 (10^6) ft^2, in SI units (km)?

5. A student has derived the following non-dimensionally homogeneous equation:

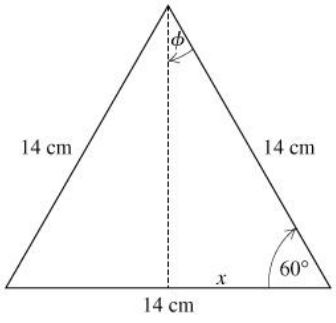
$$a = \frac{x}{t^2} - vt + \frac{F}{m}$$

where v is a velocity's magnitude, a is an acceleration's magnitude, t is a time, m is a mass, F is a force's magnitude, and x is a distance (or length). Which terms are dimensionally homogeneous?

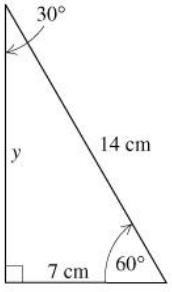
6. An equilateral triangle is a triangle with all three sides of equal length (figure to the right). All of the angles in an equilateral triangle are equal. What is the measure of angle θ in the triangle shown? Express your answer in degrees.



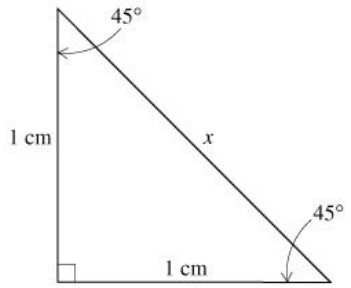
7. Using the figure to the right, find the measure of angle ϕ in degrees minutes and seconds and the length of segment x in centimeters. Express the two answers in degrees and centimeters, respectively. Separate the two with a comma.



8. Using the figure to the right, what is the length y of the remaining, vertical side of the 30-60 right triangle? Express your answer in centimeters to three significant figures.



9. In the figure at right both are given lengths of 1 cm. What is the length of the hypotenuse of this triangle? Express your answer in centimeters to four significant figures.

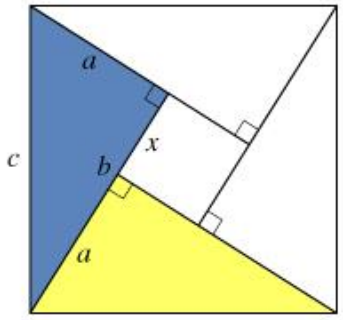


10. Now, consider a right triangle with legs of lengths 5 cm and 12 cm. What is the length c of the hypotenuse of this triangle? Express your answer to three significant figures.

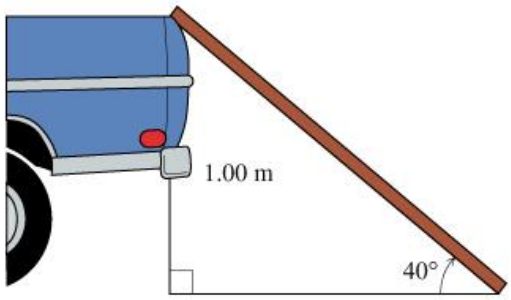
11. Suppose that you have measured a length of 6 cm on one board and 8 cm on the other. You would adjust the two boards until the length of the string had value c to ensure that the boards made a right angle. What is c? Express your answer in centimeters to three significant figures.

12. Using the figure to the right, what is the length x of a side of the small inner square? Express your answer in terms of some or all of the variables a, b, and c.

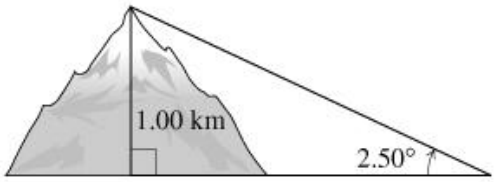
13. Using the same figure. Given that the side of the square has a length b−a, find the area of one of the four triangles and the area of the small inner square. Give the area of one of the triangles followed by the area of the small inner square separated by a comma.



14. Suppose that you need to get a heavy couch into the bed of a pickup truck (figure to the right). You know the bed of the truck is at a height of 1.00 m and you need a ramp that makes an angle of 40 with the ground if you are to be able to push the couch. Use the sine function to determine how long of a board you need to use to make a ramp that just reaches the 1.00-m high truck bed at a 40 angle to the ground. Express your answer in meters to three significant figures.



15. Surveyors frequently use trig functions. Suppose that you measure the angle from your position to the top of a mountain to be 2.50 (figure below). If the mountain is 1.00 km higher in elevation than your position, how far away is the mountain? Express your answer in kilometers to three significant figures.



16. A support wire is attached to a recently transplanted tree to be sure that it stays vertical (figure to the right). The wire is attached to the tree at a point 1.50 m from the ground, and the wire is 2.00 m long. What is the angle ϕ between the tree and the support wire? Express your answer in degrees minutes and seconds to three significant figures.