

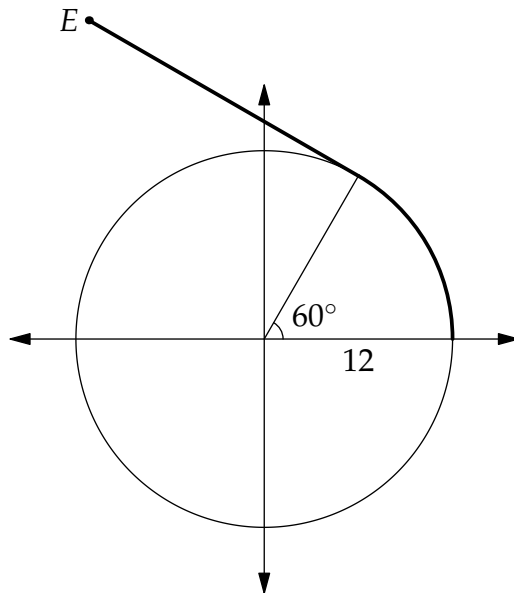
18.022 Recitation Handout  
3 September 2014

1. Leona discovered a set of instructions for finding a buried treasure. The instructions say:

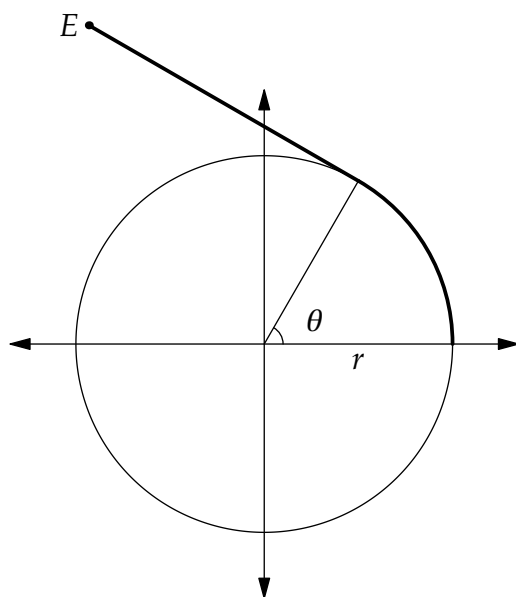
1. Start at the old oak tree in the downtown park.
2. Walk 14 meters northeast.
3. Walk 12 meters west.
4. Walk 10 meters north.
5. Walk 14 meters southeast.
6. Walk 8 meters east.
7. Dig a hole two feet deep.

She hops on a train to make her way downtown, and during the ride she decides to simplify the instructions as much as possible. Replace steps 2-6 with at most two instructions which will still get Leona to the buried treasure.

2. A rope of length  $12\pi$  units is partially wrapped around a tree of radius 12 units, as shown in the figure below. The part of the rope not touching the tree is pulled tight. Find the coordinates of the end of the rope, labeled  $E$ .



3. Repeat the previous exercise but with a general angle  $\theta$  in place of  $60^\circ$ , a general radius  $r$  in place of 12, and a general rope length  $L$  in place of  $12\pi$ .



4. (Fun/Challenge Problem) You are at the center of a circular pond, and at the perimeter there is a monster who cannot swim. The monster can run 4 times faster than your swimming speed, and both of you can change direction instantaneously at will. You can run faster than the monster, so if you reach the edge at a point where the monster is not waiting to attack, you can escape. (a) Describe a strategy for escaping the monster that works no matter how it chooses to move. (b) Find all numbers with which 4 may be replaced such that it is still possible to escape the monster.

