In Class Exercises (ICE) - 11/1/00

In Costa Rica, some varieties of ants (especially Pseudomermex spinicola) make their homes in acacia trees. An acacia tree that is the host for a colony of ants can be recognized because it is in the middle of a perfectly circular patch of bare earth (see Figure 1. below). The relationship between the ants and the acacia tree is an example of mutualism, that is organisms cooperating for mutual benefit. The ants make their home in the tree, feed off the tree and get a secure place to live. In return, the ants drive off plant eating insects and destroy all plant life near the tree, eliminating the tree's competitors. The tree benefits because the ants eliminate other plants that would compete with the Acacia tree for space, light, water and soil nutrients.

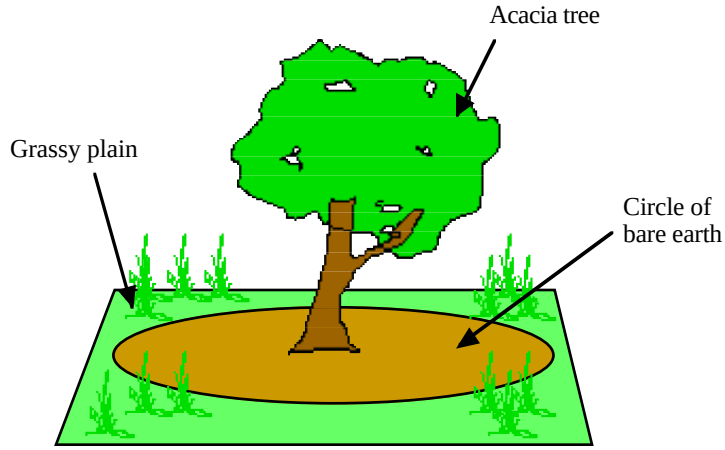
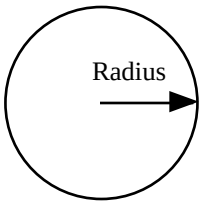


Figure 1: Picture of an Acacia tree and the circular patch of bare earth.

A colony of 100 ants just moved into an Acacia tree. After making a place to live inside the tree, the ants set about clearing the ground around the tree of other plant life. Each ant can clear 4 square inches per hour. To figure out how big the circle that the ants clear as they work, you need to know that the area of a circle can be calculated by:



$$\text{Area} = \pi * (\text{radius})^2 = 3.14 * (\text{radius}) * (\text{radius})$$

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During the first hour, 100 ants can clear 100*4 = 400 square inches. After 2 hours, the ants will have cleared a total of 800 square inches, etc.

- ***Use the information about the ants to complete the table given below.***

Hours worked	***Area of circle (square inches)***	***Radius of circle (inches)***
1	***400***	***11.3***
2	***800***	
3		
5		
10		
15		
20		

- ***In practice, it would be quite difficult to count the number of ants in the colony, but quite easy to measure the radius of the circle that the ants had cleared. An ecologist releases a group of ants onto an acacia tree that didn't have any ants to begin with. As time goes by, the ecologist measures how much area the ants manage to clear. Between the 15th and 16th hours after they are released, the radius of the circle increases by about 20 inches. Approximately how many ants did the ecologist release?***

- ***Will this be an over-estimate or an under-estimate of the actual number of ants in the colony?***