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.
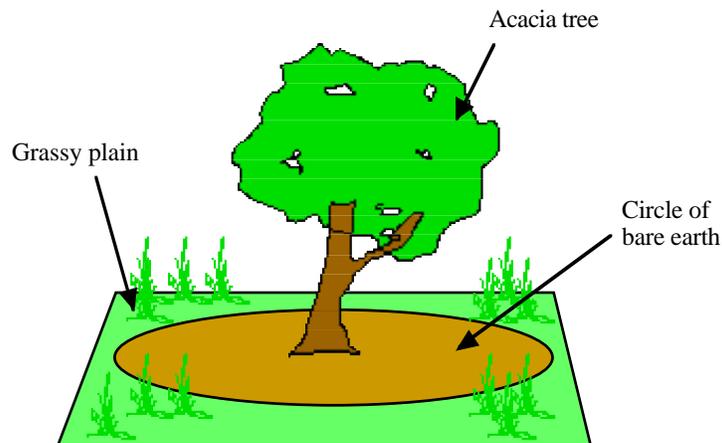

Figure 1: Picture of an Acacia tree and the circular patch of bare earth.

Studies of ants in laboratories suggests that a normal specimen of Pseudomermex spinicola can, on average, clear about 4 square inches of ground per hour.

The ultimate goal of this ICE is to help an ecologist to devise a way to figure out how many ants live in an acacia tree, based on observations of the circle of bare earth around the tree.

Note that if you were working in a forest, it would be extremely difficult to accurately count the number of ants in a colony. However, it would be a pretty simple matter to measure the radius of the circle of bare earth as time goes by.

An ecologist finds an acacia tree where the ants are busily clearing the forest floor of vegetation. The data that she collected is shown in Figure 2 below.
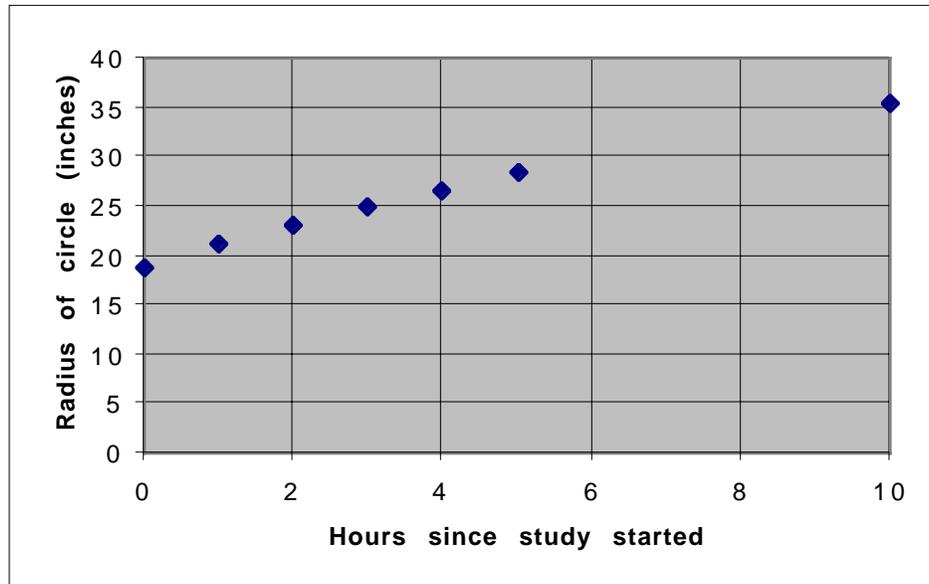

Figure 2: Data collected by ecologist.

- *How can you use this data to estimate the number of ants living in the acacia tree?*

- *Will this be an over-estimate or an under-estimate of the actual number of ants in the colony? What factors do you need to take into account here?*