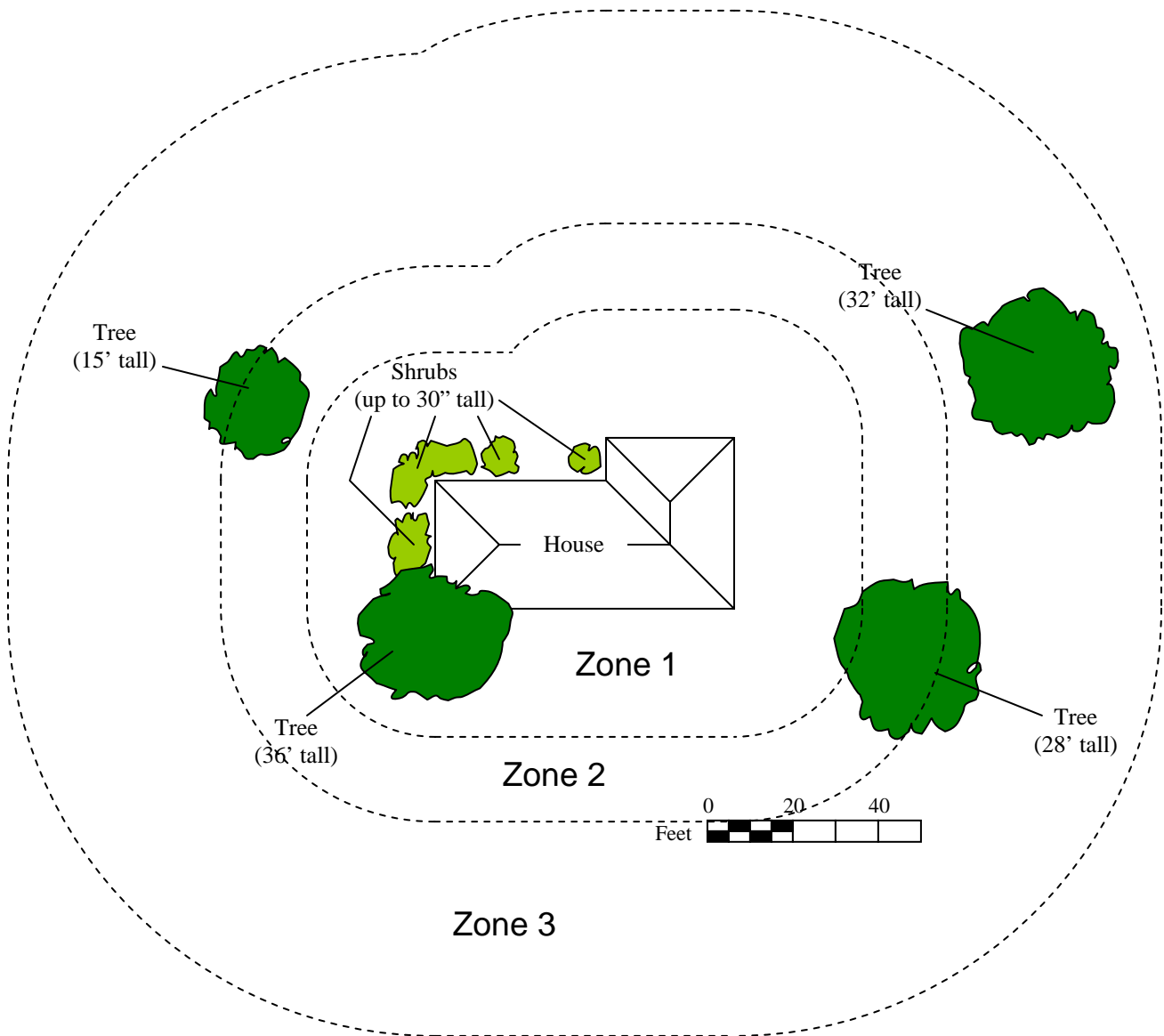


ANSWER KEY – In The Zone

1. Defensible space is the area near a house that provides protection from wildfire. The vegetation in this area is modified to reduce the threat of an oncoming fire. This area also provides a clear space for firefighters so they can effectively fight an oncoming fire.
2. Because trees and shrubs in Zone 1 are close to the house, they are spaced farther apart so that a fire in this area will be less likely to spread to the house.
3. Answers will vary.
4. Zones 1, 2, and 3 are indicated on the map below. Note that the lines indicating the zone boundaries use rounded corners; however, students at the middle school level may simply use rectangles to indicate the zones.



5. To find the area of Zone 1, students can divide the region into rectangles, triangles, and sectors. A good approximation of the total area using this method is 9280 square feet. However, students may find it difficult to calculate some of these areas, so any estimate between 8,000 and 10,000 square feet is reasonable.

There are several effective ways for students to estimate the areas:

- **Use a benchmark.** Students can determine that the area of the house is 2400 square feet; therefore, the area of Zone 1, which is about four times the size of the house, is approximately 9600 square feet. Further, it appears that Zone 1 and Zone 2 are approximately the same size. Zone 3, however, is much larger—it could be viewed as about fifteen times the size of the house, or about three times the size of Zone 1; either way, the estimate for Zone 3 is about 30,000 square feet.
 - **Use rectangles to estimate the size of each zone.** Zone 1 fits within a rectangle that measures $130' \times 100'$ and has an area of 13,000 square feet; however, the area of the house (2400 square feet) must be removed, and some additional adjustment must be made because the rectangle is slightly larger than Zone 1. Therefore, an estimate of 10,000 square feet is reasonable for Zone 1.
 - **Use circles to estimate the size of each zone.** As the zones get larger, they begin to resemble circles. Therefore, students can estimate the area of Zone 3 by assuming that the outer boundary is roughly a circle of radius 125 feet and the inner boundary is roughly a circle of radius 75 feet. The area of Zone 3, then, is the difference of the areas of these two circles, which is $\pi \times (125^2 - 75^2) \approx 31,000$ square feet. Therefore, an estimate near 30,000 square feet is reasonable for the area of Zone 3.
6. In Zone 1, the recommendation is that all shrubs and trees are at least 30' apart. Therefore, the shrubs near the house should probably be removed. The tree in Zone 1 that overlaps the house should be pruned so that the branches are not within 10' of the house; however, it may be impossible to do this, so the tree should probably be removed, too.

There are two trees in Zone 2 that are more than 10' apart, so they do not need to be removed. However, the shorter tree (15 feet) should be pruned to remove all branches up to 5' (which is $\frac{1}{3}$ of its height), and the taller tree (36 feet) should be pruned to remove all branches up to 6' (because it is over 18 feet).

No work is necessary in Zone 3.