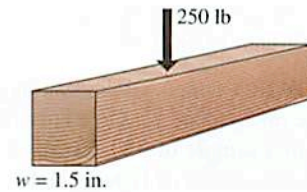
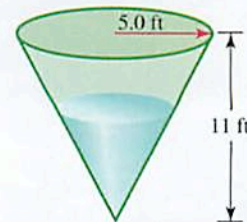


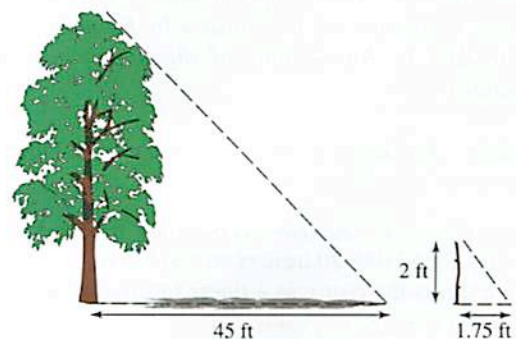
44. **Strength of a Beam** The maximum load that a horizontal beam can carry is directly proportional to its width. If a beam 1.5 inches wide can support a load of 250 pounds, find the load that a beam of the same type can support if its width is 3.5 inches. What is the constant of variation?



45. **Volume of Water** A water tank in the shape of an inverted cone has height 11 feet and radius 5.0 feet, as illustrated in the accompanying figure. Find the volume of the water in the tank when the water is 6 feet deep.



46. **Volume of Water** A water tank in the shape of an inverted cone has height 6 feet and radius 2 feet. If the water level in the tank is 3.5 feet, calculate the volume of the water.
47. **Height of a Tree** A certain tree casts a shadow 45 feet long. At the same time, the shadow cast by a vertical stick 2 feet high is 1.75 feet long. How tall is the tree? (*Hint:* Use similar triangles.)



41. **Pressure of a Liquid** The pressure exerted by a certain liquid at a given point is directly proportional to the depth of the point beneath the surface of the liquid. If the pressure exerted at 30 feet is 13 pounds per square inch, what is the pressure exerted at 70 feet?
42. **Rate of Nerve Impulses** The rate at which impulses are transmitted along a nerve fiber is directly proportional to the diameter of the fiber. If the rate for a certain fiber is 40 meters per second when the diameter is 6 micrometers, what is the rate if the diameter is 8 micrometers?
43. **Cost of Tuition** The cost of tuition is directly proportional to the number of credits taken. If 11 credits cost \$720.50, find the cost of taking 16 credits. What is the constant of variation?

48. **Height of a Streetlight** A person 66 inches tall is standing 15 feet from a streetlight. If the person casts a shadow 84 inches long, how tall is the streetlight?
49. **Hooke's Law** If a 3-pound weight stretches a spring 2.5 inches, how far will a 17-pound weight stretch the spring?
50. **Hooke's Law** If a 9.8-pound weight stretches a spring 0.75 inch, how much weight would be needed to stretch the spring 3.1 inches?

Biologists use direct variation to estimate the number of individuals of a species in a particular area. They first capture a sample of individuals from the area and mark each specimen with a harmless tag. Later, they return and capture another sample from the same area. They base their estimate on the theory that the proportion of tagged specimens in the new sample is the same as the proportion of tagged individuals in the entire area. Use this idea to work Exercises 51 and 52.

51. **Estimating Fish in a Lake** Biologists tagged 250 fish in City Park Lake on October 12. On a later date, they found 7 tagged fish in a sample of 350. Estimate, to the nearest hundred, the total number of fish in the lake.



52. **Estimating Seal Pups in a Breeding Area** According to an actual survey in 1961, to estimate the number of seal pups in a certain breeding area in Alaska, 4963 pups were tagged in early August. In late August, a sample of 900 pups was examined and 218 of these were found to have been tagged. Use this information to estimate, to the nearest hundred, the total number of seal pups in this breeding area. (Source: "Estimating the Size of Wildlife Populations," Chatterjee, S., in *Statistics by Example*, obtained from data in *Transactions of the American Fisheries Society*.)