

PROBLEM SOLVING

EXAMPLE 4

on p. 877
for Exs. 35–37

35. **LADDER ANGLE** A fire truck has a 100 foot ladder whose base is 10 feet above the ground. A firefighter extends a ladder toward a burning building to reach a window 90 feet above the ground. Draw a diagram to represent this situation. At what angle should the firefighter set the ladder?

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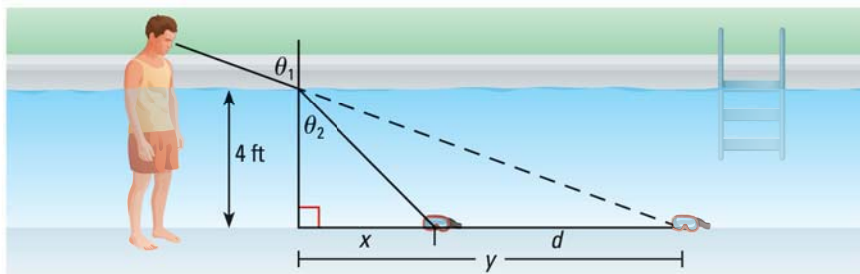
36. **ANGLE OF DESCENT** An airplane is flying at an altitude of 31,000 feet when it begins its descent for landing. If the runway is 104 miles away, at what angle does the airplane descend?

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37. **TAKS REASONING** Different types of granular substances naturally settle at different angles when stored in cone-shaped piles. The angle θ is called the *angle of repose*. When rock salt is stored in a cone-shaped pile 11 feet high, the diameter of the pile's base is about 34 feet. Find the angle of repose for rock salt. If another pile of rock salt is 15 feet high, what is the diameter of its base? *Explain.*



38. **TAKS REASONING** If you are in shallow water and look at an object below the surface of the water, the object will look farther away from you than it really is. This is because when light rays pass between air and water, the water *refracts*, or bends, the light rays. The *index of refraction* for water is 1.333. This is the ratio of the sine of θ_1 to the sine of θ_2 for the angles θ_1 and θ_2 shown below.



- a. You are in 4 feet of water in the shallow end of a pool. You look down at some goggles at angle $\theta_1 = 70^\circ$ (measured from a line perpendicular to the surface of the water). Find θ_2 .
 - b. Find the distances x and y .
 - c. Find the distance d between where the goggles are and where they appear to be.
 - d. *Explain* what happens to d as you move closer to the goggles.
39. **CYCLING** As a spectator at a cycling road race, you are sitting 100 feet from the center of a straightaway. A cyclist traveling 30 miles per hour passes in front of you. At what angle do you have to turn your head to see the cyclist t seconds later? Assume the cyclist is still on the straightaway and is traveling at a constant speed. (*Hint:* First convert 30 miles per hour to a speed v in feet per second. The expression vt represents the distance, in feet, traveled by the cyclist.)