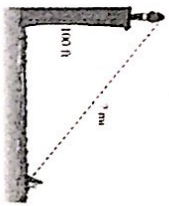


Radical Applications

1. Did you ever stand on a beach and wonder how far out into the ocean you could see? Or have you wondered how close a ship has to be to spot land? In either case, the function $d(h) = \sqrt{2h}$ can be used to estimate the distance to the horizon (in miles) from a given height (in feet).

a. Cordelia stood on a cliff gazing out at the ocean. Her eyes were 100 ft above the ocean. She saw a ship on the horizon. Approximately how far was she from that ship?



b. From a plane flying at 35,000 ft, how far away is the horizon?

$\sqrt{200} \approx 14.14$ miles
 $\sqrt{2 \cdot 35000} = 264.58$ miles

c. Given a distance, d , to the horizon, what altitude would allow you to see that far?

$d = \sqrt{2h}$
 $h = \frac{d^2}{2}$

2. A weight suspended on the end of a string is a *pendulum*. The most common example of a pendulum (this side of Edgar Allen Poe) is the kind found in many clocks. The regular back-and-forth motion of the pendulum is *periodic*, and one such cycle of motion is called a *period*. The time, in seconds, that it takes for one period is given by the radical equation $T = 2\pi \sqrt{\frac{l}{g}}$ in which g is the force of gravity (10 m/s²) and l is the length of the pendulum.

a. Find the period (to the nearest hundredth of a second) if the pendulum is 0.9 m long.

$T = 2\pi \sqrt{\frac{0.9}{10}} = 1.88$ sec

b. Find the period if the pendulum is 0.049 m long.

$T = 2\pi \sqrt{\frac{0.049}{10}} = 0.44$ sec

Show work!

c. Solve the equation for length l .

$(\frac{T}{2\pi})^2 \cdot g = l$

d. How long would the pendulum be if the period were exactly 1 s?

$l = 0.25$ m

3. When a car comes to a sudden stop, you can determine the skidding distance (in feet) for a given speed (in miles per hour) using the formula $s(x) = 2\sqrt{5x}$, in which s is skidding distance and x is speed. Calculate the speeding distance for the following speeds.

a. 55 mph $33,174$ ft c. 75 mph $38,734$ ft.

b. 65 mph $36,064$ ft. d. 40 mph $28,288$ ft.

e. Given the skidding distance s , what formula would allow you to calculate the speed in miles per hour?

$(\frac{s}{2})^2 \div 5 = x$

f. Use the formula obtained in (e) to determine the speed of a car in miles per hour if the skid marks were 35 ft long. 61.25 mph.

Solve each of the following applications.

4. The sum of an integer and its square root is 12. Find the integer.

$x + \sqrt{x} = 12$ $x = 9$

5. The difference between an integer and its square root is 12. What is the integer?

$x = 16$

6. The sum of an integer and twice its square root is 24. What is the integer?

$x = 16$

7. The sum of an integer and 3 times its square root is 40. Find the integer.

$x = 25$

$$4) \quad x + \sqrt{x} = 12$$

$$\sqrt{x} = 12 - x$$

$$x = x^2 - 24x + 144$$

$$0 = x^2 - 25x + 144$$

$$(x-9)(x-16)$$

$$\textcircled{9}, 16$$

$$5) \quad x - \sqrt{x} = 12$$

$$x - 12 = \sqrt{x}$$

$$x^2 - 24x + 144 = x$$

$$x^2 - 25x + 144 = 0$$

$$(x-9)(x-16)$$

$$\cancel{9}, \textcircled{16}$$

$$6) \quad x + 2\sqrt{x} = 24$$

$$2\sqrt{x} = 24 - x$$

$$4x = x^2 - 48x + 576$$

$$0 = x^2 - 52x + 576$$

$$(x-36)(x-16)$$

$$\cancel{36}, \textcircled{16}$$

$$7) \quad x + 3\sqrt{x} = 40$$

$$3\sqrt{x} = 40 - x$$

$$9x = x^2 - 80x + 1600$$

$$0 = x^2 - 89x + 1600$$

$$(x-64)(x-25)$$

$$\cancel{64}, \textcircled{25}$$