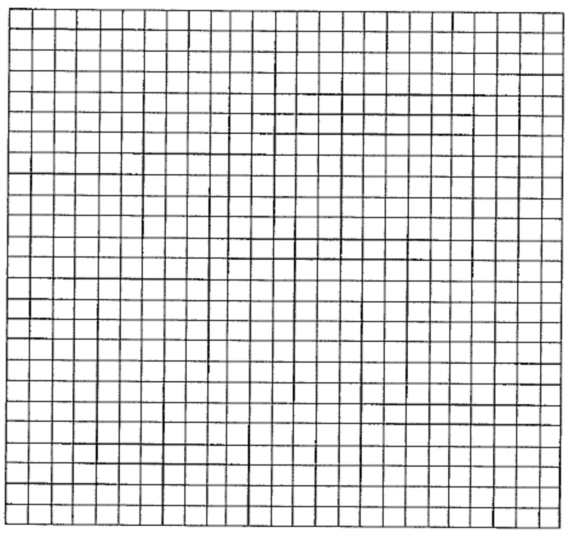
Square Root Applications Name: ____

1. The diameter d in inches of a rope needed to lift a weight of w tons is given by the formula $d = \frac{\sqrt{15w}}{3.14}$. How much weight can be lifted by a rope with a diameter of 1.5 inches?

2. The speed in mph of a tsunami can be modeled by the function $s(d) = 3.86\sqrt{d}$ where d is the average depth in feet of the water over which the tsunami travels. Graph the function using (0.0) in the lower left corner and increments of 10 on the d axis. Use the graph to predict the speed of a tsunami over water with a depth of 10, 30, and 50 feet. What would be the speed of a tsunami over water with a depth of 1500 feet?



3. The speed s in miles per hour that a car is traveling when it goes into a skid can be estimated by using the formula $s = \sqrt{30fd}$, where f is the coefficient of friction and d is the length of the skid marks in feet.

a. Estimate the speed of the car if the coefficient of friction is .5 and the length of the skid mark is 30 feet. Round to the nearest mph.

b. You are a defense attorney who is defending a driver who claims to have been traveling the speed limit of 45mph when an accident occurred. The coefficient of friction under accident conditions was .7 and the length of the skid mark was 120 feet. Is the driver telling the truth? What is your evidence to keep your client out of jail?

4. Two air balloons are flying overhead. The path of the first air balloon can be modeled by the function $h(x) = \sqrt{2x+5}$ and the second is modeled by $h(x) = 3\sqrt{x-6}$ where x is the horizontal distance and h is the altitude of the balloon. Assuming similar speeds, at what distance and altitude will the balloons collide if they collide at all?

5. Special airbags are used to protect scientific equipment when a rover lands on the surface of Mars. On Earth, the function $f(x) = \sqrt{64x}$ approximates an object's downward velocity in feet per second as the object hits the ground after bouncing x ft in height.

a. What is the height x of an object if the velocity f(x) is 40 ft/s?

b. The atmosphere on Mars causes a vertical compression factor of 3/5 applied to the equation f(x), what would the equation be for Mars?

c. How does the objects height on Mars at 40 ft/s compare to the height found on Earth (part a)?

6. "Hang time" is the time you are suspended in the air during a jump. Your hang time t (in seconds) is given by the function $t = .5\sqrt{h}$ where h is height (in feet) of the jump. Suppose a kangaroo has a hang time of .81 seconds and a snowboarder's jump has a hang time of 1.21 seconds.

a. Find the jump heights of the kangaroo and the snowboarder.

b. Double the hang times of the kangaroo and snowboarder and calculate the new jump heights.

c. When the hang time doubles, does the height of the jump double? Explain.

7. A burning candle has a radius of r inches and was initially h_0 inches tall. After t minutes, the height of the candle has been reduced to h inches. These quantities are related by the formula $r = \sqrt{\frac{kt}{\pi(h_0 - h)}}$. Solve for t.

8. The formula $r = \frac{1}{2}\sqrt{\frac{S}{\pi}}$ represents the radius of a sphere in terms of the surface area. Rewrite the formula solving for surface area (S) in terms of the radius (r).