

Problem Set 1.

1. The simple interest on an investment is directly proportional to the amount of the investment. An investment of \$3250 will earn \$113.75 after 1 year. Find a mathematical model that gives the interest I in terms of the amount invested P .

2. Use the fact that 14 gallons is approximately the same amount as 53 liters to find a mathematical model that relates liters y to gallons x . Then use the model to find the numbers of liters in 5 gallons and 25 gallons.

3. Hooke's law for springs states that the distance a spring is changed (stretched or compressed) from a relaxed state varies directly as the force on the spring. A force of 265 newtons stretches a spring .15 meters.
 - a. What force is required to stretch the spring to 0.1 meter?
 - b. How far will a force of 90 newtons stretch the spring?

4. An overhead garage door has two springs, one on each side of the door. A force of 15 pounds is required to stretch each spring 1 foot. Because of a pulley system. The springs stretch only one-half the distance the door travels. The door moves a total of 8 feet, and the springs are at their natural lengths when the door is open. Find the combined lifting force applied to the door by the springs when the door is closed.

Problem Set 2.

1. The diameter of the largest particle that can be moved by a stream varies approximately directly as the square of the velocity of the stream. A stream with a velocity of $\frac{1}{4}$ mile per hour can move coarse sand particles about 0.02 inches in diameter. Approximate the velocity required to carry particles 0.12 in in diameter.

2. The frequency of vibrations of a piano string varies directly as the square root of the tension on the string and inversely as the length of the string. The middle A string has a frequency of 440 vibrations per second. Find the frequency of a string that has 1.25 times as much tension and is 1.2 times as long.

3. The work W done when lifting an object varies jointly with the object's mass m and the height h that the object is lifted. The work done when a 120-kilogram object is lifted 1.8 meters is 2116.8 joules. How much work is done when lifting a 100-kilogram object 1.5 meters?

Problem Set 3.

1. The maximum load that can be safely supported by a horizontal beam varies jointly as the width of the beam and the square of its depth and inversely as the length of the beam. Determine the changes in the maximum safe load under the following conditions.
 - a. The width and length of the beam are doubled.
 - b. The width and depth of the beam are doubled.

2. An oceanographer took readings of the water temperatures C (in degrees Celsius) at several depths d (in meters). The data collected are shown as ordered pairs (d,C) .
DATA: (1000, 4.2) (2000, 1.9) (3000, 1.4) (4000, 1.2) (5000, 0.9)
 - a. Sketch a scatter plot of the data.
 - b. Find a model for C in terms of d .
 - c. At what depth would the water temperature be 3 degrees C ?

3. A light probe is located x centimeters from a light source, and the intensity y (in microwatts per square centimeter) of the light is measured. The results are shown as ordered pairs (x,y) .
DATA: (30, 0.1881) (34, 0.1543) (38, 0.1172) (42, 0.0998) (46, 0.0645)
 - a. Sketch a scatter plot of the data.
 - b. Find a model for Intensity, I , in terms of distance x .
 - c. What is the light intensity 25 centimeters from the light source?