

Variation problems for final:

MAC 1105

Direct variation is a function that is written $y = kx$, where k is a constant. This equation is read "y varies directly as x".

Joint variation is a function that is written $y = kxz$ where k is a constant and involves a product of more than one factor. This equation is read "y varies jointly as x and z".

Inverse variation is a function that can be expressed as $y = k/x$. This equation is read "y varies inversely as x".

A **combined variation** is a variation in which two or more types of variation occur at the same time. It is written $y = kx/z$ and is read y "varies directly as x and inversely as z".

In all cases, k is called the **constant** of proportionality.

The following problems indicate the procedure for writing equations involving variation:

1. The accuracy of a car's speedometer varies directly with the actual speed of the car. A car's speedometer reads 24 miles per hour when the car is actually traveling at 32 mph. When the speedometer reads 51 mph, how fast is the car actually going?

$A = ks$ Write the equation and solve for k .

$$24 = k(32)$$

$$k = 24/32 \text{ or } 3/4$$

$$51 = 3/4 \times s$$

$$s = 51 \times 4/3$$

$$s = 68$$

2. The volume of a rectangular solid varies jointly with the width and the height of the figure. The volume of a rectangular solid is 30 cubic meters when the width is 10 meters and the height is 5 meters. Find the volume of the rectangular solid when the width is 20 m and the height is 10 m.

$$V = kwh$$

$$K = V/(wh)$$

$$30 = k(10)(5)$$

$$30/50 = k$$

$$k = .6$$

$$V = .6(20)(10)$$

$$V = 120 \text{ cubic meters}$$

3. For a constant temperature, the pressure (P) of a gas varies inversely as the volume (V). If the pressure is 25 lb/sq.in. when the volume is 400 cubic feet, find the pressure when the volume is 150 cubic feet.

$$P = k/V$$

$$PV = k$$

$$25 = k/400$$

$$25(400) = k$$

$$10000 = k$$

$$P = 10000/(150) = 66.66 \text{ lb/sq. in.}$$

Practice problems. Write the equation for each problem using k as the constant of proportionality. Solve for k. When requested answer the problem associated with the equation.

1. The current, I, in an electrical circuit varies inversely as the resistance, r, of the circuit. The current in a circuit with constant voltage is 5 amperes when the resistance is 8 ohms. What is the current in the circuit if the resistance is increased to 10 ohms?
Answer: 4
2. The resistance of an electric wire is directly proportional to the length of the wire and inversely proportional to the square of its diameter. Write a formula expressing this property using R for resistance, L for length, and D for diameter.
3. The volume of a gas is directly proportional to the temperature of the gas and inversely proportional to the pressure exerted on the gas. Write a formula expressing this property. Use V for volume, T for temperature, and P for pressure.

4. The wind force (w) on a vertical surface varies jointly as the product of the area (A) of the surface and the square of the wind velocity (v). When the wind is blowing at 30mph, the force on an area of 10 sq. ft. is 45 lb. Find the force on this area when the wind is blowing at 60 mph. Answer: 180 lbs.

Other practice problems may be found in the 1033 Intermediate Pan, Lesson 8.4.