

Lesson 9.1: Inverse and Joint Variation

Direct Variation: (recall from 2.5) as one variable increases so does the other and as one variable decreases so does the other

$$y = kx$$

Inverse Variation: as one variable increases the other variable decreases and vice versa.

$$y = \frac{k}{x}$$

* where $x \neq 0$ and k is the constant of variation

Example 1: Do x and y show direct variation, inverse variation, or neither?

a. $xy = 4.8$

b. $x = \frac{y}{1.5}$

c. $y = x - 5$

Example 2: x and y vary inversely, $y = 6$ when $x = 1.5$

a. Write an equation that relates x and y

b. Find y when $x = \frac{4}{3}$

Example 3: The volume of gas in a container varies inversely with the amount of pressure. A gas has volume 75 in^3 at a pressure of 25 lb/in^2 . Write a model relating volume and pressure.

Joint Variation: when a quantity varies directly as the product of two or more other quantities

$$z = kab$$

* z varies jointly with a and b

Combined Variation: when a quantity contains both direct and inverse variations

Example 4: Write an equation for each situation.

a. y varies directly with x and inversely with z^2

b. y varies inversely with x^3

c. z varies jointly with x^2 and y

d. y varies inversely with x and z

Lesson 9.4 Multiplying and Dividing Rational Expressions

A rational expression is in **simplified form** provided its numerator and denominator have no common factors (other than ± 1)

Part 1:

Recall: $\frac{ac}{bc} = \frac{a}{b}$ (divide out common factor of c)

Notice: $\frac{a+c}{b+c}$ is simplified (no common factors)

Example 1: Simplify the following rational expressions.

d. $\frac{x^2-5x-6}{x^2-1}$

e. $\frac{6x^2y^3}{2x^2y^2} \cdot \frac{10x^3y^4}{18y^2}$

f. $\frac{3x-27x^3}{3x^2-2x-1} \cdot \frac{3x^2-4x+1}{3x}$

g. $\frac{x+2}{27x^3+8} \cdot 9x^2 - 6x + 4$

Part 2:

Recall: $\frac{a}{b} \div \frac{c}{d}$

Dividing a fraction is the same as _____ by the _____.

Example 2: Simplify the following rational expressions.

a. $\frac{5x}{3x-12} \div \frac{x^2-2x}{x^2-6x+8}$

b. $\frac{3}{4x-8} \div \frac{x^2+3x}{x^2+x-6}$

c. $\frac{8x^2+10x-3}{4x^2} \div 4x^2 - x$

d. $\frac{x}{x-2} \cdot 2x + 3 \div \frac{4x^2-9}{x-2}$