8.1 Model Inverse and Joint Variation

TEKS 2A.1.B, 2A.2.A, 2A.10.G

Before You wrote and used direct variation models.

Now You will use inverse variation and joint variation models.

Why? So you can model music frequencies, as in Ex. 40.

Key Vocabulary
• inverse variation
• constant of variation
• joint variation

You have learned that two variables x and y show direct variation if $y = ax$ for some nonzero constant a. Another type of variation is called *inverse variation*.

KEY CONCEPT *For Your Notebook*

Inverse Variation

Two variables x and y show **inverse variation** if they are related as follows:

$$y = \frac{a}{x}, a \neq 0$$

The constant a is the **constant of variation**, and y is said to *vary inversely* with x.

EXAMPLE 1 Classify direct and inverse variation

Tell whether x and y show *direct variation*, *inverse variation*, or *neither*.

Given Equation	Rewritten Equation	Type of Variation
a. $xy = 7$	$y = \dfrac{7}{x}$	Inverse
b. $y = x + 3$		Neither
c. $\dfrac{y}{4} = x$	$y = 4x$	Direct

REVIEW DIRECT VARIATION
The equation in part (b) does not show direct variation because $y = x + 3$ is not of the form $y = ax$.

EXAMPLE 2 Write an inverse variation equation

The variables x and y vary inversely, and $y = 7$ when $x = 4$. Write an equation that relates x and y. Then find y when $x = -2$.

$y = \dfrac{a}{x}$ **Write general equation for inverse variation.**

$7 = \dfrac{a}{4}$ **Substitute 7 for y and 4 for x.**

$28 = a$ **Solve for a.**

▶ The inverse variation equation is $y = \dfrac{28}{x}$. When $x = -2$, $y = \dfrac{28}{-2} = -14$.