Textbook p. 301

Is each equation a direct variation? If it is, find the constant of variation.

32. $f(x) = -3x$

34. $y = 2x + 5$

Write an equation of the direct variation that includes the given point.

36. (5, 1)

38. (1, 2)

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Lesson 5-6 10/1 Day 25 **Inverse Variation**

Lesson Objectives	NAEP 2005 Strand: Algebra
▼ Solve inverse variations ▼ Compare direct and inverse variation	Topic: Patterns, Relations, and Functions Local Standards:

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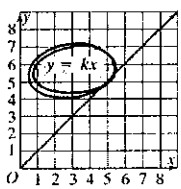
Vocabulary and Key Concepts

Direct and Inverse Variation



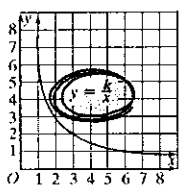
y varies directly with x.

y is directly proportional to x.

The quotient $\frac{y}{x}$ is constant.

$y = kx$

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



y varies inversely with x.

y is inversely proportional to x.

The product xy is constant.

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

so $k = x \cdot y$

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An equation in the form $xy = k$ or $y = \frac{k}{x}$, where $k \neq 0$, is an inverse variation.

The constant of variation is k.

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Examples

x_1, y_1 x_2, y_2

1 Finding the Missing Coordinate The points (5, 6) and (3, y) are two points on the graph of an inverse variation. Find the missing value.

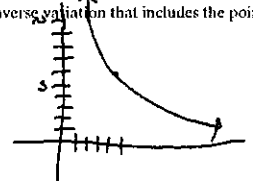
$x_1 \cdot y_1 = x_2 \cdot y_2$ Use the equation $x_1 \cdot y_1 = x_2 \cdot y_2$ since you know coordinates but not the constant of variation.

$5 \cdot 6 = 3 \cdot y$

$\frac{30}{3} = \frac{3y}{3}$

$10 = y$

The missing value is 10. The point (3, 10) is on the graph of the inverse variation that includes the point (5, 6).



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2 Applying Inverse Variation to Physics Jeff weighs 130 pounds and is 5 ft from the lever's fulcrum. If Tracy weighs 93 pounds, how far from the fulcrum should she sit in order to balance the lever?

130 lb is 5 ft

93 lb is x ft

$wght_1 = 130$ $distance_1 = 5$ ft

$weight_2 = 93$ $distance_2 = x$ ft

Tracy should sit about 7 ft from the fulcrum to balance the lever.

$w_1 d_1 = w_2 \cdot d_2$

$130(5) = 93 \cdot x$

$\frac{650}{93} = \frac{93x}{93}$

$6.99 = d_2$

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3 Determining Direct or Inverse Variation Decide whether each data set represents a direct variation or an inverse variation. Then write an equation to model the data.

a.

x	y
3	10
5	6
10	3

$3 \cdot 10 = 30$

$5 \cdot 6 = 30$ } constant

$10 \cdot 3 = 30$

$K = 30$

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

$\frac{y}{x} = K$ Direct

$y \cdot x = K$ Inverse

$y = \frac{30}{x}$

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3 Determining Direct or Inverse Variation Decide whether each data set represents a direct variation or an inverse variation. Then write an equation to model the data.

b.

x	y
2	3
4	6
8	12

$2 \cdot 3 = 6$ not inverse

$4 \cdot 6 = 24$

Direct

$\frac{3}{2} = 1.5$ $K = \frac{y}{x}$

$\frac{6}{4} = 1.5$ $K = 1.5$

$\frac{12}{8} = 1.5$

$y = K \cdot x$

$y = 1.5x$

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Quick Check p. 95

1. Each pair of points is on the graph of an inverse variation. Find the missing values.

a. $(3, y)$ and $(5, 9)$

$3 \cdot y = 5 \cdot 9$

$\frac{3y}{3} = \frac{45}{3}$

$y = 15$

b. $(75, 0.2)$ and $(x, 3)$ $x_1 y_1 \quad x_2 y_2$

$75 \cdot 0.2 = x \cdot 3$

$\frac{15}{3} = \frac{3x}{3}$

$x = 5$

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2. a. **Physics** A 100-lb weight is placed 4 ft from a fulcrum. How far from the fulcrum should a 75-lb weight be placed to balance the lever if weight and distance vary inversely?

$100 \cdot 4 = 75 \cdot y$

$\frac{400}{75} = \frac{75y}{75}$

$y = 5.\overline{3}$

you would place a 75 lb weight about 5.3 ft away from the fulcrum.

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b. An 80-lb weight is placed 9 ft from a fulcrum. What weight should you put 6 ft from the fulcrum to balance the lever?

$w \quad d \quad d$

$80 \cdot 9 = 6 \cdot w$

$\frac{720}{6} = \frac{6w}{6}$

$120 = w$

120 lb

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3. Determine whether the data in each table represent a direct variation or an inverse variation. Write an equation to model the data in each table.

a.

x	y	
3	12	36
6	6	36
9	4	36

inverse $K = y \cdot x$

$K = 36$

$y = \frac{36}{x}$ $\quad y = \frac{K}{x}$

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3. Determine whether the data in each table represent a direct variation or an inverse variation. Write an equation to model the data in each table.

b.

x	y
3	12
5	20
8	32

4
4
4

direct

$y = 4x$

$y = kx$

$\frac{3}{12} = \frac{1}{4}$

$\frac{y}{x}$ $\frac{12}{3} = 4$

$\frac{20}{5} < 4$ $\frac{32}{8} = 4$

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4. Explain whether each situation represents a direct variation or an inverse variation.

a. You are a discount store. All sweaters are on sale for $15 each.

(1; 15) $\frac{15}{1} = 15$

(2; 30) $\frac{30}{2} = 15$

(3; 45) $\frac{45}{3} = 15$

direct

$y = 15x$

b. You walk 5 miles every day. Your speed and time vary from day to day.

inverse

WKbK 5-6 WKST

p. 333 (3-24 (right column))

25-35 all

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tmrtuyer67

p. 333 5-6 WKST

Separate Sheet of Paper

(3-24 last column)

& 27-35 all

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① $x = 9$ $y = 6$

$k = x \cdot y$

$k = 9 \cdot 6$

$k = 54$

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

$y = \frac{54}{x}$

ex $x = \frac{2}{3}$ $y = \frac{1}{4}$

$k = \frac{2}{3} \cdot \frac{1}{4}$

$k = \frac{1}{6}$

$y = \frac{1/6}{x}$

$y = \frac{.7}{x}$

Oct 1-7:17 AM