

2.2 Direct Variation

DIRECT VARIATION: $y = kx$ or $\frac{y}{x} = k$, where $k \neq 0$

x represents input values, and y represents output values

CONSTANT OF VARIATION: $\frac{y}{x} = k$

Except for $(0, 0)$ the ratio of all output-input pairs equals the constant k

Ex. 1 For each function, determine whether y varies directly with x . If so, what is the constant of variation and the function rule?

A

x	y
1	2
3	6
4	8

Yes

$$y = 2x$$

$$k = 2$$

B

x	y
1	4
2	8
3	11

NO

Ex. 2 For each function, determine whether y varies directly with x . If so, what is the constant of variation and the function rule?

A) $3y = 7x$

$$\frac{3}{3} = \frac{7}{3}$$

Yes

$$y = \frac{7}{3}x$$

$$k = \frac{7}{3}$$

B) $7y = 14x + 7$

$$\frac{7}{7} = \frac{14}{7} + \frac{7}{7}$$

$$y = 2x + 1$$

No, not $y = kx$

Ex. 3 Suppose y varies directly with x , and $y = 9$ when $x = -15$. What is y when $x = 21$?

$$y = kx$$

$$\frac{y}{x} = k \text{ for all } (x, y)$$

$$\frac{y_1}{x_1} = \frac{y_2}{x_2}$$

Since both are equal to k

$$\frac{9}{-15} = \frac{y_2}{21}$$

$$\frac{-15y_2}{-15} = \frac{189}{-15}$$

$$y_2 = -12.6$$

$$\text{or } y_2 = -\frac{63}{5}$$

Ex. 4 A salesperson's commission varies directly with sales. For \$1,000 in sales, the commission is \$85. What is the commission for \$2300?

$$y = kx \quad \frac{\text{Comm}}{\text{Sales}} \frac{y_1}{x_1} = \frac{y_2}{x_2} \quad \frac{85}{1000} = \frac{x}{2300}$$

$$\frac{y}{x} = k \quad x = \$195.50$$

Ex. 5 The number of Calories varies directly with the mass of cheese. If 50 grams of cheese contain 200 Calories, how many Calories are in 70 grams of cheese?

$$y = kx \quad \frac{\text{cal}}{\text{grams}} \frac{y_1}{x_1} = \frac{y_2}{x_2} \quad \frac{200}{50} = \frac{y_2}{70}$$

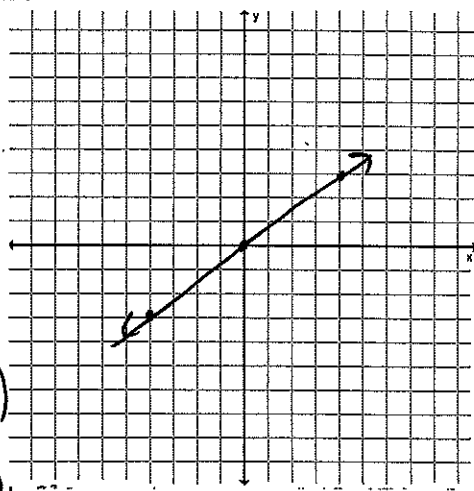
$$\frac{y}{x} = k \quad y_2 = 280 \text{ calories}$$

$$k = \text{constant of variation} = \frac{y}{x} = \frac{200}{50} = 4$$

Ex. 6 What is the graph of each direct variation equation?

A) $y = \frac{3}{4}x$

x	-4	0	4
y	-3	0	3



Note, all direct variation equations go through (0,0) and constant of variation (k) is the slope of the line (m).

B) $y = -2x$

x	-1	0	1
y	2	0	-2

