Key

Direct Variation

A **Direct Variation** is a specific relationship in which there is a constant *change* between all ordered pairs.

Direct Variation Equations are written in the form $y = kx$

Finding The Constant (k)

Identify the constant of the ordered pairs below. Then, write the equation to represent the relationship.

1) {(1, 4), (2, 8), (3, 12), (4, 16)}

$\frac{4}{1}\ \frac{8}{2}\ \frac{12}{3}\ \frac{16}{4}$

$k = 4$

$y = 4x$

2) {(-6, 3), (-4, 2), (0, 0), (2, -1)}

$\frac{3}{-6}\ \frac{2}{-4}\ \frac{0}{0}\ \frac{-1}{2} = -\frac{1}{2}$

$y = -\frac{1}{2}x$

3)

x	y
-12	-8
-6	-4
0	0
3	2

$\frac{-8}{-12}\ \frac{-4}{-6}\ \frac{2}{3}$

$k = \frac{2}{3}$

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

4)

x	-4	-1	3	5
y	12	3	-9	-15

$\frac{12}{-4}\ \frac{3}{-1}\ \frac{-9}{3}\ \frac{-15}{5}$

$k = -3$

$y = -3x$

Identifying equations

Identify the equations below that represent a direct variation. If yes, identify the constant of variation.

5) $y = 3x$ Yes

$k = 3$

6) $y = -\frac{4}{5}x$ Yes

$k = -\frac{4}{5}$

7) $y = 2$ No

8) $\frac{2y}{2} = \frac{5x}{2}$

$y = \frac{5}{2}x$

$k = \frac{5}{2}$

9) $y = x - 4$ No

10) $y = -x$ Yes

$k = -1$

11) $\frac{2y}{2} = \frac{x}{2}$

$y = \frac{1}{2}x$

$k = \frac{1}{2}$

12) $4x + 2y = 6$

$-4x \quad -4x$

$\frac{2y}{2} = \frac{-4x}{2} + \frac{6}{2}$

$y = -2x + 3$

No

13) $5x + y = 0$

$-5x \quad -5x$

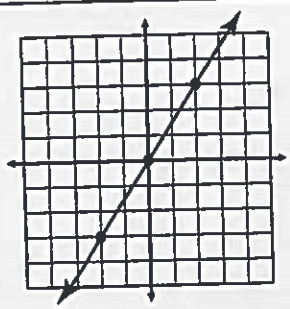
$y = -5x$

$k = -5$

Identifying graphs

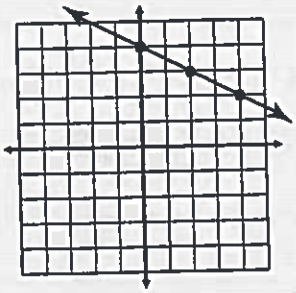
Identify the graphs below that represent a direct variation. If yes, identify the constant of variation.

14)



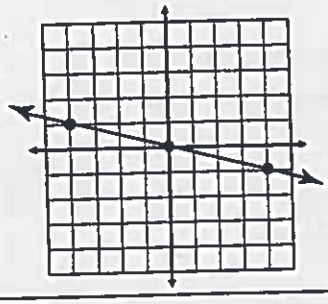
Yes
$k = \frac{3}{2}$

15)



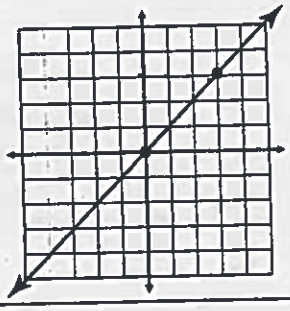
No

16)



Yes
$k = \frac{1}{4}$

17)



Yes
$k = 1$

Finding missing values

If the following ordered pairs represent a direct variation, find the missing value.

18) (2, -4) and (-6, y)

$\frac{-4}{2} = -2$ $y = 12$ $y = -2(-6)$ $y = 12$

$\frac{-4}{2} = \frac{y}{-6}$

19) (4, 16) and (x, 24)

$\frac{16}{4} = 4$ $\frac{24}{9} = \frac{4x}{4}$ $x = 6$

$\frac{16}{4} = \frac{24}{x}$

20) (12, y) and (4, 7)

$k = \frac{7}{4}$ $y = \frac{7}{4}(12)$ $y = 21$ $\frac{y}{12} = \frac{7}{4}$

21) (x, -16) and (6, 24)

$\frac{-16}{x} = \frac{24}{6}$ $k = \frac{24}{6} = 4$ $-16 = 4(9x)$ $x = -4$

22) If $y = -18$ when $x = 3$, find x when $y = 30$

$k = \frac{-18}{3} = -6$ $30 = -6(x)$ $x = -5$

$\frac{-18}{3} = \frac{30}{x}$

23) If $y = 80$ when $x = 32$, find x when $y = 100$

$k = \frac{80}{32} = \frac{5}{2}$ $100 = \frac{5}{2}x \cdot \frac{2}{5}$ $x = 40$

$\frac{80}{32} = \frac{100}{x}$

24) If $y = 10$ when $x = -4$, find y when $x = 12$

$k = \frac{10}{-4} = -\frac{5}{2}$ $y = -\frac{5}{2}(12)$ $y = -30$

$\frac{10}{-4} = \frac{y}{12}$

25) If $y = -7$ when $x = -28$, find y when $x = 20$

$k = \frac{-7}{28} = \frac{1}{4}$ $y = \frac{1}{4}(20)$ $y = 5$

$\frac{-7}{-28} = \frac{y}{20}$

applications of direct & inverse variation

WHEN DO WE USE DIRECT?	WHEN DO WE USE INVERSE?
In situations where as one variable ↑, the other variable ↑.	In situations where as one variable ↑, the other variable ↓.

direct variation examples

1. The sales at a baseball game vary directly with the number of people attending. If the sales for a game are $12,000 when 800 people attend, determine how many people attend if the sales for a game are $15,000.

$12000 = k\,800$

$k = 15$

$y = 15x$

$15000 = 15x$

$x = 1000$

$\frac{12,000}{800} = \frac{15,000}{x}$

150
$4\overline{)600}$
4
20

2. Ounces of medication vary directly with the weight of the patient. If a 120 lb. adult requires three-fourths of an ounce of medication, how many ounces are required for a 200 lb. adult?

$\frac{3}{4} = \frac{y}{120}$ $\quad \frac{3}{4} = k\,120$

$y = \frac{1}{160}x$

$k = \frac{3}{4} \cdot \frac{1}{120} = \frac{1}{160}$

$y = \frac{1}{160} \cdot 200$

$y = 1\frac{1}{4}$ oz

1
$120\overline{)150}$
120
30

3. The number of shares varies directly with the amount of dividends received per year. If Kim owns 5 shares of stock and receives $12 per year, how many shares of stock will she need to receive $24?

$\frac{12}{5} = \frac{24}{x}$

$\frac{12}{5} = \frac{k5}{5}$

$k = \frac{12}{5}$

$y = \frac{12}{5}x$

$\frac{5}{12} \cdot 24 = \frac{12}{5}x \cdot \frac{5}{12}$

$x = 10$ shares

2
24
$\times\ 5$
120

16
$12\overline{)120}$
12
$\overline{120}$

4. Acreage varies directly with the production in bushels of wheat produced. In a 20-acre field, 300 bushels of wheat are produced. At this rate, how many bushels will be produced in a 50-acre field?

$\frac{300}{20} = \frac{k20}{20}$

$k = 15$

$y = 15(50)$

$y = 750$ bushels

$\frac{300}{20} = \frac{y}{50}$

5. The income of a computer analyst varies directly as the number of hours worked. If the analyst earns $256 for working 8 hours, find the constant of variation.

$k = \frac{256}{8} = 32$

6. The gallons of water used to take a shower vary directly with the number of minutes in the shower. If an 8 minute shower uses 48 gallons of water, find the constant of variation

$k = \frac{48}{8} = 6$