

Direct & Inverse Variation

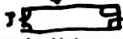
Do I Have to Mow the Whole Thing?

NAME Ms. Maher
DATE _____



Imagine you've been asked to mow a rectangular garden that is 24 square yards. In your mind, you probably have an idea of the dimensions of the garden from this description.

1. Sketch a rectangle whose area is 24 square units and label its dimensions:



Length: 8
Width: 3

2. Sketch another rectangle with the same area but different dimensions:



Length: 6
Width: 4

3. Find more combinations of lengths and widths that will generate a rectangle with an area of 24 square units.

| | | | | | | | | | | | | | | |
|--------|----|----|---|---|---|----|---|-----|-----|-----|-----|-----|-----|-----|
| LENGTH | 2 | 24 | 8 | 6 | 3 | 12 | 4 | 1.5 | 16 | 0.5 | 48 | 120 | .2 | 0.3 |
| WIDTH | 12 | 1 | 3 | 4 | 8 | 2 | 6 | 16 | 1.5 | 48 | 0.5 | .2 | 120 | 80 |

4. Graph the data points from the table above, using *length* for your *x*-values and *width* for your *y*-values. (It's reasonable not to graph *all* the points that you've found.)

5. If you were to connect the points, how would you describe the graph of the function?
downward sloping curve

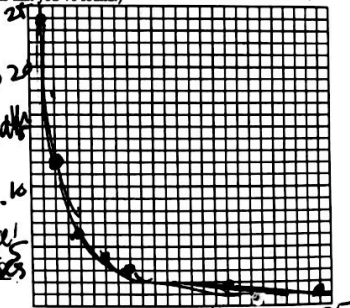
6. What rule describes the relationship between the length and the width?
width

multiples of 24

7. Fill in the blanks in the sentences below:

As the length increases, the width decreases
As the length decreases, the width increases

8. What equation represents this relationship? $y = \frac{24}{x}$
If you haven't already done so, solve this equation for *y*: length



$$\frac{24}{x} = \frac{xy}{x}$$

$$y = \frac{24}{x}$$



Professor Jenkins has finished a manuscript that he's written by hand. It will take four typists nine days to type the entire manuscript.

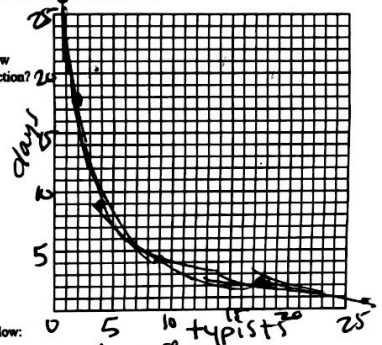
9. How many days of typing will it take if only two typists are available to type the manuscript?
10. How many days will it take one typist to type the manuscript?
11. How many typists are needed if he needs the manuscript in three days?
12. Fill in the table with as many *typist-days* pairs that you can find.

| | | | | | | | | | | | | | |
|---------|---|----|----|----|-----|-----|---|----|----|----|----|-----|------|
| TYPISTS | 4 | 2 | 1 | 12 | 9 | 5 | 9 | 18 | 36 | 3 | 10 | 11 | 13 |
| DAYS | 9 | 18 | 36 | 3 | 4.5 | 7.2 | 4 | 2 | 1 | 12 | 6 | 3.6 | 3.27 |

13. Graph the data points from the table above, using *typist* for your *x*-values and *days* for your *y*-values. (It's reasonable not to graph *all* the points that you've found.)

14. If you were to connect the points, how would you describe the graph of the function?
downward sloping curve

downward sloping curve



15. Fill in the blanks in the sentences below:

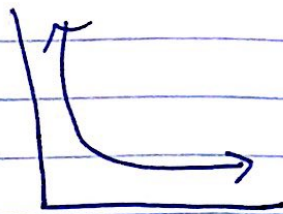
As the number of typists increases, the number of days decreases
As the number of days increases, the number of typists decreases

16. What equation represents this relationship? $xy = 36$
If you haven't already done so, solve this equation for *y*: $y = \frac{36}{x}$

Special Relationships

Inverse Variation

↑↓ ↓↑



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

k ← constant of variation

Key Features:

→ curve

→ proportional

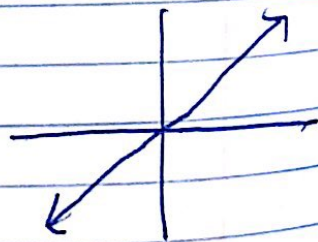
Find k : $k = yx$

EX) $y = 40$ $x = 8$, What is k ?

$$k = 320$$

Direct Variation:

↑↑ ↓↓



$$y = kx$$

Compare to $y = mx + b$

↑
 $b = 0$

Key Feature:

→ straight line

→ cross through origin

52 Find k : $\frac{y}{x}$

EX) $y = 64$ $x = 4$. What's k ?
 $k = 16$

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

- | | | | |
|----------------------------|---|---------------------------------|----------------------------------|
| 1. $y = 2x + 3$ Neither | 2. $y = \frac{x}{3} \cdot \frac{1}{3}x$ Direct | 3. $x = \frac{3}{y}$ Inverse | 4. $\frac{1}{2}xy = 2$ Direct |
| 5. $y = 2x$ Direct | 6. $y = x - 4$ Neither | 7. $y = \frac{5}{x}$ Inverse | 8. $xy = 9$ Inverse |

The variables x and y vary inversely. Use the given values to write an equation relating to x and y. Then find y when x = 0.5

- | | | |
|---|--|---|
| 1. $x = 4$ $y = 6$ $k = 4(6) = 24$ $y = 48$ | 2. $x = -3$ $y = 2$ $k = -3(2) = -6$ $y = -12$ | 3. $x = 48$ $y = \frac{1}{12}$ $k = 48(\frac{1}{12}) = 4$ $y = 8$ |
|---|--|---|

The variables x and y vary directly. Write an equation that relates x and y. Then find y when x = 3.

- | | | |
|--|---|---|
| 1. $x = 12$ $y = -4$ $k = \frac{-4}{12} = -\frac{1}{3}$ $y = -\frac{1}{3}(3) = -1$ | 2. $y = 24$ $x = 8$ $k = \frac{24}{8} = 3$ $y = 3(3) = 9$ | 3. $x = 6$ $y = \frac{4}{3}$ $k = \frac{4}{6} = \frac{2}{3}$ $y = \frac{2}{3}(3) = 2$ |
|--|---|---|

Answer the following:

- On a map, distance in km and distance in cm varies directly and 25 km are represented by 2 cm. If two cities are 7 cm apart on the map, what is the actual distance between them?
 $25 = k(2)$
 $k = 12.5$
 $y = 12.5(7) = 87.5$ km
- The time it takes to fly from Los Angeles to New York varies inversely as the speed of the plane. If the trip takes 6 hours at 900 km/h, how long would it take at 800 km/h?
 $900 = \frac{k}{6}$
 $800 = \frac{5400}{h}$
6.75 hours
- The number of kilograms of water in a person's body varies directly as the person's mass. A person with a mass of 90 kg contains 60 kg of water. How many kilograms of water are in a person with a mass of 50 kg?
 $60 = 90k$
 $\frac{2}{3} = k$
 $90 = k(60)$
 $k = 1.5$
 $50 = 1.5(x)$
 $33 \frac{1}{3}$ kg water

$x = 50(\frac{2}{3})$