

Name 2 things with a relation so:

a) If one increases, the other does.

Oil price ↑, gas price ↑  
weight ↑, clothes size ↑  
temp ↑, attitude (😊) ↑

hours worked ↑, pay ↑  
More (good) food <sup>eaten</sup> ↑, happy ↑  
More \$ ↑, smiles ↑

b) If one goes down, other goes up

gas price ↑, Tyler's \$ ↓  
Wolf pop ↑, deer pop ↓  
Supply crop ↓, price of it ↑

Weight ↓, Confidence ↑  
temp ↑, desire to be <sub>in school</sub> ↓  
gamer time ↑, grades ↓

# 8.1 Direct & Inverse Variation

Direct  $x \uparrow, y \uparrow$   
 $x \downarrow, y \downarrow$   
 $y = ax$   
 $y = mx + b$  ~~is at 0, or the origin!~~  $y$ -intercept is at 0, or the origin!

Inverse  $x \uparrow, y \downarrow$   
 $x \downarrow, y \uparrow$   
 $y = \frac{a}{x}$   
 $a = \text{Constant of Variation}$   
 $= \text{Slope}$   
 $= \text{Rate of change}$

## Example

An MP3 player can hold 2,500 songs for average size of 4MB.

Ⓐ Direct or inverse relation? Find 'a'.  
 $\# \text{ Songs } \uparrow, \text{ size/space } \downarrow$   
 Inverse  $\left\{ \begin{array}{l} y = \frac{a}{x} \\ \# \text{ Songs} = \frac{a}{\text{Size of song}} \\ 2500 = \frac{a}{4} \\ 10000 = a \end{array} \right.$

So...  $\# \text{ Songs} = \frac{10000}{\text{Size}}$

Ⓑ Find # Songs for average size of:

size MB	2	3	5	35
# Songs	5,000	3333 <small>cut off .3</small>	2000	285 <small>cut off .7</small>
	$\frac{10000}{2}$	$\frac{10000}{3}$	$\frac{10000}{5}$	$\frac{10000}{35} = 285$

$$\textcircled{13} \quad y = \frac{a}{x} \xrightarrow{\substack{y=9 \\ x=1}} 9 = \frac{a}{1} \rightarrow a=9$$

$$y = \frac{9}{x}$$

3 →

$$y = \frac{9}{3}$$
$$\textcircled{y=3}$$

$$y = \frac{a}{x} \rightarrow q = \frac{a}{1}$$

$a = 9$

When  $y = 9, x = 1$

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$$y = \frac{9}{x} \text{ for } x = 3$$

$$y = \frac{9}{3} \rightsquigarrow y = 3$$

$$n = \frac{a}{s} \quad \left\{ \quad 54 = \frac{a}{1.92} \right.$$

$$a = 103.68$$

$$n = \frac{103.68}{3.87} = 26$$

$$\frac{9}{1} = \frac{a}{1} \longrightarrow a = 9$$

$$y = \frac{9}{x} \rightarrow x = 3 \quad y = \frac{9}{3} \quad y = 3$$

$$\textcircled{31} \quad x = \frac{y}{z} \quad \textcircled{32} \quad y = xz^2 \quad \textcircled{53} \quad w = \frac{xz}{y}$$