

2.5 Model Direct Variation

Formula / Definition

Direct Variation $\rightarrow y = ax$

$$y = ax + 0$$
$$y = mx + b$$

x and y vary directly
when $x = 4$ and $y = -8$.

Find the equation of
direct variation.

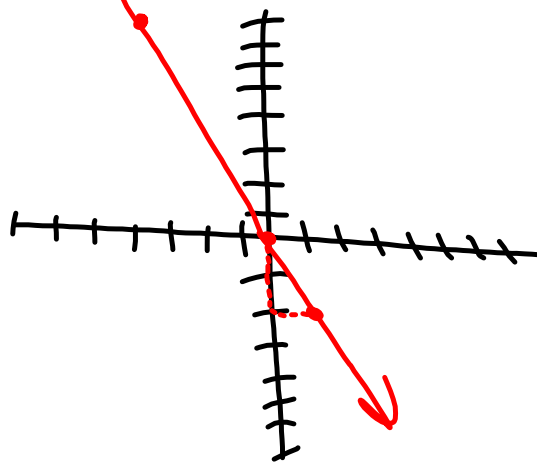
$$y = ax$$

$$\frac{-8}{4} = a \left(\frac{4}{4} \right) \rightarrow a = -2$$

$$y = -2x$$

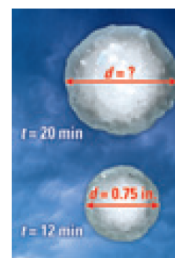
EXAMPLE 1 Write and graph a direct variation equationWrite and graph a direct variation equation that has $(-4, 8)$ as a solution.

$$y = ax$$
$$8 = a(-4)$$
$$\frac{8}{-4} = \frac{a(-4)}{-4}$$
$$a = -2$$
$$y = -2x + 0$$



EXAMPLE 2 Write and apply a model for direct variation

METEOROLOGY Hailstones form when strong updrafts support ice particles high in clouds, where water droplets freeze onto the particles. The diagram shows a hailstone at two different times during its formation.



$$d = 0.75 \text{ in} \\ t = 12 \text{ min}$$

- a. Write an equation that gives the hailstone's diameter d (in inches) after t minutes if you assume the diameter varies directly with the time the hailstone takes to form.

$$d = at \quad \boxed{d = \frac{1}{16}t}$$

$$0.75 = a(12)$$

$$\frac{3}{4} = \frac{a(12)}{12} \quad a = \frac{1}{16}$$

- b. Using your equation from part (a), predict the diameter of the hailstone after 20 minutes.

$$d = \frac{1}{16}(20) = \frac{20}{16} = \boxed{\frac{5}{4}} \text{ in} \text{ or } \boxed{1.25 \text{ in}}$$

WRITING AND EVALUATING The variables x and y vary directly. Write an equation that relates x and y . Then find y when $x = 12$.

$$x = -3, y = -5$$

$$y = ax$$
$$-5 = a(-3)$$
$$\frac{-5}{-3} = \frac{a(-3)}{-3}$$

$$a = \frac{5}{3}$$

$$y = \frac{5}{3}x$$

$$y = \frac{5}{3}(12) = 20$$

~~$y = \frac{10}{3}x$~~

~~$y = \frac{5}{3}x$~~

~~$y = \frac{5}{3}x$~~

IDENTIFYING DIRECT VARIATION Tell whether the equation represents direct variation. If so, give the constant of variation.

21. $2y - 5x = 0$
 $+5x +5x$

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

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

$$y = ax$$

Yes

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

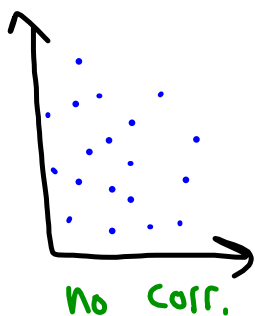
STOP

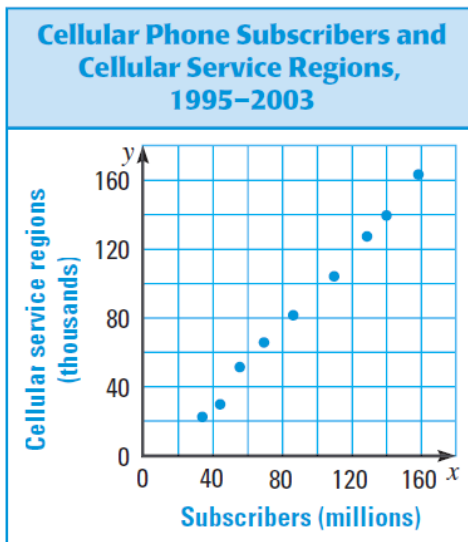
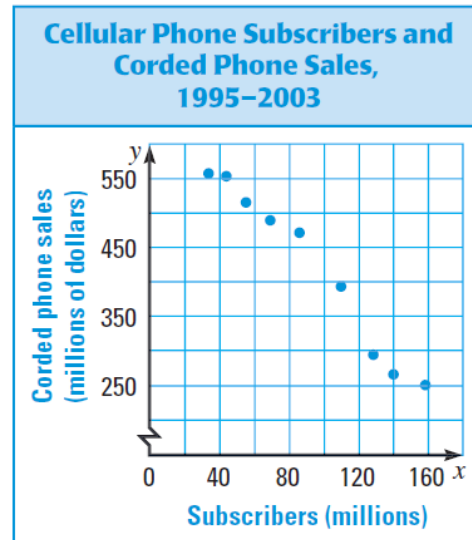
Work on Section 2.5 homework

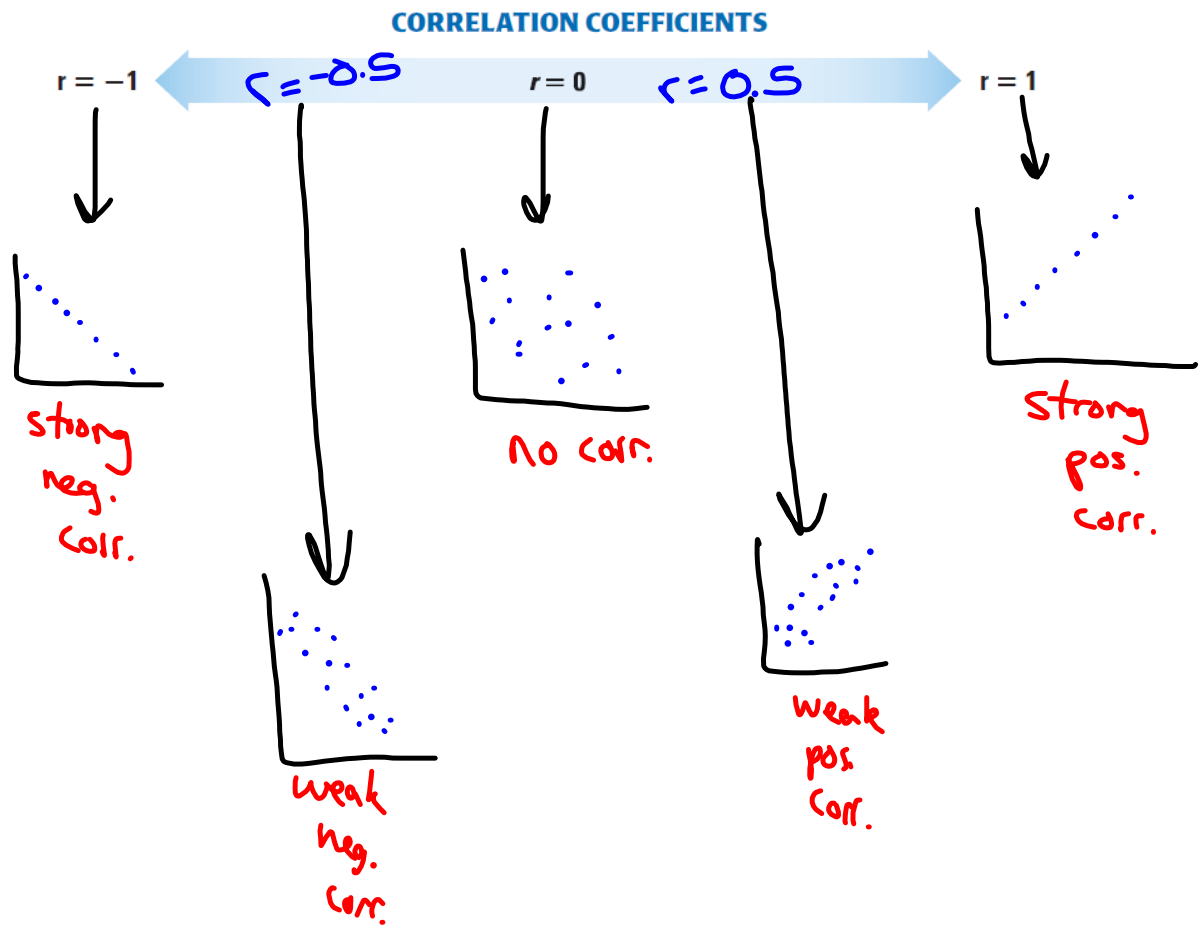
2.6 Draw Scatter Plots and Best-Fitting Lines

Scatter Plots:

a graph that has lots
of data points.

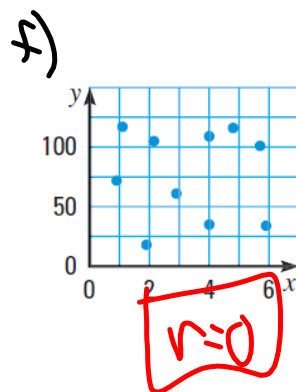
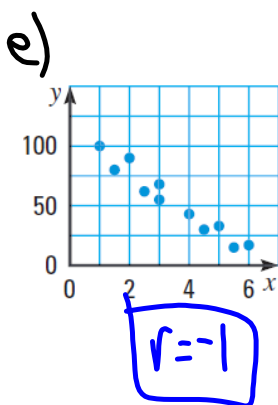
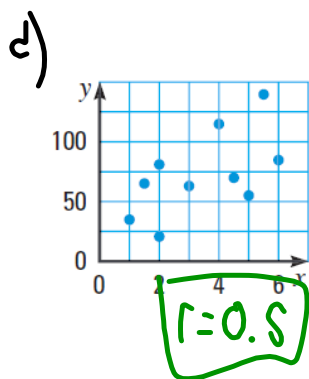
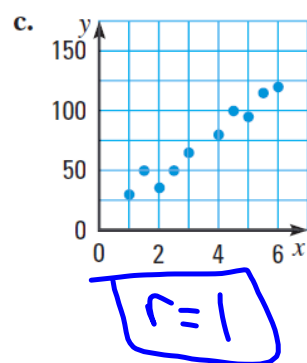
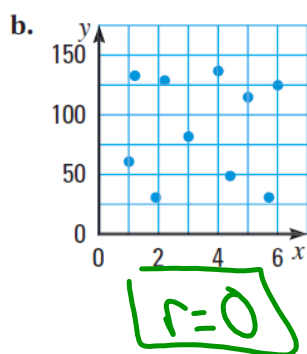
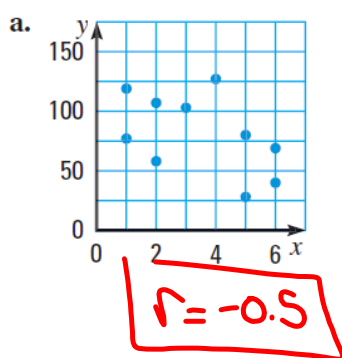


EXAMPLE 1 Describe correlation**TELEPHONES** Describe the correlation shown by each scatter plot.*positive corr.**negative corr.*



EXAMPLE 2 Estimate correlation coefficients

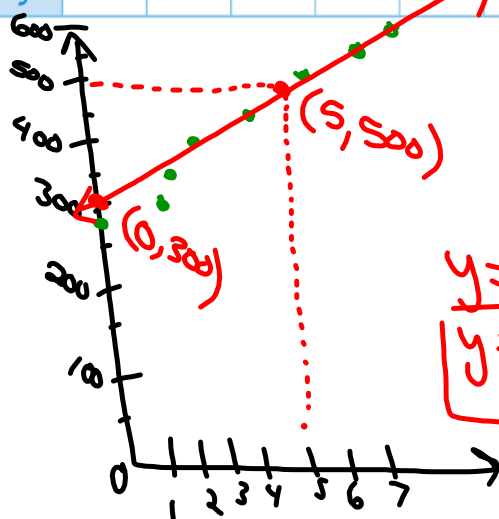
Tell whether the correlation coefficient for the data is closest to -1 , -0.5 , 0 , 0.5 , or 1 .



EXAMPLE 3 Approximate a best-fitting line

ALTERNATIVE-FUELED VEHICLES The table shows the number y (in thousands) of alternative-fueled vehicles in use in the United States x years after 1997. Approximate the best-fitting line for the data.

x	0	1	2	3	4	5	6	7
y	280	295	322	395	425	471	511	548



EXAMPLE 4 Use a line of fit to make a prediction

Use the equation of the line of fit from Example 3 to predict the number of alternative-fueled vehicles in use in the United States in ~~2010~~.

$$2015 \quad x=18$$

$$y = 40x + 300$$

$$y = 40(18) + 300$$

$$y = 720 + 300$$

$$y = 1020$$

1,020,000 cars