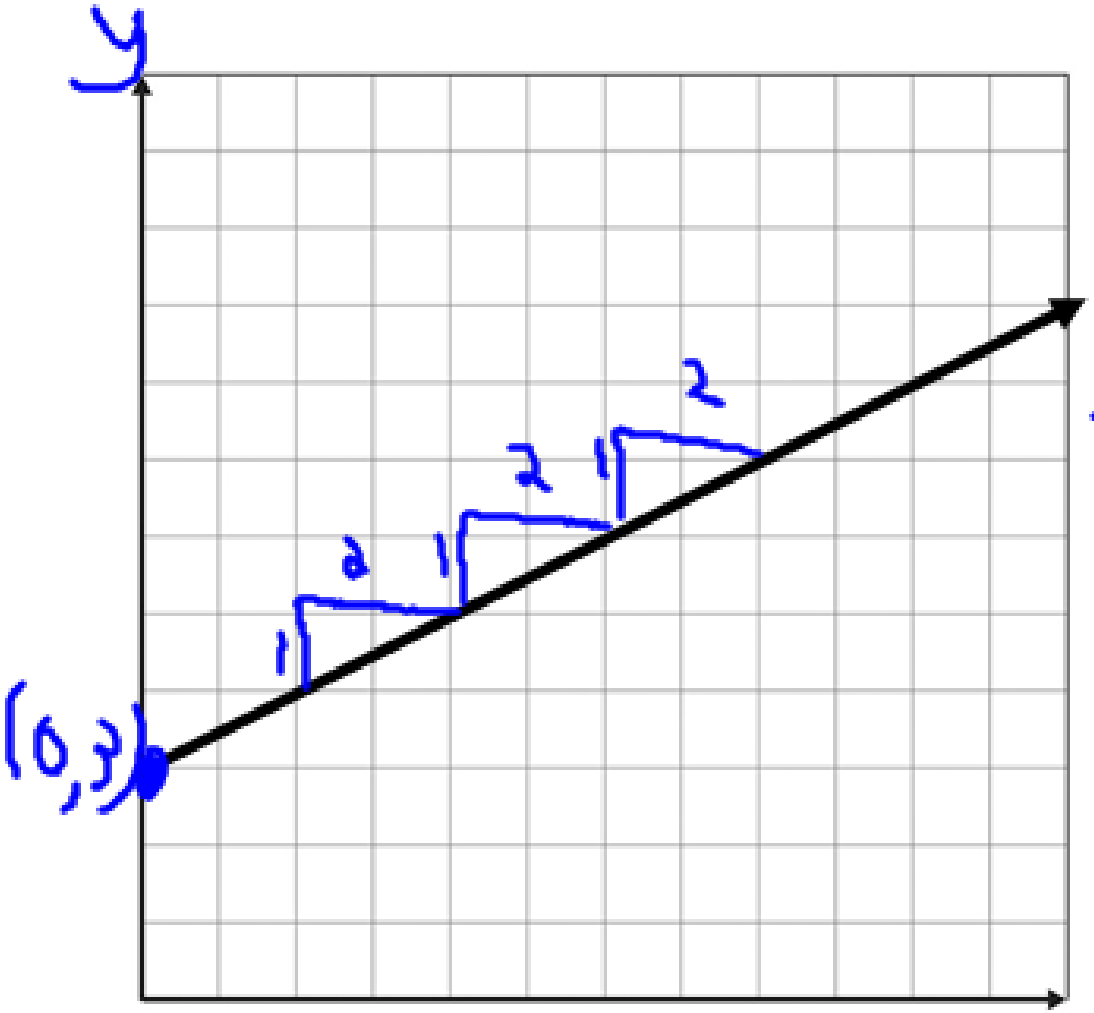
Get out your homework and have it ready to check. Warm Up by writing an equation that represents the line below. Then find the value of y when x is 16.

Classwork - Lines of Best Fit



$y = mx + b$

$m = \frac{\text{rise}}{\text{run}}$

$b = (0, y)$

$m = \frac{1}{2}$ $b = (0, 3)$

$y = \frac{1}{2}x + 3$

$y = ?$ $x = 16$

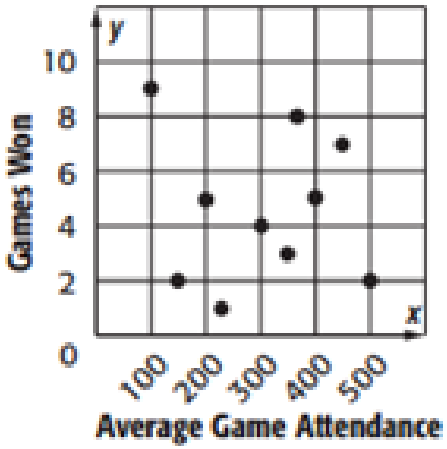
$y = \frac{1}{2}(16) + 3$

$y = 8 + 3$

$y = 11$

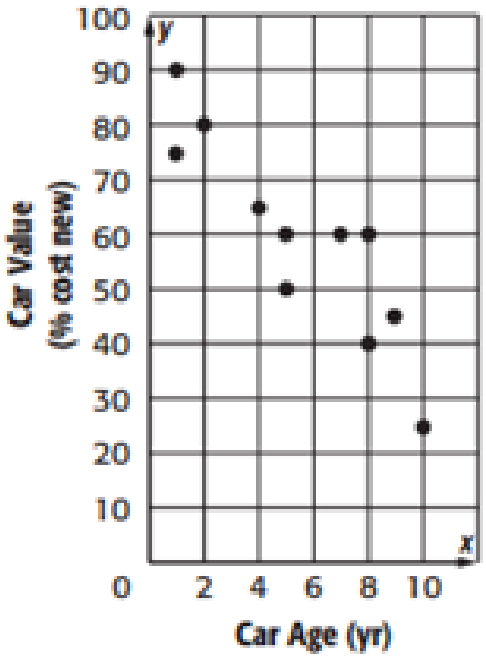
Interpret each scatter plot.

1.



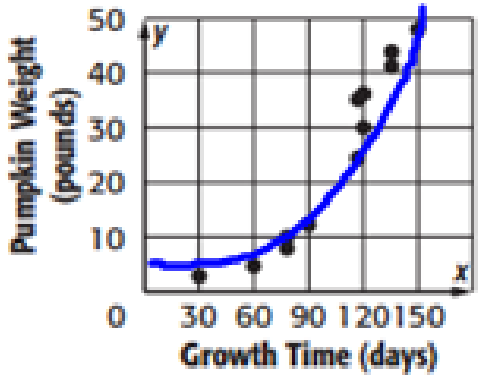
no association; Sample answer: The game attendance does not affect the games won.

2.



negative; Sample answer: As the age of the car increases, the value of the car decreases. There appears to be a linear association.

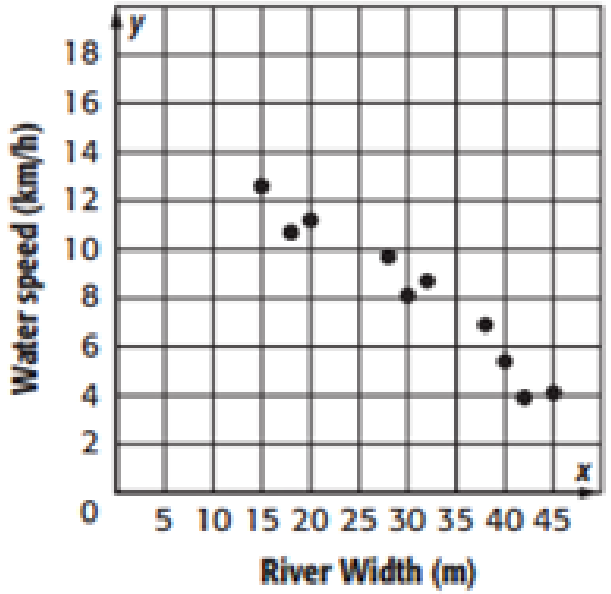
3.



positive; Sample answer: As the growth time increases, the pumpkin weight increases. There appears to be a nonlinear association.

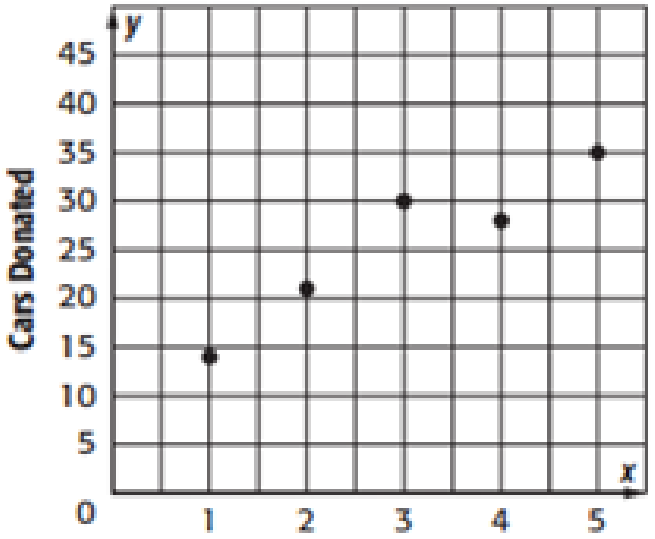
4. RIVER Construct a scatter plot of the river's width and the water's speed.

River Width (m)	15	18	20	28	30	32	38	40	42	45
Water Speed (km/h)	12.6	10.7	11.2	9.7	8.1	8.7	6.9	5.4	3.9	4.1



5. DONATIONS Construct a scatter plot of the number of cars donated to a local charity over the past five years since 2007.

Years Since 2007	1	2	3	4	5
Number of Cars	14	21	30	28	35



Real-World Link

Cookies The table shows the average annual cost of one pound of chocolate chip cookies.

Years Since 2000	0	1	2	3	4	5	6	7	8	9
Average Cost ($)	2.59	2.81	2.65	2.67	2.88	2.70	2.85	2.88	3.17	3.24

1. What year corresponds to 0 years since 2000? _____

9 years since 2000? _____

2. If the data were displayed in a scatter plot, would the scatter plot show a positive, negative, or no association? Explain.

_____

_____

3. Would a more reasonable prediction for the cost of cookies in 2015 be $3.25 or $4.00? Explain.

Line of Best Fit

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When data are collected, the points graphed usually do not form a straight line, but may approximate a linear relationship. A **line of best fit** is a line that is very close to most of the data points.

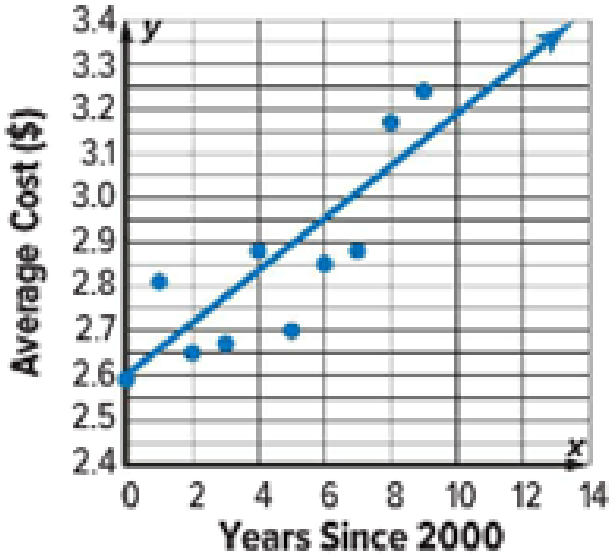
Examples

Refer to the information in the table about the cost of cookies.

1. **Construct a scatter plot using the data. Then draw and assess a line that seems to best represent the data.**

Years Since 2000	0	1	2	3	4	5	6	7	8	9
Average Cost ($)	2.59	2.81	2.65	2.67	2.88	2.70	2.85	2.88	3.17	3.24

Graph each of the data points. Draw a line that fits the data. About half of the points are above the line and half of the points are below the line. Judge the closeness of the data points to the line. Most of the points are close to the line.



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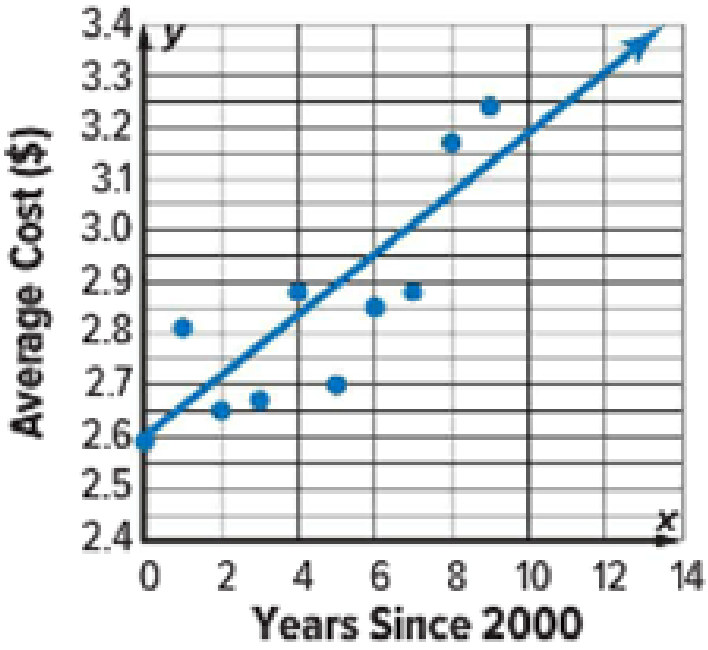


2. Use the line of best fit to make a conjecture about the cost of cookies in 2013.

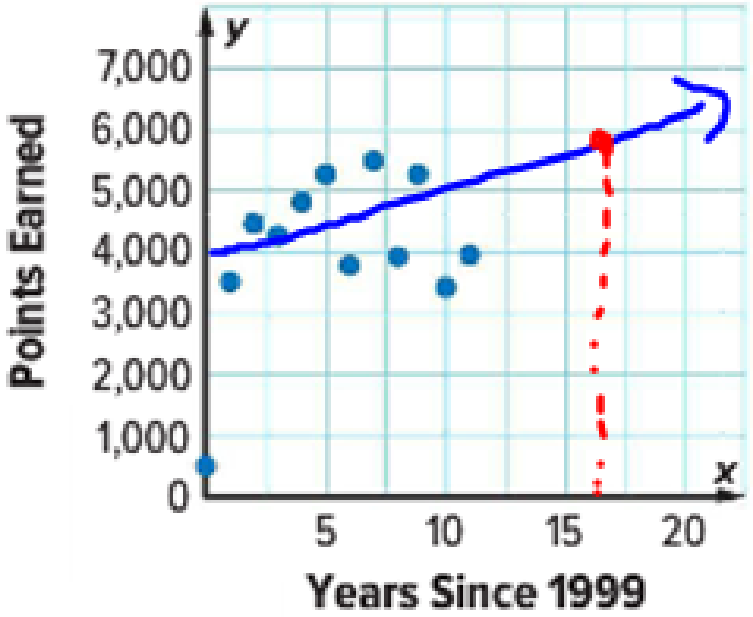
Extend the line so that you can estimate the *y*-value for an *x*-value of 2013 − 2000 or 13. The *y*-value for 13 is about $3.35. We can predict that in 2013, a pound of chocolate chip cookies will cost $3.35.

Got it? **Do these problems to find out.**

Refer to the scatter plot about yearly points scored by a certain race car driver.

a. Draw and assess a line that seems to best represent the data.

b. Use the line of best fit to make a conjecture about the points the driver will score in 2015.



5,900 points in 2015.

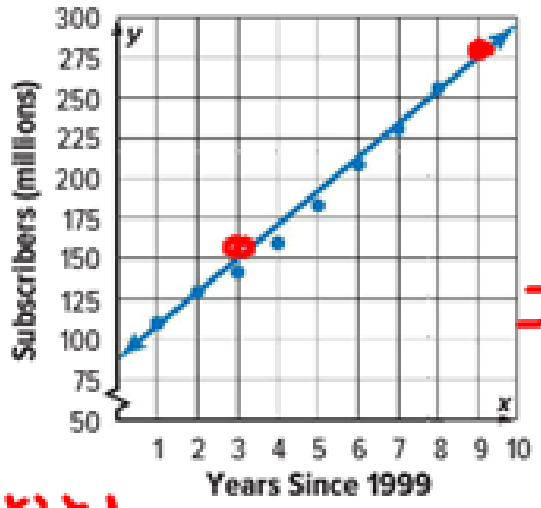
2015 → x = 16 y = ?

Examples

Tutor

The scatter plot shows the number of cellular service subscribers in the U.S.

3. **Write an equation in slope-intercept form for the line of best fit that is drawn, and interpret the slope and *y*-intercept.**



Choose any two points on the line. They may or may not be data points. The line passes through points (3, 150) and (9, 275). Use these points to find the slope, or rate of change, of the line.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$ Definition of slope

$$m = \frac{275 - 150}{9 - 3}$$ $(x_1, y_1) = (3, 150)$ and $(x_2, y_2) = (9, 275)$

$m = \frac{125}{6}$ or about 20.83 Simplify.

The slope is about 20.83. This means the number of cell phone subscribers increased by about 20.83 million people per year.

The *y*-intercept is 87.5 because the line of fit crosses the *y*-axis at about the point (0, 87.5). This means there were about 87.5 million cell phone subscribers in 1999.

$y = mx + b$ Slope-intercept form

$y = 20.83x + 87.5$ Replace m with 20.83 and b with 87.5.

The equation for the line of best fit is $y = 20.83x + 87.5$.

4. **Use the equation to make a conjecture about the number of cellular subscribers in 2015.**

The year 2015 is 16 years after 1999.

$y = 20.83x + 87.5$	Equation for the line of best fit
$y = 20.83(16) + 87.5$	Replace x with 16.
$y = 333.28 + 87.5$	Simplify.

So, in 2015, there will be about 420.83 million cellular subscribers.

Got it? **Do these problems to find out.**

(4, 65) (7, 70)

The scatter plot shows the graduation rate of high school students.

c. Write an equation in slope-intercept form for the line of best fit that is drawn, and interpret the slope and *y*-intercept.

d. Use the equation to make a conjecture about the graduation rate in 2020.

$m = \frac{70-65}{7-4} = \frac{5}{3} = 1.\overline{6}$

$65 = 1.\overline{6}(4) + b$

$65 = 6.\overline{6} + b$

$-6.\overline{6} \quad -6.\overline{6}$

$58.\overline{3} = b$

$y = 1.\overline{6}x + 58.\overline{3}$