

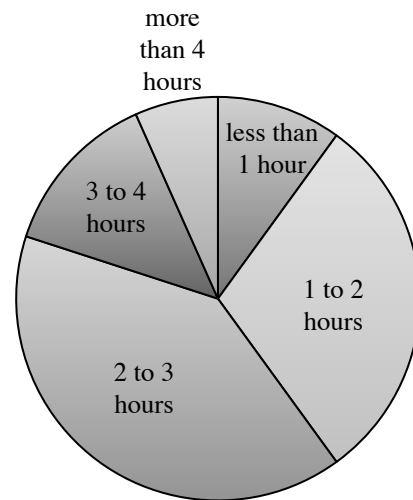
A circle graph (or pie chart) is a diagram that represents proportions of categorized data as parts of a circle. Each sector or wedge represents a percent or fraction of the circle. The fractions or percents must total 1, or 100%. Since there are 360° in a circle, the size of each sector (in degrees) is found by multiplying the fraction or percent by 360°.

For additional information, see the Math Notes box in Lesson 7.1.1 of the *Core Connections, Course 3* text.

Example 1

Ms. Sallee’s class of 30 students was surveyed about the number of hours of homework done each night and here are the results:

less than 1 hour	3 students
1 to 2 hours	9 students
2 to 3 hours	12 students
3 to 4 hours	4 students
more than 4 hours	2 students



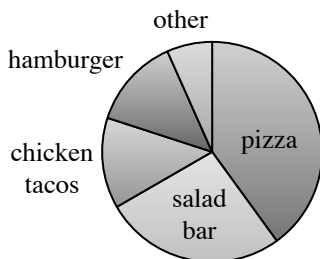
The proper size for the sectors is found as follows:

$$\begin{aligned}
 < 1: \frac{3}{30} \cdot 360^\circ = 36^\circ; & \quad 1 \text{ to } 2: \frac{9}{30} \cdot 360^\circ = 108^\circ \\
 2 \text{ to } 3: \frac{12}{30} \cdot 360^\circ = 144^\circ; & \quad 3 \text{ to } 4: \frac{4}{30} \cdot 360^\circ = 40^\circ \\
 > 4: \frac{2}{30} \cdot 360^\circ = 20^\circ
 \end{aligned}$$

The circle graph is shown at right.

Example 2

The 800 students at Central Middle School were surveyed to determine their favorite school lunch item. The results are shown below.



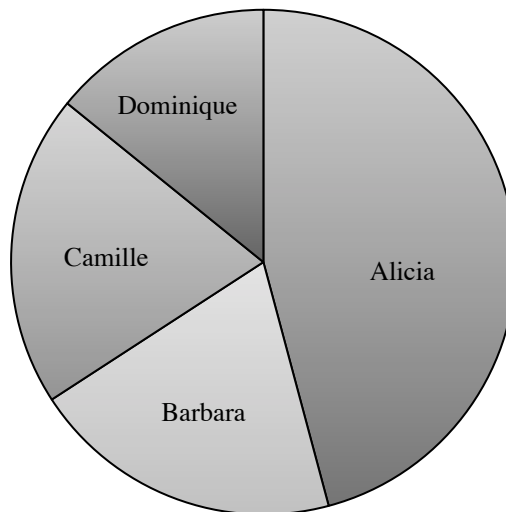
Use the circle graph at left to answer each question.

- Which lunch item was most popular?
- Approximately how many students voted for the salad bar?
- Which two lunch items appear to have equal popularity?

Answers: a. pizza is the largest sector; b. $\frac{1}{4} \cdot 800 = 200$;
 c. hamburger and chicken tacos have the same size sectors

Problems

For problems 1 through 3 use the circle graph at right. The graph shows the results of the 1200 votes for prom queen.

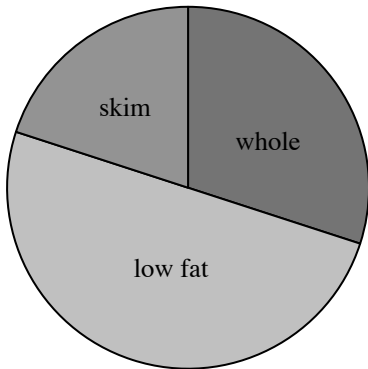


1. Who won the election?
2. Did the person who won the election get more than half of the votes?
3. Approximately how many votes did Camille receive?
4. Of the milk consumed in the United States, 30% is whole, 50% is low fat, and 20% is skim. Draw a circle graph to show this data.
5. On an average weekday, Sam's time is spent as follows: sleep 8 hours, school 6 hours, entertainment 2 hours, homework 3 hours, meals 1 hour, and job 4 hours. Draw a circle graph to show this data.
6. Records from a pizza parlor show the most popular one-item pizzas are: pepperoni 42%, sausage 25%, mushroom 10%, olive 9% and the rest were others. Draw a circle graph to show this data.
7. To pay for a 200 billion dollar state budget, the following monies were collected: income taxes 90 billion dollars, sales taxes 74 billion dollars, business taxes 20 billion dollars, and the rest were from miscellaneous sources. Draw a circle graph to show this data.
8. Greece was the host country for the 2004 Summer Olympics. The Greek medal count was 6 gold, 6 silver, and 4 bronze. Draw a circle graph to show this data.

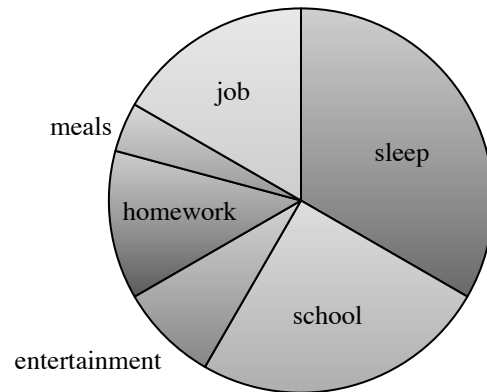
Answers

1. Alicia
2. No, Alicia's sector is less than half of a circle.
3. Approximately 240 votes.

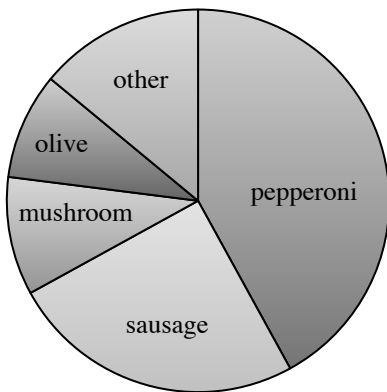
4.



5.



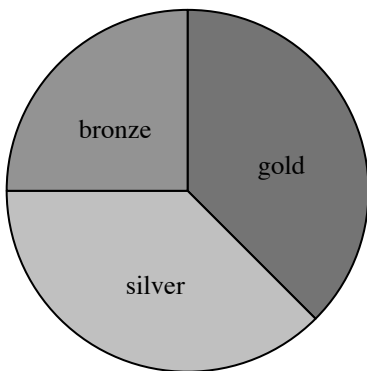
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SCATTERPLOTS, ASSOCIATION, AND LINE OF BEST FIT 7.1.2 – 7.1.3

Data that is collected by measuring or observing naturally varies. A scatterplot helps students decide if there is a relationship (an **association**) between two numerical variables.

If there is a possible linear relationship, the trend can be shown graphically with a line of best fit on the scatterplot. In this course, students use a ruler to estimate a line of best fit. The equation of the best-fit line can be determined from the slope and the y-intercept.

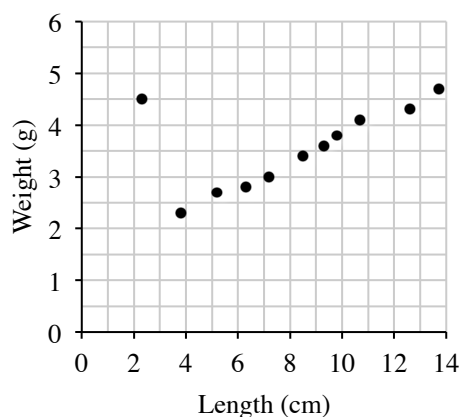
An association is often described by its form, direction, strength, and outliers. See the Math Notes boxes in Lessons 7.1.2, 7.1.3, and 7.3.2 of the *Core Connections, Course 3* text.

For additional examples and practice, see the *Core Connections, Course 3* Checkpoint 9 materials.

Example 1

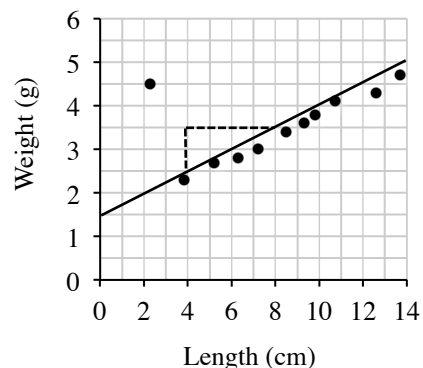
Sam collected data by measuring the pencils of her classmates. She recorded the length of the painted part of each pencil and its weight. Her data is shown on the graph at right.

- Describe the association between weight and length of the painted part of the pencil.
- Create a line of best fit where y is the weight of the pencil in grams and x is the length of the painted part of the pencil in centimeters.
- Sam's teacher has a pencil where the painted part is 11.5 cm long. Predict the weight of the teacher's pencil using the equation found in part (b).



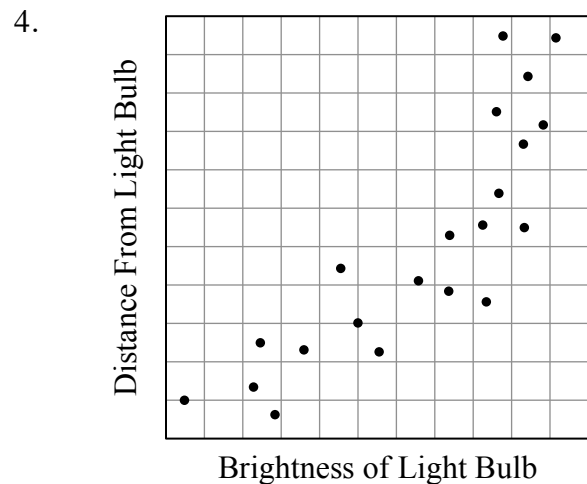
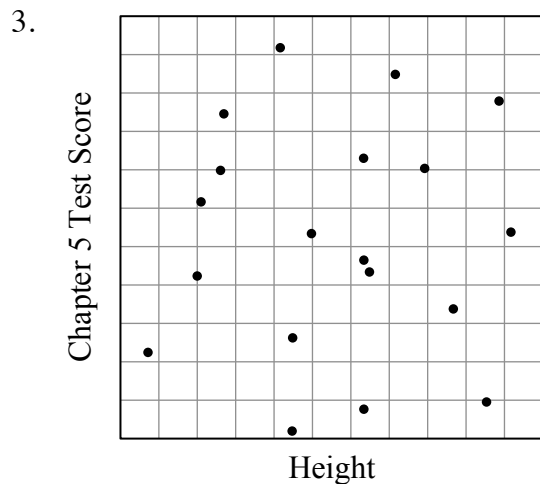
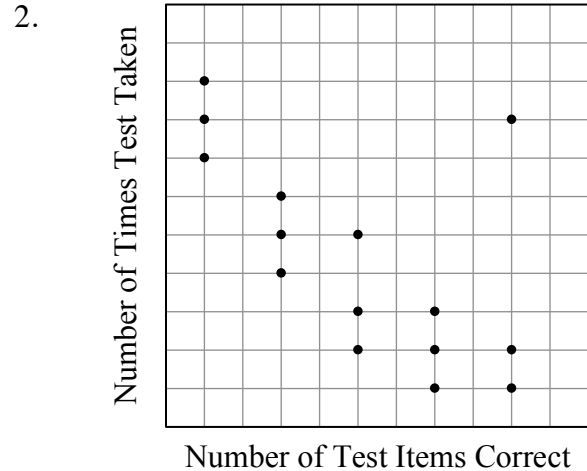
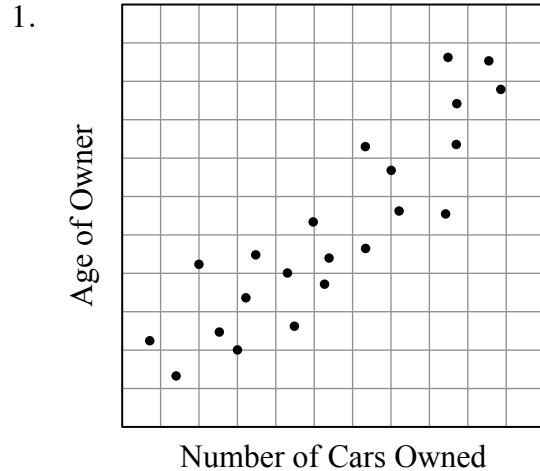
Answer:

- There is a strong positive linear association with one apparent outlier at 2.3 cm.
- The equation of the line of best fit is approximately $y = \frac{1}{4}x + 1.5$. See graph at right.
- $\frac{1}{4}(11.5) + 1.5 \approx 4.4$ g



Problems

In problems 1 through 4 describe (if they exist), the form, direction, strength, and outliers of the scatterplot.



5. Dry ice (frozen carbon dioxide) has the unusual property of sublimating (changing directly from a solid to a gas). Giulia's father uses dry ice to keep the glasses in the restaurant cold. Since dry ice sublimates in the restaurant cooler, Giulia was curious how long a piece of dry ice would last. She collected the data shown in the table at right.

Draw a scatterplot and a line of best fit. What is the approximate equation of the line of best fit?

# of hours after noon	Weight of dry ice (oz)
0	15.3
1	14.7
2	14.3
3	13.6
4	13.1
5	12.5
6	11.9
7	11.5
8	11.0
9	10.6
10	10.2

6. Ranger Scott is responsible for monitoring the population of the elusive robins in McNeil State Park. He would like to find a relationship between the elm trees (their preferred nesting site) and the number of robins in the park. He randomly selects 7 different areas in the park and painstakingly counts the elms and robins in each area.

Elms	8	13	4	5	10	9	4
Robins	5	9	3	5	7	7	5

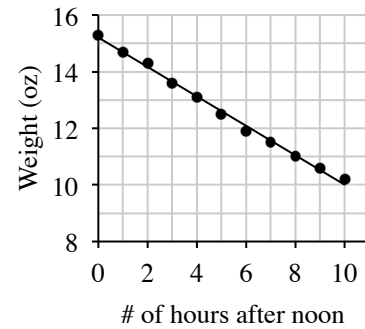
- Make a scatterplot on graph paper and describe the association.
 - Sketch the line of best fit on your scatterplot. Find the equation of the line of best fit.
 - Based on the equation, how many robins should Ranger Scott expect to find in an area with 6 elm trees?
7. A study was done for a vitamin supplement that claims to shorten the length of the common cold. The data the scientists collected from ten patients in an early study are shown in the table below.

Number of months taking supplement	0.5	2.5	1	2	0.5	1	2	1	1.5	2.5
Number of days cold lasted	4.5	1.6	3	1.8	5	4.2	2.4	3.6	3.3	1.4

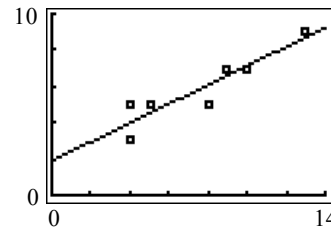
- Create a scatterplot and describe the association.
- Model the data with a line of best fit. Use x to represent the number of months taking the supplement and y to represent the length of the cold.
- According to your model, how many days do you expect a cold to last for patient taking the supplement for 1.5 months?

Answers

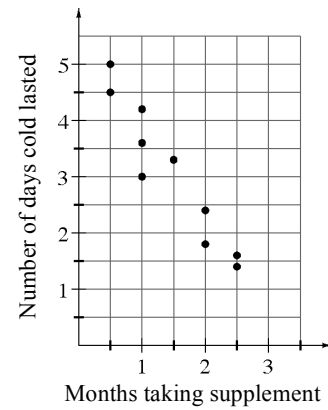
1. Moderate, positive, linear association with no outliers.
2. Strong, negative, linear association with an outlier.
3. No association.
4. Strong, positive, curved association.
5. $y = -\frac{1}{2}x + 15.3$



6. Strong, positive linear association with no outliers.
 $y = \frac{1}{2}x + 2$
 5 robins



7. a. The form is linear, the direction is negative, the strength is moderate, and there are no apparent outliers.
- b. $y = -\frac{5}{3}x + 5$
- c. $-\frac{5}{3}(\frac{3}{2}) + 5 = 2\frac{1}{2}$ days



The slope of a line is the ratio of the change in y to the change in x between any two points on a line. Slope indicates the steepness (or flatness) of a line, as well as its direction (up or down) left to right.

Slope is determined by the ratio $\frac{\text{vertical change}}{\text{horizontal change}}$ between *any* two points on a line.

For lines that go up (from left to right), the sign of the slope is positive (the change in y is positive). For lines that go down (left to right), the sign of the slope is negative (the change in y is negative). A horizontal line has zero slope while the slope of a vertical line is undefined.

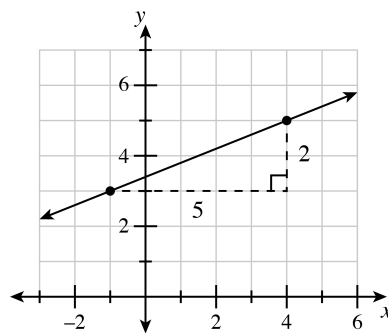
For additional information see the Math Notes box in Lesson 7.2.4 of the *Core Connections, Course 3* text.

Example 1

Write the slope of the line containing the points $(-1, 3)$ and $(4, 5)$.

First graph the two points and draw the line through them.

Look for and draw a slope triangle using the two given points.

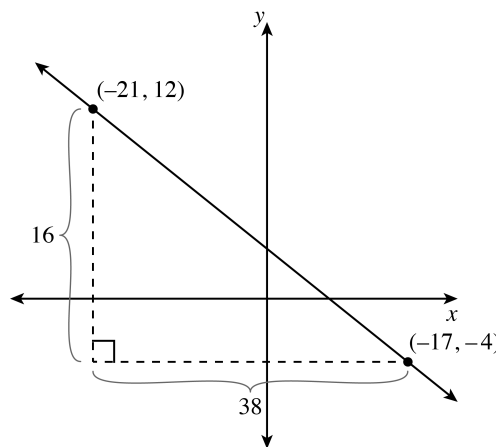


Write the ratio $\frac{\text{vertical change in } y}{\text{horizontal change in } x}$ using the legs of the right triangle: $\frac{2}{5}$.

Assign a positive or negative value to the slope (this one is positive) depending on whether the line goes up (+) or down (-) from left to right.

Example 2

If the points are inconvenient to graph, use a “generic slope triangle,” visualizing where the points lie with respect to each other. For example, to find the slope of the line that contains the points $(-21, 12)$ and $(17, -4)$, sketch the graph at right to approximate the position of the two points, draw a slope triangle, find the length of the leg of each triangle, and write the ratio $\frac{y}{x} = \frac{16}{38}$, then simplify. The slope is $-\frac{8}{19}$ since the change in y is negative (decreasing).



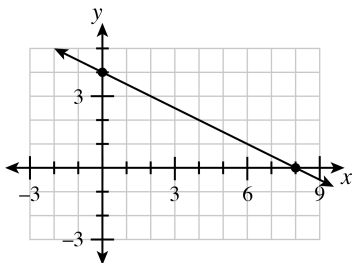
Problems

Write the slope of the line containing each pair of points.

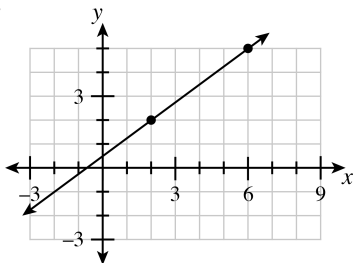
1. $(3, 4)$ and $(5, 7)$
2. $(5, 2)$ and $(9, 4)$
3. $(1, -3)$ and $(-4, 7)$
4. $(-2, 1)$ and $(2, -2)$
5. $(-2, 3)$ and $(4, 3)$
6. $(32, 12)$ and $(12, 20)$

Determine the slope of each line using the *highlighted points*.

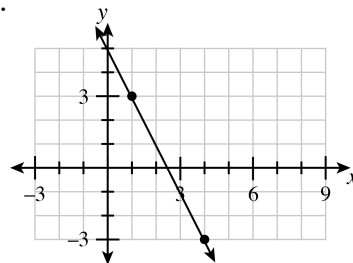
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Answers

1. $\frac{3}{2}$
2. $\frac{1}{2}$
3. -2
4. $-\frac{3}{4}$
5. 0
6. $-\frac{2}{5}$
7. $-\frac{1}{2}$
8. $\frac{3}{4}$
9. -2