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 is there is a relationship (an **association**) between two numerical variables.

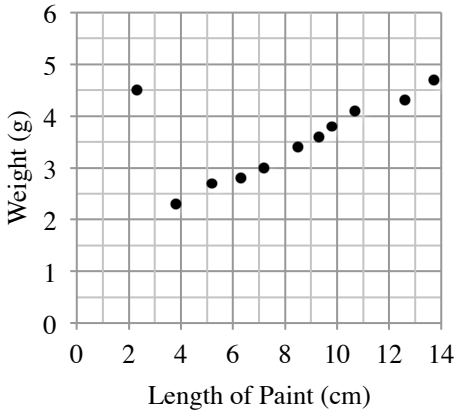
If there is a possible linear relationship, the trend can be shown graphically with a line of best fit on the scatterplot. In this course, students use a ruler to "eyeball" a line of best fit. The equation of the best-fit line can be determined from the slope and the *y*-intercept.

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.



a. Describe the association between weight and length of the pencil.

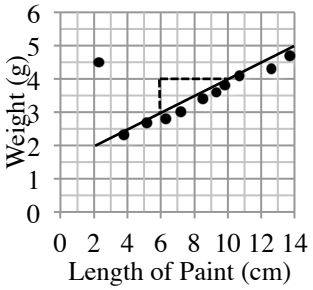
b. Create a line of best fit where *y* is the weight of the pencil in grams and *x* is the length of the paint on the pencil in centimeters.

c. Sam's teacher has a pencil with 11.5 cm of paint. Predict the weight of the teacher's pencil using the equation found in part (b).

Answer:

a. There is a strong positive linear association with one apparent outlier at 2.3 cm.

b. The equation of the line of best fit is approximately $y = \frac{1}{4}x + 1.5$. See graph at right.

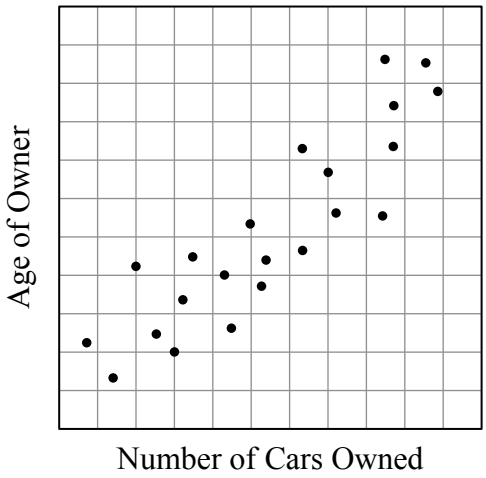


c. $\frac{1}{4}(11.5) + 1.5 \approx 4.4$ g

Problems

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

1.



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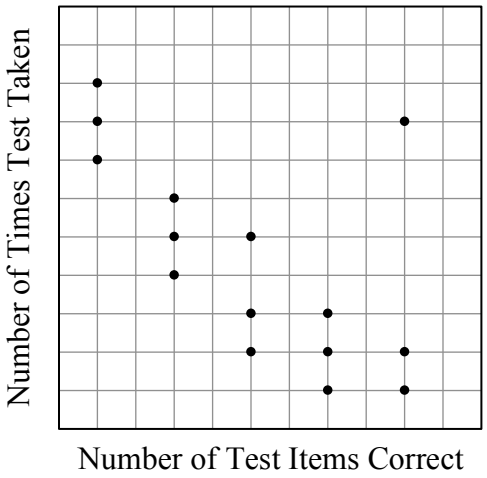

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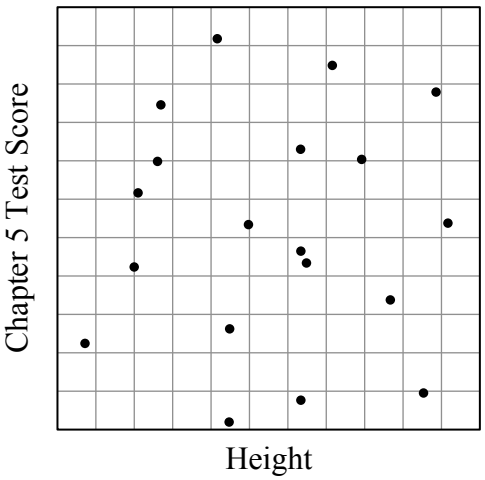
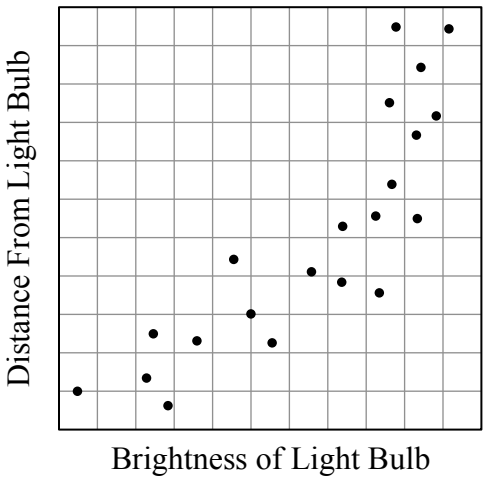


4.



5. Dry ice (frozen carbon dioxide) evaporates at room temperature. Giulia's father uses dry ice to keep the glasses in the restaurant cold. Since dry ice evaporates 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

a. Make a scatterplot on graph paper and describe the association.

b. Sketch the line of best fit on your scatterplot. Find the equation of the line of best fit.

c. 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

a. Create a scatterplot and describe the association.

b. 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.

c. According to your model, how many days do you expect a cold to last for patient taking the supplement for 1.5 months?

Answers

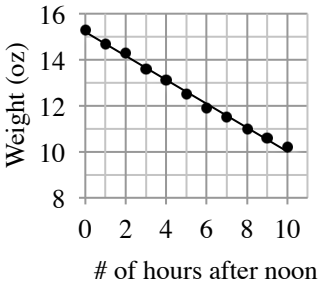
1. Moderate, positive, linear association with no outliers.

2. Strong, negative, linear association with an outlier.

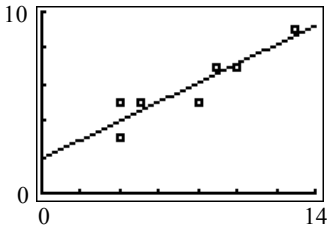
3. No association.

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