

LESSON 34: Create and Interpret a Scatter Plot

[OBJECTIVE]

The student will create and interpret scatter plots.

[PREREQUISITE SKILLS]

Plotting points, slope

[MATERIALS]

Student pages **S445–S458**

Tape measure (one per student pair)

Graphing calculators (optional)

Tape (optional for wall scatter plot)

Sticky notes (optional for wall scatter plot)

[ESSENTIAL QUESTIONS]

1. When is it best to use a scatter plot to display data? Defend your thinking.
2. What does it mean if a scatter plot shows a positive association? Justify your answer.
3. Explain how to determine if a scatter plot suggests a linear association.

[WORDS FOR WORD WALL]

scatter plot, positive association, negative association, no association, slope, linear, non-linear, cluster, outlier

[GROUPING]

Cooperative Pairs (CP), Whole Group (WG), Individual (I)

[LEVELS OF TEACHER SUPPORT]

Modeling (M), Guided Practice (GP), Independent Practice (IP)

[MULTIPLE REPRESENTATIONS]

SOLVE, Pictorial Representation, Verbal Description, Algebraic Formula, Table, Graph, Graphic Organizer

[WARM-UP] (IP, WG, I) S445 (Answers on T919.)

Have students turn to S445 in their books to begin the Warm-Up. Students will decide what types of slope different lines have. Monitor students to see if any of them need help during the Warm-Up. Have students complete the problems and then review the answers as a class. {**Graph, Pictorial Representation**}

[HOMEWORK]

Take time to go over the homework from the previous night.

[LESSON] [2-3 days (1 day = 80 minutes) - (M, GP, WG, CP, IP)]

LESSON 34: Create and Interpret a Scatter Plot

SOLVE Problem (GP, WG)**(GP, WG) S446 (Answers on T920.)**

Have students turn to S446. The first problem is a SOLVE problem. You are only going to complete the S step with students at this point. Tell students that today they will learn how to create and interpret scatter plots, and they will use this knowledge to complete this SOLVE problem at the end of the lesson. {**SOLVE, Verbal Description, Graphic Organizer**}

Height and Foot Length**(IP, CP, WG) S446**

Have each student measure their height and foot length in inches with a tape measure. Students can work in pairs to complete the measurements. Have students write down the data in the table on S446 and record the data for the whole group. {**Concrete Representation, Graphic Organizer, Table**}

Creating Scatter Plots**(M, GP, CP, WG) S446, S447 (Answers on T920, T921.)**

M, GP, CP, WG: Students will work with the data that they collected on S446 regarding the height and foot length of the students in the class to create a scatter plot. The teacher can create a wall plot using painter's tape and sticky notes to model as students complete their chart on S447. Assign the roles of Partner A and Partner B to students. {**Pictorial Representation, Verbal Description, Graph**}

MODELING**Creating Scatter Plots**

- Step 1:** Partner A, when we display data in a line plot, bar graph, circle graph or box plot, how many characteristics do we plot? (1)
- Partner B, how many characteristics were we working with when we collected data about height and foot length? (2)
 - Tell students that they are going to plot the data that was collected on a graph that we can use to show the relationship between two characteristics. This graph is called a **scatter plot**.
 - Have student pairs discuss the possible relationship between the two characteristics of height and foot length and make predictions. Will the two be related in any way?
 - Partner A, identify the person in the classroom who is the tallest. (Answers will vary.)
 - Partner B, what is the foot length of that person? (Answers will vary.)
 - Partner A, identify the person in the classroom who is the shortest. (Answers will vary.)
 - Partner B, what is the foot length of that person? (Answers will vary.)
 - Have student pairs identify any pattern that they might see. (Possible answers: The taller person has the longest foot; the shorter person has the shortest foot.)

LESSON 34: Create and Interpret a Scatter Plot

Step 2: Direct students to the graph on S447.

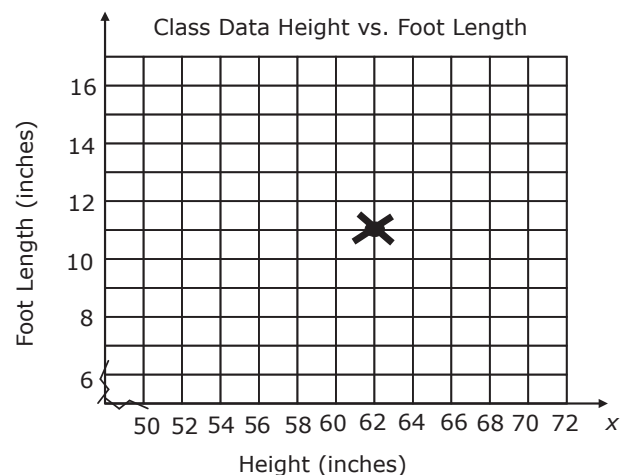
- Partner A, what is the title of the graph? (Class Data Height vs. Foot Length)
- Partner B, what is the label for the x-axis? (height in inches)
- Partner A, what is the label for the y-axis? (foot length in inches)

Step 3: Partner B, what else do we need to create the graph? (a scale for the x-axis and the y-axis)

- Partner A, what is an appropriate scale for foot length? (answers will vary but will probably be 1 or 2 for the y-axis)
- Partner B, what is an appropriate scale for height in inches? (Look at the minimum and maximum heights and find the difference. Probably a scale of 1 or 2 will be appropriate.)
- Model and have students write in the scale for the graph. (You may want to use a break line on the x-axis.) Explain to students that a break line is used when the data points do not start at zero, so that the plot is not misleading.)

Step 4: Have a student model how to plot a point on the wall graph for the class using their own height and foot length.

- Partner A, where do we start when we plot a point? [at the origin – (0,0)]
- Partner B, which direction do we move for the x-coordinate? (to the right)
- Partner A, which direction do we move for the y-coordinate? (up)
- Have the student plot a point at that location. Place a check next to that student's height and foot length in the table to show that it has been plotted.
- Repeat for all students. If two students have the exact same height and foot length once there is already a point, have the next student place an X over the point to show that there are two people with the same height and foot length. For example, if the first two students have the height of 62 inches and a foot length of 11 inches, the scatter plot would look like the one below.



LESSON 34: Create and Interpret a Scatter Plot

- Step 5:** Partner B, what do you notice about the data points on the scatter plot? (They should see that all of the points seem to be in a grouping, and as they move from left to right, they also move upwards.)
- Partner A, describe the relationship between height and foot length by looking at the scatter plot. (As the heights get taller, the foot length gets longer.) Record.

Data Trends in Scatter Plots**(M, CP, GP, WG) S448 (Answers on T922.)**

- M, GP, CP, WG :** Students will examine three scatter plots to identify the association between the two characteristics. Be sure students know their designation as Partner A or Partner B. {**Graph, Graphic Organizer, Verbal Description**}

MODELING**Data Trends in Scatter Plots**

- Step 1:** Partner A, what is the title of Scatter Plot A on S448? (Snakes)
- Partner B, identify the label and scale for the x-axis. (The label is length in feet and the scale is 1.)
 - Partner A, identify the label and scale for the y-axis. (The label is weight in pounds and the scale is 1.)
 - Partner B, describe the pattern of the data points from left to right. (As the x-values increase from left to right, y-values increase.) Record.
 - Partner A, explain the association between the two characteristics. (As the length of the snake increases, the weight also increases.) Record.
 - When the trend of the data is to go up from left to right, we characterize this as a **(positive association)**. Record.
- Step 2:** Partner B, what is the title of Scatter Plot B? (Free Time)
- Partner A, identify the label and scale for the x-axis. (The label is hours outside and the scale is 1.)
 - Partner B, identify the label and scale for the y-axis. (The label is hours watching TV and the scale is 1.)
 - Partner A, describe the pattern of the data points from left to right. (As the x-values increase from left to right, the y-values decrease.) Record.
 - Partner B, explain the association between the two characteristics. (As the hours spent outside increase, the number of hours spent watching TV decreases.) Record.
 - When the trend of the data is to go down from left to right we characterize this as a **(negative association)**. Record.

LESSON 34: Create and Interpret a Scatter Plot

Step 3: Partner A, what is the title of Scatter Plot C. (Siblings)

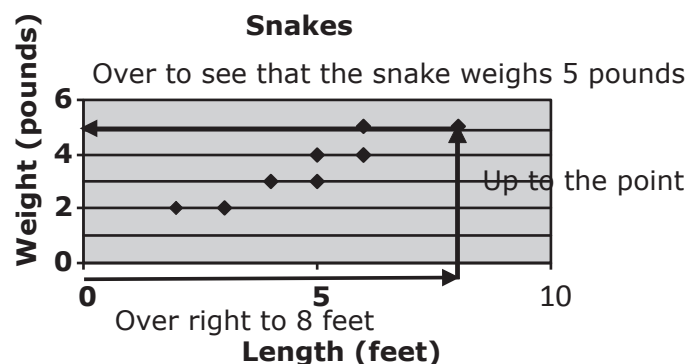
- Partner B, identify the label and scale for the x -axis. (The label is age in years and the scale is 5.)
- Partner A, identify the label and scale for the y -axis. (The label is number of siblings and the scale is 1.)
- Partner B, describe the pattern of the data points from left to right. (As the x -values increase from left to right, there is no detectable pattern in the y -values.) Record.
- Partner A, explain the association between the two characteristics. (The age of a person has no effect on the number of siblings they have.) Record.
- The association is categorized as **(no association)**. Record.

Interpreting Scatter Plots (M, GP, IP, WG, CP) S448, S449 (Answers on T922, T923.)

M, GP, CP, WG : Students will examine the three scatter plots from S448 to interpret the data and to answer questions on S449 about the information from the graph. Be sure students know their designation as Partner A and Partner B. {Graph, Graphic Organizer, Verbal Description}

MODELING**Interpreting Scatter Plots****Step 1:** Have students look at the first scatter plot on S448.

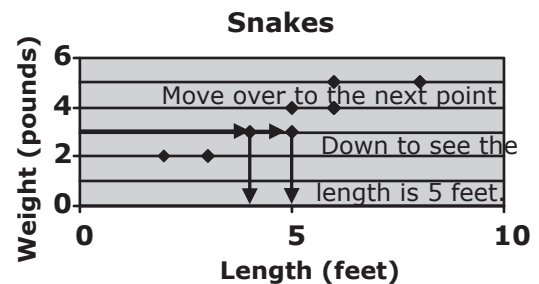
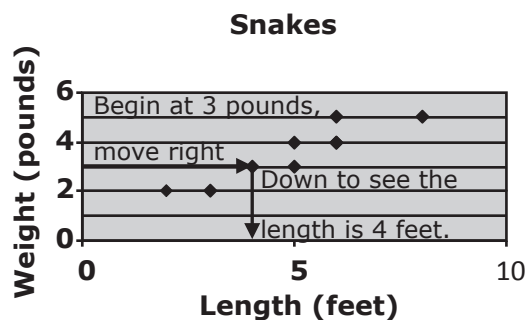
- Partner A, what is Question 1 on S449 asking us to find? (the weight of a snake that is 8 feet long)
- Partner B, explain how we can determine the weight. (We find the point on the x -axis of 8 feet and then find its y -value which will give us the weight.)
- Model how to move to the right to 8 feet and then up to the point. Then use your finger to move over left to see the weight of the snake.



LESSON 34: Create and Interpret a Scatter Plot

Step 2: Partner A, what is the weight of a snake that is 8 feet long? (5 pounds) Record.

- Partner B, what is Question 2 asking us to find? (the length of a snake that weighs 3 pounds)
- Partner A, identify what we know in this question. (the weight of the snakes)
- Partner B, which axis shows us the weight? (y -axis)
- Partner A, explain where to start for this question. (We know the weight, or the y -value, and need to find the x -value, or height. We start with the weight of 3 pounds and move to the right until we find a point.)
- Partner B, what is the length of the snake that weighs 3 pounds? (4 feet)
- Partner A, is that the only answer? Explain how you know. (No, there is another snake that weighs 3 pounds because there is another point on that line.)
- Partner B, how long is the second snake that weighs three pounds? (5 feet)
- Have students record the length of both snakes that weigh 3 pounds. (4 and 5 feet) Record.



Step 3: Have students read Question 3.

- Partner A, what is this question asking you to find? (the weight of a snake that is 9 feet long)
- Partner B is there a data point on the scatter plot for a snake that is 9 feet long? Justify your answer. (No, because there is no point on the x -axis at 9 feet.)
- Partner A, what type of association did we identify for this scatter plot? (positive) Explain what this means. (As the x -coordinates increase, the y -coordinates will increase.)

LESSON 34: Create and Interpret a Scatter Plot

- Partner B, explain what will happen as we move farther right on the scatter plot. (increase on the x -axis) [We would also move up (increase on the y -axis), so a scatter plot with a positive association would allow you to make an estimate for a point that is not plotted on the graph.]
- Have student pairs discuss what may be an appropriate estimate based on the information provided in the scatter plot. (5 - 6 pounds would be an appropriate estimate based on the information provided.) Record.

Step 4: Partner A, what is Question 4 asking us to find? (the length of a snake that weighs 1 pound)

- Partner B, is it possible to determine that information from the data points on the scatter plot? Explain your thinking. (No, because there is not a data point shown that has a weight of 1 pound.)
- Partner A, explain how we could make an estimate based on the information provided in the scatter plot. Read Question 4. Partner A, what type of association did we identify for this scatter plot? (positive) Explain what this means. (As the x -coordinates increase, the y -coordinates will increase.)
- Partner B, explain what will happen as we move farther left on the scatter plot. (decrease on the x -axis) [We would also move down (decrease on the y -axis), so a scatter plot with a positive association would allow you to make an estimate for a point that is not plotted on the graph.]
- Have student pairs discuss what may be an appropriate estimate based on the information provided in the scatter plot. (1 foot would be an appropriate estimate based on the information provided.) Record.

IP, CP, WG:

Have students work with partners to complete the question about Scatter Plots B and C on S449. Students will need to refer to the scatter plots on S448 to answer the questions and make the estimations about the data. Complete the conclusion question at the bottom of the page and review the answers for Scatter Plot B and C as a whole group.
{**Verbal Description, Graphic Organizer, Graph**}

Data Analysis - Clusters and Outliers on the Scatter Plot

(GP, M, WG, CP) S450, S451 (Answers on T924, T925.)

M, GP, CP, WG:

Students will examine scatter plots to identify clusters of data and outliers of data on the scatter plot. Be sure students know their designation as Partner A or Partner B.
{**Graph, Graphic Organizer, Verbal Description**}

LESSON 34: Create and Interpret a Scatter Plot

MODELING

Data Analysis – Clusters and Outliers on the Scatter Plot

Step 1: Have students look at the first scatter plot on S450.

- Partner A, what are the two items that we are examining for association? (hours of sleep and science exam scores)
- Have student pairs read the first paragraph in the column next to the scatter plot.
- Partner B, what is Mr. Simmons trying to identify? (any association that might exist between the amount of sleep and the test scores)

Step 2: Partner A, how would you describe the association between the amount of sleep and the exam grade for most of the students? (Positive association; the more sleep the students had, the better they scored on the test.) Record.

- Partner B, can you identify any specific groupings of data in the scatter plot? (Yes) Record.
- Partner A, describe the grouping or **cluster** of data. [A significant number of data points (12 out of the 20) are grouped in the range of 6-7 hours of sleep with a grade of approximately 70-85.] Record.
- Partner B, explain the meaning of this information. (60% of the students slept between 6 and 7 hours and scored between a 70 and 85 on the test.) Record.

Step 3: Steven is in Mr. Simmons science class and took the exam. He had been sick the night before the exam and had only slept about 2 hours. When Mr. Simmons scored the exam Steven had a score of 30%.

- Partner A, describe how to add this point of data. [Plot a point at (2, 30)] Record.
- Partner B, because this data point is not grouped with the other data points, what term could we use to describe it? (outlier) Record.

Step 4: Have students turn to page S451. The zookeeper at the city zoo kept statistics on the weight and length of all the snakes in the reptile house at the zoo.

- Partner A, what kind of association is there between the length of the snake and the weight? (There is a positive association.) Record.
- Partner B, justify this answer. (The longer the snake, the heavier the weight.) Record.

Step 5: Partner A, can you identify any specific groupings of data in the scatter plot? (Yes) Record.

- Partner B, describe the cluster. (Most of the snakes were between 4 and 6 feet in length and weighed between 3 and 8 pounds.) Record.
- Partner A, explain what this means. What does this tell us? (15 out of the 20 snakes, or 75% of the snakes, were in that range.) Record.

LESSON 34: Create and Interpret a Scatter Plot

- Partner B, the zoo had an opportunity to obtain a snake from another zoo. This new snake was longer than any other snake in the reptile house. What was the length of the new snake? (10 feet) Record.
- We would expect that as a snake gets longer its weight gets heavier. In this case, the longest snake is not as heavy as expected. The point is very far away from the expected location near the path of the line (10, 10). This point is an (**outlier**). Record.

Scatter Plots – Linear and Non-linear Association

(GP, IP, WG, M, CP) S452, S453 (Answers on T926, T927.)

M, GP, CP, WG: Students will examine scatter plots to linear and non-linear associations and describe the association as the slope of the line. Be sure students know their designation as Partner A and Partner B. {**Graph, Graphic Organizer, Verbal Description**}

MODELING**Scatter Plots – Linear and Non-linear Association**

Step 1: Have students look at the first scatter plot on S452 and read Problem 1.

- Partner A, what are the two items that we are examining for association? (shoe size and height)
- Partner B, is it possible to identify a trend or association with the data points on the scatter plot? Explain your thinking. (As we move from left to right on the graph both the x-values and the y-values increase, so there is a positive association.)
- Partner A, is it possible to draw a line on the graph to show the pattern of the data points. (Yes)
- Model and have student pairs draw a line through the data points.

***Teacher note:** For this lesson and standard, students will be informally fitting the line, not determining the actual equation of the line. As you model drawing the line, talk to student about placing the line so that about half the data points are above and half are below.

- Partner B, is this graph linear or non-linear? Justify your answer. (**Linear**. It is possible to draw a straight line that will represent the relationship of the data in the scatter plot.) Record.
- Partner A, if we were to describe the line in terms of slope, how would we explain the line? (The line has a positive **slope** because it goes up from left to right.)

Step 2: Have students look at the second scatter plot on S452 and read Problem 2.

- Partner B, what are the two items that we are examining for association? (age and time spent driving)
- Partner A, is it possible to identify a trend or association with the data points on the scatter plot? Explain your thinking. (As we move from left to right on the graph the data trend is first increasing and then decreasing.)

LESSON 34: Create and Interpret a Scatter Plot

- Partner A, is it possible to draw a straight line on the graph to show the pattern of the data points. (No.)
- Model and have student pairs draw a curve that will follow the data points.
- Partner B, is this graph linear or **non-linear**? Justify your answer. (Non-linear. It is not possible to draw a straight line that will represent the relationship of the data in the scatter plot.) Record.
- Partner A, if we were to describe the line in terms of slope, how would we explain the line. (It is not possible to identify a slope because it is not a straight line.)

IP, CP, WG:

Have students work with partners to complete Problems 3 and 4 on S453. Students will identify the trend of the data as linear or non-linear. If it is linear, they will draw a line to model the pattern of the data on the graph. They will also identify the slope as positive, negative or no slope as applicable. After students complete the problems, review the answers as a whole group. {**Verbal Description, Graphic Organizer, Graph**}

SOLVE Problem**(GP, WG) S454 (Answers on T928.)**

Have students turn to S454. Remind students that the SOLVE problem is the same one from the beginning of the lesson. Complete the SOLVE problem with your students. Ask them for possible connections from the SOLVE problem to the lesson. (Students will create and interpret the scatter plot.) {**SOLVE, Algebraic Formula, Verbal Description, Graph, Graphic Organizer**}

If time permits...**(IP, CP) S455 (Answers on T929.)**

Have students use the data table on S455 to construct a scatter plot and answer the questions about the graph they have created.

****Teacher note:** On page S456 (T930) there are calculator instructions for creating a scatter plot. Use the data from the table on S455 to complete a scatter plot with the class, and compare it to the one the students completed in their books. Students can also make a scatter plot on the calculator for the SOLVE problem on S454. Circulate around the room to answer questions, and be sure students are correctly following the directions for the calculator.

LESSON 34: Create and Interpret a Scatter Plot

[CLOSURE]

To wrap up the lesson, go back to the essential questions and discuss them with students.

- When is it best to use a scatter plot to display data? Defend your thinking. (*A scatter plot can be used to display bivariate data and investigate and model any patterns of association between the data.*)
- What does it mean if a scatter plot shows a positive association? Justify your answer. (*It means that as the value displayed on the x-axis increases, the value displayed on the y-axis increases.*)
- Explain how to determine if a scatter plot suggests a linear association. (*If a scatter plot has a linear association then a straight line can be informally drawn through the points to model the data. When the data has a linear association the slope of the line can be identified as positive, negative or no slope.*)

[HOMEWORK] Assign S457 and S458 for homework. (Answers on T931 and T932.)

[QUIZ ANSWERS] T933–T935

1. **A** 2. **C** 3. **A** 4. **A** 5. **C** 6. **B** 7. **C** 8. **D** 9. **D** 10. **B**

The quiz can be used at any time as extra homework or to see how students progress on interpreting and creating scatter plots.

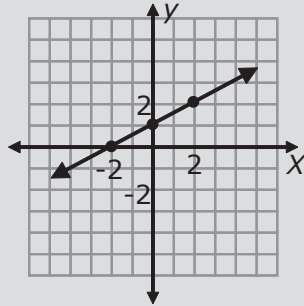
LESSON 34: Create and Interpret a Scatter Plot

Here is the key to **S445**.

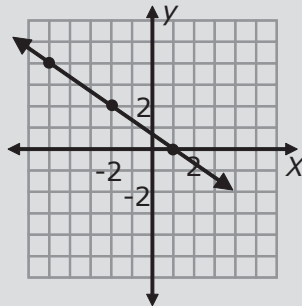
Warm-Up

Directions: Identify what type of slope each line has.

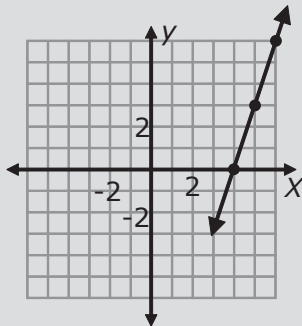
1. Positive



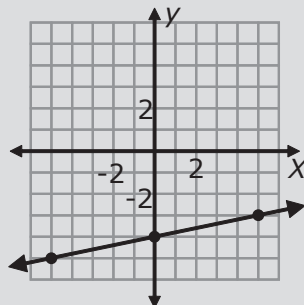
2. Negative



3. Positive



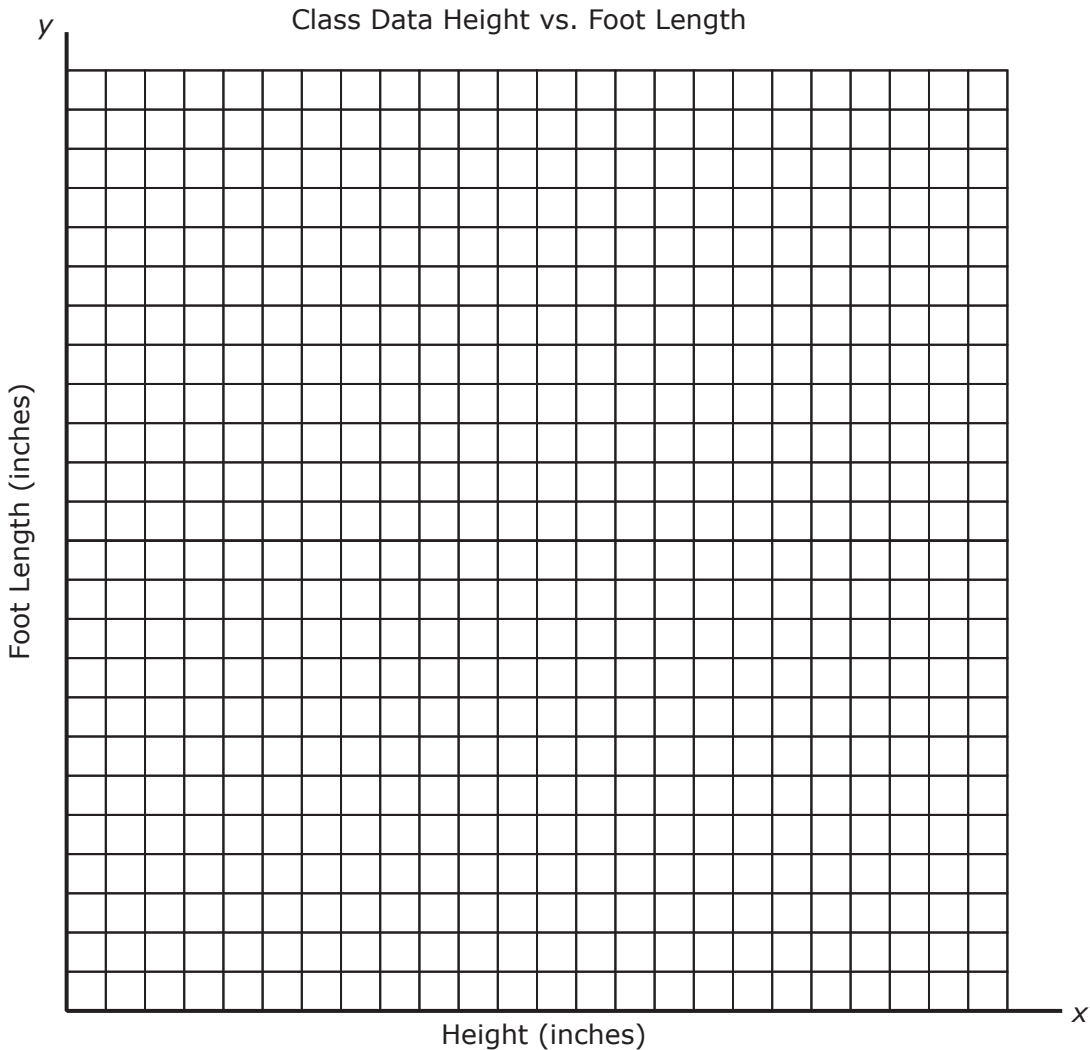
4. Positive



LESSON 34: Create and Interpret a Scatter Plot

Here is the key to **S447**.

Directions: Complete this page with your teacher and partner.



Points on the graph will vary depending on the data collected.

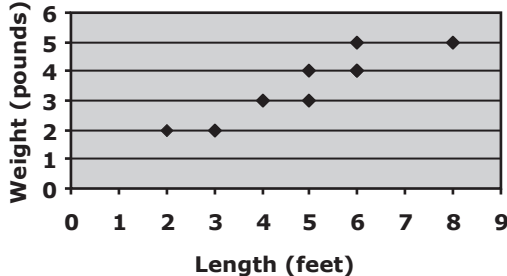
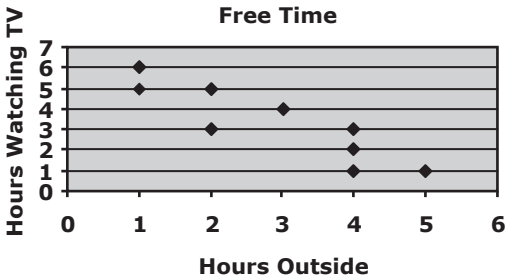
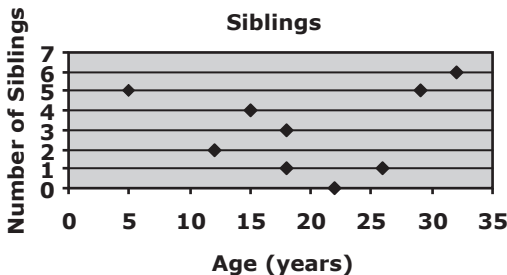
Is there a relationship between a person's height and his or her foot length?

As the height gets taller, the foot length increases.

LESSON 34: Create and Interpret a Scatter Plot

Here is the key to **S448**.

Directions: Complete this page with your teacher and partner.

Scatter Plot	Describe the pattern of the data points from left to right.	What type of association does the scatter plot show?																				
<p>A.</p> <p style="text-align: center;">Snakes</p>  <table border="1" style="display: none;"> <caption>Data for Snakes</caption> <thead> <tr> <th>Length (feet)</th> <th>Weight (pounds)</th> </tr> </thead> <tbody> <tr><td>2</td><td>2</td></tr> <tr><td>3</td><td>2</td></tr> <tr><td>4</td><td>3</td></tr> <tr><td>5</td><td>3</td></tr> <tr><td>5</td><td>4</td></tr> <tr><td>6</td><td>4</td></tr> <tr><td>6</td><td>5</td></tr> <tr><td>8</td><td>5</td></tr> </tbody> </table>	Length (feet)	Weight (pounds)	2	2	3	2	4	3	5	3	5	4	6	4	6	5	8	5	<p>As the x-values increase from left to right, the y-values increase.</p>	<p>As the length of the snake increases, the weight also increases.</p> <p style="text-align: center;">Positive association</p>		
Length (feet)	Weight (pounds)																					
2	2																					
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4	3																					
5	3																					
5	4																					
6	4																					
6	5																					
8	5																					
<p>B.</p> <p style="text-align: center;">Free Time</p>  <table border="1" style="display: none;"> <caption>Data for Free Time</caption> <thead> <tr> <th>Hours Outside</th> <th>Hours Watching TV</th> </tr> </thead> <tbody> <tr><td>1</td><td>5</td></tr> <tr><td>1</td><td>4</td></tr> <tr><td>2</td><td>3</td></tr> <tr><td>2</td><td>5</td></tr> <tr><td>3</td><td>4</td></tr> <tr><td>4</td><td>2</td></tr> <tr><td>4</td><td>3</td></tr> <tr><td>5</td><td>1</td></tr> </tbody> </table>	Hours Outside	Hours Watching TV	1	5	1	4	2	3	2	5	3	4	4	2	4	3	5	1	<p>As the x-values increase from left to right, the y-values decrease.</p>	<p>As the hours spent outside increase, the number of hours spent watching tv decreases.</p> <p style="text-align: center;">Negative association</p>		
Hours Outside	Hours Watching TV																					
1	5																					
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<p>C.</p> <p style="text-align: center;">Siblings</p>  <table border="1" style="display: none;"> <caption>Data for Siblings</caption> <thead> <tr> <th>Age (years)</th> <th>Number of Siblings</th> </tr> </thead> <tbody> <tr><td>5</td><td>5</td></tr> <tr><td>12</td><td>2</td></tr> <tr><td>15</td><td>4</td></tr> <tr><td>18</td><td>3</td></tr> <tr><td>19</td><td>1</td></tr> <tr><td>22</td><td>0</td></tr> <tr><td>25</td><td>1</td></tr> <tr><td>30</td><td>5</td></tr> <tr><td>32</td><td>6</td></tr> </tbody> </table>	Age (years)	Number of Siblings	5	5	12	2	15	4	18	3	19	1	22	0	25	1	30	5	32	6	<p>As the x-values increase from left to right, there is no detectable pattern in the y-values.</p>	<p>The age of a person has no effect on the number of siblings they have.</p> <p style="text-align: center;">No association</p>
Age (years)	Number of Siblings																					
5	5																					
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30	5																					
32	6																					

LESSON 34: Create and Interpret a Scatter Plot

Here is the key to **S449**.

Directions: Complete this page with your teacher and partner.

Scatter Plot A:

1. How much does the snake that is 8 feet long weigh? **5 pounds**
2. How long are the snakes that weigh 3 pounds? **4 and 5 feet**
3. If a snake had a length of 9 feet, about how much would you expect the snake to weigh? **5 or 6 pounds**
4. If a snake weighed 1 pound, about how many feet long would you expect the snake to be? **1 foot**

Conclusion: It is possible to make estimates on data points that are not on the **scatter plot** based on the information that is **graphed**, because the graph has a **positive association**.

Scatter Plot B:

1. A person who spends 3 hours of time outside, spent how much time watching tv? **4 hours**
2. A person who spends 6 hours watching tv, spent how much time outside? **1 hour**
3. If a person said that they spent 6 hours outside, how much time would you expect them to spend watching tv? **0 hours**
4. If a person said that they spent 7 hours watching tv, how much time would you expect them to spend outside? **0 to 1 hours**

Conclusion: It is possible to make estimates on data points that are not on the **scatter plot** based on the information that is **graphed**, because the graph has a **negative association**.

Scatter Plot C:

1. The person who is 22 years old has how many siblings? **0 siblings**
2. How old is the person who has 6 siblings? **32 years**
3. If a person is 8 years old, how many siblings would you expect them to have? **It is impossible to guess.**
4. If a person is 35 years old, how many siblings would you expect them to have? **It is impossible to guess.**

Conclusion: It is not possible to make estimates based on data points that are not on the **scatter plot** based on the information that is **graphed**, because the graph has **no correlation**.

LESSON 34: Create and Interpret a Scatter Plot

Here is the key to **S450**.

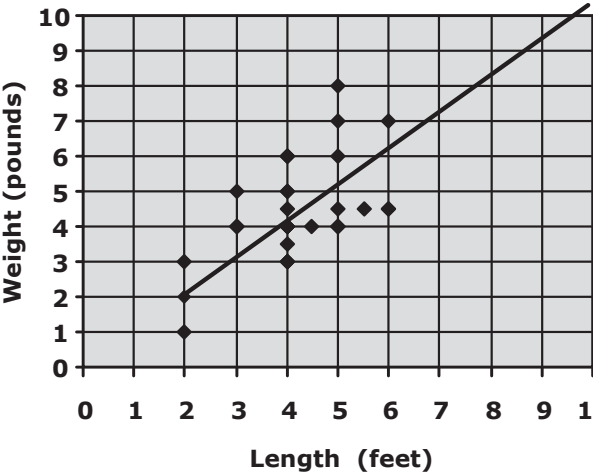
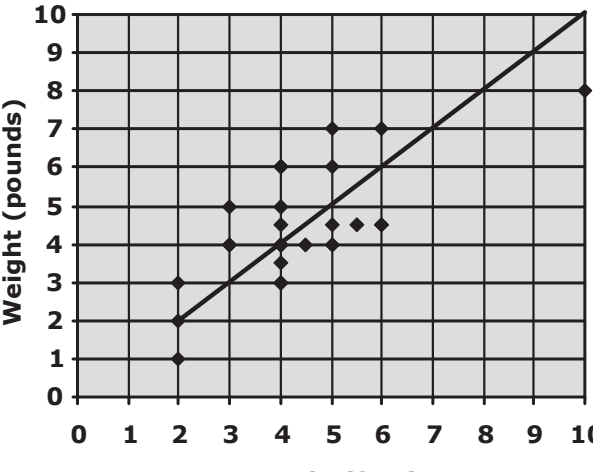
Directions: Complete this page with your teacher and partner.

Scatter Plot	Clusters and Outliers
<p>Science Exam Score</p> <p># of Hours of Sleep</p>	<p>Mr. Simmons was looking at the test data of his science students. He was trying to identify any association that might exist between the number of hours of sleep that students had and their exam grade.</p> <p>What kind of association is there between the hours of sleep and the exam grade for most of the students? Positive association; the more sleep the students had, the better they scored on the test.</p> <p>Can you identify any specific groupings of data in the scatter plot? Yes</p> <p>Describe the cluster. A significant number of data points (12 out of the 20) are grouped in the range of 6 – 7 hours of sleep with a grade of approximately 70-85.</p>
<p>Science Exam Score</p> <p># of Hours of Sleep</p>	<p>What does this tell us? 60% of the students slept between 6 and 7 hours and scored between a 70 and 85 on the test.</p> <p>Steven is in Mr. Simmons science class and took the exam. He had been sick the night before the exam and had only slept about 2 hours. When Mr. Simmons scored the exam Steven had a score of 30%.</p> <p>How would you explain adding this point? Place an additional point at (2, 30).</p> <p>This data point would be considered an outlier because it is not grouped with the other data points.</p>

LESSON 34: Create and Interpret a Scatter Plot

Here is the key to **S451**.

Directions: Complete this page with your teacher and partner.

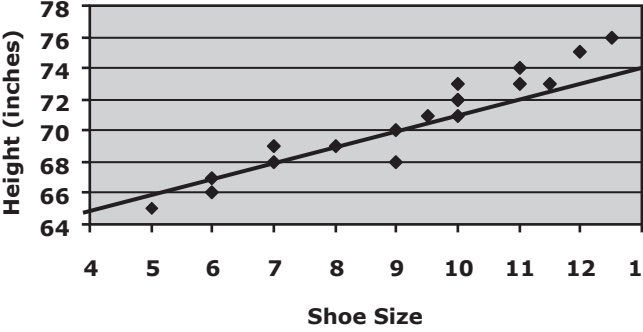
Scatter Plot	Clusters and Outliers
<p style="text-align: center;">City Zoo Snake Measuremets</p>  <p style="text-align: center;">Weight (pounds)</p> <p style="text-align: center;">Length (feet)</p>	<p>The zookeeper at the city zoo kept statistics on the weight and length of all the snakes in the reptile house at the zoo.</p> <p>What kind of association is there between the length of the snake and the weight? There is a positive association.</p> <p>Justify your answer.</p> <p>The longer the snake, the heavier the weight.</p> <p>Can you identify any specific groupings of data in the scatter plot? Yes</p> <p>Describe the cluster. Most of the snakes were between 4 and 6 feet in length and weighed between 3 and 8 pounds.</p>
<p style="text-align: center;">City Zoo Snake Measuremets</p>  <p style="text-align: center;">Weight (pounds)</p> <p style="text-align: center;">Length (feet)</p>	<p>What does this tell us? 15 out of the 20 snakes, or 75% of the snakes, were in that range.</p> <p>The zoo had an opportunity to obtain a snake from another zoo. This new snake was longer than any other snake in the reptile house. What was the length of the new snake? 10 feet</p> <p>We would expect that as a snake gets longer its weight gets heavier. In this case the longest snake is not as heavy as expected. The point is very far away from the expected location near the path of the line (10, 10). This point is an outlier.</p>

LESSON 34: Create and Interpret a Scatter Plot

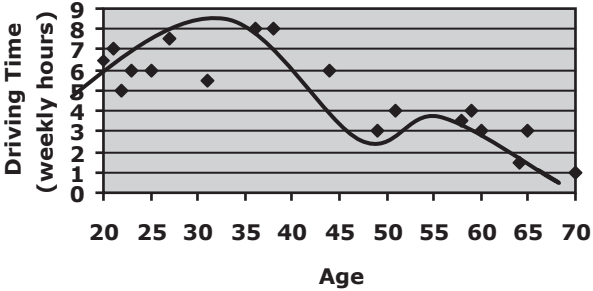
Here is the key to **S452**.

Directions: Complete this page with your teacher and partner.

1. Kyle collected data from a group of students about their shoe size and their height. The scatter plot below represents his research. Using the scatter plot below, what kind of association, if any, can be identified?

Scatter Plot	Linear or Non-linear (Explain your thinking.)	Description of the line
<p style="text-align: center;">Height and Shoe Size</p> 	<p style="text-align: center;">Linear</p> <p>It is possible to draw a straight line that will represent the relationship of the data in the scatter plot.</p>	<p>The line has a positive slope because it goes up from left to right.</p>

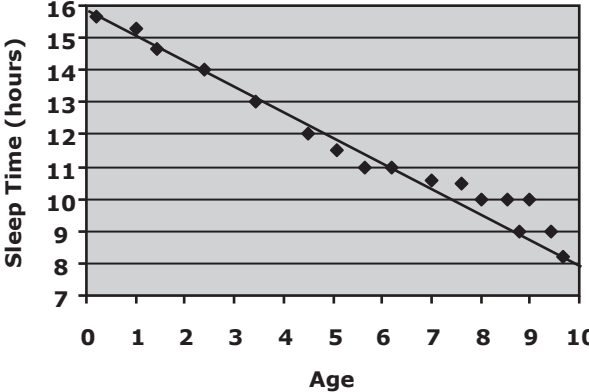
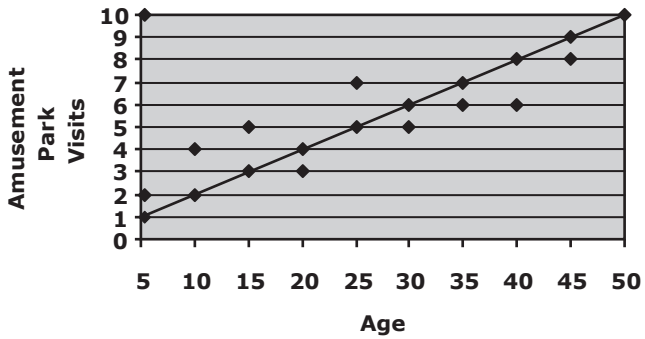
2. Missy decided to do research on age and amount of time spent driving. She randomly surveyed people ranging from 20 to 70 asking them to identify how many hours they spent driving throughout a one week period. Using the scatter plot below, what kind of association, if any, can be identified?

Scatter Plot	Linear or Non-linear (Explain your thinking.)	Description of the line
<p style="text-align: center;">Age and Time Spent Driving</p> 	<p style="text-align: center;">Non-linear</p> <p>The pattern of the data cannot be represented with a straight line.</p>	<p style="text-align: center;">N/A</p>

LESSON 34: Create and Interpret a Scatter Plot

Here is the key to **S453**.

Directions: Complete this page with your partner.

<p>3. A local doctor’s office collected data through a random survey. They were looking for trends about age and time spent sleeping. Using the scatter plot below, what kind of association, if any, can be identified?</p>																										
<p>Scatter Plot</p>	<p>Linear or Non-linear (Explain your thinking.)</p>	<p>Description of the line</p>																								
<p>Age and Sleep Time Trends</p>  <table border="1"> <caption>Data for Age and Sleep Time Trends</caption> <thead> <tr> <th>Age</th> <th>Sleep Time (hours)</th> </tr> </thead> <tbody> <tr><td>0</td><td>15.5</td></tr> <tr><td>1</td><td>15.0</td></tr> <tr><td>2</td><td>14.5</td></tr> <tr><td>3</td><td>14.0</td></tr> <tr><td>4</td><td>13.0</td></tr> <tr><td>5</td><td>12.0</td></tr> <tr><td>6</td><td>11.5</td></tr> <tr><td>7</td><td>11.0</td></tr> <tr><td>8</td><td>10.5</td></tr> <tr><td>9</td><td>10.0</td></tr> <tr><td>10</td><td>9.0</td></tr> </tbody> </table>	Age	Sleep Time (hours)	0	15.5	1	15.0	2	14.5	3	14.0	4	13.0	5	12.0	6	11.5	7	11.0	8	10.5	9	10.0	10	9.0	<p>Linear</p> <p>It is possible to draw a straight line that will represent the relationship of the data in the scatter plot.</p>	<p>The line has a negative slope because it goes down from left to right.</p>
Age	Sleep Time (hours)																									
0	15.5																									
1	15.0																									
2	14.5																									
3	14.0																									
4	13.0																									
5	12.0																									
6	11.5																									
7	11.0																									
8	10.5																									
9	10.0																									
10	9.0																									
<p>4. The scatter plot below shows the data collected randomly from a sample of people at an amusement park last summer.</p>																										
<p>Scatter Plot</p>	<p>Linear or Non-linear (Explain your thinking.)</p>	<p>Description of the line</p>																								
<p>Amusement Parks Visits and Age</p>  <table border="1"> <caption>Data for Amusement Parks Visits and Age</caption> <thead> <tr> <th>Age</th> <th>Amusement Park Visits</th> </tr> </thead> <tbody> <tr><td>5</td><td>1</td></tr> <tr><td>10</td><td>2</td></tr> <tr><td>15</td><td>3</td></tr> <tr><td>20</td><td>4</td></tr> <tr><td>25</td><td>5</td></tr> <tr><td>30</td><td>6</td></tr> <tr><td>35</td><td>7</td></tr> <tr><td>40</td><td>8</td></tr> <tr><td>45</td><td>9</td></tr> <tr><td>50</td><td>10</td></tr> </tbody> </table>	Age	Amusement Park Visits	5	1	10	2	15	3	20	4	25	5	30	6	35	7	40	8	45	9	50	10	<p>Linear</p> <p>It is possible to draw a straight line that will represent the relationship of the data in the scatter plot.</p>	<p>The line has a positive slope because it goes up from left to right.</p>		
Age	Amusement Park Visits																									
5	1																									
10	2																									
15	3																									
20	4																									
25	5																									
30	6																									
35	7																									
40	8																									
45	9																									
50	10																									

LESSON 34: Create and Interpret a Scatter Plot

Here is the key to **S454**.

Directions: Complete the following SOLVE problem with your teacher.

Jonathan just got back his science test on weather. | He scored an 85. | He was curious to see how the amount of sleep a student got the night before affected the test score. | He surveyed 10 of his friends |, and the results are in the table below |. Make a scatter plot of his data, and determine what type of association there is between the number of hours of sleep students got the night before and the test grades.

Hours	8	9	6	7	8	7	4	8	9	6
Grade	85	95	75	85	95	95	60	100	90	80

S Underline the question.

The problem is asking me to find **the type of association between number of hours of sleep and test grades.**

O Identify the facts.

Eliminate the unnecessary facts.

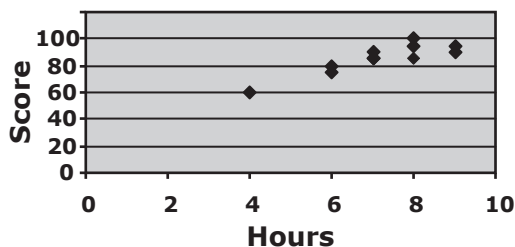
List the necessary facts **(8, 85), (9, 95), (6, 75), (7, 85), (8, 95), (7, 95), (4, 60), (8, 100), (9, 90), (6, 80)**

L Write in words what your plan of action will be.

Make a scatter plot, and see if the points go up from left to right, down from left to right, or are scattered all over.

Choose an operation or operations. **N/A**

V Estimate your answer. **I think it will be a positive association, because my teacher always tells me to get a good night's sleep before a test.**



The points generally go up from left to right, so there is a positive association.

E Does your answer make sense? (Compare your answer to the question.) **Yes, I told what the association is.**

Is your answer reasonable? (Compare your answer to the estimate.) **Yes, I thought it would be positive, and it is.**

Is your answer accurate? (Check your work.) **Yes**

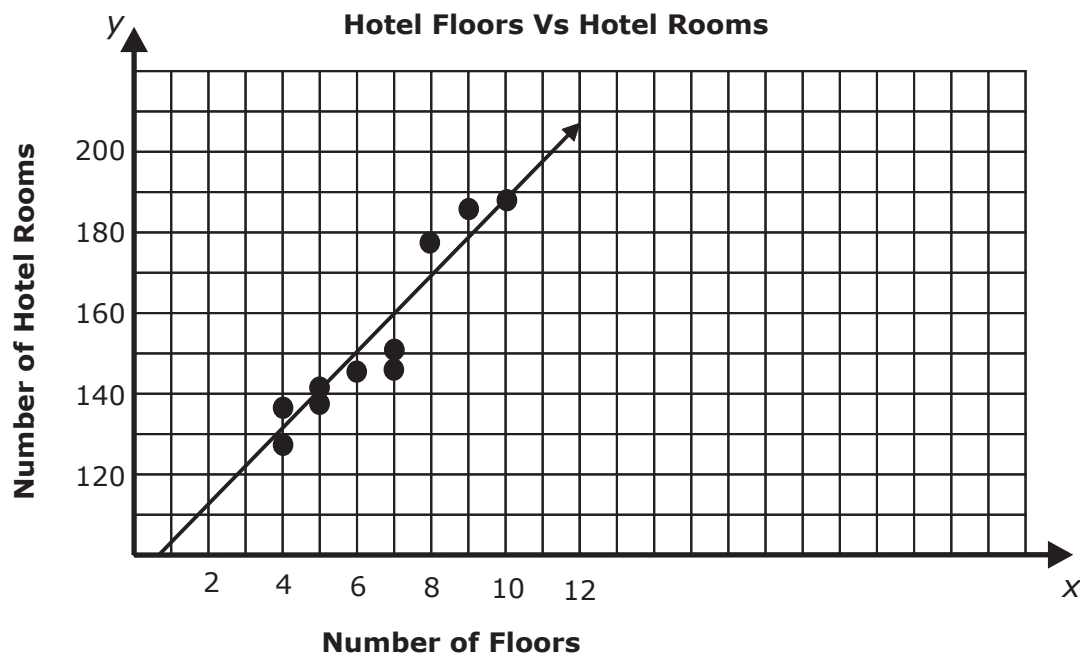
Write your answer in a complete sentence. **There is a positive association between the number of hours of sleep the night before a test and the test grade.**

LESSON 34: Create and Interpret a Scatter Plot

Here is the key to **S455**.

Directions: The table below shows the number of floors and hotel rooms for ten different hotels. Make a scatter plot of the data, then answer the questions about your scatter plot.

Number of Floors	4	10	4	5	5	7	6	8	9	7
Number of Hotel Rooms	136	187	127	141	138	151	146	179	185	145



1. What type of association is there between the number of floors in a hotel and the number of hotel rooms? **There is a positive association. The more floors there are, the more rooms there are.**
2. If a hotel had 2 floors, how many hotel rooms would you expect it to have? **between 110 and 120**
3. If a hotel had 12 floors, how many hotel rooms would you expect it to have? **more than 200**
4. Does this scatter plot represent a linear association? Explain your thinking. **Yes. It is possible to draw a straight line to represent the scatter plot. The slope of the line will be positive.**

LESSON 34: Create and Interpret a Scatter Plot

Here is the key to **S456**.



Graphing Calculator Instructions

Making a Scatter Plot

Steps:

1. Press      


to clear the lists.

2. Press   to enter the coordinates for the scatter plot.

- Enter the x coordinates in L_1 .
- Enter the y coordinates in L_2 .

3. Press    .

4. Set up the Stat Plot

- Press  to highlight ON.
- The scatter plot **Type** should be highlighted already which is in the first row, first column of type. The **Type** should be scatter plot.
- x-list** should be L_1
- y-list** should be L_2
- Choose your **mark** of preference.

5. Press  to set the window.

Set the maximum and minimum values according to your data.

- X_{\min} = below the lowest x -value
- X_{\max} = above the highest x -value
- X_{scl} = 1 if you want a tick mark for each unit, 5 if you want a tick mark for each 5 units, etc.
- Y_{\min} = below the lowest y -value
- Y_{\max} = above the highest y -value
- Y_{scl} = 1 if you want a tick mark for each unit, 5 if you want a tick mark for each 5 units, etc.

6. Press  to see the scatter plot.

LESSON 34: Create and Interpret a Scatter Plot

Here is the key to **S457**.

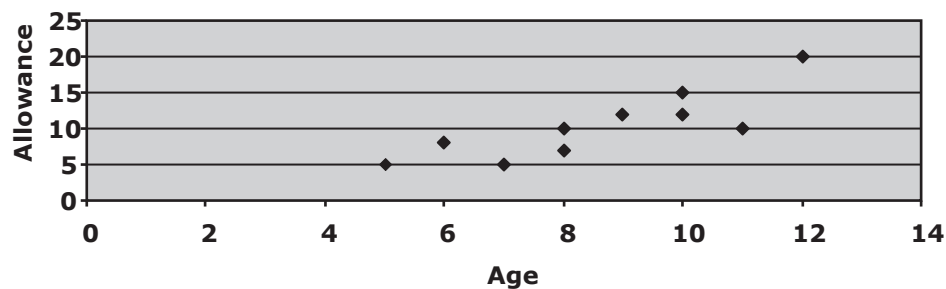
Homework

Directions: Use the data in Problem 1 to make a scatter plot. Use the scatter plot to answer Questions 2–5.

- Barry asked the children in his neighborhood how much money they got each week for allowance.

Age	5	8	7	10	6	10	11	8	9	12
Allowance	5	7	5	15	8	12	10	10	12	20

Age Vs Allowance



- What type of association is there between a child’s age, and their allowance? **a positive association**
- A child moves into Barry’s neighborhood, and is 14 years old. According to the scatter plot, about how much money should the child get for allowance? **\$20 to \$25**
- Another child moves into the neighborhood that is four years old. According to the scatter plot, about how much money should they get for allowance? **under \$5**
- Does this scatter plot represent a linear association? Explain your thinking. **Yes. It is possible to draw a straight line to represent the scatter plot. The slope of the line will be positive.**

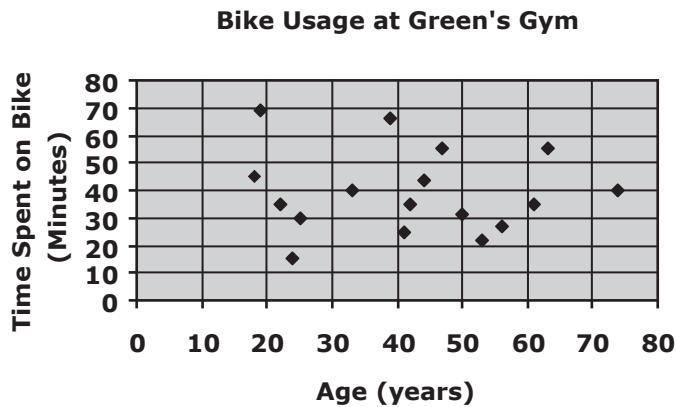
LESSON 34: Create and Interpret a Scatter Plot

Here is the key to **S458**.

Homework

.....

Directions: Use the scatter plot below to answer Questions 6–10.



6. How long did the person who is 33 spend on the bike? **40 minutes**

7. Is there an association between the age of the person riding the bike and the amount of time they spent on the bike? **No, there is no association between the two.**

8. What is the most amount of time that a person spent riding the bike? **70 minutes**

9. How long did the oldest person on the bike ride? **40 minutes**

10. Does this scatter plot represent a linear association? Explain your thinking. **No. There is not a specific pattern in the data so it is not possible to draw a straight line which would be representative of the scatter plot.**

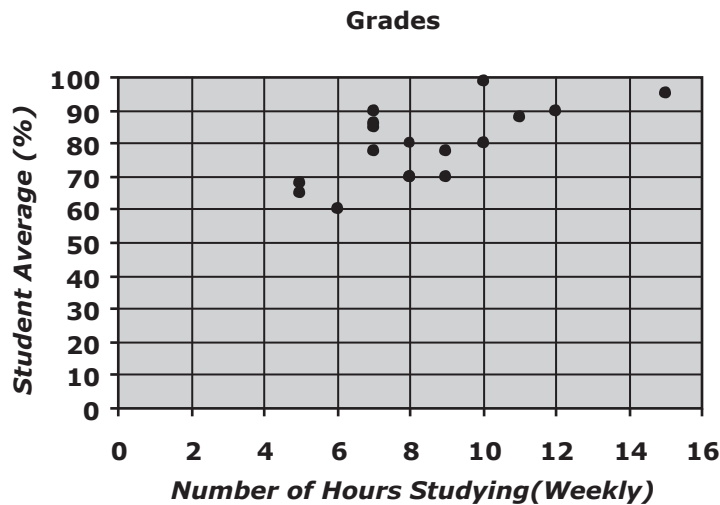
LESSON 34: Create and Interpret a Scatter Plot

Name _____

Date _____

Quiz

Directions: Use the scatter plot below for Questions 1–4.



1. What type of association is shown in the scatter plot?
 - A. positive association
 - B. negative association
 - C. diagonal association
 - D. no association

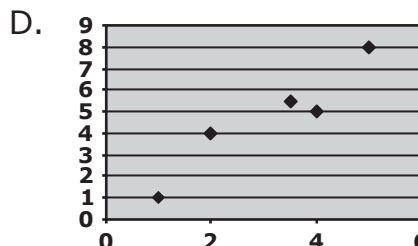
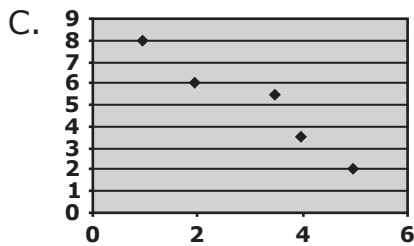
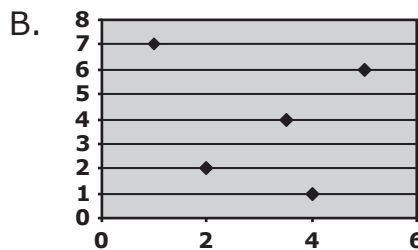
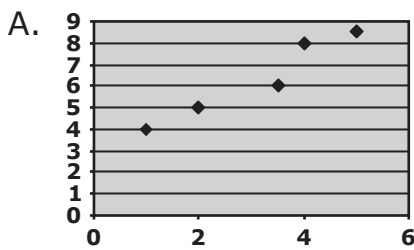
2. Which of the following would describe a cluster of data on the scatter plot?
 - A. 3 – 5 hours
 - B. 5 – 7 hours
 - C. 7 – 9 hours
 - D. 12 – 16 hours

3. Which of the following situations would add an outlier to the scatter plot?
 - A. A student who studies 1 hour scores 98%.
 - B. A student who studies 16 hour scores 100%.
 - C. A student who studies 7 hour scores 80%.
 - D. A student who studies 10 hour scores 87%.

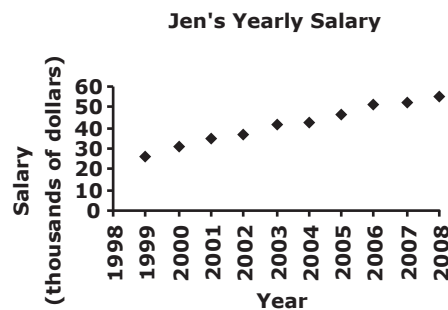
LESSON 34: Create and Interpret a Scatter Plot

4. Does this scatter plot represent a linear association? Explain your thinking.
- Yes. It is possible to draw a straight line to represent the scatter plot. The slope of the line will be positive.
 - Yes. It is possible to draw a straight line to represent the scatter plot. The slope of the line will be negative.
 - Yes. It is possible to draw a straight line to represent the scatter plot. The line will be horizontal.
 - No. It is not possible to draw a straight line to represent the scatter plot.

5. Which scatter plot shows a negative association?



Directions: Use the scatter plot below for Questions 6–9.



6. What type of association is shown in the scatter plot?
- Negative, because as the years go down, the salary goes down.
 - Positive, because as the years go up, the salary goes up.
 - Diagonal, because the scatter plot almost makes a diagonal line.
 - No association, because the year has no effect on the salary.

LESSON 34: Create and Interpret a Scatter Plot

7. In what year, was Jen making about \$40,000?

- A. 1999
- B. 2000
- C. 2003
- D. 2005

8. Between which of the following two years, did Jen make almost the same amount of money?

- A. 1999 to 2000
- B. 2002 to 2003
- C. 2004 to 2005
- D. 2006 to 2007

9. About what salary should Jen expect to make in the year 2010?

- A. \$55
- B. \$60
- C. \$55,000
- D. \$60,000

10. Which of the following scatter plots correctly shows the data in the table?

Number of letters in name	3	4	4	5	6	6	7	8	10	12
Age (years)	32	12	29	35	41	16	8	15	38	4

