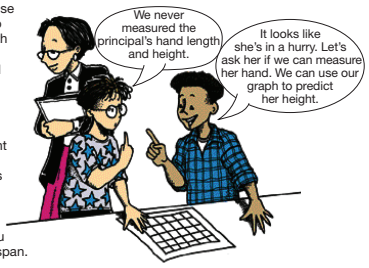
Finally, when their graph was finished, they **analyzed and discussed** their results.

Irma and Jerome chose to investigate the two variables Hand Length and Height. You, like Irma and Jerome, will investigate two variables which describe your class. The arm span and height of each student in your class will be measured. Your job is to find out whether you can predict a fourth-grade student's height if you know his or her arm span.



You will begin by drawing a picture of what you will do in the experiment. Then, collect and organize data in a table. Next, you will make a graph of the data. Finally, you will explore the data by looking for patterns.

Discuss

1. **A.** Is arm span a categorical or a numerical variable?
   B. Is height a categorical or a numerical variable? Explain how you know.

Draw

Draw a picture to show how you are going to collect data to compare the variables Arm Span *(S)* and Height *(H)*. Use Irma's hand length and height picture to help you draw a picture. Remember to label the variables.

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Collect

Measure the arm span and height of each person in your group to the nearest inch. Record your group's data in a data table like the one at the right or use a *Four-Column Data Table*. Write your data as ordered pairs. Discuss with your group what the letters *S* and *H* stand for.

Arm Span vs. Height Data Table

Name	S Arm Span (in inches)	H Height (in inches)	Ordered Pairs

Discuss any patterns you see in the data table.

Graph

- **Graph your group's data. Plot arm span on the horizontal axis and height on the vertical axis. Scale your horizontal axis to at least 75 inches and the vertical axis to at least 100 inches. Remember to label each axis. Use the *Centimeter Graph Paper.***
- **A class graph of *Arm Span vs. Height* will provide more data for you to analyze. Plot one point, your own data for arm span and height, on the class graph.**

Explore

Use your class data and your graphs to help you and your group answer the following questions. Include units with your answers. Be ready to share your answers with the entire class.

2. What is the same about all the people you measured for this experiment?
3. **A.** Describe your group's graph. What do you notice about the points?
   B. Describe the class graph. What do you notice about the points?
4. Compare your group's graph and the class graph. How are they alike and how are they different?

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Student Guide

Questions 1–10 (SG pp. 38–41)

1. **A.** numerical
   B. numerical; The values are numbers.
2. Answers will vary. Students might say that they measured only fourth-graders.

*The answers to ***Questions 3–6*** are based on the sample class graph in Figure 4 in the lesson. Figure 3 in the lesson provides a sample picture.

3.* **A.** Answers will vary. Students might say the data points are "clumped together."
   B. Answers will vary. Students might say the data points are "clumped together." In some cases, as in the graph in Figure 4 of the lesson, the data points may "run diagonally."
4. Answers will vary. The data points in both graphs should cluster fairly close to one another.

***Answers and/or discussion are included in the lesson.**

5.* A. Students may show their answer using the class graph. Students should realize that a new fourth-grader's data point should lie within the cluster of points on the graph.

B–C. The height and arm span are usually within two inches or so of one another. If the new fourth-grader had an arm span of 53 inches, his height would probably be in the range of 51–55 inches. Discuss the range of arm spans and the range of heights in your class.

6. A. B; First-graders are shorter, so their arm spans will be shorter too. The data points will be below the 4th-grade data points.

B.* A; the kangaroo's arms are shorter than its legs; arms are measured on the horizontal axis so the cluster will be to the left of the fourth-graders'.

*The answers to ***Questions 7 and 8*** are based on the sample class graph in Figure 4 in the lesson. Answers will vary depending on your class data.

7. 54 inches

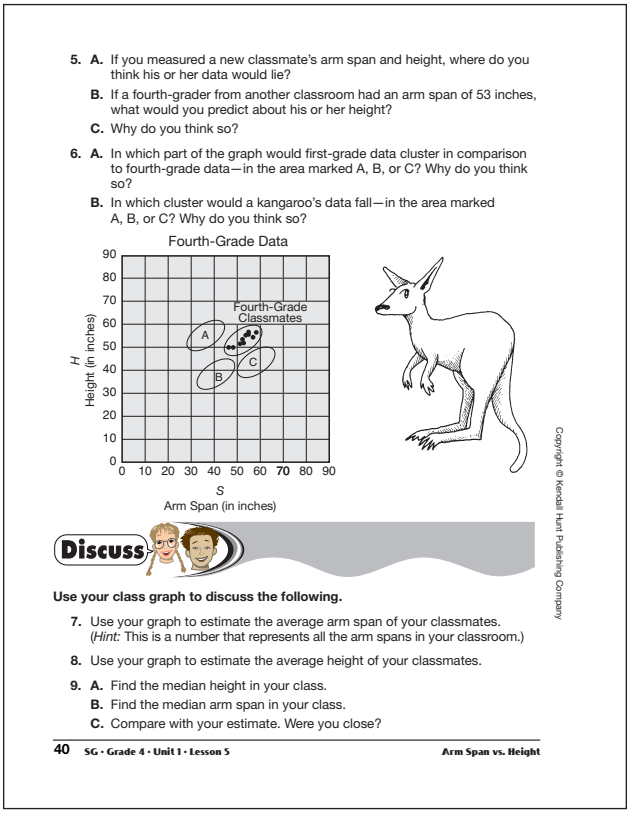
8. 55 inches

9. A–B.* Answers will vary. Students may line up in order displaying their height and arm spans on sheets of paper. The student in the middle is the median. Alternatively, the values could be displayed in order and the median determined by finding the middle value.

C. Students should compare the answers to ***Questions 9A*** and ***9B*** to their estimates in ***Questions 7*** and ***8.***

10. A. Answers will vary. Plot the points from your answers to ***Questions 9A and 9B*** on the class graph.

B. The data point for the median values should be in the middle of the cluster.


5. **A.** If you measured a new classmate's arm span and height, where do you think his or her data would lie?
B. If a fourth-grader from another classroom had an arm span of 53 inches, what would you predict about his or her height?
C. Why do you think so?

6. **A.** In which part of the graph would first-grade data cluster in comparison to fourth-grade data—in the area marked A, B, or C? Why do you think so?
B. In which cluster would a kangaroo's data fall—in the area marked A, B, or C? Why do you think so?

Discuss

Use your class graph to discuss the following.

7. Use your graph to estimate the average arm span of your classmates. (*Hint:* This is a number that represents all the arm spans in your classroom.)

8. Use your graph to estimate the average height of your classmates.

9. **A.** Find the median height in your class.
B. Find the median arm span in your class.
C. Compare with your estimate. Were you close?

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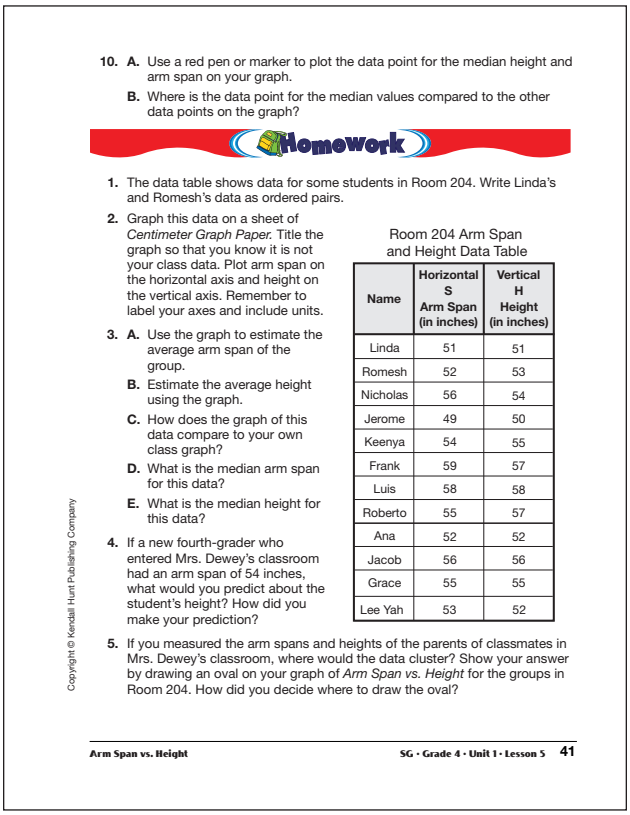
10. **A.** Use a red pen or marker to plot the data point for the median height and arm span on your graph.
B. Where is the data point for the median values compared to the other data points on the graph?

Homework

1. The data table shows data for some students in Room 204. Write Linda's and Romesh's data as ordered pairs.

2. Graph this data on a sheet of *Centimeter Graph Paper.* Title the graph so that you know it is not your class data. Plot arm span on the horizontal axis and height on the vertical axis. Remember to label your axes and include units.

Room 204 Arm Span and Height Data Table

Name	Horizontal S Arm Span (in inches)	Vertical H Height (in inches)
Linda	51	51
Romesh	52	53
Nicholas	56	54
Jerome	49	50
Keenya	54	55
Frank	59	57
Luis	58	58
Roberto	55	57
Ana	52	52
Jacob	56	56
Grace	55	55
Lee Yah	53	52

3. **A.** Use the graph to estimate the average arm span of the group.
B. Estimate the average height using the graph.
C. How does the graph of this data compare to your own class graph?
D. What is the median arm span for this data?
E. What is the median height for this data?

4. If a new fourth-grader who entered Mrs. Dewey's classroom had an arm span of 54 inches, what would you predict about the student's height? How did you make your prediction?

5. If you measured the arm spans and heights of the parents of classmates in Mrs. Dewey's classroom, where would the data cluster? Show your answer by drawing an oval on your graph of *Arm Span vs. Height* for the groups in Room 204. How did you decide where to draw the oval?

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***Answers and/or discussion are included in the lesson.**

10. **A.** Use a red pen or marker to plot the data point for the median height and arm span on your graph.
    B. Where is the data point for the median values compared to the other data points on the graph?

Homework

1. The data table shows data for some students in Room 204. Write Linda's and Romesh's data as ordered pairs.
2. Graph this data on a sheet of *Centimeter Graph Paper.* Title the graph so that you know it is not your class data. Plot arm span on the horizontal axis and height on the vertical axis. Remember to label your axes and include units.
3. **A.** Use the graph to estimate the average arm span of the group.
   B. Estimate the average height using the graph.
   C. How does the graph of this data compare to your own class graph?
   D. What is the median arm span for this data?
   E. What is the median height for this data?
4. If a new fourth-grader who entered Mrs. Dewey's classroom had an arm span of 54 inches, what would you predict about the student's height? How did you make your prediction?
5. If you measured the arm spans and heights of the parents of classmates in Mrs. Dewey's classroom, where would the data cluster? Show your answer by drawing an oval on your graph of *Arm Span vs. Height* for the groups in Room 204. How did you decide where to draw the oval?

Room 204 Arm Span and Height Data Table

Name	Horizontal S Arm Span (in inches)	Vertical H Height (in inches)
Linda	51	51
Romesh	52	53
Nicholas	56	54
Jerome	49	50
Keenya	54	55
Frank	59	57
Luis	58	58
Roberto	55	57
Ana	52	52
Jacob	56	56
Grace	55	55
Lee Yah	53	52

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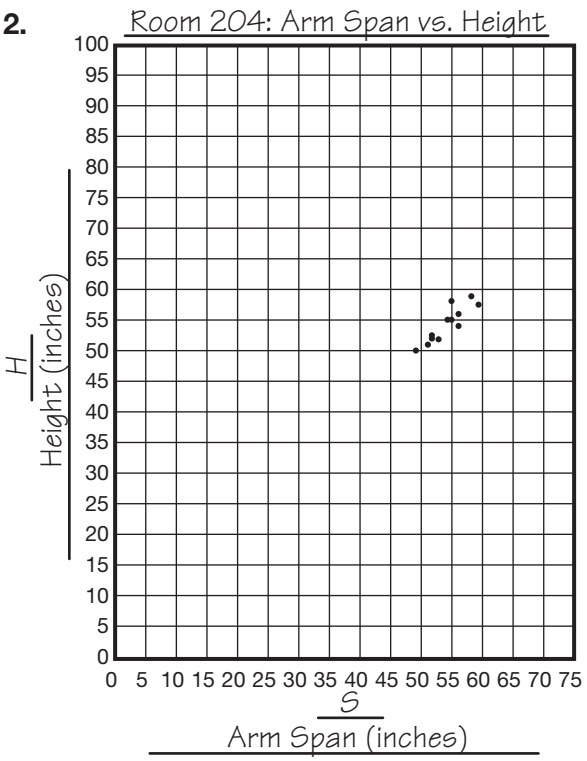
Homework (SG p. 41)

Questions 1–5

1. Linda (51, 51)
   Romesh (52, 53)

2. 

3. **A.** About 53 or 54 inches
   B. About 53 or 54 inches
   C. The group's graph should look similar to your class graph. The data points should form a cluster.
   D. $54\frac{1}{2}$ inches
   E. $54\frac{1}{2}$ inches
4. Answers will vary. Height and arm span are usually within two inches or so of one another. The student's height could be in the range of 52–56 inches. It also could be the exact same as his arm span—54 inches.
5. Above and to the right of the fourth-grade data. The parents could be expected to be taller and have longer arms.

Student Activity Book

Plotting Points Pictures (SAB pp. 7–8)

Picture 1 is an octopus or spider.

Picture 2 is a sailboat.

Name _____ Date _____

Plotting Points Pictures

1. Follow the directions below to create Picture 1.

A. Number the axes on a sheet of *Centimeter Grid Paper* by ones.

B. Plot the data shown below. Use a ruler to connect the points with lines as you plot each point. When the data table says stop, start at the next new point, but do not connect it to the point before it.

Picture 1

Horizontal Axis	Vertical Axis
1	1
2	3
4	5
5	7
6	8
5	6
5	4
3	3
2	1
4	2
6	2
7	5
8	3
7	0
10	3
9	6
10	4
12	2
15	1
14	3
12	4
11	5
10	7
12	5
14	5
15	7
15	11

Horizontal Axis	Vertical Axis
14	13
12	13
10	11
11	13
15	15
10	15
9	13
8	14
8	16
10	17
12	16
15	17
12	18
10	19
7	18
6	16
6	14
7	12
6	13
4	17
2	19
0	19
3	16
5	12
6	11
4	12
2	12

Horizontal Axis	Vertical Axis
0	10
0	5
2	9
3	10
5	9
4	8
3	6
1	4
1	1
S T O P	
12	12
10	10
10	8
12	6
S T O P	
13	11
12	11
12	10
13	10
13	11
S T O P	
13	8
12	8
12	7
13	7
13	8
S T O P	

***Student Activity Book* - Page 7**

Name _____ Date _____

2. Follow the directions below to create Picture 2.

A. Fill in the rest of the ordered pairs on the table.

B. Number the axes on a sheet of *Centimeter Grid Paper* by tens. The horizontal axis must go up to 150 and the vertical axis must go up to 200.

C. Plot the data shown below on grid paper. Use a ruler to connect the points with lines as you plot each point.

Picture 2

Horizontal Axis	Vertical Axis	Ordered Pairs
45	0	(45, 0)
85	0	(85, 0)
125	40	(125, 40)
130	80	(130, 80)
70	80	(70, 80)
70	90	(70, 90)
150	90	(150, 90)
70	180	
105	185	
70	200	
70	80	
60	80	
60	200	
0	90	
60	90	
60	80	
0	80	
5	40	
45	0	

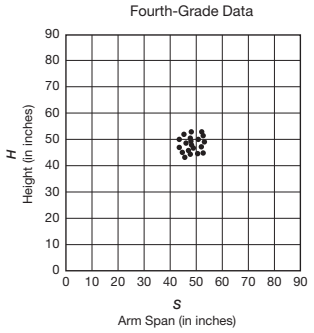
***Student Activity Book* - Page 8**

Name _____ Date _____

More Arm Span vs. Height Data

1. The data below is taken from another fourth-grade classroom. Estimate the average height and arm span for a fourth-grader from this class.

   Average Height _____ Average Arm Span _____



2. Maria is in sixth grade. Her arm span measures 62 inches. Her height measures 63 inches. Add her point to the graph. How does her arm span and height compare to the other points on the graph?

***Teacher Guide* - Page 1**

Name _____ Date _____

3. Jack joins this fourth-grade classroom. His height is 45 inches. What would you predict about his arm span? Explain how you made your prediction.

More Arm Span vs. Height Data Feedback Box	Expectation	Check In	Comments
Estimate the median of a data set. [Q# 1]	E6		
Read a table or graph to find information about a data set. [Q# 1–3]	E7		
Model real-world situations with bar and point graphs. [Q# 1–2]	E8		
Make predictions and generalizations about a data set using a median. [Q# 2]	E9		
Make predictions and generalizations about a data set using a data table and graph. [Q# 3]	E10		

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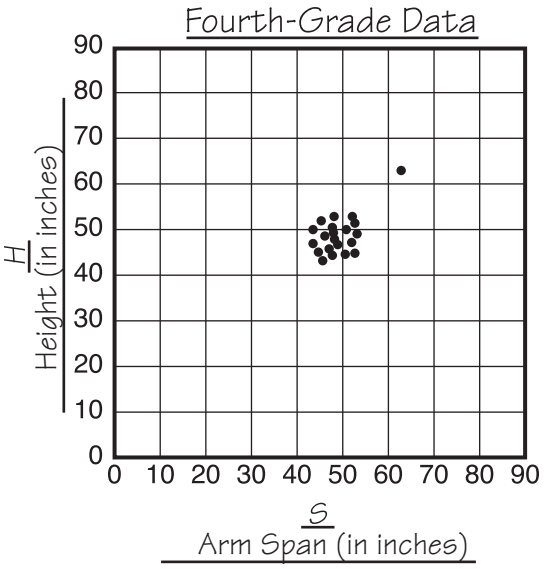
Teacher Guide

More Arm Span vs. Height Data (TG pp. 1–2)

1. Answers will vary; approximately 48 inches for height and 48 inches for arm span.

2. 

   Students should note that Maria's point is to the right and above the cluster for fourth graders. It is on a diagonal from the lower left to the upper right.

3. Answers will vary; Based on the data in the graph, his arm span could be equivalent to his height or it could be within 2 inches of his height. 43–47 inches are acceptable answers.