Finding Medians

Street	Number of Cars in Minute #1	Number of Cars in Minute #2	Number of Cars in Minute #3	Median
Shannon's Street	2	3	2	
Maya's Street	9	11	11	
Roberto's Street	2	0	7	

★●■1. Shannon, Maya, and Roberto want to find out whose street has the most traffic. They counted the number of cars passing each of their houses in one minute and put the information into a data table. They did this three times on each street.

- **A.** Find the median number of cars passing in one minute for each student's street.
- **B.** What are the variables in their investigation?
- **C.** Are the variables categorical or numerical?
- **D.** Make a bar graph of Shannon's, Maya's, and Roberto's data on a piece of graph paper. Use the median values for your graph.
- **E.** Whose street do you think is the busiest? Whose is the least busy? Explain why you think so.
- **F.** Shannon, Maya, and Roberto collected their data around 3:30 p.m. on a Thursday. Predict what might happen to the median number of cars if they collected their data at 5:30 p.m., 8:30 p.m., and 3:00 a.m.
- **G.** About how many cars do you think would pass Shannon's house in ten minutes? How did you make your estimate?

■2. In music class at Bessie Coleman School, Lee Yah, Roberto, Grace, and Luis lined up across the front of the room to demonstrate a folk dance. They began with their arms outstretched and their fingers just touching. They could just reach across the room. If the median arm span of the students in Room 204 is 54 inches, about how wide is the room? Tell how you know.

***Student Guide* - Page 43**

A scientist who studies birds is called an ornithologist (pronounced "or-nuh-THAH-luh-jist"). A team of ornithologists captured several types of birds to take measurements of them. The data they recorded is in the tables in Questions 3 and 4.

●3. The ornithologists measured the mass of a type of bird known as a vireo (say "VEER-ee-oh"). They measured the mass in grams (g). Find the median mass for the two varieties of vireos they captured.

A.

White-Eyed Vireo Mass Data

Mass (grams)
9
12
13
15
15

B.

Red-Eyed Vireo Mass Data

Mass (grams)
28
29
17
15
20
19
20
22

- **C.** Which type of bird would you say is larger? Use the medians you found in parts A and B to explain your answer.

***Student Guide* - Page 44**

Student Guide

Workshop: Graphs and Averages

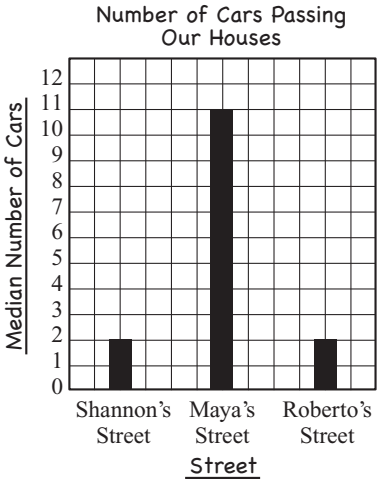
Questions 1–9 (SG pp. 43–49)

1. A. Shannon: 2 cars; Maya: 11 cars; Roberto: 2 cars

B. Street; number of cars that go by in a minute.

C. Street is categorical; number of cars passing is numerical.

D.



E. Answers will vary. Possible responses: Maya's street is the busiest because it has the highest median number of cars, or because it has the most total cars; least busy streets are both Shannon's and Roberto's because they have the lowest median (2 cars), or Shannon's because the fewest total cars passed, or Roberto's because it has the lowest single value (0).

F. Answers will vary. Median values should reflect traffic levels at various times of day.

G. Possible response: About 20 cars, found by multiplying the median number of cars in one minute by 10 minutes. $2 \times 10 = 20$.

2. Possible response: About 216 inches. If the average arm span is 54 inches for each student, and it took 4 of them to reach across the room, the width of the room can be estimate by multiplying $54 \times 4 = 216$.

3. A. 13 grams

B. 20 grams

C. The red-eyed vireo is larger because its median mass is greater than the white-eyed vireo.

4. A. 100 millimeters

B. 103 millimeters

C. $63\frac{1}{2}$ millimeters

D. The indigo bunting has the shortest wing length. Its median wing length was the least of the three birds.

E. The wood thrush and the rose-breasted grosbeak have similar median wing lengths, but the wood thrush's median wing length is slightly longer.

F. $39\frac{1}{2}$ mm; Answer can be found by subtracting the indigo bunting's median wing length from the wood thrush's median wing length. $103 - 63\frac{1}{2} = 39\frac{1}{2}$ mm

5. A. Type of Bird and Number of Birds Captured.

B. Type of Bird is categorical, Number of Birds Captured is numerical.

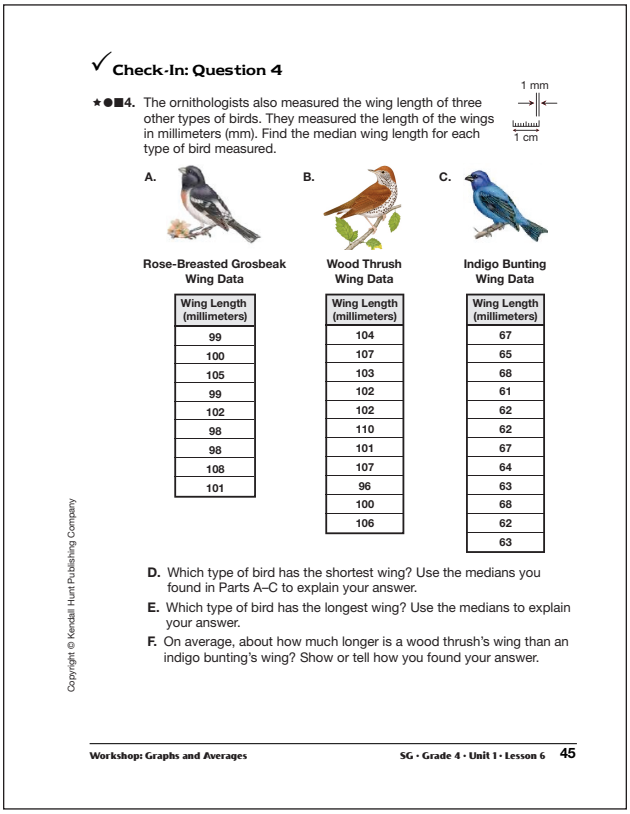
C. About 32

D. About 21

E. Catbird

F. White-eyed vireo

G. Responses will vary. Students may say that about equal numbers of wood thrushes and indigo buntings were caught; or that about 3 times as many warblers as rose-breasted grosbeaks were caught.



✓ **Check-In: Question 4**

★●■**4.** The ornithologists also measured the wing length of three other types of birds. They measured the length of the wings in millimeters (mm). Find the median wing length for each type of bird measured.

1 mm

1 cm

A.

Rose-Breasted Grosbeak Wing Data

Wing Length (millimeters)
99
100
105
99
102
98
98
108
101

B.

Wood Thrush Wing Data

Wing Length (millimeters)
104
107
103
102
102
110
101
107
96
100
106

C.

Indigo Bunting Wing Data

Wing Length (millimeters)
67
65
68
61
62
62
67
64
63
68
62
63

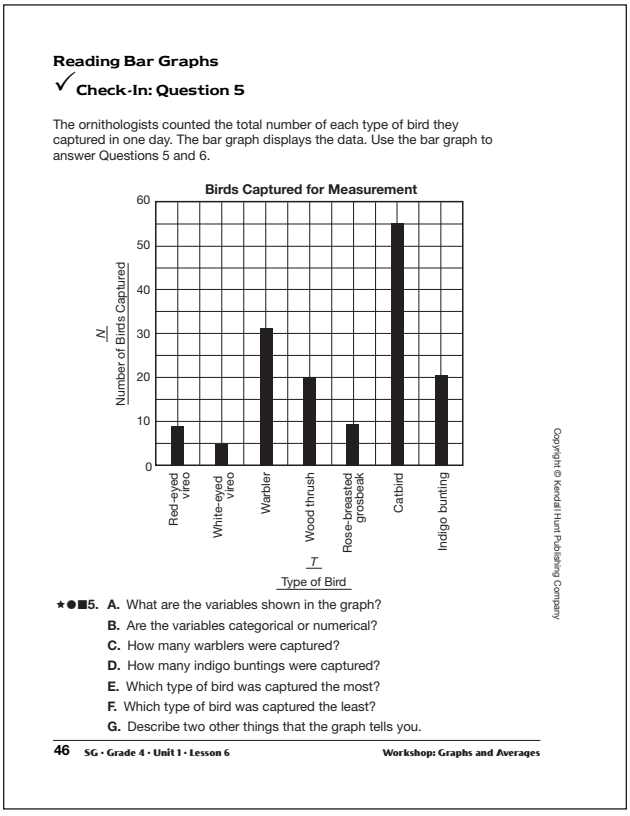
D. Which type of bird has the shortest wing? Use the medians you found in Parts A–C to explain your answer.

E. Which type of bird has the longest wing? Use the medians to explain your answer.

F. On average, about how much longer is a wood thrush's wing than an indigo bunting's wing? Show or tell how you found your answer.

Workshop: Graphs and Averages SG • Grade 4 • Unit 1 • Lesson 6 45

***Student Guide* - Page 45**



Reading Bar Graphs

✓ **Check-In: Question 5**

The ornithologists counted the total number of each type of bird they captured in one day. The bar graph displays the data. Use the bar graph to answer Questions 5 and 6.

★●■**5. A.** What are the variables shown in the graph?

B. Are the variables categorical or numerical?

C. How many warblers were captured?

D. How many indigo buntings were captured?

E. Which type of bird was captured the most?

F. Which type of bird was captured the least?

G. Describe two other things that the graph tells you.

46 SG • Grade 4 • Unit 1 • Lesson 6 Workshop: Graphs and Averages

***Student Guide* - Page 46**

■6. **A.** Estimate the total number of birds that were captured.

B. What was the median number of birds captured? Which type of bird had the median number captured? Show or tell how you know.

C. Were more vireos (red-eyed and white-eyed combined) captured than wood thrushes? Show or tell how you know.

Making Predictions: Mass vs. Wing Length

★7. The ornithologists measured the wing length and mass for white-eyed vireos. They measured the length of the wings in millimeters (mm) and the mass in grams (g). They recorded their data in the table below:

White-Eyed Vireo Data

Wing Length (millimeters)	Mass (grams)
61	9
58	12
62	13
59	15
61	15

A. Make a point graph of the data for white-eyed vireos. Plot wing length on the horizontal axis and mass on the vertical axis. Scale your horizontal axis to 100 millimeters and your vertical axis to 20 grams.

B. Using the graph, estimate the average wing length of the white-eyed vireos that were captured.

C. Using the graph, estimate the average mass of the white-eyed vireos that were captured.

D. Use the data in the table to find the exact value of the median wing length.

E. How does your answer for Part B compare with your answer for Part D?

F. Another bird, the yellow-breasted chat, typically has a wing length of about 75 millimeters and a mass of about 25 grams. If you measured the wing length and mass for several yellow-breasted chats, where on your graph would the data cluster?

***Student Guide* - Page 47**

●8. The ornithologists measured the wing length and mass for rose-breasted grosbeaks. They measured the length of the wings in millimeters (mm) and the mass in grams (g). They recorded their data in the table below:

Rose-Breasted Grosbeak Data

Wing Length (millimeters)	Mass (grams)
99	58
100	59
105	47
99	56
102	48
98	38
98	49
108	60
101	56
91	42
102	61

A. Make a point graph of the data for rose-breasted grosbeaks. Plot wing length on the horizontal axis and mass on the vertical axis. Scale your horizontal axis to 150 millimeters and your vertical axis to 100 grams.

B. Using the graph, estimate the average wing length of the rose-breasted grosbeaks that were captured.

C. Using the graph, estimate the average mass of the rose-breasted grosbeaks that were captured.

D. Use the data in the table to find the exact value of the median mass.

E. How does your answer for Part C compare with your answer for Part D?

F. Another bird, a cardinal, typically has a wing length of about 90 millimeters and a mass of about 35 grams. If you measured the wing length and mass for several cardinals, where on your graph would the data cluster be?

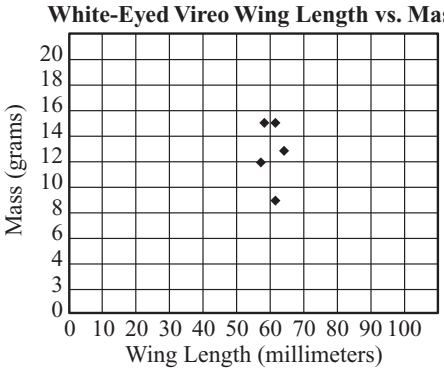
***Student Guide* - Page 48**

6. A. About 150 birds.

B. About 20 birds. Wood thrush was the type of bird with the median number caught. I found the median number caught and it was about 20. I used the bar graph and found that 20 wood thrushes were captured.

C. No; about 13 red-eyed and white-eyed vireos combined were captured, 20 wood thrushes were captured.

7. A.



B. About 60 millimeters

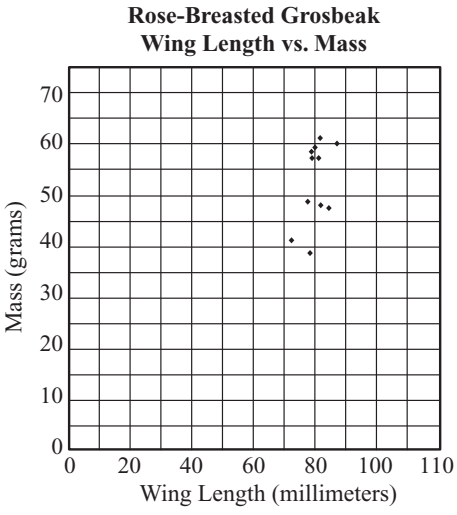
C. Estimates will vary: about 13 grams

D. 61 millimeters

E. Estimated and exact medians should be reasonably close.

F. The data points should cluster around the point (75, 25).

8. A.



B. About 100 millimeters

C. Estimates will vary: 50–55 grams.

D. 56 grams

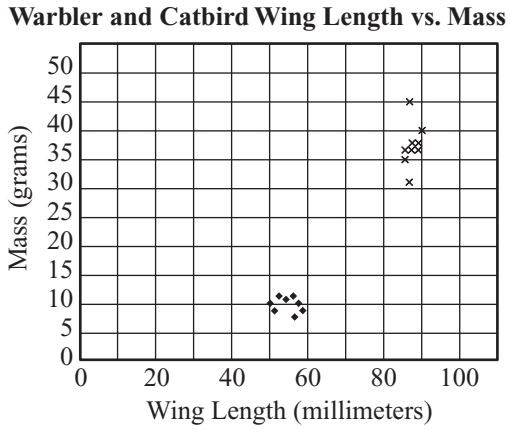
E. Estimated and exact medians should be reasonably close.

F. The data points should cluster around the point (90, 35).

9. A. 55 millimeters

B. $10\frac{1}{2}$ grams

C.



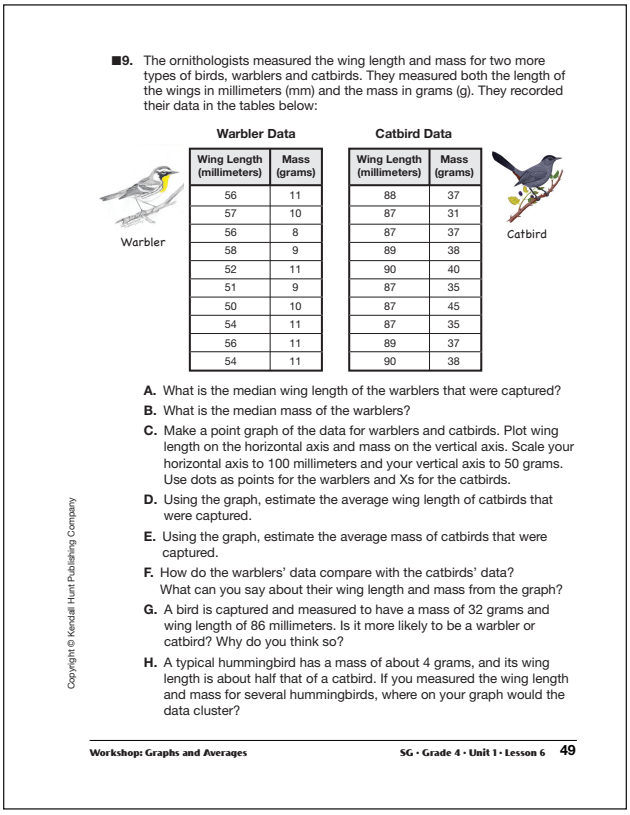
D. About 88 millimeters

E. About 37 grams

F. The warblers' mass and wing length are much smaller than the catbirds'. They have an average wing length of about 55 millimeters and an average mass of about 10 grams.

G. It is more likely a catbird. When the bird's data is put on the graph, its data point is in the catbirds' cluster.

H. The data would cluster around the point (44, 4).



■**9.** The ornithologists measured the wing length and mass for two more types of birds, warblers and catbirds. They measured both the length of the wings in millimeters (mm) and the mass in grams (g). They recorded their data in the tables below:

Warbler

Warbler Data

Wing Length (millimeters)	Mass (grams)
56	11
57	10
56	8
58	9
52	11
51	9
50	10
54	11
56	11
54	11

Catbird Data

Wing Length (millimeters)	Mass (grams)
88	37
87	31
87	37
89	38
90	40
87	35
87	45
87	35
89	37
90	38

Catbird

A. What is the median wing length of the warblers that were captured?

B. What is the median mass of the warblers?

C. Make a point graph of the data for warblers and catbirds. Plot wing length on the horizontal axis and mass on the vertical axis. Scale your horizontal axis to 100 millimeters and your vertical axis to 50 grams. Use dots as points for the warblers and Xs for the catbirds.

D. Using the graph, estimate the average wing length of catbirds that were captured.

E. Using the graph, estimate the average mass of catbirds that were captured.

F. How do the warblers' data compare with the catbirds' data? What can you say about their wing length and mass from the graph?

G. A bird is captured and measured to have a mass of 32 grams and wing length of 86 millimeters. Is it more likely to be a warbler or catbird? Why do you think so?

H. A typical hummingbird has a mass of about 4 grams, and its wing length is about half that of a catbird. If you measured the wing length and mass for several hummingbirds, where on your graph would the data cluster?

***Student Guide* - Page 49**