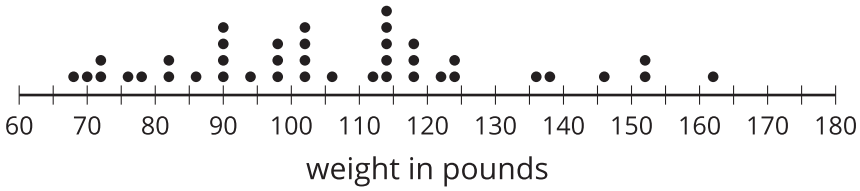
Unit 8, Lesson 6

Interpreting Histograms

Let's explore how histograms represent data sets.

6.1 Dog Show (Part 1)

Here is a dot plot showing the weights, in pounds, of 40 dogs at a dog show.



1. Write two statistical questions that can be answered using the dot plot.

2. What would you consider a typical weight for a dog at this dog show? Explain your reasoning.

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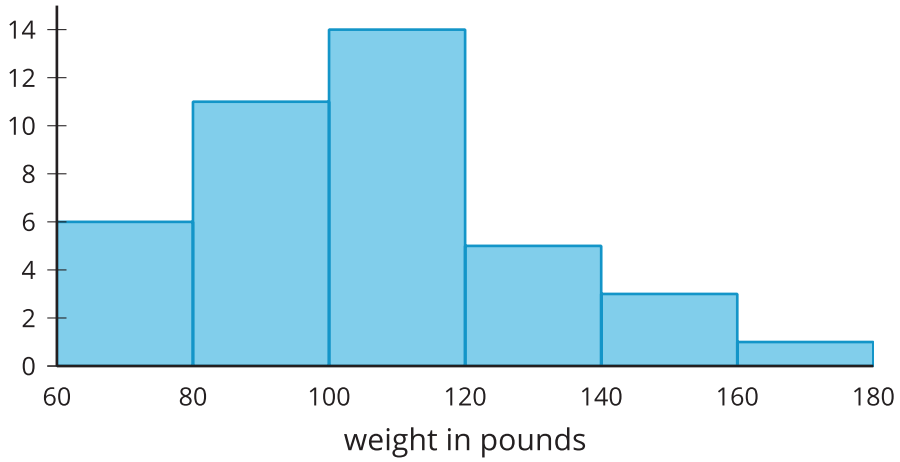
6.2 Dog Show (Part 2)

Here is a **histogram** that shows some dog weights in pounds.



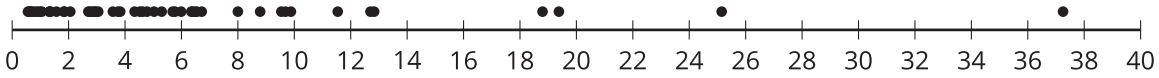
Each bar includes the left-end value but not the right-end value. For example, the first bar includes dogs that weigh 60 pounds and 68 pounds but not 80 pounds. An 80-pound dog would be included in the second bar with a frequency of 11.

1. Use the histogram to answer these questions.
   a. How many dogs weigh between 100 and a little less than 120 pounds?
   b. How many dogs weigh exactly 70 pounds?
   c. How many dogs weigh at least 120 pounds?
   d. How much does the heaviest dog at the show weigh?
   e. What would you consider a typical weight for a dog at this dog show? Explain your reasoning.

2. Discuss with a partner:
   - If you used the dot plot to answer the same five questions you just answered, how would your answers be different?
   - How are the histogram and the dot plot alike? How are they different?

6.3 Population of States

Every ten years, the United States conducts a census, which is an effort to count the entire population. The dot plot shows the population data from the 2010 census for each of the fifty states and the District of Columbia (DC).



population of states in millions

1. Here are some statistical questions about the population of the fifty states and DC. How difficult would it be to answer the questions using the *dot plot*?
   In the middle column, rate each question on its difficulty to answer based on this dot plot as either easy, hard, or impossible. Be prepared to explain your reasoning.

statistical question	using the dot plot	using the histogram
a. How many states have populations greater than 15 million?		
b. Which states have populations greater than 15 million?		
c. How many states have populations less than 5 million?		
d. What is a typical state population?		
e. Are there more states with fewer than 5 million people or more states with between 5 and 10 million people?		
f. How would you describe the distribution of state populations?		

2. Here are the population data for all states and the District of Columbia from the 2010 census. Use the information to complete the table.

Alabama	4.78
Alaska	0.71
Arizona	6.39
Arkansas	2.92
California	37.25
Colorado	5.03
Connecticut	3.57
Delaware	0.90
District of Columbia	0.60
Florida	18.80
Georgia	9.69
Hawaii	1.36
Idaho	1.57

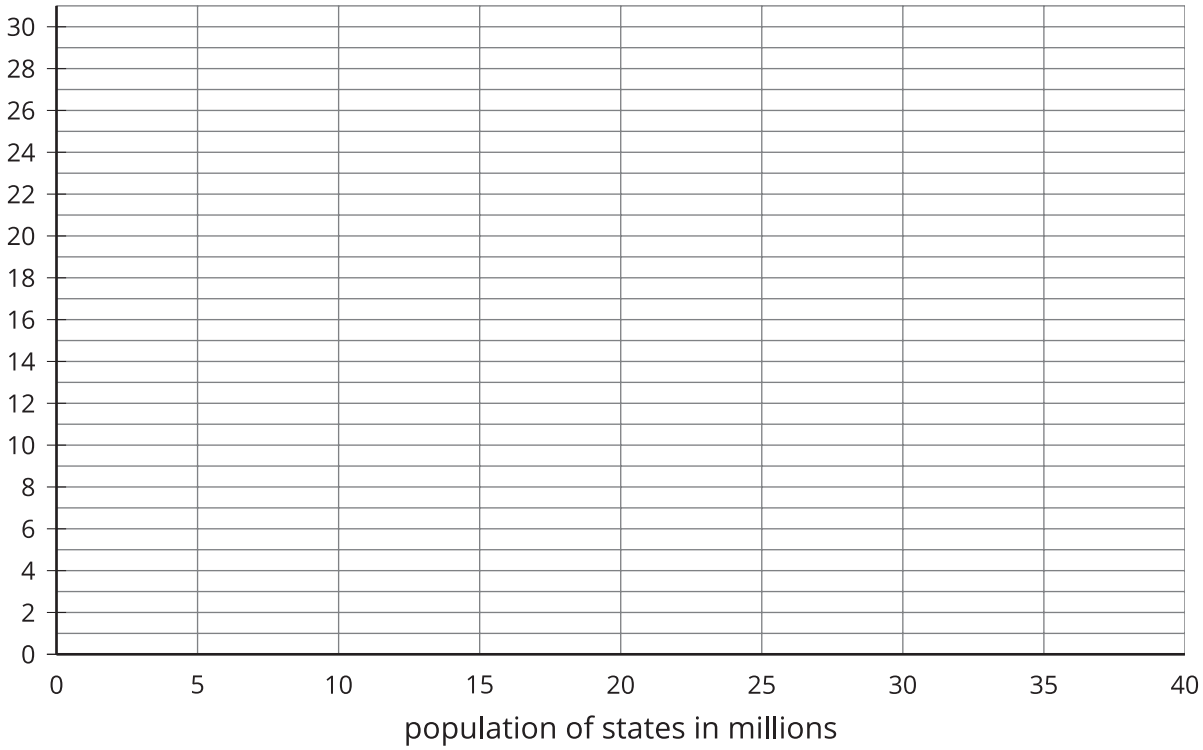
Illinois	12.83
Indiana	6.48
Iowa	3.05
Kansas	2.85
Kentucky	4.34
Louisiana	4.53
Maine	1.33
Maryland	5.77
Massachusetts	6.55
Michigan	9.88
Minnesota	5.30
Mississippi	2.97
Missouri	5.99

Montana	0.99
Nebraska	1.83
Nevada	2.70
New Hampshire	1.32
New Jersey	8.79
New Mexico	2.06
New York	19.38
North Carolina	9.54
North Dakota	0.67
Ohio	11.54
Oklahoma	3.75
Oregon	3.83
Pennsylvania	12.70

Rhode Island	1.05
South Carolina	4.63
South Dakota	0.81
Tennessee	6.35
Texas	25.15
Utah	2.76
Vermont	0.63
Virginia	8.00
Washington	6.72
West Virginia	1.85
Wisconsin	5.69
Wyoming	0.56

population (millions)	frequency
0–5	
5–10	
10–15	
15–20	
20–25	
25–30	
30–35	
35–40	

3. Now, use the grid and the information in your table to create a *histogram*.



4. Return to the statistical questions at the beginning of the activity. Which ones are now easier to answer?

   Complete the table, rating the difficulty of answering each question—this time using your histogram. Be prepared to explain your reasoning.

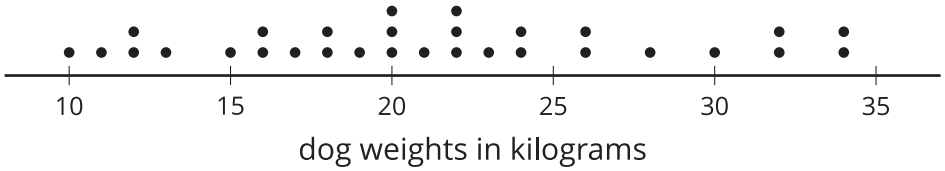
Are you ready for more?

Think of two more statistical questions that can be answered using the data about populations of states. Then, decide whether each question can be answered using the dot plot, the histogram, or both.

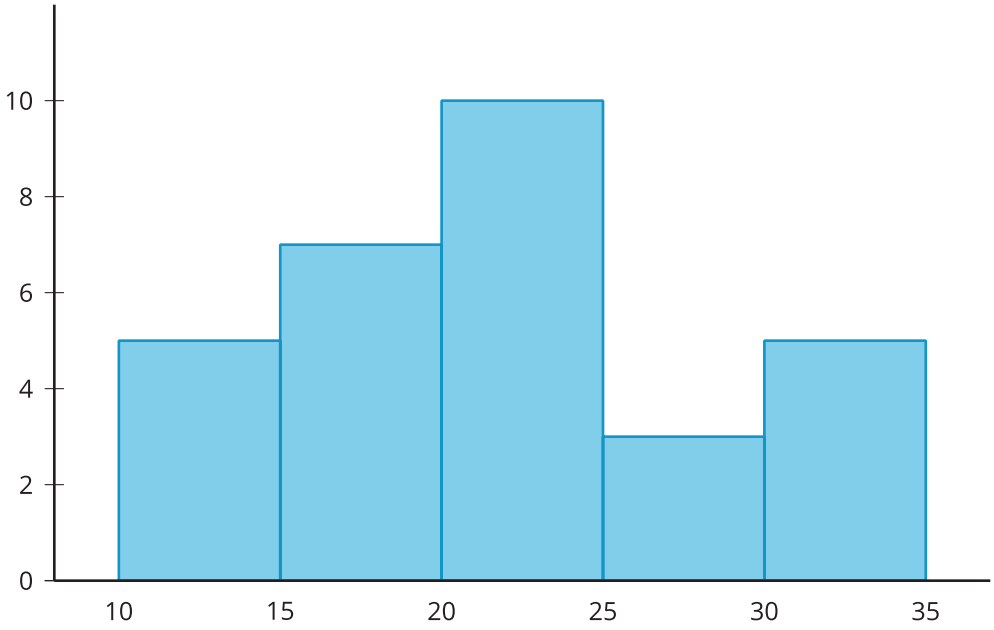
Lesson 6 Summary

In addition to using dot plots, we can also represent distributions of numerical data using **histograms**.

Here is a dot plot that shows the weights, in kilograms, of 30 dogs, followed by a histogram that shows the same distribution.



dog weights in kilograms



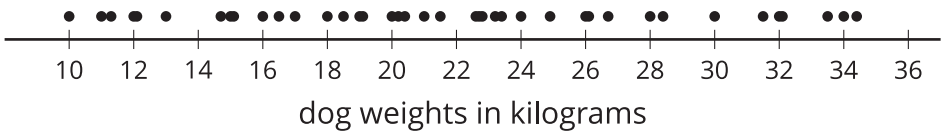
dog weights in kilograms

In a histogram, data values are placed in groups, or "bins," of a certain size, and each group is represented with a bar. The height of the bar tells us the frequency for that group.

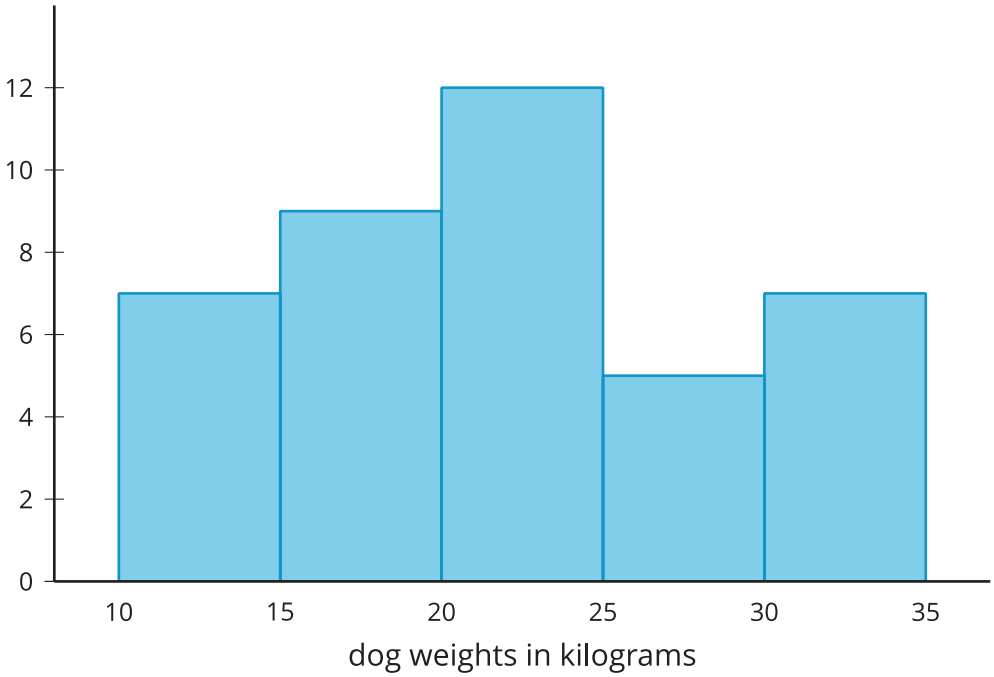
For example, the height of the tallest bar is 10, and the bar represents weights from 20 to less than 25 kilograms, so there are 10 dogs whose weights fall in that group. Similarly, there are 3 dogs that weigh anywhere from 25 to less than 30 kilograms.

Notice that the histogram and the dot plot have a similar shape. The dot plot has the advantage of showing all of the data values, but the histogram is easier to draw and to interpret when there are a lot of values or when the values are all different.

Here is a dot plot showing the weight distribution of 40 dogs. The weights were measured to the nearest 0.1 kilogram instead of the nearest kilogram.



Here is a histogram showing the same distribution.



In this case, it is difficult to make sense of the distribution from the dot plot because the precision of the measurement means the dots are distinct and so close together. The histogram of the same data set does a much better job showing the distribution of weights by grouping similar values to show an overall trend, even though we can't see the individual data values.