



# Histograms

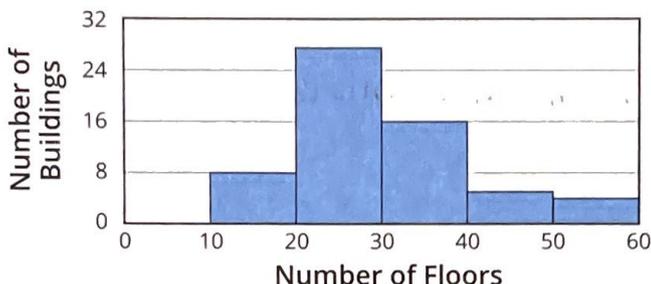
In the remainder of this lesson, you will analyze and create *histograms*, which look similar to bar graphs but do not display the same type of data.

## HABITS OF MIND

- Model with mathematics.
- Use appropriate tools strategically.

Minneapolis and St. Paul are known as the Twin Cities. Both cities are home to flourishing downtowns with tall buildings.

**Number of Floors in the Tallest Buildings in the Twin Cities**



## TAKE NOTE...

A **histogram** is a graphical way to display quantitative or numeric data using vertical bars.

### 1 Analyze the histogram.

- (a) How is this graph different from the bar graphs you have used previously?

*The bars are touching  
 There are numbers instead of categories*

- (b) What information does the histogram display? Describe the data represented in the histogram shown. Look at the title and the labels on the axes.

*The histogram displays the number of floors in the tallest building in the Twin Cities.*

- (c) Are the data represented in the histogram discrete or continuous? **Explain your reasoning.**

*Discrete you can only have whole number of floors and buildings.*

- (d) Describe the distribution of the data, such as the overall shape and the existence of peaks, clusters, and gaps.

*There is a peak in the 20's  
 Skewed right*

## TAKE NOTE...

The width of a bar in a histogram represents an interval of data known as a bin. The height of the bar indicates the frequency, or the number of data values included in any given bin.



2 Let's think about the bars in the histogram.

(a) How many bins are there?

6 bins

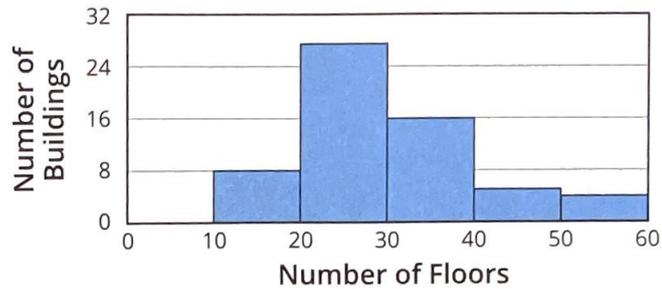
(b) Are all the bins the same size?

They each represent a range of 10 floors.

(c) What does the height of each bar represent?

How many buildings are in that interval

Number of Floors in the Tallest Buildings in the Twin Cities



3 Describe the range of floors included in each of the remaining bins shown on the horizontal axis.

(a) 2nd bin: interval 20–30

at least 20 but less than 30  
20, 21, 22, 23, 24, 25, 26, 27, 28, 29

(b) 3rd bin: interval 30–40

at least 30 but less than 40

(c) 4th bin: interval 40–50

at least 40 but less than 50

(d) 5th bin: interval 50–60

at least 50 but less than 60

THINK ABOUT...

In the second bin, the *bounds* are the numbers 20 and 30. What are the bounds of the 5th bin?

4 Suppose a new building has 20 floors. Which bin would change? **How would it change?**

Bin 2 would increase by 1



5 Tell whether you can determine each number, using the histogram. **Explain why or why not.**

(a) The total number of buildings

Find the height of each bar (bin) and add them together.

(b) The number of buildings that have 31 floors

Can't be determined. You only know some buildings have floor numbers in the 30's but you can't tell specific data points

(c) The range of the data set

Can't be determined. You don't know the shortest or tallest building.

**TAKE NOTE...**

Dot plots show individual data values. Histograms display grouped data.

**DID YOU KNOW?**

The **range** is the difference between the maximum and minimum values of a data set.

6 Write a summary to report the results of your data analysis about the number of floors in the Twin Cities' tallest buildings.

Most buildings have between 20-29 floors. Very few have 40 or more floors.



- Creating Histograms
- Exploring Histograms

# Creating and Analyzing Histograms

You can analyze the histograms of two different data sets to compare the displays.

### HABITS OF MIND

- Model with mathematics.
- Use appropriate tools strategically.

New York City has over 5800 tall buildings and is home to the ninth tallest building in the United States, the Empire State Building, which is 1250 feet tall, or 1454 feet to its tip. Not to be outdone, Chicago is home to the Willis Tower, formerly known as Sears Tower. It stands an impressive 1450 feet tall, or 1729 feet to its tip.

The table shows the number of floors in the 15 tallest buildings in New York City.

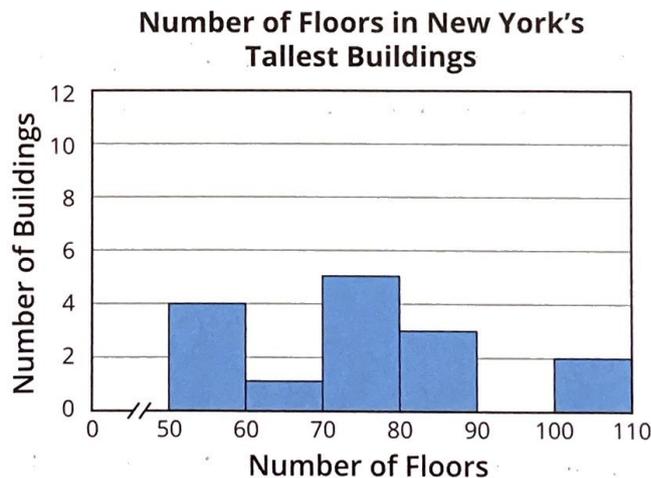
104	75	77	54	70
89	74	52	80	59
103	66	76	82	52

To create a histogram, organize data into a *grouped frequency table*. A **grouped frequency table** organizes data according to how many times the data values within a given range of values occur.

### WORKED EXAMPLE

You can create a histogram of the data in a table.

Number of Floors	Frequency (f)
50-60	
60-70	
70-80	
80-90	
90-100	
100-110	



The slashes on the horizontal axis of the histogram indicate a break in the range of data values.

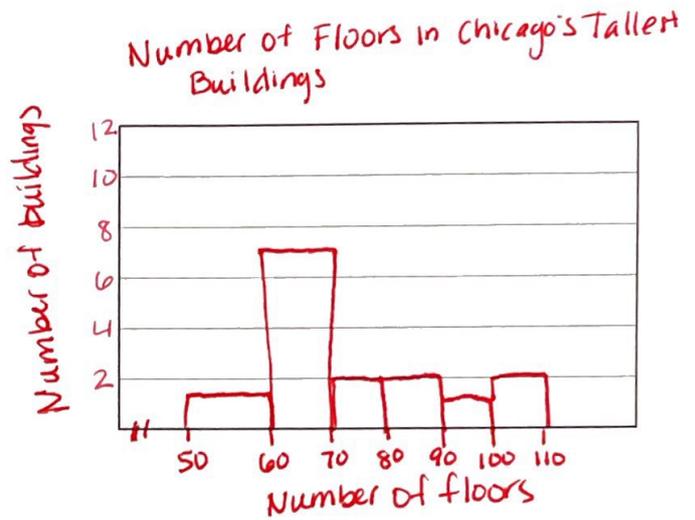


The table shows the number of floors in the 15 tallest buildings in Chicago.

<del>108</del>	<del>60</del>	<del>64</del>	<del>100</del>	<del>67</del>
<del>98</del>	<del>74</del>	<del>65</del>	<del>61</del>	<del>73</del>
<del>83</del>	<del>82</del>	<del>57</del>	<del>60</del>	<del>66</del>

- Complete the grouped frequency table for the number of floors in Chicago's buildings. Then complete the histogram. **Make sure that you name your table and histogram.**

Number of Floors	Frequency (f)
50-60	1
60-70	4
70-80	2
80-90	2
90-100	1
100-110	2



- What is similar about the histograms? What are the differences between the two histograms?

They each have similar ranges.

New York has a gap in the 90's and a peak in the 70's  
 Chicago has a peak in the 60's  
 New York is more symmetrical and Chicago is skewed right

- Use what you know about the distributions and patterns of a graphical display to describe what the histograms say about the number of floors in each city's buildings.

New York has gaps and is symmetric  
 Chicago is skewed right but contains no gaps