Name _____

Chapter 2 Organizing Data

Section 2.1 Frequency Distributions, Histograms, and Related Topics

Objective: In this lesson you learned to organize raw data, construct graphs, and recognize distribution shapes.

Important Vocabulary		
Frequency Table	Class Width	Lower/Upper Class Limit
Lower/Upper Class Boundaries	Cumulative Frequency	

What are three criteria a graphical display should have?

I. Frequency Table

Focus Point:
- Organize raw data using a frequency table

A **frequency table:**

How to find the class width (interger data):

1.

2.

The **lower class limit:**

The **upper class limit:**

The **class width:**

What is class frequency?

What is the midpoint of a class?

How to find class boundaries (integer data):

What is relative frequency?

How do you calculate relative frequency?

The total of the relative frequencies should be _____.

How to make a frequency table:

1.

2.

3.

4.

5.

6.

How to make a relative frequency table:

II. Histograms and Relative-Frequency Histograms

Focus Point:
- Construct histograms, relative-frequency histograms, and ogives.

How to make a (Relative-Frequency) Histogram:

1.

2.

3.

Why use class boundaries in histograms?

III. Distribution of Shapes

Focus Point:
- Recognize basic distribution shapes: uniform, symmetric, skewed, and bimodal

Mound-shaped Symmetrical:

Uniform or Rectangular:

Skewed left/right:

Bimodal:

Outliers:

What do (relative-frequency) histograms tell us?

-
-
-
-

IV. Cumulative-Frequency Tables and Ogives

Focus Point:

- Interpret graphs in the context of the data setting

The **cumulative frequency:**

What is an ogive?

How to make an ogive:

1.
2.
3.

What does an ogive tell us?

-

-

Section 2.1 Examples – Frequency Distributions, Histograms, and Related Topics

(1) An irate customer called Dollar Day Mail Order Company 40 times during the last two weeks to see why his order had not arrived. Each time he called, he recorded the length of time he was put "on hold" before being allowed to talk to a customer service representative. See table above.

Length of Time on Hold, in Minutes

1	5	5	6	7	4	8	7	6	5
5	6	7	6	6	5	8	9	9	10
7	8	11	2	4	6	5	12	13	6
3	7	8	8	9	9	10	9	8	9

a. What are the largest and smallest values in the table? If we want five classes in a frequency table, what should the class width be?

b. Complete the following frequency table.

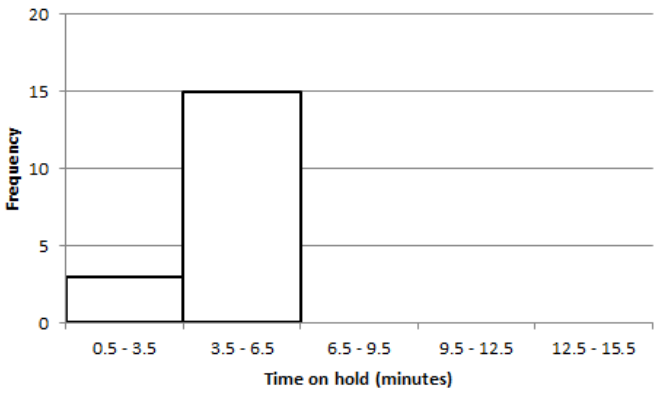
Time on Hold

Class Limits Lower-Upper	Tally	Frequency	Midpoint
1 - 3			
4 - _____			
_____ - 9			
_____ - _____			
_____ - _____			

c. Recall that the class boundary is halfway between the upper limit of one class and the lower limit of the next. Use this fact to find the class boundaries in the table below (left) and to complete the partial histogram below (right).

Class Boundaries

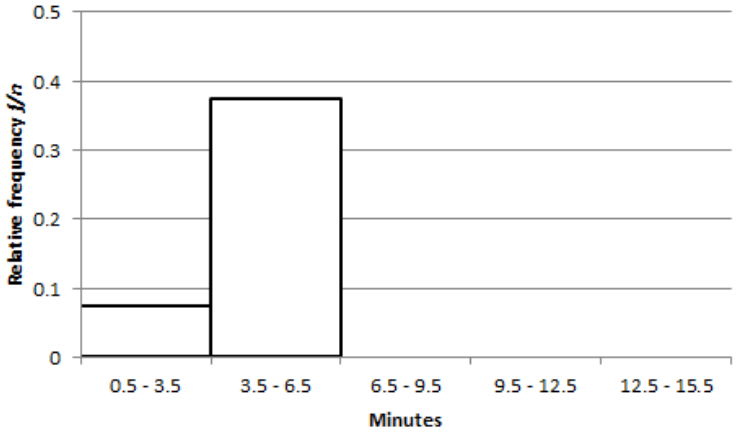
Class Limits	Class Boundaries
1 - 3	0.5 - 3.5
4 - 6	3.5 - 6.5
7 - 9	6.5 - _____
10 - 12	_____ - _____
13 - 15	_____ - _____



d. Compute the relative class frequency f/n for each class in the table below (left) and complete the partial relative-frequency histogram below (right).

Relative Class Frequency

Class	*f/n*
1 - 3	
4 - 6	
7 - 9	
10 - 12	
13 - 15	



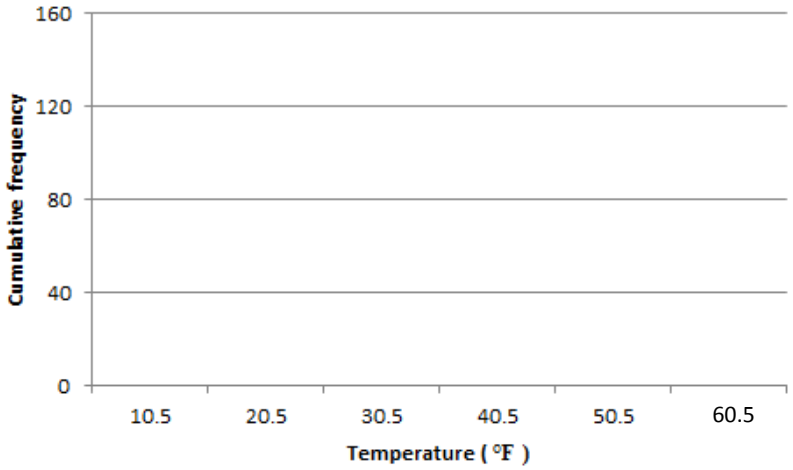
(2) Aspen, Colorado, is a world-famous ski area. If the daily high temperature is above $40°\text{F}$, the surface of the snow tends to melt. It then freezes again at night. This can result in a snow crust that is icy. It also can increase avalanche danger. The table below gives a summary of daily high temperatures ($°\text{F}$) in Aspen during the 151-day ski season.

a. The cumulative frequency for a class is computed by adding the frequency of that class to the frequencies of the previous classes. Complete the table below.

High Temperatures During the Aspen Ski Season ($°\text{F}$)

Class Boundaries			
Lower	Upper	Frequency	Cumulative Frequency
10.5	30.5	23	23
20.5	30.5	43	66 (sum 23 + 43)
30.5	40.5	51	
40.5	50.5	27	
50.5	60.5	7	

b. To draw the corresponding ogive, we place a dot at cumulative frequency 0 on the lower class boundary of the first class. Then we place dots over the *upper class boundaries* at the height of the cumulative class frequency for the corresponding class. Finally, we connect the dots. Complete the ogive below.



c. Looking at the ogive, estimate the total number of days with a high temperature lower than or equal to $40°\text{F}$.

Section 2.2 Bar Graphs, Circle Graphs, and Time-Series Graphs

Objective: In this lesson you learned how to determine appropriate graphs based on data, construct graphs, and interpret information displayed in graphs.

Important Vocabulary		
Pareto Chart	Circle Graph	Time-Series Graph
Time-Series Data		

Focus Points:
- Determine types of graphs appropriate for specific data
- Construct bar graphs Pareto charts, circle graphs, and time-series graphs
- Interpret information displayed in graphs

I. Bar Graphs

Histograms are a useful visual display for the distribution of data.

However, the data must be _____.

Bar graphs can be used to display _____ or

_____.

Features of a bar graph

1.

2.

3.

4.

Changing Scale:

II. Pareto Charts

A **Pareto chart:**

III. Circle Graphs

In a **circle graph:**

IV. Time-Series Graphs

In a **time-series graph:**

Time-series data:

How to decide which type of graph to use:

1. Bar Graphs –

2. Pareto Charts –

3. Circle Graphs –

4. Time-series Graphs –

5. For any graph –

What do graphs tell us?

-
-
-

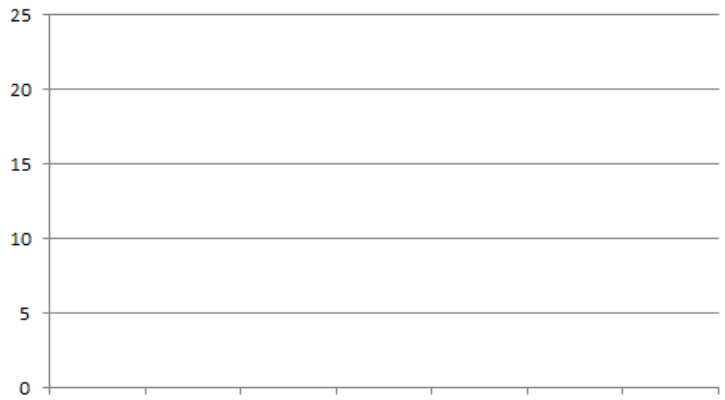
Section 2.2 Examples – Bar Graphs, Circle Graphs, and Time-Series Graphs

(1) Suppose you want to arrive at college 15 minutes before your first class so that you can feel relaxed when you walk into class. An early arrival time also allows room for unexpected delays. However, you always find yourself arriving "just in time" or slightly late. What causes you to be late? Charlotte made a list of possible causes and then kept a checklist for 2 months (table above). On some days more than one item was checked because several events occurred that caused her to be late.

Causes for Lateness (September - October)

Cause	Frequency
Snoozing after alarm goes off	15
Car trouble	5
Too long over breakfast	13
Last-minute studying	20
Finding something to wear	8
Talking too long with roommate	9
Other	3

a. Make a Pareto chart showing the causes for lateness. Be sure to label the causes, and draw the bars using the same vertical scale.



b. Looking at the Pareto chart, what recommendations do you have for Charlotte?

(2) How long do we spend talking on the telephone after hours (at home after 5 P.M.)? The results from a recent survey of 500 people (as reported in *USA Today*) are shown in the table below. Make a circle graph to display these data.

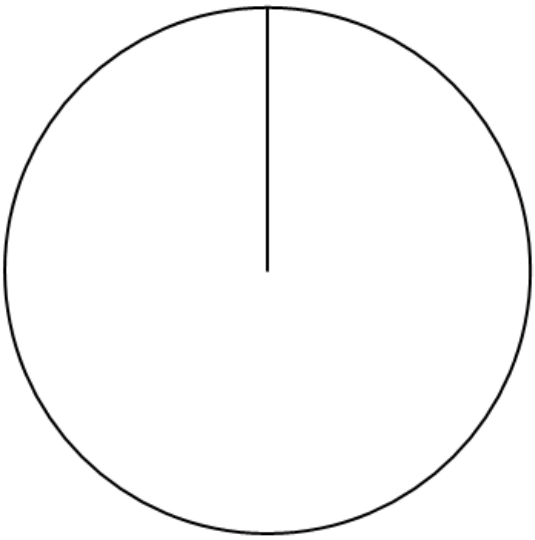
Time Spent on Home Telephone after 5 P.M.

Time	Number	Fractional Part	Percentage	Number of Degrees
Less than 0.5 hour	296	296/500	59.2	$59.2\% \times 360^\circ \approx 213^\circ$
0.5 hour to 1 hour	83	83/500	16.6	$16.6\% \times 360^\circ \approx 60^\circ$
More than 1 hour	121	_____	_____	_____
Total	_____		_____	_____

a. Fill in the missing parts in the table (above) for "More than 1 hour." Remember that the central angle of a circle is 360°. Round to the nearest degree.

b. Fill in the totals. What is the total number of responses? Do the percentages total 100% (within rounding error)? Do the number of degrees total 360° (within rounding error)?

c. Draw a circle graph. Divide the circle into pieces with the designated numbers of degrees. Label each piece, and show the percentage corresponding to each piece.



Section 2.3 Stem-and-Leaf Displays

Objective: In this lesson you learned how to construct, use, and compare stem-and-leaf displays

Important Vocabulary
Stem-and-Leaf Display

I. Exploratory Data Analysis

Exploratory data analysis techniques are particularly useful for _____

_____.

What are some key ingredients in exploratory data analysis?

II. Stem-and-Leaf Displays

Focus Points:

- Construct a stem-and-leaf display from raw data
- Use a stem-and-leaf display to visualize data distribution
- Compare a stem-and-leaf display to a histogram

A **stem-and-leaf display:**

A stem-and-leaf display is a device that organizes and groups data

but _____

_____.

How to make a stem-and-leaf display

1.

2.

3.

4.

What do stem-and-leaf displays tell us?

-
-
-

Section 2.3 Examples – Stem-and-Leaf Displays

(1) What does it take to win at sports? If you're talking about basketball, one sportswriter gave the answer. He listed the winning scores of the conference championship games over the last 35 years. The scores for those games follow below.

132	118	124	109	104	101	125	83	99
131	98	125	97	106	112	92	120	103
111	117	135	143	112	112	116	106	117
119	110	105	128	112	126	105	102	

To make a stem-and-leaf display, we'll use the first *two* digits as the stems.

a. Use the first *two* digits as the stem. Then order the leaves. Provide a label that shows the meaning and units of the first stem and first leaf.

b. Looking at the distribution, would you say that it is fairly symmetrical?