

COMPACTED MATHEMATICS

CHAPTER 3

STATISTICS

TOPICS COVERED:

- Mean, Median, Mode, and Range
- Line, Bar, Double Bar, Circle, and Pictographs
- Misleading Graphs
- Stem-and-Leaf Plots
- International Travel Brochure Project

Activity	Statistics Vocabulary	NAME:
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Five sixth grade teacher calculated how many letter there were combined in their first and last names. Here are the results:

9 9 12 12 13

Mean – The mean of a set of numbers is the same as the average. To determine the mean, add up all of the numbers and divide by the quantity of numbers.

$$\text{MEAN} = \frac{9+9+12+12+13}{5} = 11$$

Median – The median of a set of numbers is the middle number when the numbers are lined up from greatest to least. In other words, half of the numbers are more than the median and half of the numbers are less than the median.

9 9 12 12 13

12 is the median of this set of numbers.

If two numbers are in the middle, the median is determined by averaging those two numbers.

Mode – The mode of a set of numbers is the most common number in a set. If two or more numbers are the most common, all of those numbers are the modes. If all numbers in a set are in equal amounts, then there is “*no mode*”.

The mode of the set of numbers above is **9** and **12**.

Range – The range of a set of numbers can be listed two ways. The first is stating the smallest and largest number in the set. The range can also be shown as the difference between the smallest and largest numbers.

The range for the set of numbers above is **9 to 13** or **4**.

Find the mean, median, mode, and range of letters in names of the students in your math class.

Activity 3-1	Mean, Median, Mode, Range	NAME:
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The **mean** is the average. Add all of the numbers and divide by how many numbers there are.
 The **median** is the middle number once the numbers are ordered from least to greatest. If two numbers are in the middle, average them.
 The **mode** is the most common number. If all numbers tie, there is no mode. If two or more numbers tie, list each of them.
Range #1 is the smallest number to the biggest number.
Range #2 is the difference between the smallest and biggest numbers.

Find the mean, median, mode, and range for each set of data.

		Mean	Median	Mode	Range #1	Range #2
ex.	1, 2, 2, 3, 3, 7	3	2.5	2 and 3	1 to 7	6
1.	6, 9, 2, 4, 3, 6, 5					
2.	25, 18, 14, 27, 25, 14, 18, 25, 23					
3.	453, 345, 543, 345, 534					
4.	13, 6, 7, 13, 6					
5.	8, 2, 9, 4, 6, 8, 5					
6.	13, 7, 17, 19, 7, 15, 11, 7					
7.	1, 15, 9, 12, 18, 9, 5, 14, 7					
8.	28, 32, 23, 43, 32, 27, 21, 34					
9.	3, 9, 4, 3, 9, 4, 2, 3, 8					
10.	42, 35, 27, 42, 38, 35, 29, 24					
11.	157, 124, 157, 124, 157, 139					

Use the data below to answer questions 12-15.

12.	What is the mode?	
13.	What is the median?	
14.	What is the mean?	
15.	If the price of swimming lessons went up to \$6, would it change the:	
	a. mode? Why?	
	b. median? Why?	
	c. mean? Why?	
	d. range? Why?	

After-School Activities	Cost per Hour
Piano	\$14.00
Ballet	10.00
Swimming	5.00
Karate	15.00
Skating	12.00
Aerobics	5.00
Arts & Crafts	8.00
Drama	10.00
Scouts	2.00

Activity 3-2	Mean, Median, Mode, Range	NAME:
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Find the mean, median, mode, and range for each set of data.

		Mean	Median	Mode	Range #1	Range #2
1.	31, 18, 19, 18, 18, 17, 12					
2.	5, 0, 9, 9, 3, 0, 5, 5, 4					
3.	81, 81, 83, 84, 83, 85, 86					
4.	77, 70, 65, 62, 65, 80, 85					
5.	5, 6, 3, 9, 0, 4, 1, 2, 7					
6.	9, 9, 3, 2, 8, 7, 1, 1, 8					
7.	24, 33, 43, 44, 23, 41, 40					
8.	77, 76, 55, 76, 66, 58, 55					
9.	3.8, 4.2, 4.0, 4.2, 4.2					
10.	8.1, 9.0, 9.1, 8.4, 8.4, 8.4, 8.4					
11.	1,220, 1,440, 1,220, 1,660, 1,660					
12.	3,200, 3,100, 3,100, 3,000, 3,300					

Use the table below to answer the following.

		Mean	Median	Mode	Range #1	Range #2
13.	Five countries military research and development					
14.	Five countries civilian research and development					

Money spent on Research and Development in Selected Countries (billions of dollars)		
Country	Military	Civilian
United States	37.3	79.4
United Kingdom	3.5	8.5
France	3.5	14.6
West Germany	1.4	26.1
Japan	0.3	44.0

Activity 3-3	Popular American Names	NAME:
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US: MOST POPULAR and MOST COMMON NAMES

	<i>Most Common Last Name</i>	<i>Letters</i>	<i>Most Popular Boys' Names</i>	<i>Letters</i>	<i>Most Popular Girls' Names</i>	<i>Letters</i>
1	Smith		Jacob		Emily	
2	Johnson		Michael		Hannah	
3	Williams		Matthew		Madison	
4	Jones		Joshua		Ashley	
5	Brown		Christopher		Sarah	
6	Davis		Nicholas		Alexis	
7	Miller		Andrew		Samantha	
8	Wilson		Joseph		Jessica	
9	Moore		Daniel		Taylor	
10	Taylor		Tyler		Elizabeth	
11	Anderson		William		Lauren	
12	Thomas		Ryan		Alyssa	
13	Jackson		Brandon		Kayla	
14	White		John		Abigail	
15	Harris		Zachary		Brianna	
16	Martin		David		Olivia	
17	Thompson		Anthony		Emma	
18	Garcia		James		Megan	
19	Martinez		Justin		Grace	
20	Robinson		Alexander		Victoria	

Mean, Median, Mode, and Range					
	<i>MEAN (to the nearest tenth)</i>	<i>MEDIAN</i>	<i>MODE</i>	<i>RANGE</i>	<i>RANGE 2</i>
Top 10 Last Names					
Top 20 Last Names					
Top 10 Boys' Names					
Top 20 Girls' Names					
Your family*					

* Determine the M, M, M, and R for the total number of letters in the name of each person who currently lives in your house.

Activity 3-4	Popular Japanese Names	NAME:
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JAPAN: MOST POPULAR and MOST COMMON NAMES

	<i>Most Common Last Name</i>	<i>English Letters</i>	<i>Most Popular Boys' Names</i>	<i>English Letters</i>	<i>Most Popular Girls' Names</i>	<i>English Letters</i>
1	Satou 佐藤		Yuuta		Ayaka	
2	Suzuki 鈴木		Ryou		Misaki	
3	Takahashi 高橋		Daiki		Haruka	
4	Tanaka 田中		Takumi		Mai	
5	Watanabe 渡辺		Kazuki		Miki	
6	Itou 伊藤		Naoki		Rina	
7	Yamamoto 山本		Shouta		Yuka	
8	Nakamura 中村		Kenta		Natsumi	
9	Kobayashi 小林		Kouhei		Aya	
10	Katou 加藤		Ryota		Kana	
11	Yosida 吉田		Yuuki		Yui	
12	Yamada 山田		Tsubasa		Miho	
13	Sasaki 佐々木		Takuya		Ayano	
14	Yamaguchi 山口		Daichi		Haruna	
15	Matsumoto 松本		Daisuke		Nanami	
16	Saitou 斎藤		Ren		Shiori	
17	Inouoe 井上		Yuu		Akane	
18	Kimura 木村		Shou		Kaede	
19	Hayashi 林		Kou		Nana	
20	Simizu 清水		Shun		Reina	

Mean, Median, Mode, and Range					
	<i>MEAN (to the nearest tenth)</i>	<i>MEDIAN</i>	<i>MODE</i>	<i>RANGE</i>	<i>RANGE 2</i>
Top 10 Last Names					
Top 20 Last Names					
Top 10 Boys' Names					
Top 20 Boys' Names					
Top 10 Girls' Names					
Top 20 Girls' Names					
Your family*					

* Create a 4 person family: mom, dad, daughter, and son with the names above (first and last name). Determine the M, M, M, and R for the total.

Activity 3-5	“Mean” Football Players	NAME:
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On October 12, 2002, Emmitt Smith of Dallas Cowboys only needed 234 yards to replace Walter Payton, as the leading rusher of all time in NFL history. In the first five games of the season, Emmitt Smith rushed for 67, 59, 52, 58, and 70 yards. Using these five numbers find the mean, median, mode, and both ranges. At this pace when during what game would Emmitt Smith have passed Walter Payton as the all-time leading rusher?

Upcoming Games:

Sun., Oct. 13, 2002	CAROLINA PANTHERS
Sun., Oct. 20, 2002	@Arizona Cardinals
Sun., Oct. 27, 2002	SEATTLE SEAHAWKS
Sun., Nov. 3, 2002	@ Detroit Lions
Sun., Nov. 10, 2002	BYE – No game
Sun., Nov. 17, 2002	@ Indianapolis Colts
Sun., Nov. 24, 2002	JACKSONVILLE JAGUARS
Thu., Nov. 28, 2002	WASHINGTON REDSKINS
Sun., Dec. 8, 2002	SAN FRANCISCO 49ERS
Sun., Dec. 15, 2002	@ New York Giants
Sat., Dec. 21, 2002	PHILADELPHIA EAGLES
Sun., Dec. 29, 2002	@ Washington Redskins

Activity 3-6	Bar Graphs	NAME:
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Utilize the graphs provided to answer the following questions.

COVENIENCE STORES IN JAPAN		
1	Each horizontal line represents an increase of how many convenience stores?	
2	Each small horizontal tick to the right of the numbers on the left side represents how many convenience stores?	
3	About how many SUNKUS stores are in Japan?	
4	Are there more 7-11 or Circle K stores in Japan?	
5	Which store is the least common in Japan?	
6	About how many more Lawson stores are there than MINISTOP's?	
7	What is the total of FamilyMart's and am/pm stores?	
8	Which store is the most common in Japan?	
9	Which store has the closest number of stores to 8000?	
10	Which chains have less than 3000 stores?	
11	SUNKUS and Circle K merged. How many total stores do they have?	

JAPANESE CLOSENESS POLL		
1	If you add up all of the percents, what will the total be?	
2	What was the most popular answer?	
3	About what percentage of Japanese say "yes" that they feel close to the US?	
4	About what percentage of Japanese answered "not really" or "no"?	
5	What was the least popular answer?	
6	About what percentage more said "yes" than "no"?	
7	The horizontal lines each represent an increase of what percentage?	
8	In a sentence of 10 words or less summarize the results of this poll.	
9	What is the range of the data in this poll?	

Activity 3-7	Bar and Double Bar Graphs	NAME:
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Utilize the graphs provided to answer the following questions.

8TH GRADE MATH TEST SCORES		
1	Each vertical line represents an increase of what percentage on the test?	
2	Which country scored highest on this math test?	
3	What was the range of the percentages of the countries listed on this math test?	
4	Which country scored almost exactly 50% on this math test?	
5	What percent of questions did students in the USA correctly answer?	
6	What percent of questions did students in Sweden correctly answer?	
7	Did students in France or the Netherlands do better on this math test?	
8	About what percentage of questions did students in Japan miss on this test?	
9	About how much higher were the scores in France compared to England?	
10	In a sentence of 10 words or less summarize the results of this poll.	

JAPANESE TEACHERS: MALE vs. FEMALE		
1	Each horizontal line represents an increase of what decimal amount of teachers?	
2	The sum of the teachers in each category is always exactly....	
3	This graph is misleading because....	
4	The amount of elementary teachers that are male is...	
5	The amount of lower secondary teachers that are female is...	
6	Are more upper secondary teachers male or female?	
7	About what is the difference between the amount of lower secondary teachers that are male versus female?	
8	About what is the increase between male elementary and male lower secondary teachers in Japan?	
9	The range of data in this poll is...	
10	In a sentence of 10 words or less summarize the results of this poll.	

Activity 3-8	Line Graphs	NAME:
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Utilize the graphs provided to answer the following questions.

US/JAPANESE ALLY POLL		
1	Each horizontal line represents an increase of what percentage on the survey?	
2	The range of the years of the survey is...	
3	In 1993, about what percentage of people did not respond either "yes" or "no"?	
4	Which year did the greatest percentage of people respond "yes"?	
5	Which year showed the greatest increase in respondents answering "yes"?	
6	About what percentage answered "no" in 1997?	
7	If the trend continued, about what percentage would have answered "yes" in 2001?	
8	In which year were the "yes" and "no" percentages almost equal?	
9	In 1995 the difference between the "yes" and "no" answers was about...	
10	In a sentence of 10 words or less summarize these results.	

STUDENT-TEACHER RATIO IN JAPAN		
1	The student-teacher ratio was highest in the lower secondary schools in the year...	
2	In every year the student-teacher ratio is lower in which type of school?	
3	In 1980 the student-teacher ratio in the elementary schools was about...	
4	In 1985 the difference between the two student-teacher ratios was about...	
5	The student-teacher ratio was lowest in the elementary schools in the year.....	
6	The government one year passed a law requiring a lower student-teacher ratio. Which year do you believe this took place? Why?	
7	In 1970 the student-teacher ratio in the lower secondary schools was about...	
8	In 1955 the difference between the two student-teacher ratios was about...	
9	The range of data in this poll is...	
10	In a sentence of 10 words or less summarize the results of this survey.	

Activity 3-9	Circle Graphs	NAME:
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Utilize the graphs provided to answer the following questions.

US AND JAPANESE IMPORTS AND EXPORTS		
1	The largest percentage of US exports goes to which country?	
2	The largest percentage of Japanese imports come from which country?	
3	On all four circle graphs the sum of the percentages is...	
4	The US imports a total of what percentage from Japan and China?	
5	The US exports a total of what percentage to Japan and China?	
6	Japan imports a total of what percentage from the US and China?	
7	Japan exports a total of what percentage to the US and China?	
8	Which country represents the same percentage of imports to and exports from the US?	
9	Japan's exports to Taiwan represent what percentage of their total?	
10	Japan's imports from the European Union represent what percentage of their total?	
11	The US's exports to Mexico represent what percentage of their total?	
12	The US's imports from Canada represent what percentage of their total?	
13	The difference between Japan's imports from "other" countries and their export to "other" countries is...	
14	The difference between US's imports from "other" countries and their export to "other" countries is...	
15	Which two countries represent 30% of all US exports?	
16	Which two countries represent 22% of all Japanese exports?	
17	Which two countries represent 17% of all US imports?	
18	Which two countries represent 25% of all Japanese exports?	
19	Overall, it appears the US's largest trading partner is...	
20	Overall, it appears Japan's largest trading partner is...	

Activity 3-10	Circle Graphs and Pictographs	NAME:
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Utilize the graphs provided to answer the following questions.

ITEMS SOLD IN CONVENIENCE STORES IN JAPAN		
1	The #1 category of items sold in convenience stores in Japan is...	
2	Sweet breads account for what percentage of sales in convenience stores?	
3	Three items that tied with the about the same amount of sales...	
4	Beverages account for what percentage of sales in convenience stores?	
5	The percentage difference in sales of soft drinks and milk is...	
6	Magazines and side dishes account for what total percentage of sales in convenience stores in Japan?	
7	Breads account for what percentage of sales in convenience stores?	
8	The ten biggest sale categories account for what total percentage of sales?	
9	Cigarettes account for twice as much of overall sales as...	
10	In a sentence of 10 words or less summarize the results of this survey.	

STUDENTS BULLIED IN JAPAN		
11	Each symbol  represents how many students?	
12	Students are bullied in which grade the most?	
13	The range of grades in this study is...	
14	The range of bullied students in this study is...	
15	About how many 9 th grade students were bullied?	
16	About how many more 8 th graders were bullied than 6 th graders?	
17	In this study, the least amount of bullied students was in grade...	
18	About how many more 7 th graders were bullied than 5 th graders?	
19	The total amount of bullied students in grades 4 through 10 was approximately...	
20	In a sentence of 10 words or less summarize the results of this survey.	

Activity 3-11	Creating Graphs	NAME:
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Utilize the tables below as well as **graph paper** to create the suggested graphs.

1. Create a bar graph displaying the Kagoshima University data.

UNDERGRADUATE STUDENTS AT KAGOSHIMA UNIVERSITY	
Law, Economics, & Humanities	1770
Education	1160
Science	761
Medicine	820
Dentistry	360
Engineering	1960
Agriculture	1024
Fisheries	570

2. Create a line graph displaying the Nikkei Index data.

NIKKEI INDEX (JAPANESE STOCK MARKET) OVER TIME	
1980	6800
1983	13500
1986	24700
1989	38900
1992	24200
1995	18800
1998	17300
2001	11800

3. Create one graph of your choice that will display the top 6 choices of the boys and girls in an easy to read format.

ONE THOUSAND 6TH GRADERS IN JAPAN WERE ASKED: “WHAT DO YOU WANT TO BE WHEN YOU GROW UP?” (The top 6 answers for boys and girls are shown below.)				
OCCUPATION	BOYS		GIRLS	
	<i>Number</i>	<i>Rank</i>	<i>Number</i>	<i>Rank</i>
Salaried Worker	451	1	95	5
Baseball Player	127	2		
Teacher	113	3	167	2
Soccer Player	78	4		
Medical Doctor	72	5	84	6
TV Personality	65	6		
Nursery School Assistant			198	1
Cartoonist			132	3
Nurse			108	4

4. Create a circle graph using data of your choice or data provided by the teacher.

Use the following guidelines to choose the most appropriate graph to display specific data.

LINE GRAPHS

- Data is continuous
- Intermediate values have meaning

Example

- Changes in the height of a plant over time

BAR GRAPHS

- Data are not continuous
- Intermediate values have no meaning

Example

- The amount of time you spent doing homework each day

CIRCLE GRAPHS

- Parts are compared to the whole and to each other
- The circle represents the whole
- Each sector represents a proportional part or a percentage of the whole

Example

- The percent of people who prefer pepperoni, cheese, sausage, or green pepper pizza

Determine which kind of graph is the most appropriate.

1.	Show the number of students enrolled in each grade at a particular high school.	
2.	Compare the cost of a telephone call with the length of the call.	
3.	Show the number of winning games for different soccer teams during a season.	
4.	Show the depths reached by a deep sea diver during various dives.	
5.	Show the monthly sales of all the departments in a store.	
6.	Compare the increase in typing speed with the number of hours of practice.	
7.	Show the average hours of sunlight for each month during one year.	

Activity 3-13	Stem-and-Leaf Plots	NAME:
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Make a stem-and-leaf plot of each set of data.

1.	54, 50, 62, 51, 63, 70, 58, 60, 60, 70
2.	13, 22, 27, 16, 36, 7, 27, 33, 36, 36

Thirty-five students took one of Mr. Underwood's difficult tests. The scores (out of 30) were: 7, 10, 7, 10, 6, 7, 2, 9, 6, 0, 20, 10, 16, 18, 14, 10, 18, 10, 6, 18, 16, 20, 20, 24, 18, 27, 21, 12, 15, 24, 15, 12, 21, 30, and 21.

3.	Construct a stem-and-leaf plot for the data	
4.	What were the lowest and highest scores?	
5.	What was the mode score?	
6.	Make two statements about the data.	

The ages of the first thirty people into a Britney Spears concert on Friday were: 19, 21, 24, 18, 20, 20, 19, 17, 20, 23, 18, 20, 21, 20, 24, 25, 22, 21, 25, 18, 19, 20, 21, 19, 22, 23, 17, 22, 25, and 23.

7.	Construct a stem-and-leaf plot for the data	
8.	How old was the oldest person?	
9.	How young was the youngest person?	
10.	What was the median age?	
11.	What might account for the limited range of years?	

Activity 3-14	Travel Brochure	NAME:
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DISCOVERING THE WORLD!

Creating a Travel Brochure

Objective: Create a travel brochure to a well-known city including weather data and places to visit!

Resources provided: Weather data

Additional resources: Internet, books, people, anything else you can think of!

Your name should be written small on the back of the brochure in the bottom, right corner.

Your travel brochure will consist of six sections:

1. COVER – The cover of your brochure should be neat and colorful. At a minimum the cover should contain the **city name** and either some **wording** about why the city is special or a **picture** about something famous in the city.
2. LINE GRAPH OF YEARLY WEATHER – Create a line graph on grid paper (to be glued on to the construction paper) showing the average high, the average low, and the average temperature for each month of the year. The graph should contain a title, both an X and Y axis, and labels so that anyone can interpret your graph. The graph will have **three lines**.
3. TABLE CONTAINING WEATHER DATA– Create a table on grid paper (to be glued on to the construction paper) showing the following items: **the mean and median temperature, mean and median high temperature, and mean and median low temperature**. Also list the **highest and lowest temperatures** ever recorded for your city and the **annual precipitation**.
4. BAR GRAPH OF THE NUMBER OF DAYS AT CERTAIN TEMPERATURES – Create at least a **double bar graph** showing the number of days each month that your city’s temperature exceeds 90 degrees, 70 degrees, and drops below 32 degrees (the levels vary for each city – pick two).
5. STEM-AND-LEAF PLOT – Create four separate stem-and-leaf plots: one for the average temperature for every month, one for the average high every month, one for the average low every month, and one for the average precipitation per month. Be sure to include a key explaining your plot.
6. SIGHTSEEING – **List and explain** at least **5 things** that a tourist visiting your city for the first time would want to experience. Include at least one fun coupon that a visitor could use at one of your places during their visit. You will need to do some research to find real places to visit in your city or area.

BONUS ITEMS: Any information you include in brochure that you find on your own can earn you bonus points. This may include pictures about your city (possibly from the internet) or more in-depth information than is provided by the teacher. Statistics are the best – numbers, numbers, numbers about your city. Please write on a separate piece of paper what information you found and where you found it. Turn this page in with your brochure.

Round all numbers to the nearest tenth.

For all graphs be sure to include: a title, a key, and x- and y-axis labels. Make sure all components of a good graph are included for full credit!