

I. Central Tendency & Dispersion

Mean, Median, Mode & Range:

_____ is the sum of the data values divided by the number of values.

_____ is the number in the middle of a set of data values.

_____ is the value that occurs most often in a set of data values.

Example 1:

Assume that the girls' soccer team scored 0, 2, 6, 1 and 3 goals in its last five games. Find the mean, median and mode.

Example 2:

The selling prices of 5 houses in one neighborhood were \$114,000, \$150,000, \$223,000, \$198,000, and \$139,000. Which conclusion is true?

- A The mean price was about \$15,000 higher than the median price.
- B The median price was about \$15,000 higher than the mean price.
- C The mean and median prices were identical.
- D The mean price was double the median price.

_____ is a measure of dispersion that is computed by finding the difference between the highest and lowest numbers in a data set.

Example 3:

- a) Among the 30 people at a picnic, the youngest person is 3 years old, and the oldest person is 79 years old. What is the range?
- b) At another picnic, the youngest person is 10 years old and the range is 21. What can you say about the oldest person?

Example 4:

A company asked 7 employees to turn in receipts for their travel expenses. The expenses were separated into transportation (plane travel, car rental, taxi) and lodging (hotel rooms, meals).

TRAVEL EXPENSES

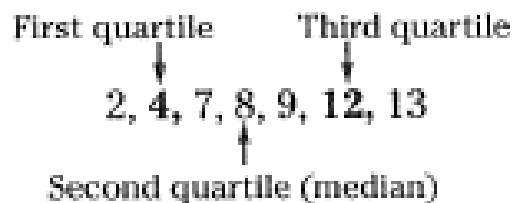
Employee	Transportation	Lodging
Watkins	\$460	\$534
Sawamura	\$912	\$350
Jensen	\$794	\$483
Stolzfus	\$329	\$311
McManus	\$409	\$612
Escobar	\$211	\$543
Chang	\$902	\$433

- A Which was more spread out, the transportation expenses or the lodging expenses? Justify your answer.
- B The company is planning to send another employee on a business trip. About how much money, in all, should the company expect the employee to spend on the trip? Explain how you determined the answer.

Quartiles and Interquartile Range

When data are divided into fourths, the divisions between the groups of data are called _____.

- The **first quartile** is the median of the lower half of the data.
- The **second quartile** is the median of all of the data.
- The **third quartile** is the median of the upper half of the data.
- The **interquartile range** is the range between the third and first quartiles.



The interquartile range is $12 - 4 = 8$.

The quartiles and interquartile range lead to various statements that can be made about data:

- Roughly one-fourth of data fall below the first quartile.
- Roughly one-fourth of data fall above the third quartile.
- Roughly one-half of data (the middle 50%) fall between the first and third quartiles.
- The interquartile range is a measure of how spread out the middle 50% of the data are.

Example 5:

A scientist recorded the temperature, in degrees Celsius, in 12 different parts of a rainforest. Her results are shown below.

11, 14, 12, 15, 8, 16, 21, 10, 11, 17, 13, 10

What is the interquartile range, in degrees Celsius, of the temperatures?

- A 0.5 B 2.0 C 4.5 D 5.0

Practice:

Read each problem. Circle the letter of the best answer.

1. A marine biologist weighed sea otters. The results are shown below.

SEA OTTER WEIGHTS

Sea Otter	Weight (pounds)
1	70.1
2	99.0
3	85.9
4	79.4
5	73.8
6	62.7

What is the median sea otter weight?

- A 76.6 pounds
B 78.5 pounds
C 79.4 pounds
D 82.7 pounds

2. The scores Terrence got in the last ten video games he played are listed below.

400 900 -250 -150 500
650 1,200 -100 1,350 950

What is the range of these scores?

- A 1,100
B 1,200
C 1,500
D 1,600

3. The table below shows the area, in square miles, of 11 U.S. territories.

U.S. TERRITORIES

Territory	Area (sq mi)
Puerto Rico	3,515
Guam	212
U.S. Virgin Islands	136
American Samoa	77
Northern Mariana Islands	184
Midway Islands	2
Wake Island	3
Johnston Atoll	1
Baker, Howland, and Jarvis Islands	1
Kingman Reef	1
Navassa Island	2

What is the third quartile of the data shown?

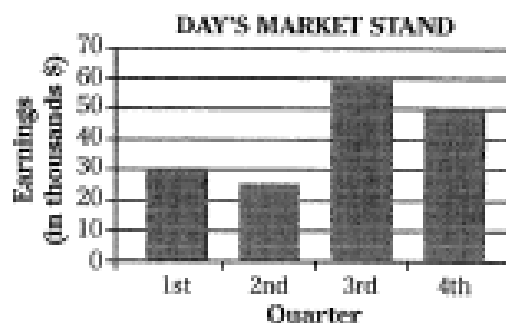
- A 136 square miles
 B 145 square miles
 C 184 square miles
 D 212 square miles
4. Eight judges rated a movie on a scale of 1 to 10. Their ratings are given below.

6, 8, 9, 10, 6, 9, 9, 8

What was the mode of the ratings?

- A 4
 B 6
 C 8
 D 9

5. This bar graph shows how much Day's Market Stand earned in 2012.



What is the mean amount Day's Market Stand earned per quarter in 2012?

- A \$38,000
 B \$41,250
 C \$44,500
 D \$49,000

6. The prices of the five most popular big screen television sets at an electronics store are listed below.

\$2,499 \$1,359 \$2,299
 \$2,999 \$1,789

If the price of the next most popular television set is included with this data, the range in prices increases by \$800. What could be the price of the next most popular television set?

- A \$2,159
 B \$2,199
 C \$3,799
 D \$3,859

7. Javier's scores in 7 basketball games are shown below.

18, 15, 20, 14, 12, 17, 18

Javier has one more game, and he wants to average 17 points for all 8 games. How many points does he need to score in his last game?

- A 14
- B 17
- C 20
- D 22

8. The hourly pay rates of employees at a bookstore are listed below.

\$7.15	\$7.50	\$7.50	\$7.75
\$7.90	\$8.00	\$8.00	\$8.00
\$8.25	\$8.60	\$8.80	\$9.00
\$9.00	\$10.20	\$11.00	\$11.15
\$11.75	\$16.00	\$16.75	\$19.25

Which statement is **best** supported by this data?

- A One-fourth of the employees have an hourly pay rate less than \$7.95.
- B Half of the employees have an hourly pay rate between \$8.00 and \$9.60.
- C One-fourth of the employees have an hourly pay rate greater than \$11.15.
- D Half of the employees have an hourly pay rate between \$8.85 and \$19.25.

9. The median age of cars on a used car lot is 4 years. The interquartile range of the cars' ages is 7 years. Which statement is most likely to be true?

- A About 25% of the cars will be less than 4 years old.
- B About 25% of the cars will be more than 4 years old.
- C About 50% of the cars will be between 4 and 7 years old.
- D About 75% of the cars will be less than 8 years old.

10. Omer counted the number of characters in 60 text messages and recorded the data. He found that the lower quartile of the data was 31, the median was 55, and the upper quartile was 96. Which is the best estimate of the number of text messages that had between 31 and 55 characters?

- A 15
- B 24
- C 30
- D 45

II. Predictions from Data

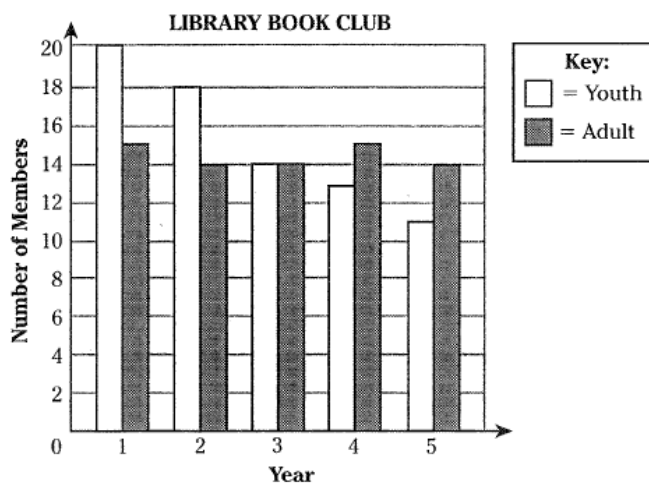
Predictions Based on Trends

Data samples and trends found from data are often used to predict outcomes of larger populations or of future events. For example, this graph shows the amount of sales a company earned each year they were in business. This data can be used to predict the amount of sales they might expect to earn one year, two years, or five years into the future. From the trend in this data, a reasonable prediction might be that this company can expect to earn about \$1,000,000 in sales by year 7.



Example 1:

The library formed a youth book club and an adult book club 5 years ago. The number of members in each book club is shown in the bar graph below.



Assuming the trend in number of members in each book club continues, about how many total members would be expected in both book clubs by year 6?

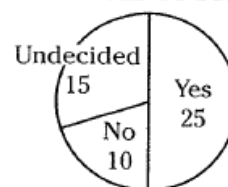
- A 8 B 14 C 22 D 28

Predictions Based on Probability

Predictions can be made on populations of data by finding probabilities of events occurring in samples. For example, the circle graph at right shows the responses of 50 people to a survey question.

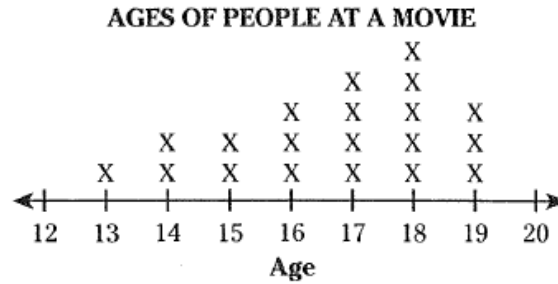
The numbers tell you how many people chose *yes*, *no*, or *undecided*. There are 50 total responses and 15 out of 50, or 0.3, are *undecided*. This is the relative frequency. Therefore, if the survey is conducted with 600 people, you can predict that the number of people who are undecided would be $0.3 \times 600 = 180$ people.

RESPONSES TO SURVEY



Example 2:

The line plot below shows the ages of a sample of people at a movie theater.



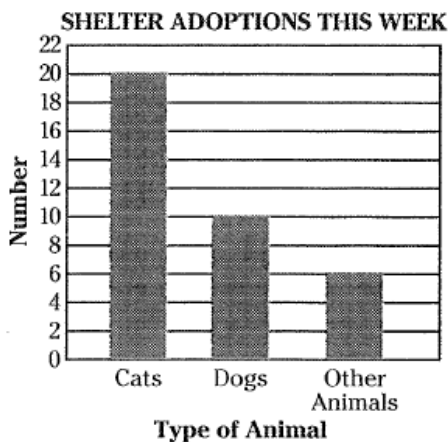
If there are 280 people in the theater, which prediction about the audience would you expect to be true?

- A 50% will be younger than 16.
- B 50% will be older than 18.
- C About 70 people will be from 13 to 16 years old.
- D About 210 people will be from 16 to 19 years old.

Practice:

Read each problem. Circle the letter of the best answer.

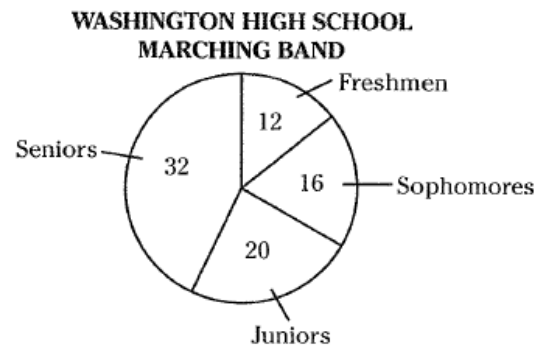
1. The bar graph below shows the numbers of different kinds of animals adopted from a shelter one week.



If 50 animals are adopted next week, which is the **best** estimate of the number of dogs that will be adopted?

- A 10
- B 14
- C 20
- D 28

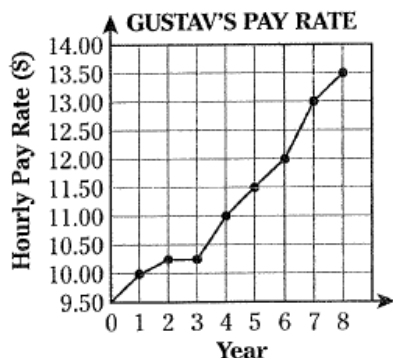
2. The circle graph below shows the number of students at each grade level in one high school marching band.



Hoshi is in the marching band. What is the likelihood that she is a senior?

- A 32%
- B 40%
- C 52%
- D 68%

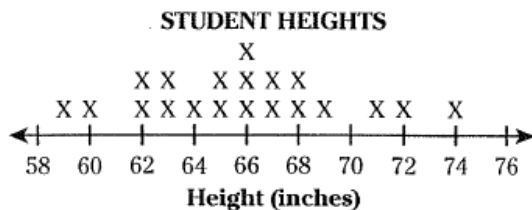
3. The line graph below shows how Gustav's hourly rate of pay changed during the past eight years.



If Gustav stays in this job 10 years, what can he expect his hourly rate to be?

- A \$13.50
- B \$14.00
- C \$14.50
- D \$15.00

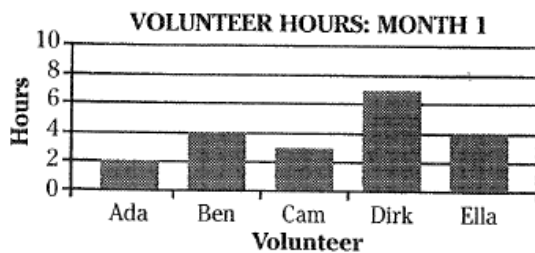
4. The line plot shows the heights of 20 randomly selected students at a high school.



There are a total of 1,200 students at the high school. Which statement is the most reasonable conclusion from the data?

- A Approximately 300 students at the school are 63 inches tall.
- B Approximately 600 students at the school are 66 inches tall.
- C Approximately 300 students at the school are more than 66 inches tall.
- D Approximately 900 students at the school are more than 63 inches tall.

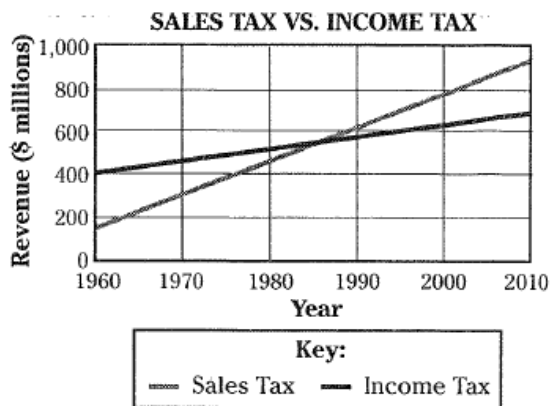
5. Five students volunteer for a service project. The bar graph below shows the hours each student put in during the first month.



The project will continue for a total of 5 months. If the data in the graph is representative, how many more hours will Dirk have volunteered during the project than Ada?

- A 10
- B 15
- C 25
- D 35

6. The line graph shows the revenue from sales tax and income tax in one state over time.



Which is the **best** estimate of the expected difference between revenue from sales tax and income tax in 2020?

- A \$90 million
- B \$200 million
- C \$300 million
- D \$400 million

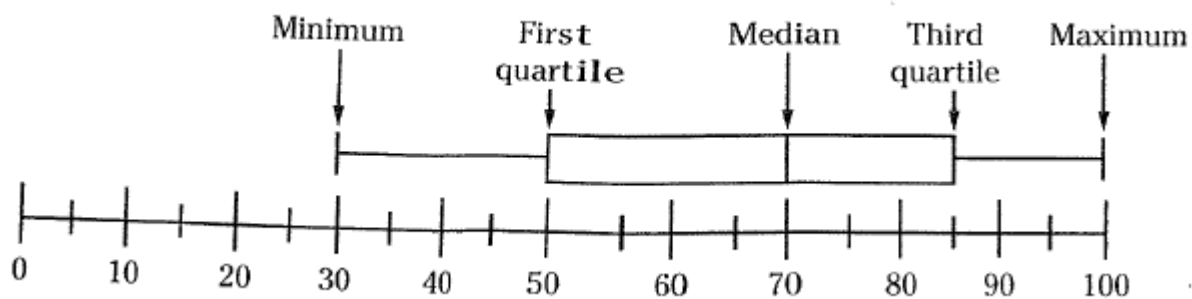
III. Representations of Data

Box and Whisker Plots

Quartiles are used to create Box and Whisker Plots.

- _____ is the left most whisker.
- _____ is the left edge of the box.
- _____ (or second quartile) is the middle line in the box.
- _____ is the right edge of the box.
- _____ is the right most whisker.

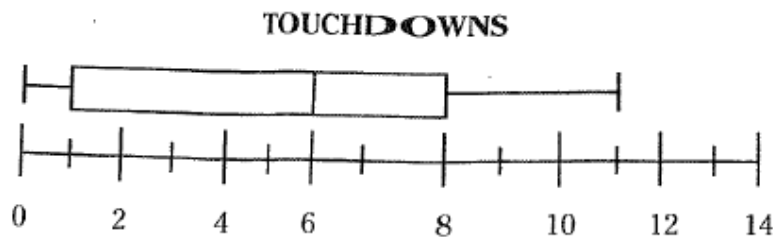
Example 1: What is the median and interquartile range?



Median: _____ first quartile: _____ third quartile: _____ interquartile range: _____

Example 2:

The box-and-whisker plot below shows the number of touchdowns scored each year by a football player.

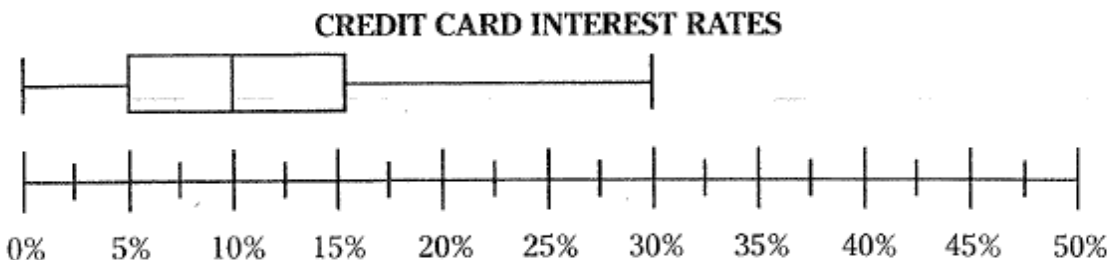


What was his median number of touchdowns?

- A 1 B 6 C 8 D 11

Example 3:

The box-and-whisker plot below shows the interest rates charged by credit card companies.



A Estimate the median interest rate charged by credit card companies. Explain how you found your answer.

B A credit card company that charges 6% interest claims that their rates are lower than 75% of all other credit card companies. Is this claim correct? Use mathematics to justify your answer.

Stem and Leaf Plots

To make a stem and leaf plot, the left digit or digits of all data values are lined up in the “_____” of the plot. The right digit of each individual data is placed in the corresponding “_____” of the stem.

For example, the ages of cast members in a play are 19, 35, 16, 24, 22, 37, 60, 34, 57, and 19. The stem-and-leaf plot shown here organizes these data values. Notice that the tens digits are the stem in this plot, and the individual ones digits are the leaves.

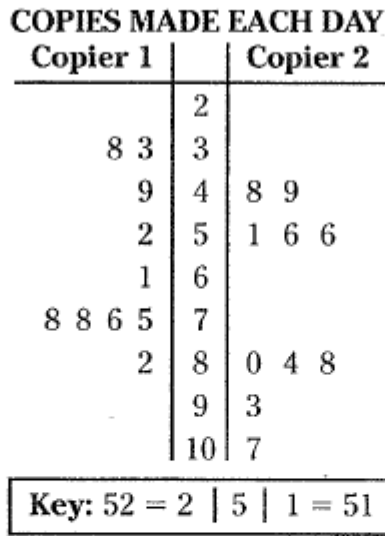
AGES OF CAST MEMBERS

1	6 9 9
2	2 4
3	4 5 7
4	
5	7
6	0

Key: 1 | 6 = 16

Example 4:

The stem-and-leaf plot below shows the number of copies made on the two copiers in the school library during a two-week period.

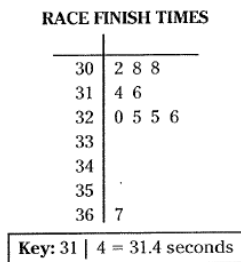


Which statement can be concluded from this data?

- A The range for copier 1 is greater than the range for copier 2.
- B The range for copier 2 is greater than the range for copier 1.
- C The median for copier 1 is greater than the median for copier 2.
- D The median for copier 2 is greater than the median for copier 1.

Practice:

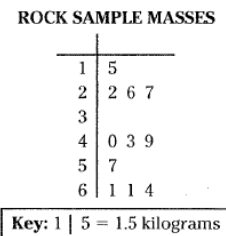
9. The stem-and-leaf plot below shows the finish times, in seconds, of the top ten runners in a race.



Which statement about the race times on the plot is true?

- A The range of times is less than 6 seconds.
- B The median time is exactly 1 second greater than the first quartile time.
- C The third quartile time is more than 1 second greater than the median.
- D The interquartile range of the times is more than 2 seconds.

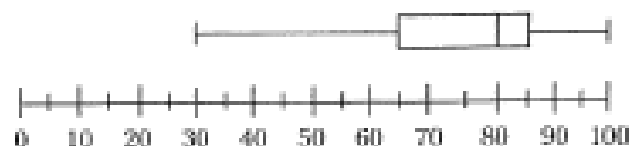
10. A geologist recorded the masses of some rock samples in the stem-and-leaf plot below.



Based on the data, which statement is most accurate?

- A About 25% of the masses are less than 3 kilograms.
- B About 50% of the masses are less than 4 kilograms.
- C About 50% of the masses are between 2 and 6 kilograms.
- D About 75% of the masses are less than 6 kilograms.

1. The algebra test scores from Ms. Grange's class are shown in the box-and-whisker plot below.



What is the interquartile range of the algebra test scores?

- A 5
B 15
C 20
D 25
2. Luke has 40 folders of digital pictures on his computer. The number of digital pictures in each folder is shown in the stem-and-leaf plot below.

DIGITAL PICTURES PER FOLDER

0	
1	3 5 6 6 8
2	5 5 7
3	0 2 4 4 4 8 8
4	4 6 7 8 8
5	0 0 2 2 2 2 5 7 9 9
6	1 3 4 4 5 5
7	0 2 4
8	5

Key: 1 | 3 = 13 pictures

What is the median number of digital pictures Luke has stored per folder?

- A 34
B 49
C 52
D 72

3. The stem-and-leaf plot below shows the length, in minutes, of each movie playing at the local theater complex this week.

MOVIE LENGTHS

8	8
9	3 4 7 9
10	0 8
11	2 5 6 8 8
12	0 4 5
13	3

Key: 8 | 8 = 88 minutes

Which statement about the data is true?

- A The first quartile is 97.
B The second quartile is 113.
C The third quartile is 119.
D The interquartile range is 22.
4. Zoe gathered information on annual car insurance rates in her area. These data are shown in the box-and-whisker plot below.

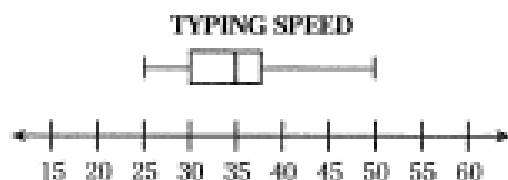
ANNUAL CAR INSURANCE RATES (\$)



Which amount is closest to the interquartile range of these rates?

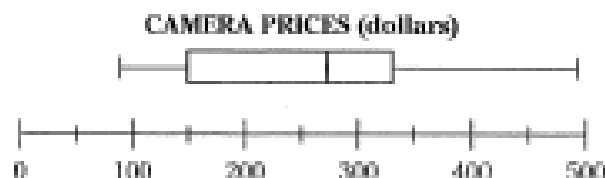
- A \$300
B \$525
C \$675
D \$950

5. The box-and-whisker plot below shows the typing speed, in words per minute, of the students in Mr. Panko's typing class at the beginning of the year.



Based on this plot, which of the following statements must be true?

- A Exactly one student types 35 words per minute.
 - B Exactly one student types 37 words per minute.
 - C Half of the students type 35 words per minute or less.
 - D Half of the students type 37 words per minute or less.
6. The box-and-whisker plot shows the distribution of prices for 25 digital cameras for sale at an electronics store.



Which is the **best** estimate for the median of the data?

- A \$200
- B \$225
- C \$275
- D \$300

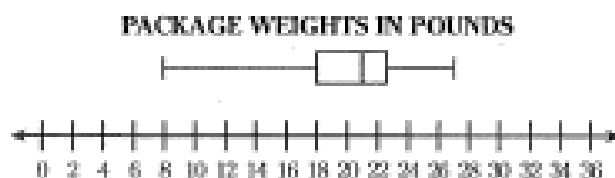
7. Jason and Stephen went fishing. The stem-and-leaf plot shows the lengths of the fish each boy caught.

FISH LENGTHS		
Jason		Stephen
8 5 2	1	4 7
3 3	2	0 6 8
	3	2 5
0	4	

Key: 12 cm = 2 | 1 | 4 = 14 cm

According to the data, if one more fish is caught, what is the probability it will be more than 30 centimeters long?

- A $\frac{2}{7}$
 - B $\frac{3}{10}$
 - C $\frac{2}{13}$
 - D $\frac{3}{13}$
8. The box-and-whisker plot below shows the weight, in pounds, of each package a shipping company delivered one day.



Which statement is **best** supported by the data in the box-and-whisker plot?

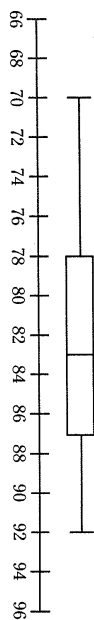
- A The median package weight was about 21 pounds.
- B The range in package weights was about 27 pounds.
- C More than half the packages weighed less than 18 pounds.
- D About one-fourth of the packages weighed between 21 and 27 pounds.

Unit 7

Constructed-Response Review

Read the problem. Write your answer for each part.

- I. The box-and-whisker plot below shows students' scores on a practice driving test.



- A What is the range of the scores?

Answer: _____

- B What is the interquartile range?

Answer: _____

- C If the plot represents 64 students, about how many scored above the third quartile?

Answer: _____

- D A passing score is 80. Explain how you know whether or not 50% of the students passed the test.

Read the problem. Write your answer for each part.

2. Isaac's bowling scores for April are shown below. His mean score after all five games was 221.

ISAAC'S BOWLING SCORES

Game	1	2	3	4	5
Score	225	245	222	230	?

- A What was Isaac's score in game 5?

Answer: _____

- B What was Isaac's median score for the five games?

Answer: _____

- C Isaac bowls a sixth game and his median score changes to 227. What is Isaac's score on the sixth game?

Answer: _____

- D Explain how you know your answer to part C is correct.

Read the problem. Write your answer for each part.

3. Brittney randomly selected 30 cars in a parking lot and determined each car's year of manufacture. She made this stem-and-leaf plot to show the results.

CARS IN PARKING LOT—YEAR OF MANUFACTURE

197	1
198	2 6
199	3 4 5 5 7 7 8 9 9
200	1 2 4 5 5 6 7 7 8 9 9
201	0 0 1 1 2 2 2

Key: 197 | 1 = 1971

- A There are about 70,000 cars in the city where Brittney lives. According to Brittney's data, about how many of the cars in her city were manufactured before the year 2000?

Answer: _____

- B Find the lower quartile and upper quartile of the data.

Answer: _____

- C About how many of the cars in Brittney's city were manufactured between the years you found in **part B**?

Answer: _____

- D Explain how you found your answer to **part C**.