Unit 1 Review
Name\_\_\_\_\_

MULTIPLE CHOICE. Choose the one alternat	tive that best completes the statement or answers the qu	uestion.
1) In a Normal model, what percent of data is be	tween –1 and +2 standard deviations of the mean?	1)
A) It depends upon the standard deviation.	B) 68	
C) 81.5	D) 95	
2) Which of these variables is most likely to follo	w a Normal model?	2)
A) eye color		
B) number of cigarettes smoked daily		
C) hours of homework last week		
D) head circumference		
E) number of TV sets at home		
3) Suppose that a Normal model describes the ac z-score of 1.8. This means that the acidity of that	idity (pH) of rainwater, and that water tested after last w rain 3)	eek's storm had a
A) varied with a standard deviation of 1.8		
B) had a pH 1.8 standard deviations higher than	that of average rainwater.	
C) had a pH of 1.8.		
D) had a pH 1.8 higher than average rainfall.		
E) had a pH 1.8 times that of average rainwater.		
4) In a Normal model, what percent of data is be	tween -1 and +1 standard deviations of the mean?	4)
A) 68 B) 95		
C) It depends upon the standard deviation.	D) 99.7	
5) We collect these data from 50 male students. V	Vhich variable is categorical?	5)
A) eye color		
B) number of TV sets at home		
C) hours of homework last week		
D) number of cigarettes smoked daily		
E) head circumference		
6) Which of these variables is most likely to be bi	modal?	6)
A) hours of homework last week		
B) eye color		
C) number of TV sets at home		
D) head circumference		
E) number of cigarettes smoked daily		
7) The mean number of hours worked for the 30	males was 6, and for the 20 females was 9. The overall m	ean number of
hours worked		7)
A) is 6.5		
B) cannot be determined.		
C) is 7.5		
D) is 7.2		

E) is none of these.

8) Which of the following variables would mostly likely follow a Normal model?

A) weights of small orders of French fries at a local fast food restaurant

B) selling prices of houses in Arizona

C) family income

D) scores on an easy test

9) Suppose that a Normal model described student scores in a history class. Parker has a standardized score (*z*-score) of +2.5. This means that Parker's score 9) \_\_\_\_\_

A) is 2.5 times the class average.B) is 2.5 points above the class average.C) has a standard deviation of 2.5.D) is 2.5 standard deviations above the class average.

10) Suppose that a Normal model describes the number of pages printer ink cartridges last. A certain cartridge has a standardized score (z-score) of 0.2. What does this mean regarding this cartridge? 10) \_\_\_\_\_

A) It produced 0.2 more pages than the average cartridge.

B) It produced 20% more pages than the average cartridge.

C) It produced a number of pages equal to 0.2 standard deviations.

D) It produced 0.2 standard deviations pages more than average.

11) Suppose that a Normal model describes fuel economy (miles per gallon) for automobiles and that a certain model has a standardized score (z-score) of +2.2. What does this mean regarding this model's gas mileage? 11)

A) It is 2.2 miles per gallon.

- B) It is 2.2 mpg better than the average car.
- C) It has a standard deviation of 2.2 mpg.

D) It is 2.2 times the gas mileage of the average car.

E) It is 2.2 standard deviations better than the average car.

12) We collect these data from 50 male students. Which variable is most likely to follow a Normal model? 12)

A) Number of TV sets at home.

B) eye color

- C) Hours of homework last week
- D) Head circumference
- E) Number of cigarettes smoked daily

13) Which is true of the data whose distribution is shown?

- I. The distribution is skewed to the right.
- II. The mean is probably smaller than the median.
- III. We should summarize with mean and standard deviation.



13) \_\_\_\_\_

A) II only B) I and II C) II and III D) I, II and III E) I only

14) Suppose that a Normal model described student scores in a history class. Parker has a standardized score (*z*-score) of +2.5. This means that 14)\_\_\_\_\_

A) Parker scored 2.5 points above the class average.

B) Parker's score is fairly typical compared to his class.

C) Parker scored 2.5 standard deviations above the class average.

D) the scores have a standard deviation of 2.5.

15) The heights of Dutch men have a mean of 184 cm and standard deviation of 8 cm. The heights of French men have a mean of 174 cm and a standard deviation is 7.1 cm. Which of the following back to back histograms best represent these heights? 15)



16) Which is true about the weights of people shown in these parallel boxplots?



16) \_\_\_\_\_

A) The third quartile of group 1 is less than the median of group 2

B) The IQR of group 1 is less than the IQR of group 2

C) The weights in group 2 are skewed to the left.

D) Each person in group 2 is heavier than those in the lighter half of group 1

17) The standard deviation of the data displayed in this dotplot is most likely to be ...



A) I only B) none C) II only

- D) II and III
- E) I, II, and III

20) Which are the best statistics to use to describe the center and spread of data in this histogram?



A) center: median; spread: IQR

B) center: median; spread: standard deviation

C) center: standard deviation; spread: mean

D) center: mean; spread: IQR

E) center: mean; spread: Standard deviation

F) center: median; spread: range

## SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

22) The boxplots show the age of people involved in accidents according to their role in the accident.

20) \_\_\_\_\_



- a. Which role involved the youngest person, and what is the age?
- b. Which role had the lowest median age, and what is the age?
- c. Which role had smallest range of ages, and what is it?
- d. Which role had the largest IQR of ages, and what is it?
- e. Which role generally involves the oldest people? Explain.

Here is the number of grams of sugar in a serving of the some of the breakfast cereals approved by the North Carolina Woman's Infant and Children (WIC) program.

(http://www.communityhealth.dhhs.state.nc.us/dental/ed\_resources/Sugar\_In\_Cereal.pdf)

13	9	1
14	17	13
9	3	5
1	13	4
13	12	13
11	9	5
6	12	6
10	12	8
14	16	0
13	18	16

23) Describe the distribution of sugar content in these cereals.

24) A survey conducted in a college intro stats class asked students about the number of credit hours they were taking that quarter. The number of credit hours for a random sample of 16 students is given in the table.

10 10 12 14 15 15 15 15 17 17 19 20 20 20 20 22

Suppose that the student taking 22 credit hours was actually taking 28 credit hours instead of 22 (so we would replace the 22 in the data set with 28). Indicate whether changing the number of credit hours for that student would make each of the following summary statistics increase, decrease, or stay about the same:

- a: mean
- b: median
- c: range
- d: IQR
- e. standard deviation

Here again are the results from the January 2007 Gallup poll example from your textbook regarding what respondents were most looking forward to seeing during the upcoming Super Bowl.

	Male	Female	Total
Game	279	200	479
Commercials	81	156	237
Won't watch	132	160	292
Total	492	516	1008

25) Find the marginal distribution of sex.

26) What percent of those who were looking forward to watching commercials were males?

27) The heights of Dutch men have a mean of 184 cm and standard deviation of 8 cm. The heights of French men have a mean of 174 cm and a standard deviation is 7.1 cm. Who is taller compared to males in their country, a French man who is 194 cm tall or a Dutch man who is 204 cm tall? Explain.

28) One thousand students from a local university were sampled to gather information such as gender, high school GPA, college GPA, and total SAT scores. The results were used to create histograms displaying high school grade point averages (GPA's) for both males and females.



Imagine there was an error in the GPA calculations so that every student's GPA was actually 0.2 points less. Describe what would measures of center and spread would change and what would NOT change if the histograms above were redrawn with the corrected data.

Here is a stem and leaf plot of the number of grams of sugar in a serving of the 109 breakfast cereals approved by the North Carolina Woman's Infant and Children (WIC) program.

(http://www.communityhealth.dhhs.state.nc.us/dental/ed\_resources/Sugar\_In\_Cereal.pdf)

```
Variable: sugar(g)
```

29) Describe (in context, of course) what the underlined 1 on the third line of the stem and leaf plot represents.

30) Here are the salaries in thousands of dollars for the employees of two small companies.

Company		Salaries								mean	sd	
A	36	37	44	44	46	47	49	50	50	51	45.4	5.30
В	50	51	53	53	56	56	57	58	58	62	55.4	3.66

a. Why is it appropriate to use the mean and standard deviation to describe these distributions?

b. Who is paid more in relation to their company's payroll, the highest paid employee of company A or the highest paid employee of company B? Justify your choice.

Assume human body temperatures taken via the ear follow a Normal model with a mean of 98.7°F and standard deviation of 0.7°F. Sketch, label, and shade a Normal model and show your work.

31) An ear temperature of 97° F or less may indicate hypothermia (low body temperature). What percent of people have ear temperatures that may indicate hypothermia?

Here again are the results from the January 2007 Gallup poll example from your textbook regarding what respondents were most looking forward to seeing during the upcoming Super Bowl.

	OCA			
	Male	Female	Total	
Game	279	200	479	
Commercials	81	156	237	
Won't watch	132	160	292	
Total	492	516	1008	

32) Describe these W's for this data:

Who:	
What:	
When:	
Why:	 -

Assume human body temperatures taken via the ear follow a Normal model with a mean of 98.7°F and standard deviation of 0.7°F. Sketch, label, and shade a Normal model and show your work.

33) You take your ear temperature and find it to be 97.9° F. Is your temperature unusual compared to what is described by the Normal model? Use statistics to explain:

35) Match each description with its term. You may end up using a term from the pool more than once or not at all.

	Word Pool	
Mean	Standard Deviation	IQR (Interquartile Range)
Median	Range	Third quartile
Mode		First quartile

——A good choice for describing the center of skewed data

\_\_\_\_\_Compares the extremes of the data.

\_\_\_\_\_Summarizes how far each data value is from the average of the data

\_\_\_\_\_Splits a histogram into halves.

\_\_\_\_\_Describes the center of symmetric data better than it describes the center of skewed data.

\_\_\_\_\_Summarizes the spread of the central 50% of the data.

——Where the peaks of a histogram are.

Here again are the results from the January 2007 Gallup poll example from your textbook regarding what respondents were most looking forward to seeing during the upcoming Super Bowl.

	OCA			
	Male	Female	Total	
Game	279	200	479	
Commercials	81	156	237	
Won't watch	132	160	292	
Total	492	516	1008	

36) What percent of those who were looking forward to watching commercials were males?

Here is a boxplot of the heights in inches of a group of people at a family reunion. (Uncle Marty is measuring everyone's height as they arrive-he's kind of strange that way.)



37) Uncle Marty now discovers that the beginning of his tape measure is broken off, so he actually has been recording heights that are 1.5 inches greater than they really are. If he now subtracts 1.5 inches from everyone's height, how will each summary statistic change when compared to the original data?

	Decreases by 1.5	No change	Different change (describe)
Min		5.0 C	
Q1	6 		
Median			
Q3			
Max			
Range	6 		
IQR			
Mean	6 2		
StdDev			

39) Use the 1.5 IQR Outlier Rule of Thumb to describe possible outliers.



Has the percentage of young girls drinking milk changed over time? The following table is consistent with the results from "Beverage Choices of Young Females: Changes and Impact on Nutrient Intakes" (Shanthy A. Bowman, Journal of the American Dietetic Association, 102(9), pp. 1234–1239).

Nationwide Food Survey Years 1987-1988 1989-1991 1994-1996 Total **Drinks Milk** 354 502 366 1222 Yes 226 927 No 335 366

837

40) Find the following. Show your work.

580

Total

a. What percent of the young girls reported that they drink milk?

b. What percent of the young girls were in the 1989–1991 survey?

c. What percent of the young girls who reported that they drink milk were in the 1989–1991 survey?

2149

d. What percent of the young girls in 1989–1991 reported that they drink milk?

732

41) Describe these W's for this study.

Who:	
What:	
When:	
How:	

Here is the number of grams of sugar in a serving of the some of the breakfast cereals approved by the North Carolina Woman's Infant and Children (WIC) program.

(http://www.communityhealth.dhhs.state.nc.us/dental/ed\_resources/Sugar\_In\_Cereal.pdf)

13	9	1
14	17	13
9	3	5
1	13	4
13	12	13
11	9	5
6	12	6
10	12	8
14	16	0
13	18	16

42) Do you expect the mean amount of sugar to be greater than, less than, or about equal to the median? Explain.

43) Here are the ages of the last 15 Presidents of the United States at their first inauguration. Find the five number summary of this set of data and describe what each number tells you about the data.

51, 54, 51, 60, 62, 43, 55, 56, 61, 52, 69, 64, 46, 54, 47

5 Number Summary	Value	Describe in Context
Minimum		
First Quartile		
Median		
Third Quartile	31 34	
Maximum		

Here again are the results from the January 2007 Gallup poll example from your textbook regarding what respondents were most looking forward to seeing during the upcoming Super Bowl.

	Sex			
	Male	Female	Total	
Game	279	200	479	
Commercials	81	156	237	
Won't watch	132	160	292	
Total	492	516	1008	

44) Sketch a rough pie chart to represent the responses of the Females only. Label your chart completely.



45) Here are the ages of the last 15 Presidents of the United States at their first inauguration, listed from youngest to oldest. Examine this histogram of the ages. Is it appropriate to use mean and standard deviation to describe this distribution? Why or why not?

43, 46, 47, 51, 51, 52, 54, 54, 55, 56, 60, 61, 62, 64, 69



47) The heights of Dutch men have a mean of 184 cm and standard deviation of 8 cm. The heights of French men have a mean of 174 cm and a standard deviation is 7.1 cm.

- a. Describe the similarities and differences of histograms of these distributions.
- b. Who is taller compared to males in their country, a French man who is 194 cm tall or a Dutch man who is 204 cm tall? Explain:

48) A machine that fills cans with soda fills according to a Normal model with mean 12.1 ounces and standard deviation 0.05 ounces. Show work for each question.

- a. If the cans claim to have 12 ounces of soda each, what percent of cans are under-filled?
- b. What does it mean in this context to change the standard deviation?

To determine if people's preference in dogs had changed in the recent years, organizers of a local dog show asked people who attended the show to indicate which breed was their favorite. This information was compiled by dog breed and gender of the people who responded. The table summarizes the responses.

	Female	Male	Total
Yorkshire Terrier	73	59	132
Dachshund	49	47	96
Golden Retriever	58	33	91
Labrador	37	41	78
Dalmatian	45	28	73
Other breeds	86	67	153
Total	348	275	623

49) State the marginal distribution of breeds.

Here again are the results from the January 2007 Gallup poll example from your textbook regarding what respondents were most looking forward to seeing during the upcoming Super Bowl.

	Male	Female	Total
Game	279	200	479
Commercials	81	156	237
Won't watch	132	160	292
Total	492	516	1008

51) Express the data as percentages for females for each response. The first one has been done for you.

		Females
e	Game	200/516 = <u>38.8%</u>
espons	Commercials	
×	Won't watch	
	Total	100%

Here is a stem and leaf plot of the number of grams of sugar in a serving of the 109 breakfast cereals approved by the North Carolina Woman's Infant and Children (WIC) program.

(http://www.communityhealth.dhhs.state.nc.us/dental/ed\_resources/Sugar\_In\_Cereal.pdf)

Variable: sugar(g)

56) Describe the shape, center and spread of these data (again, in context!)

Here again are the results from the January 2007 Gallup poll example from your textbook regarding what respondents were most looking forward to seeing during the upcoming Super Bowl.

	Sex		
	Male	Female	Total
Game	279	200	479
Commercials	81	156	237
Won't watch	132	160	292
Total	492	516	1008

57) Describe the W's for this data.

To determine if people's preference in dogs had changed in the recent years, organizers of a local dog show asked people who attended the show to indicate which breed was their favorite. This information was compiled by dog breed and gender of the people who responded. The table summarizes the responses.

Female	Male	Total
73	59	132
49	47	96
58	33	91
37	41	78
45	28	73
86	67	153
348	275	623
	Female           73           49           58           37           45           86           348	Female         Male           73         59           49         47           58         33           37         41           45         28           86         67           348         275

58) Fill in the W's for this information.

Who:	
What:	

How: \_\_\_\_\_ Why: \_\_\_\_\_

59) The students in a biology class kept a record of the height (in centimeters) of plants for a class experiment.

	C1			0.
49	67	38	55	62
54	36	41	56	43
48	75	44	60	48
52	48	53	59	32

a. Sketch a histogram for these data.

b. Find the mean and standard deviation of the plant heights.

- c. Is it appropriate to use the mean and standard deviation to summarize these data? Explain.
- d. Describe the association of plant heights.

Assume human body temperatures taken via the ear follow a Normal model with a mean of 98.7°F and standard deviation of 0.7°F. Sketch, label, and shade a Normal model and show your work.

60) What percent of people have ear temperatures that are 1 or more degrees greater than the mean?

61) A survey conducted in a college intro stats class asked students about the number of credit hours they were taking that quarter. The number of credit hours for a random sample of 16 students is given in the table.

10 10 12 14 15 15 15 15 17 17 19 20 20 20 20 22

- a. Sketch a histogram of these data.
- b. Find the mean and standard deviation for the number of credit hours.
- c. Find the median and IQR for the number of credit hours.
- d. Is it more appropriate to use the mean and standard deviation or the median and IQR to summarize these data? Explain.

62) Here are the ages of the last 15 Presidents of the United States at their first inauguration, listed from youngest to oldest. Find the five number summary of this set of data and describe what each number tells you about the data.

43, 46, 47, 51, 51, 52, 54, 54, 55, 56, 60, 61, 62, 64, 69

5 Number Summary	Value	Describe in Context
Minimum		
First Quartile		
Median		
Third Quartile		
Maximum		

At a family reunion, Uncle Marty is measuring everyone's height in inches as they arrive-he's kind of strange that way. 63) Think about how each of the following summary statistics of Uncle Marty's height data would change if he converted each measurement to centimeters by multiplying by 2.54. For each statistic, check "multiplied by 2.54", "no change" or, if it changes some other way, describe that change.

	Multiplied by 2.54	No change	Different change (describe)
Min		104 C	
Q1			
Median			
Q3	9		
Max			
Range			
IQR			
Mean			
StdDev			

64) Here are the ages of the last 15 Presidents of the United States at their first inauguration. Is it appropriate to use mean and standard deviation to describe this distribution? Why or why not?

51, 54, 51, 60, 62, 43, 55, 56, 61, 52, 69, 64, 46, 54, 47

65) Sketch a boxplot to match the data displayed in this histogram and justify your work.



66) Describe where to look for outliers for each set of data below.



67) The heights of Dutch men have a mean of 184 cm and standard deviation of 8 cm. The heights of French men have a mean of 174 cm and a standard deviation is 7.1 cm. Who is taller compared to males in their country, a French man who is 194 cm tall or a Dutch man who is 204 cm tall? Explain.

68) Adult female Dalmatians weigh an average of 50 pounds with a standard deviation of 3.3 pounds. Adult female Boxers weigh an average of 57.5 pounds with a standard deviation of 1.7 pounds. One statistics teacher owns an underweight Dalmatian and an underweight Boxer. The Dalmatian weighs 45 pounds, and the Boxer weighs 52 pounds. Which dog is more underweight? Explain using statistics.

To determine if people's preference in dogs had changed in the recent years, organizers of a local dog show asked people who attended the show to indicate which breed was their favorite. This information was compiled by dog breed and gender of the people who responded. The table summarizes the responses.

	Female	Male	Total
Yorkshire Terrier	73	59	132
Dachshund	49	47	96
Golden Retriever	58	33	91
Labrador	37	41	78
Dalmatian	45	28	73
Other breeds	86	67	153
Total	348	275	623

69) Identify the variables and tell whether each is categorical or quantitative.

70) At a large business, employees must report to work at 7:30 A.M. The arrival times of employees can be described by a Normal model with mean of 7:22 A.M. and a standard deviation of 4 minutes. For questions a, b, and c, sketch, label, and shade a Normal model and show your work.

a. What percent of employees are late on a typical work day?

b. A psychological study determined that the typical worker needs five minutes to adjust to their surroundings before beginning their duties. What percent of this business' employees arrive early enough to make this adjustment?

c. The manager is scheduling a morning visit by his supervisor. He thinks it will reduce future tardiness if his supervisor arrives just before the latest 10% of employees arrive. What is the earliest time he should schedule the supervisor's visit?

d. Explain what achieving a smaller standard deviation means in the context of this problem.

To determine if people's preference in dogs had changed in the recent years, organizers of a local dog show asked people who attended the show to indicate which breed was their favorite. This information was compiled by dog breed and gender of the people who responded. The table summarizes the responses.

	Female	Male	Total
Yorkshire Terrier	73	59	132
Dachshund	49	47	96
Golden Retriever	58	33	91
Labrador	37	41	78
Dalmatian	45	28	73
Other breeds	86	67	153
Total	348	275	623

71) Give the conditional relative frequency distribution of the breeds among female respondents.

72) Here are the ages of the last 15 Presidents of the United States at their first inauguration, listed from youngest to oldest. Find the mean and standard deviation of these ages using your calculator.

Has the percentage of young girls drinking milk changed over time? The following table is consistent with the results from "Beverage Choices of Young Females: Changes and Impact on Nutrient Intakes" (Shanthy A. Bowman, Journal of the American Dietetic Association, 102(9), pp. 1234–1239).

			Years		
'n		1987-1988	1989-1991	1994-1996	Total
s Milk	Yes	354	502	366	1222
DTINKS	No	226	335	366	927
	Total	580	837	732	2149

Nationwide Food Survey

73) Do you think that milk consumption by young girls is independent of the nationwide survey year? Justify your answer using the data:

74) Write a complete sentence describing what the number 335 represents in this data.

75) Costs for standard veterinary services at a local animal hospital follow a Normal model with a mean of \$80 and a standard deviation of \$20.

a. Draw and clearly label this model with  $\pm$  1, 2, and 3 $\sigma$  and the corresponding dollar amounts and percents.



- b. Fill in the blanks according to this model:
- The middle 95% of veterinary bills cost between \$\_\_\_\_\_ and \$\_\_\_\_\_
- \_\_\_\_\_% of veterinary bills are between \$60 and \$80.
- \_\_\_\_\_% of veterinary bills are between \$20 and \$140.

c. Show work and shaded Normal models for each question

1.	What percent of bills are less than \$55	
2.	What percent of bills are greater than \$100	

3.	What percent of bills are between \$25 and \$50?	
4.	20% of bills are for less than what amount?	
5.	Is it unusual to have a veterinary bill for \$125? Explain.	

To determine if people's preference in dogs had changed in the recent years, organizers of a local dog show asked people who attended the show to indicate which breed was their favorite. This information was compiled by dog breed and gender of the people who responded. The table summarizes the responses.

	Female	Male	Total
Yorkshire Terrier	73	59	132
Dachshund	49	47	96
Golden Retriever	58	33	91
Labrador	37	41	78
Dalmatian	45	28	73
Other breeds	86	67	153
Total	348	275	623

76) Find each percent.

a. What percent of all responses were from males who favor Labradors?

- b. What percent of the male responses favor Labradors?
- c. What percent of the people who choose Labradors were males?

Here is a boxplot of the heights in inches of a group of people at a family reunion. (Uncle Marty is measuring everyone's height as they arrive-he's kind of strange that way.)



77) If each height is converted from inches to centimeters and graphed again on the same axes, how would the appearance of the new graph compare to the graph above? (1 inch = 2.54 cm)

Assume human body temperatures taken via the ear follow a Normal model with a mean of 98.7°F and standard deviation of 0.7°F. Sketch, label, and shade a Normal model and show your work.

78) What percent of people have ear temperatures that are 1 or more standard deviations greater than the mean?

79) IQ (Intelligence Quotient) test scores on the WAIS-R (Wechsler Adult Intelligence Scale –Revised) follow a Normal model with mean 100 and standard deviation 15. Draw and clearly label this model showing the mean,  $\pm 1$ ,  $\pm 2$ , and  $\pm 3$  standard deviations, and the percentage of people in those ranges.



Use your drawing to answer the following. Show your work:

- a. What percent of adults have an IQ between 70 and 130?
- b. What percent of adults have an IQ between 85 and 115?
- c. What percent of adults have an IQ greater than 115?
- d. What are the IQ's of the lowest scoring 16% of the population?

80) Owners of an exercise gym believe that a Normal model is useful in projecting the number of clients who will exercise in their gym each week. They use a mean of 800 clients and a standard deviation of 90 clients.

a. Draw and clearly label this model with  $\pm 1$ , 2, and  $3\sigma$  and the corresponding dollar amounts and percents.



b. Fill in the blanks according to this model:

• The middle 95% of weekly clients is between \_\_\_\_\_ and \_\_\_\_\_

• \_\_\_\_\_% of weeks have between 710 and 890 clients.

• \_\_\_\_\_% of weeks have between 620 and 890 clients.

c. The owner believes they need at least 700 clients a week to be profitable. What percent of the time does this model project the gym to be profitable? Show work.

d. What is the first quartile of the weekly number of clients? Show work.

Assume human body temperatures taken via the ear follow a Normal model with a mean of 98.7°F and standard deviation of 0.7°F. Sketch, label, and shade a Normal model and show your work.

81) Find the interquartile range for ear temperatures.

82) Name the statistic (mean, median, etc) that best fits each description below.

\_\_\_\_\_A good choice for describing the center of skewed data

\_\_\_\_\_Compares the extremes of the data.

\_\_\_\_\_Summarizes how far each data value is from the average of the data

\_\_\_\_\_Splits a histogram into halves.

- \_\_\_\_\_Describes the center of symmetric data better than it describes the center of skewed data.
- \_\_\_\_\_Summarizes the spread of the central 50% of the data.
- \_\_\_\_\_The "balancing point" of the data.
- \_\_\_\_\_The center of the lower half of the data.
  - ————Where the peaks of a histogram are.

Here is a stem and leaf plot of the number of grams of sugar in a serving of the 109 breakfast cereals approved by the North Carolina Woman's Infant and Children (WIC) program.

(http://www.communityhealth.dhhs.state.nc.us/dental/ed\_resources/Sugar\_In\_Cereal.pdf)

Variable: sugar(g)

- 0 : 000000112233334444
- 0 : 5555556666666678899999999
- 1 : 0000001111222222222233333333333333444444444
- 1 : 55555556666777889
- 2 : 000

(2:4=24 grams of sugar)

83) Draw a histogram of these same data using the grid below and fill in the missing labels.



In June 2003 *Consumer Reports* published an article on some sport–utility vehicles they had tested recently. They reported some basic information about each of the vehicles and the results of some tests conducted by their staff. Among other things, the article told the brand of each vehicle, its price, and whether it had a standard or automatic transmission. They reported the vehicle's fuel economy, its acceleration (number of seconds to go from zero to 60 mph), and its braking distance to stop from 60 mph. The article also rated each vehicle's reliability as much better than average, better than average, average, worse, or much worse than average.

84) List the variables. Indicate whether each variable is categorical or quantitative. If the variable is quantitative, tell the units.

85) One thousand students from a local university were sampled to gather information such as gender, high school GPA,

college GPA, and total SAT scores. The results were used to create histograms displaying high school grade point averages (GPA's) for both males and females. Compare the grade distribution of males and females.



86) Find the possibility of outliers for the following data.

		Data	Outlier test		
Min 45	Min         Q1         Median         Q2         Max           45         76         98         112         115				Outliers could be less than or greater than
<b>ا</b>	-l 15		 25		Outliers could be less than or greater than
Heigh 40, 36, 35,	ts (inch 35, 35, 1	ies) of 14 Sh 36, 36, 43, 3	etland 1 7, 38, 3	Ponies: 19, 40, 40, 32	Outliers could be less than or greater than

87) A brake and muffler shop reported the repair bills, in dollars, for their customers yesterday.

88	283	312	290	172
154	400	381	346	181
203	118	143	252	227
56	192	292	213	422

a. Sketch a histogram for these data.

b. Find the mean and standard deviation of the repair costs.

c. Is it appropriate to use the mean and standard deviation to summarize these data? Explain.

d. Describe the association of repair costs.

88) An automobile service shop reported the summary statistics shown for repair bills (in \$) for their customers last month.

Min	27
Q1	88
Median	132
Q3	308
Max	1442
Mean	284
SD	140

a. Were any of the bills outliers? Show how you made your decision.

b. After checking out a problem with your car the service manager gives you an estimate of "*only* \$90." Is he right to imply that your bill will be unusually low? Explain briefly.

93) Here are the ages of the last 15 Presidents of the United States at their first inauguration. Find the mean and standard deviation of these ages using your calculator.

51, 54, 51, 60, 62, 43, 55, 56, 61, 52, 69, 64, 46, 54, 47

95) Adult female Dalmatians weigh an average of 50 pounds with a standard deviation of 3.3 pounds. Adult female Boxers weigh an average of 57.5 pounds with a standard deviation of 1.7 pounds. One statistics teacher owns an underweight Dalmatian and an underweight Boxer. The Dalmatian weighs 45 pounds, and the Boxer weighs 52 pounds. Which dog is more underweight? Explain using statistics.

96) The boxplots show prices of used cars (in thousands of dollars) advertised for sale at three different car dealers.



- a. Which dealer offers the cheapest car offered, and at what price?
- b. Which dealer has the lowest median price, and how much is it?
- c. Which dealer has the smallest price range, and what is it?
- d. Which dealer's prices have the smallest IQR, and what is it?
- e. Which dealer generally sells cars cheapest? Explain.

97) Assume human body temperatures taken via the ear follow a Normal model with a mean of 98.7° F and standard deviation of 0.7°F. For each question, sketch, label, and shade a Normal model and show your work.

a. What percent of people have ear temperatures that are 1 or more standard deviations greater than the mean?

b. What percent of people have ear temperatures that are 1 or more degrees greater than the mean ?

c. An ear temperature of 97°F or less may indicate hypothermia (low body temperature). What percent of people have ear

temperatures that may indicate hypothermia?

d. Find the Interquartile Range for ear temperatures.

Assume human body temperatures taken via the ear follow a Normal model with a mean of 98.7°F and standard deviation of 0.7°F. Sketch, label, and shade a Normal model and show your work. 98) What percent of people have temperatures that are greater than 100° F?

In June 2003 *Consumer Reports* published an article on some sport-utility vehicles they had tested recently. They reported some basic information about each of the vehicles and the results of some tests conducted by their staff. Among other things, the article told the brand of each vehicle, its price, and whether it had a standard or automatic transmission. They reported the vehicle's fuel economy, its acceleration (number of seconds to go from zero to 60 mph), and its braking distance to stop from 60 mph. The article also rated each vehicle's reliability as much better than average, better than average, average, worse, or much worse than average. 99) Describe the W's, if the information is given:

- Who:
- What:
- When:
- Where:
- How:
- Why:

Has the percentage of young girls drinking milk changed over time? The following table is consistent with the results from "Beverage Choices of Young Females: Changes and Impact on Nutrient Intakes" (Shanthy A. Bowman, Journal of the American Dietetic Association, 102(9), pp. 1234–1239).

## Nationwide Food Survey

			Years		
1		1987-1988	1989-1991	1994-1996	Total
s Milk	Yes	354	502	366	1222
Drinks	No	226	335	366	927
toolog .	Total	580	837	732	2149

100) Consider the following pie charts of a subset of the data above:



Do the pie charts above indicate that milk consumption by young girls is independent of the nationwide survey year? Explain:





What females look most forward to about Super Bowl 2007

- 22) a. Passenger, less than 1 year.
- b. Passenger, 21 yrs
- c. Cyclist, 40 yrs
- d. Pedestrian, 44 yrs

e. Pedestrian. While the oldest person involved in an accident is not a pedestrian, the median

age for pedestrians is almost 45 years, while the median age in the other groups are between 22 and 35 years old. The oldest 50% of the Pedestrian group, from 45 to 87 years, is generally older than the youngest 75% of two groups – Cyclist and Passenger, and only the Driver group has any of its middle 50% as old. The driver and passenger groups have a few people older than the pedestrian group.

23) The distribution of sugar content in cereals approved by North Carolina's WIC program is unimodal and slightly skewed to the left. A typical cereal has 11.5 grams of sugar, and the IQR is 7.25 grams of sugar.

24) a. increase

- b. stay about the same
- c. increase
- d. stay about the same
- e. increase

25) 48.8% (492/1008) of the respondents were male, and 51.2% (516/1008) of the respondents were female

26) 81/237 = 34.2% of those who were looking forward to watching commercials were males.

27) French man: 
$$z = \frac{194 - 174}{7.1} = 2.82$$
  
 $204 - 184$ 

Dutch man: z = 8 = 2.5

Since the French man has a higher *z*-score than the Dutch man, he is taller compared to other males in his country. 28) Change: Mean, Median, Quartiles, Minimum, Maximum

Not Change: IQR, Standard Deviation, Range

29) One of the cereals approved by North Carolina's WIC Program contains 11 grams of sugar.

30) a. The distributions of salaries are both roughly unimodal and symmetric.



b. Company A:  $z = \frac{5.30}{\frac{62 - 55.4}{5.30}}$ 



The employee at company B is paid higher in relation to his or her company's payroll, since that employee has the higher *z*-score.

31)



According to the Normal model, approximately 0.8% of people are expected to have ear temperatures below 97°, which may indicatehypothermia.

32) Who: 1008 Americans

What: Respondents' sex and what they were most looking forward to during the Super Bowl

When: January 2007

Why: Not specified, but it is likely this poll was conducted for market research 33)



Your temperature is certainly lower than the mean temperature, but not unusually so. According to the Normal model, 12.7% of people are expected to have ear temperatures lower than yours.

1 1	
34) Testbank Starts at (	Ch. 2
35) Median:	A good choice for describing the center of skewed data
Range:	Compares the extremes of the data.
Standard Deviation: Su	ummarizes how far each data value is from the average of the data
Median:	Splits a histogram into halves.
Median:	Describes the center of symmetric data better than it describes the center of

	skewed data.
IQR:	Summarizes the spread of the central 50% of the data.
Mean:	The "balancing point" of the data.
First Ouartile:	The center of the lower half of the data.

Mode: Where the peaks of a histogram are.

36) 81/237 = 34.2% of those who were looking forward to watching commercials were males. 37)

	Decreases by 1.5	No change	Different change (describe)
Min	✓		10
Q1	✓		
Median	~		
Q3	✓		
Max	✓		
Range	6 	~	
IQR		~	
Mean	✓		
StdDev		~	

## 38)

Variable	Possible values for this variable	Categorical or Quantitative?
Dog Breed	Yorkshire Terrier, Dachshund, Golden Retriever, Labrador, Dalmatian, Other breeds	Categorical
Gender	Female, Male	Categorical

39)



40) a. 1222/2149 = 0.569 = 56.9%

b. 837/2149 = 0.389 = 38.9%

c. 502/1222 = 0.411 = 41.1%

d. 507/837 = 0.600 = 60.0%

41) **Who**: Young females

What:Whether or not they drink milk and range of years

When:1987 - 1996

How: Nationwide food survey

42) Less than; The distribution of number of grams of sugar in cereals approved by North Carolina's WIC program, is skewed to the left, so the mean will be less than the median. The mean is pulled down by the values in the tail of the

distribution.

43)

5 Number Summary	Value	Describe in Context The youngest inaugurated President was 43 years old.		
Minimum	43			
First Quartile	51	25% of Presidents are younger than 51 years old at inauguration.		
Median	Median 54 Half of Presidents were older, half younger than 54 yes inauguration.			
Third Quartile	61	25% of Presidents were older than 61 years old at inauguration		
Maximum 69 The		The oldest inaugurated President was 69 years old.		

44)



Vhat females look most forward to about Super Bowl 2007

45) Yes; Mean and standard deviation are appropriate measures of center and spread, since the distribution of ages is roughly unimodal and symmetric.

46)



47) a. Similarities: The spreads are similar. Both distributions of heights of men have approximately the same standard deviation.

Differences: The mean height of Dutch men is 10 cm taller than the mean height of French men.

b. French man: 
$$z = \frac{\frac{194 - 174}{7.1}}{\frac{204 - 184}{8}} = 2.82$$
  
Dutch man:  $z = \frac{2}{8} = 2.5$ 

Since the French man has a higher *z*-score than the Dutch man, he is taller compared to other males in his

country.

48) a. According to the Normal model, we expect approximately 2.3% of cans to be under-filled.



b. A change in standard deviation means that the cans are filled either more or less consistently.

49) There were 132 Yorkshire terrier responses, 96 Dachshund responses, 91 Golden Retriever responses, 78 Labrador responses, 73 Dalmatian responses, and 153 Other responses.

50) Shape - Both distributions of heights are unimodal and roughly symmetric.

Center - Each distribution of heights appears to be centered around 164 cm.

Spread - The heights for the US women appear to be more spread out than those for the European

51)

		Females	
Response	Game	200/516 = <u>38.8%</u>	
	Commercials	156/516 = 30.2%	
	Won't watch	160/516 = 31.0%	
	Total	100%	

women.

52) A lower standard deviation indicates that measurements of rectal temperatures are more consistent than measurements of ear temperatures.





According to the Normal model, approximately 15.9% of people are expected to have ear temperatures 1 or more standard deviations greater than the mean.





According to the Normal model, the first quartile for ear temperatures is approximately 99.23°. 55)



56) The distribution of sugar content in cereals approved by North Carolinas WIC program is unimodal and slightly skewed to the left. A typical cereal has 12 grams of sugar, and the IQR is 8 grams of sugar.

57) Who: 1008 respondents.

What: Respondents' sex and what they were most looking forward to during the Super Bowl. Where: Not specified, but probably United States.

When: January 2007.

How: Random poll.

Why: Not specified, but probably market research.

58) Who: Dog Show attendees

What: Dog breed and gender of the respondent

How: Survey

Why: To determine if peoples' preference in dogs has changed over time 59) a.

59) a.



- b. x = 51.0 cm; s = 10.6 cm
- c. Yes, the data are roughly unimodal and symmetric with no outliers.

d. The data are roughly symmetric with no outliers; however there is a small gap from 70 to 75 cm. The

average plant height is 51.0 centimeters, with a standard deviation of 10.6 centimeters. The range of plant heights is 43 centimeters. The distribution of plant heights has a mode between 45 and 49 centimeters. 60)



According to the Normal model, approximately 7.7% of people are expected to have ear temperatures 1 or more degrees greater than the mean.

61) a.



b. x = 16.3 credit hours; s = 3.7 credit hours

c. The median is 16.0 credit hours. IQR = Q3 - Q1 = 20 - 14.5 = 5.5 credit hours

d. It is more appropriate to use the median and IQR to summarize these data, because these data are not unimodal and symmetric.

62)

5 Number Summary	Value	Describe in Context	
Minimum	43	The youngest inaugurated President was 43 years old.	
First Quartile	51	25% of Presidents are younger than 51 years old at inauguration.	
Median	54	Half of Presidents were older, half younger than 54 years old at inauguration.	
Third Quartile	61	25% of Presidents were older than 61 years old at inauguration.	
Maximum	69	The oldest inaugurated President was 69 years old.	

63)

	Multiplied by 2.54	No change	Different change (describe)
Min	✓		
Q1	~		
Median	✓		
Q3	✓		
Max	~		
Range	✓		
IQR	✓		
Mean	✓		
StdDev	✓		



Mean and standard deviation are appropriate measures of center and spread, since the distribution of ages is roughly unimodal and symmetric.



Justification: The distributions are skewed to the left with median approximately 50. 66)



Since the French man has a higher *z*-score than the Dutch man, he is taller compared to other males in his country.

68) Dalmation:  ${}^{z}D = \frac{45-50}{3.3} = -1.52$ 52 - 57.5 1.7 Boxer:  $^{zB} =$ = -3.24

The Dalmatian is 1.52 standard deviations underweight, while the Boxer is 3.24 standard

deviations underweight. So, the Boxer is more underweight.

69) Gender and Breed; both categorical.

70) a. According to the Normal model, approximately 2.3% of employees are late on a typical work day.



b. According to the Normal model, approximately 77.3% of employees arrive before 7:25 A.M., allowing them 5 minutes to acclimate before work begins at 7:30 A.M.



c. According to the Normal model, the manager should schedule the supervisor's visit for 7:27 A.M.



d. Achieving a smaller standard deviation means having more consistency in employee arrival times.

71) Among females, 20.9% chose Yorkshire Terriers, 14.2% Dachshunds, 16.7% Golden Retrievers, 10.6% Labs, and 12.9% Dalmatians. The remaining 24.7% of females preferred other breeds.

72) Mean = 55 years old; Standard Deviation = 7.17 years old

73) No. 56.9% of all young girls surveyed reported drinking milk, but 60% of the young girls reported drinking milk in the 1989-1991 survey. Since these percentages differ, milk consumption and year are not independent.

74) 335 young females indicated that they did not drink milk, and were surveyed between 1989 and 1991.





• The middle 95% of veterinary bills cost between  $\$\frac{40}{2}$ 

\_\_\_\_\_ and  $\$\frac{120}{}$ 

- <u>34</u>% of veterinary bills are between \$60 and \$80.
  - 99.7 % of veterinary bills are between \$20 and \$140.



76) a. 6.6%

b. 14.9%

c. 52.6%

77) The boxplot would have the same shape, but each of the numbers in the 5# Summary would be multiplied by 2.54. The range and IQR would be multiplied by 2.54 as well.

78)

b.



According to the Normal model, approximately 15.9% of people are expected to have ear temperatures 1 or more standard deviations greater than the mean.





According to the No	formal model, the IQR of ear temperatures is $Q3 - Q1 = 98.23 - 99.17 = 0.94^{\circ}$ .
82) Median:	A good choice for describing the center of skewed data
Range:	Compares the extremes of the data.
Standard Deviation	: Summarizes how far each data value is from the average of the data
Median:	Splits a histogram into halves.
Median:	Describes the center of symmetric data better than it describes the center of
	skewed data.
IQR:	Summarizes the spread of the central 50% of the data.
Mean:	The "balancing point" of the data.
First Quartile:	The center of the lower half of the data.
Mode:	Where the peaks of a histogram are.
83)	



84) Categorical: brand, transmission type, reliability

Quantitative: price (US\$), fuel economy (mpg), acceleration (seconds), braking distance (probably feet?)

85) The distributions of high school GPA for both males and females are skewed to the left, and both distributions appear to be centered at a GPA of about 3.0. The distribution of male GPA appears slightly more spread out than the distribution of female GPA.

86)



87) a.



b. x = \$236.25; s = \$103.43

c. Yes, the data are roughly unimodal and symmetric with no outliers.

d. The repair costs averaged \$236.25, ranging from \$56 to \$422 with a standard deviation of \$103.43. The distribution was approximately symmetric, with typical repair costs clustered between \$150 and \$300.

88) a. Yes. IQR = 308 - 88 = 220. The upper fence for outliers is one and a half IQR's above the third quartile, or 308 + 1.5(220) = 638. The maximum repair bill was \$1442, well above \$638, so it is certainly an outlier. Since Q1 = 88, the lower fence is less than zero, so there are no low outliers.

b. No. \$90 is higher than over 25% of the bills, so it is not unusually low.89)





According to the Normal model, approximately 7.7% of people are expected to have ear temperatures 1 or more degrees greater than the mean.

91)

	How it changes	
Min	Decreases by 1.5	
Q1	Decreases by 1.5	
Median	Decreases by 1.5	
Q3	Decreases by 1.5	
Max	Decreases by 1.5	
Range	Unchanged	
IQR	Unchanged	
Mean	Decreases by 1.5	
StdDev	Unchanged	

92) a. 6.6%

b. 14.9%

c. 52.6%

93) Mean = 55 years old; Standard Deviation = 7.17 years old

94) To find the mean number of grams of sugar in cereals approved by North Carolina's WIC program, add all the collected measurements together, and divide by 109, the total number of cereals.

95) Dalmation: 
$${}^{z}D = \frac{45 - 50}{3.3} = -1.52$$
  
Boxer:  ${}^{z}B = \frac{52 - 57.5}{1.7} = -3.24$ 

The Dalmatian is 1.52 standard deviations underweight, while the Boxer is 3.24 standard

deviations underweight. So, the Boxer is more underweight.

96) a. Car Z:\$5000

b. BuyIt:\$10,000

c. Ace: \$10,000

d. CarZ:\$3000

e. BuyIt; half of their cars are cheaper than any of the cars at Ace, and 25% of their cars are

cheaper than all but one car at CarZ. The third quartile of their prices is well below the third quartile at CarZ, and below even the median price at Ace.

97) a. According to the Normal model, approximately 15.9% of people are expected to have ear temperatures 1 or more standard deviations greater than the mean.



b. According to the Normal model, approximately 7.7% of people are expected to have ear temperatures 1 or more degrees greater than the mean.



c. According to the Normal model, approximately 0.8% of people are expected to have ear temperatures below 97°, which may indicate hypothermia.



d. According to the Normal model, the IQR of ear temperatures is  $Q3 - Q1 = 98.23 - 99.17 = 0.94^{\circ}$ .



According to the Normal model, approximately 3.2% of people are expected to have ear temperatures above 100°.

99) • Who: SUV's currently on the market. We don't know how many models.

- What: When: prior to June 2003
- Where: not specified, probably the United States
- How: testing the vehicles by driving each
- Why: information for potential consumers

100) No. It looks like there is some sort of relationship between milk consumption and nationwide survey year, since the percentage of young girls who reported drinking milk is a larger slice of the pie chart for the 1989–1991 survey than the same response for the 1994–1996 survey.