## Unit 1 Review

Name $\qquad$

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) In a Normal model, what percent of data is between -1 and +2 standard deviations of the mean?
2) $\qquad$
A) It depends upon the standard deviation.
B) 68
C) 81.5
D) 95
3) Which of these variables is most likely to follow a Normal model?
4) $\qquad$
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
5) Suppose that a Normal model describes the acidity $(\mathrm{pH})$ of rainwater, and that water tested after last week's storm had a z-score of 1.8. This means that the acidity of that rain ... $\qquad$
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.
6) In a Normal model, what percent of data is between -1 and +1 standard deviations of the mean?
7) $\qquad$
$\begin{array}{ll}\text { A) } 68 & \text { B) } 95\end{array}$
C) It depends upon the standard deviation.
D) 99.7
8) We collect these data from 50 male students. Which variable is categorical?
9) $\qquad$
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
10) Which of these variables is most likely to be bimodal?
11) $\qquad$
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
12) The mean number of hours worked for the 30 males was 6 , and for the 20 females was 9 . The overall mean number of hours worked...
13) $\qquad$
A) is 6.5
B) cannot be determined.
C) is 7.5
D) is 7.2
E) is none of these.
14) Which of the following variables would mostly likely follow a Normal model?
15) $\qquad$
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
16) 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
17) $\qquad$
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.
18) 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?
19) $\qquad$
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.
20) Suppose that a Normal model describes fuel economy (miles per gallon) for automobiles and that a certain model has a standardized score ( $\mathrm{z}-\mathrm{score}$ ) of +2.2 . What does this mean regarding this model's gas mileage?
21) $\qquad$
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.
22) We collect these data from 50 male students. Which variable is most likely to follow a Normal model? 12) $\qquad$
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
23) 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.

24) $\qquad$
A) II only
B) I and II
C) II and III
D) I, II and III
E) I only
25) 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
26) $\qquad$
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.
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 . Which of the following back to back histograms best represent these heights?
28) $\qquad$
A)

B)


200 cm
C)

D)

16) $\qquad$
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 ...

17) $\qquad$
A) 5 .
B) 12 ..
C) 18 . D) 8 .
E) 20 .
18) For all Normal models, the mean is related to the $\qquad$ of the distribution and the standard deviation is related to the $\qquad$ of the distribution.
18) $\qquad$
A) shape,.spread
B) center, shape C) center, spread
D) spread, center
19) Suppose a Normal model describes the number of pages printer ink cartridges last. If we keep track of printed pages for the 47 printers at a company's office, which must be true?
I. The page counts for those ink cartridges will be normally distributed.
II. The histogram for those page counts will be symmetric.
III. $95 \%$ of those page counts will be within 2 standard deviations of the mean.
19) $\qquad$
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?

20) $\qquad$
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.

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.
$\begin{array}{llllllll}10 & 10 & 12 & 14 & 15 & 15 & 15 & 15 \\ 17 & 17 & 19 & 20 & 20 & 20 & 20 & 22\end{array}$

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.

| $\begin{aligned} & \text { \& } \\ & 0 \\ & \vdots \\ & 0 \end{aligned}$ | Sex |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  |  | 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)

```
0 : 000000112233334444
0 : 555555666666678899999999
1 : 00000001111222222222222333333333333333444444444
1 : 55555556666777889
2 : 000
    (2 : 4 = 24 grams of sugar)
```

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 |
| B | 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 $98.7^{\circ} \mathrm{F}$ and standard deviation of $0.7^{\circ} \mathrm{F}$. Sketch, label, and shade a Normal model and show your work.
31) An ear temperature of $97^{\circ} \mathrm{F}$ 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.

Sex

|  |  | 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: $\qquad$
What: $\qquad$
When: $\qquad$
Why: $\qquad$

Assume human body temperatures taken via the ear follow a Normal model with a mean of $98.7^{\circ} \mathrm{F}$ and standard deviation of $0.7^{\circ} \mathrm{F}$. Sketch, label, and shade a Normal model and show your work.
33) You take your ear temperature and find it to be $97.9^{\circ} \mathrm{F}$. 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.
___The "balancing point" of the data.
$\qquad$ The center of the lower half of the data.
$\ldots$ 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.

| $\begin{aligned} & 0 \\ & \frac{n}{6} \\ & 0 \\ & \frac{1}{n} \\ & \stackrel{y}{6} \end{aligned}$ |  | 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 |  |  |  |
| Q1 |  |  |  |
| Median |  |  |  |
| Q3 |  |  |  |
| Max |  |  |  |
| Range |  |  |  |
| IQR |  |  |  |
| Mean |  |  |  |
| StdDev |  |  |  |

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

| Data | Outlier test |
| :---: | :---: |
| Min Q1 Median Q3 Max <br> 45 76 98 112 115 | Calculations: <br> Data greater than $\qquad$ <br> or less than $\qquad$ |
|  | Calculations: <br> Data greater than $\qquad$ <br> or less than $\qquad$ |
| Heights (inches) of 14 Shetland Ponies: $32,35,35,35,36,36,36,37,38,39,40,40,40,43$ | Calculations: <br> Data greater than $\qquad$ or less than $\qquad$ |

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 |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | $1987-1988$ | $1989-1991$ | $1994-1996$ | Total | |  | 354 | 502 | 366 | 1222 |
| :---: | :---: | :---: | :---: | :---: |
|  | Yes | 326 | 335 | 366 |

40) Find the following. Show your work.
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?
d. What percent of the young girls in 1989-1991 reported that they drink milk?
41) Describe these W's for this study.

Who: $\qquad$
What: $\qquad$
When: $\qquad$
How: $\qquad$

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

46) 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:
47) 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 | $\mathbf{1 3 2}$ |
| 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.

Sex

|  | 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 |
| :---: | :---: | :---: |
|  | Game | $200 / 516=\underline{38.8} \%$ |
|  | 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)

```
0:000000112233334444
0 : 555555666666678899999999
1 : 00000001111222222222222333333333333333444444444
1:555555566\overline{6}6777889
2:000
```

    (2 : \(4=24\) grams of sugar)
    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

| $\begin{aligned} & \ddot{0} \\ & \frac{n}{6} \\ & 0 \\ & \frac{1}{n} \\ & \underset{\sim}{2} \end{aligned}$ |  | 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 |
| :---: | :---: | :---: | :---: |
| 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 |

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

Who: $\qquad$
What: $\qquad$

How: $\qquad$
Why: $\qquad$
59) The students in a biology class kept a record of the height (in centimeters) of plants for a class experiment.

| 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 $98.7^{\circ} \mathrm{F}$ and standard deviation of $0.7^{\circ} \mathrm{F}$. 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.
$\begin{array}{llllllll}10 & 10 & 12 & 14 & 15 & 15 & 15 & 15\end{array}$
$\begin{array}{llllllll}17 & 17 & 19 & 20 & 20 & 20 & 20 & 22\end{array}$
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 |  |  |  |
| Q1 |  |  |  |
| Median |  |  |  |
| Q3 |  |  |  |
| 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.

| Data |  |  |  |  | Outliers |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Min | Q1 | Median | Q2 | Max |  |
| 45 | 76 | 98 | 112 | 115 |  |
|  |  |  |  |  |  |
| 10 | 15 | 20 | 25 | 30 |  |
| Heights (inches) of 14 Shetland Ponies: |  |  |  |  |  |
| $32,35,35,35,36,36,36,37,38,39,40,40,40,43$ |  |  |  |  |  |

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 | $\mathbf{7 3}$ | $\mathbf{5 9}$ | $\mathbf{1 3 2}$ |
| Dachshund | $\mathbf{4 9}$ | 47 | $\mathbf{9 6}$ |
| Golden Retriever | $\mathbf{5 8}$ | 33 | 91 |
| Labrador | 37 | 41 | 78 |
| Dalmatian | $\mathbf{4 5}$ | 28 | 73 |
| Other breeds | 86 | 67 | $\mathbf{1 5 3}$ |
| Total | $\mathbf{3 4 8}$ | $\mathbf{2 7 5}$ | $\mathbf{6 2 3}$ |

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 | $\mathbf{1 3 2}$ |
| 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).

| Nationwide Food Survey |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | $1987-1988$ | $1989-1991$ | $1994-1996$ | Total |
|  | Yes | 354 | 502 | 366 |

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 $\$$ $\qquad$
- $\quad$ _ of veterinary bills are between $\$ 60$ and $\$ 80$.
- $\quad$ _ $\%$ 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 $\$ 55$ |  |$|$


| 3.What percent of bills are <br> between $\$ 25$ and $\$ 50$ ? |  |
| :--- | :--- |
| 4. $20 \%$ of bills are for less <br> than what amount? |  |
| 5. it unusual to have a <br> veterinary bill for $\$ 125 ?$ <br> 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 | $\mathbf{5 9}$ | $\mathbf{1 3 2}$ |
| Dachshund | 49 | 47 | 96 |
| Golden Retriever | $\mathbf{5 8}$ | 33 | 91 |
| Labrador | 37 | 41 | 78 |
| Dalmatian | 45 | 28 | 73 |
| Other breeds | 86 | 67 | $\mathbf{1 5 3}$ |
| Total | $\mathbf{3 4 8}$ | 275 | $\mathbf{6 2 3}$ |

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 $=2.54 \mathrm{~cm})$

Assume human body temperatures taken via the ear follow a Normal model with a mean of $98.7^{\circ} \mathrm{F}$ and standard deviation of $0.7^{\circ}$. 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 $\qquad$ and $\qquad$
- _ \% of weeks have between 710 and 890 clients.
- $\quad \%$ 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 $98.7^{\circ} \mathrm{F}$ and standard deviation of $0.7^{\circ}$. 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 : 555555666666678899999999
1 : 00000001111222222222222333333333333333444444444
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.

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 $98.7^{\circ} \mathrm{F}$ and standard deviation of $0.7^{\circ} \mathrm{F}$. 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 $97^{\circ} \mathrm{F}$ 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 $98.7^{\circ} \mathrm{F}$ and standard deviation of $0.7^{\circ} \mathrm{F}$. Sketch, label, and shade a Normal model and show your work.
98) What percent of people have temperatures that are greater than $100^{\circ} \mathrm{F}$ ?

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).

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:

1) $C$
2) $D$
3) $D$
4) $A$
5) $A$
6) E
7) D
8) $A$
9) $D$
10) D
11) E
12) $D$
13) C
14) C
15) A
16) $D$
17) $A$
18) C
19) B
20) A
21) 



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: $z=\frac{\frac{194-174}{7.1}}{}=2.82$

Dutch man: $z=\frac{\frac{204-184}{8}}{}=2.5$
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: $\mathrm{z}=\frac{\frac{51-45.4}{5.30}}{}=1.05$

Company B: $\mathrm{z}=\frac{\frac{62-55.4}{5.30}}{}=1.80$
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 $97^{\circ}$, 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.
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: 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.
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 | $\checkmark$ |  |  |
| Q1 | $\checkmark$ |  |  |
| Median | $\checkmark$ |  |  |
| Q3 | $\checkmark$ |  |  |
| Max | $\checkmark$ | $\checkmark$ |  |
| Range |  | $\checkmark$ |  |
| IQR | $\checkmark$ | $\checkmark$ |  |
| Mean |  |  |  |
| StdDev |  |  |  |

38) 

| Variable | Possible values for this variable | Categorical or <br> Quantitative? |
| :---: | :---: | :---: |
| Dog Breed | Yorkshire Terrier, Dachshund, Golden Retriever, Labrador, <br> Dalmatian, Other breeds | Categonical |
| Gender | Female, Male | Categonical |

39) 

| Data |  |  |  |  | Outlier test |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Calculations: $\mathrm{IQR}=112-76=36$ <br> $112+1.5(36)=166 \quad 76-1.5(36)=22$ <br> Data greater than 166 <br> or less than $\quad 22$ |  |  |  |  |  |
|  |  |  |  |  | Calculations: $\mathrm{IQR}=22-15=7$ $22+1.5(7)=32.5 \quad 15-1.5(7)=4.5$ <br> Data greater than 32.5 <br> or less than $\quad 4.5$ |
| Heights (inches) of 14 Shetland Ponies: <br> $32,35,35,35,36,36,36,37,38,39,40,40,40,43$ |  |  |  |  | Calculations: $\mathrm{IQR}=40-35=5$ $40+1.5(5)=47.5 \quad 35-1.5(5)=27.5$ <br> Data greater than $\quad 47.5$ <br> or less than $\quad 27.5$ |

40) a. $\quad 1222 / 2149=0.569=56.9 \%$
b. $\quad 837 / 2149=0.389=38.9 \%$
c. $\quad 502 / 1222=0.411=41.1 \%$
d. $\quad 507 / 837=0.600=60.0 \%$
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 |
| :---: | :---: | :--- |
| Minimum | 43 | The youngest inaugurated President was 43 years old. |
| First Quartile | 51 | $25 \%$ of Presidents are younger than 51 years old at <br> inauguration. |
| Median | 54 | Half of residents were older, half younger than 54 years old at <br> 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. |

44) 



What 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)

Sugar Content in Breakfast Cereals

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.

$$
\frac{194-174}{7.1}
$$

b. French man: $\mathrm{z}=7.1=2.82$

$$
\frac{204-184}{8}
$$

Dutch man: $\mathrm{z}=\quad 8 \quad=2.5$

$$
=2.5
$$

Since the French man has a higher z-score than the Dutch man, he is taller compared to other
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 women.
51)

|  |  | Females |
| :---: | :---: | :---: |
|  | Game | $200 / 516=\underline{38.8} \%$ |
|  | Commercials | $156 / 516=30.2 \%$ |
|  | Won't watch | $160 / 516=31.0 \%$ |
|  | Total | 100\% |

52) A lower standard deviation indicates that measurements of rectal temperatures are more consistent than measurements of ear temperatures.
53) 



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.
54)


According to the Normal model, the first quartile for ear temperatures is approximately $99.23^{\circ}$. 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.

b. $\quad \mathrm{X}=51.0 \mathrm{~cm} ; s=10.6 \mathrm{~cm}$
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. $\quad \overline{\mathrm{x}}=16.3$ credit hours; $s=3.7$ credit hours
c. The median is 16.0 credit hours. $\mathrm{IQR}=\mathrm{Q} 3-\mathrm{Q} 1=20-14.5=5.5$ 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 inauguated President was 43 years old. |
| First Quartile | 51 | 25\% of Presidents are younger than 51 years old at <br> inauguration. |
| Median | 54 | Half of President were older, half younger tham 54 years old at <br> 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 | $\checkmark$ |  |  |
| Q1 | $\checkmark$ |  |  |
| Median | $\checkmark$ |  |  |
| Q3 | $\checkmark$ |  |  |
| Max | $\checkmark$ |  |  |
| Range | $\checkmark$ |  |  |
| IQR | $\checkmark$ |  |  |
| Mean | $\checkmark$ |  |  |
| StdDev | $\checkmark$ |  |  |

64) 



Mean and standard deviation are appropriate measures of center and spread, since the distribution of ages is roughly unimodal and symmetric.
65)


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


Since the French man has a higher z-score thanthe Dutch man, he is taller compared to other males in his country.
68) Dalmation: ${ }^{z} D=\frac{\frac{45-50}{3.3}}{}=-1.52$

Boxer: ${ }^{z_{B}}=\frac{\frac{52-57.5}{1.7}}{}=-3.24$
The Dalmatian is 1.52 standard deviations underweight, while the Boxer is 3.24 standard deviations underweight. So, the Boxer is more underweight.
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.
75) a.

b. - The middle $95 \%$ of veterinary bills cost between $\$ \underline{40}$ $\qquad$ and $\$ 120$

- $\quad 34 \quad \%$ of veterinary bills are between $\$ 60$ and $\$ 80$.
- 

99.7 $\%$ of veterinary bills are between $\$ 20$ and $\$ 140$.
c.


According to the Normal model, $10.6 \%$ of vet bills are expected to be less than $\$ 55$.
2. What percent of bills are greater than $\$ 100$

According to the Normal model, $15.9 \%$ of bills are expected to be greater than $\$ 100$.
=
3. What percent of bills are between $\$ 25$ and $\$ 50$ ?

According to the Normal model, $6.4 \%$ of bills are expected to be between $\$ 25$ and $\$ 50$.

4. $20 \%$ of bills are for less than what amount?

According to the Normal model, $20 \%$ of bills are expected to be less than \$63.17.
5. Is it unusual to have a veterinary bill for $\$ 125$ ? Explain.

According to the Normal model, it would be unusual to get a $\$ 125$ bill. Only $1.2 \%$ of bills are that high or higher.

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)


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.
79)

a. $95 \%$
b. $68 \%$
c. $16 \%$
d. 85 and below
80) a.

b.

- The middle $95 \%$ of weekly clients is between $\underline{620}$ and $\underline{980}$
- $68 \quad \%$ of weeks have between 710 and 890 clients.
- $81.5 \quad$ \% of weeks have between 620 and 890 clients.
c. According to the Normal model, thegym is predicted to be profitable about $86.7 \%$ of the time.

d. According to the Normal model, the first quartile of the weekly number of gym clients is approximately 739.3 clients.


81) 



According to the Normal model, the IQR of ear temperatures is $\mathrm{Q} 3-\mathrm{Q} 1=98.23-99.17=0.94{ }^{\circ}$.
82) Median:

Range:
A good choice for describing the center of skewed data
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:
Mode: The center of the lower half of the data.
83)

Sugar Content in Breakfast Cereals

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. $\quad \mathrm{X}=\$ 236.25 ; s=\$ 103.43$
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)

90)


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 | Dereases by 1.5 |
| Q3 | Decreases by 1.5 |
| Max | Decreases by 1.5 |
| Range | Unchanged |
| IQR | Unchanged |
| Mean | Decreases by 1.5 |
| StaDev | Unchanged |

92) a. $6.6 \%$
b. $\quad 14.9 \%$
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: $z_{D}=\frac{\frac{45-50}{3.3}}{}=-1.52$

Boxer: ${ }^{z_{B}}=\frac{\frac{52-57.5}{1.7}}{}=-3.24$
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. Buylt; 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 $97^{\circ}$, which may indicate hypothermia.

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

98)


According to the Normal model, approximately $3.2 \%$ of people are expected to have ear temperatures above $100^{\circ}$.
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.
