

**LESSON  
MASTER****1-1****Questions on SPUR Objectives**

See pages 73–79 for objectives.

**Uses** Objective D

In 1 and 2, consider the following scenario: A soft-drink company tests its new strawberry lemonade by releasing it to a mid-size city. After a 2-month trial period, the acceptance of the lemonade is evaluated.

- Identify the population. \_\_\_\_\_
  - Identify the sample. \_\_\_\_\_
  - Identify the variable. \_\_\_\_\_
- Give one reason why the company might survey a sample rather than the entire population.  
\_\_\_\_\_  
\_\_\_\_\_

**Uses** Objective E

In 3–5, use this table of percents.

Improper Driving as Factor in Accidents, 1993

Kind of improper driving	Fatal accidents			Injury accidents			All accidents		
	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
<b>Improper driving</b>	<b>57.7</b>	<b>54.7</b>	<b>59.4</b>	<b>72.7</b>	<b>74.3</b>	<b>69.6</b>	<b>68.6</b>	<b>69.8</b>	<b>66.1</b>
Speed too fast or unsafe	16.5	14.4	17.7	13.5	11.8	17.6	12.2	11.1	15.4
Right of way	12.7	17.0	10.1	25.0	28.8	15.5	20.6	23.2	13.7
<i>Failed to yield</i>	7.8	9.4	6.8	17.3	19.3	12.3	15.1	16.6	11.3
<i>Passed stop sign</i>	2.7	2.7	2.7	2.7	3.0	1.9	2.0	2.1	1.4
<i>Disregarded signal</i>	2.2	4.9	0.6	5.0	6.5	1.3	3.5	4.5	1.0
Drove left of center	7.6	3.2	10.1	2.1	1.3	4.0	1.8	1.1	3.4
Improper overtaking	1.2	0.6	1.5	1.0	0.8	1.4	1.3	1.1	1.7
Made improper turn	2.9	2.7	3.0	3.4	3.3	3.7	4.5	4.6	4.2
Followed too closely	0.5	0.4	0.6	6.2	7.2	3.7	5.5	6.2	3.6
Other improper driving	16.3	16.4	16.4	21.5	21.1	23.7	22.7	22.5	24.1
<b>No improper driving stated</b>	<b>42.3</b>	<b>45.3</b>	<b>40.6</b>	<b>27.3</b>	<b>25.7</b>	<b>30.4</b>	<b>31.4</b>	<b>30.2</b>	<b>33.9</b>
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

Source: 1996 Information Please Almanac

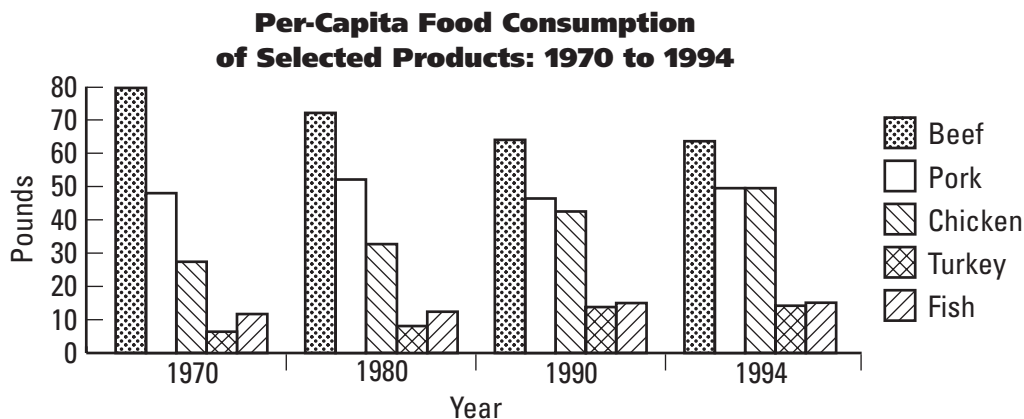
- Which numbers in the column for rural accidents resulting in injury total 15.5? \_\_\_\_\_
- What percent of all accidents involved improper turns? \_\_\_\_\_

► **LESSON MASTER 1-1** page 2

5. In 1993, there were approximately 42,000 deaths due to motor-vehicle accidents. Estimate the total number of deaths caused by unsafe speeds or right-of-way accidents. \_\_\_\_\_

**Representations** Objective G

In 6 and 7, use the graph below.



Source: *Statistical Abstract of the United States*, 1996

6. Which food types have shown a consistent increase in consumption? Why do you think their consumption has increased?
- \_\_\_\_\_
- \_\_\_\_\_

7. In 1994, what was the approximate total per-capita food consumption in pounds for these selected products? \_\_\_\_\_

**Representations** Objective J

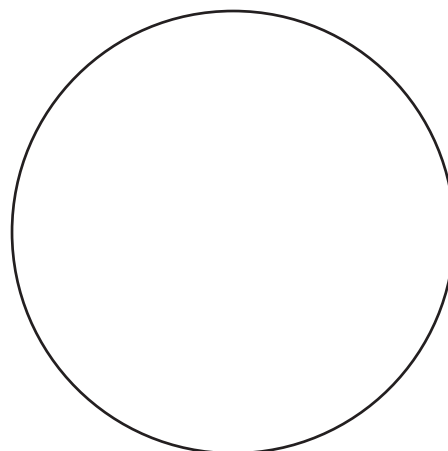
8. Use the table below. Draw a circle graph showing the distribution of age groups visiting emergency rooms in 1994.

**Hospital Emergency-Room  
Visits by Age Group in 1994  
(in thousands)**

Under 15 years old	23,751
15 to 24 years old	15,411
25 to 44 years old	28,219
45 to 64 years old	13,011
65 to 74 years old	5,797
75 years old and over	7,214

Source: *Statistical Abstract of the United States*, 1996

**Emergency-Room Visits  
by Age Groups, 1994**



**LESSON  
MASTER****1-2****Questions on SPUR Objectives**  
See pages 73–79 for objectives.

In 1–6, use the stemplot below, which gives the results of Ginnie Davis's survey of a group of college students majoring in music. Ginnie asked the number of music CDs each person owned.

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

**Skills** Objective A

1. For each data set, identify each statistic.

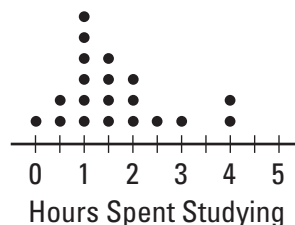
- a. the minimum \_\_\_\_\_
- b. the maximum \_\_\_\_\_
- c. the range \_\_\_\_\_

**Uses** Objective F

2. How many more underclassmen should Ginnie survey to have equal numbers of participants in each group? \_\_\_\_\_
3. What does the first row 4|0|0, represent?  
\_\_\_\_\_
4. How many upperclassmen in the survey have fewer than 30 CDs? \_\_\_\_\_
5. Describe any similarities and differences between the two groups.  
\_\_\_\_\_  
\_\_\_\_\_
6. Which values, if any, appear to be outliers in each population? \_\_\_\_\_

► **LESSON MASTER 1-2** page 2**Representations** Objective I

In 7 and 8, use the dotplot at the right, which shows the distribution of total time spent studying one weekend by students in Mr. Bell's morning class.



7. What is the frequency of students who study for 2 hours? \_\_\_\_\_

8. Which time has the greatest frequency? \_\_\_\_\_

**Representations** Objective J

9. The following sets of data show the average number of points scored by players on the boys' and girls' basketball teams.

Boys: 4.7 0.3 11.6 0.3 3.6 6.2 1.3 1.1  
3.1 7.6 4.0 20.5 0.8 2.5 3.6

Girls: 7.0 2.6 9.8 6.3 5.7 0.8 6.5 8.5  
12.4 7.2 5.3 7.9 9.1 7.6 6.9

a. At the right, make a back-to-back stemplot of these data.

b. Which scores, if any, appear to be outliers in each data set?

\_\_\_\_\_

c. Identify the range for both sets of data.

\_\_\_\_\_

10. Write several sentences comparing and contrasting the scores of the two teams. Include how the characteristics found in Exercises 9b and 9c describe each basketball team.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**LESSON  
MASTER****1-3****Questions on SPUR Objectives**

See pages 73–79 for objectives.

**Skills** Objective A

1. Find two different measures of center for the data given in the stemplot at the right.
- \_\_\_\_\_
- \_\_\_\_\_

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

2. Stuart Dent has scored 75, 85, 76, 92, and 87 on his first five tests.

- a. What score does Stu need on the next test in order to raise his mean score to 85?
- \_\_\_\_\_

- b. What score does Stu need on the next test in order to have a median score of 85?
- \_\_\_\_\_

3. Practicing for an upcoming bowling tournament, the Turkeys kept track of their individual averages. For 9 games, John had a 168 average; for 12 games, Dennis had a 175 average; for 8 games, Chris had a 153 average; and for 10 games, Mark had a 161 average. What is the average score of all the Turkeys' games?
- \_\_\_\_\_

**Properties** Objective B

In 4–6,  $x_i$  equals the normal precipitation in inches in the  $i$ th month of the calendar year in Memphis, TN.

$$x_1 = 3.7, x_2 = 4.4, x_3 = 5.4, x_4 = 5.5, x_5 = 5.0, x_6 = 3.6, \\ x_7 = 3.8, x_8 = 3.4, x_9 = 3.5, x_{10} = 3.0, x_{11} = 5.1, x_{12} = 5.7$$

Source: *The World Almanac and Book of Facts*, 1996

4. a. Write an expression using  $\Sigma$ -notation to represent the yearly precipitation in Memphis, TN.
- \_\_\_\_\_

- b. Evaluate your expression in part a.
- \_\_\_\_\_

5. Consider the expression  $\frac{1}{3} \sum_{i=7}^9 x_i$ .

- a. What does this expression represent?
- \_\_\_\_\_

- b. Evaluate this expression.
- \_\_\_\_\_

► **LESSON MASTER 1-3** page 2

6. a. Find  $\bar{x}$ .

\_\_\_\_\_

b. Find  $\sum_{i=1}^4 (x_i - \bar{x})^2$ .

\_\_\_\_\_

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**Properties** Objective C

7. Find a counterexample to the following statement: *For any set of three numbers, the mean is equal to the median.*

\_\_\_\_\_

8. *True or false.* For any set of consecutive integers, the mean is equal to the median. Give examples to illustrate your answer.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

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**Uses** Objective F

In 9 and 10, use the data below, which give the weights in pounds of the crews participating in a rowing race between Oxford and Cambridge.

Cambridge: 188.5, 183, 194.5, 185, 214, 203.5, 186, 178.5, 109

Oxford: 186, 184.5, 204, 184.5, 195.5, 202.5, 174, 183, 109.5

Source: *The Independent*, March 31, 1992

9. On the average, which team has the lighter crew members? Use measures of center to justify your answer.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

10. Each crew has an outlier when it comes to weight. What is the effect of this outlier on the measures of center of the data sets? Tell the purpose of this person on the crew team, if you know.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**LESSON  
MASTER****1-4****Questions on SPUR Objectives**

See pages 73–79 for objectives.

**Skills** Objective A

1. The stemplot at the right displays the team batting averages of all Major League Baseball teams for the 1995 season. The stem represents the first two decimal places of the averages. Identify each of the following.

Source: 1996 *Information Please Almanac*

24	7 7 9
25	2 8 9 9
26	0 1 1 1 3 3 4 5 5 6
27	0 1 5 5 6 6 9 9
28	0 1
29	9

- a. the first quartile \_\_\_\_\_
- b. the third quartile \_\_\_\_\_
- c. the median \_\_\_\_\_
- d. the interquartile range \_\_\_\_\_
- e. the number closest to the 60th percentile \_\_\_\_\_

**Uses** Objective F

2. The stemplot at the right gives the prices, rounded to the nearest dollar, of the 30 stocks in the Dow Jones Industrials on January 2, 1996, and December 31, 1996.

- a. Find the five-number summaries for each date.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

- b. Find any outliers using the  $1.5 \times \text{IQR}$  criterion.

\_\_\_\_\_

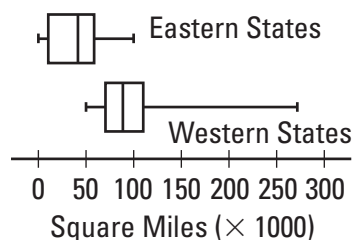
January 2	December 31
	0 9
7 4 3	1
	2 0 2
9 8 8	3
9 7 6 5 2 0	4 1 1 4 5 6
4 3 2 1	5 1 3 6 7
9 8 4 1 0	6 4 5 6 7
9 4 2	7 0 5
3 1 1 0	8 0 0 3
2 1	9 4 8 8 8 9
	10 6 8
	11 3
	12
	13
	14
	15

► **LESSON MASTER 1-4** page 2

- c. The only two stocks which posted a decrease in price for 1996 were McDonald's, which started at 46 and dropped to 45, and Bethlehem Steel. If Bethlehem Steel stock opened the year at 14, what was its change for the year? \_\_\_\_\_
- d. The Dow Jones Industrials is one of many indices used to gauge the entire stock market. Based on the above data, do you think the stock market increased or decreased for the 1996 year? Justify your answer.
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

**Representations** Objective H

3. Refer to the box plots at the right, which represent the areas, in thousands of square miles, of the 48 contiguous states east and west of the Mississippi River.



Source: 1996 Information Please Almanac

- a. Which is greater, the maximum eastern-states area or the upper quartile of the western states? \_\_\_\_\_
- b. There are 26 states east of the Mississippi River. How many states have areas which are at or below the lower quartile? \_\_\_\_\_
- c. Use your knowledge of geography to answer this question: If Alaska and Hawaii were included with the western-states data, which values of the five-number summary would change in the western-states box plot? \_\_\_\_\_
- \_\_\_\_\_

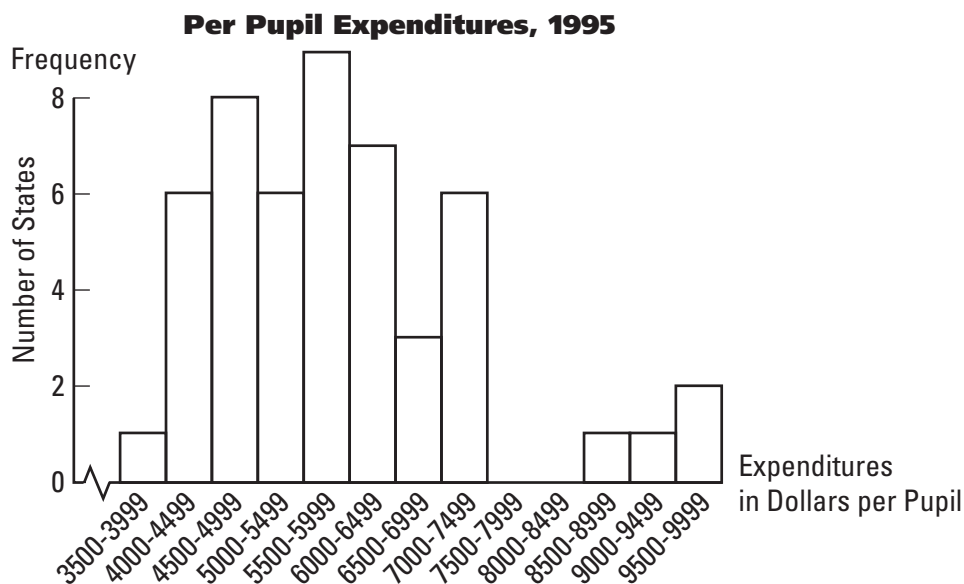
**Representations** Objective J

4. Draw two box plots to illustrate the data in Exercise 2.



**LESSON  
MASTER****1-5****Questions on SPUR Objectives**  
See pages 73–79 for objectives.**Representations** Objective I

1. Below is a frequency histogram displaying average expenditures per pupil for the 50 states in 1995.



- a. How many states spend between \$6000 and \$6999 per pupil? \_\_\_\_\_
- b. In what interval is the median? Justify your answer.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- c. How could the frequency histogram be changed to become a relative frequency histogram?  
\_\_\_\_\_  
\_\_\_\_\_
- d. What percent of states spend more than \$8000 per pupil? \_\_\_\_\_

► **LESSON MASTER 1-5** page 2

2. The table at the right gives the relative frequency of drivers by age group in 1995.

a. What percent of the driving population are 45 years of age or older?

\_\_\_\_\_

b. If there were about 16,900,000 drivers between the ages of 45 and 49, how many drivers are 24 years old or younger?

\_\_\_\_\_

Age	Relative Frequency
15–19	5.2
20–24	8.8
25–29	10.2
30–34	11.5
35–39	11.7
40–44	10.7
45–49	9.6
50–54	7.3
55–59	5.8
60–64	5.1
65–69	4.8
70–74	4.1
75–80	2.9
80–84	1.6
85 and over	0.8

Source: U.S. Dept. of Transportation

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**Representations** Objective J
 

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3. Below are the birth weights in pounds of a group of babies.

7.10	7.14	8.00	6.10	7.00	6.82	7.12	8.10	8.23
6.20	5.66	6.66	5.90	7.50	6.42	5.81	5.43	6.26
7.40	7.00	5.20	6.80	7.33	5.91	6.05	6.22	8.80
3.25	6.20	3.66	7.20	7.91	6.37	8.72	9.15	7.33
6.98	7.25	8.20	7.10	8.02	7.25	7.75	5.67	
9.22	7.78	5.36	6.50	5.55	6.88	7.55	6.70	

- a. Determine each statistic from this data set.

i. minimum

\_\_\_\_\_

ii. maximum

\_\_\_\_\_

iii. range

\_\_\_\_\_

- b. Use intervals of size 1 to draw a histogram representing the data.

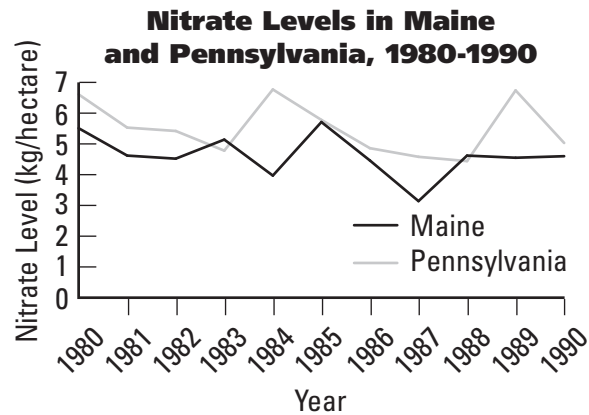
- c. Use intervals of size 0.5 to draw a histogram representing the data.

- d. Babies born weighing less than 5.5 pounds are at a higher risk of having developmental problems. What percent of the babies in the data set are at risk? \_\_\_\_\_

**LESSON  
MASTER****1-6****Questions on SPUR Objectives**  
See pages 73–79 for objectives.**Representations Objective G**

1. One measurement of acid rain is the level of nitrate deposits. The following data for Maine and Pennsylvania from 1980 to 1990 are displayed in the line graph below.

Nitrate Levels		
Year	Maine	Pennsylvania
1980	5.51	6.61
1981	4.62	5.53
1982	4.52	5.42
1983	5.14	4.78
1984	3.97	6.77
1985	5.71	5.78
1986	4.46	4.86
1987	3.14	4.58
1988	4.62	4.44
1989	4.55	6.74
1990	4.60	5.03



Source: U.S. Department of Agriculture

- a. Calculate the average rate of change of nitrate levels between 1984 and 1988 in each state.
- i. Pennsylvania \_\_\_\_\_ ii. Maine \_\_\_\_\_
- b. Which answer to part a better represents what happened between 1984 and 1988? Explain why.
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- c. Give two reasons why line graphs are good displays for this set of data.
- \_\_\_\_\_
- \_\_\_\_\_
- d. Calculate the mean nitrate levels for Maine and Pennsylvania from 1980 to 1990. \_\_\_\_\_
- e. Draw horizontal lines on the graph to show the mean for each state. Then explain why this is helpful in reading the graph.
- \_\_\_\_\_
- \_\_\_\_\_

► **LESSON MASTER 1-6** page 2**Representations** Objective J

2. The following list displays the scores of the latest test in Ben Faire's algebra class.

83 76 82 62 57 82 83 72 76 74 90 84 76  
88 91 54 79 75 72 67 93 87 80 68 95 72

Draw a graph that you feel best displays the range of scores in B. Faire's algebra class.

3. Refer to the table below which shows the number of active military personnel from 1960 to 1994 in each branch of the United States armed forces.

Year	Army	Navy	Marine Corps	Air Force
1960	873,078	616,987	170,621	814,752
1965	969,066	669,985	190,213	824,662
1970	1,322,548	691,126	259,737	791,349
1975	784,333	535,085	195,951	612,751
1980	777,036	527,153	188,469	557,969
1985	780,787	570,705	198,025	601,515
1990	732,403	579,417	196,652	535,233
1994	541,343	468,662	174,158	426,327

Source: 1996 Information Please Almanac

- a. Draw a graph that you feel best compares the distribution of military personnel over the branches in 1970 and 1994.

- b. Explain why you chose the type of graph you used.

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### **Skills** Objective A

1. Find the variance and standard deviation of each data set.
- a. 5, 9, 10, 3, 2, 4, 5, 7, 2, 5                      b. -6, 1, -2, 0, -1, 8, 3, 1

2. Consider the following two data sets.  
 $\{1, 2, 3, 4, 5, 6, 7, 8\}$        $\{1, 1, 1, 1, 8, 8, 8, 8\}$
- a. Without using a calculator, tell how the means and the standard deviations of the two data sets compare.

- b.** Use a calculator to find the mean and the standard deviation of each set to check your answer to part a.

## Properties Objective B

**In 3–7, match each expression with a descriptor of the data set  $\{x_1, x_2, \dots, x_n\}$ .**

- |                                    |                       |
|------------------------------------|-----------------------|
| I. mean                            | IV. variance          |
| II. sum of the deviations          | V. standard deviation |
| III. sum of the deviations squared |                       |

$$3. \sum_{i=1}^n (x_i - \bar{x})^2$$

4.  $\sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n - 1}}$

$$5. \frac{\sum_{i=1}^n x_i}{n}$$

$$6. \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n - 1}$$

$$7. \sum_{i=1}^n (x_i - \bar{x})$$

## Properties Objective C

8. Tell whether the statistic may be negative. Write *yes* or *no*.
- |                 |       |                           |       |
|-----------------|-------|---------------------------|-------|
| a. the mean     | _____ | b. a deviation            | _____ |
| c. the variance | _____ | d. the standard deviation | _____ |

► **LESSON MASTER 1-7** page 2**Uses** Objective F

9. The following data give the total amount of snowfall, in inches, recorded at New York's JFK Airport in the month of January for the years 1965 to 1996.

1965	17.4	1971	11.6	1977	13.4	1983	1.0	1989	4.7	1995	0.1
1966	10.1	1972	1.7	1978	20.1	1984	10.1	1990	1.4	1996	23.0
1967	2.8	1973	0	1979	7.4	1985	12.4	1991	5.7		
1968	4.5	1974	6.7	1980	3.0	1986	3.0	1992	1.9		
1969	0.6	1975	0.6	1981	7.7	1987	11.8	1993	0.8		
1970	5.5	1976	6.9	1982	12.5	1988	15.7	1994	7.1		

Source: National Climate Data Center

- Find the mean and the standard deviation of the snowfall data using a statistics utility. \_\_\_\_\_
- What percent of these data are within 1 standard deviation of the mean? \_\_\_\_\_
- The blizzard of January, 1996, which hit the East Coast was one of the worst in history. How many standard deviations above the mean was the snowfall for January of 1996? \_\_\_\_\_

In 10 and 11, use the following table, which lists the percents of on-time flight arrivals and departures at major U.S. airports in 1994.

Airport City	1st qtr.	3rd qtr.	Airport City	1st qtr.	3rd qtr.
Atlanta	75.2	78.2	Newark	53.5	74.3
Boston	59.0	75.1	NY (Kennedy)	67.0	70.2
Charlotte	78.7	82.2	NY (LaGuardia)	70.3	77.9
Chicago (O'Hare)	73.8	85.9	Orlando	72.8	80.2
Cincinnati	77.7	83.7	Philadelphia	70.0	77.3
Dallas/Ft. Worth	77.5	84.9	Phoenix	80.7	87.4
Denver	71.9	86.8	Pittsburgh	69.9	82.0
Detroit	80.3	86.9	Raleigh/Durham	82.0	87.2
Houston	77.1	85.9	St. Louis	79.0	89.9
Las Vegas	79.5	84.1	Salt Lake City	82.3	86.0
Los Angeles	75.0	83.7	San Diego	78.5	87.5
Miami	73.3	78.7	San Francisco	71.4	84.3
Minneapolis/St. Paul	81.4	87.0	Seattle-Tacoma	72.9	84.4
Nashville	84.2	88.8	Tampa	72.5	78.6
			Washington, D.C.	72.4	81.6

Source: Statistical Abstract of the United States, 1995

10. Find the mean and the standard deviation

- of the first-quarter percents. \_\_\_\_\_
- of the third-quarter percents. \_\_\_\_\_
- Which set of percents is more variable? Explain why this seems reasonable. \_\_\_\_\_