Ch. 2 Descriptive Statistics

2.1 Frequency Distributions and Their Graphs

1 Interpret a Frequency Distribution

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

Use the given frequency distribution to find the
(a) class width.
(b) class midpoints of the first class.
(c) class boundaries of the first class.

1) **Height (in inches)**

Class	Frequency, f
50 – 52	5
53 – 55	8
56 – 58	12
59 – 61	13
62 – 64	11

A) (a) 3
(b) 51
(c) 49.5–52.5

B) (a) 2
(b) 51.5
(c) 49.5–52.5

C) (a) 3
(b) 51
(c) 50–52

D) (a) 2
(b) 51.5
(c) 50–52

2) **Phone Calls (per day)**

Class	Frequency, f
8 – 11	18
12 – 15	23
16 – 19	38
20 – 23	47
24 – 27	32

A) (a) 4
(b) 9.5
(c) 7.5–11.5

B) (a) 3
(b) 10.5
(c) 8–11

C) (a) 4
(b) 10.5
(c) 8–11

D) (a) 3
(b) 9.5
(c) 7.5–11.5

3) **Weight (in pounds)**

Class	Frequency, f
135 – 139	6
140 – 144	4
145 – 149	11
150 – 154	15
155 – 159	8

A) (a) 5
(b) 137
(c) 134.5–139.5

B) (a) 5
(b) 137
(c) 135–139

C) (a) 4
(b) 137.5
(c) 134.5–139.5

D) (a) 4
(b) 137.5
(c) 135–139

4) **Miles (per day)**

Class	Frequency, f
1 – 2	9
3 – 4	22
5 – 6	28
7 – 8	15
9 – 10	4

A) (a) 2
(b) 1.5
(c) 0.5–2.5

B) (a) 1
(b) 1.5
(c) 0.5–2.5

C) (a) 2
(b) 1
(c) 1–2

D) (a) 1
(b) 1
(c) 1–2

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

Use the maximum and minimum data entries and the number of classes to find the class width, the lower class limits, and the upper class limits.

5) min = 1, max = 30, 6 classes

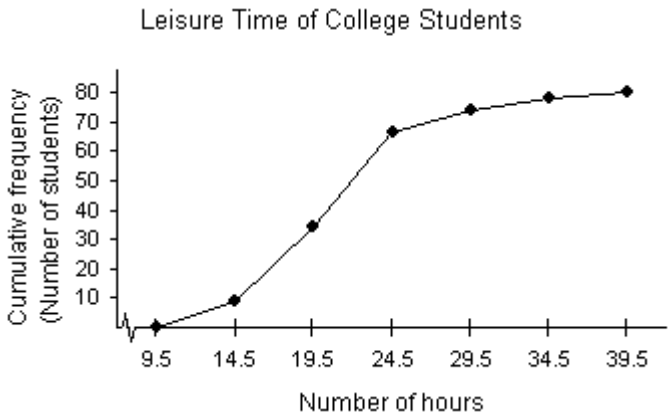
6) min = 80, max = 265, 6 classes

2 Interpret Frequency Distribution Graphs

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

Provide an appropriate response.

1) Use the ogive below to approximate the number in the sample.



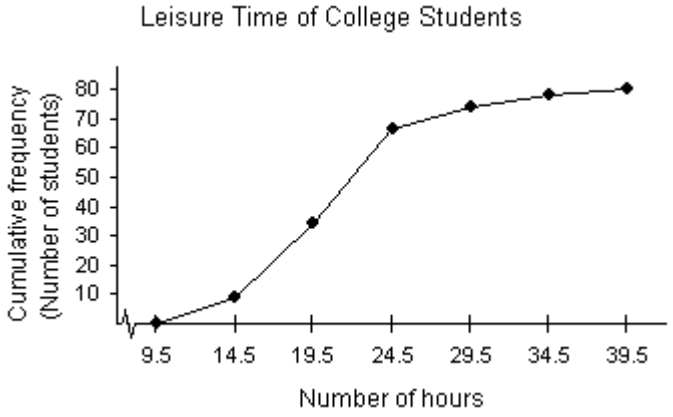
A) 80

B) 100

C) 341

D) 28

2) Use the ogive below to approximate the cumulative frequency for 24 hours.

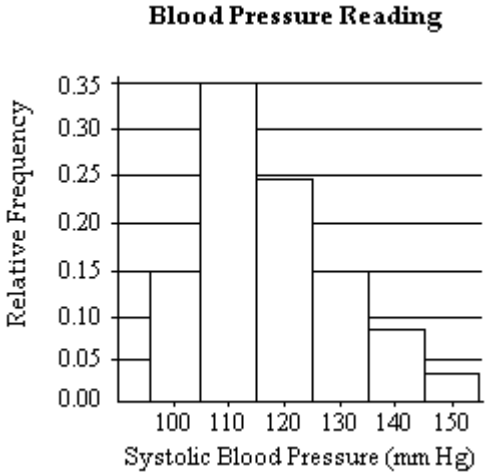


A) 63 B) 17 C) 27 D) 75

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

Use the relative frequency histogram to
a) identify the class with the greatest, and the class with the least, relative frequency.
b) approximate the greatest and least relative frequencies.
c) approximate the relative frequency of the fifth class.

3)



Use the given frequency distribution to construct a frequency histogram, a relative frequency histogram and a frequency polygon.

4) **Height (in inches)**

Class	Frequency, f
50 – 52	5
53 – 55	8
56 – 58	12
59 – 61	13
62 – 64	11

5) **Weight (in pounds)**

Class	Frequency, f
135 – 139	6
140 – 144	4
145 – 149	11
150 – 154	15
155 – 159	8

Use the given frequency distribution to construct a cumulative frequency distribution and an ogive.

6) **Phone Calls (per day)**

Class	Frequency, f
8 – 11	18
12 – 15	23
16 – 19	38
20 – 23	47
24 – 27	32

7) **Height (in inches)**

Class	Frequency, f
50 – 52	5
53 – 55	8
56 – 58	12
59 – 61	13
62 – 64	11

8) **Weight (in pounds)**

Class	Frequency, f
135 – 139	6
140 – 144	4
145 – 149	11
150 – 154	15
155 – 159	8

9) **Miles (per day)**

Class	Frequency, f
1 – 2	9
3 – 4	22
5 – 6	28
7 – 8	15
9 – 10	4

3 Construct a Frequency Distribution from Data Set

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

Provide an appropriate response.

1) A city in the Pacific Northwest recorded its highest temperature at 91 degrees Fahrenheit and its lowest temperature at 12 degrees Fahrenheit for a particular year. Use this information to find the upper and lower limits of the first class if you wish to construct a frequency distribution with 10 classes.

A) 12–19 B) 12–20 C) 7–17 D) 12–18

2) A sample of candies have weights that vary from 2.35 grams to 4.75 grams. Use this information to find the upper and lower limits of the first class if you wish to construct a frequency distribution with 12 classes.

A) 2.35–2.55 B) 2.35–2.54 C) 2.35–2.65 D) 2.35–2.75

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

The grade point averages for 40 students are listed below.

2.0	**3.2**	**1.8**	**2.9**	**0.9**	**4.0**	**3.3**	**2.9**	**3.6**	**0.8**
3.1	**2.4**	**2.4**	**2.3**	**1.6**	**1.6**	**4.0**	**3.1**	**3.2**	**1.8**
2.2	**2.2**	**1.7**	**0.5**	**3.6**	**3.4**	**1.9**	**2.0**	**3.0**	**1.1**
3.0	**4.0**	**4.0**	**2.1**	**1.9**	**1.1**	**0.5**	**3.2**	**3.0**	**2.2**

3) Construct a frequency distribution, a relative frequency distribution, and a cumulative frequency distribution using eight classes. Include the midpoints of the classes.

4) Construct a frequency histogram, a relative frequency histogram and a frequency polygon using eight classes.

5) Construct an ogive using eight classes.

The heights (in inches) of 30 adult males are listed below.

70	**72**	**71**	**70**	**69**	**73**	**69**	**68**	**70**	**71**
67	**71**	**70**	**74**	**69**	**68**	**71**	**71**	**71**	**72**
69	**71**	**68**	**67**	**73**	**74**	**70**	**71**	**69**	**68**

6) Construct a frequency distribution, a relative frequency distribution, and a cumulative frequency distribution using five classes.

7) Construct a frequency histogram using five classes.

8) Construct a relative frequency histogram using five classes.

9) Construct a frequency polygon using five classes.

10) Construct a ogive using five classes.

The Highway Patrol, using radar, checked the speeds (in mph) of 30 passing motorists at a checkpoint. The results are listed below.

44	**38**	**41**	**50**	**36**	**36**	**43**	**42**	**49**	**48**
35	**40**	**37**	**41**	**43**	**50**	**45**	**45**	**39**	**38**
50	**41**	**47**	**36**	**35**	**40**	**42**	**43**	**48**	**33**

11) Construct a frequency distribution, a relative frequency distribution, and a cumulative frequency distribution using six classes.

12) Construct a frequency histogram, a relative frequency histogram and a frequency polygon using six classes.

13) Construct an ogive using six classes.

Provide an appropriate response.

14) Listed below are the ACT scores of 40 randomly selected students at a major university.

18	22	13	15	24	24	20	19	19	12
16	25	14	19	21	23	25	18	18	13
26	26	25	25	19	17	18	15	13	21
19	19	14	24	20	21	23	22	19	17

a) Construct a relative frequency histogram of the data, using eight classes.
b) If the university wants to accept the top 90% of the applicants, what should the minimum score be?
c) If the university sets the minimum score at 17, what percent of the applicants will be accepted?

4 Concepts

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

Provide an appropriate response.

1) Explain the difference between class limits and class boundaries.

2.2 More Graphs and Displays

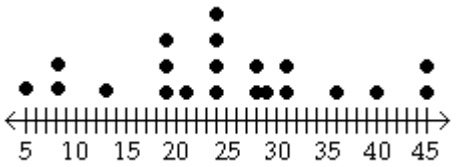
1 Interpret Data Sets

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

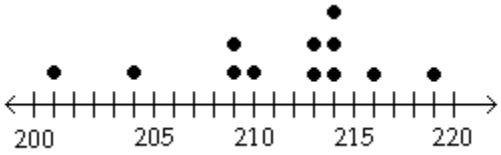
Match the description of the sample with the correct plot.

1) Time (in minutes) it takes a sample of employees to drive to work

A)



B)



C) Key: 0|9 = 0.9

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

D) Key: 7|2 = 72

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

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

Provide an appropriate response.

2) The numbers of home runs that Sammy Sosa hit in the first 15 years of his major league baseball career are listed below. Make a stem–and–leaf plot for this data. What can you conclude about the data?

4 15 10 8 33 25 36 40 36 66 63 50 64 49 40

3) The numbers of home runs that Barry Bonds hit in the first 18 years of his major league baseball career are listed below. Make a stem–and–leaf plot for this data. What can you conclude about the data?

16	25	24	19	33	25	34	46	37
33	42	40	37	34	49	73	46	45

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

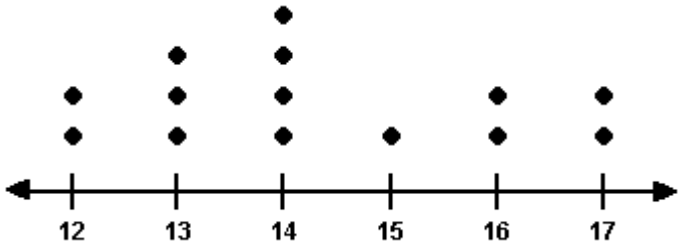
4) For the stem–and–leaf plot below, what is the maximum and what is the minimum entry?

Key : 11| 9 = 11.9

11	6 9
12	4 6 6 7 8 9
13	0 1 1 2 3 6 6 7 8 8
14	3 4 6 6 8 9 9 9
15	0 1 1 2 3 7 7 8 9
16	2 2 5 7 8 8 9 9
17	7 8

A) max: 17.8; min: 11.6
B) max: 178; min: 116
C) max: 17.7; min: 11.6
D) max: 17.8; min: 11.9

5) For the dot plot below, what is the maximum and what is the minimum entry?



A) max: 17; min: 12
B) max: 54; min: 15
C) max: 54; min: 12
D) max: 14; min: 12

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

6) The heights (in inches) of 30 adult males are listed below. Construct a stem–and–leaf chart for the data. What can you conclude about the data?

70	72	71	70	69	73	69	68	70	71
67	71	70	74	69	68	71	71	71	72
69	71	68	67	73	74	70	71	69	68

7) The Highway Patrol, using radar, checked the speeds (in mph) of 30 passing motorists at a checkpoint. The results are listed below. Construct a stem–and–leaf plot for the data, listing each stem twice. What can you conclude about the data?

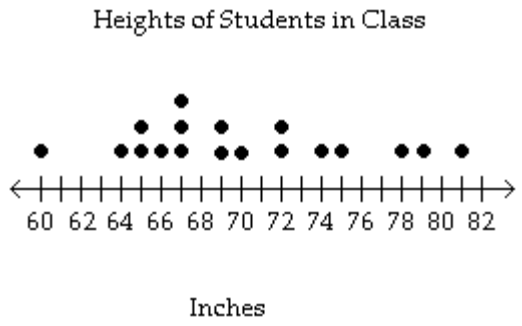
44	38	41	50	36	36	43	42	49	48
35	40	37	41	43	50	45	45	39	38
50	41	47	36	35	40	42	43	48	33

2 Graph Data Sets

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

Provide an appropriate response.

1) Display the data below in a stem–and–leaf plot.



A)

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

B)

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

C)

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

D)

5	0
6	0
7	7
8	1

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

2) The Highway Patrol, using radar, checked the speeds (in mph) of 30 passing motorists at a checkpoint. The results are listed below. Construct a dot plot for the data.

44	38	41	50	36	36	43	42	49	48
35	40	37	41	43	50	45	45	39	38
50	41	47	36	35	40	42	43	48	33

3) The heights (in inches) of 30 adult males are listed below. Construct a dot plot for the data.

70	72	71	70	69	73	69	68	70	71
67	71	70	74	69	68	71	71	71	72
69	71	68	67	73	74	70	71	69	68

4) A study was conducted to determine how people get jobs. Four hundred subjects were randomly selected and the results are listed below.

Job Sources of Survey Respondents	Frequency
Newspaper want ads	69
Online services	124
Executive search firms	72
Mailings	32
Networking	103

Construct a pie chart of the data.

5) A study was conducted to determine how people get jobs. Four hundred subjects were randomly selected and the results are listed below.

Job Sources of Survey Respondents	Frequency
Newspaper want ads	72
Online services	124
Executive search firms	69
Mailings	32
Networking	103

Construct a Pareto chart of the data.

6) The heights (in inches) of 30 adult males are listed below. Construct a Pareto chart for the data.

70	72	71	70	69	73	69	68	70	71
67	71	70	74	69	68	71	71	71	72
69	71	68	67	73	74	70	71	69	68

7) Use a scatter plot to display the data below. All measurements are in milligrams per cigarette.

Brand	Tar	Nicotine
Benson & Hedges	16	1.2
Lucky Strike	13	1.1
Marlboro	16	1.2
Viceroy	18	1.4
True	6	0.6

8) The numbers of home runs that Barry Bonds hit in the first 10 years of his major league baseball career are listed below. Use a scatter plot to display the data. Is there a relationship between the home runs and the batting averages?

Home Runs	16	25	24	19	33	25	34	46	37	33
Batting Average	.223	.261	.283	.248	.301	.292	.311	.336	.312	.294

9) The data below represent the numbers of absences and the final grades of 15 randomly selected students from a statistics class. Use a scatter plot to display the data. Is there a relationship between the students' absences and their final grades?

Student	Number of Absences	Final Grade as a Percent
1	5	79
2	6	78
3	2	86
4	12	56
5	9	75
6	5	90
7	8	78
8	15	48
9	0	92
10	1	78
11	9	81
12	3	86
13	10	75
14	3	89
15	11	65

10) The data below represent the infant mortality rates and the life expectancies for seven selected countries in Africa. Use a scatter plot to display the data.

Infant Mortality	63	199	71	61	67	35	194
Life Expectancy	45	31	51	47	39	70	37

11) The data below represent the smoking prevalence among U.S. adults over a 35–year period. Use a time series chart to display the data. Describe any trends shown.

Year	1965	1985	1990	1995	2000
Percent of Smokers	42	30	25	25	23

12) A safety engineer wishes to use the following data to show the number of deaths from the collision of passenger cars with trucks on a particular highway. Use a time series chart to display the data. Describe any trends shown.

Year	Number of Deaths
1930	12
1940	17
1950	22
1960	21
1970	16
1980	13
1990	11
2000	12

13) Women were allowed to enter the Boston Marathon for the first time in 1972. Listed below are the winning women's times (in minutes) for the first 10 years. Use a time series chart to display the data.

Year	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
Time	190	186	167	162	167	168	165	155	154	147

14) The five longest winning streaks for NCAA Men's Division I Basketball are listed below. Construct a Pareto chart for the data.

University	Number of Games
Indiana	57
San Francisco	51
UCLA	76
Marquette	56
Kentucky	54

15) The lengths, in kilometers, of the world's largest subway systems are listed below. Construct a Pareto chart for the data.

City	Length
Moscow	340
Paris	211
London	415
Tokyo	281
New York City	371

16) The number of beds in a sample of 24 hospitals are listed below. Construct a stem–and–leaf plot for the data.

149	167	162	127	130	180	160	167
221	145	137	194	207	150	254	262
244	287	137	204	166	174	180	151

17) The number of minutes that a dentist kept 20 patients waiting beyond their appointment times are listed below. Construct a stem–and–leaf plot for the data.

12.9	12.1	9.6	9.8	11.5	13.0	10.5	10.3	15.7	11.3
10.7	10.0	13.0	9.7	11.4	12.8	11.9	9.3	9.6	10.1

18) A study was conducted to determine how certain families pay on their credit card balances. Two hundred families with a household annual income between $25,000 and $49,999 were randomly selected and the results are listed below. Construct a pie chart of the data.

Payment schedule	Frequency
Almost always pay off balance	97
Sometimes pay off balance	41
Hardly ever pay off balance	62

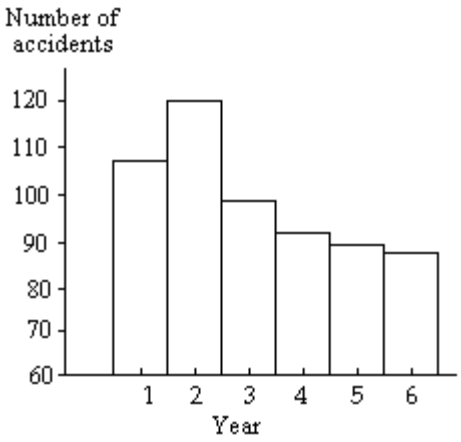
19) Of the 55 tornado fatalities in a recent year, the locations of the victims are listed below. Construct a pie chart of the data.

Location	Fatalities
Mobile home	37
Permanent home	10
Vehicle	4
Business	2
Unknown	2

20) The data below represent the alcohol–related driving fatalities, in thousands, in the United States over a 20–year period. Use a time series chart to display the data. Describe any trends shown.

Year	1983	1985	1987	1989	1991	1993	1995	1997	1999	2001
Fatalities	25	23	24	22	20	18	18	17	17	17

21) The graph below shows the number of car accidents occurring in one city in each of the years 1 through 6. The number of accidents dropped in year 3 after a new speed limit was imposed. Does the graph distort the data? How would you redesign the graph to be less misleading?



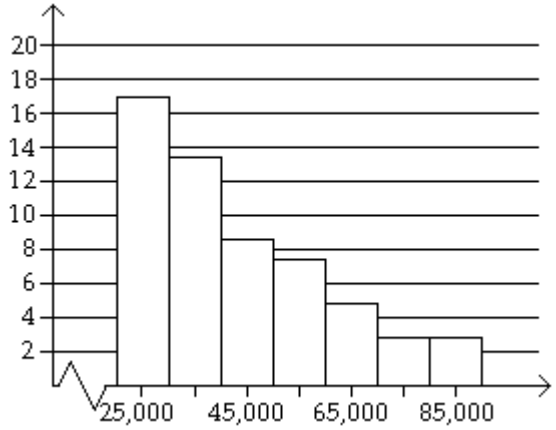
2.3 Measures of Central Tendency

1 Interpret the Graph of a Distribution

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

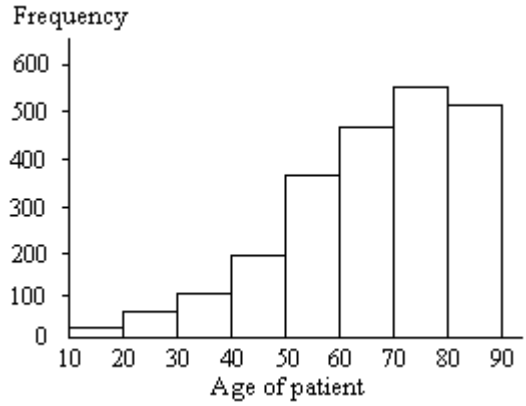
Provide an appropriate response.

1) Determine whether the approximate shape of the distribution in the histogram is symmetric, uniform, skewed left, skewed right, or none of these.



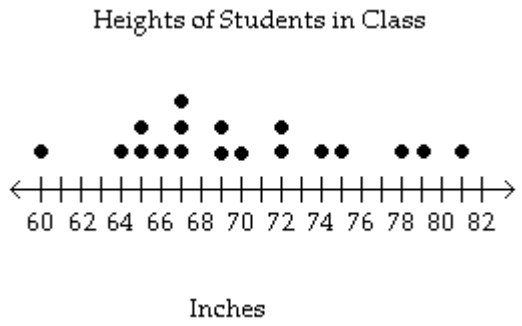
A) skewed right B) skewed left C) symmetric D) uniform

2) Determine whether the approximate shape of the distribution in the histogram is symmetric, uniform, skewed left, skewed right, or none of these.



A) skewed left B) skewed right C) symmetric D) uniform

3) Find the mean, median, and mode of the data.



A) $\bar{x} = 70$; median = 69; mode = 67
B) $\bar{x} \approx 70.1$; median = 69; mode = 68
C) $\bar{x} \approx 70.3$; median = 69; mode = 68
D) $\bar{x} = 70$; median = 67; mode = 69

For the given data , construct a frequency distribution and frequency histogram of the data using five classes. Describe the shape of the histogram as symmetric, uniform, skewed left, or skewed right.

4) Data set: California Pick Three Lottery

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

A) uniform B) symmetric C) skewed left D) skewed right

5) Data set: California Pick Three Lottery

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

A) skewed left B) symmetric C) uniform D) skewed right

6) Data set: ages of 20 cars randomly selected in a student parking lot

12 6 4 9 11 1 7 8 9 8
9 13 5 15 7 6 8 8 2 1

A) symmetric B) uniform C) skewed left D) skewed right

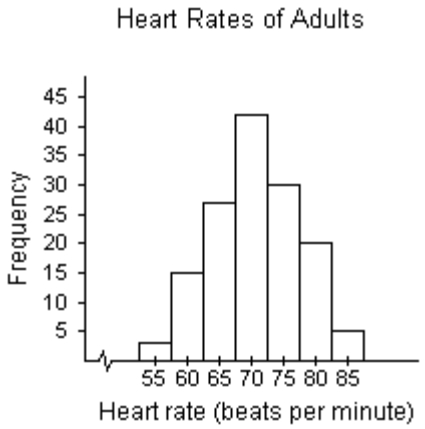
7) Data set: systolic blood pressures of 20 randomly selected patients at a blood bank

135 120 115 132 136 124 119 145 98 110
125 120 115 130 140 105 116 121 125 108

A) symmetric B) uniform C) skewed left D) skewed right

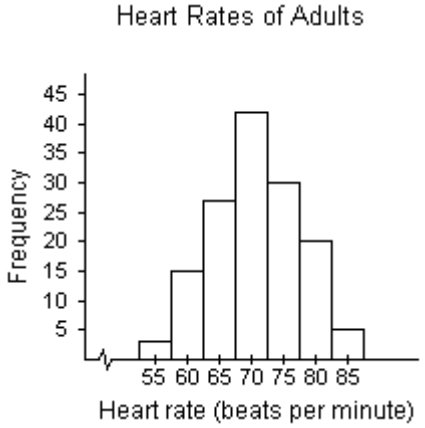
Provide an appropriate response.

8) Use the histogram below to approximate the mode heart rate of adults in the gym.



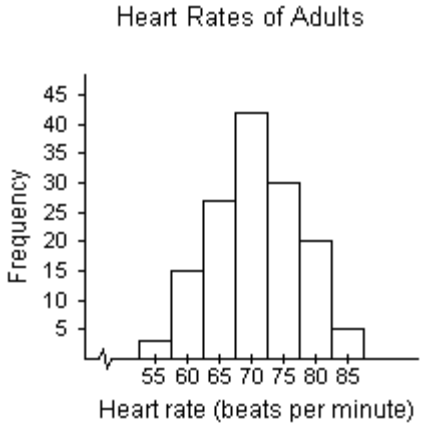
A) 70 B) 42 C) 55 D) 2

9) Use the histogram below to approximate the median heart rate of adults in the gym.



A) 70 B) 65 C) 75 D) 42

10) Use the histogram below to approximate the mean heart rate of adults in the gym.



A) 70.8 B) 1425.7 C) 70 D) 31.6

2 Find the Mean, Median, and Mode

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

Provide an appropriate response.

1) Find the mean, median, and mode of the following numbers:

65 68 61 65 58 66 65 59 60 63

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

2) The top 14 speeds, in miles per hour, for Pro–Stock drag racing over the past two decades are listed below. Find the mean speed.

181.1 202.2 190.1 201.4 191.3 201.4 192.2
201.2 193.2 201.2 194.5 199.2 196.0 196.2

A) 195.8 B) 196.1 C) 201.2 D) 210.9

3) The scores of the top ten finishers in a recent golf tournament are listed below. Find the mean score.

71 67 67 72 76 72 73 68 72 72

A) 71 B) 67 C) 68 D) 72

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

4) The numbers of runs batted in that Sammy Sosa hit in the first 15 years of his major league baseball career are listed below. Find the mean and median number of runs batted in. Round the mean to the nearest whole number.

13 70 33 25 93 70 119 100
119 158 141 138 160 108 103

5) The numbers of home runs that Barry Bonds hit in the first 18 years of his major league baseball career are listed below. Find the mean and median number of home runs. Round the mean to the nearest whole number. Which measure of central tendency– the mean or the median– best represents the data? Explain your reasoning.

16 25 24 19 33 25 34 46 37
33 42 40 37 34 49 73 46 45

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

6) The top 14 speeds, in miles per hour, for Pro–Stock drag racing over the past two decades are listed below. Find the median speed.

181.1 202.2 190.1 201.4 191.3 201.4 192.2
201.2 193.2 201.2 194.5 199.2 196.0 196.2

A) 196.1 B) 196.7 C) 195.8 D) 201.2

7) The scores of the top ten finishers in a recent golf tournament are listed below. Find the median score.

67 67 68 71 72 72 72 72 73 76

A) 72 B) 67 C) 71 D) 73

8) The top 14 speeds, in miles per hour, for Pro–Stock drag racing over the past two decades are listed below. Find the mode speed.

181.1 202.2 190.1 201.4 191.3 201.4 192.2
201.2 193.2 201.2 194.5 199.2 196.0 196.2

A) bimodal: 201.2, 201.4 B) 201.4
C) 201.2 D) no mode

9) The scores of the top ten finishers in a recent golf tournament are listed below. Find the mode score.

71 67 67 72 76 72 73 68 72 72

A) 72 B) 67 C) 76 D) 73

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

10) The amounts of money won by the top ten finishers in a recent Daytona 500 are listed below. Find the mean and median winnings. Round to the nearest dollar. Which measure– the mean or the median– best represents the data? Explain your reasoning.

$2,194,246 $464,084 $164,096 $199,209 $438,834
$613,659 $142,884 $240,731 $145,809 $290,596

3 Find the Weighted Mean

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

Provide an appropriate response.

1) A student receives test scores of 62, 83, and 91. The student's final exam score is 88 and homework score is 76. Each test is worth 20% of the final grade, the final exam is 25% of the final grade, and the homework grade is 15% of the final grade. What is the student's mean score in the class?
A) 80.6 B) 76.6 C) 90.6 D) 85.6

2) Grade points are assigned as follows: A = 4, B = 3, C = 2, D = 1, and F = 0. Grades are weighted according to credit hours. If a student receives an A in a four–credit class, a D in a two–credit class, a B in a three–credit class and a C in a three–credit class, what is the student's grade point average?
A) 2.75 B) 1.75 C) 2.50 D) 3.00

4 Find the Mean of Frequency Distribution

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

Approximate the mean of the frequency distribution.

1)

Miles (per day)	Frequency
1–2	15
3–4	28
5–6	11
7–8	14
9–10	9

A) 5 B) 4 C) 6 D) 15

2)

Phone calls (per day)	Frequency
8–11	37
12–15	49
16–19	17
20–23	46
24–27	39

A) 18 B) 17 C) 16 D) 19 E) 38

3)

Weight (in pounds)	Frequency
135–139	7
140–144	12
145–149	10
150–154	11
155–159	20

A) 149 B) 147 C) 151 D) 12

5 Concepts

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

Provide an appropriate response.

1) What is the difference between using μ and $\bar{x}$ to represent a mean?

2) Why do data entries need to be ordered before the median can be found?

3) On a recent Statistics test, the scores were 15, 66, 66, 81, 82, 83, 85, 88, 90, 92, 93, and 95. Is the mean a good representation of the center of data? If not, why?

4) On a recent Statistics test, the scores were 15, 66, 66, 81, 82, 83, 85, 88, 90, 92, 93, and 95. Is the mode a good representation of the center of data? If not, why?

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

5) On a recent Statistics test, the scores were 61, 66, 68 , 82, 84, 86, 88, 90, 92, and 97. Find the 10% trimmed mean of this data.

A) 82 B) 77 C) 38.5 D) 85

6) The lengths of phone calls from one household (in minutes) were 2, 4, 6, 7, and 10 minutes. Find the midrange for this data.
A) 6 minutes B) 2 minutes C) 10 minutes D) 7 minutes

7) The cost of five homes in a certain area is given.

$141,000 $149,000 $169,000 $139,000 $1,219,000

Which measure of central tendency should be used?
A) median B) mean C) mode D) midrange

8) The cost of five homes in a certain area is given.

$186,000 $194,000 $214,000 $184,000 $1,264,000

List any outlier(s).
A) $1,264,000 B) $186,000
C) $1,264,000 and $186,000 D) There are no outliers.

9) The cost of five homes in a certain area is given.

$206,000 $214,000 $234,000 $204,000 $1,284,000

Calculate the midrange.
A) $540,000 B) $214,000 C) $1,080,000 D) $428,400

2.4 Measures of Variation

1 Find Measures of Variation

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

Provide an appropriate response.

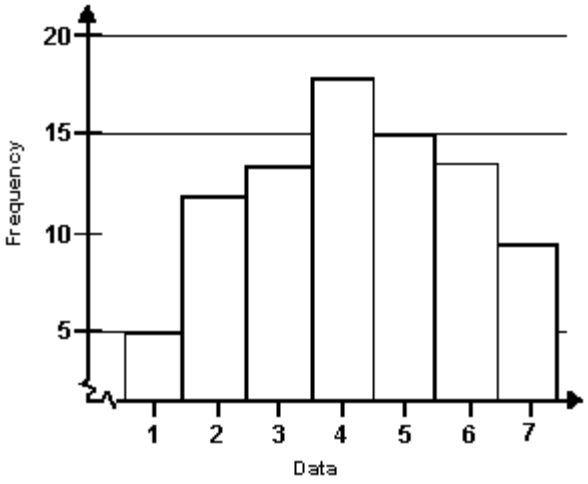
1) For the stem–and–leaf plot below, find the range of the data set.

Key: 2|7 = 27

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

A) 29 B) 43 C) 14 D) 37

2) Find the range of the data set represented by the graph.



A) 6 B) 17 C) 20 D) 5

3) The grade point averages for 10 students are listed below. Find the range of the data set.

2.0 3.2 1.8 2.9 0.9 4.0 3.3 2.9 3.6 0.8
A) 3.2 B) 2.45 C) 1.4 D) 2.8

4) The heights (in inches) of 20 adult males are listed below. Find the range of the data set.

70 72 71 70 69 73 69 68 70 71
67 71 70 74 69 68 71 71 71 72
A) 7 B) 5 C) 6 D) 6.5

5) Find the sample standard deviation.

2 6 15 9 11 22 1 4 8 19
A) 7.1 B) 6.8 C) 2.1 D) 6.3

6) Find the sample standard deviation.

15 42 53 7 9 12 14 28 47
A) 17.8 B) 16.6 C) 29.1 D) 15.8

7) Find the sample standard deviation.

22 29 21 24 27 28 25 36
A) 4.8 B) 4.2 C) 1.6 D) 2.8

8) The heights (in inches) of 10 adult males are listed below. Find the sample standard deviation of the data set.

70 72 71 70 69 73 69 68 70 71
A) 1.49 B) 70 C) 3 D) 2.38

9) Sample annual salaries (in thousands of dollars) for public elementary school teachers are listed. Find the sample standard deviation.

17.0 10.7 38.7 32.1 16.4 15.9

A) 10.97 B) 35.40 C) 3453.36 D) 2851.44

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

10) The heights (in inches) of all 10 adult males in an office are listed below. Find the population standard deviation and the population variance.

70 72 71 70 69 73 69 68 70 71

11) In a random sample, 10 students were asked to compute the distance they travel one way to school to the nearest tenth of a mile. The data is listed below. Compute the range, standard deviation and variance of the data.

1.1 5.2 3.6 5.0 4.8 1.8 2.2 5.2 1.5 0.8

2 Interpret Data

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

Provide an appropriate response.

1) Without performing any calculations, use the stem–and–leaf plots to determine which statement is accurate.

(i)

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

(ii)

10	9
11	5 8
12	3 3 7 7
13	2 5
14	1

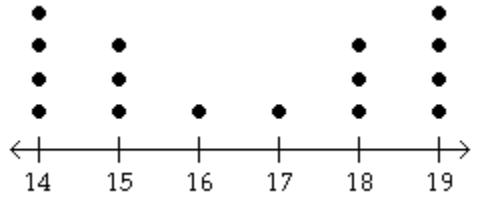
(iii)

0	
1	5
2	3 3 3 3 7 7 7 7
3	5
4	

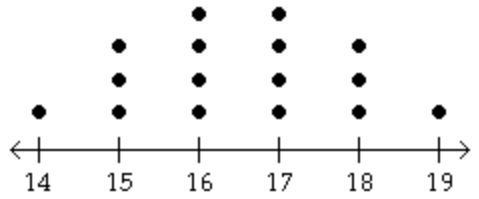
A) Data sets (i) and (ii) have the same standard deviation.
B) Data set (ii) has the greatest standard deviation.
C) Data set (i) has the smallest standard deviation.
D) Data sets (i) and (iii) have the same range.

2) You are asked to compare three data sets. Without calculating, determine which data set has the greatest sample standard deviation and which has the least sample standard deviation.

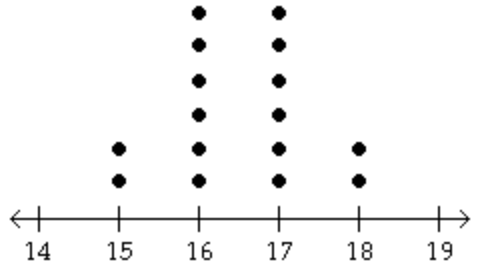
(i)



(ii)



(iii)



A) Greatest sample standard deviation: (i)
Least sample standard deviation: (iii)

B) Greatest sample standard deviation: (i)
Least sample standard deviation: (ii)

C) Greatest sample standard deviation: (iii)
Least sample standard deviation: (ii)

D) Greatest sample standard deviation: (iii)
Least sample standard deviation: (i)

3) You are asked to compare three data sets. Without calculating, determine which data set has the greatest sample standard deviation and which has the least sample standard deviation.

(i)

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

(ii)

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

(iii)

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

A) Greatest sample standard deviation: (iii)
Least sample standard deviation: (ii)

B) Greatest sample standard deviation: (iii)
Least sample standard deviation: (i)

C) Greatest sample standard deviation: (i)
Least sample standard deviation: (ii)

D) Greatest sample standard deviation: (i)
Least sample standard deviation: (iii)

3 Compare Two Data Sets

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

Provide an appropriate response.

1) You need to purchase a battery for your car. There are two types available. Type A has a mean life of five years and a standard deviation of one year. Type B has a mean life of five years and a standard deviation of one month. Both batteries cost the same. Which one should you purchase if you are concerned that your car will always start? Explain your reasoning.

2) Here are the batting averages of Sammy Sosa and Barry Bonds for 13 recent years. Which player is more consistent? Explain your reasoning.

Sammy Sosa	0.203	0.260	0.261	0.300	0.268	0.273	0.251	0.308	0.288	0.320	0.328	0.288	0.279
Barry Bonds	0.292	0.311	0.336	0.312	0.294	0.308	0.291	0.303	0.262	0.306	0.328	0.370	0.341

3) You are the maintenance engineer for a local high school. You must purchase fluorescent light bulbs for the classrooms. Should you choose Type A with $\mu = 3000$ hours and $\sigma = 200$ hours, or Type B with $\mu = 3000$ hours and $\sigma = 250$ hours?

4 Use the Empirical Rule

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

Provide an appropriate response.

1) The mean IQ score of adults is 100, with a standard deviation of 15. Use the Empirical Rule to find the percentage of adults with scores between 70 and 130. (Assume the data set has a bell-shaped distribution.)
A) 95% B) 68% C) 99.7% D) 100%

2) The mean score of a placement exam for entrance into a math class is 80, with a standard deviation of 10. Use the Empirical Rule to find the percentage of scores that lie between 60 and 80. (Assume the data set has a bell-shaped distribution.)
A) 47.5% B) 68% C) 34% D) 95%

3) The mean IQ score of students in a particular calculus class is 110, with a standard deviation of 5. Use the Empirical Rule to find the percentage of students with an IQ above 120. (Assume the data set has a bell-shaped distribution.)
A) 2.5% B) 11.15% C) 13.5% D) 15.85%

4) The mean score of a competency test is 65, with a standard deviation of 4. Use the Empirical Rule to find the percentage of scores between 53 and 77. (Assume the data set has a bell-shaped distribution.)
A) 99.7% B) 50% C) 68% D) 95%

5) The mean score of a competency test is 82, with a standard deviation of 2. Between what two values do about 99.7% of the values lie? (Assume the data set has a bell-shaped distribution.)
A) Between 76 and 88 B) Between 80 and 84 C) Between 78 and 86 D) Between 74 and 90

6) The mean length of a human pregnancy is 266 days, with a standard deviation of 9 days. Use the Empirical Rule to determine the percentage of women whose pregnancies are between 257 and 275 days. (Assume the data set has a bell-shaped distribution.)
A) 68% B) 50% C) 95% D) 99.7%

7) The mean SAT verbal score is 462, with a standard deviation of 98. Use the Empirical Rule to determine what percent of the scores lie between 462 and 560. (Assume the data set has a bell–shaped distribution.)
A) 34% B) 68% C) 49.9% D) 47.5%

8) The mean SAT verbal score is 486, with a standard deviation of 95. Use the Empirical Rule to determine what percent of the scores lie between 391 and 486. (Assume the data set has a bell–shaped distribution.)
A) 34% B) 68% C) 49.9% D) 47.5%

9) The mean SAT verbal score is 500, with a standard deviation of 100. Use the Empirical Rule to determine what percent of the scores lie between 500 and 700. (Assume the data set has a bell–shaped distribution.)
A) 47.5% B) 68% C) 34% D) 49.9%

10) The mean SAT verbal score is 490, with a standard deviation of 96. Use the Empirical Rule to determine what percent of the scores lie between 298 and 586. (Assume the data set has a bell–shaped distribution.)
A) 81.5% B) 68% C) 34% D) 83.9%

11) The mean monthly rent for a sample of studio apartments in one city is $1200 with a standard deviation of $210. The monthly rents for eight more studio apartments in the city are listed. Using the sample statistics above, determine which of the data values are unusual. Are any of the data values very unusual? Explain. (Assume the data set has a bell–shaped distribution.)
$1074, $1536, $1641, $528, $801, $1662, $1347, $696
A) $1641, $528, $1662, $696 are unusual because they are more than 2 standard deviations from the mean. $528 is very unusual because it is more than 3 standard deviations from the mean.
B) $1536, $1641, $528, $801, $1662, $696 are unusual because they are more than 1 standard deviation from the mean. $1641, $528, $1662, $696 are very unusual because they are more than 2 standard deviations from the mean.
C) $528 is unusual because it is more than 3 standard deviations from the mean. There are no values that are very unusual because no value is more than 4 standard deviations from the mean.
D) $1641, $528, $801, $1662, $696 are unusual because they are more than 2 standard deviations from the mean. $528 and $696 are very unusual because they are more than 3 standard deviations from the mean.

5 Use Chebychev's Theorem

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

Provide an appropriate response.

1) Heights of adult women have a mean of 63.6 in. and a standard deviation of 2.5 in. Does Chebyshev's Theorem say about the percentage of women with heights between 58.6 in. and 68.6 in.?

2) Heights of adult women have a mean of 63.6 in. and a standard deviation of 2.5 in. Apply Chebyshev's Theorem to the data using k = 3. Interpret the results.

6 Use Grouped Data to Calculate a Mean and Standard Deviation

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

Use the grouped data formulas to find the indicated mean or standard deviation.

1) The salaries of a random sample of a company's employees are summarized in the frequency distribution below. Approximate the sample mean.

Salary ($)	Employees
5,001–10,000	16
10,001–15,000	14
15,001–20,000	11
20,001–25,000	16
25,001–30,000	23

A) $18,500.50 B) $17,500 C) $20,350.55 D) $16,650.45

2) The speeds of a random sample of 100 cars are recorded as they pass a highway checkpoint. The results are summarized in the frequency distribution below. Approximate the sample mean.

Speed (mph)	Cars
30–39	3
40–49	17
50–59	50
60–69	19
70–79	11

A) 56.3 mph B) 54.5 mph C) 61.9 mph D) 59.1 mph

3) The manager of a bank recorded the amount of time a random sample of customers spent waiting in line during peak business hours one Monday. The frequency distribution below summarizes the results. Approximate the sample mean. Round your answer to one decimal place.

Waiting time (minutes)	Number of customers
0 – 3	12
4 – 7	14
8 – 11	13
12 – 15	6
16 – 19	8
20 – 23	2
24 – 27	1

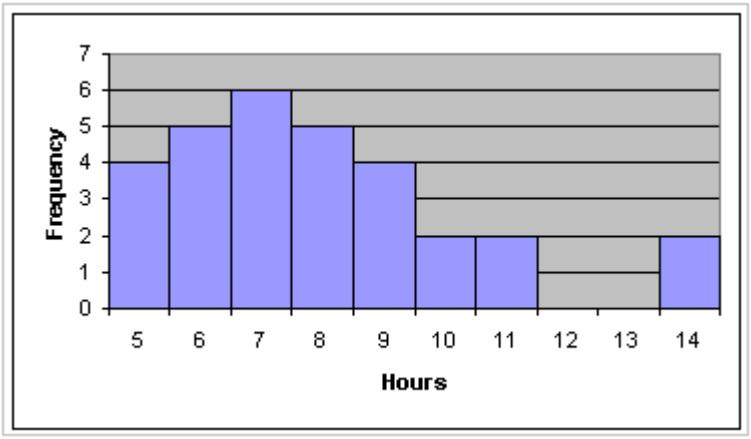
A) 9.1 min B) 13.5 min C) 8.0 min D) 9.2 min

4) The heights of a random sample of professional basketball players are summarized in the frequency distribution below. Approximate the sample mean. Round your answer to one decimal place.

Height (in.)	Frequency
70 – 71	1
72 – 73	6
74 – 75	8
76 – 77	12
78 – 79	9
80 – 81	5
82 – 83	2

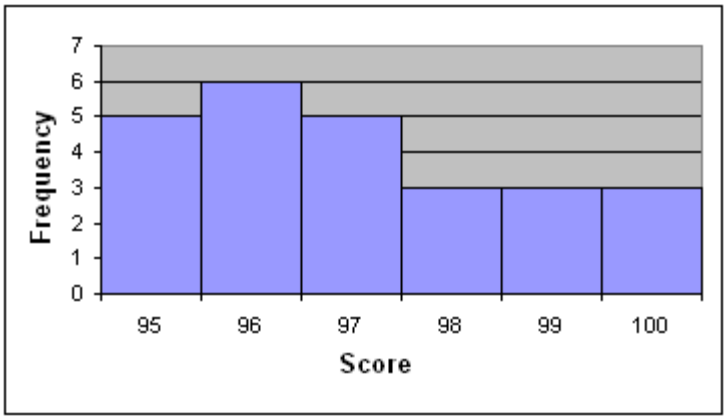
A) 76.6 in. B) 13.5 in. C) 74.9 in. D) 78.4 in.

5) A random sample of 30 high school students is selected. Each student is asked how many hours he or she spent on the Internet during the previous week. The results are shown in the histogram. Estimate the sample mean.



A) 7.9 hr B) 7.7 hr C) 8.1 hr D) 8.3 hr

6) A random sample of 25 community service projects is selected and the scores are recorded. The results are shown in the histogram. Estimate the sample mean.



A) 97.1 B) 97.3 C) 96.9 D) 96.7

7) For the following data set, approximate the sample standard deviation.

Miles (per day)	Frequency
1–2	9
3–4	22
5–6	28
7–8	15
9–10	4

A) 2.1 B) 5.1 C) 2.9 D) 1.6

8) For the following data set, approximate the sample standard deviation.

Phone calls (per day)	Frequency
8–11	18
12–15	23
16–19	38
20–23	47
24–27	32

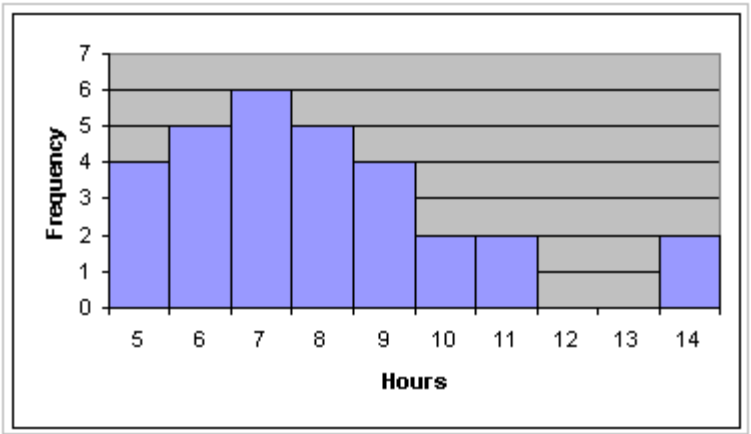
A) 5.1 B) 18.8 C) 2.9 D) 3.2

9) For the following data set, approximate the sample standard deviation.

Height (in inches)	Frequency
50–52	5
53–55	8
56–58	12
59–61	13
62–64	11

A) 3.85 B) 1.86 C) 2.57 D) 0.98

10) A random sample of 30 high school students is selected. Each student is asked how many hours he or she spent on the Internet during the previous week. The results are shown in the histogram. Estimate the sample standard deviation.



A) 2.4 hr B) 2.2 hr C) 2.6 hr D) 2.0 hr

7 Use Formulas to Analyze Data

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

Provide an appropriate response.

1) For the data below, find Pearson's index of skewness. The data set: The systolic blood pressures of 20 randomly selected patients at a blood bank.

130 120 115 132 136 124 119 145 98 110
125 120 115 130 140 105 116 121 125 108

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

2) In a random sample, 10 students were asked to compute the distance they travel one way to school to the nearest tenth of a mile. The data is listed below.

a) If a constant value k is added to each value, how will the standard deviation be affected?

b) If each value is multiplied by a constant k, how will the standard deviation be affected?

1.1 5.2 3.6 5.0 4.8 1.8 2.2 5.2 1.5 0.8

A) The standard deviation will not be affected.
B) The standard deviation will be multiplied by the constant k.

8 Compute the Coefficient of Variation

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

Provide an appropriate response.

1) In a random sample, 10 students were asked to compute the distance they travel one way to school to the nearest tenth of a mile. The data is listed below. Compute the coefficient of variation.

1.1 5.2 3.6 5.0 4.8 1.8 2.2 5.2 1.5 0.8

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

Find the coefficient of variation for each of the two sets of data, then compare the variation. Round results to one decimal place.

2) Listed below are the systolic blood pressures (in mm Hg) for a sample of men aged 20–29 and for a sample of men aged 60–69.

Men aged 20–29: 118 124 129 118 131 123
Men aged 60–69: 131 151 137 125 164 139

A) Men aged 20–29: 4.4%
Men aged 60–69: 10.0 %
There is substantially more variation in blood pressures of the men aged 60–69.

B) Men aged 20–29: 4.6%
Men aged 60–69: 10.5%
There is substantially more variation in blood pressures of the men aged 60–69.

C) Men aged 20–29: 4.2%
Men aged 60–69: 8.1%
There is substantially more variation in blood pressures of the men aged 60–69.

D) Men aged 20–29: 7.2%
Men aged 60–69: 4.6%
There is more variation in blood pressures of the men aged 20–29.

3) The customer service department of a phone company is experimenting with two different systems. On Monday they try the first system which is based on an automated menu system. On Tuesday they try the second system in which each caller is immediately connected with a live agent. A quality control manager selects a sample of seven calls each day. He records the time for each customer to have his or her question answered. The times (in minutes) are listed below.

Automated Menu:	11.2	7.2	4.0	2.9	9.2	6.3	5.5
Live agent:	6.3	2.5	4.8	4.1	3.4	5.2	3.7

A) Automated Menu: 43.7%
Live agent: 29.4%
There is substantially more variation in the times for the automated menu system.

B) Automated Menu: 45.3%
Live agent: 30.5%
There is substantially more variation in the times for the automated menu system.

C) Automated Menu: 46.9%
Live agent: 31.5%
There is substantially more variation in the times for the automated menu system.

D) Automated Menu: 24.3%
Live agent: 46.2%
There is substantially more variation in the times for the live agent.

4) Compare the variation in heights to the variation in weights of thirteen–year old girls. The heights (in inches) and weights (in pounds) of nine randomly selected thirteen–year old girls are listed below.

Heights (inches):	59.3	61.2	62.6	64.7	60.1	58.3	64.6	63.7	66.1
Weights (pounds):	86	97	93	119	96	90	123	98	139

A) Heights: 4.3%
Weights: 17.2%
There is substantially more variation in the weights than in the heights of the girls.

B) Heights: 4.1%
Weights: 16.4%
There is substantially more variation in the weights than in the heights of the girls.

C) Heights: 3.9%
Weights: 15.4%
There is substantially more variation in the weights than in the heights of the girls.

D) Heights: 11.5%
Weights: 6.5%
There is substantially more variation in the heights than in the weights of the girls.

2.5 Measures of Position

1 Create or Interpret a Box–and–whisker Plot

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

Provide an appropriate response.

1) The test scores of 30 students are listed below. Find the five–number summary.

31	41	45	48	52	55	56	58	63	65
67	67	69	70	70	74	75	78	79	79
80	81	83	85	85	87	90	92	95	99

A) Min = 31, Q_1 = 58, Q_2 = 72, Q_3 = 83, Max = 99

B) Min = 31, Q_1 = 58, Q_2 = 70, Q_3 = 83, Max = 99

C) Min = 31, Q_1 = 57, Q_2 = 70, Q_3 = 81, Max = 99

D) Min = 31, Q_1 = 57, Q_2 = 72, Q_3 = 81, Max = 99

2) The weights (in pounds) of 30 preschool children are listed below. Find the five-number summary.

25	25	26	26.5	27	27	27.5	28	28	28.5
29	29	30	30	30.5	31	31	32	32.5	32.5
33	33	34	34.5	35	35	37	37	38	38

A) Min = 25, Q_1 = 28, Q_2 = 30.75, Q_3 = 34, Max = 38

B) Min = 25, Q_1 = 28, Q_2 = 30.5, Q_3 = 34, Max = 38

C) Min = 25, Q_1 = 27.5, Q_2 = 30.75, Q_3 = 33, Max = 38

D) Min = 25, Q_1 = 27.5, Q_2 = 30.5, Q_3 = 33.5, Max = 38

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

3) The weights (in pounds) of 30 preschool children are listed below. Find the interquartile range of the 30 weights listed below. What can you conclude from the result?

25	25	26	26.5	27	27	27.5	28	28	28.5
29	29	30	30	30.5	31	31	32	32.5	32.5
33	33	34	34.5	35	35	37	37	38	38

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

4) The cholesterol levels (in milligrams per deciliter) of 30 adults are listed below. Find the interquartile range for the cholesterol level of the 30 adults.

154	156	165	165	170	171	172	180	184	185
189	189	190	192	195	198	198	200	200	200
205	205	211	215	220	220	225	238	255	265

A) 31 B) 30 C) 211 D) 180

5) The cholesterol levels (in milligrams per deciliter) of 30 adults are listed below. Find Q_1.

154	156	165	165	170	171	172	180	184	185
189	189	190	192	195	198	198	200	200	200
205	205	211	215	220	220	225	238	255	265

A) 180 B) 200 C) 184.5 D) 171

6) Use the data to identify any outliers.

35	40	54	65	67
69	71	73	74	76
80	82	87	90	99

A) 35, 40 B) 35, 99 C) 35 D) None

7) Use the data to identify any outliers.

16	25	1	33	15
5	18	8	20	14
17	19	16	10	21
28	14	37	18	

A) 1, 33, 37 B) 1, 37 C) 33, 37 D) None

8) Use the data to identify any outliers.

15 18 18 19 22 23 24
24 24 24 25 26 26 27
28 28 30 32 33 40 42

A) 40, 42 B) 42 C) 15, 42 D) None

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

9) The test scores of 30 students are listed below. Draw a box–and–whisker plot that represents the data.

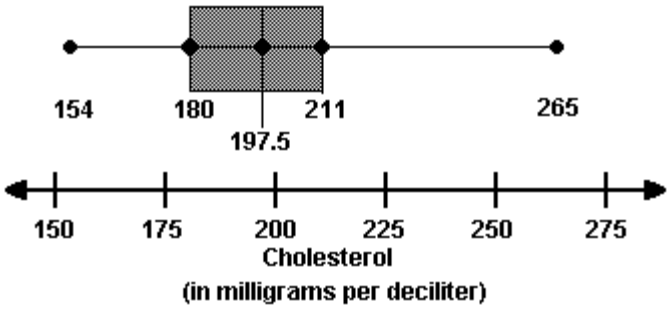
31 41 45 48 52 55 56 56 63 65
67 67 69 70 70 74 75 78 79 79
80 81 83 85 85 87 90 92 95 99

10) The cholesterol levels (in milligrams per deciliter) of 30 adults are listed below. Draw a box–and–whisker plot that represents the data.

154 156 165 165 170 171 172 180 184 185
189 189 190 192 195 198 198 200 200 200
205 205 211 215 220 220 225 238 255 265

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

11) Use the box–and–whisker plot below to determine which statement is accurate.



A) One half of the cholesterol levels are between 180 and 211.
B) One half of the cholesterol levels are between 180 and 197.5.
C) About 25% of the adults have cholesterol levels of at most 211.
D) About 75% of the adults have cholesterol levels less than 180.

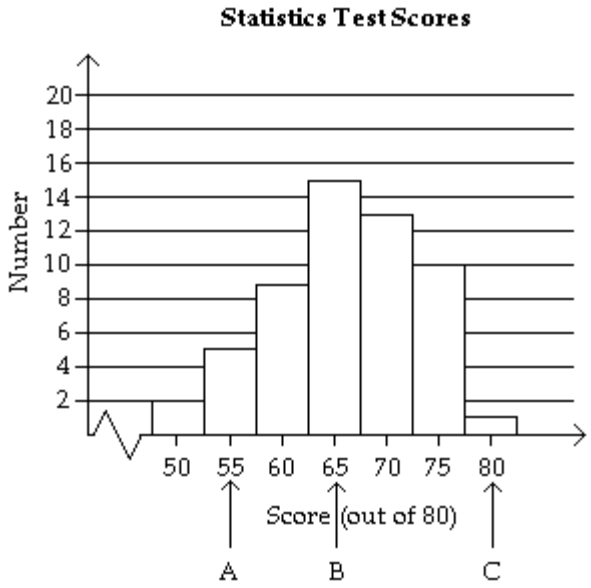
2 Calculate or Compare z–scores

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

Provide an appropriate response.

1) The midpoints A, B, and C are marked on the histogram. Without calculating, match them with the indicated z–scores. Which z–scores, if any, would be considered unusual?

z = 0
z = -1.33
z = 2.01



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

2) Find the z–score for the value 62, when the mean is 79 and the standard deviation is 4.
A) z = -4.25 B) z = -4.50 C) z = -0.73 D) z = 0.73

3) Many firms use on–the–job training to teach their employees computer programming. Suppose you work in the personnel department of a firm that just finished training a group of its employees to program, and you have been requested to review the performance of one of the trainees on the final test that was given to all trainees. The mean and standard deviation of the test scores are 81 and 3, respectively, and the distribution of scores is bell–shaped and symmetric. Suppose the trainee in question received a score of 77. Compute the trainee's z–score.
A) z = -1.33 B) z = 1.33 C) z = -0.91 D) z = 0.91

4) A radio station claims that the amount of advertising per hour of broadcast time has an average of 17 minutes and a standard deviation equal to 2.7 minutes. You listen to the radio station for 1 hour, at a randomly selected time, and carefully observe that the amount of advertising time is equal to 11 minutes. Calculate the z–score for this amount of advertising time.
A) z = -2.22 B) z = 2.22 C) z = -0.49 D) z = 0.49

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

5) Test scores for a history class had a mean of 79 with a standard deviation of 4.5. Test scores for a physics class had a mean of 69 with a standard deviation of 3.7. Suppose a student gets a 65 on the history test and a 74 on the physics test. Calculate the z–score for each test. On which test did the student perform better?

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

6) For the mathematics part of the SAT the mean is 514 with a standard deviation of 113, and for the mathematics part of the ACT the mean is 20.6 with a standard deviation of 5.1. Bob scores a 660 on the SAT and a 27 on the ACT. Use z-scores to determine on which test he performed better.
A) SAT B) ACT

7) The birth weights for twins are normally distributed with a mean of 2353 grams and a standard deviation of 647 grams. Use z-scores to determine which birth weight could be considered unusual.
A) 3647 g B) 1200 g C) 2000 g D) 2353 g

3 Find the Midquartile

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

Provide an appropriate response.

1) The ages of 10 grooms at their first marriage are listed below. Find the midquartile.

35.1 24.3 46.6 41.6 32.9 26.8 39.8 21.5 45.7 33.9

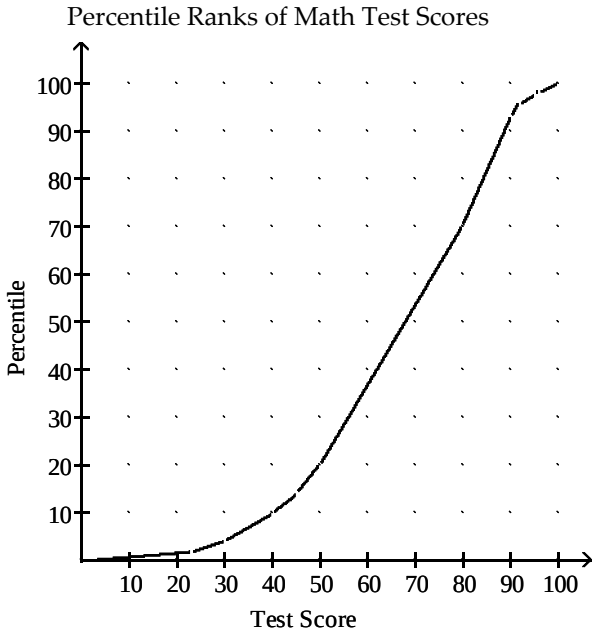
A) 34.2 B) 43.7 C) 34.1 D) 34.5

4 Find a Percentile

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

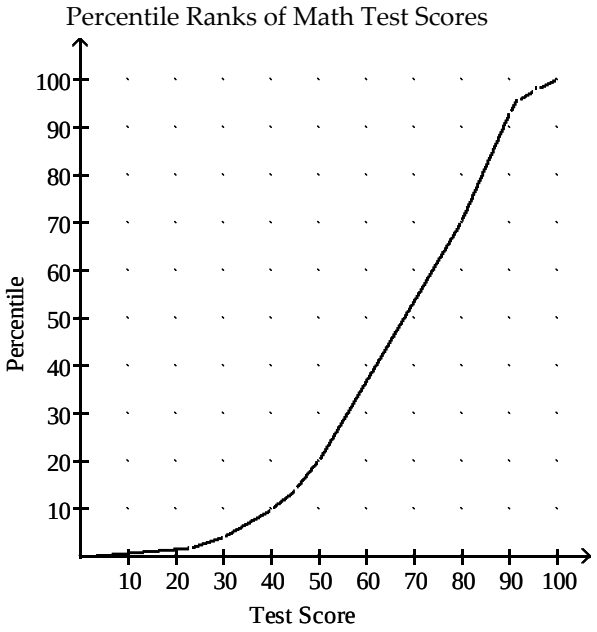
Provide an appropriate response.

1) The graph below is an ogive of scores on a math test.



Use the graph to approximate the percentile rank of an individual whose test score is 70.
A) 53 B) 80 C) 58 D) 75

2) The graph below is an ogive of scores on a math test.



Use the graph to approximate the test score that corresponds to the 10th percentile?

A) 40 B) 1 C) 34 D) 6

3) The cholesterol levels (in milligrams per deciliter) of 30 adults are listed below. Find the percentile that corresponds to a cholesterol level of 238 milligrams per deciliter.

154 156 165 165 170 171 172 180 184 185
189 189 190 192 195 198 198 200 200 200
205 205 211 215 220 220 225 238 255 265

A) 90th percentile B) 30th percentile C) 40th percentile D) 50th percentile

4) The test scores of 30 students are listed below. Find the percentile that corresponds to a score of 74.

31 41 45 48 52 55 56 56 63 65
67 67 69 70 70 74 75 78 79 79
80 81 83 85 85 87 90 92 95 99

A) 50th percentile B) 90th percentile C) 30th percentile D) 40th percentile

5) The test scores of 30 students are listed below. Which test scores are above the 75th percentile?

31 41 45 48 52 55 56 56 63 65
67 67 69 70 70 74 75 78 79 79
80 81 83 85 85 87 90 92 95 99

A) 85, 85, 87, 90, 92, 95, 99 B) 90, 92, 95, 99
C) 83, 85, 85, 87, 90, 92, 95, 99 D) 87, 90, 92, 95, 99

6) The weights (in pounds) of 30 preschool children are listed below. Which weights are below the 25th percentile?

25 25 26 26.5 27 27 27.5 28 28 28.5
29 29 30 30 30.5 31 31 32 32.5 32.5
33 33 34 34.5 35 35 37 37 38 38

A) 25, 25, 26, 26.5, 27, 27, 27.5
B) 25, 25, 26, 26.5, 27, 27, 27.5, 28, 28
C) 25, 25, 26, 26.5, 27, 27
D) 25, 25, 26, 26.5

7) A teacher gives a 20–point quiz to 10 students. The scores are listed below. What percentile corresponds to the score of 12?

20 8 10 7 15 16 12 19 14 9

A) 40
B) 13
C) 25
D) 12

8) In a data set with a minimum value of 54.5 and a maximum value of 98.6 with 300 observations, there are 186 points less than 81.2. Find the percentile for 81.2.

A) 62
B) 71
C) 68
D) 53

9) The cholesterol levels (in milligrams per deciliter) of 30 adults are listed below. Find the percentile that corresponds to cholesterol level of 195.

154 156 165 165 170 171 172 180 184 185
189 189 190 192 195 198 198 200 200 200
205 205 211 215 220 220 225 238 255 265

A) 50
B) 12
C) 33
D) 58

5 Concepts

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

Provide an appropriate response.

1) A student's score on the SAT–1 placement test for U.S. history is in the 90th percentile. What can you conclude about the student's test score?

Ch. 2 Descriptive Statistics
Answer Key

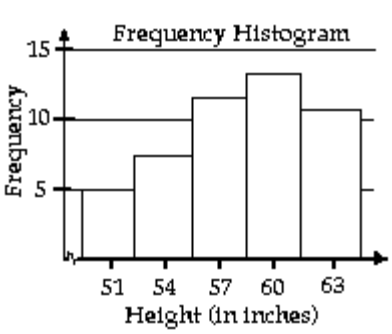
2.1 Frequency Distributions and Their Graphs

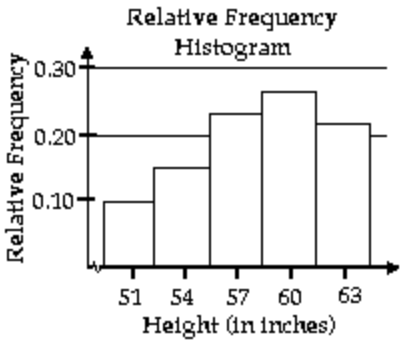
1 Interpret a Frequency Distribution

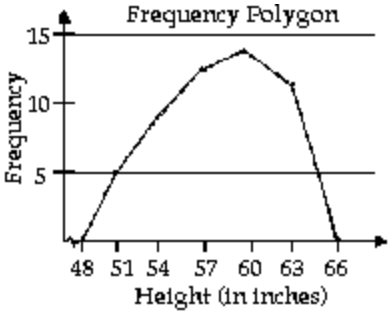
1) A
2) A
3) A
4) A
5) Class width = 5, Lower class limits: 1, 6, 11, 16, 21, 26; Upper class limits: 5, 10, 15, 20, 25, 30
6) Class width = 31, Lower class limits: 80, 111, 142, 173, 204, 235; Upper class limits: 110, 141, 172, 203, 234, 265

2 Interpret Frequency Distribution Graphs

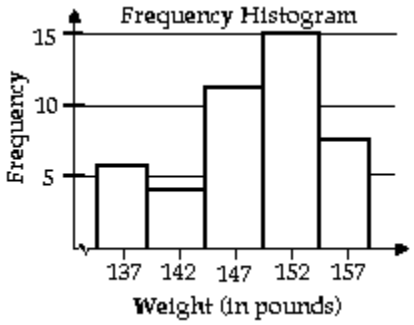
1) A
2) A
3) a) Class with greatest relative frequency: 105–115 mm Hg
   Class with least relative frequency: 145–155 mm Hg
   b) Greatest relative frequency ≈ 0.35
   Least relative frequency ≈ 0.03
   c) Approximately 0.08
4)

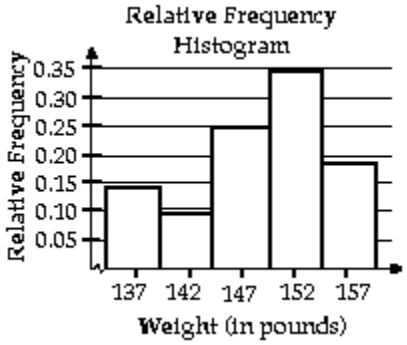


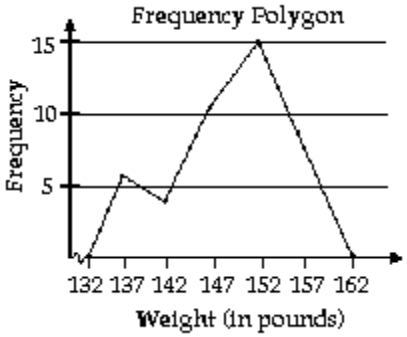




5)

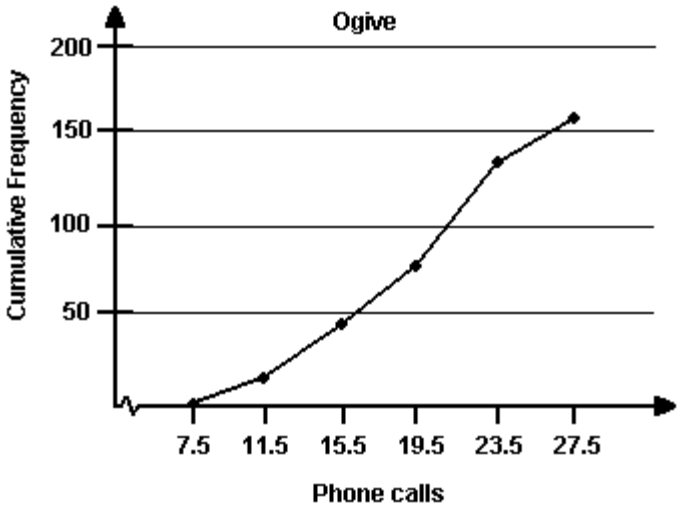






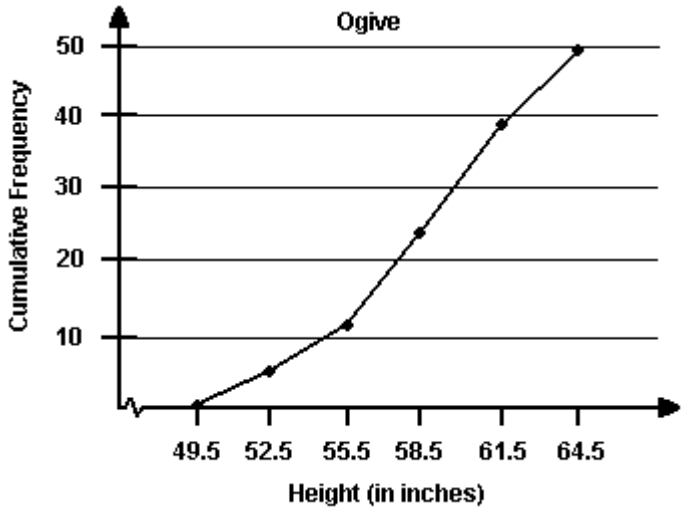
6) **Phone Calls (per day)**

Class	Frequency, f	Cumulative frequency
8 – 11	18	18
12 – 15	23	41
16 – 19	38	79
20 – 23	47	126
24 – 27	32	158



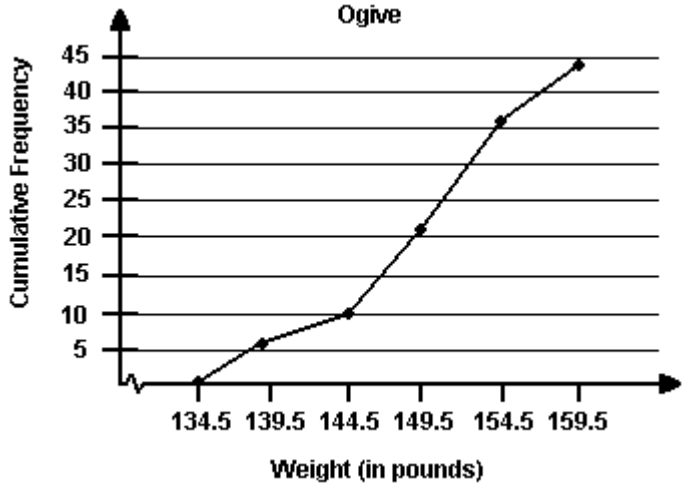
7) **Height (in inches)**

Class	Frequency, f	Cumulative frequency
50 – 52	5	5
53 – 55	8	13
56 – 58	12	25
59 – 61	13	38
62 – 64	11	49



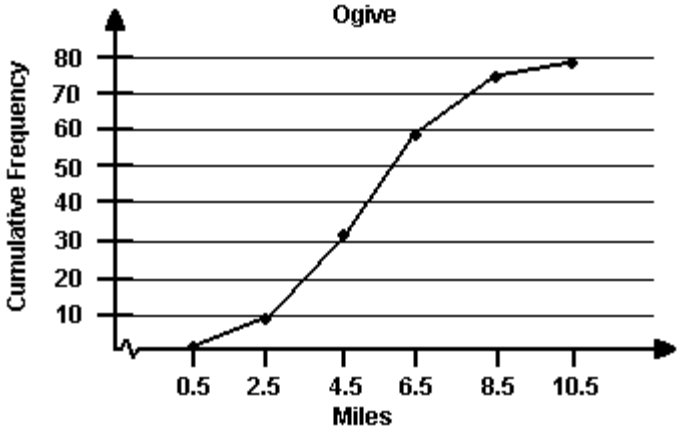
8) **Weight (in pounds)**

Class	Frequency, f	Cumulative frequency
135 – 139	6	6
140 – 144	4	10
145 – 149	11	21
150 – 154	15	36
155 – 159	8	44



9) **Miles (per day)**

Class	Frequency, f	Cumulative frequency
1 – 2	9	9
3 – 4	22	31
5 – 6	28	59
7 – 8	15	74
9 – 10	4	78

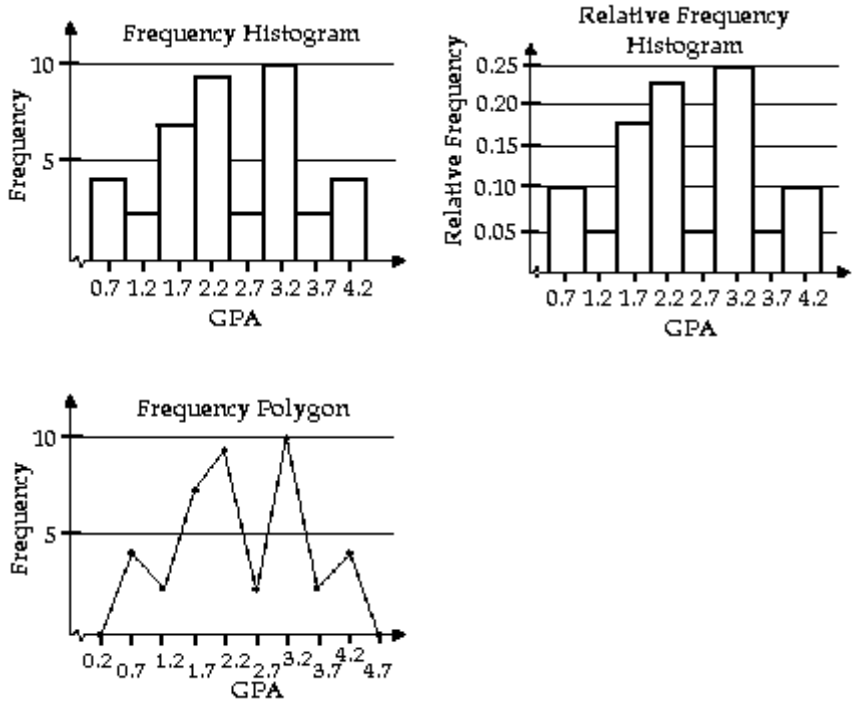


3 Construct a Frequency Distribution from Data Set

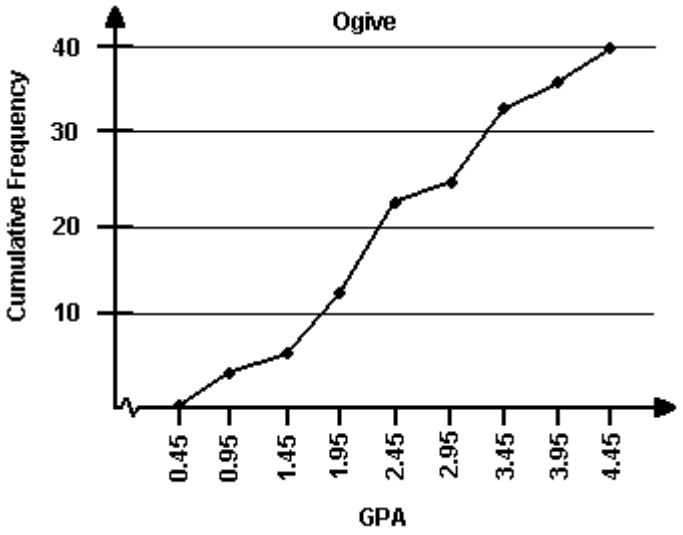
1) A
2) A
3)

GPA	Frequency	Midpoint	Relative Frequency	Cumulative Frequency
0.5–0.9	4	0.7	0.10	4
1.0–1.4	2	1.2	0.05	6
1.5–1.9	7	1.7	0.175	13
2.0–2.4	9	2.2	0.225	22
2.5–2.9	2	2.7	0.05	24
3.0–3.4	10	3.2	0.25	34
3.5–3.9	2	3.7	0.05	36
4.0–4.4	4	4.2	0.10	40

4)

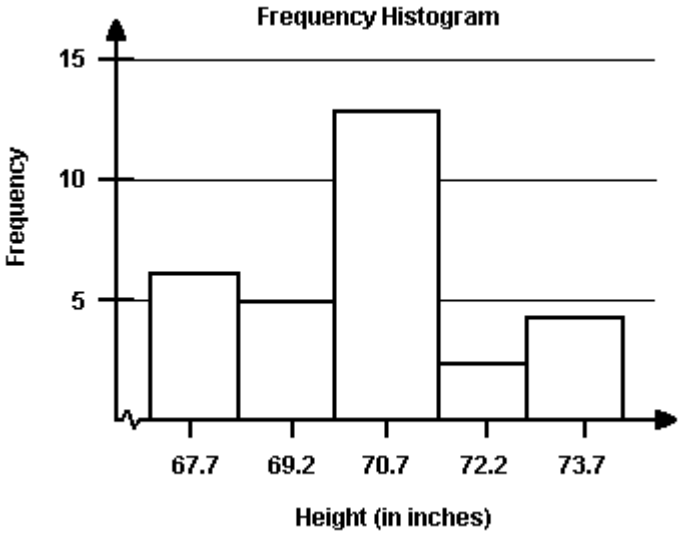


5)



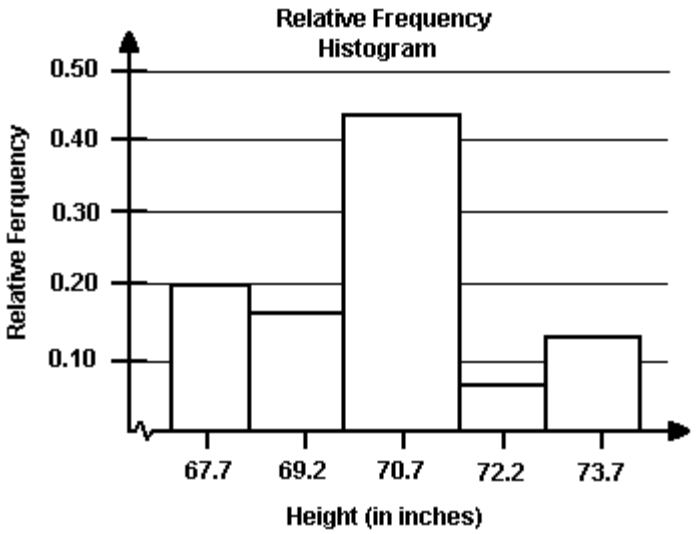
6)

Height (in inches)	Frequency	Relative Frequency	Cumulative Frequency
67.0–68.4	6	0.20	6
68.5–69.9	5	0.167	11
70.0–71.4	13	0.433	24
71.5–72.9	2	0.067	26
73.0–74.4	4	0.133	30

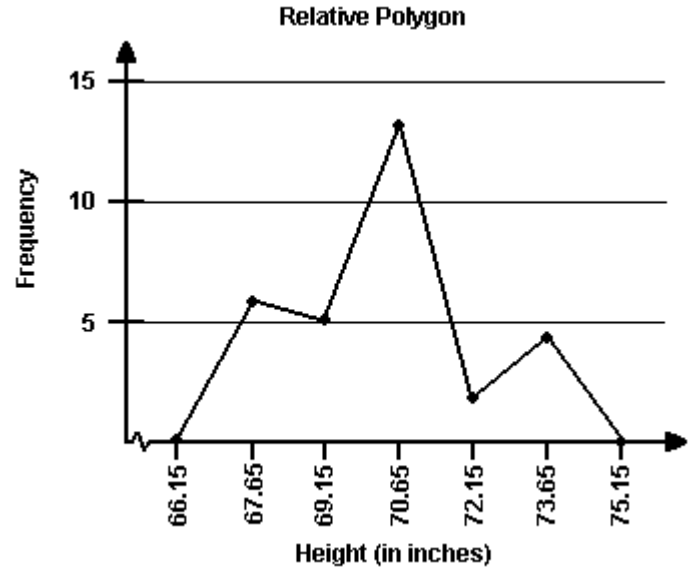


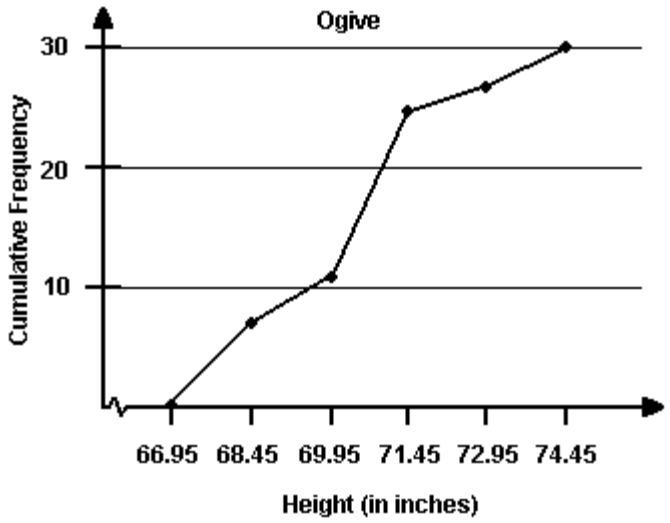
7)

8)



9)



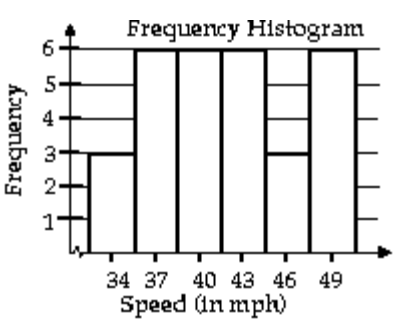


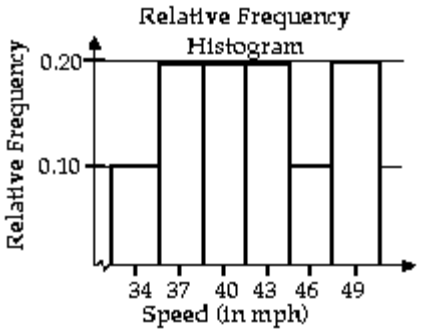
10)

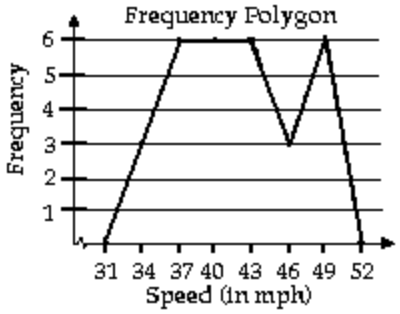
11)

Speed (in mph)	Frequency	Relative Frequency	Cumulative Frequency
33–35	3	0.10	3
36–38	6	0.20	9
39–41	6	0.20	15
42–44	6	0.20	21
45–47	3	0.10	24
48–50	6	0.20	30

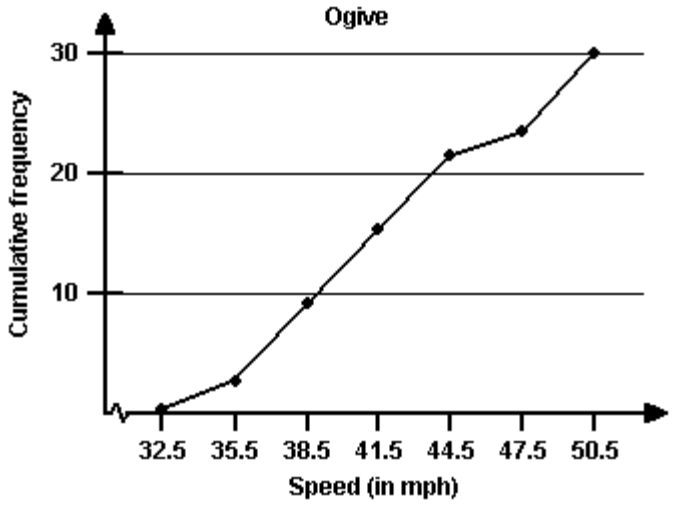
12)



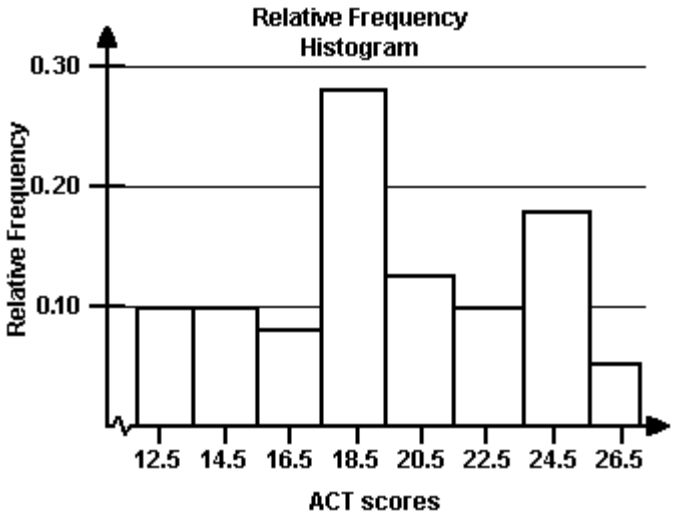




13)



14) a) See graph below
b) The minimum score = 14
c) The university will accept 76.57% of the applicants.



4 Concepts

1) Class limits determine which numbers can belong to that class. Class boundaries are the numbers that separate classes without forming gaps between them.

2.2 More Graphs and Displays

1 Interpret Data Sets

1) A
2) Key: 0 | 4 = 4

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

Most of these years he hit 36 or more home runs.

3) Key: 1 | 6 = 16

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

Most of these years he hit between 33 and 49 home runs.

4) A
5) A

6) Key: 6 | 7 = 67

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

Most of these males had heights of 70 or more inches.

7) Key: 3 | 3 = 33

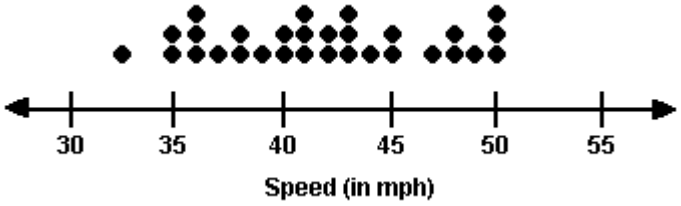
3	3
3	5 5 6 6 6 7 8 8 9
4	0 0 1 1 1 2 2 3 3 3 4
4	5 5 7 8 8 9
5	0 0 0
5	

Most of the motorists were going 40 – 49 miles per hour.

2 Graph Data Sets

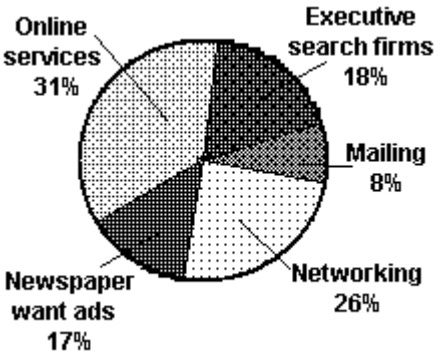
1) A

2)

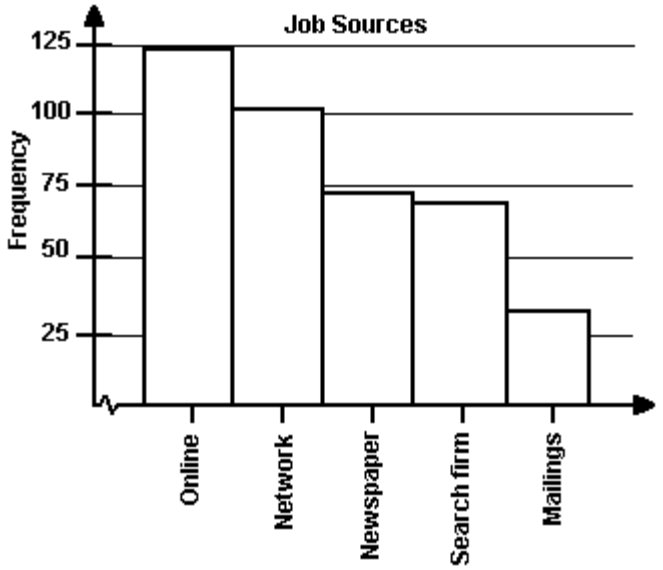


3)

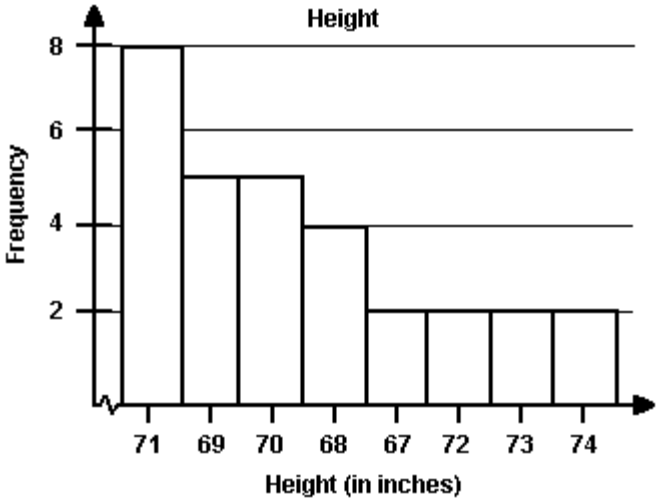
4)



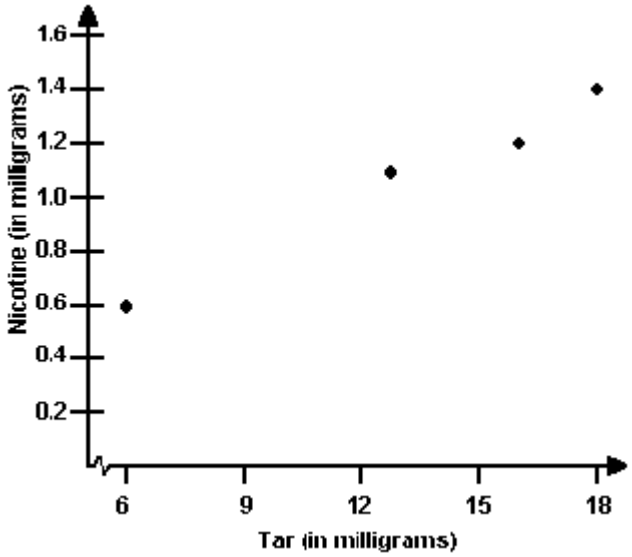
5)



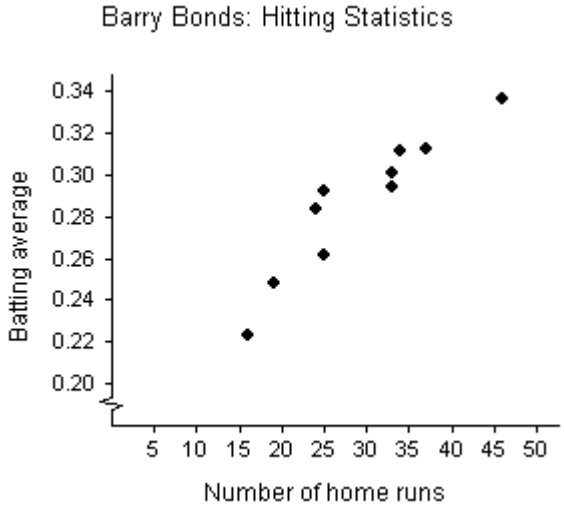
6)



7)

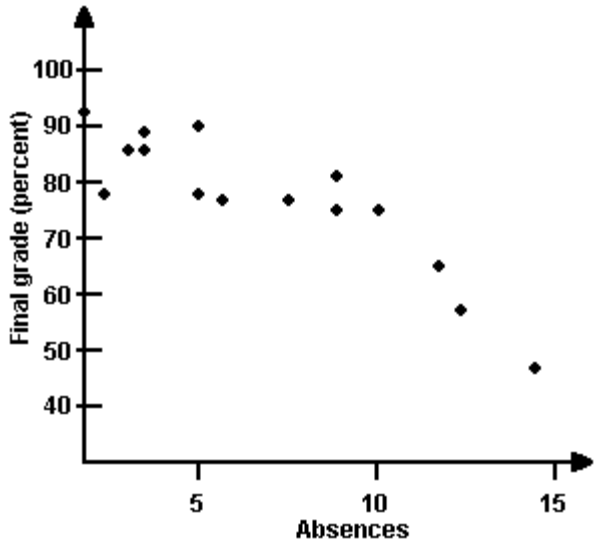


8)



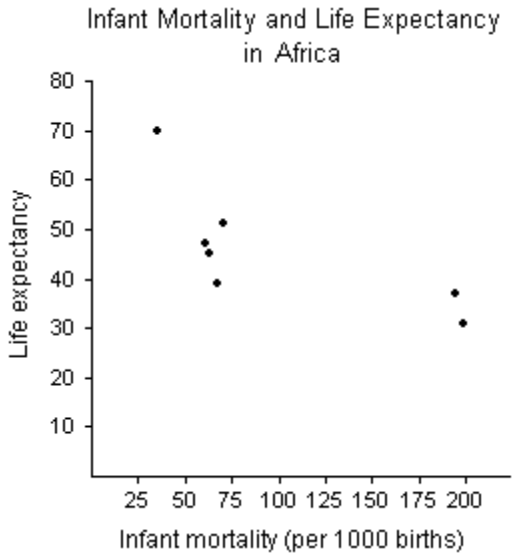
In general, there appears to be a relationship between the home runs and batting averages. As the number of home runs increased, the batting averages increased.

9)

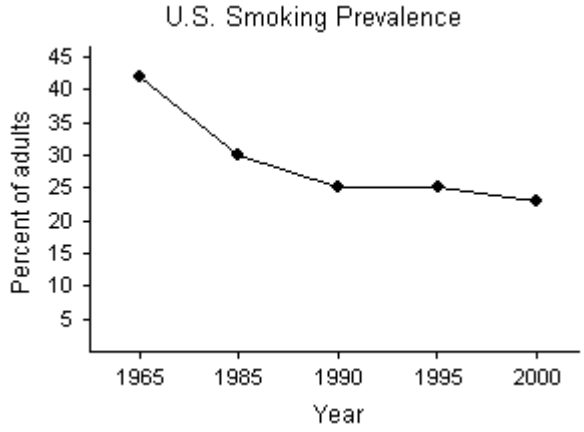


In general, there appears to be a relationship between the absences and the final grades. As the number of absences increased, the students' final grades decreased.

10)

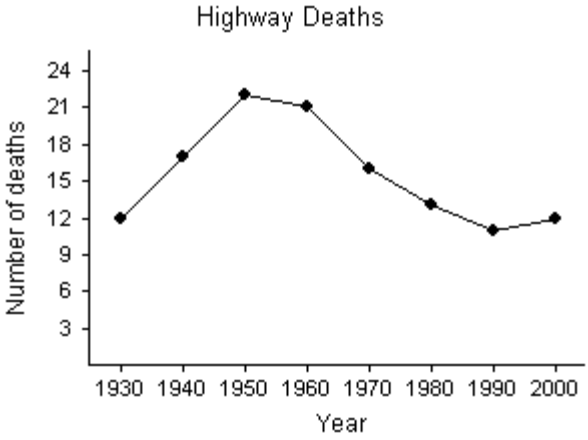


11)



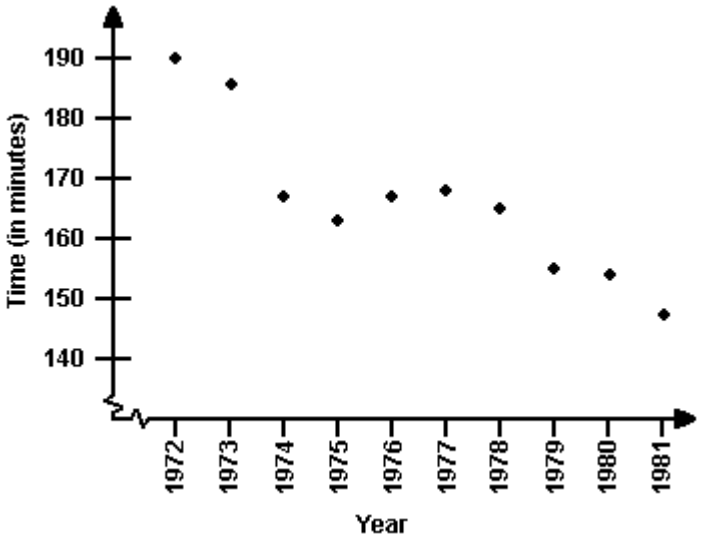
It appears the percent of U.S. adults who smoke is declining.

12)

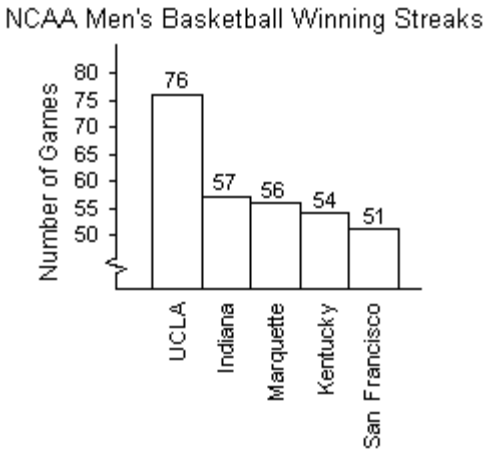


It appears the number of deaths peaked in 1950.

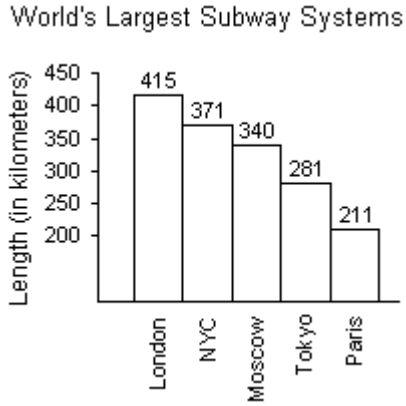
13)



14)



15)



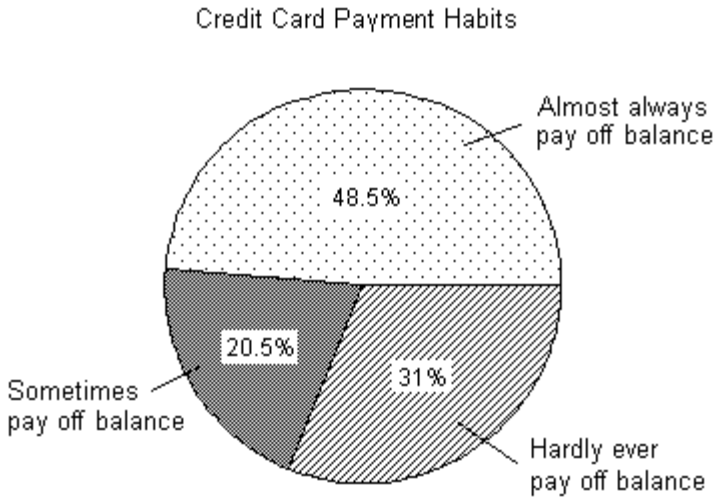
16) Key: $12 \mid 7 = 127$

12	7
13	0 7 7
14	5 9
15	0 1
16	0 2 6 7 7
17	4
18	0 0
19	4
20	4 7
21	
22	1
23	
24	4
25	4
26	2
27	
28	7

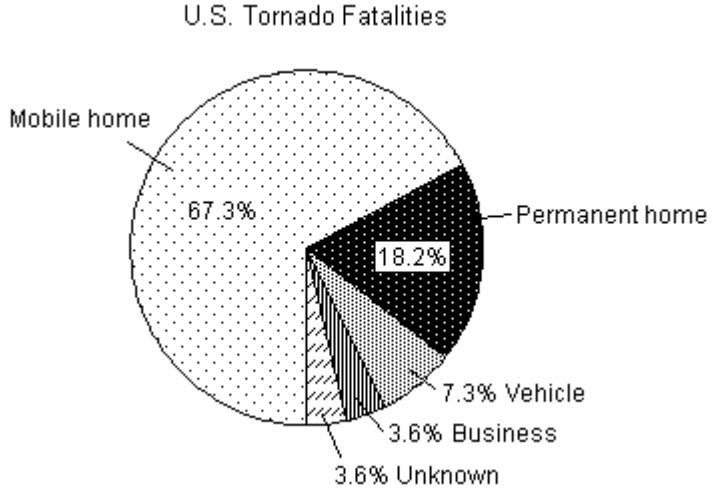
17) Key: $9 \mid 3 = 9.3$

9	3 6 6 7 8
10	0 1 3 5 7
11	3 4 5 9
12	1 8 9
13	0 0
14	
15	7

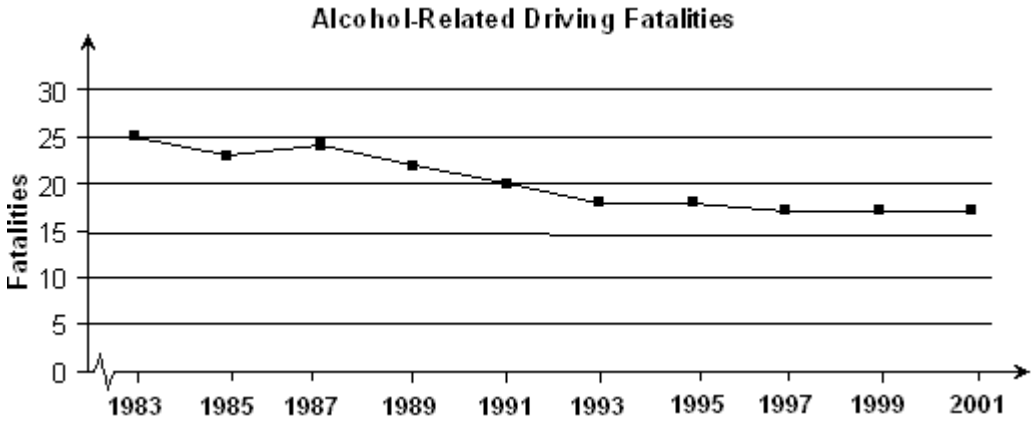
18)



19)



20)



It appears the number of alcohol–related fatalities is gradually declining.

21) The graph distorts the data because the the vertical scale starts at 60 rather than 0, giving the impression of a large difference in the number of accidents, when actually the number of accidents only varies from 90 to 120. To make the graph less misleading, change the vertical scale so that it begins at 0 and increases in increments of 20.

2.3 Measures of Central Tendency

1 Interpret the Graph of a Distribution

1) A
2) A

3) A
4) A
5) A
6) A
7) A
8) A
9) A
10) A

2 Find the Mean, Median, and Mode

1) mean 63, median 64, mode 65
2) A
3) A
4) mean: 97; median 103
5) mean: 37; median: 35.5; The median best represents the data because the mean is affected by the outlier (73) which causes a gap in the distribution.
6) A
7) A
8) A
9) A
10) mean: $489,415; median: $265,664; The median represents the data better because the mean is affected by the outlier ($2,194,246) which causes a gap in the distribution.

3 Find the Weighted Mean

1) A
2) A

4 Find the Mean of Frequency Distribution

1) A
2) A
3) A

5 Concepts

1) μ represents a population mean and $\bar{x}$ represents a sample mean.
2) The median is found by calculating the mean of the two middle data entries. The middle entries cannot be found unless the data entries are first ordered.
3) No, the mean is not a good representation of the center. The mean score is 78, and 9 of the scores are better than this.
4) No, the mode is not a good representation of the center. The mode score is 66, and 9 of the scores are better than this.
5) A
6) A
7) A
8) A
9) A

2.4 Measures of Variation

1 Find Measures of Variation

1) A
2) A
3) A
4) A
5) A
6) A
7) A
8) A
9) A
10) $\sigma = 1.42$, $\sigma^2 = 2.01$
11) range = 4.4, $s = 1.8$, $s^2 = 3.324$

2 Interpret Data

1) A

2) A
3) A

3 Compare Two Data Sets

1) Battery Type B has less variation. As a result, it is less likely to fail before its mean life is up.
2) Sosa: $\bar{x} = 0.279$ and $s = 0.033$; Bonds: $\bar{x} = 0.312$ and $s = 0.027$.
Bonds is more consistent since his standard deviation is less.
3) The bulbs with the lower standard deviation are more consistent and it is easier to plan for their replacement.

4 Use the Empirical Rule

1) A
2) A
3) A
4) A
5) A
6) A
7) A
8) A
9) A
10) A
11) A

5 Use Chebychev's Theorem

1) At least 75% of the heights should fall between 58.6 in. and 68.6 in.
2) (56.1, 71.1) 89% of the heights are between 56.1 and 71.1 inches.

6 Use Grouped Data to Calculate a Mean and Standard Deviation

1) A
2) A
3) A
4) A
5) A
6) A
7) A
8) A
9) A
10) A

7 Use Formulas to Analyze Data

1) $\bar{x} = 121.7$, $s = 11.82$, $P = 0.31$. Since $-1 \le P \le 1$, there is no significant skewness.
2) A

8 Compute the Coefficient of Variation

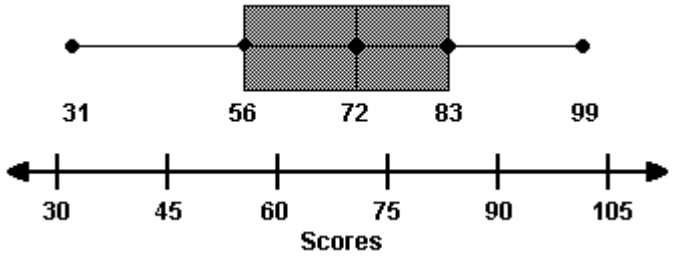
1) coefficient of variation $= \frac{1.82}{3.12} \times 100\% = 58.3\%$
2) A
3) A
4) A

2.5 Measures of Position

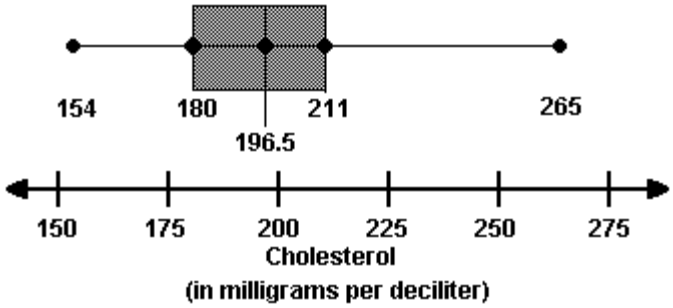
1 Create or Interpret a Box–and–whisker Plot

1) A
2) A
3) $IQR = Q_3 - Q_1 = 34 - 28 = 6$. This means that the weights of the middle half of the data set vary by 6 pounds.
4) A
5) A
6) A
7) A
8) A

9)



10)



11) A

2 Calculate or Compare z–scores

1) A → z = -1.33
   B → z = 0
   C → z = 2.01
   A z–score of 2.01 would be unusual.
2) A
3) A
4) A
5) history z–score = -3.11; physics z–score = 1.35; The student performed better on the physics test.
6) A
7) A

3 Find the Midquartile

1) A

4 Find a Percentile

1) A
2) A
3) A
4) A
5) A
6) A
7) A
8) A
9) A

5 Concepts

1) The student's score was higher than the scores of 90% of the students who took the test.