11-1 Descriptive Statistics

For Exercises 1-4, complete each step.
a. Construct a histogram and use it to describe the shape of the distribution.
**b. Summarize the center and spread of the data using either the mean and standard deviation or the five-number summary. Justify your choice.**

1. **AVIATION** The landing speeds in miles per hour of 20 commercial airplane flights at a certain airport are shown.

Landing Speeds (mph)			
150	157	153	145
155	158	158	162
149	142	138	154
156	161	146	148
158	144	151	152

SOLUTION:

a. On a graphing calculator, press **STAT, EDIT** and input the data into L^1. Then turn on **Plot1** under the **STAT PLOT** menu and choose the histogram icon. Graph using **ZoomStat** or by adjusting the window manually.
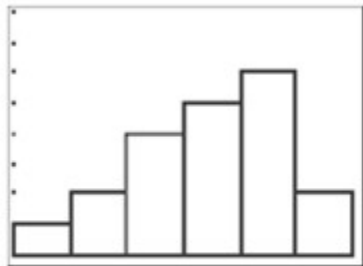
[135, 165] scl: 5 by [0, 8] scl: 1

The tail extends to the left, so the graph is negatively skewed. You can analyze the scale of the graph or use the **TRACE** feature to determine that the peak is in the interval [155, 160] and the smallest columns are [135, 140] and [160, 165]. Therefore, the majority of the landings occurred between 155 and 160 mph, with few that were greater than 160 mph or less than 140 mph.

b. Sample answer: Since the distribution is skewed, the five-number summary can be used to describe the distribution of data. Select **STAT, CALC, 1-VAR Stats**.

The landing speeds ranged from 138 to 162 mph, the median landing speed was 152.5 mph, and half of the speeds were between 147 and 157.5 mph.

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2. **COMPUTERS**   The retail prices of laptop and desktop computers at a certain electronics store are shown.

Computer Prices ($)		
950	1000	975
1150	450	1075
675	1250	540
1025	1180	925
580	950	890

SOLUTION:

a. On a graphing calculator, press **STAT, EDIT** and input the data into L^1. Then turn on **Plot1** under the **STAT PLOT** menu and choose the histogram icon. Graph using **ZoomStat** or by adjusting the window manually.
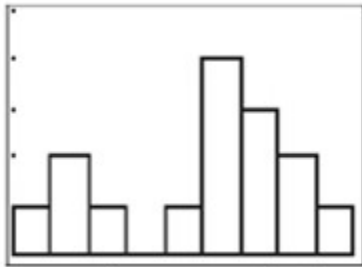
[400, 1300] scl: 100 by [0, 5] scl: 1

The graph is bimodal with two separate clusters, which suggests that there are two different price levels of computers mixed in the data set.

b. Since the lower cluster of data is approximately symmetrical, we can use the mean and standard deviation for this group of data.

A mean price of $561.25 and standard deviation of $80.81 can be used to describe the center and spread of the data, respectively.

The upper cluster is positively skewed. Therefore, the five-number summary indicates can be used.

The prices ranged from $890 to $1250, the median price was $1000, and half of the prices were between $950 and $1150.

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4. **SALARIES** The starting salary for an employee at a certain new company ranges between $20,000 and $90,000. Starting salary depends in part on the employee's years of previous experience and the level of the position for which they were hired. The starting salaries for all the company's new-hires last year are shown.

Salaries (thousands of dollars)			
24	40	34	59
48	52	65	54
68	26	85	32
36	42	33	45
38	89		

SOLUTION:

a. On a graphing calculator, press **STAT, EDIT** and input the data into $L1$. Then turn on **Plot1** under the **STAT PLOT** menu and choose the histogram icon. Graph using **ZoomStat** or by adjusting the window manually.
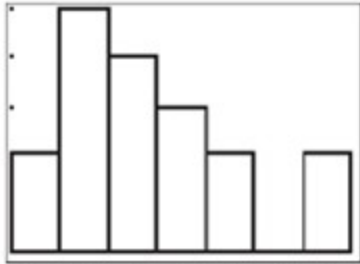
[20, 90] scl: 10 by [0, 5] scl: 1

The tail, or lower level, extends to the right, so the graph is positively skewed. You can analyze the scale of the graph or use the **trace** feature to determine that the peak is in the interval [30, 40]. Therefore, the majority of the employees make between $30,000 and $40,000, with few salaries that were greater than $60,000 or less than $30,000.

**b.** Since the distribution is skewed, the five-number summary can be used to describe the distribution of data. Select **STAT, CALC, 1-VAR Stats**.


```
1-Var Stats
↑n=18
 minX=24
 Q₁=34
 Med=43.5
 Q₃=59
 maxX=89
```

The salaries ranged from $24,000 to $89,000, the median starting salary was $43,500, and half of the salaries were between $34,000 and $59,000.

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Write the letter of the box plot that corresponds to each of the following histograms.


11.
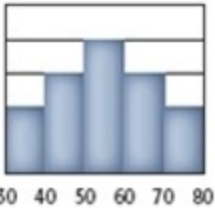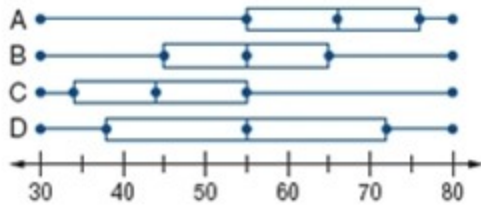
SOLUTION:

The histogram appears to be symmetric with most of the data in the middle. This eliminates choices A and C because they are skewed. Choice D is eliminated because the box is extremely large, meaning that the middle 50% of the data are from about 37 to 72. This contradicts with the histogram, which suggests that the middle 50% of the data are between about 45 and 65. The correct choice is B.


12.
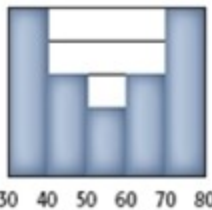
SOLUTION:

The histogram appears to be symmetric with most of the data on the tails. This eliminates choices A and C because they are skewed. Choice B is eliminated because the box is fairly average compared to the ends, meaning that the middle 50% of the data are from about 45 to 65. This contradicts with the histogram, which suggests that the middle 50% of the data are between about 37 and 72. The correct choice is D.

13.
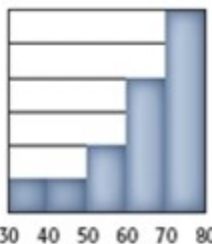
SOLUTION:

The histogram is negatively skewed, meaning most of the data will be clustered to the right of the distribution. Choices B and D are eliminated because they are symmetrical. Choice C is positively skewed because the right whisker is longer than the left, and the line representing the median is closer to Q_1. Therefore, the correct choice is A.

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30 40 50 60 70 80

14.
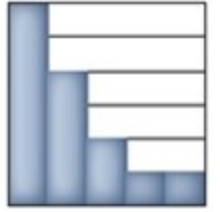
SOLUTION:

The histogram is positively skewed, meaning most of the data will be clustered to the left of the distribution. Choices B and D are eliminated because they are symmetrical. Choice A is negatively skewed because the left whisker is longer than the right, and the line representing the median is closer to Q_3.Therefore, the correct choice is C.

45. **REVIEW**   The value of a certain car depreciated at a constant rate. If the initial value was $25,000 and the car was worth $8192 after five years, find the annual rate of depreciation.

F 10%

G 20%

H 30%

J 40%

SOLUTION:

$$N = N_0(1-r)^t$$
$$8192 = 25,000(1-r)^5$$
$$\frac{8192}{25,000} = (1-r)^5$$
$$\sqrt[5]{\frac{8192}{25,000}} = 1-r$$
$$0.8 = 1-r$$
$$r = 0.2$$

The correct choice is G, 20%.