**Chapter 8 – Organizing and Displaying Data for Comparison**    *Answer Key*

## 8.1     Basic Graph Types

**Answers**

1.

TABLE 8.1:

| Type of graph | Type of Variable |
|---|---|
| a. Histogram | *b* discrete |
| b. Stem-and-leaf plot | *d* discrete |
| c. Broken line graph | *e* discrete |
| d. Bar graph | *a* continuous |
| e. Pie chart | *c* continuous |

2.

TABLE 8.2:

| Type of graph | Type of Variable |
|---|---|
| a. Broken line graph | *b* qualitative |
| b. Bar graph | *a* numerical |
| c. Pie chart | *c* categorical |
| d. Stem-and-leaf plot | *d* quantitative |
| e. Histogram | *e* numerical |

3. Continuous data

4. Discrete data

5. Continuous data

6. Discrete data

7. Categorical (qualitative) data

8. Numerical (quantitative) data

9. Numerical (quantitative) data

10. Categorical (qualitative) data

## 8.2     Double Line Graphs

**Answers**

1. The graph is wrong because it shows the time spent on games increasing and then decreasing for both Michael and Scott multiple times. It should only show the time spent on games increasing or staying the same.

2. Answers will vary, but they could include some of the following statements:

18-wheeler        18-wheeler with       18-wheeler
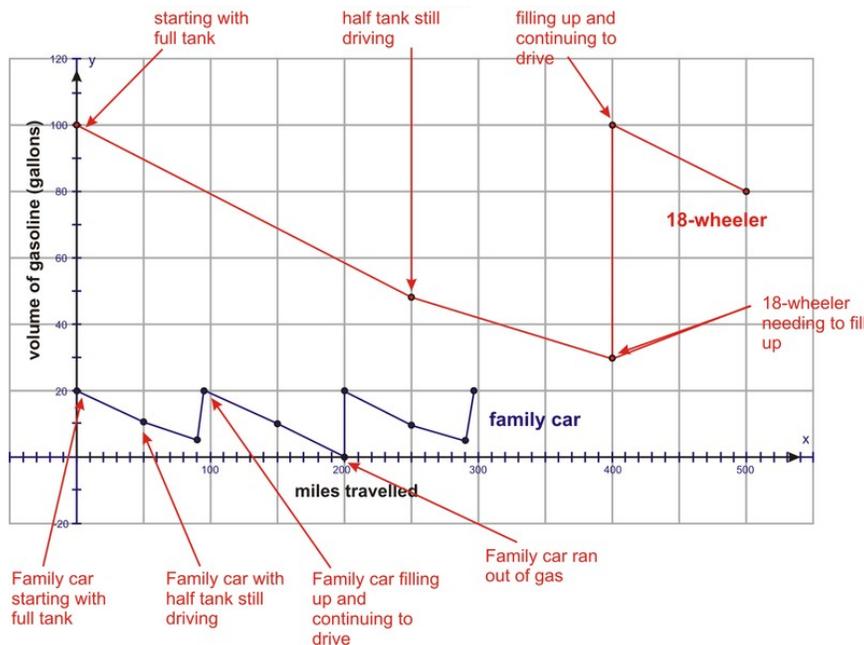
An 18-wheeler typically holds 100 gallons of fuel. The data in the graph shows that the tank needed to be refilled at approximately 400 miles. Therefore, the 18-wheeler can go about 4 miles to the gallon. A car can hold a variety of gallons of fuel. This car holds 20 gallons, which is usually typical of a larger car or an SUV. From 100 to 200 miles, the car began with a full tank and then ran out of gas, so the car can go about 5 miles per gallon.

3. Room temperature is approximately 20◦C.

4. Thomas' oven was about 350◦C.

5. Thomas baked the cookies for about 8 minutes.

6. Thomas let the cookies cool for about 15 minutes before he taste-tested them.

7. The cookies were approximately 30◦C when Thomas taste-tested them.

8. It took Jack about 5 minutes to boil the water.

9. Jack let the water cool for approximately 10 minutes before taste-testing his hot chocolate.

10 Jack's hot chocolate was about 40◦C when he taste-tested it.

## 8.3    Two-Sided Stem − and − Leaf Plors

**Answers**

1. The range for the number of home runs hit by the Mets was 0 to 51, while the range for the number of home runs hit by the Phillies was 0 to 48.

2. The median for the number of home runs hit by the Mets was 22, while the median for the number of home runs hit by the Phillies was 17.

3. The mode for the number of home runs hit by the Mets was 0, while the mode for the number of home runs hit by the Phillies was 1.

4. The Mets had 13 players with 20 or more home runs, while the Phillies had 10 players with 20 or more home runs. Therefore, the Mets had more players with 20 or more home runs.

5. The range for the highest scores for the girls was 92 to 204, while the range for the highest scores for the boys was 105 to 195.
6. The median for the highest scores for the girls was , while the median for the highest scores for the boys was 144.

7. The mode for the highest scores for the girls was 125, while the mode for the highest scores for the boys was 162.

8. The highest score for the girls was 204, while the highest score for the boys was 195. Therefore, a girl had the highest score in the intramural bowling league.

9. Answer:

| Girls | | Boys |
|---:|:---:|:---|
| 8, 8, 5, 4, 4, 0 | 6 | |
| 9, 8, 8, 7, 6, 6, 6, 6, 5, 2, 2, 2, 0, 0 | 7 | 0, 0, 0, 6, 6, 8, 9 |
| 9, 8, 4, 4, 2, 1, 0, 0 | 8 | 0, 1, 2, 2, 2, 3, 4, 5, 5, 5, 5, 6, 7, 8 |

Answers will vary, but the data suggests that there is a wider variation in the pulse rates for the group of girls than for the group of boys. For the girls, the pulse rates ranged from 60 to 89, whereas for the boys, the pulse rates ranged from 70 to 88. The median for the girls group is at 76, and the mode is also at 76. For the group of boys, however, the median is at 85, and the mode is at 82. The boys seem to have higher pulse rates.

10. Answer:

| Starbucks | | Just Us Coffee |
|---:|:---:|:---|
| 8, 8 | 0 | |
| 9, 8, 7, 6, 5, 2, 2, 2 | 1 | 0, 0, 0, 2, 3, 5, 5, 6, 6, 7 |
| 7, 6, 6, 0, 0 | 2 | 0, 2, 2, 4, 9 |

Answers will vary, but the data suggests that the variations in the line-up times for the customers of Starbucks and for the customers at Just Us Coffee are the same. For the Starbucks customers, the line-up times ranged from 8 to 27 minutes, whereas for the Just Us Coffee customers, the line-up times ranged from 10 to 29 minutes. The median for the Starbucks customers' line-up times is at 17 minutes, and the mode is at 12 minutes. For the Just Us Coffee customers, however, the median is at 16 minutes, and the mode is at 10 minutes. It would seem that the Just Us Coffee customers have slightly shorter line-up times.

# 8.4  Double Bar Graphs

**Answers**

1. More dogs were adopted than cats during the third and fourth quarters of last year.

2. More cats were adopted than dogs during the first and second quarters of last year.

3. In total, 15 + 12 + 18 + 21 = 66 dogs were adopted last year, and 21 + 24 + 15 + 18 = 78 cats were adopted last year.

4. Dealership A and Dealership B combined to sell the most cars on Saturday, when they sold 8 + 9 = 17 cars.

5. On Monday, Dealership B sold 4 − 1 = 3 more cars than Dealership A.

6. The biggest difference between cars sold by the 2 dealerships happened on Thursday, when Dealership A sold 6 – 2 = 4 more cars than Dealership B.

7. 8 − 3 = 5 more of the non-college graduates primarily use television to follow the news than use the newspaper.

8. When college graduates and non-college graduates are combined, radio is primarily used the least to follow the news. Only 2 + 1 = 3 people prefer this form of media.

9. The percentage of college graduates who primarily use the internet to follow the news can be calculated as follows;

10. Answer:

Answers will vary, but here is a possible answer: With the survey done by the guidance counselor, it was found that more girls were planning on going to university following high school, and more boys were planning on going to college, the military, or directly into some form of employment. It was also found that more girls were unsure of what their plans were than boys. Of the 186 students surveyed, 75 (or 40%) were planning on attending university, and 124 (or 66.7%) were planning on attending either university or college.

# 8.5    Double Box – and – Whisker Plots

**Answers**
1.  Answer:
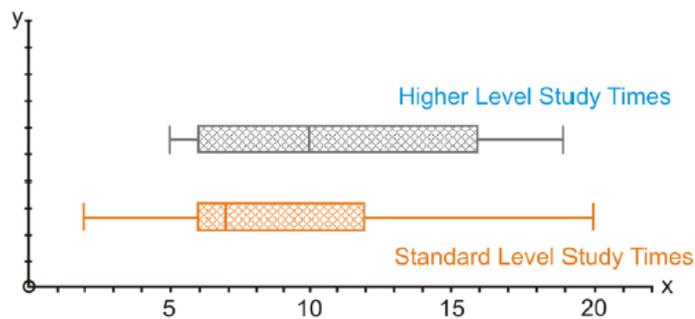


Using Autograph
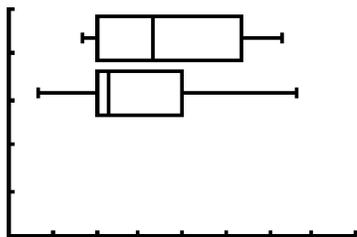
### TABLE 8.3:

| 5-number summary | Higher Level Study Times | Standard Level Study Times |
| --- | --- | --- |
| Minimum | 5 | 2 |
| Lower Quartile (Q1) | 6 | 6 |
| Median | 10 | 7 |
| Upper Quartile (Q3) | 16 | 12 |
| Maximum | 19 | 20 |

Conclusions drawn may vary, but some points made by students could include the following:

Using the medians, 50% of the students spent at least 10 hours studying for the higher level exams, and 50% of the students spent at least 7 hours studying for the standard level exams. This would seem reasonable, since the higher level exams are on more material than the standard level exams. The range for the higher level exam study times was $19 - 5 = 14$ hours, while the range for the standard level exam study times was $20 - 2 = 18$ hours. Since the range for the higher level exam study times is smaller, it means the study times are less spread out. This would then mean that the study times are more predictable and reliable.

Also, the data in the standard level exam study times is not very even, meaning that the box is not split into two equal parts. The same can be found for the higher level exam study times, but not to the extreme as with the standard level exam study times. In addition, the tails for the higher level exam study times and the standard level exam study times show the lower halves are shorter than the upper halves. This means that the lower halves have less dispersed data than the upper halves. However, for the higher level exam study times, the tails seem to be of more equal lengths, meaning the data has a more equal distribution than the data for the standard level exams.

2. The double box-and-whisker plots should appear as follows:



3. Answer:
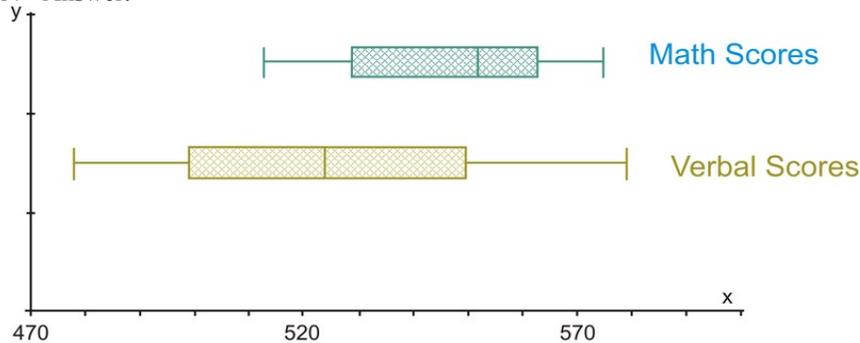


Using Autograph

TABLE 8.4:

| 5-number summary | Math Scores | Verbal Scores |
| --- | --- | --- |
| Minimum | 513 | 478 |
| Lower Quartile (Q1) | 529 | 499 |
| Median | 552 | 524 |
| Upper Quartile (Q3) | 563 | 550 |
| Maximum | 575 | 579 |

Conclusions drawn may vary, but some points made by students could include the following:

Using the medians, 50% of the students scored at least 552 on the math portion of the SAT exam, and 50% of the students scored at least 524 on the verbal portion of the SAT exam. This is probably expected, since the students were members of the AP Stats course. The range for the math scores was $575 - 513 = 62$ points, while the range for the verbal scores was $579 - 478 = 101$ points. Since the range for the math scores is smaller, it means the math scores obtained by the students are less spread out. This would then mean that the math scores are more predictable and reliable.

Also, the data for the verbal scores is very even, meaning that the box is split into two equal parts. This is not the same as in the box-and-whisker plot for the math scores on the top. In addition, the tails for the math scores show the upper half is slightly shorter than the lower half. This means that the upper half has less dispersed data than the lower half. For the verbal scores, the reverse is true. The upper tail seems to be slightly longer than the lower tail, so the data in the lower half is less dispersed than in the upper half.

4. The double box-and-whisker plots should appear as follows:
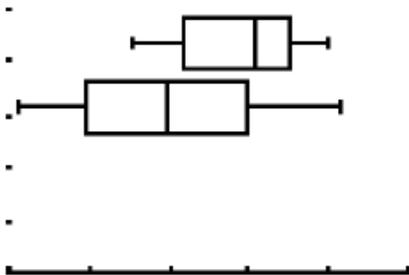


5. The five-number summary for the 2006 games is as follows:

TABLE 8.5:

| 5-number summary | 2006 Games |
| --- | --- |
| Minimum | 7 |
| Lower Quartile (Q1) | 7.7 |
| Median | 8 |
| Upper Quartile (Q3) | 8.6 |
| Maximum | 9.2 |

6. The five-number summary for the 2010 games is as follows:

TABLE 8.6:

| 5-number summary | 2010 Games |
| --- | --- |
| Minimum | 6.4 |
| Lower Quartile (Q1) | 7.7 |
| Median | 8.5 |
| Upper Quartile (Q3) | 9.1 |
| Maximum | 9.9 |

7. Using the medians, 50% of the judge's scores were at least 8 for the 2006 winter games, but in 2010, 50% of the scores were at least 8.5.

8. The range for the scores in the 2006 winter games was 9:2 - 7 = 2:2 points, while the range for the scores in the 2010 winter games was 9:9 - 6:4 = 3:5 points.

9. Answers will vary, but the data in the 2006 winter games is not very even, meaning that the box is not split into two equal parts. The reverse is true for the 2010 winter games. However, the tails for the 2010 winter games show the lower half is longer than the upper half. This means that the upper half has less dispersed data than the lower half. For the 2006 winter games, the tails seem to be of equal lengths, meaning an equal distribution of data.

10. Answers will vary, but since the range for the 2006 winter games is smaller, it means the judges scores are less spread out. This could then mean that the scoring was more predictable and reliable.

**CK-12 Basic Probability and Statistics Concepts**     **8**