



Question 1

RUBRIC

Score	Description
3	Response demonstrates a thorough understanding of range. <ul style="list-style-type: none">• The range is correct. (1 point)• The explanation is clear, thorough, and completely correct. (2 points)

SAMPLE RESPONSE

To find the range, subtract the lowest value in the data set from the highest value in the set.

NOTE: Answers will vary. Use the student's data table to confirm accuracy.

Question 2

RUBRIC

Score	Description
3	Response demonstrates a thorough understanding of median. <ul style="list-style-type: none">• The median is correct. (1 point)• The explanation is clear, thorough, and completely correct. (2 points)

SAMPLE RESPONSE

The median is the middle number in a data set that is sorted in value order. If the data set has an even number of entries, the median is half way between the two middle numbers.

The median is 3. To find the median, I listed all the numbers in order, from lowest to highest, and found the middle number. Since there are 41 people who responded to my survey, the median is the 21st number in the list.

NOTE: Answers will vary. Use the student's data table to confirm accuracy.

Question 3

RUBRIC

Score	Description
3	Response demonstrates a thorough understanding of mean. <ul style="list-style-type: none">• The mean is correct. (1 point)• The explanation is clear, thorough, and completely correct. (2 points)

SAMPLE RESPONSE

To find the mean, find the sum of the all numbers in the data set and divide by the number of entries in the set.

The mean is 3.4. To find the mean, I found the sum of all the numbers (141). Then, I divided by the number of observations (41).

NOTE: Answers will vary. Use the student's data table to confirm accuracy.

Question 4

RUBRIC

Score	Description
3	Response demonstrates a thorough understanding of MAD. <ul style="list-style-type: none">• The MAD is correct. (1 point)• The explanation is clear, thorough, and completely correct. (2 points)

SAMPLE RESPONSE

To find the MAD, subtract every number in the data set from the mean to find the deviations. Take the absolute value of the deviations and add them together. Divide by the total number of deviations.

The MAD is 1.5. To find the MAD, I subtracted each value from the mean and took the absolute value of each number. The absolute value is the number without a sign, for example, the absolute value of -4 is 4. Then I found find the average of the absolute values.

NOTE: Answers will vary. Use the student's data table to confirm accuracy.

Question 5

RUBRIC

Score	Description
4	<p>Response demonstrates thorough understanding of summarizing numerical data using a box plot (or histogram / dot plot).</p> <ul style="list-style-type: none">• All data points are plotted accurately.• The graph includes appropriate interval scales.• The axes are concisely labeled with precision.• The title is exceptionally clear.
3	<p>Response demonstrates general understanding of summarizing numerical data using a box plot (or histogram / dot plot).</p> <ul style="list-style-type: none">• Most data points are accurately plotted.• The graph includes interval scales.• The axes are correctly labeled.• Student generally explains what the graph shows about the variability in the data set. <p>Errors do not interfere with drawing accurate conclusions from the graph.</p>
2	<p>Response demonstrates partial understanding of summarizing numerical data using a box plot (or histogram / dot plot).</p> <ul style="list-style-type: none">• Some data points are accurately plotted.• The graph may not include interval scales.• The axes are labeled.• The title tells part of what the data show.
1	<p>Response demonstrates limited understanding of summarizing numerical data using a box plot (or histogram / dot plot).</p> <ul style="list-style-type: none">• Data points are plotted inaccurately.• The graph may not include interval scales.• The axes may be incorrectly labeled.• The title is vague.
0	<p>The student's response is mostly or all incorrect.</p>

SAMPLE RESPONSE

No sample provided. Response will be specific to the student's data set.

Question 6

RUBRIC

Score	Description
4	Response demonstrates thorough understanding of box plots. <ul style="list-style-type: none">• Student thoroughly explains each part of the graph.• Student thoroughly explains what the graph shows about the variability in the data set.
3	Response demonstrates general understanding of box plots. <ul style="list-style-type: none">• Student explains most or all parts of the graph.• Student generally explains what the graph shows about the variability in the data set.
2	Response demonstrates partial understanding of box plots.
1	Response demonstrates limited understanding of box plots.
0	The student's response is mostly or all incorrect.

SAMPLE RESPONSE

A box plot shows the distribution of the data. The box shows the inter quartile range (the middle part of the data). The line in the middle of the box is the median. The two ends of the box show the upper limit of the first quartile (left) and the lower limit of the third quartile (right side of box). The whiskers extend to the lowest and highest values in the data set.

The box plot shows that the data points are clustered between 2 and 4. The distribution is skewed to the left (positive skew) because there some outliers in the higher numbers.

NOTE: Answers will vary. Use the student's data table to confirm accuracy.

Question 7

RUBRIC

Score	Description
4	<p>Response demonstrates thorough understanding of summarizing numerical data using a box plot (or histogram / dot plot).</p> <ul style="list-style-type: none"> • All data points are plotted accurately. • The graph includes appropriate interval scales. • The axes are concisely labeled with precision. • The title is exceptionally clear.
3	<p>Response demonstrates general understanding of summarizing numerical data using a box plot (or histogram / dot plot).</p> <ul style="list-style-type: none"> • Most data points are accurately plotted. • The graph includes interval scales. • The axes are correctly labeled. • Student generally explains what the graph shows about the variability in the data set. <p>Errors do not interfere with drawing accurate conclusions from the graph.</p>
2	<p>Response demonstrates partial understanding of summarizing numerical data using a box plot (or histogram / dot plot).</p> <ul style="list-style-type: none"> • Some data points are accurately plotted. • The graph may not include interval scales. • The axes are labeled. • The title tells part of what the data show.
1	<p>Response demonstrates limited understanding of summarizing numerical data using a box plot (or histogram / dot plot).</p> <ul style="list-style-type: none"> • Data points are plotted inaccurately. • The graph may not include interval scales. • The axes may be incorrectly labeled. • The title is vague.
0	The student's response is mostly or all incorrect.

SAMPLE RESPONSE

No sample provided. Response will be specific to the student's data set.

Question 8

RUBRIC

Score	Description
4	Response demonstrates thorough understanding of histograms. <ul style="list-style-type: none">• Student thoroughly explains what the graph communicates about the data.• Student thoroughly explains what the shape of the graph communicates about the data.
3	Response demonstrates general understanding of histograms. <ul style="list-style-type: none">• Student generally explains what the graph communicates about the data.• Student generally explains what the shape of the graph communicates about the data.
2	Response demonstrates partial understanding of histograms.
1	Response demonstrates limited understanding of histograms.
0	The student's response is mostly or all incorrect.

SAMPLE RESPONSE

A histogram uses bars to display data. It is like a bar graph but, in a histogram, the numbers are grouped into ranges, called classes or bins. The bars are in order from the smallest range to the largest range. The shape of the histogram tells about the distribution and probability of a finding a certain value. If the histogram is flat, every value appears about the same number of times in the data set. In symmetrical (normal) distributions, most of the values are clustered in the middle. If the distribution is skewed to one side, most values are on the lower or higher end of the distribution.

A histogram is like a bar graph, but it groups the numbers into ranges, or bin sizes. I chose a small bin size (2) because the numbers are not very spread out. If I used a larger bin size, the differences in how much time people spend watching TV would be harder to see. Most people who answered the survey watch between 2 and 3 hours of TV on a weekday. About half as many people watch 4-5 hours. The graph is skewed to the left (positive skew), which means there are a few outliers who watch a lot of TV.

Question 9

RUBRIC

Score	Description
5	<p>Response demonstrates thorough understanding of measures of variability.</p> <ul style="list-style-type: none">• Student thoroughly explains what each measure of variability tells about the data. (2 points)• Student thoroughly explains a situation where one measure would be preferable over the other. (2 points)• Student thoroughly explains why it does or does not matter which measure is used to describe this particular data set. (1 point)

SAMPLE RESPONSE

Range and MAD are measures of variability. For both measures, larger numbers indicate more variability. Variability is used to estimate the accuracy of predictions based on the data. With lots of variability, predictions may not be very accurate. The range is affected by outliers and should not be used when the data set includes extreme numbers at one end of the distribution. (Student should relate this to the variability of his/her data set.)

Variability tells about the spread of the data. Range and IQR are measures of variability (so is MAD). Larger numbers mean more variability. The range is affected by outliers and should not be used when the data set includes extreme numbers at one end of the distribution. Of all the measures of variability, IQR is least affected by outliers. So, if you don't need to know about the outliers, IQR is the best choice for describing variability. Since there are a few people who watch a lot more TV than any of the other people who took the survey, range is not a very good measure of variability for this data set.

Question 10

RUBRIC

Score	Description
5	<p>Response demonstrates thorough understanding of measures of variability.</p> <ul style="list-style-type: none">• Student thoroughly explains what each measure of variability tells about the data. (2 points)• Student thoroughly explains a situation where one measure would be preferable over the other. (2 points)• Student thoroughly explains why it does or does not matter which measure is used to describe this particular data set. (1 point)

SAMPLE RESPONSE

Mean and median are measures of center for numerical data sets. The median is the middle number in a data set, and it represents the most typical value in the data. The mean is the arithmetic average. Mean is affected by outliers and can be misleading for skewed data sets. For skewed data sets, the median is a better measure of center. (Student should relate this to the distribution of his/her data set.)

Measures of center tell about the middle part of the data set. Most of the values are in the middle. Mean and median are measures of center for numerical data sets. The median is the middle number in a data set and it represents the most typical value in the data. The mean is the arithmetic average. Mean is affected by outliers and can be misleading for skewed data sets. For skewed data sets, the median is a better measure of center. In this case, it probably doesn't matter since both numbers are pretty close together.

RUBRIC

Score	Description
4	<p>Response demonstrates thorough understanding of graphing categorical data.</p> <ul style="list-style-type: none"> • The student chooses an appropriate format for graphing categorical data. • All data points are plotted accurately. • The graph includes appropriate interval scales. • The axes are concisely and precisely labeled. • The title is exceptionally clear and precise. • The explanation of how to read and interpret the graph is exceptionally clear.
3	<p>Response demonstrates general understanding of graphing categorical data.</p> <ul style="list-style-type: none"> • The student chooses an appropriate format for graphing categorical data. • Most data points are plotted accurately. • The graph includes interval scales. • The axes are correctly labeled. • The title tells what the data show. • The explanation of how to read and interpret the graph is accurate. <p>Errors do not interfere with drawing accurate conclusions from the graph.</p>
2	<p>Response demonstrates thorough understanding of graphing categorical data.</p> <ul style="list-style-type: none"> • The student chooses an appropriate format for graphing categorical data. • Some data points are plotted accurately. • The graph may not include interval scales. • The axes are labeled. • The title tells part of what the data show. • The explanation of how to read and interpret the graph is weak.
1	<p>Response demonstrates limited understanding of what is being assessed.</p> <ul style="list-style-type: none"> • Data points are plotted inaccurately. • The graph may not include interval scales. • The axes may be incorrectly labeled. • The title is vague. • The explanation of how to read and interpret the graph is unclear.
0	The student's response is mostly or all incorrect.

SAMPLE RESPONSE

No sample provided. Response will be specific to the student's data set.

NOTES: For categorical data, a bar graph (or possibly a pie chart) is most appropriate. When interpreting the graph, students should refer to the mode.