

**Question 1****RUBRIC**

Score	Description
5	<p>Response demonstrates thorough understanding of summarizing and investigating patterns of association in bivariate categorical data.</p> <ul style="list-style-type: none">• The student represents survey data appropriately in a two-way frequency table.• All relative frequencies are calculated accurately.• The table includes appropriate row and/or column labels.• The explanation of the relative frequencies in the context of the survey is clear and demonstrates an understanding of the concepts.• The conclusion of any association between the variables is clear and accurate.
3	<p>Response demonstrates general understanding of summarizing and investigating patterns of association in bivariate categorical data.</p> <ul style="list-style-type: none">• The student represents survey data appropriately in a two-way frequency table.• Most relative frequencies are calculated accurately.• The table has row and/or column labels that are correct.• The explanation of the relative frequency in the context of the survey is accurate.• Errors do not interfere with drawing accurate conclusions from the relative frequencies.• The conclusion of any association between the variables is correct.
2	<p>Response demonstrates partial understanding of summarizing and investigating patterns of association in bivariate categorical data..</p> <ul style="list-style-type: none">• The student represents survey data appropriately in a two-way frequency table.• Some relative frequencies are calculated accurately.• The table may not include appropriate row and/or column labels or has incorrect labels.• The explanation of the relative frequency in the context of the survey is weak.• The conclusion of any association between the variables has minor inaccuracies or is not clear.
1	<p>Response demonstrates limited understanding of summarizing and investigating patterns of association in bivariate categorical data..</p> <ul style="list-style-type: none">• Most relative frequencies are calculated accurately.• The table may not include row and/or column labels or has missing data.• The explanation of the relative frequency in the context of the survey is unclear and/or incorrect.• The conclusion of any association between the variables has major inaccuracies.
0	<p>The student's response has major flaws.</p>

SAMPLE RESPONSE

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

Question 2

RUBRIC

Score	Description
4	<p>Response demonstrates thorough understanding of summarizing bivariate measurement data using a scatter plot.</p> <ul style="list-style-type: none">• All data points are plotted accurately.• The percent of urban population with access to safe drinking water plotted on the horizontal axis, and average life expectancy in years plotted on the vertical axis.• The graph used an appropriate scale for the axes.• The axes are concisely labeled with precision.• The title is exceptionally clear and precise
3	<p>Response demonstrates general understanding of summarizing bivariate measurement data using a scatter plot.</p> <ul style="list-style-type: none">• Most data points are plotted accurately.• The percent of urban population with access to safe drinking water plotted on the horizontal axis, and average life expectancy in years plotted on the vertical axis.• The graph used an appropriate scale for the axes.• The axes are correctly labeled.• The title tells what the data show.• Errors do not interfere with drawing accurate conclusions from the graph.
2	<p>Response demonstrates partial understanding of summarizing bivariate measurement data using a scatter plot.</p> <ul style="list-style-type: none">• Some data points are plotted accurately.• The graph uses an incorrect or inconsistent scale for the axes.• The axes are labeled.• The title only includes one of the variables.
1	<p>Response demonstrates limited understanding of summarizing bivariate measurement data using a scatter plot.</p> <ul style="list-style-type: none">• Data points are plotted inaccurately.• The graph does not use an appropriate scale for the axes.• The axes may be incorrectly labeled.• The title is vague, incorrect, or missing.
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 3**RUBRIC**

Score	Description
3	Response demonstrates thorough understanding of patterns of association between two quantities. <ul style="list-style-type: none">• Student thoroughly explains that the data have a linear correlation. (1 point)• Student thoroughly explains that the linear correlation is positive. (1 point)• Student thoroughly explains that the data have a strong correlation. (1 point)

SAMPLE RESPONSE

The pattern of points in the scatter plot resembles a line, so the variables have a linear association. (The pattern is not a curve, so the association is not non-linear.)

The trend of the data in the graph is an increase when moving from left to right, so the association is not negative.)

The points closely resemble a line, so the variables have a strong association. (The shape is not loose or "cloud-like", so the association is not weak.)

Question 4**RUBRIC**

Score	Description
3	Response demonstrates thorough understanding of clustering in a scatter plot. <ul style="list-style-type: none">• Student identifies that there is one main cluster. (1 point)• The explanation is clear, thorough, and completely correct. (2 points)

SAMPLE RESPONSE

There is one main cluster, because almost all of the data is together in a single group.

Question 5**RUBRIC**

Score	Description
3	Response demonstrates thorough understanding of outliers in a scatter plot. <ul style="list-style-type: none">• Student identifies that there is one outlier (1 point)• The explanation is clear, thorough, and completely correct. (3 point)

SAMPLE RESPONSE

The data for Mauritania, which is represented by the point (63, 52), is the one outlier for this graph.

Question 6**RUBRIC**

Score	Description
5	Response demonstrates thorough understanding of the relationship between patterns of association observed between the variables in a scatter plot and patterns in the bivariate measurement data represented by the variables. <ul style="list-style-type: none">• Student provides a thorough explanation about what the scatter plot says about the data. (2 points)• Student thoroughly explains what could be reasonably concluded about one variable given information about the other variable. (2 points)• Student thoroughly explains why the outlier, if there is one, is unusual in context. (1 point)

SAMPLE RESPONSE

In general, as access to safe drinking water by a country's urban population increases, the average life expectancy of that country's population increases. If access to safe drinking water decreases, then average life expectancy decreases.

For example, if the percent of the urban population that has access to safe drinking water is low, then I can likely conclude that that country has a low average life expectancy.

By the same logic, if a country has a high average life expectancy, then I can likely conclude that a high percent of its urban population has access to safe drinking water.

The data for Mauritania, which is represented by the point (63, 52), is the one outlier for this graph. It is unusual because this country has a low average life expectancy in comparison to the other countries whose data is given, but its urban population's access to safe drinking water is considerably lower than would be expected from the pattern shown in the data for the other countries.

Question 7**RUBRIC**

Score	Description
5	<p>Response demonstrates thorough understanding of trend lines in scatter plots.</p> <ul style="list-style-type: none">• Student uses a ruler or graphing technology to draw a straight line as close to as many points as possible, with as many points above it as below it. (1 point)• Student writes a reasonable equation for the trend line as drawn. (1 point)• Student thoroughly explains the slope in context and why interpreting the y-intercept in the context does not make sense. (2 points)• The explanation is clear, thorough, and completely correct. (1 point)

SAMPLE RESPONSE

Graph of scatter plot with trend line:

Equation of trend line (with the outlier): $y = 0.59x + 18.54$

The slope is positive, so it indicates a positive association between the variables. The approximated value of the slope indicates that for each additional 1% of a country's urban population that has access to safe drinking water, we can expect that the average life expectancy at birth for people who live in that country increases by about 0.59 year, or about 7 months.

The approximate y-intercept is (0, 18.54). This means that, if 0% of the urban population has access to safe drinking water, then the average life expectancy at birth for people who live in that country is about 18.54 years. It does not make sense to interpret the y-intercept in the context of this problem, because it is not realistic for none of a country's urban population to have access to safe drinking water.

[Note: Answers may vary, depending on how the student draws the trend line. Equation and graph should be close to what is given as a sample, because the data have a strong positive association.]

Question 8**RUBRIC**

Score	Description
4	<p>Response demonstrates thorough understanding of making predictions from a trend line for a scatter plot.</p> <ul style="list-style-type: none">• Student correctly calculates the average life expectancy using the calculated trend line. (2 points)• The explanation is clear, thorough, and completely correct. (2 points)

SAMPLE RESPONSE

[Note: Answers may vary, depending on how the student draws the trend line. Students should calculate an age that is close to 61 years, and report that their prediction based on the trend line was close to the actual because their trend line was a good representation of the pattern of association in the data.]