



Coordinate Algebra EOC (GSE) Quiz Answer Key

Interpreting Categorical and Quantitative Data - (MGSE9-12.S.ID.9) Correlation And Causation

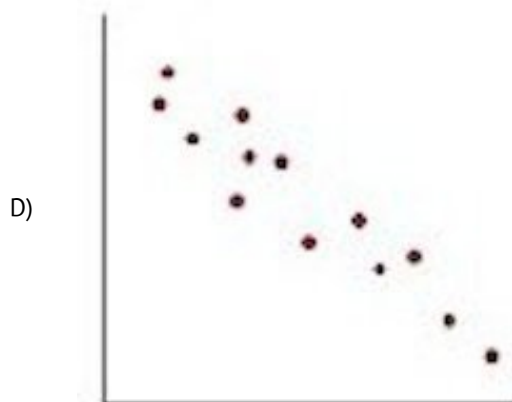
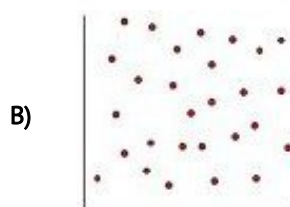
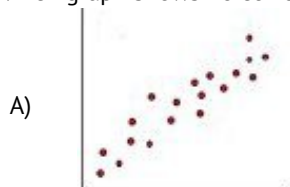
Student Name: _____

Date: _____

Teacher Name: THUYNGA DAO

Score: _____

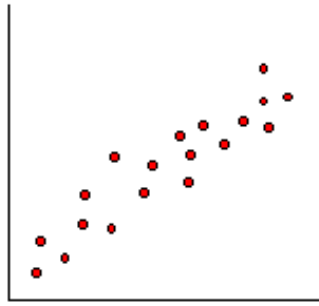
1) Which graph shows no correlation?



Explanation:

The solution is **B**. There is no clear correlation with the points in the graph.

2)



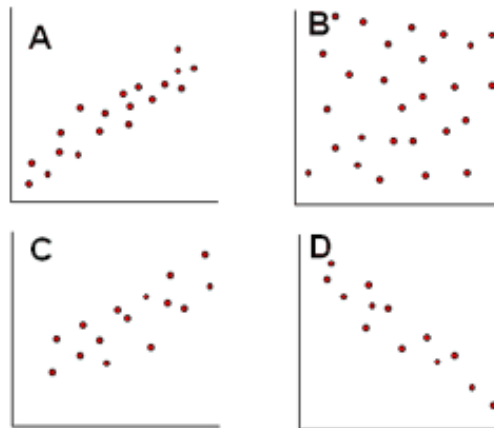
Describe the correlation.

- A) no correlation
- B) prime correlation
- C) **positive correlation**
- D) negative correlation

Explanation:

The solution is **positive correlation**. As one variable increases, the other variable increases. This indicates that the correlation is positive.

3)



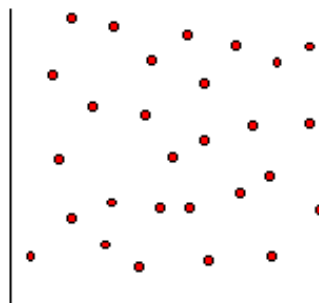
Which scatterplot(s) show a positive correlation?

- A) Plot B
- B) Plot D
- C) **Plots A and C**
- D) Plots A, C and D

Explanation:

The solution is **A and C**. when you draw lines of best fit, the lines for A and C have a positive slope and therefore a positive correlation.

4)



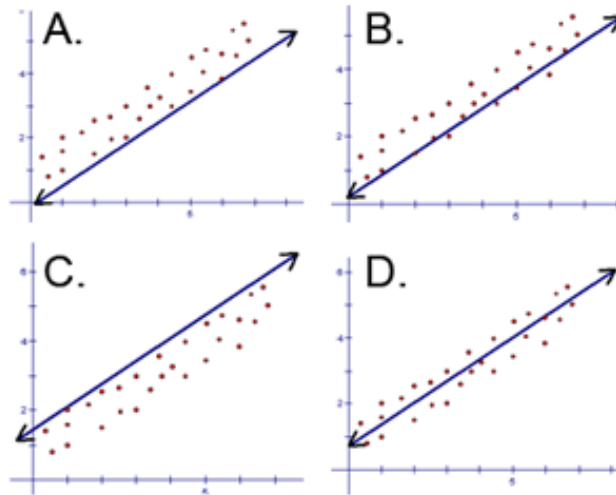
Describe the correlation.

- A) **no correlation**
- B) prime correlation
- C) positive correlation
- D) negative correlation

Explanation:

The solution is **no correlation**. There is no apparent correlation between the variables.

5)



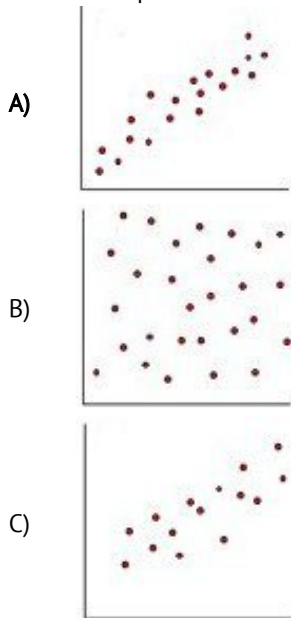
The plots in A-D all show _____ correlation.

- A) negative
- B) no
- C) **positive**
- D) prime

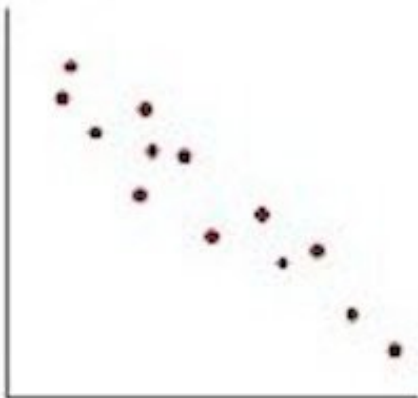
Explanation:

The solution is **A**. All of the graphs show a positive correlation since the y-values increase from left to right.

6) Which scatterplot has the strongest positive correlation?



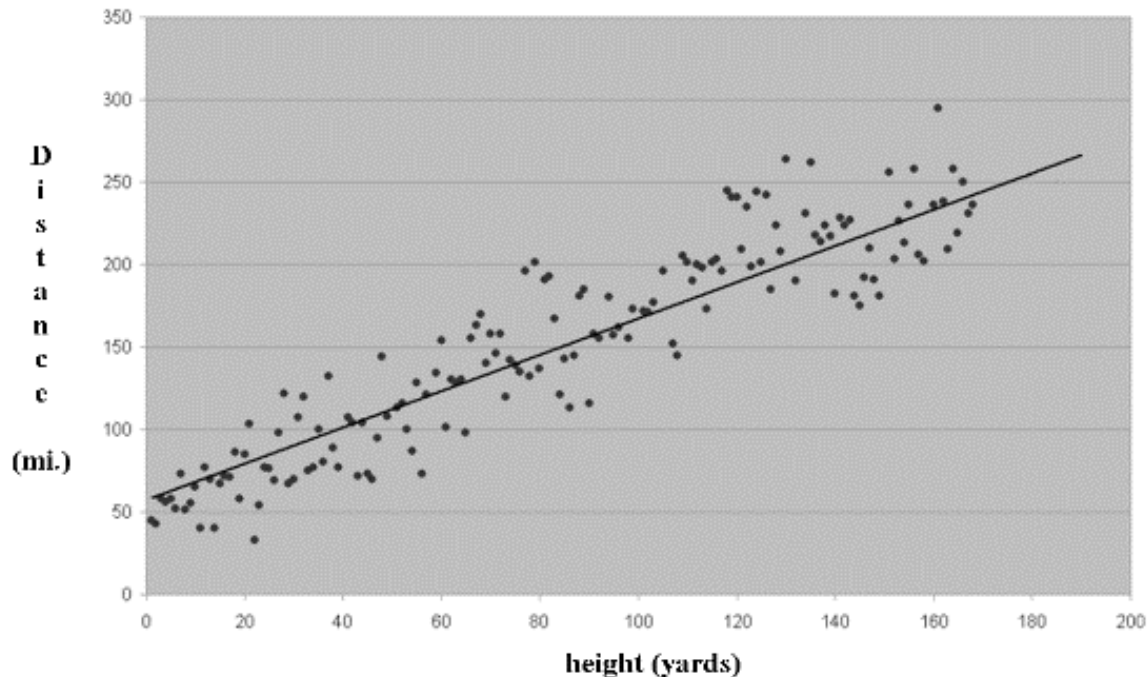
D)

**Explanation:**

The answer is choice **A**. A and C are the only positive correlations. A has a stronger correlation because the data points are closer together and form a better linear pattern. There is more scatter in Scatterplot C.

7)

Distance (miles) as a function of height (yards)



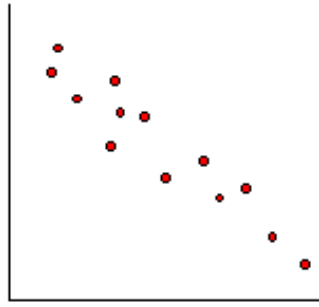
Josephine has made the scatterplot shown here, and has graphed the least-squares regression line on it. Which conclusion is justified?

- A) **There is a positive correlation between height and distance.**
- B) There is a negative correlation between height and distance.
- C) There is a binomial correlation between height and distance.
- D) There is a non-linear correlation between height and distance.

Explanation:

There is a positive correlation between height and distance. This is clear from the scatterplot, as well as from the positive slope of the regression line.

8)



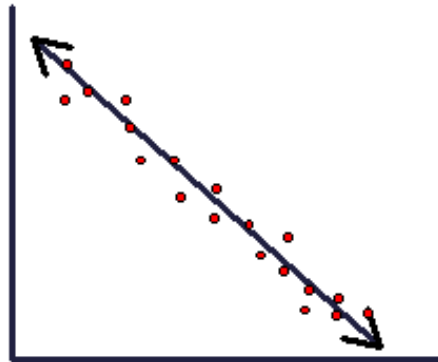
Describe the correlation.

- A) no correlation
- B) prime correlation
- C) positive correlation
- D) **negative correlation**

Explanation:

The solution is **negative correlation**. As one variable increases, the other variable decreases. This indicates that the correlation is negative.

9)



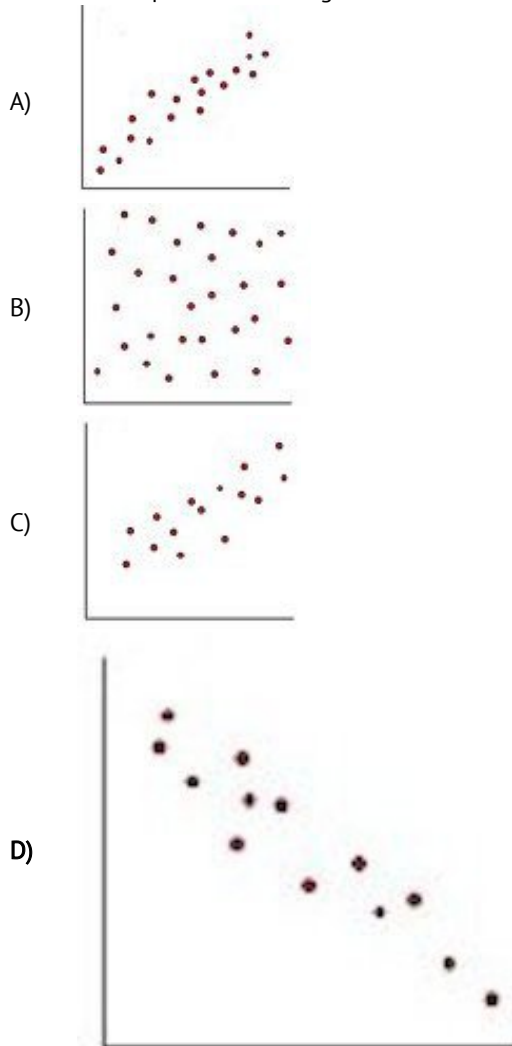
Describe the correlation of the scatterplot.

- A) no correlation
- B) prime correlation
- C) positive correlation
- D) **negative correlation**

Explanation:

The solution is **negative correlation**. The slope of the line of best fit is negative, therefore, the correlation is negative.

10) Which scatterplot shows a negative correlation?



Explanation:

The solution is **D**. If you draw a line of best fit, you can see that the slope is negative. Therefore, the correlation is negative.

11) Five-year-old Samantha notices that, whenever her mother takes her umbrella to work, there is rain outside and she can't go out to play. One day she says, "Mommy, please put your umbrella away so I can go outside later!" Samantha is

- A) **wrong in thinking that the umbrella causes the rainfall.**
- B) wrong in thinking that the rain won't stop in time for her to go out.
- C) wrong in thinking that she can play outside any time it doesn't rain.
- D) wrong in thinking that there are no other umbrellas available for her.

Explanation:

wrong in thinking that the umbrella causes the rainfall. Samantha is confusing the correlation of the umbrella and the rain with causation.

12) What is the correlation between these points?

(1, 2), (2, 2), (2, 3), (2, 4), (3, 4), (4, 5)

- A) weak positive
- B) weak negative
- C) **strong positive**
- D) strong negative

Explanation:

When you graph the points you will see the points are clustered close together and are moving in a positive direction. This is a

strong positive correlation.

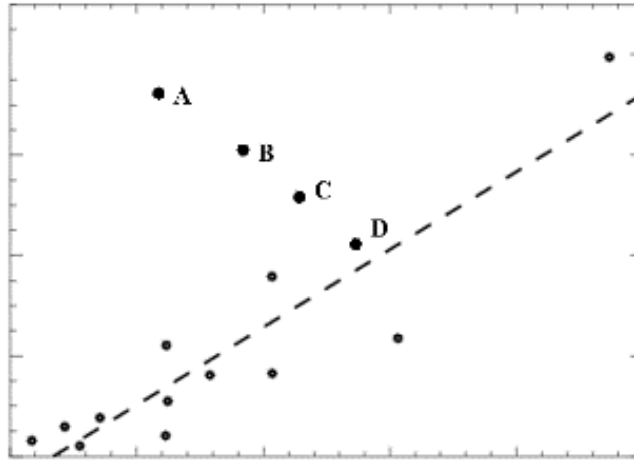
13) A study has demonstrated that the more television a person watches, the lower that person's level of physical fitness. However, Pablo has experienced the exact opposite effect. The more television he watches, the greater his level of physical fitness. This is because Pablo watches television while running on a treadmill. Based on these facts, which is the most valid conclusion?

- A) Watching television causes lower physical fitness.
- B) Watching television causes greater physical fitness.
- C) Running on a treadmill causes lower physical fitness.
- D) **Running on a treadmill causes greater physical fitness.**

Explanation:

The study demonstrated a negative correlation between the amount of television a person watches and that person's level of physical fitness. However, that does not mean that watching more television causes lower physical fitness. As Pablo showed, it is possible to watch more television and have greater physical fitness. Yet, this does not mean that watching television causes greater physical fitness, either. Watching television does not cause physical fitness to go up or down. It is what you're doing while you're watching television that matters. Therefore, the most valid conclusion is that **running on a treadmill causes greater physical fitness.**

14)



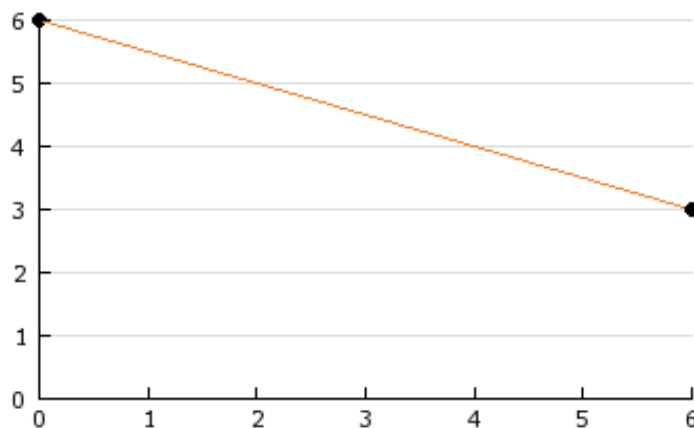
The graph shows a scatterplot, along with the best fit line. The points A, B, C, and D are not part of the set. Adding which point will most DECREASE the value of the correlation coefficient?

- A)
- B)
- C)
- D)

Explanation:

A is correct. Adding it to the set will cause the scatterplot to become the most "spread out," which lowers the value of r closest to 0.

15)



Based on this graph, which statement MUST be true?

- A) More x causes less y .
- B) More x causes more y .
- C) **There is a negative correlation between x and y .**
- D) There is a positive correlation between x and y .

Explanation:

There is a negative correlation between x and y . The fact that there is a correlation between x and y does NOT guarantee that x causes y to decrease.

16) A professional hockey team has noticed that, over the past several seasons, as the number of wins increases, the total number of hot dogs sold at the concession stands increases. The hockey team concludes that winning makes people crave hot dogs.

What is wrong with the hockey team's conclusion?

- A) **It does not take into account the attendance during each season.**
- B) It does not take into account the number of hamburgers sold during each season.
- C) It does not take into account the number of concession stands in the hockey arena.
- D) It does not take into account the number of seasons the hockey team has been in existence.

Explanation:

There is a positive correlation between the number of wins during a season and the total number of hot dogs sold. However, this does not necessarily mean that winning makes people crave hot dogs. In fact, this probably isn't true. Therefore, the hockey team's conclusion is wrong because **it doesn't take into account the attendance during each season.**

17) Which causal relationship is justifiable?

- A) Children with bigger feet spell better. Spelling better causes a child's feet to grow.
- B) Surf board sales rise when lemonade sales rise. Drinking lemonade causes more people to buy surfing boards.
- C) **The traffic is heavier around the stadium when a game is being played. Games being played cause more traffic.**
- D) An elementary school child has more cavities than his baby brother. He also has a larger vocabulary. An increased vocabulary causes cavities.

Explanation:

The traffic is heavier around the stadium when a game is being played. Games being played cause more traffic.

More cars are at the stadium because of the game being played.

A child's number of cavities and vocabulary words increase as the child's age increases.

Spelling better cannot make feet grow. Children with bigger feet are older and have more spelling knowledge.

Surf board and lemonade sales both rise because of the season(summer).

18) Which relationship is likely ONLY a correlation and NOT one of causation?

- A) As the temperature increases, the number of air conditioners being used increases.
- B) As the price of a gallon of gas increases, the number of gallons of gas sold decreases.
- C) **As the number of visitors to a park increases, the number of flowers in bloom at the park increases.**
- D) As the amount of time a student spends studying for a test decreases, the student's score on the test decreases.

Explanation:

An increase in temperature would likely cause the number of air conditioners being used to increase. Likewise, a decrease in the amount of time a student spends studying for a test would likely cause the student's score on the test to decrease, and an increase in the price of a gallon of gas would likely cause the number of gallons of gas sold to decrease. However, would an increase in the number of visitors to a park cause the number of flowers in bloom at the park to increase? Probably not. An increase in both of these variables would likely be caused by the season. Therefore, the relationship that's likely only a correlation is **as the number of visitors to a park increases, the number of flowers in bloom at the park increases.**

19) Which statement about correlation and causation is true?

- A) Correlation implies causation.
- B) **Causation implies correlation.**
- C) No correlation implies causation.
- D) No causation implies no correlation.

Explanation:

If two variables are in correlation, it does not necessarily mean that one causes the other. For this reason, correlation does not imply causation. Likewise, since " P implies Q " is the logical equivalent of "Not Q implies not P ," no causation does not imply no correlation. Also, no correlation would not imply causation. In fact, no correlation would imply no causation. Therefore, the statement about correlation and causation that is true is **causation implies correlation.**

20) When Danielle goes grocery shopping, she usually buys a gallon of milk and some dinner rolls. She has noticed that there seems to be a correlation between the price of milk and dinner rolls. In other words, when the price of milk goes up, the price of dinner rolls goes up, and when the price of milk goes down, the price of dinner rolls goes down.

Which fact would lead you to believe that the relationship between the prices is not only a correlation, but also one of causation?

- A) Whenever milk is on sale, dinner rolls are also on sale.
- B) Milk and dinner rolls are often served during the same meal.
- C) **Milk is one of the major ingredients used to make dinner rolls.**
- D) The prices of milk and dinner rolls both move with the rate of inflation.

Explanation:

Even though the prices of milk and dinner rolls both move with the rate of inflation, it does not mean that an increase or a decrease in the price of milk causes an increase or a decrease in the price of dinner rolls. However, if milk is used to make dinner rolls, an increase in its price would cause the cost of making dinner rolls to increase, and this, in turn, would likely cause the price of dinner rolls to rise. Therefore, one would believe that the relationship between the prices is not only a correlation, but also a causation if **milk is one of the major ingredients used to make dinner rolls.**

21) LaTroy plotted a number of data points in the form of (x, y) on a Cartesian grid with his graphing calculator and then used the linear regression feature. His calculator returned a correlation coefficient (r) of 1, suggesting a perfect correlation between x and y . Which statement is true?

- A) Because there is a perfect correlation between x and y , x must cause y .
- B) Because there is a perfect correlation between x and y , y must cause x .
- C) **Even though there is a perfect correlation between x and y , x may not cause y .**
- D) Even though there is a perfect correlation between x and y , x must not cause y .

Explanation:

Two variables are in correlation if there is a relationship between the two. However, even though there is a relationship between two variables, one variable does not necessarily cause the other. At the same time, it doesn't mean that one variable doesn't cause the other. In this scenario, there is no way to know if x causes y . It depends on what x and y are. Therefore, **even though there is a perfect correlation between x and y , x may not cause y .**

22)

For 10 weeks Dolly wrote down everything she ate as well as weighed herself each morning. For two separate weeks during the 10 week period when her car was broken down and she was walking to work she was running late each day so she did not have a chance to write down what she ate.

At the end of the 10 weeks she graphed her weight over time and noticed that for the two weeks she didn't write down anything she lost weight. She concluded that for this experiment NOT writing down what she ate would help her lose weight.

Which mistake did Dolly have in her conclusion?

- A) **Confusing causation with correlation.**
- B) Confusing an experiment with an observational study.
- C) That her experiment lasted for 10 weeks since she did not record what she ate for 2 weeks.
- D) She did not make any mistakes in her conclusion.

Explanation:

When Dolly analyzed her results she saw that there was a correlation between weight loss and writing down what she ate--when one changed the other changed. What she did not consider were other facts that might have affected this. Therefore she confused **correlation with causation.**

23) Ellen, a political intern, analyzes poll data for Cal Stegall, a candidate for state legislature. She notices Stegall's popularity was highest after he gave three speeches on the need for tax reform. When she suggests to the team that Stegall should focus on tax reform closer to the election, the campaign manager points out that even if there is a correlation, that does not prove the speeches CAUSED the increase in popularity.

Whose analysis is correct and why?

- A) The intern is correct since tax reform is a major issue to the voters in Stegall's district.
- B) The intern is correct since the increase in the polls occurred within a day of the speeches on tax reform.
- C) The campaign manager is correct since he has worked with Stegall for several years and is more familiar with his record.
- D) **The campaign manager is correct since other favorable events could have boosted Stegall's popularity after those speeches.**

Explanation:

When analyzing data, it may be tempting to assume that a correlation between two variables indicates one variable caused the other. However, other factors may affect the data. In this example, **The campaign manager is correct since other favorable events could have boosted Stegall's popularity after those speeches.**

24) Susie gains more weight over Christmas than any other time of the year. Christmas makes Susie gain weight. This conclusion is

- A) justifiable, because Christmas is in December.
- B) justifiable, because Susie is happier at Christmas.
- C) justifiable, because everyone gains weight at Christmas.
- D) **not justifiable, because there is another variable to consider.**

Explanation:

not justifiable, because there is a hidden variable causing the weight gain.

Christmas cannot make you gain weight. However, more food is available at Christmas. So, Susie eats more. Eating more food makes Susie gain weight.

25) Ice cream sales and the number of shark attacks have a positive correlation. The conclusion that eating ice cream causes shark attacks is

- A) justifiable, because the milk in ice cream attracts sharks.
- B) justifiable, because a positive correlation implies causation.
- C) not justifiable, because a positive correlation negates causation.
- D) **not justifiable, because ice cream sales and shark attacks both rise during the summer.**

Explanation:

not justifiable, because ice cream sales and shark attacks both rise during the summer.

The conclusion is flawed because both ice cream sales and shark attacks rise during the summer because more people are at the beach.

26) The Dudley family just brought home twins from the hospital. Their neighbor's baby was born on the same day as the twins. A reasonable conclusion is that the Dudley family will spend money on diapers. Is this association positive, negative, or neither? Is the relationship more likely a causation or correlation?

- A) neither
- B) positive; causation**
- C) negative; correlation
- D) positive; correlation

Explanation:

positive; causation

The Dudley family will be buying more diapers BECAUSE they have more babies.

27) Global warming is the result of burning fossil fuels. Which concept(s) describe(s) this statement?

- A) causation
- B) correlation
- C) correlation and causation**
- D) complementary justification

Explanation:

correlation and causation

There is a positive correlation. As more fossil fuels are burned, global warming increases. It's reasonable that burning fossil fuels has an effect on global warming.

28) Since the 1950's, air pollution and robberies have increased. The conclusion that air pollution causes robberies is

- A) not justifiable, because population is another variable.**
- B) justifiable, because poor air quality affects good judgement.
- C) justifiable, because there is a weak correlation between air pollution and robberies.
- D) justifiable, because there is a complementary correlation between air pollution and robberies.

Explanation:

not justifiable, because population is another variable.

Air pollution cannot cause robberies. An increase in population is more likely to have caused the increase in air pollution and robberies.

29) Joseph gives a math test to all the students in a middle school and notices that taller students have higher scores. He concludes that taller people are better at math. This conclusion is

- A) not justified, since the taller students could have cheated.
- B) justified, especially if it can be repeated on a second test.
- C) not justified, since taller students have had more math in school.**
- D) justified, assuming that the test was given fairly to all students.

Explanation:

not justified, since taller students have had more math in school. Time, which is what allows the older students to grow taller, also allows them to learn more math. This is correlation, not causation.

30) A study has found that if a person has participated in a smoking cessation program in his or her lifetime, the person will have a lower life expectancy than a member of the general population.

The study concludes that smoking cessation programs lower life expectancy and recommends that no one attend them. Why is the conclusion flawed?

- A) Correlation always implies causation.
- B) The conclusion assumes causation, when only correlation has been shown.**
- C) Correlation shown in an observational study is never reliable.
- D) The conclusion assumes correlation, when only causation has been shown.

Explanation:

The conclusion assumes causation, when only correlation has been shown. The cause of the lower life expectancy is likely not the cessation program, but the smoking which preceded it. Correlation does not imply causation.