

TEST NAME: **S-ID.9**  
TEST ID: **844130**  
GRADE: **09 - Ninth Grade**  
SUBJECT: **Mathematics**  
TEST CATEGORY: **School Assessment**

Student: \_\_\_\_\_

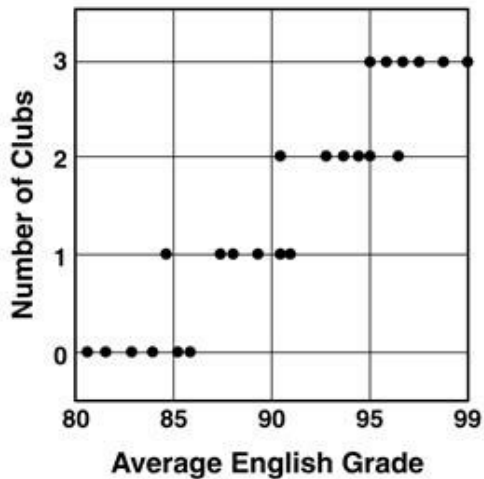
Class: \_\_\_\_\_

Date: \_\_\_\_\_

1. Bobby surveyed a random sample of 24 of the 150 seniors at his high school. He made the graph shown based on their answers to two questions.

- In how many clubs do you participate?
- What is your average English grade?

**Average English Grade  
vs. Participation in School Clubs**



Bobby concluded that participation in more clubs causes a student to earn higher grades in English.

Is Bobby's conclusion valid and, if so, why?

- A. Bobby's conclusion is invalid because he did not survey all of the students.
- B. Bobby's conclusion is valid because there is a positive cause-and-effect relationship shown in the graph.
- C. Bobby's conclusion is invalid because the number of clubs in which the student participates does not necessarily cause the English grade of a student to increase.
- D. Bobby's conclusion is valid because there is a positive correlation between the number of clubs in which a student participates and the student's English grade.

2. Which statement about the relationship between correlation and causation is true?

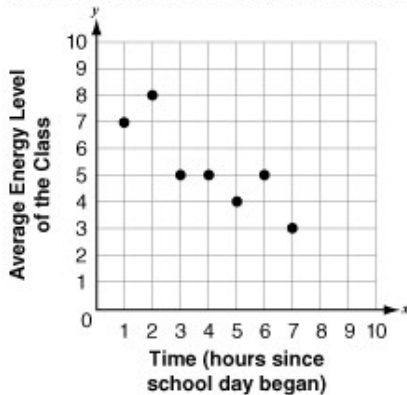
- A. Causation implies correlation.
- B. Correlation implies causation.
- C. Positive correlation implies causation.
- D. Negative correlation implies a lack of causation.

3. A study shows that there is a negative correlation between a student's anxiety before a test and the student's score on the test.

Which statement can be concluded?

- A. Higher anxiety causes lower test scores.
  - B. Lower anxiety causes lower test scores.
  - C. There is no correlation between a student's anxiety and the student's test score.
  - D. There is a correlation but not necessarily a causation between a student's anxiety and the student's test score.
4. As part of a science project, Andy surveys several students in his class to determine their energy levels throughout the day. He asks the students to rate their energy level on a scale from 1 to 10, where 10 is the highest energy level possible and 1 is the lowest energy level possible. Andy then finds the average energy level for the class for each hour after the school day begins until the end of the day. He graphs his data as shown below.

**AVERAGE ENERGY LEVEL OF ANDY'S CLASS THROUGHOUT THE SCHOOL DAY**



He observes that students seem to have less energy as the day progresses. Which of these statements is true?

- A. Andy's study shows causation.
- B. Andy's study shows correlation.
- C. Andy's study shows both correlation and causation.
- D. Andy's study shows neither correlation nor causation.

5. Which of these is the **best** example of correlation but NOT causation?
- A the time of year and the toy sales of a department store
  - B the amount of food an animal eats daily and the height of the animal
  - C the number of fruits placed in a grocery basket and the weight of the basket
  - D the amount of gas a car's tank can hold and the number of times the car stops at a gas station to fill up the tank
6. **Which statement is the best hypothesis to be tested for a causal relationship?**
- A Students drink more bottles of water based on the time of day.
  - B Students drink more bottles of water when they are exercising.
  - C Students drink more bottles of water when the price is lower.
  - D Students drink more bottles of water after a major test.
7. Which statement **best** describes the relation between correlation and causation?
- A Correlation results in causation.
  - B Correlation does not imply causation.
  - C Correlation and causation are unrelated.
  - D Correlation and causation are the same thing.
8. **Which relationship is an example of causation?**
- A The more education a person has, the more they read.
  - B More time spent on homework results in higher grades.
  - C More weight on one side of a balance scale will tip the scale in that direction.
  - D Animals that consume higher than average amounts of feed per week gain weight.
9. Which of these correlations represents causation?
- A As the sales of a product increase, its price increases.
  - B The weight of a person increases with an increase in the person's height.
  - C As the speed of a vehicle increases, the time taken to cover a distance decreases.
  - D As the sales of ice cream in the summer increase, sales of sunglasses at a store also increase.

10. Which conclusions imply causation?

I. It rained on John's 9th, 10th, and 11th birthdays, so he believes that it always rains on his birthday.

II. Sylvia burns 250 calories when exercising for 20 minutes, 340 calories when exercising for 30 minutes, and 460 calories when exercising for 40 minutes; therefore, she concludes that she burns more calories when she exercises more.

III. A particular population of insects has been decreasing by 5% each year. A scientist concludes that the decrease in the insect population will likely lead to a decrease in the bird population for which the primary food source is the insects.

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II, and III

11. **Kara compared the number of text messages 100 students sent in one day and the grade point average (GPA) of each student. The correlation coefficient among the data is  $-0.9$  rounded to the nearest tenth. Based on this information, which statement is most likely true?**

- A. There is correlation but not causation between GPA and the number of text messages.
- B. There is causation but not correlation between GPA and the number of text messages.
- C. There is both correlation and causation between GPA and the number of text messages.
- D. There is neither correlation nor causation between GPA and the number of text messages.

12. **Which two variables are related by causation?**

- A. age and income
- B. height and weight
- C. speed and distance traveled
- D. reading ability and shoe size

13. **Which stated relationship is one of correlation, but not causation?**

- A. High intensity exercise increases metabolism.
- B. Lower crop yields result in higher produce prices.
- C. Increased pressure results in increased temperature.
- D. People who attended college have more successful careers.

14. Which statements are true?

- I. Correlation implies causation.
- II. Correlation does not imply causation.
- III. "A causes B" does not imply that "B causes A."
- IV. "A is correlated with B" does not imply that "B is correlated with A."

- A. I and III
- B. I and IV
- C. II and III
- D. II and IV

15. Which of the following best describes a relationship that is not a causation?

- A. the more the rooster crows, the more often it rains
- B. the more miles driven, the more gasoline needed
- C. the faster the pace of the runner, the more quickly the runner finishes
- D. the higher the hourly wage, the greater the income for 40 hours of work

16. Which equation represents the relationship between two variables that are negatively correlated?

- A.  $2 - y = x - 3$
- B.  $-2 - y = 3 - x$
- C.  $y - 2 = x - 3$
- D.  $-y - 2 = -3 - x$

17. The following situations showed a strong correlation. Which situation is an example of causation?

- A. The fewer police substations in a city, the higher the number of crimes that occur there.
- B. The higher the number of miles a car is driven, the less gasoline is left in the tank.
- C. The farther students sit from the front of the class, the lower their grades.
- D. The more years of education a person has, the higher their income.

18. Which relationship is an example of causation?

- A. Running longer increases the number of calories burned.
- B. The more education a person has, the higher their income.
- C. Students who watch a lot of television will have lower grades.
- D. College students with higher entrance exam scores also have higher grades.

19. Which statement illustrates a causation effect?

- A. As the number of high schools increases, the number of enrolled students goes up.
- B. As the number of weddings increases, the number of marriage licenses increases.
- C. As the number of gym memberships increases, the number of people who lose weight increases.
- D. As the number of visitors to theme parks increases, the number of hamburgers sold at theme park concession stands increases.

20. The coach of a college athletics team studied the impact of different brands of shoes on the running times of his students. He concluded that a change in the brand of shoes used results in a reduction of the time it takes a runner to run a given distance. Which statement is **true**?

- A. His conclusion represents correlation and causation.
- B. His conclusion represents correlation but no causation.
- C. Because the running time decreases, the change in the brand and running time are not correlated.
- D. Because the change in brand causes a change in running time, his conclusion represents causation but not correlation.

21. Students were asked how many minutes they spent doing homework during one week. The table shows their recorded times and their test scores at the end of that week.

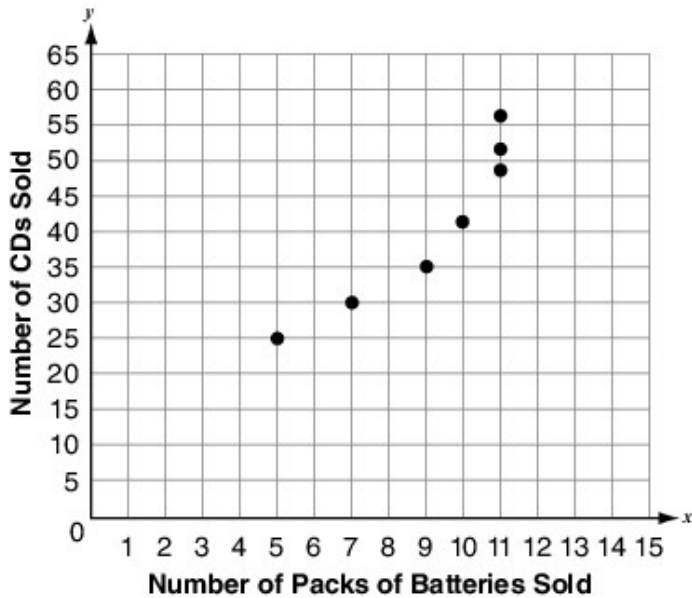
Student	Time Doing Homework (minutes)	Test Score
1	60	70%
2	55	70%
3	80	95%
4	65	80%
5	65	72%
6	90	85%
7	75	87%

The correlation coefficient of the line of best fit for the data in the table is 0.81. Based on this information, which statement is true?

- A. The correlation coefficient indicates a strong correlation, which means that spending more time on homework causes higher test scores.
- B. The correlation coefficient indicates no correlation, which means that spending more time on homework does not cause higher test scores.
- C. The correlation coefficient indicates a strong correlation, but this does not mean that spending more time on homework causes higher test scores.
- D. The correlation coefficient indicates no correlation, and this does mean that spending more time on homework causes higher test scores.



22. The graph below shows the number of compact disks and the number of packs of batteries sold in a certain store each day during a one-week time period.



Which statement is **true**?

- A. The sales of compact disks and batteries are positively correlated, and the graph implies causation.
  - B. The sales of compact disks and batteries are negatively correlated, and the graph implies causation.
  - C. The sales of compact disks and batteries are positively correlated, and the graph does not imply causation.
  - D. The sales of compact disks and batteries are negatively correlated, and the graph does not imply causation.
23. Which description is a causation relationship?
- A. a person's age and the number of siblings the person has
  - B. the distance a person can run in 1 hour and the size of the person's shoes
  - C. the number of students in a class and the number of students in the class who wear glasses
  - D. the number of questions a student answers correctly on an exam and the student's score on the exam

