# Math 216 Clicker Questions – Chapter 1

1. Draw the following dart board: A dart board is constructed from three concentric circles with radii 1 inch, 2 inches, and 3 inches, respectively. If a dart lands in the innermost circle, the player receives 4 points. If the dart lands between the innermost circle and the middle circle, the player receives 2 points. If the dart lands between the middle circle and the outermost circle, the player receives 1 point. Assume that the probability of a dart landing in any particular region is proportional to the area of that region. Define the variable x to be the sum of the player's score on two successive throws. Then x is what type of variable?
   A. Discrete
   B. Continuous

2. Same dart board, but now suppose that a player's score on a single dart throw is defined to be the distance between the dart and the center of the board. Define the variable x to be the sum of the player's score on two successive throws. Then x is what type of variable?
   A. Discrete
   B. Continuous

3. A radioactive mass emits particles at an average rate of 15 particles per minute. Define the random variable X to be the number of particles emitted in a 10-minute time frame. Then X is what type of random variable?
   A. Discrete
   B. Continuous

4. A radioactive mass emits particles at an average rate of 15 particles per minute. A particle is emitted at noon today. Define the random variable X to be the time elapsed between noon and the next emission. Then X is what type of random variable?
   A. Discrete
   B. Continuous

5. Consider the variable x = the age of a randomly chosen Vanderbilt student. Then x is what type of variable?
   A. Discrete
   B. Continuous

6. Which of the following best describes the relationship between $\bar{x}$ and μ?
   A. $\bar{x}$ is the mean of just a select number of data points, while μ is the mean of the whole population. So since $\bar{x}$ is just a percentage of μ, μ is a more accurate representation but also a lot harder to acquire which is why $\bar{x}$ is used most of the time.

B. Both μ and $\bar{x}$ are the statistical means of a data set and are calculated in the same way: sum of the numerical observations divided by the number of observations. The difference is that $\bar{x}$ is the mean of a sample while μ is the mean of a population.

C. $\bar{x}$ is the average of a sample of the population. μ is the average of the entire population. $\bar{x}$ is attempting to approximate μ without collecting data on every member of the population.

D. $\bar{x}$ is the mean of the subset of a population, while μ is the mean of the whole population. The values of $\bar{x}$ and μ are very close because $\bar{x}$ is a rough estimate of μ.

7. Suppose you sample 10 steel bars produced by Machine A and find the sample has an average length of 1 meter with a standard deviation of 5 millimeters. Suppose you sample 10 steel bars produced by Machine B and find the sample has an average weight of 100 kilograms with a standard deviation of 1 kilogram. All the steel bars produced by either machine should be identical. Which of the following statements is best supported by these data?
    A. Machine A is more reliable than Machine B.
    B. Machine B is more reliable than Machine A.
    C. The reliability of Machines A and B cannot be compared using these data.

8. Suppose you sample 10 steel bars produced by Machine A and find the sample has an average length of 1 meter with a standard deviation of 5 millimeters. Suppose you sample 10 steel bars produced by Machine B and find the sample has an average length of 1 meter with a standard deviation of 10 millimeters. All the steel bars produced by either machine should be identical. Which of the following statements is best supported by these data?
    A. Machine A is more reliable than Machine B.
    B. Machine B is more reliable than Machine A.
    C. The reliability of Machines A and B cannot be compared using these data.

9. True or False: Usually about 70% of the data are within one standard deviation of the mean and about 95% are within two standard deviations.
    A. True
    B. False

10. Below are boxplots for two data sets. TRUE or FALSE: There is a greater proportion of values outside the box for the set of data on the right than for the set of data on the left.
    A. True
    B. False
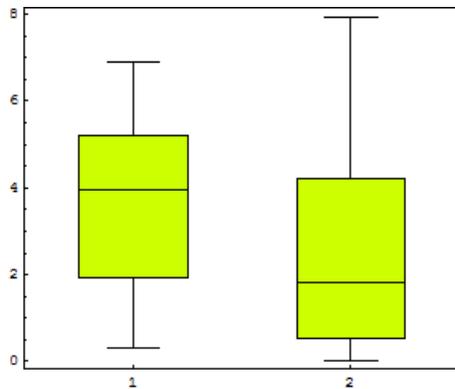
11. Suppose you take a random sample of 10 Vanderbilt engineering juniors who received the same model laptop when they were first-years. You test these 10 laptops to determine how long their batteries last before needing to be recharged, and you obtain the following data (in hours): 1.2, 1.3, 3.8, 3.9, 3.9, 4.0, 4.1, 4.1, 4.2, 4.3. What should be done with the values 1.2 and 1.3? Which of the following is the best course of action?
    A. Delete them from the data set since they are outliers.
    B. Keep them in the data set even though they are outliers.
    C. Determine why these values were so low, then delete them.
    D. Determine why these values were so low, then keep them in the data set, provided they aren't due to data entry errors.

12. Professor X just finished teaching a physics course with 100 students, only 35 of whom completed the course evaluation. For the evaluation item "Give an overall rating of this instructor", Professor X's average rating was 2.8 on a scale of 1 (poor) to 5 (excellent). If all of Professor X's students had completed the course evaluations, his average rating for this item would probably have been…
    A. Less than 2.8.
    B. Equal to 2.8.
    C. Greater than 2.8.
    D. There's no way to know given these data.

13. Suppose an observational study indicates a positive association between the average global temperature and the National Science Foundation budget. Which of the following are possible lurking variables in this study?
    A. US population size
    B. Levels of public interest in alternative energy
    C. Both A and B
    D. Neither A nor B

14. I need two calculus sections, one that will use clickers and one that won't. Instead of using sections taught by Professors X and Y, who teach at the same time, I use two sections both

taught (at different times) by Professor Z. Which principle of experimental design have I followed?
- A. Control
- B. Randomization
- C. Replication
- D. Blocking

15. Which of the following conditions violates the experimental design principle of **randomization**?
- A. Professor Z is a popular professor, so lots of students take her calculus sections.
- B. Most students who take calculus are math, science, or engineering majors.
- C. One of Professor Z's sections meets at 9am, the other at noon.
- D. All of the above.
- E. None of the above.

Answers

1. A
2. B
3. A
4. B
5. B*
6. C*
7. C
8. A
9. B*
10. B*
11. D
12. D
13. C
14. A
15. C

* denotes a "best" answer among more than one defensible answers.