AP Statistics Session 2 – MCQ

1. A large online retailer places packed and ready-to-be-shipped boxes in a line on a conveyor belt. A sample of boxes will be used to estimate the mean weight of boxes shipped on a given day. One proposed method for selecting the sample is as follows:

   ▪ Generate a random integer from 1 to 20.
   ▪ Use that integer to select an initial box from the first 20 boxes in line on the conveyor belt.
   ▪ Select every 25th box that follows the initial box on the conveyor belt for the rest of the day.

   Which of the following best describes the proposed sampling method?

   A. Stratified random sample, stratified by time of day
   B. Cluster sample, with times of day as clusters
   C. Cluster sample, with box weights as clusters
   D. Systematic random sample
   E. Convenience sample

2. An experiment was conducted to investigate whether submersion in cold water causes a lower heart rate. The experiment used 50 volunteers. The 25 youngest volunteers had their heart rate measured while holding their breath for 30 seconds with their face submerged in cold water. The 25 oldest volunteers had their heart rate measured while holding their breath for 30 seconds with their face not submerged in cold water. The mean heart rate for volunteers who had their face submerged in cold water was lower than the mean heart rate for volunteers who did not have their face submerged in cold water.

   Which of the following elements of a well-designed experiment is missing?

   I. Comparison of at least two treatment groups
   II. Random assignment of treatments to experimental units
   III. Replication

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

3. The probability that a particular electrical component operates successfully is $\frac{3}{4}$. An electrical system

   consists of three such components that operate independently. The system will function successfully if at least one of the three components operates successfully.

   What is the probability that the system will function successfully?

   A. $\frac{1}{64}$

   B. $\frac{27}{64}$

   C. $\frac{37}{64}$

   D. $\frac{3}{4}$

   E. $\frac{63}{64}$

4. The driving route between a student's home and the student's high school has two traffic lights. The distribution of total time spent driving has mean 5 minutes and standard deviation 1 minute. The distribution of time spent waiting at a light has mean 0.75 minute and standard deviation 0.25 minute. The total time spent driving and the time spent waiting at a light are independent. The total travel time from the student's home to the student's high school consists of the total time spent driving and the time spent waiting at two lights.

   What are the mean and the standard deviation of the total travel time?

   A. The mean is 5.75 minutes and the standard deviation is about 1.03 minutes.

   B. The mean is 5.75 minutes and the standard deviation is about 1.06 minutes.

   C. The mean is 6.5 minutes and the standard deviation is about 1.06 minutes.

   D. The mean is 6.5 minutes and the standard deviation is about 1.12 minutes.

   E. The mean is 6.5 minutes and the standard deviation is about 1.5 minutes.

5. A national newspaper reported that 40 percent of high school students engage in community service activities. A school administrator wondered whether the proportion of high school students at the administrator's school who engage in community service activities is less than 40 percent. The administrator selected a random sample of 100 students, and 36 responded that they do engage in community service activities. The conditions for inference were met, and an appropriate hypothesis test resulted in a p-value of 0.207.

   Which of the following is a correct interpretation of this p-value?

   A. The probability that a randomly selected student at this high school engages in community service activities is 0.207.

   B. The probability is 0.40 that less than 20.7 percent of students at this high school engage in community service activities.

   C. The probability is 0.207 that less than 40 percent of students at this high school engage in community service activities.

D. If the proportion of all students at the school who engage in community service activities is 0.4, the probability of observing 36 or fewer in a random sample of 100 students who engage in community service activities is 0.207.

E. If the proportion of all students at the school who engage in community service activities is 0.36, the probability of obtaining 40 or fewer in a random sample of 100 who engage in community service activities is 0.207.