Justifying a Claim About the Difference of Two Means Based on a Confidence Interval Quiz

1. To test the durability of cell phone screens, phones are dropped from a height of 1 meter until they break. A random sample of 40 phones was selected from each of two manufacturers. The phones in the samples were dropped until the screens broke. The difference in the mean number of drops was recorded and used to construct the 90 percent confidence interval $(0.46, 1.82)$ to estimate the population difference in means.

    Consider the sampling procedure taking place repeatedly. Each time samples are selected, the phones are dropped and the statistics are used to construct a 90 percent confidence interval for the difference in means. Which of the following statements is a correct interpretation of the intervals?

    (A) Approximately 90 percent of the intervals will extend from 0.46 to 1.82.

    (B) Approximately 90 percent of the intervals constructed will capture the difference in sample means.

    (C) Approximately 90 percent of the intervals constructed will capture the difference in population means.

    (D) Approximately 90 percent of the intervals constructed will capture at least one of the sample means.

    (E) Approximately 90 percent of the intervals constructed will capture at least one of the population means.

2. A biologist studied the frequency of croaks for frogs from two different regions. From a random sample of 32 frogs located in the northern region, the mean number of croaks per hour was 21.3, and from a random sample of 38 frogs located in the southern region, the mean number of croaks per hour was 28.9. To estimate the difference in the mean number of croaks (southern minus northern), a 95 percent confidence interval was constructed from the samples. The interval was reported as $(7.1, 8.1)$.

    Which of the following claims is supported by the interval?

    (A) All southern frogs croak more times per hour than do all northern frogs.

    (B) The northern frogs are likely to have a greater mean number of croaks per hour than the southern frogs.

    (C) The southern frogs are likely to have a greater mean number of croaks per hour than the northern frogs.

    (D) All frogs in the study have about the same number of croaks per hour.

    (E) The northern and southern frogs have the same mean number of croaks per hour.

3. A consumer group studied two different manufacturers of cars, J and K, to investigate differences in gas mileage for cars made by the two manufacturers. For a similar type of car, a random sample of 15 cars from J and a random sample of 12 cars from K were selected, and the gas mileages, in miles per gallon (mpg), were recorded. The difference in the sample mean gas mileages was used to construct the 90 percent confidence interval $(3.5, 5.7)$.

    Assuming all conditions for inference were met, which of the following is a correct interpretation of the interval?

    (A) The probability is 0.90 that the difference in sample means for gas mileage for the two car manufacturers is between 3.5 mpg and 5.7 mpg.

    (B) The probability is 0.90 that the population mean difference in gas mileage for the two car manufacturers is between 3.5 mpg and 5.7 mpg.

    (C) About 90 percent of the differences in gas mileage for the two car manufacturers are between 3.5 mpg and 5.7 mpg.

    (D) We are 90 percent confident that the difference in sample means for gas mileage for the two car manufacturers is between 3.5 mpg and 5.7 mpg.

    (E) We are 90 percent confident that the population mean difference of gas mileage for the two car manufacturers is between 3.5 mpg and 5.7 mpg.

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4. A 99 percent confidence interval for a difference in means was given as 25.1 ± 4.3.

Assuming all conditions for inference were met, which of the following is a correct interpretation of the 99 percent confidence level?

(A) In repeated samples of the same size, approximately 99 percent of the intervals constructed from the samples will extend from 20.8 to 29.4.

(B) In repeated samples of the same size, approximately 99 percent of the sample means will fall between 20.8 and 29.4.

(C) In repeated samples of the same size, approximately 99 percent of the samples will fall between 20.8 and 29.4.

(D) In repeated samples of the same size, approximately 99 percent of the intervals constructed from the samples will capture the difference in sample means.

(E) In repeated samples of the same size, approximately 99 percent of the intervals constructed from the samples will capture the difference in population means.

5. Two 99 percent confidence intervals will be constructed to estimate the difference in means of two populations, R and W. One confidence interval, I_9, will be constructed using samples of size 9 from each of R and W, and the other confidence interval, I_{81}, will be constructed using samples of size 81 from each of R and W.

When all other things remain the same, which of the following describes the relationship between the two confidence intervals?

(A) The width of I_{81} will be $\frac{1}{9}$ the width of I_9.

(B) The width of I_{81} will be $\frac{1}{3}$ the width of I_9.

(C) The width of I_{81} will be equal to the width of I_9.

(D) The width of I_{81} will be 3 times the width of I_9.

(E) The width of I_{81} will be 9 times the width of I_9.

6. A random sample of size 32 is selected from population X, and a random sample of size 43 is selected from population Y. A 90 percent confidence interval to estimate the difference in means is given as $(-1.25, 0.87)$.

Consider a change in the sample sizes such that a random sample of size 52 is selected from population X and a random sample of size 63 is selected from population Y. When all other things remain the same, what effect would such a change have on the interval?

(A) The width of the interval will increase.

(B) The width of the interval will decrease.

(C) The interval will contain no negative numbers.

(D) The level of confidence will increase.

(E) The sample means will increase.

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7. A soda manufacturer claims that its Cherry Fizz soda has more carbonation than a competitor's Cherry Eclipse soda. Bottles of both types of soda are opened, covered with a balloon, and then shaken. The diameter of each balloon is then measured. The mean balloon diameters are 2.3 inches for the Cherry Fizz soda and 2.1 inches for the Cherry Eclipse soda. A 90 percent confidence interval to estimate the difference in mean diameters, in inches, is $(-0.8, 1.2)$. Which of the following claims is supported by the interval?

   (A) Because 2.3 inches is larger than 2.1 inches, the manufacturer is correct, and Cherry Fizz has more carbonation.

   (B) Because the interval has more positive values than negative values, Cherry Fizz has more carbonation.

   (C) Because 2.3 and 2.1 are very similar, there is no difference in the mean carbonation levels.

   (D) The interval cannot be interpreted because negative measurements are not possible.

   (E) Because the interval contains 0, it is possible that there is no difference in mean carbonation levels.

8. The weekly sales at two movie theaters were recorded for a random sample of 25 weeks. A 95 percent confidence interval for the difference in mean weekly sales for the two movie theaters was calculated as $(\$1{,}288, \$2{,}586)$.

   With all else remaining constant, which of the following would have resulted in a confidence interval narrower than the calculated interval?

   (A) A sample size less than 25

   (B) A sample size greater than 25

   (C) An increase to 99 percent confidence

   (D) A sample mean greater than $1,937

   (E) A sample mean less than $1,937

9. Random samples of players for two types of video games were selected, and the mean number of hours per week spent playing the games was calculated for each group. The sample means were used to construct the 90 percent confidence interval $(1.5, 3.8)$ for the difference in the mean number of hours per week spent playing the games.

   The maker of one of the video games claims that there is a difference in the population mean number of hours per week spent playing the two games. Is the claim supported by the interval?

   (A) Yes, because 0 is not contained in the interval.

   (B) Yes, because the midpoint of the interval is greater than 1.

   (C) Yes, because the margin of error for the estimate is less than 1.

   (D) No, because the margin of error for the estimate is greater than 1.

   (E) No, because 0 is not contained in the interval.