

In a random sample of six wheat plants from a plot, the moisture content in the seeds of each plant had a mean of 62.77 percent and a standard deviation of 1.01 percent.

- (a) Find a 95% confidence interval for the mean seed moisture content in wheat plants in this plot. Interpret the results of this confidence interval in the context of the problem.

Solution:

A confidence interval for the mean moisture content is 62.77 ± 1.06 , or the interval from 61.71 to 63.83. We are 95% confident that the mean moisture content in wheat seeds in wheat plants from this plot are between 61.71 and 63.83 percent.

- (b) Suppose that in a different plot we knew that the population mean and standard deviation of seed moisture content were 63.34 percent and 1.23 percent respectively. What is the probability that the sample mean seed moisture content in a random sample of forty plants would be less than 62.77?

Solution:

The z -score is -2.93. The area to the left of -2.93 under a standard normal curve is 0.0017. We may confidently use the normal curve because the sample size is large enough that the central limit theorem suggests that the sampling distribution of the z statistic is approximately standard normal.

For each problem, circle TRUE or FALSE. If the answer is FALSE, either explain why it is false or make a small change to make the statement true.

- (c) TRUE or FALSE:

A 95% confidence interval for μ will be wider than a 90% confidence interval for μ when based on the same data.

Solution: True. The critical t multiplier for a 95% confidence interval is larger than for a 90% confidence interval.

- (d) TRUE or FALSE:

A 95% confidence interval for the mean number of children of 40-year-old American women cannot be (1.7, 1.9) because the number of children each woman has is a whole number.

Solution: False. The population mean need not be an integer even if the individual values are.

- (e) TRUE or FALSE:

If a set of 500 seeds were divided into two groups of equal size at random, then every potential factor that affects seed moisture (genetic factors, size, and so on) is guaranteed to be exactly balanced between the two groups.

Solution: False. Randomization guarantees that on average, factors will tend to be balanced and that for large samples the imbalance will tend to be small. However, for any given randomization it is quite unlikely that each factor will be exactly balanced.