Answer on Question #53550 – Math – Statistics and Probability

How large a sample should one select to be 86% confident that the sampling error is 10 or less? Assume that the population standard deviation is 250.

a. 1360

b. 890

c. 820

d. 280

Solution

Margin of Error (half of confidence interval) = 10

The margin of error is defined as the "radius" (or half the width) of a confidence interval for a particular statistic.

Level of Confidence = .86

σ: population standard deviation = 250

('z critical value') from Look-up Table for 86% = 1.475

The Look-up in the Table for the Standard Normal Distribution utilizes the Table's cumulative 'area' feature. The Table shows positive and negative values of ('z critical') but since the Standard Normal Distribution is symmetric, only the magnitude of ('z critical') is important.

For a Level of Confidence = 86% the corresponding LEFT 'area' = 0.43. And due to Table's symmetric nature, the corresponding RIGHT 'area' = 0.43 The ('z critical') value Look-up is 1.475.

$$\text{Margin of Error} = \frac{(\text{'z critical value'}) \cdot \sigma}{\sqrt{n}},$$

where n is sample size.

Algebraic solution for n:

$$n = \left[\frac{(\text{'z critical value'}) \cdot \sigma}{\text{Margin of Error}}\right]^2 = \left[\frac{1.48 * 250}{10}\right]^2 = 1360$$

Answer: a.