Answer on Question #62838 – Math – Statistics and Probability

Question

Which sample size will produce a margin of error of ±4.1%?

856

595

782

362

Solution

For a 95% confidence level, standard deviation σ and sample size n, the margin of error is given by

$$\pm 1.96 \frac{\sigma}{\sqrt{n}} = \pm E = \pm 0.041.$$

Hence

$$n = \left(\frac{1.96\sigma}{E}\right)^2 = \frac{1.96^2\sigma^2}{E^2} = 2285.306\sigma^2.$$

For a 95% confidence level $E \approx \frac{0.98}{\sqrt{n}}$, hence

$$n \approx \left(\frac{0.98}{E}\right)^2 = \left(\frac{0.98}{0.041}\right)^2 \approx 571$$

For a 99% confidence level $E \approx \frac{1.29}{\sqrt{n}}$, hence

$$n \approx \left(\frac{1.29}{E}\right)^2 = \left(\frac{1.29}{0.041}\right)^2 \approx 990$$

For a 90% confidence level $E \approx \frac{0.82}{\sqrt{n}}$, hence

$$n \approx \left(\frac{0.82}{E}\right)^2 = \left(\frac{0.82}{0.041}\right)^2 \approx 400$$