

Sample size practice

1. Edgar Martinez and Ingrid Gustafson are the candidates for mayor in a large city. We want to estimate the proportion p of all registered voters in the city who plan to vote for Gustafson with 95% confidence and a margin of error no greater than 0.03. How large a random sample do we need?

$$.03 = 1.96 \sqrt{\frac{.5 \times .5}{n}} \quad \hat{p} = 0.5$$

$$\left(\frac{.03}{1.96}\right)^2 = \frac{.5 \times .5}{n}$$

$$n \times (.0153)^2 = \frac{.25}{\cancel{\cancel{n}}} \times \cancel{\cancel{n}} \quad \rightarrow \quad n = \frac{.25}{.0153^2}$$

$$= 1067.96$$

$$= \boxed{1068}$$

2. High school students who take the SAT Math exam a second time generally score higher than on their first try. Past data suggest that the score increase has a standard deviation of about 50 points. How large a sample of high school students would be needed to estimate the mean change in SAT score to within 2 points with 95% confidence?

M.O.E. = $t^* \frac{S_x}{\sqrt{n}}$
 \uparrow
 Use z^* instead

$$\sqrt{n} \times 1.02 = \frac{50}{\sqrt{n}} \times \cancel{\cancel{n}}$$

$$2 = 1.96 \times \frac{50}{\sqrt{n}}$$

$$\sqrt{n}^2 = \frac{50^2}{1.02}$$

$$\boxed{n = 2401}$$

3. A college student organization wants to start a nightclub for students under the age of 21. To assess support for the idea, the organization will select an SRS of students and ask each if he or she would patronize this type of establishment. What sample size is required to obtain a 90% confidence interval with a margin of error of at most 0.04 if they suspect $\hat{p} = .75$?

$$\frac{.04}{1.645} = \frac{1.645}{1.645} \sqrt{\frac{.75 \times .25}{n}} \quad n \times .0243^2 = \frac{.1875}{\cancel{\cancel{n}}} \times \cancel{\cancel{n}}$$

$$.0243^2 = \frac{.75 \times .25}{n}$$

$$n = \frac{.1875}{.0243^2}$$

$$= 317.5$$

$$= \boxed{318}$$