What Sample Size is Needed? Worksheet

Proportion:
we want margin of error = 0.03
98% confidence level
How many people needed?

$$ME = z^* \sqrt{\frac{\hat{p}\hat{q}}{n}}$$

$$0.03 = 2.326 \sqrt{\frac{.5(.5)}{n}}$$

$$n = \left(\frac{2.326(.5)}{.03}\right)^2 = 1502.8$$

1503 people needed

Mean:
we want margin of error = 2 inches
96% confidence level; σ = 8 inches
How many widgets are needed?

$$ME = \mathbf{z^*} \frac{\sigma}{\sqrt{n}}$$

$$2 = 2.054 \frac{8}{\sqrt{n}}$$

$$n = \left(\frac{2.054(8)}{2}\right)^2 = 67.5$$

68 widgets are needed.

SHOW ALL OF YOUR WORK ON YOUR OWN PAPER.

State the type of data (categorical/proportions or numerical/means) and then find the sample size needed for each.

1. You want to estimate the mean SAT score for a population of students with a 90% confidence interval. Assume that the population standard deviation is σ = 100. If you want the margin of error to be approximately 10, what is the desired minimal sample size?

2. A researcher wishes to use a 92% confidence interval to estimate the proportion of Americans who have visited an entertainment theme park near Orlando within the last five years. The researcher wishes to choose a size that will ensure a margin of error not to exceed 0.05. What is the smallest size that meets these criteria?

3. A health fitness research group wishes to estimate the mean amount of time (in hours) that members of a fitness center spend each week exercising at the center. They want to estimate the mean within a margin of error of 0.5 hours with a 95% level of confidence. Previous data suggests that σ = 2.2 hours. What is the smallest sample size that meets these criteria?

4. What sample size should we select if we wish to develop a 90% confidence interval for the average diameter of the washers produced by our company, yet we wish to have a margin of error of no more than 0.035 mm? Assume our manufacturing process results in a standard deviation of 0.2.

5. An association wishes to design and conduct a poll to determine the proportion of Americans who oppose a law limiting the sale of handguns. If they wish to be 94% confident that their sample results differ from the true population proportion by no more than 0.07, what is the smallest size they should use?

6. The financial aid office wishes to estimate the mean cost of textbooks per semester for students at Podunk University. For the estimate to be useful, it should be within $20 of the true population mean. How large a sample should be used to be 95% confident of achieving this level of accuracy? A reasonable estimate of σ is $100.

7. A research group wishes to estimate the proportion of homes in Australia that had internet access in 2012. With no prior data about the proportion of such homes with internet access, what is the minimum sample size that should be used to construct a 95% confidence interval if the group wishes the margin of error to be no larger than 0.025?

8. Now suppose that the research group in the last problem knows that the proportion of Australian homes with internet access was 74% in 2008. If it is reasonable to believe that this proportion is at least this high in 2012 (in other words, that the proportion of Australian homes with internet access has either increased or stayed the same from 2008), what is the minimum sample size that should be used to construct a 95% confidence interval with a margin of error of no more than 0.025? *(hint: since you have more information now than you did in problem #7, you should NOT use p-hat = 0.5).*