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1. A consumer watchdog organization estimates the mean weight of 1-ounce “Fun-Size” candy bars to see if customers are getting full value for their money. A random sample of 25 bars is selected and weighed, and the organization reports that a 90% confidence interval for the true mean weight of the candy bars is 0.992 to 0.998 ounces.
- (a) What is the point estimate from this sample?
- (b) What is the margin of error?
- (c) Interpret the 90% confidence *interval* 0.992 to 0.998 in the context of the problem.
- (d) Interpret the confidence *level* of 90% in the context of the problem.

2. A manufacturer of flashlights wants to know how well one of their newer styles is selling in a chain of large home-improvement stores. They select a simple random sample of 20 stores, record how many of the flashlights were sold in a 30-day period, and construct a 95% confidence interval for the mean number of flashlights sold.
- (a) If, instead of constructing a 95% confidence interval, the flashlight manufacturer constructed a 98% confidence interval, would the 98% interval be wider, narrower, or the same width as the 95% interval? Explain.
- (b) How would the width of confidence interval change if the flashlight manufacturer took a larger sample? Explain.
- (c) The 20 stores in the sample were actually the only stores who provided sales figures from 36 stores that were randomly chosen to be in the sample. Can the manufacturer adjust the confidence interval to take this nonresponse into account? If so, how? If not, why not?

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3. A simple random sample of 1100 males aged 12 to 17 in the United States were asked whether they played massive multiplayer online role-playing games (MMORPGs); 775 said that they did. We want to use this information to construct a 95% confidence interval to estimate the proportion of all U.S. males aged 12 to 17 who play MMORPGs.
- (a) State the parameter our confidence interval will estimate.
- (b) Identify the conditions that must be met to use this procedure, and explain how you know that each one has been satisfied.
- (c) Find the appropriate critical value and the standard error of the sample proportion.
- (d) Give the 95% confidence interval.
- (e) Interpret the confidence interval constructed in part (d) in the context of the problem.

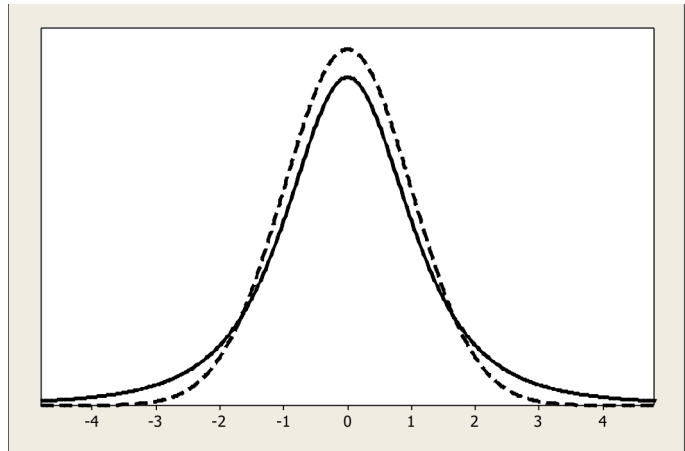
- (f) Suppose you wanted to estimate the proportion of 12-to-17 year-old males who play MMORPG's with 95% confidence to within  $\pm 2\%$ . Calculate how large a sample you would need.
- (g) If you wanted to have a margin of error of  $\pm 2\%$  with 99% confidence, would your sample have to be larger, smaller, or the same size as the sample in part (f)? Explain.
- (h) This poll was conducted through email. Explain how undercoverage could lead to a biased estimate in this case, and speculate about the direction of the bias.

4. Below are the graphs of a standard Normal distribution and a  $t$ -distribution with 3 degrees of freedom.

- (a) Indicated which graph is which and explain how you know.

Dotted graph =

Solid graph =



- (b) On the same figure sketch a graph of a  $t$ -distribution with 1 degree of freedom.

5. Find the critical  $t^*$  value for each of the following confidence intervals:

(a) 95% confidence interval with 8 degrees of freedom.

(b) 80% confidence interval when  $n = 20$

6. You want to estimate the mean fuel efficiency of Ford Focus automobiles with 99% confidence and a margin of error of no more than 1 mile per gallon. Preliminary data suggests that  $\sigma = 2.4$  miles per gallon is a reasonable estimate of the standard deviation for all cars of this make and model. How large a sample do you need?

7. Pauly's Pizza claims that the mean time it takes for them to deliver a pizza to dorms at Nat's college is 30 minutes. After a long wait one night, Nat decides to test this claim. He randomly selects 15 dormitory residents and asks them to record the time it takes for Pauly's to deliver the next time they order pizza. Here are the results (in minutes).

31	38	39	25	26
45	42	32	23	38
42	21	40	37	28

- (a) The sample mean is  $\bar{x} = 33.8$  and the sample standard deviation is  $s = 7.72$ . Calculate and interpret the standard error of the mean for these data.

- (b) Construct and interpret a 90% confidence interval to estimate the mean delivery time. Does the data support Pauly's claim? Use the four-step process.