

### Quiz 8.2A

1. (a) The parameter is the true proportion of U.S. males aged 12 to 17 in the U.S. who play MMORPG's. (b) Random: The problem states that an SRS was taken. The sample of 1100 U.S. Males is clearly less than 10% of the population. Large counts:  $n\hat{p} = 775 \geq 10$ ;  $n(1 - \hat{p}) = 325 \geq 10$ . (c) The critical value for 95%

confidence, based on Table A, is  $z^* = 1.96$ , and since  $\hat{p} = \frac{775}{1100} \approx 0.705$ , the standard error is

$$\sqrt{\frac{(0.705)(0.295)}{1100}} \approx 0.0138. \text{ (d) } 0.705 \pm 1.96(0.0253) \rightarrow 0.705 \pm 0.050 \rightarrow (0.655, 0.755). \text{ (e) We are}$$

95% confident that the interval from 0.655 to 0.755 contains the true proportion of males aged 12 to 17 in the U.S. who play MMORPG's. (f) Assuming  $p$  is close to our sample  $\hat{p} = 0.705$ , we want a sample size  $n$  such

that  $(1.96)\sqrt{\frac{(0.705)(0.295)}{n}} \leq 0.02$ . Solving as an equality produces  $n \geq 1997.39$ , so  $n$  must be 1998 to

ensure a margin of error below 0.02. (g) Since a 99% confidence interval will have a critical  $z^*$  of 2.57 instead of 1.96,  $n$  will have to be larger to make the margin of error 0.02. (h) A poll conducted by email will undercover individuals in the population who spend less time online or do not go online at all. This probably would cause our sample to overestimate the proportion of males aged 12 to 17 in the U.S. who play MMORPG's.

### Quiz 8.2B

1. (a) The parameter is the true proportion of adults who feel that unemployment compensation should be extended an additional six months. (b) Random: The problem states that the subjects were "randomly selected." The sample of 1548 is obviously less than 10% of the population. Large counts:

$n\hat{p} = 433 \geq 10$ ;  $n(1 - \hat{p}) = 1115 \geq 10$ . (c) The critical value for 95% confidence, based on Table A, is

$$z^* = 1.96, \text{ and since } \hat{p} = \frac{433}{1548} \approx 0.280, \text{ the standard error is } \sqrt{\frac{(0.28)(0.72)}{1548}} \approx 0.0114.$$

(d)  $0.280 \pm 1.96(0.0114) \rightarrow 0.280 \pm 0.022 \rightarrow (0.258, 0.302)$ . (e) We are 95% confident that the interval from 0.258 to 0.302 contains the true proportion of adults who feel that unemployment compensation should be extended an additional six months. (f) Assuming  $p$  is close to our sample  $\hat{p} = 0.28$ , we want a sample size  $n$

such that  $(1.96)\sqrt{\frac{(0.28)(0.72)}{n}} \leq 0.015$ . Solving as an equality produces  $n = 3442.07$ , so  $n$  must be 3443 to

ensure a margin of error below 0.015. (g) Since a 99% confidence interval will have a critical  $z^*$  of 2.57 instead of 1.96,  $n$  will have to be larger to make the margin of error 0.015. (h) A poll conducted by cell phone will miss individuals in the population who do not own cell phones. It's possible that a higher proportion of unemployed people do not have cell phones, so this would cause our sample to underestimate the proportion of adults who feel that unemployment compensation should be extended an additional six months.

### Quiz 8.2C

1. (a) State: We wish to estimate, with 90% confidence, the true proportion of women in the continental 48 states who feel that they don't get enough time for themselves. Plan: We will use a one-sample  $z$ -interval for a population proportion. Conditions: *Random*: The problem states that women were randomly selected, and the sample of 1025 is clearly less than 10% of women in the lower 48 states. *Large counts*:

$n\hat{p} = (1025)(0.47) = 481.75 \geq 10$ ;  $n(1 - \hat{p}) = 543.25 \geq 10$ . Do: 90% confidence interval is

$$0.47 \pm 1.645 \left( \sqrt{\frac{(0.47)(.53)}{1025}} \right) \rightarrow 0.47 \pm 0.026 \rightarrow (0.444, 0.496). \text{ Conclude (i.e., interpret the interval):}$$

We are 90% confident that the interval 0.444 to 0.496 contains the true proportion of women in the U.S. (excluding Alaska and Hawaii) who feel that they don't have enough time for themselves. (b) If a large number of confidence intervals were constructed in this way, about 90% of them would contain the true proportion of women in the U.S. who feel that they don't have enough time for themselves. (c) Women who work outside the home are unlikely to be home between 9 am and 5 pm, so they would be under-represented in the sample. If we assume that these women are busier than those who do not work outside the home—or at least are less likely to be alone at home for some part of the day—our sample will underestimate the proportion of women who feel they don't have enough time for themselves. 2. (a) Using the conservative value  $\hat{p} = 0.5$ , we

want a sample size  $n$  such that  $(1.96) \sqrt{\frac{(0.5)(0.5)}{n}} \leq 0.05$ . Solving as an equality produces  $n = 384.16$ , so  $n$  must be 385 to ensure a margin of error below 0.05. (b) To satisfy the 10% condition when sampling a finite population, the number of students must be at least  $10 \times 385 = 3,850$ . A big school!