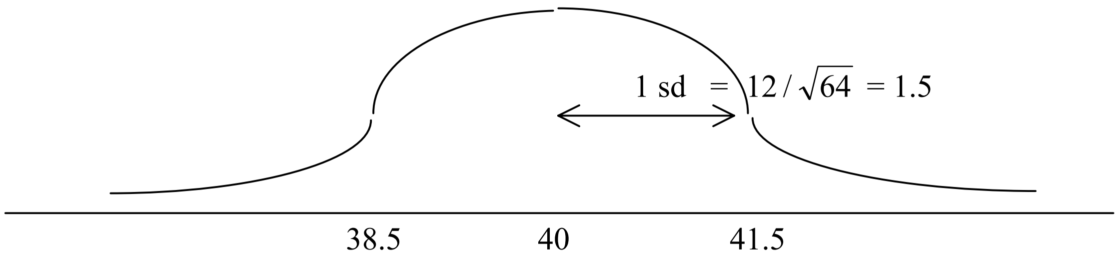
Answers to Practice Test #3

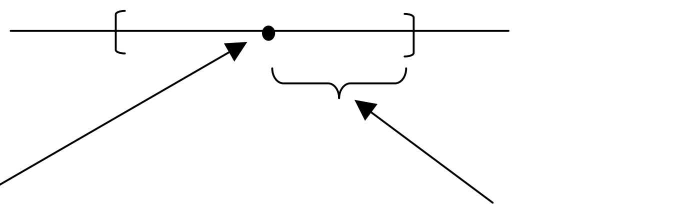
1. (a) If samples are repeatedly taken from the population and $\bar{x}$ is calculated for each one, these values form a distribution. This is the sampling distribution of $\bar{x}$.

(b)



(c) The samples need to be SRS's.

2.



(a) sample proportion, point estimate or statistic (b) margin of error

3. (a) We are 95% confident that the mean number of hours per week that Elbonia College students spend going to parties is in between 5.72 and 7.42 hrs.

(b) H_0: $\mu = 7.5$ H_a: $\mu \neq 7.5$

(c) $t = \dfrac{\bar{x} - \mu_0}{s/\sqrt{n}} = \dfrac{6.75 - 7.5}{2.66/\sqrt{40}} = -2.21$

(d) d.f. = $n - 1 = 39$; $t = -2.21$ falls between the tabled critical values for .025 and .01. Since the alternative hypothesis is two-sided we have to double the p-value. Thus $.02 < p\text{-value} < .05$.

4. (a) $\hat{p} = 556/5000 = .111$

For 99% confidence, $Z^* = 2.576$ (since the area between -2.576 and 2.576 is 99%).

So our confidence interval is $.111 \pm 2.576\sqrt{\dfrac{.111 \times (1 - .111)}{5000}} = .111 \pm .011$, or (.100, .122).

(b) H_0: $\theta = .10$ H_a: $\theta > .10$

$$Z = \frac{.111-.10}{\sqrt{\frac{.10\times(1-.10)}{5000}}} = 2.64$$ (your answer may differ slightly due to rounding)

p-value = P(Z≥ 2.64) = 1− .9959 = .0041. We have strong evidence that more than 10% of all Americans are left handed.

5. (a) The larger the sample size, the narrower the confidence interval.
   (b) The higher the confidence level, the wider the confidence interval.

Of course each of these could be said in other equivalent ways.

6. (a) $\hat{p}$ = 1921/2372 = .81 = 81%.

$$z^*\sqrt{\frac{\hat{p}(1-\hat{p})}{n}} = 1.96\sqrt{\frac{.81(1-.81)}{2372}} = .016 = 1.6\%.$$

(b) No, since the data came from a voluntary response sample rather than a SRS.

7. (a) 1/4 = .25

(b) H_0: $\theta = .25$

(c) H_a: $\theta \neq .25$

(d) $\hat{p}$ = 17/40 = .425. $$Z = \frac{\hat{p}-\theta_0}{\sqrt{\frac{\theta_0(1-\theta_0)}{n}}} = \frac{.425-.25}{\sqrt{\frac{.25(1-.25)}{40}}} = 2.56.$$

(e) p-value = P(Z ≥ 2.56) = 1 − .9948 = .0052. We have strong evidence against H_0; thus we can conclude that the psychologist's belief is probably correct.