Matthew Sirota HW 3

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6.17 a) $n = 340$ $z = 1.96$

$\bar{x} = 5.4$

$\sigma = 2.3$

$(1.96)\dfrac{2.3}{\sqrt{340}} = 0.2445 =$ margin of error

$5.4 \pm 0.2445 = 5.1555 \le \mu \le 5.6445$

I am 95% confident that the true mean lies from 5.1555 to 5.6445

b) 99%, $z = 2.576$

$(2.576)\dfrac{(2.3)}{\sqrt{340}} = 0.32132 =$ margin of error

$5.4 \pm 0.32132 = 5.07868 \le \mu \le 5.72132$

I am 99% confident that the true mean lies from 5.07868 to 5.72132

6.27 a) $\bar{x} \pm 1.96 \left(\dfrac{\sigma}{\sqrt{n}}\right)$ $\bar{x} = 11.5$ $\sigma = 8.3$

$11.5 \pm 1.96 \left(\dfrac{8.3}{\sqrt{1200}}\right)$ $11.03 \le \mu \le 11.97$ hours

I am 95% confident the true mean is between 11.03 and 11.97 hours

b) No, it means that there is a 95% confidence that the population mean is between these values. It does not mean that 95% of responses will be in that range.

c) The sample is large and therefore follows a normal distribution. A confidence interval based on a normal distr. will be a good approximation.

6.28 a) $\bar{X}_h = 11.5 * 60 = 690 \text{ minutes} = \bar{X}_{min}$

$\sigma_h = 8.3 * 60 = 498 \text{ minutes} = \sigma_{min}$

b) $1.96\left(\frac{498}{\sqrt{1200}}\right) = 28.177$ $\quad 690 \pm 28.177$

$$661.823 \leq \mu \leq 718.177$$

I am 95% confident that the true mean is between 661.823 and 718.177 minutes

c) I could have muliplied the interval by 60, which would provide the same answer as part b.

6.58 a) 0.0384
b) 0.9616
c) 0.0768

6.59 a) 0.9545
b) 0.0455
c) 0.091

6.71 a) $z = \frac{\bar{x} - \mu_0}{\sigma/\sqrt{n}} = \frac{127.8 - 11.5}{30/\sqrt{25}} = 2.13$

$P(z \geq 2.13) = 1 - 0.9836 = 0.0164 = P$

$\alpha = 0.05$

$0.0164 < 0.05$, the null hypothesis is rejected.

There is sufficient sample evidence to conclude that the mean is not 115

b) It was assumed that it is a simple random sample and the distribution is normal.

The assumption that it is normal is the most important

6.73 a) null: $H_0: \mu = 0$ μ is the mean difference

alt: $H_a: \mu \neq 0$

$\bar{x} = 2.73$

$z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} = \frac{2.73 - 0}{3/\sqrt{20}} = 4.07$

$2 * (z \geq 4.07) \approx 2 * (0)$

reject null hypothesis

There is sufficient sample evidence to conclude there is a big difference between the two.

6.99 A. $\mu = 2403.7$ $n = 100$ $\sigma = 880$ $\bar{x} = 2453.7$

$$z = \frac{2453.7 - 2403.7}{880 / \sqrt{100}} = 0.57$$

$$P(z \geq 0.57) = 1 - 0.7157 = 0.2843$$

B. $\mu = 2403.7$ $n = 500$ $\sigma = 880$ $\bar{x} = 2453.7$

$$z = \frac{2453.7 - 2403.7}{880 / \sqrt{500}} = 1.27$$

$$P(z \geq 1.27) = 1 - 0.8980 = 0.102$$

C. $\mu = 2403.7$ $n = 2500$ $\sigma = 880$ $\bar{x} = 2453.7$

$$z = \frac{2453.7 - 2403.7}{880 / \sqrt{2500}} = 2.84$$

$$P(z \geq 2.84) = 1 - 0.9977 = 0.0023$$

6.120 a) $P(\text{Type I error}) = P(X=0 \text{ or } X=1)$
$= 0.1 + 0.1 = 0.2$

b) $P(\text{Type II error}) = P(X = 2, 3, 4, 5, \text{ or } 6)$
$= 1 - P(x=0 \text{ or } 1)$
$= 1 - (0.1 + 0.3)$
$= 0.6$

7.22 $H_0: \mu = 8$ $n = 16$ $t = 2.15$
$H_a: \mu > 8$

a) df = 15
b) 2.131 and 2.249
c) 0.025 and 0.02
d) reject H_0 at $\alpha = 0.05$ significant
fail to reject H_0 at $\alpha = 0.01$ not significant
e) $p = 0.024137$

7.23 $H_0: \mu = 40$ $n = 27$ $t = 2.01$
$H_A: \mu \neq 40$

a) df = 26
b) 1.703 and 2.056
c) 0.10 and 0.05
d) fail to reject H_0 at $\alpha = 0.05$ and at $\alpha = 0.01$. Not significant
e) $p = 0.0549$