Mathematics 363 - Exam II

April 27, 2009

1. (a) 7/2 and 35/1200

   (b)
$$z = \frac{3.75 - 3.5}{\sqrt{35/1200}} = 1.46385, P\{Z > 1.4635\} = 0.0716$$

   (c) Decrease. The distribution of $\bar{X}$ will be more concentrated about the mean and so devations from of the mean of 0.25 or more is less likely.

2. (a) X_2 It is the more reliable measurement.

   (b)
$$L(\mu|x_1, x_2) = \frac{1}{\sqrt{\pi}} \exp -(x_1 - \mu)^2 \cdot \frac{\sqrt{10}}{\sqrt{\pi}} \exp -10(x_2 - \mu)^2 = \frac{\sqrt{10}}{\pi} \exp -((x_1 - \mu)^2 + 10(x_2 - \mu)^2)$$

   (c) $\ln L(\mu|x_1, x_2) = \ln \frac{\sqrt{10}}{\pi} - ((x_1 - \mu)^2 + 10(x_2 - \mu)^2)$
$$\hat{\mu} = \frac{x_1 + 10x_2}{11}.$$

   (d) 3.21

   (e) Yes

3. (a) $111/278 = 0.3992806$

   (b)
$$\hat{p} \pm z_{0.01}\sqrt{\frac{\tilde{p}(1 - \tilde{p})}{n}} = 0.3993 \pm 0.0683$$
   with $\tilde{p} = 0.4007092$ and $z_{0.01} = 2.326$

   (c) Larger - we have fewer observations.

4. (a) $H_0 : \mu \geq 18$ versus $H_1 : \mu < 18$ where μ is the mean iron intake for adult females under the age of 51.

   (b)
$$t = \frac{16.8 - 18}{3.08/\sqrt{41}} = -2.4947$$

(c) Make a drawing of the t density curve and shade in the area corresponding to the p-value.

(d) Yes and yes. The p-value is about 0.8%.

5. (a) $H_0 : \mu_h \leq \mu_w$ versus $H_1 : \mu_h > \mu_w$ where μ_w is the mean age of a women on the date of marriage and μ_h is the mean age of a men on the date of marriage.

(b) We look to a match pair procedure. The mean age difference $\bar{x} = 2$ and the standard deviation $s = 3.406$.

(c) $t = 2/(3.406/\sqrt{6}) = 1.4383$. Using the t distribution with 5 degrees of freedom, we find that the p-value is between 0.10 and 0.15.

(d) It would double.