Homework #8 Solutions

6.6, 6.8, 6.44, 6.48, 8.19, 8.20

Problem 6.6

First work out $\bar{x}$.

$\bar{x} = 61.7917$ $\quad\quad$ $n = 24$

(a) $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{4.5}{\sqrt{24}} = 0.9186$ (4dp)

(b) A 95% CI for μ is given by

$61.7917 \pm 1.96(0.9188)$

61.7917 ± 1.8003

so 95% CI is

$(59.99 \ , 63.59)$

Since this interval is completely below 65kg we can be quite sure that mean weight is less than 65kg.

Problem 6.8

a) what happens to $\bar{x}$ if we convert to pounds?

$\bar{x} = 2.2(61.7917) = 135.9417$

b) and $\sigma_{\bar{x}} = 2.2(0.9186) = 2.0208$

c) So a 95% CI for μ in pounds

$135.9417 \pm 1.96(2.0208)$

135.9417 ± 3.96

so a 95% CI for mean weight in pounds

$(131.98, 139.90)$

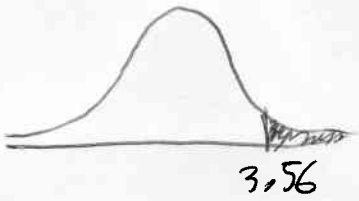
Problem 6.44

$\bar{x} = 11.2 \quad \sigma = 2.7 \quad n = 5$

$H_0: \mu \leq 6.9$

$H_A: \mu > 6.9$

Test statistic $z = \dfrac{11.2 - 6.9}{2.7/\sqrt{5}} = 3.56.$



$P\text{value} = P(Z > 3.56) < P(Z > 3.49) = 1 - P(Z < 3.49)$

$= 1 - .9998$

$= .0002$

Since the P-value is small we can reject the null hypothesis in favor of the alternative hypothesis. In otherwords, it is likely the word is by another poet.

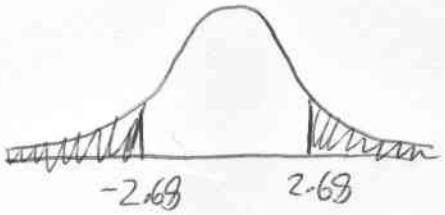
Problem 6.48

$\bar{x} = 9.58 \quad \sigma = 0.4 \quad n = 180$

a) $H_0: \mu = 9.5$

$H_A: \mu \neq 9.5$

b) Test statistic $z = \dfrac{9.58 - 9.5}{0.4/\sqrt{180}} = 2.68$



P value

$2P(Z > 2.68)$

$= 2(1 - P(Z < 2.68))$

$= 2(1 - .9963)$

$= .0074$

Since the p-value is small lots of evidence that the null hypothesis is false. Therefore it is likely that the mean calcium level differs from 9.5.

c) A 95% CI for μ is given by

$$9.58 \pm 1.96\left(\frac{0.4}{\sqrt{180}}\right)$$

$$9.58 \pm 0.0584$$

so 95% CI for mean calcium level is

$$(9.52, 9.64)$$

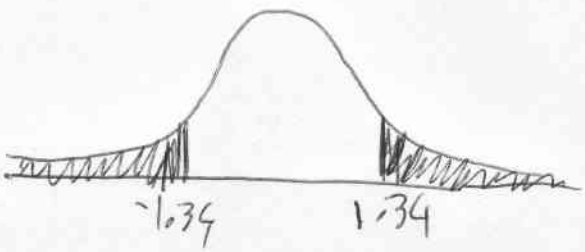
Problem 8.19

a) $$\hat{p} = \frac{5067}{10000} = .5067$$

H_0: $p = .5$ (i.e. coin is fair)

H_A: $p \neq .5$ (unfair coin)

$$Z = \frac{.5067 - .5}{\sqrt{\frac{.5(1-.5)}{10000}}} = 1.34$$



$$\text{Pvalue} = 2P(Z > 1.34) = 2(1 - P(Z < 1.34))$$
$$= 2(1 - .9099)$$
$$= .1802$$

Since .1802 > .05 cannot reject the null hypothesis.
ie there is no evidence that the coin is unfair.

b) A 95% CI for p is

$$\hat{p} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

$$.5067 \pm 1.96 \sqrt{\frac{.5067(1-.5067)}{10000}}$$

$$.5067 \pm .0098$$

so 95% CI for p is

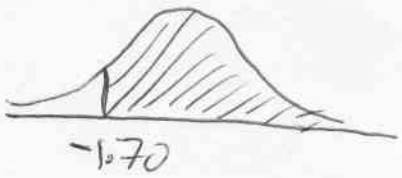
$$(.4969, .5165)$$

Problem 8.20

a) H_0: $p \leq .5$ (less than a majority) $\quad \hat{p} = \frac{19}{50} = .38$

H_A: $p > .5$ (a majority)

$$z = \frac{.38 - .5}{\sqrt{\frac{.5(1-.5)}{50}}} = -1.70$$



$P\text{value} = P(Z > -1.70)$

$= 1 - P(Z < -1.70)$

$= 1 - .0446$

$= .9554$ Since $.9554 > .05$ cannot reject H_0.

so we have no evidence to show that a majority prefer fresh brewed coffee.

(b) A 90% CI for p is

$$.38 \pm 1.645\sqrt{\frac{.38(1-.38)}{50}}$$

$.38 \pm 0.1129$

so 90% CI for p is

$(.267, .492)$