

Homework #8 Solutions

(1)

6.6, 6.8, 6.44, 6.48, 8.19, 8.20

Problem 6.6

First work out \bar{x} .

$$\bar{x} = 61.7917$$

$$n = 24$$

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

(b) A 95% CI for μ is given by

$$61.7917 \pm 1.96(0.9188)$$

$$61.7917 \pm 1.8003$$

so 95% CI is

$$(59.99, 63.59)$$

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

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

$$135.9417 \pm 1.96 (2.0208)$$

$$135.9417 \pm 3.96$$

so a 95% CI for mean weight in pounds

$$(131.98, 139.90)$$

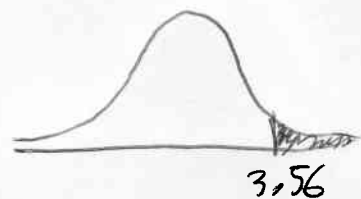
Problem 6.44

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

$$H_0: \mu \leq 6.9$$

$$H_A: \mu > 6.9$$

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



$$\begin{aligned} \text{P value} &= P(Z > 3.56) < P(Z > 3.44) = 1 - P(Z < 3.44) \\ &= 1 - .9998 \\ &= .0002 \end{aligned}$$

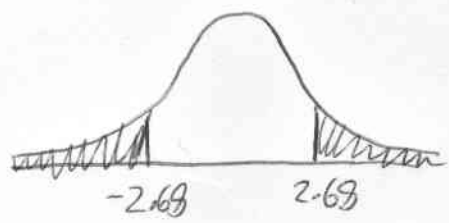
Since the P-value is small we can reject the null hypothesis in favor of the alternative hypothesis. In other words, it is likely the word is by another poet.

Problem 6.48

- a) $H_0: \mu = 9.5$
- $H_A: \mu \neq 9.5$

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

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



P value

$$\begin{aligned}
 & 2P(Z > 2.68) \\
 & = 2(1 - P(Z < 2.68)) \\
 & = 2(1 - .9963) \\
 & = .0074
 \end{aligned}$$

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 calculated is

$$(9.52, 9.64)$$

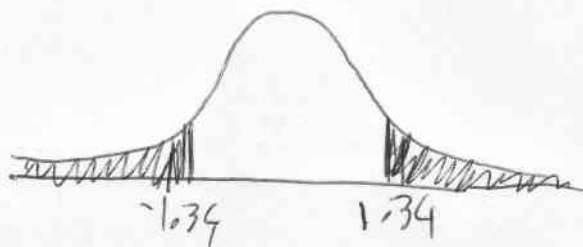
Problem 8.19

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

$$H_0: p = .5 \quad (\text{ie coin is fair})$$

$$H_A: p \neq .5 \quad (\text{unfair coin})$$

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



$$P\text{value} = 2P(Z > 1.34) = 2(1 - P(Z < 1.34))$$

$$= 2(1 - .9099)$$

$$= .1802$$

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

$$(.4969, .5165)$$

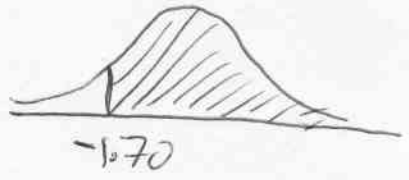
Problem 8.20

a) $H_0: p \leq .5$ (less than a majority)

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

$$\hat{p} = \frac{19}{50} = .38$$

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



$$\begin{aligned}
 \text{P value} &= P(Z > -1.70) \\
 &= 1 - P(Z < -1.70) \\
 &= 1 - .0446 \\
 &= .9554
 \end{aligned}$$

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

$$(.267, .492)$$