AMS102: HOMEWORK 12

SOLUTIONS

Chapter 9

9.20. (a) $\hat{p} = 0.36$. The standard error $SE(\hat{p}) = \sqrt{\dfrac{0.36(1-0.36)}{400}} = 0.024$. The confidence interval $\hat{p} \pm z^* SE(\hat{p}) = 0.36 \pm 1.96 \cdot 0.024$ is $(0.313, 0.407)$.

(b) With 95% confidence we conclude that between 31.3% and 40.7% voters voted "yes" on the proposal.

(c) It won't: the confidence interval depends only on the size of the sample.

(d) The standard error will become smaller; hence the confidence interval will be shorter.

9.25. Proportion of failures is $\hat{p} = 5/80 = 0.0625$. The standard error is $SE(\hat{p}) = \sqrt{\dfrac{0.0625(1-0.0625)}{80}} \approx 0.027$. The confidence interval is $\hat{p} \pm z^* SE(\hat{p}) = 0.0625 \pm 1.645 \cdot 0.027$ which is $(0.018, 0.107)$.

Chapter 10

10.3. (a) H_0: $\mu = 5000$; H_1: $\mu < 5000$

(b) $z = \dfrac{4995 - 5000}{16/\sqrt{64}} = -2.5$

(c) p-value$= P(z < -2.5) = 0.0062$

(d) $0.0062 < 0.01$, so the results are statistically significant (we reject H_0 and conclude that the milk is safe to drink)

10.6. (a) H_0: $\mu = 32$; H_1: $\mu > 32$

(b) $z = \dfrac{38 - 32}{5.8/\sqrt{64}} \approx 8.3$. The p-value is $P(z > 8.3) \approx 0 < 0.025$. The data is statistically significant. We reject H_0.

(c) Mice on the special diet live longer than 32 months.

10.13. (a) H_0: $\mu = 12$; H_1: $\mu > 12$

(b) For the sample, $\bar{x} = \dfrac{21 + 38 + 12 + 15 + 14 + 8}{6} = 18$ and $s = \sqrt{\frac{(21-18)^2+(38-18)^2+(12-18)^2+(15-18)^2+(14-18)^2+(8-18)^2}{6-1}} \approx 10.7$. The test statistic is $t = \dfrac{18 - 12}{10.7/\sqrt{6}} \approx 1.376$

(c) The sample should be random and the concentration should be normally distributed

(d) The p-value is $P(t > 1.376)$

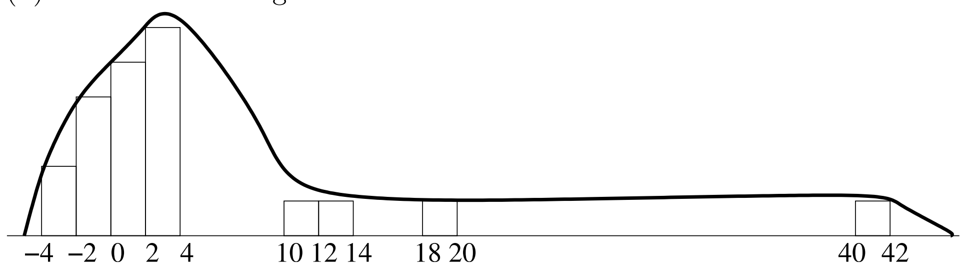
(e) The borderline value of t for $\alpha = 0.05$ and $df = 5$ is 2.015. Since $1.376 < 2.015$, the data is not statistically significant. We do not reject the null hypothesis.

10.16. (a) H_0: $\mu = 0$; H_1: $\mu < 0$.

(b) For the sample, $\bar{x} \approx 4.52$ and $s \approx 10.03$. The test statistic is $t = \dfrac{4.52 - 0}{10.03/\sqrt{22}} \approx 2.11$.

(c) The p-value is $P(t < 2.11)$ which is greater than 50%. The result is thus not statistically significant at the 1% level.

(d) This is the histrogram with the distribution:



The distribution isn't quite bell-shaped and is skewed to the right. Another assumption that we need to make is for the sample to be random.