Mat 2377

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Review Exercises

4.17 (a) $\mu = \sum xf(x) = (4)(0.2)+(5)(0.4)+(6)(0.3)+(7)(0.1) = 5.3$, and $\sigma^2 = \sum(x-\mu)^2 f(x) = (4.5.3)2(0.2) + (5.5.3)2(0.4) + (6.5.3)2(0.3) + (7.5.3)2(0.1) = 0.81$. (b) With $n = 36$,$\mu = 5.3$ and $\sigma^2/n = 0.81/36 = 0.0225$. (c) $n = 36$, $\mu = 5.3$, $\sigma^2/n = 0.9/6 = 0.15$, and $z = (5.5 - 5.3)/0.15 = 1.33$. So, $P(Z < 1.33) = 0.9082$.

4.25 (a) When the population equals the limit, the probability of a sample mean exceeding the limit would be 1/2 due the symmetry of the approximated normal distribution. (b) $P(\bar{X} \geq 7960|\mu = 7950) = P(Z \geq (7960 - 7950)/(100/\sqrt{25})) = P(Z \geq 0.5) = 0.3085$. No, this is not very strong evidence that the population mean of the process exceeds the government limit.

4.30 (a)$\chi^2_{0.01} = 38.932$. (b) $\chi^2_{0.025} = 12.592$. (c)$\chi^2_{0.05} = 23.209$ and $\chi^2_{0.025} = 20.483$ with $\alpha = 0.01 + 0.015 = 0.025$.

4.37 (a) From Table A.4 we note that 2.069 corresponds to $t_{0.025}$ when $\nu = 23$. Therefore, $-\mathrm{t}_{0.025} = -2.069$ which means that the total area under the curve to the left of $t = k$ is $0.025 + 0.965 = 0.990$. Hence, $\mathrm{k} = \mathrm{t}_{0.01} = 2.500$. (b) From Table A.4 we note that 2.807 corresponds to $\mathrm{t}_{0.005}$ when $\nu = 23$. Therefore the total area under the curve to the right of t = k is $0.095 + 0.005 = 0.10$. Hence, $k = \mathrm{t}_{0.10} = 1.319$. (c) $\mathrm{t}_{0.05} = 1.714$ for 23 degrees of freedom.

4.52 $\mu = 5{,}000$ psi, $\sigma =$ 400 psi, and n = 36. (a) Using approximate normal distribution (by CLT), $P(4800 < \bar{X} < 5200) = P\left(\frac{4800-5000}{400/\sqrt{36}} < Z < \frac{5200-5000}{400/\sqrt{36}}\right)$
$= P(-3 < Z < 3) = 0.9974$. (b) To find a z such that $P(-z < Z < z) = 0.99$, we have $P(Z < z) = 0.995$, which results in $z = 2.575$. Hence, by solving $2.575 = \frac{5100-5000}{400/\sqrt{n}}$ we have $n = 107$. Note that the value n can be affected by the z values picked (2.57 or 2.58).

5.57 $s^2 = 6.0025$ with $v = 19$ degrees of freedom. Also, $\chi^2_{0.025} = 32.852$ and $\chi^2_{0.975} = 8.907$. Hence, $(19)(6.0025)/32.852 < \sigma^2 < (19)(6.0025)/8.907$, or $3.472 < \sigma^2 < 12.804$.

5.58 Similar to 5.57. We get $1.258 < \sigma^2 < 5.410$

5.62 n = 12, $\bar{d}$ = 417.5, s$_d$ = 1186.643, and t$_{0.05}$ = 1.796 with 11 degrees of freedom. So, $417.5 \pm (1.796)\ \frac{1186.643}{\sqrt{12}} = 417.5 \pm 615.23$, which yields $-197.73 < \mu_D < 1032.73$.

5.67 n$_1$ = n$_2$ =300, $\bar{x}_1$ = 102300, $\bar{x}_2$ = $98500, s_1$ = 5700, and s_2 = 3800. (a) z$_{0.005}$ = 2.575. Hence, $(102300 - 98500) \pm (2.575)\sqrt{5700^2/300 + 3800^2/300} = 3800 \pm 1018.46$, which yields $2781.54 < \mu_1 - \mu_2 < 4818.46$. There is a significant difference in salaries between the two regions. (b) Since the sample sizes are large enough, it is not necessary to assume the normality due to the Central Limit Theorem. (c) Do not do

5.72 $n_1 = n_2 = 100$, $\hat{p}_1 = 0.1$, and $\hat{p}_2 = 0.06$. (a) z$_{0.025}$ = 1.96. So, $(0.1 - 0.06) \pm (1.96)\sqrt{(0.1)(0.9)/100 + (0.06)(0.94)/100} = 0.04 \pm 0.075$, which yields $-0.035 < p_1 - p_2 < 0.115$. (b) Since the confidence interval contains 0, it does not show sufficient evidence that $p_1 > p_2$.

6.88 From the data, n = 9, $\bar{d}$ = 1.58, and s$_d$ = 3.07. Using paired t-test, we observe that t = 1.55 with $p - value > 0.05$. Hence, the data was not sufficient to show that the oxygen consumptions was higher when there was little or not CO.

6.93 $\bar{d} = .2.905$, $s_d = 3.3557$, and $t = \frac{\bar{d}}{s_d/\sqrt{n}} = .2.12$. Since $0.025 < P(T > 2.12) < 0.05$ with 5 degrees of freedom, we have $0.05 < p - value < 0.10$. There is no significant change in WBC leukograms.