MTH 214 Sample final solutions (corrected)

Q0 a) i) $\frac{1}{2}\times\frac{1}{2}=\frac{1}{4}$ ii) draw 6x6 grid and count $\leadsto \frac{1}{2}$.

b) i) $H_0: \mu = 120$
$H_a: \mu \neq 120$

ii) test statistic $\frac{\bar{x}-\mu}{s/\sqrt{n}} \sim t, df=23$

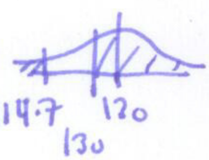
95% confidence interval $t^* = 2.069$

iii) $\frac{128-120}{12.3/\sqrt{23}} = 3.119$, p-value $= 2(1-pt(3.119, df=23)) = 0.0048$

significant at 95% level, reject H_0, i.e. significant evidence CSI students have different blood pressure.

iv) $\bar{x} \pm t^* s/\sqrt{n} = (122.7, 133.3)$

v) assume $\sigma = s = 12.3$, critical values for $\bar{x}$ are $120 \pm t^* s/\sqrt{n} = (114.7, 125.3)$

$H_a: \mu = 130$ 

power $=$ pnorm $\left(\frac{114.7-130}{12.3/\sqrt{23}}\right) + 1 -$ pnorm $\left(\frac{125.3-130}{12.3/\sqrt{23}}\right)$
-5.96 -1.83

$= 97\%$.

Q1 paired t-test H_0: difference in means 0 $\mu_{2017} = \mu_{2018}$
$H_a: \mu_{2017} > \mu_{2018}$

Q2 two sample proportion test $H_0: p_1 = p_2$ $H_a: p_1 > p_2$

Q3 χ^2 goodness of fit H_0: all day equally likely H_a: not all equally likely

Q4 χ^2 test of independence H_0: variable independent H_a: variables not independent

Q5 H_0: variables independent, H_a: variables not independent. Test not significant at 5% level

Q6 $H_0: \mu_1 = \mu_2$ $H_a: \mu_1 > \mu_2$ Columbia $\mu_1 = 11.36711$ Lewis $\mu_2 = 11.28962$ not significant at 5% level.

Q7 conditions for linear regression: SRS, common $N(0,\sigma)$ residuals indep of x.
yes, satisfied.

Q8 TFTF

Q9 SRS, numbers of success, failures ≥ 5. Yes.

Q10 sample size $15 \leq n \leq 40$, then use if not skew or outliers. not satisfied.

Q11 $\hat{p} \pm z^* \sqrt{\hat{p}(1-\hat{p})/n}$ $\quad z^* = 1.96 \quad \hat{p} = 23/50 \quad \rightsquigarrow (0.0366, 0.0554)$

want $z^* \sqrt{\hat{p}(1-\hat{p})/n} \leq 0.01$, $n = \left(\frac{1.96}{0.01}\right)^2 \hat{p}(1-\hat{p}) = 1686$.

Q12 FFTTF

Q13 TTF

Q14 TTF

Q15 TTTTFT