Solutions, Assignment 5, Stat 1510

Question 1) See the solution manual Ex. 17.10.

Question 2) See the solution manual Ex. 17.22.

Question 3) " " " " " 20.04.

Question 4) " " " " " 20.10.

Question 5) " " " " " 20.16.

Question 6) " " " " " Ex. 20.20.

Question 7) " " " " " Ex. 21.12.

Question 8) " " " " " Ex. 21.20.

Note: Q 21.20 is written poorly! If student found the CI almost correctly (Regardless of their interpretation), give them full mark.

Question 9) " " " " " Ex. 21.30.

Question 10) Ex. 21.36.

Question 11)

(a) The sample space is $S = \{2, 3, 4, 5, \ldots, 12\}$

e.g. $P(2) = P(\{1,1\}) = 1/36$

$P(3) = P(\{(1,2),(2,1)\}) = 2/36$

$\vdots$

outcome	2	3	4	5	6	7	8	9	10	11	12
prob	$1/36$	$2/36$	$3/36$	$4/36$	$5/36$	$6/36$	$5/36$	$4/36$	$3/36$	$2/36$	$1/36$

(b) The expected value becomes:

$$\left(2 * \tfrac{1}{36}\right) + \left(3 * \tfrac{2}{36}\right) + \left(4 * \tfrac{3}{36}\right) + \left(5 * \tfrac{4}{36}\right) + \left(6 * \tfrac{5}{36}\right) + \left(7 * \tfrac{6}{36}\right)$$

$$+ \left(8 * \tfrac{5}{36}\right) + \left(9 * \tfrac{4}{36}\right) + \left(10 * \tfrac{3}{36}\right) + \left(11 * \tfrac{2}{36}\right) + \left(12 * \tfrac{1}{36}\right)$$

$$= \frac{2 + 6 + 12 + 20 + 30 + 42 + 40 + 36 + 30 + 22 + 12}{36}$$

$$= \frac{1}{36}\left(2+6+12+20+30+42+40+36+30+22+12\right)$$

$$= \frac{1}{36}(252) = \frac{252}{36} = 7$$

(b) According to the law of large numbers, if we repeatedly roll two dice many many times, the mean of the sum of the numbers faced up approaches to the expected value (that is 7).

Question 12

$$\hat{p} \sim \text{Normal}\left(\mu = 0.51, \sigma = 0.15\right)$$

(a) $$P(\hat{p} < 0.46) = P\left(z \leq \frac{0.46 - 0.51}{0.15}\right) = P(z \leq -0.33)$$

$$= .3707$$

(b) $n=100$, $\hat{p}=0.41$, $(1-\alpha)100=90$

$\Rightarrow 1-\alpha=0.9 \Rightarrow \alpha=0.1 \Rightarrow 1-\frac{\alpha}{2}=1-\frac{0.1}{2}=0.95$

$Z_{1-\frac{\alpha}{2}}=Z_{0.95}=1.65$

The CI at 90% level for $\hat{p}$ is

$$\hat{p} \pm Z_{1-\frac{\alpha}{2}} \cdot \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} = 0.41 \pm \left(1.65 * \sqrt{\frac{0.41 * 0.59}{100}}\right)$$

$$= 0.41 \pm \left(1.65 * 0.0491\right) = 0.41 \pm 0.08$$

$$= (0.33, 0.49)$$

(c) We are 90% confident that the proportion of teens who use password in Mount Pearl is between $(0.33, 0.49)$.