Assignment 7/ Solution

7.28 a) If a random sample of n measurements is selected from a population with mean u and standard deviation σ, the sample distribution of the sample mean $\bar{x}$ will have mean u and standard deviation $\sigma/\sqrt{n}$.

b) From the Empirical Rule (and the general properties of the normal distribution) approximately 95% of the measurements will lie in 2 standard deviations of the mean: $u + 2\sigma/\sqrt{n}$ = (64575, 66640).

c) $p(\bar{x} > 67000) = p(z > \dfrac{67000-65608}{4000/\sqrt{n}}) = 0.0035$

d) \$67000 does not lies in the interval (64575, 66640), so we would consider this is unusual.

7.30 a) The approximate sampling distribution of the sample mean of n=10 is: $\bar{x} \sim N(20, 2^2/10)$.

b) $p(\bar{x} < 20) = p(z < \dfrac{20-21}{2/\sqrt{20}}) = p(z < -1.58) = 0.0571$

c) $p(\bar{x} < 20) = 0.001 \Rightarrow p(z < \dfrac{20-u}{2/\sqrt{20}}) = 0.001$

$\Rightarrow p(z < -3.1) = 0.001 \Rightarrow u = 21.95$

7.44 a) $\hat{p}$ =66% since n$\hat{p}$ =660 and n$\hat{q}$ =340, both of them are greater than 5, the binomial distribution can be approximately by a normal distribution with mean p=0.66 and SE=0.015.

b) $z = \dfrac{\hat{p}-p}{\sqrt{pq/n}} \approx$ 1.33, so p (z>1.33) = 0.09

c) $z = \dfrac{\hat{p}-p}{\sqrt{pq/n}} \approx$ -1.33, so p (-1.33<z<1.33) = 0.8164

d) $z = \dfrac{0.7-0.66}{0.0498} = 2.67$, then $p(\hat{p} > 0.7) = 1 - p(\hat{p} < 0.7) = 1 - p(z < 2.67)$

$= 1 - 0.9962 = 0.0038$

7.46 a) $z = \dfrac{\hat{p}-p}{\sqrt{pq/n}}$ = $\dfrac{0.25-0.15}{0.036}$ = 2.78, $p(\hat{p} > 0.25) \approx p(z > 2.78) = 0.0027$

b) $z = \dfrac{\hat{p} - p}{\sqrt{pq/n}} = \dfrac{0.12 - 0.15}{0.036}$ = -0.83, $p(\hat{p} < 0.12) \approx p(z < -0.84) = 0.2005$

c) $z = \dfrac{\hat{p} - p}{\sqrt{pq/n}} = \dfrac{0.3 - 0.15}{0.036} = 4.16$, the value is unusual because $\hat{p}$ = 0.3 lies 4.16 standard deviations above the mean p=0.15.

7.57