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BSSE23058
Section-A

Assignment # 4
Probability & Statistics.

6.36 $n = 200$.

X = The no of no show up with $p = 2\% = 0.02$.

show up with $p = 1 - 0.02 = 0.98$

$$P(X > 197) = P(X = 198) + P(X = 199) + P(X = 200)$$

Using normal approximation to the Binomial

$$\mu = np = 200 \times 0.98 = 196.$$

$$\sigma = \sqrt{np(1-p)} = \sqrt{200 \times 0.98 \times 0.02}$$

$$= 1.98$$

$$P(X > 197) = P\left(Z > \frac{197.5 - 196}{1.98}\right)$$

$$P(X < 3) = P\left(Z < \frac{2.5 - 4}{1.98}\right)$$

$$= P(Z < -0.76)$$

$$= 0.2236$$

P(overbooking) $= 0.2236$

22.36 %.

8.28 $n_1 = 25$ $n_2 = 36$

$\mu_1 = 80$ $\mu_2 = 75$

$\sigma_1 = 5$ $\sigma_2 = 3$

$$P(3.4 \leq \bar{X}_1 - \bar{X}_2 \leq 5.9)$$

$$\mu_{\bar{X}_1 - \bar{X}_2} = 80 - 75 = 5$$

$$\sigma_{\bar{X}_1 - \bar{X}_2} = \sqrt{\frac{5^2}{25} + \frac{3^2}{36}}$$

$$= \sqrt{\frac{25}{25} + \frac{9}{36}}$$

$$= 1.118$$

$P(3.35 \leq \bar{X}_1 - \bar{X}_2 \leq 5.85)$ $Z_1 = \frac{3.35 - 5}{1.118} = -1.48$

$$Z_2 = \frac{5.85 - 5}{1.118} = 0.76$$

$$P(-1.48 \leq Z \leq 0.76)$$

$$= P(Z \leq 0.76) - P(Z \leq -1.48)$$

$$= 0.7764 - 0.0694$$

$$= 0.7070$$

9.5 $n = 100$

$\bar{x} = 23500$

$S = 3900$

confidence level = 99%

z-value for 99% confidence $z_{0.005} = 2.575$

a. $\bar{x} + z \times \frac{s}{\sqrt{n}}$

$\frac{3900}{\sqrt{100}} = \frac{3900}{10} = 390$

Margin of error = $2.575 \times 390 = 1004.25$

Confidence level = 23500 ± 1004.25

$23500 - 1004.25 = 22,496$ | $23500 + 1004.25 = 24,504$

$22,496 < \mu < 24504$

b. $E = 2.575 \times \frac{3900}{\sqrt{100}}$

$= 1004$

$e < 1004$

9.35 $n_1 = 25,\ \bar{x}_1 = 80,\ \sigma_1 = 5$

$n_2 = 36,\ \bar{x}_2 = 75,\ \sigma_2 = 3$

Confidence level = 94% $\Rightarrow z_{.003} = 1.88$

$$\bar{x}_1 - \bar{x}_2 = 80 - 75 = 5$$

$$\sqrt{\frac{5^2}{25} + \frac{3^2}{36}} = \sqrt{1 + 0.25} = 1.118$$

Margin of error $= 1.88 \times 1.118 = 2.10$

$5 \pm 2.10 = (2.9, 7.1)$

$2.9 < \mu_1 - \mu_2 < 7.1$

10.4 a. $H_0 : p = 0.6$

Reject H_0 if $X \leq 3$. $X \sim \text{Binomial}(n = 10, p)$

$$\alpha = P(X \leq 3 \mid p = 0.6)$$

$$= 0.0548$$

b. $\beta(0.3) = 1 - P(X \leq 3 \mid p = 0.3)$

$= 1 - 0.6496 = 0.3504$

$\beta(0.4) = 1 - 0.3823 = 0.6177$

$\beta(0.5) = 1 - 0.1719 = 0.8281$