

*** Solutions ***
 King Fahd University of Petroleum & Minerals
 Department of Mathematical Science
 STAT-211-Term052-I
 Quiz #6

Section:

Name:

ID:

Serial:

Q1. (4-Points)

A population is normally distributed, with a mean of 100 and a standard deviation of 20, if a random sample of size 5 selected from this population, then:

a. What is the sampling distribution of the sample mean?

② \bar{x} has a normal dist. with $\mu_{\bar{x}} = \mu = 100$, $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{20}{\sqrt{5}} = 8.9443$
 or $\bar{x} \sim N(100, 8.9443)$

b. What is the probability that the sample mean will be less than 95?

②
$$P(\bar{x} < 95) = P\left(\frac{\bar{x} - 100}{8.9443} < \frac{95 - 100}{8.9443}\right)$$

$$= P(Z < -0.56) = P(Z > 0.56)$$

$$= 0.5 - P(0 \leq Z < 0.56)$$

$$= 0.5000 - 0.2123 = 0.2877$$



Q2 (6 points)

Given a population in which the probability of success is $p = 0.35$, if a sample of 1000 is taken, if the sample yields 370 success items, then:

a. Using the sample results, find the sampling error

② $\bar{p} = \frac{x}{n} = \frac{370}{1000} = 0.37 \Rightarrow \text{The Sampling Error} = \bar{p} - p = .37 - .35 = .02$

b. What is the sampling distribution of the sample proportion?

② \bar{p} has approximately normal dist. with. Note: 1. $np = 350 \geq 5$
2. $n(1-p) = 650 \geq 5$

$$\mu_{\bar{p}} = p = 0.35$$

$$\sigma_{\bar{p}} = \sqrt{\frac{p(1-p)}{n}} = \sqrt{\frac{(0.35)(1-0.35)}{1000}} = 0.0151.$$

c. What is the probability that the proportion of success in the sample is less than 0.37?

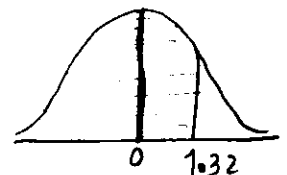
②
$$P(\bar{p} < 0.37) = P\left(\frac{\bar{p} - 0.35}{0.0151} < \frac{0.37 - 0.35}{0.0151}\right)$$

$$= P(Z < 1.32)$$

$$= 0.5000 + P(0 < Z < 1.32)$$

$$= 0.5000 + 0.4066$$

$$= 0.9066$$



* Solutions *

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STAT-211-Term052-II

Quiz #6

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Q1 (4-Points)

A population with unknown shape has a mean of 100 and a standard deviation of 25, a random sample of size 50 selected from this population, then:

- a. What is the sampling distribution for the sample mean?

② OR \bar{X} has approximately normal dist. with: $\mu_{\bar{x}} = \mu = 100$, $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{25}{\sqrt{50}} = 3.5355$

② $\bar{X} \approx N(100, 3.5355)$

- b. What is the probability that the sample mean will be more than 95?

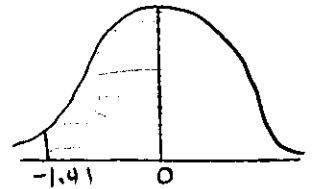
②
$$P(\bar{X} > 95) = P\left(\frac{\bar{X} - 100}{3.5355} > \frac{95 - 100}{3.5355}\right)$$

$$= P(Z > -1.41)$$

$$= P(Z < 1.41)$$

$$= 0.5000 + 0.4207$$

$$= 0.9207$$



Q2 (6-Points)

Given a population in which the probability of success is $p = 0.45$, if a sample of 1000 is taken, if the sample yields 470 success items, then:

- a. Using the sample results, find the sampling error

② $\bar{P} = \frac{x}{n} = \frac{470}{1000} = 0.47 \Rightarrow \text{The Sampling error} = \bar{P} - P = 0.47 - 0.45 = 0.02$

- b. What is the sampling distribution of the sample proportion?

\bar{P} has approximately normal dist. with

Note 1. $np = 450 \geq 5$
2. $n(1-p) = 550 \geq 5$

② $\mu_{\bar{P}} = P = 0.45$

$$\sigma_{\bar{P}} = \sqrt{\frac{P(1-P)}{n}} = \sqrt{\frac{(0.45)(1-0.45)}{1000}} = 0.0157$$

- c. What is the probability that the proportion of success in the sample is less than 0.47?

②
$$P(\bar{P} < 0.47) = P\left(\frac{\bar{P} - 0.45}{0.0157} < \frac{0.47 - 0.45}{0.0157}\right)$$

$$= P(Z < 1.27)$$

$$= 0.5000 + P(0 < Z < 1.27)$$

$$= 0.5000 + 0.3980$$

$$= 0.8980$$

