

NAME Solution

SECTION _____

FINAL STA291 Spring 2009 Sec 13, 14, 15 by Dr Yoshida

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MULTIPLE CHOICE

1. A larger standard deviation of a normal distribution indicates that the distribution becomes:
- a. narrower and more peaked.
 - b. flatter and wider.
 - c. more skewed to the right.
 - d. more skewed to the left.
2. A point estimator is defined as:
- a. a range of values that estimates an unknown population parameter.
 - b. a range of values that estimates an unknown sample statistic.
 - c. a single value that estimates an unknown population parameter.
 - d. a single value that estimates an unknown sample statistic.
3. The problem with relying on a point estimate of a population parameter is that:
- a. it is virtually certain to be wrong.
 - b. it doesn't have the capacity to reflect the effects of larger sample sizes.
 - c. it doesn't tell us how close or far the point estimate might be from the parameter.
 - d. All of these choices are true.
4. When determining the sample size necessary for estimating the true population mean, which factor is not of our concern when sampling with replacement?
- a. The population size.
 - b. The population standard deviation.
 - c. The level of confidence desired in the estimate.
 - d. The allowable or tolerable sampling error.
5. A Type II error is committed if we make:

- a. a correct decision when the null hypothesis is false.
- b. a correct decision when the null hypothesis is true.
- c. an incorrect decision when the null hypothesis is false.
- d. an incorrect decision when the null hypothesis is true.

- _____ 6. The level of significance can be:
- a. any number between -1.0 and 1.0 .
 - b. any number greater than zero.
 - c. any number greater than 1.96 or less than -1.96 .
 - d. None of these choices.

- _____ 7. The larger the confidence level, the:
- a. smaller the value of $z_{\alpha/2}$.
 - b. wider the confidence interval.
 - c. smaller the probability that the confidence interval will contain the population mean.
 - d. None of these choices.

- _____ 8. Suppose that we reject a null hypothesis at the 0.05 level of significance. Then for which of the following α -values do we also reject the null hypothesis?
- a. 0.06
 - b. 0.04
 - c. 0.03
 - d. 0.02

- _____ 9. The critical values z_{α} or $z_{\alpha/2}$ are the boundary values for:
- a. the rejection region(s).
 - b. the level of significance.
 - c. Type I error.
 - d. Type II error.

- _____ 10. If we do not reject the null hypothesis, we conclude that:
- a. there is enough statistical evidence to infer that the alternative hypothesis is true.
 - b. there is not enough statistical evidence to infer that the alternative hypothesis is true.
 - c. there is enough statistical evidence to infer that the null hypothesis is true.
 - d. there is not enough statistical evidence to infer that the null hypothesis is true.

SHORT ANSWERS

11. In the following question, indicate how to use the web applet provided in the last page (i.e., show which one we should click among Left tail, Right tail, Middle or Two-tail, and then what value you have to fill in (z-value or probability box), and then which arrow you should click).

Let X be a normally distributed random variable with a mean of 12 and a standard deviation of 1.5. What proportions of the values of X are:

a. less than 14

$$z = \frac{14 - 12}{1.5} = 1.33 \quad P(Z \leq z) = P(Z \leq 1.33)$$
$$= \boxed{0.9082}$$

b. more than 8

$$z = \frac{8 - 12}{1.5} \approx \del{2.67} -2.67$$

$$P(Z > -2.67) = 1 - P(Z \leq -2.67)$$
$$= 1 - 0.0038 = \boxed{0.9962}$$

c. between 10 and 13

$$z_1 = \frac{10 - 12}{1.5} = -1.33 \quad z_2 = \frac{13 - 12}{1.5} = 0.67$$

~~P(z)~~ $P(-1.33 \leq z \leq 0.67)$

$$= P(z \leq 0.67) - P(z \leq -1.33)$$

$$= 0.7486 - 0.0918$$

12. How large a sample of state employees should be taken if we want to estimate with 98% confidence the mean salary to within \$2,000. The population standard deviation is assumed to be \$10,500. z-value for 98% confidence is 2.326.

$$n = \left\lceil \frac{\sigma^2 z^2}{B^2} \right\rceil = \lceil 149.12 \rceil = \boxed{150}$$

13. In the following question, indicate how to use the web applet provided in the last page (i.e., show which one we should click among Left tail, Right tail, Middle or Two-tail, and then what value you have to fill in (z-value or probability box), and then which arrow you should click).

Use the standard normal distribution.

Calculate the value of the test statistic, determine the p-value and draw sampling distribution.

$H_0: \mu = 1,000$, $H_1: \mu \neq 1,000$, $\bar{X} = 980$, $n = 100$, $\sigma = 200$, and $\alpha = 0.01$.

$$z_{obs} = \frac{980 - 1000}{200/\sqrt{100}} = -1 \Rightarrow |z_{obs}| = 1$$

$$P\text{-value} = P(|z| \geq |z_{obs}|)$$

$$\begin{aligned} & \cancel{P(z \leq -1)} + \cancel{P(z \geq 1)} = 2P(z > |z_{obs}|) \\ & = 2(1 - P(z \leq |z_{obs}|)) = 2(1 - P(z \leq 1)) \\ & = 2(1 - 0.08413) \end{aligned}$$

14. For each of the following pairs of null and alternative hypotheses, determine whether or not they are statistically correct to conduct a hypothesis test. Write appropriate or in appropriate.

- a. $H_0: \mu = 25, H_1: \mu < 25$ App
- b. $H_0: \mu = 30, H_1: \mu > 30$ App
- c. $H_0: \bar{x} = 35, H_1: \bar{x} > 35$ inapp
- d. $H_0: \bar{x} = 40, H_1: \bar{x} < 40$ inapp
- e. $H_0: \mu \neq 60, H_1: \mu = 60$ inapp