

NAME _____

STUDENT ID _____

STAT 308, 75 Minute Exam
Show All Workings

1. Scores on a certain nationwide college entrance examination follow a normal distribution with a mean of 500 and a standard deviation of 100. Find the probability that a student will score

(a) over 650. Answer :

(b) less than 459. Answer :

(c) between 325 and 675. Answer :

(d) If a school only admits students who score over 680, what proportion of the students pool would be eligible for admission?
Answer :

(e) What limit (score) would you set that makes the top 20% of the students eligible? (Choose closest number in table. Do not interpolate).
Answer :

(f) If 16 examinations are selected at random and their mean is calculated,
i. what is the expected average score? Answer :

ii. what is the standard deviation for the average score?
Answer :

- iii. is the distribution of the average score exactly or approximately normal? Explain.

The distribution of the average score is (circle one) normally distributed.

Because : _____

- iv. What is the probability that the average score of the 16 examinations is over 650?

Answer :

2. Patients with chronic kidney failure may be treated by dialysis, using a machine that removes toxic wastes from the blood, a function normally performed by the kidneys. Kidney failure and dialysis can cause other changes, such as retention of phosphorus, that must be corrected by changes in diet. A study of the nutrition of dialysis patients measured the level of phosphorus in the blood of 45 dialysis patients and their average phosphorus level was 5.2 mg/dl.

- (a) Assuming blood phosphorus varies according to a normal distribution, with $\sigma = 0.9$ mg/dl, find a 99% confidence interval for the mean blood phosphorus level for dialysis patients.

99% CI :

- (b) What is the margin of error in the 99% confidence interval found in part (a)

Margin of error :

- (c) Interpret the confidence interval found in part (a)

Interpretation: _____

- (d) If the level of confidence is changed to 90%, and all the other parameters stay the same, what effect would lowering the level of confidence have in the size of the confidence interval? Explain.

The 90% confidence interval is (circle one) than the 99% confidence interval.

Because: _____

- (e) How many dialysis patients should be sampled to obtain a margin of error of no more than 0.3 in a 99% confidence interval?

Sample size =

3. *Environmental Science & Technology* (1993) reported on a study of contaminated soil in The Netherlands. Seventy-two 400-grams soil specimens were sampled, dried, and analyzed for the contaminant cyanide. The cyanide concentration (in mg/kg) of each soil specimen was determined using an infrared microscopic method. The sample resulted in a mean cyanide level of 84 mg/kg. Assume $\sigma = 80$ mg/kg. Test the hypothesis that the true mean cyanide level in soil in The Netherlands does not exceed 100 mg/kg. Use a significance level of 0.01.

- (a) State the null and alternative hypotheses

H_0 :

H_a :

- (b) Calculate the value of the test statistic. **Show workings.**

Value of test statistic =

- (c) Find the critical value(s) and draw the acceptance and rejection region.

(d) Decision is:

(Circle One) :

Reject H_0 / Not Reject H_0

Conclusion: _____

- THE END -

Note: Even though there are not questions on p-values in this practice test, they could be asked for in the coming examination.

FORMULAE

The following formulae may be useful:

$$Z = \frac{X - \mu}{\sigma}$$

$$Z = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}}$$

$$\mu_{\bar{x}} = \mu$$

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$

$$\bar{x} \pm z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$$

$$n = \left[\frac{z_{\alpha/2} \sigma}{E} \right]^2$$

$$\bar{x} \pm t_{\alpha/2, n-1} \frac{s}{\sqrt{n}}$$

$$Z = \frac{\bar{X} - \mu_0}{\sigma/\sqrt{n}}$$

$$t = \frac{\bar{X} - \mu_0}{s/\sqrt{n}}$$