STA 4170 — Exam1 — Fall 2000 — Print Name: _____

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The following 3 questions are based on the following information

A pharmaceutical researcher believes that patients with condition A will clear drug B at a slower rate than healthy subjects that do not have condtion A. Samples of 8 patients with condition A and 8 healthy patients are obtained, and the clearance of drug B is obtained on each subject (in liters/hour) is measured.

1) The independent (predictor) and dependent (response) variables are (independent/dependent):

a) Condition/Drug   b) Clearance/Drug   c) Condition/Clearance   d) Drug/Clearance

2) The ages of the 8 healthy subjects are: 24,24,26,26,34,34,36,36. Give the sample mean and sample standard deviation.

a) $\overline{X} = 30$, $S = 5.45$ b) $\overline{X} = 30$, $S = 29.71$ c) $\overline{X} = 30$, $S = 26.00$ d)$\overline{X} = 30$, $S = 5.10$ e) $\overline{X} = 120$, $S = 29.71$

3) This is an example of what type of design?

a) Crossover   b) Parallel groups

4) A study was conducted to determine whether there is a survival benefit associated with cardiac transplantation in Germany. They identified transplant patients by risk groups (low, medium, high), and observed the outcome of whether or not death occurred over a fixed time period. This study is an example of a:

a) retrospective case–control study
b) prospective case–control study
c) retrospective cohort study
d) controlled experiment
e) prospective cohort study

5) A study of emphysema rates among smokers and non-smokers finds that among $n_s = 500$ smokers over the age of 50, $x_s = 40$ suffer from emphysema. Among $n_{ns} = 500$ controls matched by age, sex, and race, $x_{ns} = 5$ suffer from emphysema. Give the sample proportions suffering from emphysema.

a)$\hat{pi}_s = .40 \hat{pi}_{ns} = .05$ b)$\hat{pi}_s = .80 \hat{pi}_{ns} = .10$ c)$\hat{pi}_s = .08 \hat{pi}_{ns} = .01$ d)$\hat{pi}_s = 12.5 \hat{pi}_{ns} = 100.0$

The following 2 questions are based on the following information

Among an island of 20 survivors, 5 members suffer from the disease *disillusionus egomanias*. The remaining members do not suffer from this disease. A psychologist devises a test to identify *disillusionus egomanias* among the islands inhabitants via television monitoring.

6) Give the sensitivity and specificity of this test (sensitivity/specificity).

a)   b)   c)   d)

7) Give the positive and negative predictive values of the test (PV^+/PV^-).

a)   b)   c)   d)

A researcher is interested in the variation in AUC for a drug among patients in a particular population. She finds that measurements are approximately normally distributed with mean 1000, and standard deviation 200.

8) Between what 2 bounds do approximately 95% of all patients lie between?

a)   b)   c)   d)

9) Give the sampling distribution of the sample mean of $n = 25$ patients from this patient population.

a)   b)   c)   d)

10) In the evolution of statistical designs to study cause and effect between risk factors and disease, case-control studies tend to occur before cohort designs.

a) True   b) False

The following 3 questions are based on the following information

A large sample test is being conducted to determine whether the mean response to a drug is higher from a high dose than to a low dose of the drug. We label the sample means as $\overline{X}_H$ and $\overline{X}_L$ for the high and low doses respectively. The true (population) means are μ_H and μ_L.

11) The appropriate null and alternative hypotheses to identify a dose-response effect are:

a) $H_0 : \mu_H - \mu_L = 0 \; H_A : \mu_H - \mu_L \neq 0$ a) $H_0 : \mu_H - \mu_L = 0 \; H_A : \mu_H - \mu_L \neq 0$ a) $H_0 : \mu_H - \mu_L = 0$ $H_A : \mu_H - \mu_L \neq 0$ a) $H_0 : \mu_H - \mu_L = 0 \; H_A : \mu_H - \mu_L \neq 0$

12) Based on your answer to the previous question, the rejection region is selected so that we conclude that the high dose has a higher true mean than the low dose if the observed Z_{obs} falls in what region if we set the Type I error rate at $\alpha = 0.05$?

a)

13) For a fixed sample size, α, and estimates of the sample variances, as the true difference $\mu_H - \mu_L$ increases,

a) The power of the test increases
b) The probability of a Type II error increases
c) The probability of a Type I error increases
d) The probability of a Type I error decreases