Biostat Exam 2, F00 (Key)

Covers probability models, intro to confidence intervals, intro to significance testing, one-sample *t* statistics, and paired sample *t* statistics. Time limit: 1.25 hours.

Short Answer

1. Suppose we take a simple random sample from a population in which $N = 125$. Population members are identified with numbers 1 through 125. What is the probability that a given person is selected at random?
   1 / 125_____________

2. A knowledgeable doctor says that your chances of surviving a particularly virulent illness is 50:50. This probability is conceived on:
   a. logic
   b. experience
   c. subjectivity
   d. none of the above

3. The binomial distribution is characterized by two parameters. Name these (or list their symbols, your choice):

   n (no. of trials)__________________

   p (probability of success)_________

4. Normal distributions are characterized by two parameters. Name these:

   μ (mean)___________________________

   (standard deviation)_____________

5. *t* distributions are characterized by one parameter. Name this parameter.

   *df*________________________________

6. Approximately what percentage of normally distributed values will fall within ±2 standard deviations of μ?

   95%_____________

7. Any single mean must be viewed as an example of similar means from a population of experiments done under the same conditions. These hypothetical means would form a:
   a. standard error of the mean
   b. standard deviation
   c. **sampling distribution of means
   d. confidence interval

8. The theorem that states SDMs tend toward normality is the:
   a. **central limit theorem
   b. law of large numbers
   c. law of unbiasedness
   d. standard error of the mean

9. A 95% confidence interval for a mean has a 95% chance of capturing:
   a. $\bar{x}$
   b. **μ
   c.
   d. *sem*

10. The *probability* of falsely rejecting H_0 is:
    a.
    b.
    c. confidence
    d. power

11. Which test is used when testing a mean when   is known?
    a. **one-sample *z* test
    b. one-sample *t* test
    c. paired *t* test
    d. none of the above

12. An investigator is looking for a mean difference greater than 0. Select the correct alternative hypothesis.
    a. H_1: $\mu < 0$
    b. **H_1: $\mu > 0$
    c. H_1: $\mu = 0$
    d. H_1: $\mu \neq 0$

13. Inference is generalizing from a __________ to a __________ with calculated degree of certainty.
    a. population . . . sample
    b. **sample . . . population
    c. statistic . . . estimator
    d. estimator . . . statistic

14. A *p* value is greater than .1 suggests data are:
    a. **not significant
    b. marginally significant
    c. significant
    d. highly significant

15. A jury acquits a man who did the crime he is accused of. This is analogous to a:
    a. type I error
    b. **type II error
    c. *p* value
    d. alpha

16. Power is the probability of :
    a. a type I error
    b. a type II error
    c. avoidance of a type I error
    d. **avoidance of a type II error

17. *t* distributions with few degrees of freedom are _________ than standard normal distributions.
    a. **flatter
    b. more peaked
    c. similar to
    d. none of the above

18. *t* distributions with infinite degrees of freedom are _________ than standard normal distributions.
    a. flatter
    b. more peaked
    c. the same as
    d. none of the above

19. The analysis of paired differences is similar to the analysis of a single sample except that it is directed toward:
    a. alpha
    b. beta
    c. gamma
    d. **delta

20. What percentage of 95% confidence intervals will fail to capture the parameter?

Calculations

1. X is a binomial random variable with n = 10 and p = .15. What is the probability of observing exactly 1 success in a sample? Show all work. (Use the back of the page if you run out of room.) [4 pts]

$\Pr(X = 1) = {}_{10}C_1(.15^1)(.85^9) = (10)(.15)(.2316) = .3474$

2. $z_{.8413} = +1$_____________

3. $z_{.1587} = -1$ _____________

4. In a sample of n = 25, $\bar{x}$ =126, and s = 40. Calculate a 95% confidence interval for μ. Show all work. [6 pts]

$126 \pm (t_{24,.975})(40/\text{sqrt}(25)) = 126 \pm (2.06)(8) = 126 \pm 16.48 = (109.52, 142.48)$

5. Testosterone levels (Int. Units) are taken before and after watching a football game. Data are:

Before	After
83	81
96	92
88	88
99	93

Test the data to see if there has been a significant change in testosterone levels. Show all testing steps. Draw the p value regions on the curve.

H_0: $\mu_d = 0$ H_1: μ_d not = 0
$x_d = 12$
mean = 12 / 4 = 3
$SS_d = 20$
s_d = sqrt(20/3) = 2.582
t_{stat} = (3 - 0) / (2.582 / sqrt(4)) = 2.32
df = 4 - 1 = 3
Curve not drawn in this document, but should show two tails shaded and at +2.32 and -2.32 with each tail representing half of the p-value and $.1 < p < .2$. The test is not significant.