American University of Beirut

STAT 210

Introductory Statistics

Fall 2004-2005

Final Exam

Name: ..... ID #: .....

Your are allowed to have a formula table, statistics tables and a calculator.

Section: Encircle your section please.

section 1	section 2	section 3	section 4
F 3:00 - 3:50 pm	T 11:00 - 11:50 am	F 12:00 - 12:50 pm	TTH 5:00 - 6:15 pm
Ms Jaber	Ms Jaber	Ms Jaber	Ms Mouzaihem

There is 30 questions in this exam counting for 150 points. A correct answer is 5 points, a wrong answer is -1 point and an unanswered question is 0 point. If you want to change your choice, just cross out your first choice and circle your new choice. If you think an answer is not given, circle the letter E, and write your one answer next to it. Don't write anything else on the exam sheet.

Good luck

1. 73% of the population have cats, and 54% have dogs. What is the minimum percentage of people that have both animals?

A. 19% B. 39% C. 27% D. 21% E. none of the above

2. Let A, B and C be three **mutually exclusive** events such that $P(A) = 0.15, P(B) = 0.45$ and $P(C) = 0.2$. Find $P((A' \cap B') \cap C)$.

A. 0.2 B. 0.3 C. 0.6 D. 0.4 E. none of the above

Use the following information to answer questions 3 to 4. Government sources claim that the spending of a family with 4 children is normally distributed with average \$100 per week, and a standard deviation of \$15.

3. What is the probability that a randomly selected family with 4 children spend more than \$130 per week?

A. 0.0814 B. 0.9772 C. 0.0228 D. 0.9186 E. none of the above

4. What is the probability that the average weekly spending of a sample of 25 such families does not exceed \$105?

A. 0.7486 B. 0.0475 C. 0.2514 D. 0.9525 E. none of the above

5. A coin is tossed 3 times and a die is rolled one time, what is the probability that the number of heads is equal to the number on the die?

A. 1/2 B. 7/48 C. 1/8 D. 3/16 E. none of the above

Use the following information to answer questions 6 to 10. In the past, the mean running time for a certain type of flashlight battery has been 9.8 hours. the manufacturer has introduced a change in production method and want to perform a test to determine if the mean running time has increased as a result. A randomly selected sample of 30 batteries yields a mean running time of 10.2 hours, with a sample standard deviation of 1.3 hours.

6. What are the null and the alternative hypothesis to test the manufacturer's claim?

i) $H_0 : \mu = 9.8$ vs. $H_a : \mu < 9.8$

ii) $H_0 : \mu = 10.2$ vs. $H_a : \mu \neq 9.8$

iii) $H_0 : \mu = 9.8$ vs. $H_a : \mu > 9.8$

iv) $H_0 : \mu = 10.2$ vs. $H_a : \mu < 9.8$

A. (i) B. (ii) C. (iii) D. (iv) E. none of the above

7. What is the P-value of the test?

A. $P > 0.4$ B. $P = 0.02$ C. $0.05 < P < 0.1$ D. $P < 0.025$ E. none of the above

8. At 5% significance level, which of the following statement is(are) true?

i) H_0 is accepted.

ii) we don't have enough evidence against H_0.

iii) we are undecided.

iv) there is enough evidence to support the claim that the mean running time of all light bulbs has increased from the previous mean of 9.8 hours.

A. (i) B. (ii) C. (iii) D. (iv) E. none of the above

9. Construct a 95% confidence interval for μ.

A. [9.73; 10.66] B. [9.71; 10.68] C. [9.71; 10.66] D. [9.73; 10.68] E. none of the above

10. If in fact the mean running time of the batteries is greater than 9.8 hours, then based on the above study, your decision is:

i) type I error

ii) correct decision

iii) type II error

iv) no decision can be made

A. (i) B. (ii) C. (iii) D. (iv) E. none of the above

11. A person answers each of two multiple choice questions at random. If there are four possible choices on each question, what is the probability that both answers are correct given that at least one is correct?

A. 1/2 B. 1/3 C. 1/4 D. 1/6 E. none of the above

12. 3 distinct integers are selected from the first 10 positive integers $\{1, 2, \ldots, 10\}$. Find the probability that their sum is even.

A. 0.45 B. 0.25 C. 0.75 D. 0.5 E. none of the above

13. Refer to question 12, what is the probability that their product is even?

A. 0.445 B. 0.364 C. 0.916 D. 0.728 E. none of the above

Use the following information to answer questions 14 to 17. A large automobile manufacturing company is trying to decide whether to purchase brand A or brand B tires for its new models. To help arrive at a decision, an experiment is conducted using 12 of each brand. The tires are run until they wear out. The results are (in kilometers). Assume the populations to be approximately normally distributed.

brand A	brand B
$\overline{x}_1 = 37.900$	$\overline{x}_2 = 39.800$
$s_1 = 5100$	$s_2 = 5900$

14. What are the null and alternative hypotheses to test that there is no difference in the 2 brands of tires?

i) $H_0 : \mu_1 - \mu_2 = 900$ vs. $H_a : \mu_1 - \mu_2 \neq 900$

ii) $H_0 : \mu_1 = \mu_2$ vs. $H_a : \mu_1 - \mu_2 \neq 900$

iii) $H_0 : \mu_1 \neq \mu_2$ vs. $H_a : \mu_1 = \mu_2$

iv) $H_0 : \mu_1 - \mu_2 = 0$ vs. $H_a : \mu_1 - \mu_2 \neq 0$

A. i) B. ii) C. iii) D. iv) E. none of the above

15. Assuming equal population standard deviation, what is the value of the test statistic for $H_0 : \mu_1 = \mu_2$?

A. -0.84 B. -0.37 C. -0.21 D. -1.45 E. none of the above

16. Assuming equal population standard deviation, what are the critical values of the test at 1% significance level?

A. ± 2.845 B. ± 2.819 C. ± 2.508 D. ± 2.528 E. none of the above

17. Assuming unequal population variances, what is the degree of freedom for $H_0 : \mu_1 = \mu_2$?

A. 19 B. 20 C. 21 D. 22 E. none of the above

18. A prospective purchaser of a fast food franchise is told that the daily earnings for the franchise have a standard deviation of \$90 a day. The purchaser wishes to estimate the actual average daily earnings to within \$20 with a probability of at least 0.95. How large a sample should he choose, if such earnings are normally distributed?

A. 54 B. 77 C. 55 D. 78 E. none of the above

19. In how many ways can a president and a vice-president be chosen from a group of 6 persons all equally qualified?

A. 64 B. 15 C. 30 D. 36 E. none of the above

20. 6 socks are drawn without replacement form a drawer containing 8 pairs of socks. What is the probability of having at least one matching pair?

(hint: compute the probability of having no matching pair)

A. 32/143 B. 111/143 C. 64/143 D. 55/143 E. none of the above

21. In a gambling game, a person draw 2 cards without replacement from a deck of 52 playing cards. If the 2 cards are of the same suit, he wins 1 dollar, otherwise he losses x dollars. Find x if the game is fair.

A. 39/12 B. 12/51 C. 12/39 D. 51/12 E. none of the above

22. On a multiple choice test with 14 questions, each has four possible answers, one of which is correct. For students who guess at all answers, find the mean for the random variable X, the number of correct answers.

A. 10.5 B. 3.5 C. 4.7 D. 7 E. none of the above

23. A laboratory blood test is 95 percent effective in detecting certain disease when it is, in fact, present. However, the test also yields a "false possible" result for 1 percent of the healthy tested persons tested (that is, if a healthy person is tested, then, with probability 0.01, the test will imply he or she has the disease). If 0.5 percent of the population actually have the disease, what is the probability that the person has the disease given that the test results is positive?

A. 0.32 B. 0.53 C. 0.68 D. 0.41 E. none of the above

Use the following information to answer questions 24 to 25. A basketball player misses 20% of his shots on a basket. Assume that he always has the same chances of hitting.

24. Among the next 20 shots, what is the probability hat he hits exactly 15 shots?

A. 0.19 B. 0 C. 0.21 D. 0.17 E. none of the above

25. If the player makes 100 shots, how many hits do you expect him to make?

A. 20 B. 80 C. 100 D. 60 E. none of the above

26. The travel time form your home to your university is normally distributed with mean 36.8 minutes and standard deviation 4 minutes. If you want to be 98 percent certain that you will not be late for an exam at 1 pm, what is the latest time that you should leave home?

A. 12:13 pm B. 12:14 pm C. 12:15 pm D. 12:16 pm E. none of the above

27. Suppose that [9.05; 13.85] is a 98% confidence interval for one population mean based on a sample of size 36. What is the population standard deviation?

A. 4.68 B. 7.22 C. 5.59 D. 6.18 E. none of the above

28. Which of the following statement(s) is(are) true?

i) if it is important not to reject a true null hypothesis, the hypothesis test should be performed at a small significance level.

ii) at fixed sample size, decreasing the confidence level will results in increasing the margin of error of a confidence interval for one population mean.

iii) at fixed sample size, increasing the sample size will results in a wider confidence interval for one population mean.

iv) the P-value is the smallest significance level for which the observed sample data results in rejection of the null hypothesis.

A. i) and ii) B. i) and iii) C. i) and iv) D. ii) and iii) E. none

29. For the hypothesis test $H_0 : \mu = \mu_0$ vs $H_a : \mu \neq \mu_0$, the z statistic was calculated and found to have the value 1.34. Then the P-value is:

A. 0.1802 B. 0.0901 C. 0.0109 D. 0.9010 E. none of the above

30. Refer to question 29. If the significance level is set at 10%, then which of the following statement(s) is(are) true?

i) reject the null hypothesis.

ii) we can not reject the null hypothesis.

iii) we can not decide according to the above information.

iv) we don't have the probability of type II error to make a decision.

A. (i) B. (ii) C. (iii) D. (iv) E. none of the above