American University of Beirut

STAT 210

Introductory Statistics

Fall 2005-2006

Final Exam

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

Aids allowed: One formula sheet, a calculator, and statistics tables.
Please answer one and only answer using the question sheet and return it with your booklet. In case you check more than one answer, then correct it by saying my answer is "—". Otherwise, you may lose all credits for that question. good luck

1. Which is the following descriptive measures can never be negative.

   (a) mean (b) standard deviation (c) Q_2 (d) mode (e) none of the above

2. In the Beirut city 10 km run, there was 12000 participants from which 6769 are men and 5231 are women. Then which of the following measures of the center is the most appropriate to use

   (a) mean (b) median (c) Q_1 (d) mode (e) none of the above

3. Suppose X is a binomial random variable with expectation $\mu = 18$ and a standard deviation of $\sigma = 3$. Find the $P(X \leq 1)$.

   (a)$(1/2)^{36}$ (b) $36(1/2)^{37}$ (c) $37(1/2)^{36}$ (d)$(1/2)^{37}$ (e) none of the above

4. Marwan, Jad and Kate simultaneously toss coins. The coin tossed by each one turns up head with probability $1/2, 1/4$ and $1/3$ respectively. If one person gets an outcome different from those of the other two, then he is the odd man out. If there is no odd man out, the players flip again and continue to do so until they get an odd man out. Find the probability that Marwan is out in the first round.

   (a) 1/24 (b) 6/24 (c) 7/24 (d) 15/24 (e) none of the above

5. If three letters are placed at random in three envelops, what is the probability that exactly one letter will be placed in the correct envelop?

   (a) 1/4 (b) 1/3 (c) 1/2 (d) 1/6 (e) none of the above

6. You select three balls at random and without replacement from an urn containing 4 red balls and 6 white balls. Suppose that you win \$1 for each white ball selected and lose \$1 for each red ball selected. What is your expected gain?

   (a) 0.2 (b) 0.6 (c) 0.4 (d) 0 (e) none of the above

7. At a grocery store, eggs come in cartons that hold 12 eggs each. 78.5% of the cartons have no broken eggs, 19.2% have one broken eggs, 2.2% have two broken eggs, and 0.1% have three broken eggs. A carton is selected then an egg is selected at random from this carton. What is the probability that this egg is broken?

   (a) 0.004 (b) 0.239 (c) 0.016 (d) 0.0199 (e) none of the above

8. A couple has decided to keep having babies till the first girl is born. Assume that the probability of having a girl is the same as having a boy equals 1/2. What is the probability that the couple will need at least 3 tries to have their first baby girl?

   (a) 1/8 (b) 1/4 (c) 1/2 (d) 3/4 (e) none of the above

9. If a population has a standard deviation σ, the the standard deviation of the mean of 100 randomly selected items from this population is

   (a) σ (b) 100σ (c) $\sigma/10$ (d) $\sigma/100$ (e) none of the above

10. An opinion poll asks a random sample of voters "Do you think elected government officials are underpaid?" Suppose 75% of the population would respond "NO." If the sample size is 400, approximate the probability that at most 90 respond "YES"

    (a) 0.0287 (b) 0.4713 (c) 0.5712 (d) 0.9713 (e) none of the above

11. You want to test the Null hypothesis $H_0 : \mu = 70$ vs. $H_a : \mu \neq 70$ at $\alpha = 0.05$, and you have calculated the 95% confidence interval of μ and found that its limits are 65 and 75. Based on this information you:

    (a) conclude that H_0 will be rejected

    (b) conclude that H_0 will not be rejected

    (c) need to know the sample size to conclude

    (d) the confidence interval and testing hypothesis are not related

    (e) none of the above

12. A statistician claims that the average age of people who buy a lottery ticket is 60 years. A random sample of 36 people is selected and their mean age was found to be 58 years, with a sample standard deviation of 6 years. To test whether the age found is different than the age claimed by the statistician we should conduct

    (a) a two-sided z-test

    (b) a two-sided t-test

    (c) a one-sided z-test

    (d) a one-sided t-test

    (e) none of the above

13. Scores on aptitude test are normally distributed with a mean of 220 and a standard deviation of 10. Determine the percentage of samples of size 25 that have a mean score within 3 points of the population mean.

    (a) 38.30% (b) 93.32% (c) 13.36% (d) 86.64% (e) none of the above

14. The management of a local restaurant wants to estimate the average amount their customers spend at the restaurant to within \$0.50, with a 95% confidence. What is the minimum sample size required, if the standard deviation is assumed to be \$3.50.

    (a) 272 (b) 189 (c) 325 (d) 196 (e) none of the above

15. Of all students enrolled at a large undergraduate university, 27% are seniors, 23% are juniors, 27% are sophomores, and 23% are freshmen. A random sample of 200 students taken from this university yielded 50 seniors, 46 juniors, 55 sophomores, and 49 freshmen. One would like to test the null hypothesis that this sample is a random sample (this sample will be random if it includes 19% seniors, 23% juniors, 27% sophomores, and 23% freshmen). Thus the

    (a) $P - value < 0.025$

    (b) $0.05 < P - value < 0.1$

    (c) $P - value > 0.10$

    (d) cannot be determined because we don't know the number of degrees of freedom

    (e) none of the above

16. A simple random sample of size n is selected from a normal population with unknown mean μ and a known standard deviation $\sigma = 6.079$. We would like to test the hypothesis $H_0 : \mu = 10$ vs $H_a : \mu < 10$. The significance level is set at 5% and the critical region is: reject H_0 if $\overline{x} < 9$. Find the value of n needed to produce such a rejection region.

    (a)10 (b) 36 (c) 81 (d)100 (e) none of the above

17. The diameter of a spindle in a small motor is supposed to be 5mm. If the spindle is either too small or too large, the motor will not perform properly. The quality insurance engineer test a sample of 36 motors to determine the mean diameter has moved away form target, the hypothesis of interest here is

    (a) $H_0 : \mu = 5$ vs $H_a : \mu > 5$

    (b) $H_0 : \mu = 5$ vs $H_a : \mu < 5$

    (c) $H_0 : \mu = 5$ vs $H_a : \mu \neq 5$

    (d) $H_0 : \mu = 5$ vs $H_a : \mu \neq 10$

    (e) none of the above

18. The developer of a new filter for tipped cigarettes claims that it leaves less nicotine in the smoke than does the current filter. Because cigarette brands differ in a number of ways, he tests each filter on one cigarette of each of the nine brands and records the difference between the nicotine content for the current filter and the new filter. That is

    D = nicotine content of the old filter - nicotine content of the new filter

    Suppose the sample of 9 brands, $\overline{D} = 1.32\ mg$ and the sample standard deviation is $s = 2.35\ mg$ and the difference in the nicotine content follows a normal distribution. What's a 90% confidence interval for μ_d, the mean content of additional nicotine removed by the new filter?

    (a)(-0.116,2.756)(b)(0.116,1.320) (c)(1.320, 2.756) (d)(0.320,2.320) (e) none of the above

19. Refer to previous question 18. If you want to assess whether the developer's claim is correct, then the situation here may be described as

    (a) left tailed hypothesis

    (b) right tailed hypothesis

    (c) two tailed hypothesis

    (d) not enough information to determine the tails of the hypothesis

    (e) none of the above

20. Refer to previous question (19). What can be said about the p-value of the above formulated hypothesis?

    (a) P-value $> 10\%$ (b) $5\% <$ P-value $< 10\%$ (c) $1\% <$ P-value $< 5\%$ (d) P-value $< 1\%$ (e) none of the above