THE UNIVERSITY OF SYDNEY

MATH1905 Statistics Advanced

Semester 2	**Sample Quiz 2 – Week 12**	2012

Time allowed 40 minutes

For the multiple choice questions please circle the letter corresponding to your answer. For questions where the calculations are on R please write your answer in pen (to 4dp) in the box provided on the answer sheet.

Name:
SID:
Tutorial time:
Marks:

1. If X is a binomial random variable, $X \sim \mathcal{B}(5, 0.2)$, the value of $\mathrm{P}(X \geq 4)$ is
(a) 0.00672

2. Suppose that $X_1 \sim \mathcal{N}(0,\ 4)$ and $X_2 \sim \mathcal{N}(0,\ 4)$. Given that X_1 and X_2 are independent random variables, $P(X_1 + X_2 > 0)$ is, to 4 d.p.,

$\boxed{0.5000}$

3. If $X_1, X_2, \cdots, X_n$ is a random sample from a population with mean μ and variance σ^2 which of the following statements about the Central Limit Theorem (CLT) is **true**?

(a) The CLT states that for large n, $\sum_{i=1}^{n} X_i \sim \mathcal{N}(n\mu, n\sigma^2)$ approximately.

4. In the general population, 8% of people have O negative blood type. In a random sample of 200 people, the probability that there are at most 14 people with O negative blood type can be approximated using the Normal variable $Y \sim \mathcal{N}(16, 14.72)$. The approximation is:
(a) $\mathrm{P}(Y \leq 14.5)$

5. A random sample of 36 observations from a normal population is collected in order to test the hypothesis that the mean, μ, of the population is 10.0 because it is believed that the true population mean is smaller than 10. The sample mean is found to be $\overline{x} = 9$. The null and alternative hypotheses are:
(a) $H_0 : \mu = 10$, $H_1 : \mu < 10$

6. A P-value of 0.01 means:
(a) there is strong evidence against H_0

7. Suppose that we wish to test the hypotheses $H_0 : \mu = 10$ against $H_1 : \mu \neq 10$ based on a sample from a normal population $\mathcal{N}(\mu, \sigma^2)$ with $\sigma = 2$. Based on 16 observations from this population we find that $\overline{x} = 11$. This indicates that (to 3 d.p.)
(a) the P-value is 0.0455 and we have evidence against H_0.

8. You have a very large set of data: 0.00012, 0.00014, $\cdots\cdots\cdots$, 0.00192.
To save time with data entry, you type $12, 14, \cdots\cdots\cdots, 192$ into your computer instead of the original data. The output produced contains two statistics: $\overline{x}$ and s..

Which of the two statistics (if any) need correction for the scaling factor used?

(a) $\overline{x}$ and s

9. Use R to find c such that $P(|t_2| \leq c) = 0.90$.

qt(0.95,2) = 2.919986

10. Consider the following dice game where the player pays the casino \$1 to play. Two fair, six sided dice are thrown. If the sum of the numbers is at least 10 then the player gets \$8, otherwise the player loses his money. The expected win for the casino is
(a) loss of \$ 1/3

11. One year a local paper published the results of a market survey. Respondents were asked "Did you ave a Christmas tree last year?" Of the 175 respondents, 125 answered "Yes". An 95% confidence interval for the proportion of respondents who had a Christmas tree last year is:
(a) $\frac{5}{7} \pm c \times \sqrt{\frac{10/49}{175}}$ where $P(|Z| < c) = 0.95$.

12. An article "Caffeine Knowledge, Attitudes, and Consumption in Adult Women" (Journal of Nutrition Education, 1992, 179–184) reports the following summary data of effective caffeine consumption for a sample of adult women: $n = 17$, $\overline{x} = 200$mg, $s = 400$mg. Based on this sample, an appropriate 90% confidence interval for the amount of antitoxin needed is:
(a) $200 \pm c \times \frac{400}{\sqrt{17}}$ where $P(|t_{16}| > c) = 0.10$

13. A 95% confidence interval for the average bilirubin level (μ) was calculated from a random sample of 50, 4-day old infants to be 6 ± 0.25 (in mg per 100ml). Which of the following is incorrect:

(a) 95% of the 50 infants had levels in the range (5.25, 6.25).

14. Eight people are weighed before and after a diet. The differences $d_i = x_i - y_i$ of weights in kilograms before (x_i) and after (y_i) the diet are as follows:

$$0,\ -1.2,\ 2.6,\ 1.5,\ -0.4,\ -2.7,\ 1.9,\ 1.1,$$

Assuming the differences come from a symmetric population with mean μ, use R to find the P-value for testing $H_0 : \mu = 0$ against $H_1 : \mu > 0$ based on the sign test.

1-pbinom(3,7,0.5) = 0.5

15. Assume the differences in question 14 can be modelled by a normal population. Using the data in question 14 find the P-value for testing the same hypotheses based on the t-test.

t.test(x,alt="g") thus, P-value = 0.2959