STAT 2507 A Midterm Test Fall 2011 (SOLUTIONS)

NOTE: THERE WAS A NUMERICAL ERROR IN QUESTION#2 (EVERYONE RECEIVED 1.25 MARKS FOR IT).

Student # ——————————

NOTES:
1. The formula sheet and the normal table are attached.
2. There are 20 multiple-choice questions in this test.
3. For each question, CIRCLE ONE ANSWER ONLY.
4. Each question has 1.25 marks.

Question 1. You are told that the equation of the least-squares regression line for predicting y from x, based on $n = 10$ pairs of observations is $y = 1.73 - 2x$. If $s_x^2 = 1$ and $s_y^2 = 16$ then the equation of the least-squares regression line for predicting x from y, based on the same $n = 10$ pairs of observations is $x = a + by$, where b is

(a) $-1/16$ **(b)** $-1/8$ (*) **(c)** $-3/16$ **(d)** $-1/2$

Question 2. Suppose that in a particular city, airport A handles 40% of all airline traffic, and airports B and C handle 40% and 20%, respectively. The detection rates for weapons at the three airports are 0.9, 0.5, and 0.4, respectively. If a passenger is found to be carrying a weapon, what is the probability that he is using airport A?

Question 3. The following data represent a sample of 10 scores on a statistics quiz:

21 21 21 21 21 23 23 25 25 25

After the mean, median, range and variance were calculated for the scores, it was discovered that one of the three 25's should have been a 23. Which of the following will change when the calculations are redone using the correct scores?

(a) Both mean and range **(b)** Only the median
(c) Both variance and range **(d)** Both mean and variance (*)

Question 4. According to Tchebysheff's theorem,
(a) at least 25% of the observations fall inside the interval $\mu \pm 2\sigma$.
(b) at most 25% of the observations fall ouside the interval $\mu \pm 2\sigma$. (*)
(c) exactly 75% of the observations fall inside the interval $\mu \pm 2\sigma$.
(d) at least 75% of the observations fall outside the interval $\mu \pm 2\sigma$.

Question 5. Suppose that in new editions of statistics books there are on the average 6 typos per 400 pages and that the number of typos is Poisson distributed. A statistics instructor has just received a copy of a new statistics book. He notices that there are 400 pages. What is the probability that there are no typos?

(a) $6\,e^{-400}$ **(b)** $6\,e^{-6}$ **(c)** e^{-6} (*) **(d)** $400\,e^{-6}$

Question 6. The proportion of people having the blood type A in a large southern city is 0.6. Find the probability of at least one type A for two randomly selected donors.
(a) 0.48 **(b)** 0.64 **(c)** 0.84 (*) **(d)** 0.24

Question 7. During a particular period a university's information technology office received 25 service orders for problems with printers, of which 5 were inkjet printers and 20 were laser models. A random sample of 4 of these service orders is selected for inclusion in a customer satisfactory survey. What is the probability that exactly 3 of the selected service orders were for inkjet printers?
(a) $\frac{C_3^5\,C_1^{20}}{C_5^{25}}$ **(b)** $\frac{C_3^5\,C_2^{20}}{C_5^{25}}$ **(c)** $\frac{C_1^5\,C_3^{20}}{C_4^{25}}$ **(d)** $\frac{C_3^5\,C_1^{20}}{C_4^{25}}$(*)

Question 8. Which of the following randomly selected measurements, X, might be considered a potential outlier if it was selected from the given population?
(a) X=16 from a population with μ =8 and σ =4
(b) X=5 from a population with μ =1 and σ =4
(c) X=-3 from a population with μ =4 and σ =2 (*)
(d) X=4 from a population with μ =0 and σ =2

Question 9. Which of the following is/are binomial experiment/experiments?
(A) Drawing 7 balls without replacement from a box that contains 10 balls, 5 of which are red and 5 are blue, and observing the colours of the drawn balls.
(B) Drawing 7 balls with replacement from a box that contains 10 balls, 5 of which are red and 5 are blue, and observing the colours of the drawn balls.
(C) Selecting a few households from New York and observing whether or not they own stocks when it is know that 27% of all households in New York own stocks.
(a) Only (A) is true. **(b)** Only (B) and (C) are true.(*)
(c) Only (C) is true. **(d)** Only (A) and (C) are true.

Question 10. If the interval $(\mu - 2\sigma,\ \mu + 2\sigma)$ is equal to (1, 5), then the interval $(\mu - 3\sigma,\ \mu + 3\sigma)$ must be
(a) (2,4) **(b)** (0,6)(*) **(c)** (3,7) **(d)** Impossible to compute

Question 11. For the probability distribution of a discrete random variable X, the probability of any single value of X is always
(a) in the range 0 to 1(*) **(b)** 1 **(c)** less than zero **(d)** greater than 1

Question 12. In which of the following is one's chance best?
I. Throwing 3 fair dice, obtaining 3 "ones", followed by the throwing of 9 fair dice, obtaining no "ones".
II. Throwing a single fair die 6 times and obtaining at least 5 "fives".
III. Throwing a single fair die 4 times and obtaining 4 "fives".
Note: A "die" has six sides and i dots on the i-th side, $i = 1, 2, \cdots 6$.

(a) Best chance is **II** **(b)** Best chance is **III**
(c) Best chance is **I** (*) **(d)** Best chance is equal in cases **I** and **III**.

Question 13. According to an estimate, 50% of the people in the USA have at least one credit card. Suppose that a random sample of 30 persons is selected. Use a suitable approximation to find the probability that fewer than 19 of them will have at least one credit card.
(a) 0.0507 **(b)** 0.9493 **(c)** 0.8997(*) **(d)** 0.0511

Question 14. The following is a histogram of the summer incomes of a random sample of 99 high school students, in thousands of dollars.

Which of the following statements is false?
(a) The median income is less than \$1000.
(b) The mean is smaller than the median. (*)
(c) The distribution of the measurements is skewed to the right.
(d) The largest observation might be more than \$3000.

Question 15. Refer back to the histogram of question 14. An estimate of the standard deviation of the summer incomes is
(a) 475 dollars **(b)** 3000 dollars **(c)** 875 dollars (*) **(d)** 2000 dollars

Question 16. A certain city has one morning newspaper and one evening newspaper. It is estimated that 45% of the city's households subscribe to the morning paper, 50% subscribe to the evening paper, and 20% subscribe to both papers. If a household is randomly selected, what is the probability that it subscribes to exactly one of the 2 types of papers?
(a) 0.55 (*) **(b)** 0.65 **(c)** 0.75 **(d)** 0.85

Question 17. Given two bivariate observations, (2, 3) and (3.5, b), where $b < 2$, the value of the correlation coefficient r

(a) is always $+1$

(b) is always -1 (*)

(c) is always either $+1$ or -1, depending on the value of b

(d) can be any number in the range 0 and $+1$, depending on the values of b.

Question 18. Which of the following is/are not correct about the normal distribution?

(i) The total area under the curve is 1.

(ii) The curve is symmetric about the median.

(iii) The value of the mean is always greater than the value of the standard deviation.

(iv) As the variance increases, the mean decreases.

(a) Only (ii) is not correct. **(b)** Only (iii) is not correct.

(c) Only (iv) is not correct. **(d)** Only (iii) and (iv) are not correct.(*)

Question 19. Suppose the life span of a calculator manufactured by Texas Instruments has a normal distribution with a mean of 55 months and a standard deviation of 4 months. What is the probability that a randomly selected calculator will start malfunctioning within 60 months of the purchase?

(a) 0.8944 (*) **(b)** 0.7123 **(c)** 0.7995 **(d)** 0.9633

Question 20. Which of the boxplots best corresponds to the following stem and leaf plot? THE ANSWER IS (c).