STAT 2507 A Midterm Test Fall 2011 (SOLUTIONS)

NOTE: QUESTION#9 HAD SOME PROBLEMS (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. Which of the following statements is true.

(a) According to Tchebysheff's theorem at least 75% of the measurements fall outside the interval $\mu \pm 2\sigma$
(b) For the observations 2, 0, 0, 3, 1, -1, -2, the median and the mode are, respectively, 3 and 0.
(c) If a histogram is unimodal, then 50% of the measurements are less than the mean.
(d) (*) If the sample variance of 5 measurements is 0 then all 5 measurements are the same.

Question 2. In which of the following is one's chance best?
I. Throwing a single fair die 4 times and obtaining 4 "fives".
II. Throwing a single fair die 6 times and obtaining at least 5 "fives".
III. Throwing 3 fair dice, obtaining 3 "fives", followed by the throwing of 9 fair dice, obtaining no "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 3. The following data represent a sample of 10 scores on a statistics quiz:

16 16 16 16 16 18 18 20 20 20

After the mean, median, range and variance were calculated for the scores, it was discovered that one of the three 20's should have been an 18. 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 mean and variance (*) **(d)** Both Variance and range

Question 4. For the probability distribution of a discrete random variable X, the sum of the probabilities of all possible values of X is always

(a) greater than 1 **(b)** 1 (*) **(c)** less than 1 **(d)** in the range 0 to 1

Question 5. Which of the following randomly selected measurements, X, might be considered a potential outlier if it was selected from the given population?
(a) X=0 from a population with μ =0 and σ =2
(b) X=−5 from a population with μ =1 and σ =4
(c) X=7 from a population with μ =3 and σ =2
(d) X=4 from a population with μ =0 and σ =1 (*)

Question 6. The proportion of people having the blood type O in a large southern city is 0.4. Find the probability of at least one type O for two randomly selected donors.
(a) 0.48 **(b)** 0.64 (*) **(c)** 0.84 **(d)** 0.24

Question 7. Brown Manufacturing makes auto parts that are sold to auto dealers. Last week the company shipped 25 auto parts to a dealer. Later on, it found that five of those parts were defective. By the time the company manager contacted the dealer, four auto parts from that shipment had already been sold. What is the probability that three of those four parts were good parts and one was defective?
(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 is/are binomial experiment/experiments?
(A) Rolling a die many times and observing the number of spots.
(B) Rolling a die many times and observing whether the number obtained is even or odd.
(C) Selecting a few voters from a very large population of voters and observing whether or not each of them favours a certain proposition in an election when 54% of all voters are known to be in favour of this proposition.
(a) Only (A) is true. **(b)** Only (B) is true.
(c) Only (C) is true. **(d)** Only (B) and (C) are true. (*)

Question 9. A junk box in your room contains a dozen old batteries and five of them are totally dead. You start picking batteries one at a time and testing them. Find the probability that the first four you pick all work.
(a) 0.071 (*) **(b)** 0.024 **(c)** 0.086 **(d)** 0.035

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

Question 11. A racing car is one of the many toys manufactured by Mack Corporation. The assembly times for this toy follow a normal distribution with a mean of 55 minutes and a standard deviation of 4 minutes. The company closes at 5 pm every day. If one worker starts to assemble a racing car at 4 pm, the probability that she will finish this job before the company closes for the days is

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

Question 12. Suppose that in a particular city, airport A handles 50% of all airline traffic, and airport B and C handle 30% 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?
(a) 0.53 **(b)** 0.86 **(c)** 0.58 **(d)** 0.66 (*)

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

Questions 14 and 15 are based on the following histogram of the lifelengths (in hours) of a random sample of 100 electrical components.

Question 14. Which of the following statements is false?
(a) The median lifelength is more than 1 hour. (*)
(b) The mean is larger than the median.
(c) The distribution of the measurements is skewed to the right.
(d) The largest observation might be more than 3.25.

Question 15. Which of the following statements is false?
(a) More than 50% of the components last less than 1 hour.
(b) The range cannot exceed 3.5.
(c) It makes sense to use $(0.875)^2$ as an approximation to the sample variance of the lifelengths.

(d) It makes sense to use 0.875 as an approximation to the lower quartile of the lifelengths. (*)

Question 16. 50% of all customers of a large insurance company have car insurance policies, 40% have homeowner policies, and 25% have both types of policy. If a customer is randomly selected what is the probability that she/he has exactly one of the 2 types of policy?

(a) 0.5 **(b)** 0.3 **(c)** 0.4 (*) **(d)** 0.6

Question 17. Given two bivariate observations (2 ,3) and (3.5, b), where $b > 3.2$, 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 mean.
(iii) The value of the mean is always greater than the value of the standard deviation.
(iv) Most of the probability fall within 1 standard deviation of the mean.

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