

## Statistics 151 Practice Midterm 2 – Multiple Choice (50 minutes)

Instructions:

1. This is a closed book exam.
  2. You may use the STAT 151 formula sheets and tables provided and a NON-PROGRAMMABLE calculator only.
  3. You have 50 minutes to complete the exam.
  4. The exam consists of 25 multiple choice questions worth 1 mark each.
  5. Topics covered: Chapters 1 – 8 in Agresti/Franklin 2.
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1. The number of undergraduates at Johns Hopkins University is approximately 2000, while the number at Ohio State University is approximately 40,000. At both schools a simple random sample of about 3% of the undergraduates is taken. We conclude that
  - A) the sample from Johns Hopkins has almost the same sampling variability as that from Ohio State.
  - B) it is impossible to make any statements about the sampling variability of the two samples because the students surveyed were different.
  - C) the sample from Johns Hopkins has more sampling variability than that from Ohio State.
  - D) the sample from Johns Hopkins has less sampling variability than that from Ohio State.

Use the following to answer questions 2-3:

An agricultural researcher plants twenty-five plots with a new variety of corn. The average yield for these plots is 150 bushels per acre with standard deviation of 10. Assume that the yield per acre for the new variety of corn follows a normal distribution.

2. A 95% confidence interval for  $\mu$  is
  - A)  $150 \pm 3.42$ .
  - B)  $150 \pm 3.92$ .
  - C)  $150 \pm 4.13$ .
  - D)  $150 \pm 4.98$ .
3. Which of the following would produce a confidence interval with a smaller margin of error than the 95% confidence interval you computed above?
  - A) Plant 100 plots rather than 25.
  - B) Compute a 99% confidence interval rather than a 95% confidence interval. The increase in confidence indicates that we have a better interval.
  - C) Plant only 5 plots rather than 25, since 5 are easier to manage and control.
  - D) None of the above.
4. A statistic is said to be unbiased if
  - A) it is used for only honest purposes.
  - B) the mean of its sampling distribution is equal to the true value of the parameter being estimated.
  - C) the survey used to obtain the statistic was designed so as to avoid even the hint of racial or sexual prejudice.
  - D) both the person who calculated the statistic and the subjects whose responses make up the statistic were truthful.
5. Ignoring twins and other multiple births, assume babies born at a hospital are independent events with the probability that a baby is a boy and the probability that a baby is a girl both equal to 0.5. If the first 4 children born are girls, what is the probability the next born child is a boy?
  - A) 0.5.
  - B) 1.0.
  - C) 0.75.
  - D) 0.8.
6. A television station is interested in predicting whether or not voters are in favor of an increase in the state sales tax. It asks its viewers to phone in and indicate whether they support or are opposed to an increase in the state sales tax in order to generate additional revenue for education. Of the 2633 viewers who phone in, 1474 (55.98%) are opposed to the increase. The sample obtained is
  - A) probably biased.
  - B) a simple random sample.
  - C) a stratified random sample.
  - D) a probability sample in which each person in the population has the same chance of being in the sample.



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14. An event  $A$  will occur with probability 0.5. An event  $B$  will occur with probability 0.6. The probability that both  $A$  and  $B$  will occur is 0.1. We may conclude  
 A) that events  $A$  and  $B$  are independent.                      C) that either  $A$  or  $B$  always occurs.  
 B) that events  $A$  and  $B$  are disjoint.                              D) None of the above.
15. Suppose that  $A$  and  $B$  are two independent events with  $P(A) = 0.2$  and  $P(B) = 0.4$ .  $P(A \text{ or } B)$  is  
 A) 0.60. B) 0.12. C) 0.08. D) 0.52.
16. You plan to construct a confidence interval for the mean  $\mu$  of a normal population with (known) standard deviation  $\sigma$ . Which of the following will reduce the size of the margin of error?  
 A) Reduce  $\sigma$     C) Use a lower level of confidence  
 B) Increase the sample size    D) All of the above.
17. I toss a penny and observe whether it lands heads up or tails up. Suppose the penny is fair, i.e., the probability of heads is  $1/2$  and the probability of tails is  $1/2$ . This means  
 A) every occurrence of a head must be balanced by a tail in one of the next two or three tosses.  
 B) regardless of the number of flips, half will be heads and half tails.  
 C) if I flip the coin many many times the proportion of tails will tend to get closer and closer to  $1/2$ .  
 D) All of the above.
18. In a particular game, a fair die is tossed. If the number of spots showing is either four or five, you win \$1. If the number of spots showing is six, you win \$4. And if the number of spots showing is one, two, or three, you win nothing. You are going to play the game twice. The probability that you win \$4 both times is  
 A)  $1/4$ . B)  $1/36$ . C)  $1/6$ . D)  $1/3$ .
19. A company produces packets of soap powder that are labeled "Giant Size 32 Ounces." The actual weight of soap powder in a box has a normal distribution with a mean of 33 oz. and a standard deviation of 0.7 oz. 95% of packets actually contain more than  $x$  oz. of soap powder. What is  $x$ ?  
 A) 31.85 B) 31.60 C) 34.15 D) 34.40

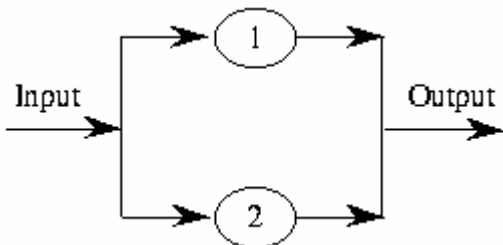
Use the following to answer question 20:

Let the random variable  $X$  represent the profit made on a randomly selected day by a certain store. Assume  $X$  is normal with a mean of \$360 and standard deviation \$50.

20. The value of  $P(X > \$400)$  is  
 A) 0.7881. B) 0.2881. C) 0.2119. D) 0.8450.

Use the following to answer question 21:

A system has two components that operate in parallel, as shown in the diagram below. Because the components operate in parallel, at least one of the components must function properly if the system is to function properly. The probabilities of *failures* for the components 1 and 2 during one period of operation are .20 and .03, respectively. Let  $F$  denote the event that the component 1 *fails* during one period of operation and  $G$  denote the event that component 2 *fails* during one period of operation. The component failures are independent.

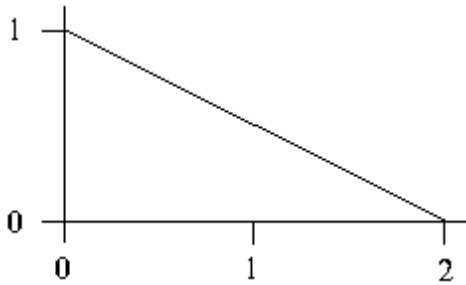


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21. The event corresponding to the above system functioning properly during one period of operation is  
A)  $F$  and  $G$ . B)  $F$  or  $G$ . C) not  $F$  or not  $G$ . D) not  $F$  and not  $G$ .
22. I collect a random sample of size  $n$  from a population and from the data collected compute a 95% confidence interval for the mean of the population. Which of the following would produce a new confidence interval with larger width based on these same data?  
A) Use a smaller confidence level.  
B) Nothing can guarantee absolutely that you will get a larger interval. One can only say the chance of obtaining a larger interval is 0.05.  
C) Use the same confidence level, but compute the interval  $n$  times. Approximately 5% of these intervals will be larger.  
D) Use a larger confidence level.
23. A Senator wants to know what the voters of his state think of proposed legislation on gun control. He mails a questionnaire on the subject to an SRS of 2500 voters in his state. His staff reports that 448 questionnaires have been returned, of which 343 support the legislation. The population is  
A) the 343 letters supporting the legislation.  
B) the voters in his state.  
C) the 2500 voters receiving the questionnaire.  
D) the 448 letters received.

Use the following to answer question 24:

Suppose  $X$  is a continuous random variable taking values between 0 and 2 and having the probability density function below.



24.  $P(1 \leq X \leq 2)$  has value  
A) 0.50. B) 0.00. C) 0.25. D) 0.33.
25. An event  $A$  will occur with probability 0.5. An event  $B$  will occur with probability 0.6. The probability that both  $A$  and  $B$  will occur is 0.1. The conditional probability of  $A$  given  $B$   
A) Cannot be determined from the information given.  
B) is 0.167.  
C) is 0.833.  
D) is 0.200.