

Sample Exam 2 - STAT 303 Session 201
Summer 2009

Name:

UIN:

Signature:

1. Do not open this test until told to do so.
2. Turn in your exam with your answers circled when you are done with the exam. You should not take the exam with you.
3. This is a closed book examination. You may use one both-sided sheet of formulas that you have brought with you. You should have no other printed or written material with you on the exam.
4. You have 60 minutes to work on this exam. There are 16 multiple choice questions and 4 work out questions, each worth 5 points.
5. You may use a calculator but not a phone during the exam.
6. If you are unsure of what a question is asking for, do not hesitate to ask the instructor or course assistant for clarification.
7. Do not sit directly next to another student.
8. Good Luck!!!

1. Which of the following is (are) appropriate statements about randomness and/or probability?
 - (a) A phenomenon is called random if individual outcomes are uncertain but in a large number of repetitions there is a regular distribution of outcomes.
 - (b) The word random in statistics is a description of a kind of order that emerges in the long run.
 - (c) Probability describes only what happens in the long run.
 - (d) In a small or moderate number of repetitions, the observed proportion of an outcome can be far from the probability of the outcome.
 - (e) **All of the above are appropriate statements.**

2. What are the missing probability and the mean for the distribution below?

X	0	1	2	3	4
p(X)	0.4	0.3	0.15	0.1	???

- (a) Without the probability, we cannot determine the mean.
 - (b) $P(X = 4) = 0.5$ and $\mu = 1.4$
 - (c) $P(X = 4) = 0.5$ and $\mu = 2.9$
 - (d) $P(X = 4) = 0.05$ **and** $\mu = 1.1$
 - (e) $P(X = 4) = 0.05$ and $\mu = 1.5$

3. Suppose a simple random sample is selected from a population with mean, μ and variance, σ^2 . The central limit theorem tells us that
 - (a) The sample mean, \bar{x} , gets closer to the population mean, μ , as the sample size increases.
 - (b) If the sample size n is sufficiently large, the sample will be approximately normal.
 - (c) The mean of \bar{X} will be μ if the sample size n is sufficiently large.
 - (d) **If the sample size is sufficiently large, the distribution of \bar{X} will be approximately normal with mean μ and standard deviation, $\frac{\sigma}{\sqrt{n}}$.**
 - (e) The distribution \bar{X} will be normal only if the population from which the sample is selected is also normal.

4. Suppose a simple random sample of 100 observations is to be selected from a population that is highly skewed with mean $\mu = 4$ and variance $\sigma^2 = 8$. Which of the following statements about the sampling distribution of \bar{X} is FALSE?
 - (a) The distribution of \bar{X} will have mean $\mu = 4$.
 - (b) The distribution will be approximately normal.

- (c) **Because the distribution is highly skewed, the shape of the distribution of \bar{X} will also show skewness.**
- (d) Even though the distribution of the population variable is skewed, the distribution of \bar{X} will be approximately symmetric around $\mu = 4$.
- (e) The standard deviation of the distribution of \bar{X} will be $\sigma = 0.283$.
5. What is the missing probability and then the mean of the distribution below?

X	-1	0	2	4
p(X)	0.4	???	0.3	0.1

- (a) 0 and $\mu = 0.6$
- (b) 0.2 and $\bar{X} = 0.6$
- (c) **0.2 and $\mu = 0.6$**
- (d) 0 and $\mu = 1.4$
- (e) 0.2 and $\mu = 1.4$
6. Using the previous distribution, how likely are you to draw a 2 and a 4?
- (a) 0.03
- (b) 0.4
- (c) 0.3
- (d) **0.2**
- (e) 0.5
7. When figure skaters need to find a partner for “pair figure skating,” it is important to find a partner who is compatible in weight. The weight of figure skaters can be modeled by a normal distribution. For male skaters, the mean is 170 lbs with a standard deviation of 10 lbs. For female skaters, the mean is 110 lbs with a standard deviation of 5 lbs. Let the random variable X = the weight of female skaters and the random variable Y = the weight of male skaters. What is the distribution of the SUM of the weights, $X + Y$, if the weights of the partners are independent?
- (a) We do not know if the distribution of the sum is normal.
- (b) $N(280, 11^2)$ (Answer)
- (c) $N(280, 15^2)$
- (d) $N(60, 5^2)$
- (e) $N(60, 15^2)$

8. How likely would the AVERAGE of 9 male skaters be more than 180 lbs, $P(\bar{Y} > 180)$?
- (a) **0.0013**
 - (b) 0.1587
 - (c) 0.8413
 - (d) 0.9987
 - (e) 0
9. How much would a female skater weigh if she was in the 80th percentile?
- (a) 80% of 110, 88 lbs.
 - (b) **114.2**
 - (c) 114
 - (d) 112.9
 - (e) 110.8
10. The law allows marketers of herbs and other natural substances to make health claims that are not supported by evidence. Brands of ginkgo extract claim to “improve memory and concentration”. A randomized comparative experiment found no evidence for such effects. The subjects were 300 healthy volunteers over 60 years old, with 120 women and 180 men. 60 of the women and 90 of the men were randomly assigned to take a ginkgo extract pill, while the remaining women and men were assigned to take a placebo pill. All subjects took a battery of tests for learning and memory before treatment started and again after six weeks. What element of good experiments is missing from this study?
- (a) Blinding
 - (b) Control group
 - (c) Randomization
 - (d) Using enough subjects
 - (e) **None of the above all the elements are present**
11. Which of the following is(are) true statements?
- (a) A probability is to a population what a sample proportion is to a sample.
 - (b) A probability can help us decide whether to believe a claim about a population (some value for a parameter) or not.
 - (c) We can use the normal distribution to find the probability of any event as long as our sample is large enough.

- (d) All of the above are true.
- (e) **Only two of the above are true.**
12. Suppose the we are sampling family income data (skewed to the right data). If the true mean is \$500 per week with standard deviation \$20 per week, what is the distribution of the average of 50 families weekly income?
- (a) $\bar{X}_{50} \sim N\left(500, \left(\frac{20}{50}\right)^2\right)$
- (b) $\bar{X}_{50} \sim N\left(500, \left(\frac{400}{50}\right)^2\right)$
- (c) $\bar{X}_{50} \sim N\left(500, \left(\sqrt{\frac{400}{50}}\right)^2\right)$ (Answer)
- (d) The mean would be 500 and the standard deviation 8, but it wouldnt be normal since the data is skewed.
- (e) The mean would be 500 and the variance 8, but it would not be normal since the data is skewed.
13. Using the discrete distribution, how likely are we to get all 1s if we draw two times, assuming each draw is independent?

X	0	1	2	3	4
p(X)	0.4	0.3	0.15	0.1	0.05

- (a) 0.6
- (b) 0.3
- (c) **0.09**
- (d) 0.0001
- (e) We don't know the exact probability using above information.
14. If $X \sim N(25, 14^2)$, how likely are we to get a sample mean from a sample of 25 that is less than 20?
- (a) 0.0179
- (b) 0.9633
- (c) 0.9821
- (d) **0.0367**
- (e) 0.3594
15. As the number of observations increases (the sample size increases),
- (a) the sample statistic (\bar{X}) gets closer to the true parameter (μ).
- (b) the distribution of the sample statistic looks more normal.

- (c) the sample statistic becomes less biased.
 - (d) Only two of the three statements are true.
 - (e) **All of the above are true.**
16. What is $P(-2.98 < Z < -1.56)$?
- (a) 0.0608
 - (b) 0.9392
 - (c) **0.0580**
 - (d) 0.9420
 - (e) You cant get a negative probability, so this is not possible.
17. Why do we use the sample mean, \bar{x} , to estimate the population mean, μ , rather than the sample median, \tilde{x} ?
- (a) because it makes sense to use a mean to estimate a mean
 - (b) because the sample mean is unbiased
 - (c) Both \bar{x} and \tilde{x} are unbiased so it does not matter which one we use.
 - (d) **because \bar{x} almost always has a smaller variance than \tilde{x}**
 - (e) It does not matter since \bar{x} and \tilde{x} are the same value for normal data.
18. The capacity of a brand of fish tank is normally distributed with a mean of 15 Liters and a standard deviation of 2 Liters. What proportion of fish tanks have a capacity between 16 and 18.5 Liters?
- (a) **0.27**
 - (b) 0.89
 - (c) 0.11
 - (d) 0.73
 - (e) 0.69
19. Why is the Central Limit Theorem so important in the study of statistics?
- (a) It allows us to use the normal distribution for any kind of data.
 - (b) It tells us that any data can be approximately normal if we take a large enough sample.
 - (c) It tells us that any sample mean can be approximately normal.
 - (d) It tells us that any sample mean will be unbiased.
 - (e) **None of the above are true statements of the CLT.**

20. In the fall of 2003, a magazine article reported that about 87% of adults drink milk. A local dairy farmers association is planning a new marketing campaign for the tri-county area they represent. They randomly polled 800 people in the area. In this sample, 654 people said that they drink milk. If 87% is the correct percentage of adults who drink milk, what is the sampling distribution of the sample proportion, p_{800} ?

(a) We cannot tell if the shape is normal since we do not have a plot of the data.

(b) $N(0.87, 0.00014^2)$

(c) $\mathbf{N(0.87, 0.01189^2)}$ (Answer)

(d) $N(0.00109, 0.00014^2)$

(e) $N(0.87, 0.00109^2)$