

Stat 2000 International – Sample Midterm 2

Midterm 2 consists of 25 questions: 15 multiple-choice questions (with exactly 1 correct answer) and 10 text-based questions where you have to provide a verbal explanation or calculate one or multiple numerical values. Some of the questions require you to use WebStat or any of the interactivities from within CyberStats.

The exam is worth a total of **200 points**. The number of points for each question is indicated in parentheses at the beginning of each question. You have exactly **60 minutes** to complete the exam. Try to correctly answer as many questions as possible during this time period. **You are allowed to answer questions in any order.** Start with a question that seems the easiest for you. If you cannot answer a question within a short time, move to another question, and come back to the previously unanswered questions toward the end of the exam.

Obviously, you are allowed to correct your answers. However, only your last submitted answer will be graded. If you change a previously correct answer and your last submitted answer is incorrect, you will obtain 0 points for your last submitted answer.

Note:

The actual exam will be fully given within CyberStats. This means you will have to mark your choices of multiple-choice questions and fill in answers to text-based questions within CyberStats. In the actual exam, interactivities will be directly linked to the questions. Make sure to memorize your CyberStats password for the exam.

1. (6 Points) A community council wishes to determine the probability that a randomly chosen driver comes to a complete stop at an intersection before proceeding through the intersection. They estimate this probability by positioning workers at several key intersections during rush hour to record whether drivers come to a complete stop or not.

The number of drivers that come to a complete stop is an example of a

- a. continuous random variable
 - b. uniform distribution
 - c. normal distribution
 - d. discrete random variable
 - e. no answer or skip this item
2. (6 Points) A business currently has 5 telephone lines. Suppose the number of lines in use at any one time has the following distribution:

Phone lines	Probability
0 lines	.10
1 line	.28
2 lines	.44
3 lines	.14
4 lines	.02
5 lines	.02

What is the probability that at least 2 lines are in use?

- a. 0.82
 - b. 0.62
 - c. 0.38
 - d. 0.18
 - e. no answer or skip this item
3. (6 Points) A fair coin is repeatedly flipped, where the player wins \$4.00 if a head shows, otherwise the player loses \$4.00. You win \$4 when a 'head' is flipped; you lose \$4 when a 'tail' is flipped. The expected value of the amount won or lost is \$0.

X	-\$4	+\$4
$\text{Pr}(X)$	0.5	0.5

What is the standard deviation for the random variable x = amount won or lost on a single play?

- a. 0
 - b. 2
 - c. 4
 - d. 6
 - e. no answer or skip this item
4. (6 Points) A life insurance company is determining the mean payout per policy for \$50,000 life insurance policies on 50 year old women. These policies have an accidental death benefit that pays beneficiaries twice the policy amount when the death is accidental. The probability is 27/10,000 that a 50 year old woman dies from natural causes during the year she is 50, and the probability is 1/10,000 that she dies from accidental causes during that year.

X	0	\$50,000	\$100,000
$\text{Pr}(X)$	9,972/10,000	27/10,000	1/10,000

What is the expected value of the mean amount paid out?

- a. \$0
 - b. \$145
 - c. \$10,000
 - d. \$20,000
 - e. no answer or skip this item
5. (6 Points) A machine produces parts. The probability that an individual part is defective is .008. If a random sample of 10 parts contains one or more defective parts, the machine is shut down for repairs.

What is the probability that the machine will NOT be shut down for repairs based on one sample?

- a. 0.923
- b. 0.0772
- c. 0.9972
- d. 0.0028
- e. no answer or skip this item

6. (6 Points) The ideal temperature, in degrees Fahrenheit, for a number of students, on an ideal summer day is assumed to be normal distributed with a mean of 78.60F and a standard deviation of 5.70F. What observation has a standardized score equal to 1.67?
- a. About 80.0F
 - b. About 88.0F
 - c. About 77.0F
 - d. About 84.0F
 - e. no answer or skip this item
7. (6 Points) A decrease in the standard deviation causes the normal curve _____.
- a. to become less peaked
 - b. to become more peaked
 - c. to shift to the right
 - d. to shift to the left
 - e. no answer or skip this item
8. (6 Points) Which of the following does not describes the approximate sampling distribution of the proportion of "heads" in 50 flips of a fair coin?
- a. The sampling distribution of the proportion of "heads" in 50 flips of a fair coin would be approximately normally distributed.
 - b. The sampling distribution of the proportion of "heads" in 50 flips of a fair coin center with a mean (proportion) of 0.5.
 - c. The sample proportions are spread from about 0.36 to 0.64.
 - d. The sampling distribution of the proportion of "heads" in 50 flips of a fair coin would be skewed towards the higher values.
 - e. no answer or skip this item
9. (6 Points) The average height of the students in a large university is 68 inches, and the s.d. is 3 inches. Imagine choosing 25 students at random from the university and finding the mean height of the sample of 25. The mean of the sample mean is closest to
- a. 25
 - b. 68
 - c. 340
 - d. 75
 - e. no answer or skip this item

- 10.** (6 Points) An individual makes sales on an average of \$800 per day during a 5 day work week. The standard deviation of the amount is \$120. Assume that the days are independent.

The standard deviation of the (sum) total sales over 5 days is closest to

- a. \$24
 - b. \$160
 - c. \$268.33
 - d. \$600
 - e. \$4000
 - f. no answer or skip this item
- 11.** (6 Points) The chi-squared distribution is not used to _____.
- a. test a hypothesis in two-way tables
 - b. calculate probabilities concerning the standard deviation
 - c. describe the sampling distribution of sample proportions
 - d. describe the sampling distributions of sums of squares of independent normal variables
 - e. no answer or skip this item
- 12.** (6 Points) The following ranges are possible 95% confidence intervals for the percentage of Americans who think that recent changes in the stock market have made them feel less confident about the nation's economy.
- For which of the confidence intervals could you conclude that a majority of the population feels that recent changes in the stock market have made them feel less confident about the nation's economy?
- a. 29% to 37%
 - b. 25% to 33%
 - c. 47% to 52%
 - d. 52% to 55%
 - e. no answer or skip this item
- 13.** (6 Points) In February 2001, a random sample of 1,011 people were surveyed by the Harris poll about seatbelt use. The 95% margin of error of the survey was 3 percentage points. One of the results was:

81% of adults now claim that they always wear seatbelts in the front seat of a car.

What is the 95% confidence interval for the percentage of adults who say they always wear seatbelts in the front seat of a car?

- a. We can be 95% confident that between 75% and 87% of all adults say they always wear seatbelts in the front seat of a car.
- b. We can be 95% confident that between 76% and 86% of all adults say they always wear seatbelts in the front seat of a car.
- c. We can be 95% confident that between 77% and 85% of all adults say they always wear seatbelts in the front seat of a car.
- d. We can be 95% confident that between 78% and 84% of all adults say they always wear seatbelts in the front seat of a car.
- e. no answer or skip this item

14. (6 Points) A fish biologist was interested in determining the average number of fish per 1000 feet in a local trout stream. She caught and released fish on 49 randomly selected 1000 foot intervals of the stream. Based on the data collected, she calculated 90%, 95%, 98% and 99% confidence interval for the true average number of fish per 1000 feet.

Which of the following must be the 90% confidence interval?

- a. 21.7 to 24.3
- b. 21.5 to 24.5
- c. 22.1 to 23.9
- d. 21.9 to 24.1
- e. no answer or skip this item

15. (11 Points) Wanting to estimate the average adult body temperatures, in degrees Fahrenheit, a researcher selected a random sample of 62 healthy adult Americans. Use WebStat to calculate a 90% confidence interval for the true average body temperature of healthy adult Americans. Use a standard deviation of 0.65 degrees. Load from 'Data>Sample data' the data set Body-temps-62_adults.dat to answer the following question.

Which statement statement correctly summarizes the confidence interval?

- a. We can be 90% confident that the true average body temperature of healthy adult Americans is between 98.14 and 98.46 degrees Fahrenheit.
- b. We can be 90% confident that the true average body temperature of healthy adult Americans is between 98.17 and 98.44 degrees Fahrenheit.
- c. We can be 90% confident that the true average body temperature of healthy adult Americans is between 98.20 and 98.41 degrees Fahrenheit.

- d. We can be 95% confident that the true average body temperature of healthy adult Americans is between 98.20 and 98.41 degrees Fahrenheit.
- e. no answer or skip this item

16. (10 Points) A random number generator produces the digits 0 through 9 randomly.

What is the probability that a random digit will be at most 5?

17. (10 Points) The U.S. Census Bureau projected that in the year 2000, 8% of the residents of California will be black and 30% of Hispanic origin. An opinion poll taken in the year 2000 is based on a random sample of 700 California residents.

Find the expected (mean) number of blacks in the poll and the standard deviation of the number of blacks in such polls.

18. (10 Points) Imagine two scales for weighing objects. Scale A is accurate to within 1 ounce, which means the standard deviation of the weighings when weighing an object many times will be about 1 ounce. Scale B is much better. It is accurate to within 0.2 ounces. Assume that weighings on the scales are independent of each other, and that the scales are unbiased. That is, the mean of many, many weighings of an object will be essentially the true weight of the object.

Compare the accuracy of one weighing on Scale B to the sample mean of 25 weighings on Scale A.

19. (10 Points) Imagine taking a random sample from a large university, looking at the weights of the people in the sample. For the entire university, the average weight is 140 pounds, and the standard deviation is 30 pounds.

If the sample has $n = 10$ people, what is the chance that the sample standard deviation is between 25 and 35 pounds?

20. (10 Points) An experiment is done to identify people who might have extrasensory perception (ESP). In each of 20 trials, the researcher randomly selects one of four cards. The participant "guesses" which card has been selected.

The sampling distribution of the number of correct guesses in 20 tries is a binomial distribution. Assuming that a participant randomly guesses, what are the values of n and p for this model?

21. (11 Points) The Graduate Record Examination (GRE) is a test taken by college students who intend to pursue a graduate degree in the United States. A longterm average for the verbal ability portion of this exam of all college seniors and graduates who take this exam is 494, with a standard deviation of 115. Assuming that the histogram of all GRE scores follows the normal curve, answer the following question. Use a normal curve calculator or a normal table of your choice.

If you received a score of 650 on the GRE exam, what percentile of the distribution would you be in?

22. (11 Points) You'll need the normal curve calculator for this question.

The heights of women have a distribution that is approximated by a normal curve with a mean of 65 inches and a standard deviation equal to 2.7 inches.

About what proportion of women are between 62 and 68 inches tall?

23. (11 Points) In a taste test, each of 50 people tastes two brands of soft drink and indicates which soda tastes better. We'll refer to the two brands as Brand A and Brand B. Assume the 50 participants have been sampled from a population in which there's an equal preference for the two sodas. In other words, assume $p=0.5$ where p is the probability that a randomly selected person prefers Brand A. (Note: This problem is similar to Example 2 in Unit B-11.)

Use the binomial probability calculator associated with **Exercises 22-26 in Exercises 3 in Unit B-11: Sampling Distribution** to determine this probability. What is the chance that at least 30 of the 50 participants prefer Brand A?

24. (11 Points) **Example 1 in Unit B-13: chi-Squared Distributions** contained data on people's political interest, intention to vote, and amount of high school education. We reorganize the data below into two tables, one for people with some high school education and one for people with no high school education. In each table, we look at the relationship between amount of political interest and whether the person intends to vote:

	Some High School	
Political Interest	Intends to vote	Does not intend to vote
Great	490	5
Moderate	917	69
None	74	58

The chi-squared statistic for testing the independence of intention to vote and political interest for those with some high school is 260.34.

What is the chance a chi-squared with those degrees of freedom exceeds 260.34?

Use the interactive in **Exercise 2, in Unit B-13: chi-Squared Distributions** to support your answer.

25. (11 Points) Lee Salk, a psychologist, designed a study to determine whether there was survival value to having a newborn infant in regular earshot of its mother's heartbeat:

A sample of 102 newborns was placed in a nursery with the sound of a human heartbeat playing continuously over a loudspeaker.

A second sample of 112 newborns was placed in a nursery with no sound playing.

In each case, Salk measured how much weight the babies gained or lost, in grams, after four days.

Calculate 95% confidence intervals for means of two populations, using the Data Tools and the 'Infants-mother_heartbeat' data set (the Web Tool Interactive with the 'Infants-mother_heartbeat' data set loaded can be found in **Unit C-2 Confidence Intervals for the Mean: Example 2**). Use the confidence intervals to draw a conclusion about the difference in the mean weight gain of the two populations.