MA 180/418 Midterm Test 1 (Sample)

Student Name (PRINT):....

Student Signature:

Use pencil, so that you can erase and rewrite if necessary.

The test consists of 10 questions.

Questions 1 through 5 are multiple-choice and worth 5 points each. Questions 6 through 10 are computational and worth 15 points each.

For questions 1 through 5, circle the correct answer $(\mathbf{a}, \mathbf{b}, \mathbf{c}, \text{ or } \mathbf{d})$ after each question. Each question is 5 points. No partial credit.

Q1 What is the difference between **mean** and **median** of a set of data?

- (a) The mean is the arithmetic average of the data values while the median is the average of the largest and smallest data values.
- (b) The mean is the average of the largest and smallest data values while the median is the middle value when the original data values are arranged in order of increasing (or decreasing) magnitude.
- (c) The mean is the arithmetic average of the data values while the median is the middle value when the original data values are arranged in order of increasing (or decreasing) magnitude.
- (d) The mean is the arithmetic average of the data values while the median is the square of the mean.

Correct answer (circle one): (a) (b) (c) (d)

Q2 What is the meaning of the term **z-score**? What are **usual z-scores**?

- (a) A z-score is the distance of a given value x from the mean. Usual z-scores are those smaller than twice of the mean.
- (b) A z-score is the number of standard deviations that a given value x is above or below the mean. Usual z-scores are those between -2 and 2.
- (c) A z-score is the distance of a given value x from the mean. Usual z-scores are those between -2 and 2.
- (d) A z-score is the number of standard deviations that a given value x is above or below the mean. Usual z-scores are those between -3 and 3.

Correct answer (circle one): (a) (b) (c) (d)

Q3 What is the meaning of the term **probability distribution**?

- (a) A probability distribution is a statement of all possible elementary outcomes of a procedure, with a stated probability for each outcome such that the sum of the probabilities is between 0.0 and 1.0.
- (b) A probability distribution is a statement of all possible elementary outcomes of a procedure, with a stated probability for each outcome such that the sum of the probabilities is 0.0.
- (c) A probability distribution is a statement of all possible elementary outcomes of a procedure, with a stated probability for each outcome such that the sum of the probabilities is at least 1.0.
- (d) A probability distribution is a statement of all possible elementary outcomes of a procedure, with a stated probability for each outcome such that the sum of the probabilities is 1.0.

Correct answer (circle one): (a) (b) (c) (d)

Q4 Which statement regarding **usual** and **unusual values** for a probability distribution is correct?

- (a) The minimum usual value is the mean minus 2 times the standard deviation. The maximum usual value is the mean plus 2 times the standard deviation.
- (b) An unusual value is the value which lies within two standard deviations of the mean.
- (c) If a value is less than the maximum usual value, then it is usual.
- (d) If a value is greater than the minimum usual value, then it is usual.

Correct answer (circle one): (a) (b) (c) (d)

Q5 What is the best definition for the term **Central Limit Theorem**?

- (a) It means that the central value (or mean) of a standard normal distribution is 0.
- (b) It means that a probability distribution has a central value equal to the sample size divided by the population standard deviation.
- (c) It means that a sampling distribution will be normal if the original population is normally distributed, or if the sample size is greater than 30.
- (d) It means that the limit on the sample size is 30 if we want the sample mean to equal the population mean.

Correct answer (circle one): (a) (b) (c) (d)

For questions 6 through 10, write your answer in the space provided. Show your work. Each question is worth 15 points.

Q6 Listed below are the numbers of bankruptcy filings in Dutchess County, New York State, for each month in a certain year:

 $55 \quad 87 \quad 90 \quad 76 \quad 129 \quad 95 \quad 44 \quad 87 \quad 68 \quad 79 \quad 61 \quad 49$

Find the following measures for this sample (round off to one decimal place):

Range =	Midrange =		
Mean =	Median =		
St. Deviation $=$	Variance =		

For extra credit, find quartiles Q_1 and Q_3 and identify unusual values.

Q7 Assume that a procedure yields a binomial distribution with a trial repeated 12 times, and the probability of success on each trial is 0.2.

(a) Find the probability that exactly 3 successes are observed by using the binomial formula or a calculator (state which method you use):

P(3) =

(b) Find the mean μ = and the standard deviation σ =

(c) Find $\mu \pm 2\sigma$, and give interpretation to these values

For extra credit, find P(at most 3) =

Q8 Assume that adults have IQ scores that are normally distributed with a mean of 100 and a standard deviation of 15. Answer the questions below by using Table A.2 or a calculator (state which method you use). Draw a diagram in each case.

(a) Find the probability that a randomly selected adult has an IQ between 105 and 125.

(b) Find the IQ score separating the bottom 90% from the top 10% of adults.

(c) If 9 adults are randomly selected, find the probability that their average IQ score is greater than 112. (Use the Central Limit Theorem.)

Q9 Assume that a procedure yields a binomial distribution with a trial repeated 50 times, and the probability of success on each trial is 0.4.

(a) Check the conditions under which the Normal Approximation to Binomial can be used. Are they satisfied?

np = nq = . Can you use Normal Approximation: Yes or No?

(b) Find the mean $\mu =$ and the standard deviation $\sigma =$

(c) Find the probability that fewer than 22 successes are observed. Use the Normal Approximation. Apply the Continuity Correction. Draw a diagram.

P(fewer than 22) =

Q10 Use the data in the following table, which summarizes blood groups and Rh types for 100 subjects:

		Group				
		Ο	А	В	AB	
Type	Rh^+	38	34	9	3	
	$\rm Rh^-$	7	6	1	2	

(a) If a subject is randomly selected, find the probability of getting someone who is group A and type Rh⁺.

Answer:

(b) If two subjects are randomly selected, with replacement, find the probability that they are both group A and type Rh⁺.

Answer:

(c) If a subject is randomly selected, find the probability of getting someone who is group A or type Rh^+ .

Answer: