MATH 282 Final Exam (200 points) Name: _____

Fall 2025

NO CELL PHONES ALLOWED. Only scientific calculators (NO graphing, Pro, Multiview, etc.) are allowed.

SHOW ALL WORK **Keep three decimal places in most calculations.**

1. [45] Circle the correct answer.

a. Suppose P(A)=0.55 and P(B)=0.25. What is $P(A \cap B)$ if A and B are **independent**?

1. 0.8000 2. 0.4000 3. 0.1375 4. 0.6625

b. Which of the following indicates the **strongest linear relationship**?

1. $r = -0.8500$ 2. $r = 0.09$ 3. $r = 0.65$ 4. $r = 0.9500$

c. Which one of these statistics is **unaffected** by outliers?

2. Mean 2. Standard deviation 3. Median 4. Range

d. Suppose two 6-sided die are rolled. What is the probability that the sum of the **two die is equal to 7**?

1. $^5/_{36}$ 2. $^1/_{12}$ 3. $^1/_6$ 4. $^5/_8$

e. A sample of 2,000 was sought to estimate the average achievement in science of fifth graders in a city's public schools. The average fifth grade enrollment in the city's elementary schools is 100 students. Thus, 20 schools were randomly selected and within each of those schools all fifth graders were tested. **What type of sampling is used?**

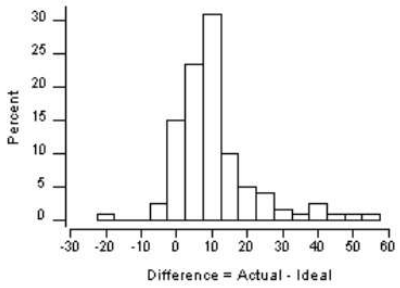
1. Simple random sampling 2. Cluster sampling 3. Systematic sampling 4. Stratified sampling

f. Determine whether the underlined value is a **parameter or a statistic.**

In a national survey on substance abuse, 13% of 12th graders reported using illicit drugs within the past month.

1. Parameter 2. Statistic

g. The following histogram shows the distribution of the difference between the actual and "ideal" weights for 119 female students.



What is the approximate **shape** of the distribution?

2. Nearly symmetric 2. Skewed to the left 3. Skewed to the right 4. Bimodal (has more than one peak)

h. An economist wants to know if the proportion of the U.S. population who commutes to work via carpooling is on the rise. What **sample size** should be obtained if the economist wants an estimate within 3 percentage points of the true proportion with 95% confidence if the economist does not use any prior estimate.

a. 66 b. 4269 c. 1068 d. 1235

i. A salesperson contacts prospective customers by telephone and estimates that 20% of all telephone calls result in a sale. The salesperson makes 10 telephone calls. Find the probability that **exactly 2** telephone calls result in a sale.

a. 0.0352 b. 0.1600 c. 0.3020 d. 0.6980

j. The reaction time X (in minutes) of a certain chemical process follows a uniform probability distribution with $2 \leq x \leq 10$. What is the probability that the reaction time is **greater than 4** minutes?

a. 0.40 2. 0.25 3. 0.60 4. 0.75

k. Determine whether the variable is **qualitative or quantitative**.

Street name of address

a. Qualitative b. Quantitative

l. Determine whether the quantitate variable is **discrete or continuous**.

Volume of liquid in a glass.

a. Discrete b. Continuous

m. A company wants to test whether the average weight of their new product is different from 50kg. Identify the type of hypothesis test and whether it is **left-tailed, right-tailed, or two-tailed.**

a. $H_0: \mu = 50$ $H_1: \mu \neq 50$ Two-tailed test

b. $H_0: \mu = 50$ $H_1: \mu < 50$ Left-tailed test

c. $H_0: \mu = 50$ $H_1: \mu > 50$ Right-tailed test

iv. Cannot determine

n. Let C be the event that a person owns a car and D be the event that a person owns a house. A survey report $P(C) = 0.55, P(D) = 0.35$, and $\mathrm{P\ (C\ or\ D)\ =\ 0.65}$. Find $\mathbf{P\ (C\ and\ D)}$, the probability that a person owns both a car and a house.

a. 0.35 b. 0.15 c. 0.10 d. 0.25

o. Suppose the null hypothesis is rejected. State the conclusion based on the results of the test.

Three years ago, the mean price of a single-family home was $ 243 775. A real estate broker believes that the mean price has increased since then. **Which of the following is the correct conclusion?**

a. There is not sufficient evidence to conclude that the mean price of a single-family home has not changed.

b. There is sufficient evidence to conclude that the mean price of a single-family home has not changed.

c. There is not sufficient evidence to conclude that the mean price of a single-family home has increased.

d. There is sufficient evidence to conclude that the mean price of a single-family home has increased.

2. [15] The following are the ages of 10 students in a classroom:

16 21 22 19 27 18 25 22 15 30

a. Find the five-number summary.

b. Is there any outlier in this data set? If any, which value? Use 1.5 IQR rule.

3. [15] Here are the travel times (in minutes) to work for 6 workers in a small town:

8 12 16 10 6 8

a. Find the sample Mode, mean and median of these numbers.

b. Find the sample standard deviation (s) of these numbers

4. [15] The 2024 ACT scores were approximately normal with mean $\mu = 21.0$ and standard deviation $\sigma = 4.6$.

a. What is the probability that a randomly selected score is 23 or higher?

b. Now take a SRS of 50 students ACT scores. Describe the sampling distribution of the mean scores.

c. What is the probability that the mean score x is 23 or higher?

5. [12] A company surveyed 40 employees to understand the type of vehicles they drive to work. The survey results are shown below:

Vehicle Type	Frequency
Sedan	15
SUV	10
Truck	7
Motorcycle	8

a. Construct a relative frequency distribution. (Create the table and round off to the 3rd decimal place.)

b. What is the proportion of employees who drive SUVs and trucks?

c. Construct a frequency bar graph. (Label axes)

6. [8] The following data are the Test 1 scores from a spring 2025 section of MATH 282. Make a stem and leaf plot to display data.

55 83 77 88 81 84 77 57 66 74 98 96 75 86 90 87 62

7. [12] Suppose it is desired to predict the yearly return (y) of the stock market from the return in January (x). Assume that the correlation r = 0.758.

variable	mean	standard deviation
January return	1.75	5.36
yearly return	9.07	15.35

a. Find the slope of the least squares line.

b. Find the intercept of the least squares line and write the least square regression line.

c. Using the least squares regression line, predict the yearly return of the stock market from the return in January x=3.

8. [12] Statistics conducted by the Road Safety Division of the Police show that 78% of drivers being tested for their license pass at the first attempt. If a group of 120 drivers are tested in one center in a year, find the probability that at least 100 passes at the first attempt. Use Normal approximation to the Binomial distribution. (Hint: Find μ and σ first. Also, apply correction of continuity)

9. [12] A survey was conducted to find out the preferred mode of transportation for daily commutes. The table below shows the results where individuals were asked to choose their ideal mode of transportation.

	Car	Bus	Train	Bicycle	Total
Male	50	30	40	10	**130**
Female	45	25	35	15	**120**
Total	**95**	**55**	**75**	**25**	**250**

a. What is the probability that a randomly selected individual prefers commuting by Train?

b. What is the probability that a randomly selected individual is female and prefers commuting by bus?

c. What is the probability that a randomly selected individual is male, given that the individual prefers commuting by bicycle?

c. So, are events" female" and" prefers train" independent? Justify.

10. [12] A survey of 2306 adult Americans aged 18 and older conducted by Harris Interactive found that 417 have donated blood in the past two years.

a. Obtain a point estimate for the population proportion of adult Americans aged 18 and older who have donated blood in the past two years.

b. Construct 99% confidence interval for the population proportion of adult Americans who have donated blood in the past two years.

11. [12] A researcher wants to estimate the mean household income in a town of 25,000 households. The researcher takes a simple random sample of 1001 households in the town and finds the sample mean household income is $57,250 with a standard deviation of $1,203. Construct a 95% confidence interval for the population mean household income.

12. [15] An inspector inspects large truckloads of potatoes to determine the proportion p in the shipment with major defects prior to using the potatoes to make potato chips. Unless there is clear evidence that p is less than 0.10, he will reject the shipment. He selects an SRS of 200 potatoes from the truck. Suppose that 12 of the potatoes are found to have major defects. Do the hypotheses test: $H_0: p = 0.10$ versus $H_1: p < 0.10$ and help him to make a decision.

a. Calculate the sample proportion $\hat{p}$.

b. Calculate the test statistic.

c. Find the p-value and make the decision. Given α=0.05.

d. Given α=0.05, what is your conclusion? Should he reject the shipment?

13. [15] A manufacturer for hard hats for construction workers wants the mean force the hard hat transmits to the worker to be less than 800 pounds (well under the legal limit), when the helmet is subjected to a standard force. A simple random sample of 40 hard hats from the manufacturer's production is taken and it is found that the sample mean force is 825 with a standard deviation of s = 48.48. Assume the CLT holds.

a) State the hypothesis.

b) Calculate the test statistic.

c) Use classical approach to make the decision. Given $\alpha = 0.05$,

d) Write the conclusion.