

MTH106: Statistics and Probability

THIS COURSE REQUIRES A FINAL EXAM

SYLLABUS

READ THESE INSTRUCTIONS NOW!

Keep work organized by week, clearly labeled and typed or copy/paste onto your syllabus. Math and hand done projects: photograph, scan or screenshot and copy/paste to your syllabus. Keep images small so your file isn't too large to submit or save work as a PDF. Go to "Student Services" online for any issues with this course. If you need Microsoft Word, request an email from Student Services and follow the steps given to you.

- **SUBMITTING WORK:** YOU MUST SUBMIT ALL WEEKS AT ONCE on one file. Your syllabus may be submitted separately if you chose not to add your work to it. Go to the website and select "Submit Work", complete the form and attach your work. You may also share a public link such as Gdocs. You have two attempts at receiving a passing grade of "C" or better so submit your full effort original work. Do not mail work. You will receive a reply in about 5 business days. Do not call or email asking for us to verify your work. All components of your course must be completed by the end of the 8th week from the time of your registration; 12 weeks for a 2 credit class. If you have a medical emergency or disability preventing you from completing your class, contact "Student Services" and send an email to request up to a 2-week extension

Online Scientific Calculator <http://thedigitalrebel.net/webcalc/>

Glossary and Organizer <http://bobhall.tamu.edu/FiniteMath/Module8/Introduction.html>

SYLLABUS

Week 1

BOOKS

ONLINE LEARNING: Use the links given

PDF TEXTBOOK: INTRO TO STATISTICS

YOUR PRACTICE & ANSWER BOOK: Probability Practice & Answers with your downloads. To be completed in Week 2

YOUR WORKBOOK: Statistics & Probability Workbook with your downloads. It is IMPORTANT that you complete your workbook as you move through your course because you will need to submit it in full for WEEK 6

Read, view, take notes and follow each demonstration for the following:

Watch the intro II : <https://www.khanacademy.org/math/statistics-probability/probability-library/modal/v/basic-probability>

A Summary: <https://www.khanacademy.org/math/statistics-probability/probability-library/modal/a/probability-the-basics>

Next Review the following

Introduction to Probability: <http://www-math.bgsu.edu/~albert/m115/probability/outline.html>

1. What is a probability?
 - the relative frequency view
 - the subjective view
2. Measuring probabilities by means of a calibration experiment
3. Interpreting odds
4. Listing all possible outcomes (the sample space)
5. Basic probability rules
6. Equally likely outcomes
7. Constructing a probability table by listing outcomes.
8. Constructing a probability table by simulation (use ALL links)
9. Probabilities of "or" and "not" events.
10. An average value of a probability distribution
11. Understanding a two-way table of probabilities

Submit responses to:

- 1.) Define-Explain terms: probability, probability scale, relative frequency, subjective probability, calibration experiment, sample space, The Addition Rule, The Compliment Rule, joint probabilities
- 2.) When is relative frequency useful?
- 3.) An "odds" of an event is what?
- 4.) How can you convert odds to probabilities? Give an example.
- 5.) Solve for questions 1-3 for "Interpreting Odds".
- 6.) What 3 rules must probability satisfy?
- 7.) Construct a probability distribution listing outcomes (make a table) for: *Suppose a room contains three men and two women. You wish to select two people from this class to serve on a committee. How many men will be on this committee?*
- 8.) In probability distribution, how do you compute the average value – mean? How can this information be useful?
- 9.) **Solve:** Tommy places 3 red chips, 2 green chips, and 4 white chips into a bag. What is the likelihood that he will pull out a green chip on the first try? A red on the first try? A green on the first try?
- 10.) **Review and Study**

ADD RESPONSE/S/ HERE

NEXT: Watch video of probability problems and take notes

1.) <https://www.khanacademy.org/math/precalculus/prob-comb/basic-prob-precalc/v/simple->

[probability](#)

2.) <https://www.khanacademy.org/math/precalculus/prob-comb/basic-prob-prec/v/probability-1-module-examples>

3.) <https://www.khanacademy.org/math/statistics-probability/probability-library/modal/v/simple-probability>

4.) Solve the problems https://www.khanacademy.org/math/precalculus/prob-comb/basic-prob-prec/e/probability_1

Screenshot your score and share:

5.) <https://www.khanacademy.org/math/statistics-probability/probability-library/modal/e/understanding-probability>

Screenshot your score and share:

WEEK 2

Probability w/Venn Diagrams – Watch and take notes:

<https://www.khanacademy.org/math/precalculus/prob-comb/addition-rule-prob-prec/v/probability-with-playing-cards-and-venn-diagrams>

Share your notes here:

Addition Rule for Probability – Watch and take notes:

<https://www.khanacademy.org/math/precalculus/prob-comb/addition-rule-prob-prec/v/addition-rule-for-probability>

Share your notes here:

Intuitive Sense of Probabilities – Watch and take notes

<https://www.khanacademy.org/math/statistics-probability/probability-library/modal/v/intuitive-sense-of-probabilities>

Share your notes here:

The Monty Hall Problem – Watch and take notes

<https://www.khanacademy.org/math/statistics-probability/probability-library/modal/v/monty-hall-problem>

Share your notes here:

PRACTICE BOOK: Probability Practice and Answers with your downloads

Study and complete all assignments.

Compare your answers to the answers given and self-correct. Type a summary on how well you completed each prompt. Which ones, if any, did you miss? What mistakes did you make? Which ones did you find easy to complete.

PDF TEXTBOOK: INTRO TO STATISTICS – Study and submit answers to: Page 62 Introduction Exercise #1, 2, 3, 5, 6, 8, &9

PLACE ANSWERS HERE

Week 3

Introduction to Basic Statistics

Research Statistics

Read Rapid Learning Statistics – Power Point Download

- 1.) **Explain/Define:** statistics, problem, problem-solving strategies, measure of central tendency, variability, variance, probability distribution. **Explain and give 2 examples for each term:** mean, mode, midrange, range, midpoint,
- 2.) For what type of data is each chart used: Categorical frequency distributions, Histogram & Bar Chart
Frequency Polygon Stem-and-Leaf Plots?
- 3.) Give an example of hypothesis testing – Null and Alternative (View the example given)

Research Statistics - Download

- 11.) **Submit responses to:** Learning Checks 1 thru 4 (Review and Study)

ADD RESPONSE/S/ HERE

Probability with Counting Outcomes – Watch and take notes

<https://www.khanacademy.org/math/statistics-probability/probability-library/probability-sample->

[spaces/v/events-and-outcomes-3](#)

Share your notes here:

Examples – All the Ways you can Flip a Coin – Watch and Take notes:

<https://www.khanacademy.org/math/statistics-probability/probability-library/probability-sample-spaces/v/coin-flipping-example>

Share your notes here:

Die Rolling Probability – Watch and Take notes: <https://www.khanacademy.org/math/statistics-probability/probability-library/probability-sample-spaces/v/events-and-outcomes-2>

Share your notes here:

Subsets of Sample Spaces: <https://www.khanacademy.org/math/statistics-probability/probability-library/probability-sample-spaces/v/describing-subsets-of-sample-spaces-exercise>

Share your notes here:

Practice Subsets: <https://www.khanacademy.org/math/statistics-probability/probability-library/probability-sample-spaces/e/describing-subsets-of-sample-spaces>

Screenshot your score and share:

PDF TEXTBOOK: INTRO TO STATISTICS – Study and submit answers to: Page 116 Graphing for Distribution Exercise # 1 – 9; Page 216 Probability Exercise #1 - 15

ADD RESPONSE/S/ HERE

Week 4

Statistical Questions – Watch and take notes: <https://www.khanacademy.org/math/statistics-probability/designing-studies/modal/v/understanding-statistical-questions>

Share your notes here:

Statistical and Non Statistical Questions – Watch and take notes:

<https://www.khanacademy.org/math/statistics-probability/designing-studies/modal/v/statistical-questions>

Share your notes here:

PDF TEXTBOOK: INTRO TO STATISTICS – Study and submit answers to: Page 247 Research Design #11, 17, 18; Page 267 #1, 2, 10, 13

ADD RESPONSE/S/ HERE

Week 5

Intro to Sampling Distribution – Watch and take notes: <https://www.khanacademy.org/math/ap-statistics/sampling-distribution-ap/what-is-sampling-distribution/v/introduction-to-sampling-distributions>

Share your notes here:

Sample Statistic Bias Worked Example – Watch and take notes: <https://www.khanacademy.org/math/ap-statistics/sampling-distribution-ap/what-is-sampling-distribution/v/sample-statistic-bias-worked-example>

Share your notes here:

Practice: Biased and Unbiased Estimator: <https://www.khanacademy.org/math/ap-statistics/sampling-distribution-ap/what-is-sampling-distribution/e/biased-unbiased-estimators>

Screenshot your score and share:

PDF TEXTBOOK: INTRO TO STATISTICS – Study and submit answers to: Page 324 Sampling Distribution #14, 16, 18, 20; Page 394 Hypothesis Testing Exercise: #1-4, 20; Page 440 Testing Mean Exercise #1, 2, 8

WEEK SIX

SUBMIT YOUR STATISTICS & PROBABILITY WORKBOOK:

Carefully organize and label your answers

ADD WORK HERE

QUIZ – COMPLETE AS YOU FOLLOW THE TUTORIALS

Make **BOLD OR HIGHLIGHT** your answers.

Choose the best answer to the question.

Problem 1

Which of the following statements are true? (Check one)

- I. Categorical variables are the same as qualitative variables.
- II. Categorical variables are the same as quantitative variables.
- III. Quantitative variables can be continuous variables.

- (A) I only
- (B) II only
- (C) III only
- (D) I and II
- (E) I and III

Problem 2

A coin is tossed three times. What is the probability that it lands on heads *exactly* one time?

- (A) 0.125
- (B) 0.250
- (C) 0.333
- (D) 0.375
- (E) 0.500

Problem 3

An auto analyst is conducting a satisfaction survey, sampling from a list of 10,000 new car buyers. The list includes 2,500 Ford buyers, 2,500 GM buyers, 2,500 Honda buyers, and 2,500 Toyota buyers. The analyst selects a sample of 400 car buyers, by randomly sampling 100 buyers of each brand.

Is this an example of a simple random sample?

- (A) Yes, because each buyer in the sample was randomly sampled.
- (B) Yes, because each buyer in the sample had an equal chance of being sampled.
- (C) Yes, because car buyers of every brand were equally represented in the sample.
- (D) No, because every possible 400-buyer sample did not have an equal chance of being chosen.
- (E) No, because the population consisted of purchasers of four different brands of car.

Problem 4

Which of the following statements is true.

- I. When the margin of error is small, the confidence level is high.
- II. When the margin of error is small, the confidence level is low.
- III. A confidence interval is a type of point estimate.
- IV. A population mean is an example of a point estimate.

- (A) I only
- (B) II only
- (C) III only
- (D) IV only
- (E) None of the above.

Problem 5

A sample consists of four observations: {1, 3, 5, 7}. What is the standard deviation?

- (A) 2
- (B) 2.58
- (C) 6
- (D) 6.67
- (E) None of the above

Problem 6

A card is drawn randomly from a deck of ordinary playing cards. You win \$10 if the card is a spade or an ace. What is the probability that you will win the game?

- (A) 1/13
- (B) 13/52
- (C) 4/13
- (D) 17/52

(E) None of the above.

Problem 7

Which of the following statements is true.

- I. The standard error is computed solely from sample attributes.
- II. The standard deviation is computed solely from sample attributes.
- III. The standard error is a measure of central tendency.

- (A) I only
- (B) II only
- (C) III only
- (D) I and II
- (E) I and III

Problem 8

Which of the following is a discrete random variable?

- I. The average height of a randomly selected group of boys.
- II. The annual number of sweepstakes winners from New York City.
- III. The number of presidential elections in the 20th century.

- (A) I only
- (B) II only
- (C) III only
- (D) I and II
- (E) II and III

Problem 9

Which of the following statements are true? (Check one)

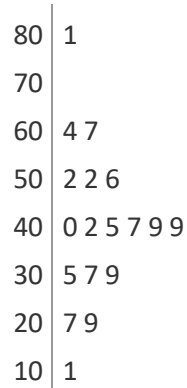
- I. A sample survey is an example of an experimental study.
- II. An observational study requires fewer resources than an experiment.
- III. The best method for investigating causal relationships is an observational study.

- (A) I only
- (B) II only
- (C) III only
- (D) All of the above.

(E) None of the above.

Problem 10

The stemplot below shows the number of hot dogs eaten by contestants in a recent hot dog eating contest.



Which of the following statements are true?

- I. The range is 70.
- II. The median is 46.
- III. The mean is 47.

- (A) I only
- (B) II only
- (C) III only
- (D) I and II
- (E) I, II, and III

Problem 11

The number of adults living in homes on a randomly selected city block is described by the following probability distribution.

Number of adults, x	1	2	3	4 or more
Probability, $P(x)$	0.25	0.50	0.15	???

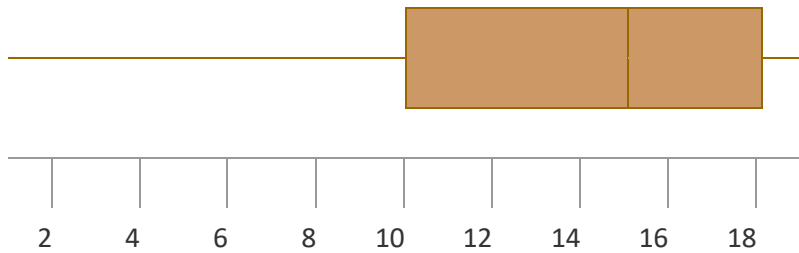
What is the probability that 4 or more adults reside at a randomly selected home?

- (A) 0.10
- (B) 0.15
- (C) 0.25
- (D) 0.89

(E) There is not enough information to answer this question.

Problem 12

Consider the boxplot below.



Which of the following statements are true?

- I. The distribution is skewed right.
- II. The interquartile range is about 8.
- III. The median is about 10.

- (A) I only
- (B) II only
- (C) III only
- (D) I and II
- (E) II and III

Problem 13

Which of the following statements are true?

- I. Random sampling is a good way to reduce response bias.
- II. To guard against bias from under-coverage, use a convenience sample.
- III. Increasing the sample size tends to reduce survey bias.
- IV. To guard against nonresponse bias, use a mail-in survey.

- (A) I only
- (B) II only
- (C) III only
- (D) IV only
- (E) None of the above.

Problem 14

Below, the cumulative frequency plot shows height (in inches) of college basketball players.



What is the interquartile range?

- (A) 3 inches
- (B) 6 inches
- (C) 25 inches
- (D) 50 inches
- (E) None of the above

Problem 15

Suppose X and Y are independent random variables. The variance of X is equal to 16; and the variance of Y is equal to 9. Let $Z = X - Y$.

What is the standard deviation of Z ?

- (A) 2.65
- (B) 5.00
- (C) 7.00
- (D) 25.0
- (E) It is not possible to answer this question, based on the information given.

Problem 16

Acme Toy Company sells baseball cards in packages of 100. Three types of players are represented in each package -- rookies, veterans, and All-Stars. The company claims that 30% of the cards are rookies, 60% are veterans, and 10% are All-Stars. Cards from each group are randomly assigned to packages.

Suppose you bought a package of cards and counted the players from each group. What method would you use to test Acme's claim that 30% of the production run are rookies; 60%, veterans; and 10%, All-Stars.

- (A) Chi-square goodness of fit test
- (B) Chi-square test for homogeneity
- (C) Chi-square test for independence
- (D) One-sample t test
- (E) Matched pairs t-test

Problem 17

Suppose a researcher conducts an experiment to test a hypothesis. If she doubles her sample size, which of the following will increase?

- I. The power of the hypothesis test.
- II. The effect size of the hypothesis test.
- III. The probability of making a Type II error.

- (A) I only
- (B) II only
- (C) III only
- (D) All of the above
- (E) None of the above

Problem 18

Suppose a die is tossed 5 times. What is the probability of getting exactly 2 fours?

- (A) 0.028
- (B) 0.161
- (C) 0.167
- (D) 0.333
- (E) There is not enough information to answer this question.

Problem 19

A national consumer magazine reported the following correlations.

- The correlation between car weight and car reliability is -0.30.
- The correlation between car weight and annual maintenance cost is 0.20.

Which of the following statements are true?

- I. Heavier cars tend to be less reliable.
- II. Heavier cars tend to cost more to maintain.
- III. Car weight is related more strongly to reliability than to maintenance cost.

- (A) I only
- (B) II only
- (C) III only
- (D) I and II

(E) I, II, and III

Problem 20

Bob is a high school basketball player. He is a 70% free throw shooter. That means his probability of making a free throw is 0.70. What is the probability that Bob makes his first free throw on his fifth shot?

(A) 0.0024

(B) 0.0057

(C) 0.0081

(D) 0.0720

(E) 0.1681