Math 142 Topics in College Mathematics

Class Days/Times/Room: Monday and Wednesday 3:00 to 4:15, room 24, Main/S-cuk To:k Campus	Autumn (*wi'ihanig*) 2016

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Course Description:

Survey of mathematical topics and applications. Includes application of mathematics to the social services, management science, growth, and probability and statistics.

Course Objectives:

During this course students will

1. Apply the principles of counting in problem solving situations.
2. Compute theoretical and empirical probabilities.
3. Compute the mean, median, mode and standard deviation for a data set.
4. Use statistics to analyze data.
5. Solve interest problems using interest formulas for simple, compound and continuous interest.
6. Analyze and solve problems using savings and amortization formulas.
7. Analyze and solve problems using linear and exponential growth.
8. Apply mathematical concepts to management, social science and other real world situations.

Student Learning Outcomes (SLOs) :
After completion of the course students will be able to
- Perform basic statistical analysis with a calculator.
- Translate and solve a real-life situation involving probability or statistics.
- Employ technology to set up and solve real world problems.
- Apply mathematical concepts to real world problems.

Texts and Materials:
No text necessary. Some form of calculating device will be necessary.

Evaluation and Grading & Assignments:
Two exams (midterm and final) at 100 points
Homework in its totality at 200 points
Total possible points is 400

To guarantee an A, you must have 400 x .9 = 360 points. A B will require 400 x .8 = 320 points.

Himdag **Cultural Component:**
My interpretation of what Nahban said in *the Desert Smells Like Rain* is this: while the *himdag* discourages direct, exact answers, in the mathematical world, one is expected to be able to come up with a precise answer for the situation. That being said, there are a few common issues shared:
- *Baban* (coyotes) are not going to affect your homework or my tests – they didn't write either. (Certainly beats the classic "My dog ate my homework!") Don't try to blame it on *hahaiwañ* or *wapkial* either.
- While one must go through a maze to see *i'itoi*, there was no mention as to how many mazes there were to get to him. Likewise, you will discover that there are many different ways to perform the math necessary to see the final answer.
- *I-we:tma*: for your success, the college's and the community's, DO NOT work alone – it is a group activity (except on the tests, of course).
- *T-Wohocudadag c t-apedag c t-pik elida*: We learn for our well-being. We respect each other, ourselves and our community. We respect and take pride in our own work. We respect each other's abilities, quirks and privacy. We believe in ourselves and others.

Prerequisites and destinations:
To be in this class, you must have
- passed math 122 here or at Pima Community College with a C or better, or
- tested into this class with a suitable COMPASS score (at least 66 in Algebra or at most 45 in College Algebra), or successor Accuplacer scores (to be determined as of July 2016), or
- obtained permission of the instructor, usually after review of previous coursework

This is a terminal math class for those majoring in social sciences, humanities or the fine or liberal arts AND transferring onward to any of the three state Universities. What terminal means here is this: This will be the LAST math class for your academic career. This may not necessarily be transferable to other institutions; please ask BOTH your instructor and your adviser for proper direction!

Policies and expectations-

- For the level of course that you are in, I will assume that you are mature enough for me **not** to grade for attendance. However, the Government does require me to take it for financial aid purposes. I understand if you miss class for legitimate reasons: E-mailing the instructor and contacting the front office **5203838401** are the best ways of letting me know if you miss class. You still are responsible for any material covered in class.
- Integrity and Honor: I don't mind if you work on the homework in groups. In fact, I expect it. (See *i-we:tma* above.) I do mind for tests and the final exam. Everything else about this topic is available in *the TOCC Student Handbook*.
- Homework and Feedback: We are adults: Although I expect homework to be done as soon as the topic(s) are covered, I understand that it may be late. Just get it done, really. I will try to return homework within one class – not every question will be checked, but I will be using what you have done wrong as a springboard for class. (If you're wondering how I can get away with accepting late homework, we do have a thing called a test. ☺) For this semester, you should spend 3 credit hrs x 3 hrs per credit hr in the fall = **9** hours a week on this course.
- Withdrawal: Final deadline is **October 26ᵗʰ 2016**. By that date, you will have had at least one test. As a general rule, if you have been absent more than 25% of the time (8 classes), you should speak with an adviser immediately. *All institutions of higher education strongly encourage instructors NEVER to ask students to withdraw from a course for both financial aid purposes and respect for the student*. (See *t-pik elida* on previous page.) Again, we will have three tests, a final exam, homework and attendance in class (I also count tutoring / Student Success Center visits).
- Incompletes (I): The nature of this course (where you are learning something new every single class) makes it very improbable for an incomplete to be given.
  However, per TOCC policy, if you have completed ¾ of the course and specifically request it, I may consider it. *Please call before final exams to assure enough time to consider your request*. In handing out an incomplete, I will assume that you:
    - will finish this course on your own time.
    - will receive a form with the I grade filled in and what work *must* be done to complete the course.
    - will have one year to complete the work, else the grade will revert to an F.
- Makeups: My homework policy has been mentioned beforehand. As for exams, I allow a *reasonable* amount of time – not more than two weeks.
- Extra credit: None available.
- Final grades: They will be sent to the address on record. Per FERPA and the Himdag, I will not give grades over the phone and am strongly discouraged from e-mailing same. (Again, see *t-pik elida* above.)
- Struggling? Tutoring is available in the Student Success Center in the main building.
- In accordance with *t-pik elida* and the Americans with Disability Act 1990 (ADA) and Section 504 of the Rehabilitation Act, if you have a learning problem, physical disability, or medical illness that requires you to have any special arrangements, please inform your instructor at the beginning of the semester so your academic performance will not suffer because of the disability or handicap.

Consolidated Course Outline and Homework Assignments. I assume that you have had MATH 122 - Intermediate algebra or equivalent. If not, see me privately as soon as possible. <u>Everything you see here - including the homework - is subject to change.</u>

		Done?
Terminology (one week)	What is statistics? What is a statistic? What is a variable? Homework: Find at least one article, preferably with an O'odham or Native emphasis, where there exists a target population, a sample from same, and a variable of interest that has the potential of being a statistic and a parameter. Write up a well-written description using said terms.	
Data display (1.5 weeks)	Why do we need to know difference between numerical and categorical data, and how does this affect our display? Handout "Data Display." Homework: "Data Display" handout. Also, find examples with Native emphasis of data display, one involving categorical data and one with numerical data. (no school Labor Day September 5th 2016)	
s-eda nu:milo c na:nko (1.5 weeks)	Data analysis -- descriptive statistics, or when you'd much rather have numbers than pictures -- mean, median and mode (the various s-eda nu:milo) and range and standard deviation (na:nko). Handout "Descriptive Statistics." Homework: "Descriptive Statistics."	
Location, location, location. (one week)	data analysis -- z-scores, or where is a particular piece of data located amongst others Handout "Location" Homework: "Location."	
Ca:nsa = chance (two weeks)	probability -- basics of how often something should happen, and why the words AND, OR, NOT matter Handout "Probability." Homework: "Probability." (no school O'odham Taṣ Friday September 23rd 2016 or St. Francis Day Monday October 3rd 2016 - **Test on first four topics tentatively October 5th 2016**)	
Expected value (two week)	putting it all together -- probability with expected value and confidence intervals. with a special mention of the O'odham stick dice game, and how expected value impacts native gaming Handout "Expected Value." Homework: "Expected Value." (last day to withdraw is Wednesday October 26th 2016)	
Catching the population version of the mean (one week)	central limit theorem, normality (no school Veteran's Day November 11th 2016)	
Trends - linear v. exponential (one week)	functions and relationships -- linear and exponential -- special emphasis on altitude v. temperature data -- regression/correlation 11/16	
More on linear v. exponential, where it hurts the most (one week)	Simple v. compound interest	

Extra appropriate topics (to end of semester)	supplemental topics -- among them, counting throughout the world, special emphasis on differences in counting among Nations dates to be determined (Final Exam Monday December 5th 2016)	

DISCLAIMER: This syllabus is designed to evolve and change throughout the semester based on class progress and interests. You will be notified of any changes as they occur.

References:

- Culin, Stewart. (1975.) *Games of the North American Indians*. New York: Dover Publications.
- Guarin, Jorge. (2011.) *Course syllabus*.
- Hronopoulos, Sophia. (2012.) *Course syllabus*.
- Moore, Charles G. (1988.) *Outdoor World Mathematics: Teacher's Guide.* Flagstaff, AZ: Northern Arizona University / Arizona Board of Regents.
- Nabhan, Gary Paul. (1982.) *The Desert Smells Like Rain: A naturalist in Papago Indian Country.* San Francisco: North Point Press.
- Newberry, Teresa. (2012.) *Course syllabus.*
- Sun-bat, Catherine. (2014.) *Course syllabus*
- Tohono O'odham Community College core values website http://www.tocc.edu/core_values.htm (2015.)

Assignment	Date	Score
Midterm		
Final		
Homework	various	
Total		Add the numbers you have in this column = _____

Below is the standard outline of offerings for math 142 as originally required by the State of Arizona for articulation and transfer purposes. It is quoted directly from Jorge Guarin's syllabus, but neither he nor I can claim copyright as it is held ultimately by the State.

Parts I through IV are required -- **two** of the rest are to be chosen. ***What I was planning to do will be in bold.*** ==***There are changes based on changes done by the State within the past decade -- all of that is highlighted in yellow.***==

- **I.** **Probability (required)**
  - A. Principles of counting
    - 1. Multiplication principle
    - 2. Repetition
    - 3. Permutations
    - 4. Combinations
  - B. Probability distributions
  - C. Joint probabilities
    - 1. Dependent events
    - 2. Independent events
  - D. Expected value
  - E. Risk analysis
- **II.** **Statistics (required)**
  - A. Data characteristics
    - 1. Mean
    - 2. Median
    - 3. Mode
    - 4. Standard deviation
  - B. Linear Regression
    - 1. Correlation coefficient
  - C. Statistical inference
    - 1. Normal distribution
    - 2. z-scores and percentiles
    - 3. Confidence intervals
  - D. Sampling Methods
    - 1. Statistical significance
    - 2. Research designs
- **III.** **Finance (required)**
  - A. Interest
    - 1. Simple
    - 2. Compound
    - 3. Continuous
  - B. Savings formula
  - C. Amortization formula
- **IV.** **Linear and Exponential Growth and Modeling (required)**
  - A. Linear
    - 1. Constant rate of change
    - 2. Linear regression
  - B. Exponential
    - 1. Definition
    - 2. Applications such as growth, decay, geometric sequences, financial models

V.   Numeracy

    A.   Unit conversion and conversion factors aka factor/label or dimensional analysis

        1.   Simple units (English, metric, currency)

        2.   Compound units – i.e. yd^3, ft/sec, etc. *I would cover this as needed for the measurements -- you may have already covered this in CHEM 080*

    B.   Uses and abuses of percentages

        1.   Absolute difference versus relative difference

        2.   Reference quantity

        3.   Percent larger versus percent smaller

    C.   Numbers in perspective

        1.   Scientific notation

        2.   Scaling

        3.   Accuracy and Precision *Again, I would cover this as needed -- you may have already covered this in CHEM 080 as well.*

    (Update May 19th 2014: Maxie from Coconino advised me that the State has NOT covered anything within this topic since before 2009.)

VI.   Logic

    A.   Propositions

        1.   Basic symbols

        2.   English and symbolic language

    B.   Connectives

        1.   Not

        2.   And, or, if then, if and only if

    C.   Truth tables

    D.   Using symbolism in analytical reasoning

        1.   Logical arguments

        2.   Evaluating English arguments with a logical model

VII.   Problem Solving

    A.   Methods of approaching problems with multiple solutions

        1.   Brainstorming

        2.   Path analysis

        3.   Decision trees

        4.   Plus/Minus/Interesting

        5.   SWOT Analysis-Strengths, Weaknesses, Opportunities, Threats

        6.   Force field analysis

    B.   Critical thinking skills

    C.   Mathematical modeling

VIII.   Scheduling

    A.   Basic Elements of Scheduling

    B.   Directed Graphs

    C.   Schedule Models

        1.   Priority List

        2.   Decreasing -Time

        3.   Critical Paths

IX.   Fair Division

    A.   Methods between two players

        1.   Divide and choose

        2.   Adjusted winner procedure

    B.   Methods between more than two players

        1.   Knaster inheritance procedure

        2.   Cake-division scheme

    C.   Apportionment

        1.   Hamilton Method

        2.   Jefferson Method

        3.   Webster Method

        4.   Hill-Huntington Method

X. Voting Methods *(this is what Maxie is covering with her classes at Coconino)*
  - A. Majority, plurality, super-majority, veto, electoral college, group preference
    1. Runoff
    2. Sequential runoff
    3. Borda Count
    4. Pair-wise competition, Condorcet competition
  - B. Fairness Criteria

XI. Graph Theory
  - A. General graph theory
    1. Graph Models, Concepts, Usage
    2. Euler's Theorems
    3. Euler Graphs, Fluery's Algorithm
  - B. Hamilton circuits and Hamilton paths
    1. Nearest neighbor algorithm (including repetitive nearest neighbor)
    2. Cheapest-link algorithm
  - C. Networks
    1. Trees
    2. Kruskal's algorithm
    3. Shortest distance among three points

XII. Linear Programming *This honestly is already covered in math 172 for the business majors not heading onward to the University of Arizona*
  - A. Graphing
  - B. Feasible solutions
  - C. Resource allocation

XIII. Geometry (non-Euclidean proof)
  - **A. Basic shapes and angles**
  - **B. Perimeter**
    1. **Basic shapes and combinations**
    2. **Applications**
  - **C. Area**
    1. **Basic shapes and combinations**
    2. **Applications**
  - **D. Volume**
    1. **Basic shapes and combinations**
    2. **Applications**

  (Update May 19th 2014: Maxie from Coconino advised me that the State has NOT covered anything within this topic since before 2009.)

XIV. Geometric Symmetry *It is a possibility here due to their basket designs… (this is what Maxie is covering with her classes at Coconino)*
  - A. Reflections
  - B. Rotations
  - C. Translations
  - D. Patterns
  - E. Fractal Geometry
    1. General Description
    2. Symmetry of Scale
    3. Mandelbrot Set

XV. Trigonometry *I'd include this as a useful item to go with the geometry for measurement purposes -- depending on the students' mathematical maturity, it could be dispensed with*
  - A. Angles, degrees
  - B. Similar triangles
  - C. Trigonometric ratios and right triangles
  - D. Right triangle applications

  (Update May 19th 2014: Maxie from Coconino advised me that the State has NOT covered anything within this topic since before 2009.)

XVI. Sets
  - A. Definition
  - B. Union, intersections, complements