Effective: Fall 2019
Last Reviewed: 05/03/2019

Course Outline

BASIC COURSE INFORMATION

Course Number: MATH 128

Course Title: APPLIED BEGINNING AND INTERMEDIATE ALGEBRA

Total Student Hours and Credit			
		Hours/Week	Hours/Term
Lecture Hours	in-class	6.00	108.00
	out-of-class	12.00	216
Lab Hours	in-class	0	0
	out-of-class	0	0
Activity Hours	in-class	0	0
	out-of-class	0	0
TBA Hours Per Term			0
Total Student Hours Per Term:			324.00
Hours-per-unit Divisor			54.00
Units of Credit:			6.00

Fall semester term is 18 weeks. Spring semester term is 17 weeks. The term length multiplier is 17.5 weeks. Curriculum is calculated based on 18 weeks.

Catalog Description:
Provides an alternative preparation for Introduction to Applied Statistics, College Algebra, or College Mathematics for the Humanities. Traditional beginning and intermediate algebra topics include the development of linear, quadratic, exponential, and logarithmic equations and functions as mathematical models, inverse functions and systems of linear equations. Preparation for transfer level statistics includes an introduction to categorical and numerical data analysis, measures of center, measures of spread, and introduction to probability. Not intended for science, technology, engineering, math, or business majors. Prerequisite: MATH 007.

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data analysis, measures of center, measures of spread, and introduction to probability. Not intended for science, technology, engineering, math, or business majors. Prerequisite: MATH 007 with a minimum grade of C or better.

Prerequisites:

- MATH 007: PREALGEBRA

Division:	Mathematics
Department:	Mathematics
Minimal Qualification Discipline Designation (MQDD):	Mathematics
Degree Applicability:	Credit - Degree Applicable

Methods of Instruction:

- Lecture and/or discussion

Grading Method:

- Letter Grade or P/NP

Repeatability:	0
Course Cap:	35
Face-to-Face Modality Limit:	35
DE Modality Limit:	35

STUDENT LEARNING OUTCOMES

1. Apply techniques of descriptive statistics to display and analyze data.
2. Determine an appropriate mathematical model with which to analyze an authentic application problem.
3. Utilize algebraic skills accurately as they are applied to mathematical problem solving.
4. Interpret and communicate the results of mathematical inquiry at a depth appropriate to the course level.

COURSE CONTENT

Objectives:
Upon completion of this course the student will be able to:

1. Evaluate and simplify algebraic expressions.
    - Group Work
    - Quizzes/Exams
    - Written/Typed Homework

2. Organize, display and analyze categorical and numerical data in a variety of formats.
    - Group Work
    - Quizzes/Exams
    - Written/Typed Homework
3. Analyze data using measures of center (median and mean) and spread (range and standard deviation).
    - Group Work
    - Quizzes/Exams
    - Written/Typed Homework
4. Apply rules of probability to determine the probability of an event.
    - Group Work
    - Quizzes/Exams
    - Written/Typed Homework
5. Generate and interpret graphs on the Cartesian plane.
    - Group Work
    - Quizzes/Exams
    - Written/Typed Homework
6. Solve application problems using linear equations, inequalities, proportions, and basic formulas.
    - Group Work
    - Quizzes/Exams
    - Written/Typed Homework
7. Recognize and evaluate a function.
    - Group Work
    - Quizzes/Exams
    - Written/Typed Homework
8. Construct and analyze linear functions as mathematical models.
    - Group Work
    - Quizzes/Exams
    - Written/Typed Homework
9. Solve systems of two variable linear equations.
    - Group Work
    - Quizzes/Exams
    - Written/Typed Homework
10. Perform operations on single variable polynomial expressions.
    - Group Work
    - Quizzes/Exams
    - Written/Typed Homework
11. Factor single variable polynomial expressions.
    - Group Work
    - Quizzes/Exams
    - Written/Typed Homework
12. Solve and apply quadratic equations using factoring, the square root property, and the quadratic formula.
    - Group Work
    - Quizzes/Exams
    - Written/Typed Homework
13. Apply quadratic functions as mathematical models

- Group Work
- Quizzes/Exams
- Written/Typed Homework

14. Apply exponential functions and equations as mathematical models.
    - Group Work
    - Quizzes/Exams
    - Written/Typed Homework
15. Recognize and graph inverse functions.
    - Group Work
    - Quizzes/Exams
    - Written/Typed Homework
16. Apply logarithmic functions and equations as mathematical models.
    - Group Work
    - Quizzes/Exams
    - Written/Typed Homework
17. Apply learning strategies to the acquisition of mathematical knowledge.
    - Group Work
    - Written/Typed Homework

Topics & Scope:

1. Algebraic Expressions
   (a) introduction to variables, constants, algebraic expressions, formulas and equations
   (b) review of exponents, square root, order of operations, scientific notation, and conversion among fractions, decimals, and percent.
   (c) evaluate expressions and formulas, including statistical formulas involving summation notation
   (d) simplifying expressions using properties of real numbers
   (e) definition of real numbers and their subsets
   (Obj 1)
2. Graphical and Tabular displays of categorical and numerical data
   (a) frequency tables, relative frequency tables, and bar graphs for categorical data
   (b) pie charts and two way tables for categorical data
   (c) Discrete vs. continuous numerical data
   (d) Rounding rules for numerical data
   (e) histograms for numerical data
   (f) misleading graphical displays of data

   (Obj 2)
3. Descriptive Statistics
   (a) measures of center: mean, median, and mode
   (b) measures of spread: range and standard deviation
   (Obj 3)
4. Computing Probability
   (a) meaning of probability
   (b) complement and addition rules, including the analysis of AND, OR, and NOT statements.
   (c) conditional probability and the multiplication rule for independent events

(Obj 4)

5. *Describing Associations of Two Variables Graphically*

(a) real numbers and points on the number line
(b) ordered pairs and points in the Cartesian plane
(c) constructing scatter plots
(d) analyzing scatter plots and line of best fit
(e) correlation and causality

(Obj 5)

6. Equations, Inequalities, and Formulas
   (a) addition and multiplication properties of equality
   (b) solving application problems using linear equations and inequalities
   (c) proportions and their applications
   (d) solving a basic formula for a given variable

(Obj 6)

7. Introduction to Functions
   (a) function notation and evaluation
   (b) function as a formula, graph or table
   (c) domain and range (as inputs and outputs)

(Obj 7)

8. Modeling with Linear Functions
   (a) presentation as an equation, table or graph
   (b) slope as rate of change and y-intercept as initial value
   (c) analyzing scatter plots and regression line
   (d) positive and negative correlation
   (e) correlation vs. causation

(Obj 8)

9. Systems of Two Variable Linear Equations
   (a) graphical and algebraic solutions
   (b) applications

(Obj 9)

10. Operations on Single Variable Polynomial Expressions

    (a) laws of whole number exponents
    (b) adding and subtracting
    (c) multiplying

(Obj 10)

11. Factoring Single Variable Polynomial Expressions
    (a) greatest common factor (GCF)
    (b) factoring by grouping
    (c) factoring trinomials with a leading coefficient of one
    (d) difference of squares

(Obj 11)

12. Quadratic Equations and Applications
    (a) solving by factoring, the square root property, and the quadratic formula

(b) recognizing and simplifying irrational solutions
(c) applications
(Obj 12)

13. Modeling with Quadratic Functions
    (a) graphing quadratic functions in standard and vertex form
    (b) applications
    (Obj 13)
14. Exponential Functions and Equations
    (a) integer exponents
    (b) graphing Exponential Functions
    (c) solving simple exponential equations
    (d) applications
    (Obj 14)
15. Inverse Functions
    (a) definition of an inverse function
    (b) graphing inverse functions
    (c) determining the equation of an inverse function
    (Obj 15)
16. Logarithmic Functions and Equations
    (a) defining and evaluating logarithmic expressions
    (b) graphing logarithmic functions
    (c) solving simple logarithmic equations
    (d) applications, including logarithmic scales
    (Obj 16)
17. Learning Strategies
    (a) study skills (organization, time management, note taking, test preparation, test taking, test and homework correction)
    (b) group work (rationale, roles, and responsibilities)
    (c) self-assessment (Learning styles, meta-cognition, performance criteria, productive struggle)
    (d) resource utilization (peer groups, learning center, technology resources)
    (Obj 17)

Assignments:
Examples of independent assignments to fulfill 216 total hours of required out-of-class work:

1. An example of a typical homework problem which requires students to practice concepts learned in class: A projectile is thrown upward so that its distance above the ground after t seconds is h(t) = -16tt^2 + 510t. After how many seconds does it reach its maximum height? How long does it take to reach the ground again? Approximate your answers to the nearest second. (Obj 13)
2. An example of a typical homework problem which requires students to practice concepts learned in class: Let W(t) = -0.20t + 59.74 be the percentage of women who are married and let M(t) = -0.27t + 64.01 be the percentage of men who are married, both at t years since 1990. During what year will the percentage of men who are married be equal to the percentage of women who are married? (Obj 9)
3. An example of a typical homework problem which requires students to practice

concepts learned in class: Determine the inverse of the function f(x) = 3x – 8 and graph both functions. (Obj 15)

Class participation and assignments require and develop critical thinking.

1. An example of a problem that requires the student to organize data and construct a linear model, then use the model to make predictions and evaluate and communicate the results. This type of problem is demonstrated and practiced in class and in homework and evaluated on exams. The following data gives the weights and life spans of 8 dogs. Weight (x) 15 35 40 60 70 80 100 140 Lifespan (y) 16 13 14 10 10 12 9 7 (a) Construct a scatter plot of the data set. (b) Determine and graph the line of best fit by hand. (c) Use the equation of the line of best fit to predict the lifespan of a 60-pound dog. (d) Use the line of best fit to predict the lifespan of a 200-pound Great Dane and comment on the validity of your answer. (e) What is the real-life meaning of the slope of the equation? (f) Betsy notices the connection between weight and lifespan and decides to put her 75-pound English Setter, Guinness, on a diet. Comment on her reasoning. (Obj 8)
2. An example of a problem that requires the student to extract information from a table of data, then apply rules of probability to determine the likelihood of events. This type of problem is demonstrated and practiced in class and in homework and evaluated on exams. A total of 803 adults were asked whether they prefer to drink coffee, tea, or neither. The table below compares the adults' responses and the regions of the country where they live. Northeast Midwest South West Total Coffee 101 102 169 89 461 Tea 40 52 106 42 240 Neither 11 39 28 24 102 Total 152 193 303 155 803 Let C stand for a person who prefers coffee, N stand for a person who lives in the Northeast and W stand for a person who lives in the west. Assuming a person is randomly selected from the 803 adults in the survey, find the following: P (C) P (NOT C) P (N AND W) P (N OR W) P (N AND C) P (N OR C) P(coffee|West) P(coffee|Northeast) P(Tea|South) P(Tea|Midwest). (Obj 4)
3. An example of a problem that requires the student to construct and apply an exponential model in order to make a prediction. This type of problem would be demonstrated in class, worked on in groups and homework, and evaluated on a test. The number of severe near collisions on airplane runways has decayed approximately exponentially from 67 in the year 2000 to 24 in the year 2007. Predict the number of severe near collisions in the year 2015. (Obj 14)

Methods of Evaluation:

- Written/Typed Homework
- Group Work
- Quizzes/Exams
- Comprehensive Final Exam

Texts, Readings, and Materials:

- **Textbooks**
  Lehmann, J. *A Pathway to Statistics* (current/e). Pearson Education, (2016). Rationale: This text is representative of the statistical literacy and exploratory data analysis content of the course.

Lehmann, J. *Elementary and Intermediate Algebra: Functions and Authentic Applications* (current/e). Pearson Education, (2015). Rationale: This is a representative text that applies beginning and intermediate algebra concepts with an early functions approach.

Cuesta General Education

D2 - Analytical Thinking

Math 128 is a 6 unit math course which applies algebra concepts from both beginning and intermediate algebra.

CSU Transfer Course

California Polytechnic State University