

The Mathematics Program

Functions, Statistics and Trigonometry (FST)

FST serves as a link from Algebra II to Pre-Calculus, AP Statistics or to most standard first-year college algebra courses. The course reviews concepts learned in Algebra II and introduces most of the main concepts taught in Pre-Calculus. Students will explore data, graphs and functions. This course covers modeling, statistics, trigonometry, polynomials, logarithms and exponentials, as well as sequences and series. It also provides experience with methods and applications for these topics. Appropriate technology, from manipulatives to calculators and application software, will be used regularly for instruction and assessment.

Prerequisites

- Use quadratic and linear functions to solve problems.
- Graph quadratic, linear, and exponential functions on the coordinate plane.
- Solve systems of equations using algebra, graphing, and matrices.
- Factor n-degree polynomials.
- Divide polynomials and understand the factor theorem.
- Understand exponential and logarithmic functions.

Competency Goal 1:

The student will demonstrate an understanding of basic data collection, representation, and analysis.

Objectives

1.01 Create and interpret displays and graphs.

- a. construct Bar graphs, Circle graphs, Stemplots, Dotplots, Boxplots, Scatterplots and Histograms.
- b. use summation notation to find the Mean, Variance and Standard Deviation of uni-variate data.
- c. calculate quartiles (Q1, Q2, Q3) and Inter-Quartile - Range (IQR).
- d. calculate Percentiles and Outliers and calculate Sample and Population Variance from data.
- e. calculate the equation of an estimated line of best fit using algebra.

1.02 Model data with functions (linear, exponential, and quadratic)

- a. use the graphic calculator to perform a linear, exponential, or quadratic regression.
- b. find and interpret the Correlation Coefficient using the graphic calculator.
- c. calculate and interpret differences between observed and predicted data (error)
- d. calculate the minimization of the deviations to find the Line of Best Fit.

1.03 Translate a set of raw data.

- a. Solve problems using translations of data
- b. Solve problems using scale changes of data

1.04 Use probability, counting, and simulation to solve problems.

- a. identify Theoretical Probability, Experimental Probability and Sample Space.
- b. determine the number of possibilities in Counting Principle situations, with and without replacement.
- c. define n factorial.
- d. identify the General Counting Principle and the Mutually Exclusive case.
- e. define Permutations for Independent and Dependent events.
- f. define Probability Distribution and calculate the expected value.
- g. define Combinations for Independent and Dependent events.
- h. define Pascal's Triangle and its relation to the Binomial Theorem.

1.05 Use binomial and normal distributions and statistics for hypothesis testing.

- a. perform binomial expansions
- b. find the n th term in a binomial expansion
- c. use the Binomial Expansion into Binomial Probability applications.
- d. identify the Binomial Distribution function.
- e. calculate the mean and standard deviation of data for the binomial Distribution function.
- f. identify null, alternative hypothesis and significance levels.
- g. identify the Standard Normal Curve and its properties.
- h. define the Z score
- i. calculate specific probabilities using the Standard Normal Distribution Table.

- j. calculate Standardizations of data.
- k. identify the difference between the Binomial Distribution and Normal distribution.

Competency Goal 2:

The student will use functions to solve problems.

Objectives

2.01 Define and graph functions

- a. define a function.
- b. use function notation.
- c. Determine the Domain and Range of a function.
- d. Sketch the following Parent Functions: Cubic, Quadratic, Hyperbola, Exponential, Absolute Value, Integer (rounding - up & down), Inverse - Square, Square Root, cube, cube-root.
- e. Identify the properties of the Parent Functions, in particular asymptotes and points of discontinuity.

2.02 Perform function operations and translations.

- a. calculate Composite functions.
- b. students will perform function operations ($f(x)*g(x)$, $f(x)/g(x)$)
- c. calculate Inverse functions
- d. recognize Odd & Even functions using graphs and/or Algebra (The Graph Translation Theorem).
- e. recognize a Vertical or Horizontal Scale Change of a function by using graphs and/or Algebra (The Graph Scale – Change Theorem).
- f. translate Parent Functions.

2.03 Use exponential and logarithmic functions to solve problems.

- a. Use Rational Exponents and be able to calculate the nth Root with the graphic calculator.
- b. simplify complex algebraic expressions involving radicals and rational exponents.
- c. define a logarithmic function with integer bases and base e .
- d. use the properties of Logarithms to solve basic logarithmic equations and simplify expressions.
- e. graph exponential and logarithmic functions.

Competency Goal 3:**3.01 Students will model and solve problems using the sine, cosine and tangent functions.**

- a. Includes both degree and radian measure.
- b. Define and apply sine, cosine and tangent ratios on right triangles.
- c. Translate between the degree and radian measure for an angle.
- d. Identify and define an angle in standard position and its radian measure.
- e. Identify the reference angle for an angle in standard position.
- f. Identify co-terminal angles.
- g. Identify the quadrant location of an angle given in degree or radian measure.
- h. Reproduce the unit circle including degree measures, radian measures, and coordinates for all multiples of 30° and 45° angles.
- i. Explain the relationship between the coordinate of a point on the unit circle and sine, cosine and tangent.
- j. Evaluate sine, cosine and tangent for specific radian measures.
- k. Find the inverse of sine, cosine and tangent values.
- l. Model and solve real-world applications using sine, cosine and tangent functions.
- m. Identify the period, amplitude and phase shift of a sine or cosine function.
- n. Graph and analyze a single period of a sine or cosine function
- o. Simplify trigonometric expressions and ratios by applying the fundamental trigonometric identities.
- p. Verify trigonometric identities by applying the fundamental identities.
- q. Identify the period, amplitude and phase shift of a sine or cosine
- r. use the Law of Sines and Cosines to solve real world problems.

Competency Goal 4: Students will demonstrate basic understanding of sequences and series.**4.01 Students will demonstrate an understanding of arithmetic and geometric sequences.**

- a. determine the difference between arithmetic and geometric series.
- b. find the explicit or recursive formulas for the nth term of an arithmetic or geometric sequence.
- c. determine the limits of certain sequences.
- d. demonstrate the difference between convergent and divergent sequences.

4.02 Students will demonstrate an understanding of arithmetic and geometric series.

- a. evaluate arithmetic and geometric series and solve associated problems.
- b. understand and use sigma (Σ) notation to find the sum of the first n terms of a arithmetic or geometric series.

Textbook: Functions, Statistics, and trigonometry

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