Advanced Functions and Modeling

Advanced Functions and Modeling provides students an in-depth study of modeling and applying functions. Home, work, recreation, consumer issues, public policy, and scientific investigations are just a few of the areas from which applications should originate. Appropriate technology, from manipulatives to calculators and application software, should be used regularly for instruction and assessment.

Prerequisites

- Describe phenomena as functions graphically, algebraically and verbally; identify independent and dependent quantities, domain, and range, and input/output.
- Translate among graphic, algebraic, numeric, tabular, and verbal representations of relations.
- Define and use linear, quadratic, cubic, and exponential functions to model and solve problems.
- Use systems of two or more equations or inequalities to solve problems.
- Use the trigonometric ratios to model and solve problems.
- Use logic and deductive reasoning to draw conclusions and solve problems.

Strands: Data Analysis and Probability, Algebra

COMPETENCY GOAL 1: The learner will analyze data and apply probability concepts to solve problems.

Objectives

1.01 Create and use calculator-generated models of linear, polynomial, exponential, trigonometric, power, and logarithmic functions of bivariate data to solve problems.

a) Interpret the constants, coefficients, and bases in the context of the data.

b) Check models for goodness-of-fit; use the most appropriate model to draw conclusions and make predictions.

1.02 Summarize and analyze univariate data to solve problems.

a) Apply and compare methods of data collection.

b) Apply statistical principles and methods in sample surveys.

c) Determine measures of central tendency and spread.
d) Recognize, define, and use the normal distribution curve.
e) Interpret graphical displays of univariate data.
f) Compare distributions of univariate data.

1.03 Use theoretical and experimental probability to model and solve problems.
a) Use addition and multiplication principles.
b) Calculate and apply permutations and combinations.
c) Create and use simulations for probability models.
d) Find expected values and determine fairness.
e) Identify and use discrete random variables to solve problems.
f) Apply the Binomial Theorem.

COMPETENCY GOAL 2: The learner will use functions to solve problems.

Objectives

2.01 Use logarithmic (common, natural) functions to model and solve problems; justify results.
a) Solve using tables, graphs, and algebraic properties.
b) Interpret the constants, coefficients, and bases in the context of the problem.

2.02 Use piecewise-defined functions to model and solve problems; justify results.
a) Solve using tables, graphs, and algebraic properties.
b) Interpret the constants, coefficients, and bases in the context of the problem.

2.03 Use power functions to model and solve problems; justify results.
a) Solve using tables, graphs, and algebraic properties.
b) Interpret the constants, coefficients, and bases in the context of the problem.

2.04 Use trigonometric (sine, cosine) functions to model and solve problems; justify results.
a) Solve using tables, graphs, and algebraic properties.
b) Create and identify transformations with respect to period, amplitude, and vertical and horizontal shifts.
c) Develop and use the law of sines and the law of cosines.

2.05 Use recursively-defined functions to model and solve problems.
a) Find the sum of a finite sequence.
b) Find the sum of an infinite sequence.
c) Determine whether a given series converges or diverges.
d) Translate between recursive and explicit representations.