



# ALGEBRA II Learning Objectives



## ALGEBRA OF FUNCTIONS AND PATTERNS

### The learner will

- ☑ solve equations and inequalities involving absolute value.
- ☑ solve systems of linear equations and inequalities (in two or three variables) by substitution, with graphs or with matrices.
- ☑ are adept at operations on polynomials, including long division.
- ☑ factor polynomials representing the difference of squares, perfect square trinomials and the sum and difference of two cubes.
- ☑ demonstrate knowledge of how real and complex numbers are related both arithmetically and graphically.
- ☑ plot complex numbers as points in the plane.
- ☑ add, subtract, multiply and divide complex numbers.
- ☑ add, subtract, multiply, divide, reduce and evaluate rational expressions with monomial and polynomial denominators and simplify complicated rational expressions, including those with negative exponents in the denominator.
- ☑ solve and graph quadratic equations by factoring, completing the square or using the quadratic formula.
- ☑ apply these techniques in solving word problems.
- ☑ solve quadratic equations in the complex number system.
- ☑ demonstrate and explain the effect that changing a coefficient has on the graph of quadratic functions; that is, students can determine how the graph of a parabola changes as  $a$ ,  $b$  and  $c$  vary in the equation  $y = a(x-b)^2 + c$ .
- ☑ graph quadratic functions and determine the maxima, minima and zeros of the function.
- ☑ know the laws of fractional exponents, understand exponential functions and use these functions in problems involving exponential growth and decay.
- ☑ determine whether a specific algebraic statement involving rational expressions, radical expressions or exponential functions is sometimes true, always true or never true.
- ☑ apply the method of mathematical induction to prove general statements about the positive integers.
- ☑ find the general term and the sums of arithmetic series and of both finite and infinite geometric series.
- ☑ derive the summation formulas for arithmetic series and for both finite and infinite geometric series.
- ☑ solve problems involving functional concepts, such as composition, defining the inverse function and performing arithmetic operations on functions.
- ☑ use properties from number systems to justify steps in combining and simplifying functions.
- ☑ perform addition and subtraction on matrices.
- ☑ multiply matrices by a scalar and perform matrix multiplication.
- ☑ demonstrate an understanding of the notion of the inverse to a square matrix and apply that concept to solve systems of linear equations.
- ☑ know that a square matrix is invertible if, and only if, its determinant is nonzero.
- ☑ compute the inverse to  $2 \times 2$  and  $3 \times 3$  matrices using row reduction methods or Cramer's rule.

## STATISTICS, DATA ANALYSIS AND PROBABILITY

### The learner will

- ☑ use fundamental counting principles to compute combinations and permutations.
- ☑ use combinations and permutations to compute probabilities.
- ☑ know the binomial theorem and use it to expand binomial expressions that are raised to positive integer powers.
- ☑ know the definition of the notion of independent events and use the rules for addition, multiplication and complementation to solve for probabilities of particular events in finite sample spaces.
- ☑ know the definition of conditional probability and use it to solve for probabilities in finite sample spaces.
- ☑ demonstrate an understanding of the notion of discrete random variables by using them to solve for the probabilities of outcomes, such as the probability of the occurrence of five heads in 14 coin tosses.
- ☑ be familiar with the standard distributions (normal and binomial) and use them to solve for events in problems in which the distribution belongs to those families.
- ☑ determine the mean of a normally distributed random variable.
- ☑ organize and describe distributions of data by using a number of different methods, including frequency tables, histograms, standard line and bar graphs, stem-and-leaf displays, scatterplots and box-and-whisker plots.
- ☑ solve probability problems with finite sample spaces by using the rules for addition, multiplication and complementation for probability distributions and understand the simplifications that arise with independent events.
- ☑ know the definition of conditional probability and use it to solve for probabilities in finite sample spaces.
- ☑ understand the notion of a continuous random variable and interpret the probability of an outcome as the area of a region under the graph of the probability density function associated with the random variable.



# ALGEBRA II Learning Objectives



## **STATISTICS, DATA ANALYSIS AND PROBABILITY**

### **The learner will**

- ☑ know the definition of the mean of a discrete random variable and determine the mean for a particular discrete random variable.
- ☑ know the definition of the variance of a discrete random variable and determine the variance for a particular discrete random variable.
- ☑ know the definitions of the mean, median and mode of distribution of data and compute each of them in particular situations.
- ☑ be familiar with the notions of a statistic of a distribution of values, of the sampling distribution of a statistic and of the variability of a statistic.
- ☑ determine confidence intervals for a simple random sample from a normal distribution of data and determine the sample size required for a desired margin of error.
- ☑ determine the P-value for a statistic for a simple random sample from a normal distribution.

## **RESOURCES**

Prentice-Hall Advanced Algebra (2005 ed.)

Internet research, applications and modeling.

PASCO measurement devices, laboratory investigations and supplemental materials.