CLEP EXAMINATION: *College Algebra*

DESCRIPTION OF THE EXAMINATION:
The College Algebra examination covers material that is usually taught in a one-semester college course in algebra. Nearly half of the test is made up of routine problems requiring basic algebraic skills; the remainder involves solving nonroutine problems in which candidates must demonstrate their understanding of concepts. The test includes questions on basic algebraic operations; linear and quadratic equations, inequalities, and graphs; algebraic, exponential, and logarithmic functions; and miscellaneous other topics. It is assumed that candidates are familiar with currently taught algebraic vocabulary, symbols, and notation. The test places little emphasis on arithmetic calculations, and it does not contain any questions that require the use of a calculators. However, an online scientific calculator (nongraphing) will be available during the examination.

The examination contains approximately 60 questions to be answered in 90 minutes. Some of these are pretest questions that will not be scored. Any time candidates spend on tutorials and providing personal information is in addition to the actual testing time.

STUDY RESOURCES:
Most textbooks used in college-level algebra courses cover the topics listed on the "CLEP Test Knowledge and Skills Required" column of the following table, but the approaches to certain topics and the emphasis given to them may differ. To prepare for the College Algebra exam, it is advisable to study one or more college textbooks, which can be found in most college bookstores. When selecting a textbook, check the table of contents against the "Knowledge and Skills Required" for this test.

CLEP TEST KNOWLEDGE AND SKILLS REQUIRED	MINNESOTA 9, 10, 11 ALGEBRA STANDARDS	Notes

	Standards	Bench-mark #	Benchmarks	
Algebraic Operations ▪ Factoring and expanding polynomials ▪ Operations with algebraic expressions ▪ Operations with exponents ▪ Properties of logarithms	Recognize linear, quadratic, exponential and other common functions in real-world and mathematical situations; represent these functions with tables, verbal descriptions, symbols and graphs; solve problems involving these functions, and explain results in the original context.	9.2.2.1	Represent and solve problems in various contexts using linear and quadratic functions.	
		9.2.2.2	Represent and solve problems in various contexts using exponential functions, such as investment growth, depreciation and population growth.	
	Generate equivalent algebraic expressions involving polynomials and radicals; use algebraic properties to evaluate expressions.	9.2.3.1	Evaluate polynomial and rational expressions and expressions containing radicals and absolute values at specified points in their domains.	
		9.2.3.2	Add, subtract and multiply polynomials; divide a polynomial by a polynomial of equal or lower degree.	
		9.2.3.3	Factor common monomial factors from polynomials, factor quadratic polynomials, and factor the difference of two squares.	
		9.2.3.4	Add, subtract, multiply, divide and simplify algebraic fractions.	
		9.2.3.5	Check whether a given complex number is a solution of a quadratic equation by substituting it for the variable and evaluating the expression, using arithmetic with complex numbers.	

		9.2.3.6	Apply the properties of positive and negative rational exponents to generate equivalent algebraic expressions, including those involving n^{th} roots.	
		9.2.3.7	Justify steps in generating equivalent expressions by identifying the properties used. Use substitution to check the equality of expressions for some particular values of the variables; recognize that checking with substitution does not guarantee equality of expressions for all values of the variables.	
	Represent real-world and mathematical situations using equations and inequalities involving linear, quadratic, exponential and nth root functions. Solve equations and inequalities symbolically and graphically. Interpret solutions in the original context.	9.2.4.1	Represent relationships in various contexts using quadratic equations and inequalities. Solve quadratic equations and inequalities by appropriate methods including factoring, completing the square, graphing and the quadratic formula. Find non-real complex roots when they exist. Recognize that a particular solution may not be applicable in the original context. Know how to use calculators, graphing utilities or other technology to solve quadratic equations and inequalities.	
		9.2.4.2	Represent relationships in various contexts using equations involving exponential functions; solve these equations graphically or numerically. Know how to use calculators, graphing utilities or other technology to solve these equations.	
		9.2.4.3	Recognize that to solve certain equations, number systems need to be extended from whole numbers to integers, from integers to rational numbers, from rational numbers to real numbers, and from real numbers to complex numbers. In particular, non-real complex numbers are needed to solve some quadratic equations with real coefficients.	

Equations and Inequalities • Linear equations and inequalities • Quadratic equations and inequalities • Absolute value equations and inequalities • Systems of equations and inequalities • Exponential and logarithmic equations	Recognize linear, quadratic, exponential and other common functions in real-world and mathematical situations; represent these functions with tables, verbal descriptions, symbols and graphs; solve problems involving these functions, and explain results in the original context.	9.2.2.1	Represent and solve problems in various contexts using linear and quadratic functions.	
		9.2.2.2	Represent and solve problems in various contexts using exponential functions, such as investment growth, depreciation and population growth.	
		9.2.2.3	Sketch graphs of linear, quadratic and exponential functions, and translate between graphs, tables and symbolic representations. Know how to use graphing technology to graph these functions.	
		9.2.2.6	Sketch the graphs of common non-linear functions such as $f(x)=\sqrt{x}$, $f(x)=|x|$, $f(x)=\frac{1}{x}$, $f(x)=x^3$, and translations of these functions, such as $f(x)=\sqrt{x-2}+4$. Know how to use graphing technology to graph these functions.	
		9.2.3.5	Check whether a given complex number is a solution of a quadratic equation by substituting it for the variable and evaluating the expression, using arithmetic with complex numbers.	
		9.2.3.7	Justify steps in generating equivalent expressions by identifying the properties used. Use substitution to check the equality of expressions for some particular values of the variables; recognize that checking with substitution does not guarantee equality of expressions for all values of the variables.	
	Generate equivalent algebraic expressions involving polynomials and radicals; use algebraic	9.2.4.1	Represent relationships in various contexts using quadratic equations and inequalities. Solve quadratic equations and inequalities by appropriate methods including factoring, completing the square,	

	properties to evaluate expressions.		graphing and the quadratic formula. Find non-real complex roots when they exist. Recognize that a particular solution may not be applicable in the original context. Know how to use calculators, graphing utilities or other technology to solve quadratic equations and inequalities.	
		9.2.4.2	Represent relationships in various contexts using equations involving exponential functions; solve these equations graphically or numerically. Know how to use calculators, graphing utilities or other technology to solve these equations	
	Represent real-world and mathematical situations using equations and inequalities involving linear, quadratic, exponential and nth root functions. Solve equations and inequalities symbolically and graphically. Interpret solutions in the original context.	9.2.4.3	Recognize that to solve certain equations, number systems need to be extended from whole numbers to integers, from integers to rational numbers, from rational numbers to real numbers, and from real numbers to complex numbers. In particular, non-real complex numbers are needed to solve some quadratic equations with real coefficients.	
		9.2.4.4	Represent relationships in various contexts using systems of linear inequalities; solve them graphically. Indicate which parts of the boundary are included in and excluded from the solution set using solid and dotted lines.	
		9.2.4.5	Solve linear programming problems in two variables using graphical methods.	
		9.2.4.6	Represent relationships in various contexts using absolute value inequalities in two variables; solve them graphically.	

		9.2.4.7	Solve equations that contain radical expressions. Recognize that extraneous solutions may arise when using symbolic methods.	
		9.2.4.8	Assess the reasonableness of a solution in its given context and compare the solution to appropriate graphical or numerical estimates; interpret a solution in the original context.	
		9.2.1.1	Understand the definition of a function. Use functional notation and evaluate a function at a given point in its domain.	
		9.2.1.2	Distinguish between functions and other relations defined symbolically, graphically or in tabular form.	
Functions and their properties ▪ Definition and interpretation ▪ Representation/modeling (graphical numerical, symbolic, and verbal representations of functions) ▪ Domain and range ▪ Algebra of functions ▪ Graphs and their properties	Understand the concept of function, and identify important features of functions and other relations using symbolic and graphical methods where appropriate.	9.2.1.3	Find the domain of a function defined symbolically, graphically or in a real-world context.	
		9.2.1.4	Obtain information and draw conclusions from graphs of functions and other relations.	
		9.2.1.5	Identify the vertex, line of symmetry and intercepts of the parabola corresponding to a quadratic function, using symbolic and graphical methods, when the function is expressed in the form $f(x) = ax^2 + bx + c$, in the form $f(x) = a(x - \text{h})^2 + k$, or in factored form.	

(including intercepts, symmetry, and transformations) ▪ Inverse functions		9.2.1.6	Identify intercepts, zeros, maxima, minima and intervals of increase and decrease from the graph of a function.	
		9.2.1.7	Understand the concept of an asymptote and identify asymptotes for exponential functions and reciprocals of linear functions, using symbolic and graphical methods.	
		9.2.1.8	Make qualitative statements about the rate of change of a function, based on its graph or table of values	
		9.2.1.9	Determine how translations affect the symbolic and graphical forms of a function. Know how to use graphing technology to examine translations.	
		9.2.2.6	Sketch the graphs of common non-linear functions such as $f(x)=\sqrt{x}$, $f(x)=|x|$, $f(x)=\frac{1}{x}$, $f(x)=x^3$, and translations of these functions, such as $f(x)=\sqrt{x-2}+4$. Know how to use graphing technology to graph these functions.	
		9.2.4.3	Recognize that to solve certain equations, number systems need to be extended from whole numbers to integers, from integers to rational numbers, from rational numbers to real numbers, and from real numbers to complex numbers. In particular, non-real complex numbers are needed to solve some quadratic equations with real coefficients.	
	Recognize linear, quadratic, exponential and other common functions in real-world and mathematical situations; represent these functions with tables, verbal	9.2.4.4	Represent relationships in various contexts using systems of linear inequalities; solve them graphically. Indicate which parts of the boundary	

	descriptions, symbols and graphs; solve problems involving these functions, and explain results in the original context.			
	Represent real-world and mathematical situations using equations and inequalities involving linear, quadratic, exponential, and nth root functions. Solve equations and inequalities symbolically and graphically. Interpret solutions in the original context.	9.2.4.5	Solve linear programming problems in two variables using graphical methods.	
		9.2.4.6	Represent relationships in various contexts using absolute value inequalities in two variables; solve them graphically.	
		9.2.4.7	Solve equations that contain radical expressions. Recognize that extraneous solutions may arise when using symbolic methods.	
		9.2.4.8	Assess the reasonableness of a solution in its given context and compare the solution to appropriate graphical or numerical estimates; interpret a solution in the original context.	
		9.2.2.4	Express the terms in a geometric sequence recursively and by giving an explicit (closed form) formula, and express the partial sums of a geometric series recursively.	
		9.2.2.5	Recognize and solve problems that can be modeled using finite geometric sequences and series, such as home mortgage and other compound interest examples. Know how to use spreadsheets and calculators to explore geometric sequences and series in various contexts.	

Number systems and operations - Real numbers - Complex numbers - Sequences and series - Factorials and Binomial Theorem - Determinants of 2-by-2 matrices	Recognize linear, quadratic, exponential and other common functions in real-world and mathematical situations; represent these functions with tables, verbal descriptions, symbols and graphs; solve problems involving these functions, and explain results in the original context.	9.2.3.5	Check whether a given complex number is a solution of a quadratic equation by substituting it for the variable and evaluating the expression, using arithmetic with complex numbers.	
		9.2.4.3	Recognize that to solve certain equations, number systems need to be extended from whole numbers to integers, from integers to rational numbers, from rational numbers to real numbers, and from real numbers to complex numbers. In particular, non-real complex numbers are needed to solve some quadratic equations with real coefficients.	