

CLEP EXAMINATION: *College Mathematics*

DESCRIPTION OF THE EXAMINATION:

The College Mathematics examination covers material generally taught in a college course for nonmathematics majors and majors in other fields not requiring knowledge of advanced mathematics. Approximately half of the test requires candidates to solve routine straightforward problems; the remainder involves solving nonroutine problems in which candidates must demonstrate their understanding of concepts. The test includes questions on the real number system, logic, sets, equations, functions and their graphs, probability, statistics, and data analyses. A few questions on other topics are included, such as complex numbers, logarithms and exponents, and applications from algebra and geometry. It is assumed that candidates are familiar with currently taught mathematics vocabulary, symbols and notation. The examination places little emphasis on arithmetic calculations, and it does not contain any questions that require the use of a calculator. However, an online nongraphing scientific calculator is available to candidates during the examination as part of the testing software.

The examination contains 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 mathematics 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 Mathematics exam, it is advisable to study one or more introductory college-level mathematics textbooks, which can be found in most college bookstores. Elementary algebra textbooks also cover many of the topics on the College Mathematics exam. 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	
Sets <ul style="list-style-type: none"> • Union and intersection • Subsets • Venn Diagrams • Cartesian product 	Calculate probabilities and apply probability concepts to solve real-world and mathematical problems.	9.4.3.6	Describe the concepts of intersections, unions and complements using Venn diagrams. Understand the relationships between these concepts and the words AND, OR, NOT, as used in computerized searches and spreadsheets.	Subsets and Cartesian products are not mentioned in the 9, 10, 11 MN State Standards.
Logic <ul style="list-style-type: none"> ▪ Truth tables ▪ Conjunctions, disjunctions, implications, and negations ▪ Conditional statements ▪ Necessary and sufficient conditions ▪ Converse, inverse, and contrapositive ▪ Hypotheses, conclusions, and counterexamples 		9.3.2.2	Accurately interpret and use words and phrases in geometric proofs such as “if...then,” “if and only if,” “all,” and “not.” Recognize the logical relationships between an “if...then” statement and its inverse, converse and contrapositive.	Truth tables, conjunctions, disjunctions, negations, necessary and sufficient conditions are not mentioned in the 9, 10, 11 MN State Standards.

<p>Real Number System</p> <ul style="list-style-type: none"> ▪ Prime and composite numbers ▪ Odd and even numbers ▪ Factors and divisibility ▪ Rational and irrational numbers ▪ Absolute value and order ▪ Open and closed intervals 				<p>Below high school standards (prerequisite knowledge)</p>
<p>Functions and their Graphs</p> <ul style="list-style-type: none"> ▪ Properties and graphs of functions ▪ Domain and range ▪ Composition of functions and inverse functions 	<p>Understand the concept of function, and identify important features of functions and other relations using symbolic and graphical methods.</p>	<p>9.2.1.1</p>	<p>Understand the definition of a function. Use functional notation and evaluate a function at a given point in its domain.</p>	<p>Composition of functions and inverse functions are not mentioned in the 9, 10, 11 MN State Standards.</p>
<p>9.2.1.2</p>	<p>Distinguish between functions and other relations defined symbolically, graphically or in tabular form.</p>			
<p>9.2.1.3</p>	<p>Find the domain of a function defined symbolically, graphically or in a real-world context.</p>			
<p>9.2.1.4</p>	<p>Obtain information and draw conclusions from graphs of functions and other relations.</p>			

		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.	
Probability & Statistics <ul style="list-style-type: none"> ▪ Counting problems, including permutations and combinations ▪ Computation of probabilities of simple and compound events ▪ Simple conditional probability ▪ Mean, median, mode and range ▪ Concept of standard deviation 	Display and analyze data; use various measures associated with data to draw conclusions, identify trends and describe relationships.	9.4.1.1	Describe a data set using data displays, such as box-and-whisker plots; describe and compare data sets using summary statistics, including measures of center, location and spread. Measures of center and location include mean, median, quartile and percentile. Measures of spread include standard deviation, range and inter-quartile range. Know how to use calculators, spreadsheets or other technology to display data and calculate summary statistics.	
		9.4.1.2	Analyze the effects on summary statistics of changes in data sets.	
		9.4.1.4	Use the mean and standard deviation of a data set to fit it to a normal distribution (bell-shaped curve) and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets and tables to estimate areas under the normal curve.	
Additional Topics from Algebra and Geometry: <ul style="list-style-type: none"> ▪ Complex numbers ▪ Logarithms & 	Recognize linear, quadratic, exponential and other common functions in real-	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	

<p>exponents</p> <ul style="list-style-type: none"> ▪ Applications from algebra and geometry ▪ Perimeter and area of plane figures ▪ Properties of triangles, circles and rectangles ▪ The Pythagorean Theorem ▪ Parallel and perpendicular lines ▪ Algebraic equations and inequalities 	<p>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.</p>		<p>growth, depreciation and population's growth.</p>
		9.2.2.3	<p>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.</p>
	<p>Generate equivalent algebraic expressions involving polynomials and radicals; use algebraic properties to evaluate expressions.</p>	9.2.3.5	<p>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.</p>
		9.2.3.6	<p>Apply the properties of positive and negative rational exponents to generate equivalent algebraic expressions, including those involving nth roots.</p>
	<p>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.</p>	9.2.4.1	<p>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.</p>
		9.2.4.2	<p>Represent relationships in various contexts using equations involving exponential functions; solve these equations graphically or numerically. Know</p>

			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.	
		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.	
		9.2.4.6	Represent relationships in various contexts using absolute value inequalities in two variables; solve them graphically.	
		9.2.4.8	Assess the reasonableness of a solution in its given context and compare the solution to appropriate graphically or numerical estimates; interpret a solution in the original context.	
Additional Topics from Algebra and Geometry: <ul style="list-style-type: none"> ▪ Complex numbers ▪ Logarithms & exponents ▪ Applications from algebra and geometry ▪ Perimeter and area of plane figures ▪ Properties of triangles, circles and rectangles 	Calculate measurements of plane and solid geometric figures; know that physical measurements depend on the choice of a unit and that they are approximations.	9.3.1.2	Compose and decompose two- and three-dimensional figures; use decomposition to determine the perimeter, area, surface area and volume of various figures.	
		9.3.1.3	Understand that quantities associated with physical measurements must be assigned units; apply such units correctly in expressions, equations and problem solutions that involve measurements; and convert between measurement systems.	
	Know and apply properties of geometric figures to	9.3.3.1	Know and apply properties of parallel and perpendicular lines, including properties of angles formed by a transversal, to solve problems and	

<ul style="list-style-type: none"> ▪ The Pythagorean Theorem ▪ Parallel and perpendicular lines Algebraic equations and inequalities	solve real-world and mathematical problems and to logically justify results in geometry.		logically justify results.
		9.3.3.2	Know and apply properties of angles, including corresponding, exterior, interior, vertical, complementary and supplementary angles, to solve problems and logically justify results.
		9.3.3.3	Know and apply properties of equilateral, isosceles and scalene triangles to solve problems and logically justify results.
		9.3.3.4	Apply the Pythagorean Theorem and its converse to solve problems and logically justify results.
		9.3.3.5	Know and apply properties of right triangles, including properties of 45-45-90 and 30-60-90 triangles, to solve problems and logically justify results.
		9.3.3.6	Know and apply properties of congruent and similar figures to solve problems and logically justify results.
		9.3.3.7	Use properties of polygons—including quadrilaterals and regular polygons—to define them, classify them, solve problems and logically justify results.
		9.3.3.8	Know and apply properties of a circle to solve problems and logically justify results.
	Solve real-world and mathematical geometric problems using algebraic methods.	9.3.4.4	Use coordinate geometry to represent and analyze line segments and polygons, including determining lengths, midpoints and slopes of line segments.
		9.3.4.7	Use algebra to solve geometric problems unrelated to coordinate geometry, such as solving for an unknown length in a figure involving similar triangles, or using the Pythagorean Theorem to obtain a quadratic equation for a length in a geometric figure.

