

**Mississippi Institutions of Higher Learning
Office of Academic and Student Affairs
College Readiness – Math Competencies**

Skills Areas	Essential Competencies	Desirable Competencies
Skill	<p>At a minimum, the student will be able to:</p> <p>Add, subtract, multiply and divide integers, fractions and decimals.</p> <p>Organize and display data using appropriate methods (including spreadsheets) to detect patterns and departures from patterns.</p> <p>Read and interpret tables, charts, and graphs.</p> <p>Compute and explain summary statistics for distributions of data including measures of center (mean, median) and spread (range, percentiles, variance, standard deviation).</p> <p>When solving problems, think ahead about strategy, test ideas with special cases, try different approaches, check for errors and reasonableness of solutions as a regular part of routine work, and devise independent ways to verify results.</p> <p>Solve quadratic equations in one variable.</p> <p>Use calculators appropriately and make estimations without a calculator regularly to detect potential errors.</p> <p>Recognize and solve problems that can be modeled using a linear equation in one variable, such as time/rate/distance problems, percentage increase or decrease problems, and ratio and proportion problems.</p>	<p>It is highly desirable that the student be able to:</p> <p>State and prove key basic theorems in geometry such as the Pythagorean theorem, the sum of the angles of a triangle is 180 degrees, and the line joining the midpoints of two sides of a triangle is parallel to the third side and half its length.</p> <p>Apply the trigonometric functions sine, cosine and tangent to solve for an unknown length of a side of a right triangle, given one of the acute angles and the length of another side.</p>
Number Sense and Numerical Operation	<p>Compute with rational numbers fluently and accurately without a calculator.</p> <p>Recognize and apply magnitude (absolute value) and ordering of real numbers.</p> <p>Understand that to solve certain problems and equations, number systems need to</p>	<p>Graph exponential functions and identify their key characteristics.</p> <p>Recognize and solve problems that can be modeled using a finite geometric series, such as home mortgage problems and other compound interest problems.</p>

	<p>be extended from whole numbers to the set of all integers (positive, negative and zero), from integers to rational numbers, from rational numbers to real numbers (rational and irrational numbers) and from real numbers to complex numbers; define and give examples of each of these types of numbers.</p> <p>Understand the capabilities and the limitations of calculators and computers in solving problems.</p>	
<p>Algebra</p>	<p>Perform basic operations on algebraic expressions fluently and accurately.</p> <p>Add, subtract and multiply polynomials; divide a polynomial by a low-degree polynomial.</p> <p>Factor polynomials by removing the greatest common factor; factor quadratic polynomials.</p> <p>Add, subtract, multiply, divide and simplify rational expressions.</p> <p>Evaluate polynomial and rational expressions and expressions containing radicals and absolute values at specified values of their variables.</p> <p>Understand functions, their representations and their properties.</p> <p>Understand functional notation and evaluate a function at a specified point in its domain.</p> <p>Apply basic algebraic operations to solve equations and inequalities.</p> <p>Solve quadratic equations in one variable.</p> <p>Graph a variety of equations and inequalities in two variables, demonstrate understanding of the relationships between the algebraic properties of an equation and the geometric properties of its graph, and interpret a graph.</p> <p>Solve problems by converting the verbal information given into an appropriate mathematical model involving equations or systems of equations; apply appropriate mathematical techniques to analyze these mathematical models; and</p>	

	<p>interpret the solution obtained in written form using appropriate units of measurement.</p> <p>Recognize and solve problems that can be modeled using a system of two equations in two variables, such as mixture problems.</p> <p>Understand the binomial theorem and its connections to combinatorics, Pascal's triangle and probability.</p>	
<p>Geometry</p>	<p>Know the basic theorems about congruent and similar triangles and use them to prove additional theorems and solve problems.</p> <p>Know the definitions and basic properties of a circle and use them to prove basic theorems and solve problems.</p> <p>Apply the Pythagorean theorem, its converse and properties of special right triangles to solve problems.</p> <p>Use rigid motions (compositions of reflections, translations and rotations) to determine whether two geometric figures are congruent and to create and analyze geometric designs.</p> <p>Know about the similarity of figures and use the scale factor to solve problems</p> <p>Know that geometric measurements (length, area, perimeter, volume) depend on the choice of a unit and that measurements made on physical objects are approximations; calculate the measurements of common plane and solid geometric figures.</p> <p>Represent geometric objects and figures algebraically using coordinates; use algebra to solve geometric problems.</p> <p>Describe a line by a linear equation.</p> <p>Find the distance between two points using their coordinates and the Pythagorean theorem.</p>	<p>Understand the different roles played by axioms, definitions and theorems in the logical structure of mathematics, especially in geometry.</p> <p>Identify, explain the necessity of and give examples of definitions, axioms and theorems.</p> <p>State and prove key basic theorems in geometry such as the Pythagorean theorem, the sum of the angles of a triangle is 180 degrees, and the line joining the midpoints of two sides of a triangle is parallel to the third side and half its length.</p> <p>Recognize that there are geometries, other than Euclidean geometry, in which the parallel postulate is not true.</p> <p>Identify and apply the definitions related to lines and angles and use them to prove theorems in (Euclidean) geometry, solve problems, and perform basic geometric constructions using a straight edge and compass.</p> <p>Visualize solids and surfaces in three-dimensional space when given two-dimensional representations (e.g., nets, multiple views) and create two-dimensional representations for the surfaces of three-dimensional objects.</p> <p>Understand basic right-triangle trigonometry and apply it to solve problems.</p> <p>Use the standard formula for the area of a triangle, $A = \frac{1}{2} bh$, to explain the area formula, $A = \frac{1}{2} ab \sin C$ where a and b are the lengths of two sides of a triangle and C is the measure of the included angle formed by these two</p>

		<p>sides, and use it to find the area of a triangle when given the lengths of two of its sides and the included angle.</p> <p>Derive basic formulas involving these functions, and use these functions and formulas to solve problems.</p>
Data Interpretation, Statistics and Probability	<p>Explain and apply quantitative information. (Patterns)</p> <p>Evaluate reports based on data published in the media by considering the source of the data, the design of the study, and the way the data are analyzed and displayed.</p> <p>Explain and apply probability concepts and calculate simple probabilities.</p>	<p>Explain and critique alternative ways of presenting and using information.</p> <p>Recognize when arguments based on data confuse correlation with causation.</p> <p>Explain the use of data and statistical thinking to draw inferences, make predictions and justify conclusions.</p> <p>Explain the differences between randomized experiments and observational studies.</p> <p>Explain how the law of large numbers can be applied in simple examples.</p>
Mathematical Reasoning	<p>Use inductive and deductive reasoning to arrive at valid conclusions.</p> <p>Use multiple representations (literal, symbolic, graphic) to represent problems and solutions.</p> <p>Understand the role of definitions, proofs and counter-examples in mathematical reasoning; constructing simple proofs.</p> <p>Use the special symbols of mathematics correctly and precisely.</p> <p>Recognize when an estimate or approximation is more appropriate than an exact answer and understand the limits on precision of approximations.</p> <p>Distinguish relevant from irrelevant information, identify missing information, and either find what is needed or make appropriate estimates.</p> <p>Recognize and use the process of mathematical modeling and recognize and clarify mathematical structures that are embedded in other contexts, formulate a problem in mathematical terms, use mathematical strategies to reach a solution, and interpret the solution in the context of the original problem.</p>	<p>Shift regularly between the specific and the general, use examples to understand general ideas, and extend specific results to more general cases to gain insight.</p>

	<p>(Math is useful)</p> <p>When solving problems, think ahead about strategy, test ideas with special cases, try different approaches, check for errors and reasonableness of solution as a regular part of a routine work, and devise independent ways to verify results.</p>	
<p>Mathematics Subject Strands</p>	<p>Number Sense and Numerical Operations</p> <p>Algebra</p> <p>Geometry</p> <p>Mathematical Reasoning</p>	<p>Data Interpretation, Statistics and Probability</p>