

## College- and Career-Readiness Assessment: Mathematics Performance Level Descriptors

### Advanced

Students at the Advanced level have a 90% probability of earning a C or higher and a 66% probability of earning a B or higher in credit-bearing math courses at 4-year institutions. Their average first year college GPA at this level is a 3.3 or above (low B or higher). Students at this level are highly likely to be on track to be successful at the next level.

Students demonstrate superior performance with challenging subject matter and clearly exhibit readiness for college and career. In addition to demonstrating broad and in-depth understanding and application of all skills in the Proficient Level, students scoring at the Advanced Level typically:

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| <ul style="list-style-type: none"><li>• Rewrite rational, radical, and exponential expressions.</li><li>• Find the value of <math>i^n</math> for any whole number <math>n</math>.</li><li>• Perform operations on complex numbers.</li><li>• Add, subtract, and perform scalar multiplication on matrices.</li><li>• Interpret a term in a linear function of a challenging context.</li><li>• Make connections between different representations of, linear functions, systems of two linear equations, and systems of two linear inequalities in two variables.</li><li>• Determine the conditions under which a system of two linear equations in two has no solution, one solution, or infinitely many solutions.</li><li>• Create and use a linear equation in two variables that represents a challenging context.</li><li>• Create and solve a 3-variable linear system.</li><li>• Create and use an inequality in one or two variables that represents a challenging context.</li><li>• Make connections between the graph and solution to a quadratic and linear system of equations.</li><li>• Given a graph of a quadratic or exponential function representing a context, interpret a value, variable, point, or input-output pair in terms of the context.</li></ul> | <ul style="list-style-type: none"><li>• Solve absolute value, logarithmic, polynomial, rational, radical, and exponential equations in real-world and mathematical problems.</li><li>• Solve quadratic equations with complex solutions.</li><li>• Analyze graphs relationships between two quantities, including relationships that are not represented by a linear, quadratic, or exponential equation.</li><li>• Identify characteristics of graphs of functions.</li><li>• Identify the effect of multiple transformations of functions.</li><li>• Find inverse functions.</li><li>• Divide polynomials.</li><li>• Solve challenging radical and rational equations.</li><li>• Solve problems involving arithmetic and geometric sequences and series.</li><li>• Identify an appropriate inference or conclusion based on information from a graph, table, or scatterplot.</li><li>• Identify the equation of a line or curve that best fits the data in a scatterplot.</li><li>• Identify the appropriate conclusion to draw from a description of a study's design and the study results.</li><li>• Compare measures of center and spread of two data distributions represented visually.</li></ul> |
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## College- and Career-Readiness Assessment: Mathematics Performance Level Descriptors

### Advanced (cont.)

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| <ul style="list-style-type: none"><li>• Find the probability of a compound event.</li><li>• Recognize the effect of standard deviation.</li><li>• Count using the Fundamental Counting Principle, combinations, and permutations, including when cases overlap.</li><li>• Identify the most appropriate sample or sampling method to best answer the question of interest.</li><li>• Identify the population to which the results of a survey can be generalized.</li><li>• Understand sampling variability when the population proportion is estimated using sample data.</li><li>• Use similarity as well as theorems related to lines, angles, and triangles to solve problems.</li><li>• Find the diameter, radius, center, or points on a circle in coordinate plane.</li></ul> | <ul style="list-style-type: none"><li>• Solve problems using properties of special right triangles, the Pythagorean Theorem or its converse, and trigonometric ratios.</li><li>• Solve problems using properties and theorems relating to circles and parts of circles, such as radii, diameters, tangents, angles, arcs, arc length, and sector area.</li><li>• Apply the triangle inequality theorem.</li><li>• Recognize congruencies that appear through the use of auxiliary lines.</li><li>• Determine an expression for the area of a regular polygon in terms of side length or apothem/altitude.</li><li>• Find area and volume of composite shapes.</li><li>• Convert area and volume to different units.</li></ul> |
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## College- and Career-Readiness Assessment: Mathematics Performance Level Descriptors

### Proficient

Students at the Proficient level have approximately a 75% or higher probability of earning a C or higher in credit-bearing math courses at all levels of higher education. Their average first year college GPA at this level is between a 2.9 and 3.3 (high C to low B). Students at this level are likely to be on track to be successful at the next level.

Students demonstrate mastery with subject matter and exhibit readiness for college and career. In addition to demonstrating understanding and application of all skills in the Basic Level, students scoring at the Proficient Level typically:

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| <ul style="list-style-type: none"><li>• Rationalize numeric expressions.</li><li>• Convert numbers with rational exponents to radical form.</li><li>• Simplify cube roots.</li><li>• Use properties of radicals and exponents to rewrite expressions.</li><li>• Evaluate slope in given contexts.</li><li>• Interpret terms in linear functions and make connections between different representations.</li><li>• Determine the number of solutions linear systems of two equations have.</li><li>• Create and solve linear equations within context.</li><li>• Create and use inequalities within context.</li><li>• Graph compound linear inequalities.</li><li>• Interpret the constant, variable, term, solution, or input-output pair in quadratic or exponential functions in context.</li><li>• Add, subtract, and multiply polynomials.</li><li>• Solve multistep quadratic equations.</li><li>• Solve radical equations.</li><li>• Solve rational equations.</li><li>• Solve systems of equations with one linear and one quadratic equation.</li><li>• Solve literal equations for a given variable.</li><li>• Use Venn diagrams to make conclusions.</li></ul> | <ul style="list-style-type: none"><li>• Make connections between the various representations of quadratic or exponential functions.</li><li>• Factor polynomial expressions.</li><li>• Determine the number of solutions quadratic equations have.</li><li>• Create and/or use quadratic or exponential functions to represent real-world contexts.</li><li>• Graph polynomial functions.</li><li>• Evaluate the effects of single function transformations.</li><li>• Evaluate logarithmic, polynomial, rational, radical, and exponential functions, including where they are undefined.</li><li>• Find near terms in geometric sequences.</li><li>• Compose 2 functions.</li><li>• Evaluate conclusions of population proportions based on sample data and margins of error.</li><li>• Identify bias in sampling methods.</li><li>• Interpret scatterplots and use lines of best fit to make predictions.</li><li>• Calculate, compare, and interpret measures of central tendency in context.</li><li>• Determine probabilities of compound events.</li><li>• Find probabilities where the sample space must be determined from the context.</li><li>• Solve problems using properties of right triangles.</li></ul> |
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## College- and Career-Readiness Assessment: Mathematics Performance Level Descriptors

### Proficient (cont.)

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| <ul style="list-style-type: none"><li>• Make connections between the equation of a circle in a coordinate plane and the center and radius of the circle.</li><li>• Solve simple problems using properties and theorems relating to circles and parts of circles.</li><li>• Solve problems using properties of similar triangles.</li><li>• Find the measure of interior angles of polygons.</li><li>• Solve problems using the midpoint formula.</li><li>• Solve problems using multiple theorems related to lines, angles, or triangles.</li></ul> | <ul style="list-style-type: none"><li>• Solve problems involving circumference, area, surface area, perimeter and volume.</li><li>• Solve problems involving translations, rotations, and reflections.</li><li>• Solve problems using the Pythagorean Theorem.</li><li>• Solve problems using the distance formula.</li><li>• Solve problems involving right triangles using trigonometric functions.</li></ul> |
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## College- and Career-Readiness Assessment: Mathematics Performance Level Descriptors

### Basic

Students at this level have a 50% or higher probability of earning a C or higher in credit-bearing math courses across all levels of higher education. Their average first year college GPA at this level is between a 2.4 to 2.8 (mid to high C student). Students at this level likely require additional coursework and/or support to be on track for college and/or career success.

Students demonstrate partial mastery with subject matter but may not exhibit readiness for college and career. In addition to demonstrating understanding and application of all skills in the Below Basic Level, students scoring at the Basic Level typically:

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| <ul style="list-style-type: none"><li>• Add complex numbers and add matrices.</li><li>• Simplify square roots.</li><li>• Rewrite monomials with integer exponents to have positive exponents.</li><li>• Create linear expressions, equations or inequalities to model contexts.</li><li>• Create systems of two linear equations to model contexts.</li><li>• Solve systems of two linear equations with integer coefficients.</li><li>• Make connections between different representations of linear relationships between two variables.</li><li>• Create and use linear relationships to solve a problem.</li><li>• Multiply polynomials by monomials.</li><li>• Multiply binomials.</li><li>• Factor monomials from polynomial expressions.</li><li>• Factor trinomials.</li><li>• Add and subtract polynomials.</li><li>• Solve quadratic equations in the form <math>ax^2 = b</math>.</li><li>• Solve simple radical equations.</li><li>• Use function notation to represent functions.</li><li>• Evaluate absolute value functions.</li></ul> | <ul style="list-style-type: none"><li>• Evaluate simple algebraic expressions.</li><li>• Identify the shape of graphs from some of their points.</li><li>• Identify graphs of nonlinear relationships between two variables based on descriptions of characteristics.</li><li>• Read and interpret information presented in graphs, scatterplots, or tables.</li><li>• Find the median or mean of data sets.</li><li>• Find probabilities of simple events.</li><li>• Estimate expected population counts or proportions from sample counts or proportions.</li><li>• Find probabilities of simple compound events.</li><li>• Calculate simple conditional probabilities.</li><li>• Solve simple problems about geometric figures using the vertical angle theorem, the triangle angle sum theorem, or theorems about a transversal crossing parallel lines.</li><li>• Solve real-world problems using the Pythagorean Theorem.</li><li>• Solve simple problems involving perimeter, area and volume.</li><li>• Identify corresponding parts of congruent triangles.</li><li>• Translate points horizontally and vertically on a coordinate plane.</li></ul> |
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### Below Basic

Students have not performed at least at the **Basic** level.

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