Higher Education Math Placement

This course covers the topics shown below.

Curriculum (314 topics)

- Whole Numbers, Fractions, and Decimals (37 topics)
  - Operations with Whole Numbers (9 topics)
    - Adding 2-digit numbers with regrouping a ten
    - Subtraction of 2-digit numbers with regrouping
    - Multiplying with regrouping
    - Introduction to multiplication of large numbers
    - Division with regrouping
    - Introduction to exponents
    - Order of operations with whole numbers
    - Order of operations with whole numbers and grouping symbols
    - Order of operations with whole numbers and exponents: Basic
  - Equivalent Fractions and Ordering (8 topics)
    - Equivalent fractions
    - Simplifying a fraction
    - Fractional position on a number line
    - Plotting fractions on a number line
    - Writing an improper fraction as a mixed number
    - Writing a mixed number as an improper fraction
    - Ordering fractions with the same denominator
    - Using a common denominator to order fractions
  - Operations with Fractions (9 topics)
    - Addition or subtraction of fractions with the same denominator
    - Introduction to addition or subtraction of fractions with different denominators
    - Addition or subtraction of fractions with different denominators
    - Product of a fraction and a whole number: Problem type 1
    - Introduction to fraction multiplication
    - Fraction multiplication
    - Fraction division
    - Division involving a whole number and a fraction
    - Mixed arithmetic operations with fractions
  - Decimal Place Value (2 topics)
    - Rounding decimals
    - Ordering decimals
  - Operations with Decimals (9 topics)
    - Addition of aligned decimals
    - Decimal addition with 3 numbers
    - Subtraction of aligned decimals
    - Multiplication of a decimal by a power of ten
    - Multiplying a decimal by a whole number
    - Decimal multiplication: Problem type 1
    - Division of a decimal by a power of ten
    - Division of a decimal by a whole number
    - Converting a fraction to a terminating decimal
- Percents, Proportions, and Geometry (32 topics)
Percentages (8 topics)
- Converting between percentages and decimals
- Converting a percentage to a fraction in simplest form
- Converting a fraction to a percentage: Denominator of 20, 25, or 50
- Writing a ratio as a percentage without a calculator
- Finding a percentage of a whole number without a calculator: Basic
- Applying the percent equation
- Finding the sale price without a calculator given the original price and percent discount
- Finding the original price given the sale price and percent discount

Proportions (4 topics)
- Solving a proportion of the form x/a = b/c
- Solving a word problem on proportions using a unit rate
- Word problem on proportions: Problem type 1
- Word problem on proportions: Problem type 2

Perimeter and Area (11 topics)
- Perimeter of a square or a rectangle
- Finding the missing length in a figure
- Finding a side length given the perimeter and side lengths with variables
- Area of a square or a rectangle
- Area of a piecewise rectangular figure
- Area of a triangle
- Area of a parallelogram
- Finding the side length of a rectangle given its perimeter or area
- Circumference and area of a circle
- Perimeter involving rectangles and circles
- Area involving inscribed figures

Volume and Surface Area (4 topics)
- Volume of a rectangular prism
- Volume of a cylinder
- Surface area of a cube or a rectangular prism
- Surface area of a cylinder: Exact answers in terms of \( \pi \)

Angles and Triangles (3 topics)
- Solving equations involving vertical angles
- Finding an angle measure of a triangle given two angles
- Finding an angle measure for a triangle with an extended side

Similar Figures (2 topics)
- Similar polygons
- Indirect measurement

Signed Numbers, Linear Equations and Inequalities (53 topics)

Integers (7 topics)
- Absolute value of a number
- Integer addition: Problem type 1
- Integer addition: Problem type 2
- Integer subtraction: Problem type 1
- Integer subtraction: Problem type 2
- Integer subtraction: Problem type 3
- Integer multiplication and division

Signed Fractions and Decimals (5 topics)
- Signed fraction addition or subtraction: Basic
- Signed fraction addition or subtraction: Advanced
- Signed fraction multiplication: Basic
- Signed fraction multiplication: Advanced
Signed decimal addition and subtraction with 3 numbers

Signed Numbers and Exponents (3 topics)
- Exponents and integers: Problem type 1
- Exponents and signed fractions
- Order of operations with integers and exponents

Algebraic Expressions (3 topics)
- Writing a one-step expression for a real-world situation
- Evaluating a linear expression: Integer multiplication with addition or subtraction
- Evaluating a quadratic expression: Integers

Properties of Real Numbers (4 topics)
- Distributive property: Whole number coefficients
- Distributive property: Integer coefficients
- Combining like terms: Integer coefficients
- Combining like terms: Advanced

Solving a Linear Equation with One Occurrence of the Variable (9 topics)
- Additive property of equality with decimals
- Additive property of equality with integers
- Additive property of equality with a negative coefficient
- Multiplicative property of equality with whole numbers
- Multiplicative property of equality with decimals
- Multiplicative property of equality with integers
- Multiplicative property of equality with signed fractions
- Solving a two-step equation with integers
- Solving a two-step equation with signed fractions

Solving a Linear Equation with Several Occurrences of the Variable (4 topics)
- Solving a linear equation with several occurrences of the variable: Variables on the same side and distribution
- Solving a linear equation with several occurrences of the variable: Variables on both sides and distribution
- Solving a linear equation with several occurrences of the variable: Fractional forms with binomial numerators
- Solving equations with zero, one, or infinitely many solutions

Applications with Linear Equations (5 topics)
- Translating a sentence into a one-step equation
- Translating a phrase into a two-step expression
- Solving a one-step word problem using the formula d = rt
- Solving a word problem with two unknowns using a linear equation
- Solving a value mixture problem using a linear equation

Solving an Inequality (8 topics)
- Graphing a linear inequality on the number line
- Graphing a compound inequality on the number line
- Solving a linear inequality: Problem type 1
- Solving a linear inequality: Problem type 2
- Solving a linear inequality: Problem type 3
- Solving a linear inequality: Problem type 4
- Solving a compound linear inequality: Graph solution, basic
- Solving a compound linear inequality: Interval notation

Solving an Equation or Inequality with Absolute Value (2 topics)
- Solving an absolute value equation of the form |ax + b| = c
- Solving an absolute value inequality: Basic

Solving a Multivariable Equation for a Variable (3 topics)
- Introduction to algebraic symbol manipulation
- Algebraic symbol manipulation: Problem type 1
- Algebraic symbol manipulation: Problem type 2
• Lines and Systems of Linear Equations (27 topics)
  ■ Graphing Lines (5 topics)
    ○ Plotting a point in the coordinate plane
    ○ Finding a solution to a linear equation in two variables
    ○ Graphing a line given its equation in slope-intercept form
    ○ Graphing a line given its equation in standard form
    ○ Graphing a vertical or horizontal line
  ■ Slope of a Line (4 topics)
    ○ Finding slope given the graph of a line on a grid
    ○ Finding slope given two points on the line
    ○ Finding the slope of a line given its equation
    ○ Finding slopes of lines parallel and perpendicular to a line given in the form $Ax + By = C$
  ■ Equation of a Line (3 topics)
    ○ Finding $x$- and $y$-intercepts of a line given the equation: Advanced
    ○ Writing the equation of a line given the slope and a point on the line
    ○ Writing the equation of the line through two given points
  ■ Solving a System of Linear Equations (4 topics)
    ○ Graphically solving a system of linear equations
    ○ Solving a system of linear equations using substitution
    ○ Solving a system of linear equations using elimination with multiplication and addition
    ○ Solving a $2\times2$ system of linear equations that is inconsistent or consistent dependent
  ■ Graphing Linear Inequalities in the Plane (3 topics)
    ○ Graphing a linear inequality in the plane: Standard form
    ○ Graphing a linear inequality in the plane: Vertical or horizontal line
    ○ Graphing a system of two linear inequalities: Basic
  ■ Applications with Lines and Systems (8 topics)
    ○ Interpreting a line graph
    ○ Interpreting the graphs of two functions
    ○ Writing an equation and drawing its graph to model a real-world situation: Advanced
    ○ Application problem with a linear function: Finding a coordinate given the slope and a point
    ○ Solving a value mixture problem using a system of linear equations
    ○ Solving a distance, rate, time problem using a system of linear equations
    ○ Solving a percent mixture problem using a system of linear equations
    ○ Solving a word problem using a $3\times3$ system of linear equations: Problem type 1
• Relations and Functions (22 topics)
  ■ Sets and Intervals (2 topics)
    ○ Set-builder and interval notation
    ○ Union and intersection of finite sets
  ■ Evaluating Functions (4 topics)
    ○ Evaluating functions: Linear and quadratic or cubic
    ○ Evaluating a piecewise-defined function
    ○ Variable expressions as inputs of functions: Problem type 1
    ○ Sum, difference, and product of two functions
  ■ Domain and Range (4 topics)
    ○ Domain and range from ordered pairs
    ○ Domain and range from the graph of a continuous function
    ○ Domain of a square root function: Advanced
    ○ Domain of a rational function: Excluded values
  ■ Graphs of Functions and their Transformations (9 topics)
    ○ Vertical line test

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Finding local maxima and minima of a function given the graph
Translating the graph of a function: One step
Transforming the graph of a function by reflecting over an axis
Transforming the graph of a function by shrinking or stretching
Writing an equation for a function after a vertical translation
Writing an equation for a function after a vertical and horizontal translation
Graphing a cubic function of the form $y = ax^3$
Graphing a square root function

Composition of Functions and Inverse Functions (3 topics)
  Composition of two functions: Basic
  Inverse functions: Linear, discrete
  Inverse functions: Rational

Integer Exponents and Factoring (30 topics)

Properties of Exponents (13 topics)
  Evaluating an expression with a negative exponent: Positive fraction base
  Evaluating an expression with a negative exponent: Negative integer base
  Introduction to the product rule of exponents
  Product rule with positive exponents: Multivariate
  Product rule with negative exponents
  Introduction to the quotient rule of exponents
  Quotient of expressions involving exponents
  Quotient rule with negative exponents: Problem type 1
  Introduction to the power rules of exponents
  Power rules with positive exponents
  Power of a power rule with negative exponents
  Power rules with negative exponents
  Power and product rules with positive exponents

Scientific Notation (2 topics)
  Scientific notation with positive exponent
  Scientific notation with negative exponent

Operations with Polynomials (7 topics)
  Simplifying a sum or difference of two univariate polynomials
  Multiplying a univariate polynomial by a monomial with a positive coefficient
  Multiplying a multivariate polynomial by a monomial
  Multiplying binomials with leading coefficients of 1
  Multiplying conjugate binomials: Univariate
  Squaring a binomial: Univariate
  Multiplication involving binomials and trinomials in two variables

Factoring Polynomials (8 topics)
  Greatest common factor of two multivariate monomials
  Factoring out a monomial from a polynomial: Univariate
  Factoring out a monomial from a polynomial: Multivariate
  Factoring a quadratic with leading coefficient 1
  Factoring a quadratic with leading coefficient greater than 1
  Factoring a product of a quadratic trinomial and a monomial
  Factoring a difference of squares
  Factoring a polynomial by grouping: Problem type 1

Quadratic and Polynomial Functions (21 topics)

Solving a Quadratic Equation (9 topics)
  Solving an equation written in factored form
  Completing the square
  Finding the roots of a quadratic equation with leading coefficient 1
Finding the roots of a quadratic equation with leading coefficient greater than 1
- Solving a quadratic equation needing simplification
- Applying the quadratic formula: Exact answers
- Discriminant of a quadratic equation
- Solving a word problem using a quadratic equation with rational roots
- Solving a word problem using a quadratic equation with irrational roots

- Solving a Quadratic Inequality (1 topics)
  - Solving a quadratic inequality written in factored form

- Graphing a Quadratic Function (5 topics)
  - Graphing a parabola of the form \( y = ax^2 \)
  - Graphing a parabola of the form \( y = (x-h)^2 + k \)
  - Graphing a parabola of the form \( y = ax^2 + bx + c \): Integer coefficients
  - Rewriting a quadratic function to find the vertex of its graph
  - Finding the x-intercept(s) and the vertex of a parabola

- Polynomial Functions (4 topics)
  - Finding zeros of a polynomial function written in factored form
  - Finding x- and y-intercepts given a polynomial function
  - Determining the end behavior of the graph of a polynomial function
  - Inferring properties of a polynomial function from its graph

- Circles (2 topics)
  - Graphing a circle given its equation in standard form
  - Graphing a circle given its equation in general form

- Rational Expressions and Functions (23 topics)

  - Simplifying Rational Expressions (12 topics)
    - Least common multiple of two monomials
    - Simplifying a ratio of polynomials: Problem type 1
    - Simplifying a ratio of multivariate polynomials
    - Adding rational expressions with common denominators and binomial numerators
    - Adding rational expressions with different denominators: \( ax, bx \)
    - Adding rational expressions with different denominators: \( x+a, x+b \)
    - Multiplying rational expressions involving multivariate monomials
    - Multiplying rational expressions involving quadratics with leading coefficients of 1
    - Dividing rational expressions involving multivariate monomials
    - Complex fraction without variables: Problem type 1
    - Complex fraction involving multivariate monomials
    - Complex fraction: GCF and quadratic factoring

  - Division of Polynomials (2 topics)
    - Dividing a polynomial by a monomial: Univariate
    - Polynomial long division: Problem type 1

  - Solving Rational Equations (4 topics)
    - Solving a rational equation that simplifies to linear: Denominator \( x \)
    - Solving a rational equation that simplifies to linear: Denominator \( x+a \)
    - Solving a rational equation that simplifies to linear: Unlike binomial denominators
    - Solving a rational equation that simplifies to quadratic: Binomial denominators and numerators

  - Direct and Inverse Variations (3 topics)
    - Word problem on direct variation
    - Word problem on inverse variation
    - Writing an equation that models variation

  - Graphing Rational Functions (2 topics)
    - Sketching the graph of a rational function: Constant over linear
○ Sketching the graph of a rational function: Linear over linear

● Radicals and Rational Exponents (20 topics)
  ■ Simplifying Expressions with Radicals (8 topics)
    ○ Square root of a rational perfect square
    ○ Simplifying the square root of a whole number less than 100
    ○ Square root of a perfect square monomial
    ○ Simplifying a radical expression with an even exponent
    ○ Simplifying a sum or difference of radical expressions: Multivariate
    ○ Simplifying a product of radical expressions: Multivariate
    ○ Rationalizing the denominator of a radical expression
    ○ Rationalizing the denominator of a radical expression using conjugates

  ■ Solving Equations with Radicals (3 topics)
    ○ Solving a radical equation that simplifies to a linear equation: One radical, basic
    ○ Solving a radical equation that simplifies to a linear equation: Two radicals
    ○ Solving a radical equation that simplifies to a quadratic equation: One radical

  ■ Pythagorean Theorem and the Distance Formula (2 topics)
    ○ Pythagorean Theorem
    ○ Distance between two points in the plane: Exact answers

  ■ Higher Roots (3 topics)
    ○ Cube root of an integer
    ○ Simplifying a higher root of a whole number
    ○ Simplifying a higher radical expression: Multivariate

  ■ Rational Exponents (4 topics)
    ○ Rational exponents: Non-unit fraction exponent with a whole number base
    ○ Rational exponents: Negative exponents and fractional bases
    ○ Rational exponents: Powers of powers with negative exponents
    ○ Rational exponents: Products and quotients with negative exponents

● Exponentials and Logarithms (20 topics)
  ■ Properties of Logarithms (7 topics)
    ○ Converting between logarithmic and exponential equations
    ○ Converting between natural logarithmic and exponential equations
    ○ Evaluating a logarithmic expression
    ○ Basic properties of logarithms
    ○ Expanding a logarithmic expression: Problem type 1
    ○ Writing an expression as a single logarithm
    ○ Change of base for logarithms: Problem type 1

  ■ Solving Logarithmic and Exponential Equations (8 topics)
    ○ Solving an equation of the form \( \log_b a = c \)
    ○ Solving an equation involving logarithms on both sides: Problem type 1
    ○ Solving a multi-step equation involving a single logarithm
    ○ Solving a multi-step equation involving natural logarithms
    ○ Solving an equation involving logarithms on both sides: Problem type 2
    ○ Solving an exponential equation by using logarithms: Exact answers in logarithmic form
    ○ Solving an exponential equation by finding common bases: Linear and quadratic exponents
    ○ Solving exponential equations by using logarithms and natural logarithms: Decimal answers

  ■ Graphing Logarithmic and Exponential Functions (3 topics)
    ○ The graph, domain, and range of an exponential function
    ○ The graph, domain, and range of a logarithmic function
    ○ Translating the graph of a logarithmic or exponential function

  ■ Applications with Exponential Functions (2 topics)
• Evaluating an exponential function that models a real-world situation
  • Finding a final amount in a word problem on exponential growth or decay

● Trigonometry (29 topics)

  ■ Angles (5 topics)
    • Converting between degree and radian measure: Problem type 1
    • Sketching an angle in standard position
    • Reference angles: Problem type 1
    • Coterminal angles
    • Arc length and central angle measure

  ■ Right Triangle Trigonometry (6 topics)
    • Sine, cosine, and tangent ratios: Variables for side lengths
    • Using a trigonometric ratio to find a side length in a right triangle
    • Using a trigonometric ratio to find an angle measure in a right triangle
    • Finding trigonometric ratios given a right triangle
    • Solving a triangle with the law of sines: Problem type 1
    • Solving a triangle with the law of cosines

  ■ Unit Circle (5 topics)
    • Finding coordinates on the unit circle for special angles
    • Trigonometric functions and special angles: Problem type 1
    • Trigonometric functions and special angles: Problem type 2
    • Finding values of trigonometric functions given information about an angle: Problem type 1
    • Finding values of trigonometric functions given information about an angle: Problem type 2

  ■ Graphing Trigonometric Functions (4 topics)
    • Amplitude and period of sine and cosine functions
    • Amplitude, period, and phase shift of sine and cosine functions
    • Sketching the graph of \( y = a \sin(x+c) \) or \( y = a \cos(x+c) \)
    • Sketching the graph of \( y = a \sin(bx) \) or \( y = a \cos(bx) \)

  ■ Inverse Trigonometric Functions (2 topics)
    • Values of inverse trigonometric functions
    • Composition of a trigonometric function with the inverse of another trigonometric function: Problem type 2

  ■ Trigonometric Identities (3 topics)
    • Simplifying trigonometric expressions
    • Sum and difference identities: Problem type 2
    • Double-angle identities: Problem type 2

  ■ Trigonometric Equations (4 topics)
    • Finding solutions in an interval for a basic equation involving sine or cosine
    • Finding solutions in an interval for a basic tangent, cotangent, secant, or cosecant equation
    • Finding solutions in an interval for a trigonometric equation using Pythagorean identities: Problem type 1
    • Solving a basic trigonometric equation involving sine or cosine