Higher Education Math Placement

Placement Assessment Problem Types

1. Whole Numbers, Fractions, and Decimals

1.1 Operations with Whole Numbers
Addition with carry
Subtraction with borrowing
Multiplication with carry
Introduction to multiplication of large numbers
Division with carry
Introduction to exponents
Order of operations: Problem type 1
Order of operations: Problem type 2
Order of operations with whole numbers and exponent: Basic

1.2 Equivalent Fractions and Ordering
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 same denominator
Ordering fractions

1.3 Operations with Fractions
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
Introduction to fraction multiplication
Fraction multiplication
Fraction division
Division involving a whole number and a fraction
Mixed arithmetic operations with fractions

1.4 Decimal Place Value
Rounding decimals
Ordering decimals

1.5 Operations with Decimals
Addition of aligned decimals
Decimal addition
Subtraction of aligned decimals
Multiplication of a decimal by a power of ten
Multiplication of 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

2. Percents, Proportions, and Geometry

2.1 Percentages
Converting between percentages and decimals
Converting a percentage to a fraction
Converting a fraction to a percentage
Writing a ratio as a percentage
Percentage of a whole number
Applying the percent equation
Finding the sale price given the original price and percent discount
Finding the original price given the sale price and percent discount

2.2 Proportions
Solving a proportion of the form x/a = b/c
Simple word problem on proportions
Word problem on proportions: Problem type 1
Word problem on proportions: Problem type 2

2.3 Perimeter and Area
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

2.4 Volume and Surface Area
Volume of a rectangular prism
Volume of a cylinder
Surface area of a cube or a rectangular prism
Surface area of a cylinder

2.5 Angles and Triangles
Solving equations involving vertical angles
Sum of the angle measures of a triangle)
Finding an angle measure for a triangle with an extended side

2.6 Similar Figures
Similar polygons
Indirect measurement

3. Signed Numbers, Linear Equations and Inequalities

3.1 Integers
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

3.2 Signed Fractions and Decimals
Signed fraction addition: Basic
Signed fraction addition: Advanced
Signed fraction multiplication: Basic
Signed fraction multiplication: Advanced
Signed decimal addition with three numbers

3.3 Signed Numbers and Exponents
Exponents and integers: Problem type 1
Exponents and signed fractions
Exponents and order of operations

3.4 Algebraic Expressions
Writing a simple variable expression for a real-world situation
Evaluating a linear expression in two variables
Evaluating a quadratic expression in one variable

3.5 Properties of Real Numbers
Distributive property: Whole number coefficients
Distributive property: Integer coefficients

Combining like terms: Integer coefficients

Combining like terms: Advanced

3.6 Solving a Linear Equation with One Occurrence of the Variable

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

3.7 Solving a Linear Equation with Several Occurrences of the Variable

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

3.8 Applications with Linear Equations

Translating a sentence into a one-step equation

Translating a sentence into a two-step expression

Solving a simple 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

3.9 Solving an Inequality

Graphing a linear inequality on the number line

Graphing a compound linear 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: Problem type 1

Solving a compound linear inequality: Problem type 2

3.10 Solving an Equation or Inequality with Absolute Value

Solving an equation involving absolute value: Basic

Solving an inequality involving absolute value: Basic

3.11 Solving a Multivariable Equation for a Variable

Introduction to algebraic symbol manipulation

Algebraic symbol manipulation: Problem type 1
Algebraic symbol manipulation: Problem type 2

4. Lines and Systems of Linear Equations

4.1 Graphing Lines
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

4.2 Slope of a Line
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
Slopes of parallel and perpendicular lines: Problem type 1

4.3 Equation of a Line
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

4.4 Solving a System of Linear Equations
Graphically solving a system of linear equations
Solving a simple system using substitution
Solving a system of linear equations using elimination with multiplication and addition
Solving a system that is inconsistent or consistent dependent

4.5 Graphing Linear Inequalities in the Plane
Graphing a linear inequality in the plane: Standard form
Graphing a linear inequality in the plane: Vertical or horizontal lines
Graphing a system of linear inequalities

4.6 Applications with Lines and Systems
Interpreting line graphs
Interpreting the graphs of two functions
Writing an equation and drawing its graph to model a real-world situation
Application problem with a linear function: Problem type 1
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 by 3 system of linear equations

5. Relations and Functions

5.1 Sets and Intervals
Set builder and interval notation
Union and intersection of finite sets

5.2 Evaluating Functions
Evaluating functions: Problem type 1
Evaluating a piecewise-defined function
Variable expressions as inputs of functions
Sum, difference, and product of two functions

5.3 Domain and Range
Domain and range from ordered pairs
Domain and range from the graph of a continuous function
Domain of a square root function
Domain of a rational function

5.4 Graphs of Functions and their Transformations
Vertical line test
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 simple cubic function
Graphing a function involving a square root

5.5 Composition of Functions and Inverse Functions
Composition of two functions: Basic
Inverse functions: Problem type 1
Inverse functions: Problem type 2

6. Integer Exponents and Factoring

6.1 Properties of Exponents
Writing a positive number without a negative exponent
Writing a negative number without a negative exponent
Introduction to the product rule of exponents
Product rule with positive exponents
Product rule with negative exponents
Introduction to the quotient rule of exponents
Quotients of expressions involving exponents
Quotient rule with negative exponents: Problem type 1
Introduction to the power rule of exponents

Power rule with positive exponents
Power rule with negative exponents: Problem type 1
Power rule with negative exponents: Problem type 2
Using the power and product rules to simplify expressions with positive exponents

6.2 Scientific Notation
Scientific notation with positive exponent
Scientific notation with negative exponent

6.3 Operations with Polynomials
Simplifying a sum or difference of two univariate polynomials
Multiplying a monomial and a polynomial: Univariate with positive leading coefficients
Multiplying a monomial and a polynomial: Multivariate
Multiplying binomials with leading coefficients of 1
Multiplying binomials that are a sum and a difference of two terms: Univariate
Squaring a binomial: Univariate
Multiplication involving binomials and trinomials in two variables

6.4 Factoring Polynomials
Greatest common factor of two 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

7. Quadratic and Polynomial Functions

7.1 Solving a Quadratic Equation
Solving equations 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

7.2 Solving a Quadratic Inequality
Solving a quadratic inequality written in factored form

7.3 Graphing a Quadratic Function
Graphing a parabola of the form $y = ax^2$

Graphing a parabola of the form y = (x-a)2 + c
Graphing a parabola of the form y = ax2 + 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

7.4 Polynomial Functions

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

7.5 Circles

Graphing a circle given its equation in standard form
Graphing a circle given its equation in general form

8. Rational Expressions and Functions

8.1 Simplifying Rational Expressions

Least common multiple of two monomials
Simplifying a ratio of polynomials: Problem type 1
Ratio of multivariate polynomials
Adding rational expressions with common denominators
Adding rational expressions with different denominators: ax, bx
Adding rational expressions with different denominators: x+a, x+b
Multiplying rational expressions: Problem type 1
Multiplying rational expressions: Problem type 2
Dividing rational expressions: Problem type 1
Complex fractions without variables: Problem type 1
Complex fraction: Problem type 1
Complex fraction: Problem type 3

8.2 Division of Polynomials

Dividing a polynomial by a monomial: Univariate
Polynomial long division: Problem type 1

8.3 Solving Rational Equations

Solving a rational equation that simplifies to a linear equation: Problem type 1
Solving a rational equation that simplifies to a linear equation: Problem type 2
Solving a rational equation that simplifies to a linear equation: Problem type 3
Solving a rational equation that simplifies to a quadratic equation: Problem type 2

8.4 Direct and Inverse Variations

Word problem on direct variation
Word problem on inverse variation
Writing an equation that models variation

8.5 Graphing Rational Functions
Sketching the graph of a rational function: Constant over linear
Sketching the graph of a rational function: Linear over linear

9. Radicals and Rational Exponents

9.1 Simplifying Expressions with Radicals
Square root of a rational perfect square
Square root simplification
Square root of a perfect square monomial
Simplifying a radical expression: Problem type 1
Simplifying a sum of radical expressions
Simplifying a product of radical expressions
Rationalizing the denominator of a radical expression
Rationalizing the denominator of a radical expression using conjugates

9.2 Solving Equations with Radicals
Solving a radical equation that simplifies to a linear equation: One radical
Solving a radical equation that simplifies to a linear equation: Two radicals
Solving a radical equation that simplifies to a quadratic equation: One radical

9.3 Pythagorean Theorem and the Distance Formula
Pythagorean Theorem
Distance between two points in the plane

9.4 Higher Roots
Cube root of an integer
Simplifying a higher radical: Problem type 1
Simplifying a higher radical: Problem type 2

9.5 Rational Exponents
Rational exponents: Basic
Rational exponents: Negative exponents and fractional bases
Rational exponents: Powers of powers
Rational exponents: Products and quotients

10. Exponentials and Logarithms

10.1 Properties of Logarithms
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 expressions as a single logarithm
Change of base for logarithms: Problem type 1

10.2 Solving Logarithmic and Exponential Equations

Solving a logarithmic equation: Problem type 1

Solving a logarithmic equation: Problem type 2

Solving a logarithmic equation: Problem type 3

Solving a logarithmic equation: Problem type 4

Solving a logarithmic equation: Problem type 5

Solving an exponential equation: Problem type 1

Solving an exponential equation: Problem type 2

Solving an exponential equation: Problem type 3

10.3 Graphing Logarithmic and Exponential Functions

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

10.4 Applications with Exponential Functions

Evaluating an exponential function that models a real-world situation

Solving a word problem using an exponential equation: Problem type 1

11. Trigonometry

11.1 Angles

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

11.2 Right Triangle Trigonometry

Sine, cosine, and tangent ratios

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

11.3 Unit Circle

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

11.4 Graphing Trigonometric Functions

Amplitude and period of sine and cosine functions

Amplitude, period, and phase shift of sine and cosine functions

Sketching the graph of a sine or cosine function: Problem type 1

Sketching the graph of a sine or cosine function: Problem type 2

11.5 Inverse Trigonometric Functions

Values of inverse trigonometric functions

Composition of a trigonometric function and an inverse trigonometric function: Problem type 2

11.6 Trigonometric Identities

Simplifying trigonometric expressions

Sum and difference identities: Problem type 2

Double-angle identities: Problem type 2

11.7 Trigonometric Equations

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

Solving a basic trigonometric equation involving sine or cosine