

Secondary Mathematics

Algebra 3-4

A+ Curriculum Guide

CURRICULUM AND INSTRUCTION SUPPORT

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# Section Descriptions

**Pacing guide** - Pacing guides are timelines showing content to cover at specific points over the course of a year. This includes all the information needed for teachers to draft lesson plans. Includes items for a particular unit such as:

* academic vocabulary lists
* common assessments
* connections to district adopted curriculum resources
* essential questions
* content standards and indicators
* critical content and skills

**Standards, grade level expectations and indicators –** These are concise, written descriptions of what students are expected to know and can do within the course. Generally, standards are first adopted by the state and then the Omaha Public Schools Board of Education adopts the final versions used for the courses.

**Scope and sequence** - *Scope* is the material or skills to be taught, and *sequence* is the order in which you teach the information. This is brief and is used as an overview of the progression of learning (e.g. K-5, 6-8, 9-12).

**Proficiency Scales/Proficiency Level Descriptors** - Proficiency scales or descriptors are written for a content standard or concept. They define what students should know and can do for each level of learning.

**Academic Vocabulary List with Definitions** – This list includes the terms that should be taught using the Marzano 6-Step Vocabulary Process and has the appropriate definitions to terms listed here. There should be approximately 90 terms per course/grade level content area for the year. Additional content specific vocabulary is listed within the Pacing Guide.

**District Adopted Resources –** This lists the core materials (textbooks, web resources, and supplemental materials) selected for the course as approved by the Omaha Public Schools Board of Education.

# Unit 1 Chapter 1: Expressions, Equations and Inequalities Pacing Guide

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| --- | --- | --- | --- | --- |
| **Time Frame** | First semester as needed. Pre-assessment will determine what types of problems to use in bell work and/or review problems in home work assigned. | | | |
| **Lessons**  **Indicators**  **Learning Goals** | |  |  |  | | --- | --- | --- | | **Lesson** | **Indicator** | **Learning Goals** | | ~~1.1 Patterns and Expressions~~ | ~~MA 8.2.3.a~~ | ~~Students will identify and describe patterns.~~ | | ~~1.2 Properties of Real Numbers~~ | ~~MA 8.1.1.a~~  ~~MA 8.1.1.d~~  ~~MA 7.1.2.c~~ | ~~Students will graph and order real numbers and identify their properties.~~ | | ~~1.3 Algebraic Expressions~~ | ~~MA 8.2.1.a~~  ~~MA 7.2.2.c~~  ~~MA 6.2.2.a~~ | ~~Students will evaluate and simplify algebraic expressions.~~ | | ~~1.4 Solving Equations~~ | ~~MA 8.2.2.a~~ | ~~Students will write and solve equations.~~ | | ~~1.5 Solving Inequalities~~ | ~~MA 8.2.2.b~~ | ~~Students will write, solve and graph inequalities.~~ | | ~~1.6 Absolute Value Equations and Inequalities~~ | ~~MA 8.2.3.b~~ | ~~Students will write and solve equations and inequalities involving absolute value.~~ | | | | |
| **Standards and Indicators** | There are no assigned standards for this chapter. | | | |
| **Vocabulary**  Academic Vocabulary terms in bold are taught using Marzano’s Six-Step Process | ~~Absolute value~~  ~~Additive inverse~~  ~~Algebraic expression~~  ~~Coefficient~~  ~~Compound inequality~~  ~~Constant~~ | ~~Constant term~~  ~~Equation~~  ~~Evaluate~~  ~~Extraneous solution~~  ~~Identity~~  ~~Inverse operations~~ | ~~Like terms~~  ~~Literal equation~~  ~~Multiplicative inverse~~  ~~Numerical expression~~  ~~Opposite~~ | ~~Reciprocal~~  ~~Solution of an equation~~  ~~Term~~  ~~Variable~~  ~~Variable quantity~~ |
| **Common Assessment**  Assessments in **bold** a**re required** | Unit 01 Chapter 01 Expressions, Equations and Inequalities Prior Knowledge Test provided. | | | |
| **Additional Note** | Sections are not to be directly taught. Use Prior Knowledge Test to determine what needs to be reviewed periodically throughout the first semester with your students. | | | |

**Unit 2 Chapter 2: Functions, Equations and Graphs Pacing Guide**

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| --- | --- | --- | --- | --- |
| **Time Frame** | 3 weeks | | | |
| **Lessons**  **Indicators**  **Learning Goals** | |  |  |  | | --- | --- | --- | | **Lesson** | **Indicator** | **Learning Goal** | | 2.1 Relations and Functions | MA 11.2.1.b | Students will graph relations and identify functions. | | ~~2.2 Direct Variation~~ | ~~MA 11.2.1.e~~ | ~~Students will write and interpret direct variation equations.~~ | | ~~2.3 Linear Functions and Slope-Intercept Form~~ | ~~MA 11.2.1.e~~ | ~~Students will write and graph linear equations.~~ | | ~~2.4 More about Linear Equations~~ | ~~MA 11.2.1.e~~  ~~MA 11.3.2.c~~ | ~~Students will write an equation of a line given its slope and a point on the line.~~ | | ~~2.4 Concept Byte: Piecewise Functions~~ | ~~MA 11.2.1.f~~ | ~~Students will graph absolute value function using piecewise definition.~~ | | ~~2.5 Using Linear Models~~ | ~~MA 11.4.2.e~~ | ~~Students will write and make predictions from linear models.~~ | | 2.6 Families of Functions | MA 11.2.1.g | Students will analyze transformations of functions. | | 2.7 Absolute Value Functions and Graphs | MA 11.2.1.f | Students will graph absolute value functions. | | 2.8 Two-Variable Inequalities | MA 11.2.3.a | Students will graph two-variable inequalities. | | | | |
| **Standards and Indicators** | **MA 11.2.1.b** Analyze a relation to determine if it is a function given graphs, tables or algebraic notation.  **MA 11.2.1.f** Analyze and graph absolute value functions (find the vertex, symmetry, transformations, determine intercepts, and minimums or maximums using the piecewise definition).  **MA 11.2.1.g** Analyze and graph quadratic functions (standard form, vertex form, finding zeros, symmetry, transformations, determine intercepts, and minimums or maximums).  **MA 11.2.3.a** Analyze, model, and solve real-world problems using various representations (graphs, tables, linear equations and inequalities, systems of linear equations, quadratic, exponential, square root, and absolute value functions). | | | |
| **Vocabulary**  Academic Vocabulary terms in bold are taught using Marzano’s Six-Step Process | **Absolute value function**  **Axis of symmetry**  **Boundary**  Dependent variable  Domain | Function  Function notation  **Function rule**  **Half-plane**  Independent variable  Linear inequality | Parent function  Range  **Reflection**  Relation  **Test point**  **Transformation** | **Translation**  **Vertex**  **Vertical compression**  Vertical line test  **Vertical stretch** |
| **Common Assessment**  Assessments in **bold** a**re required.** | **Unit 2 – Chapter 2 Summative Assessment** | | | |
| **Additional Notes** | Sections 2.4 and 2.5 contain content that is covered more in-depth in Unit 11.  Lessons with strikethrough may be taught as time permits. | | | |

# Unit 2 - Chapter 2: Functions, Equations and Graphs Proficiency Scale

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| --- | --- | --- | --- |
| **Advanced**  **Score 4.0** | The student consistently demonstrates a thorough understanding of functions, equations and graphs by making in-depth inferences and showing extended applications of the course content/grade level standard(s).  The student performs consistently at a high level of difficulty, complexity, or fluency that is above the expected course content/grade level standard.   * Exceeds expected course content/grade level standard   Applies skills and strategies in new and unfamiliar situations | | |
|  | **Proficient + (Approaching Advanced)**  **Score 3.5** | The student demonstrates partial success at showing a thorough understanding of course content/grade level standard by making in-depth inferences and applications of the course content/grade level standard(s).  The student performs with partial success at a high level of difficulty, complexity, or fluency that is above the expected course content/grade level standard.   * Demonstrates success toward exceeding course content/grade level standard * Applies skills and strategies consistently in familiar situations, and at times, in unfamiliar situations | |
| **Proficient**  **Score 3.0** | The student demonstrates a proficient understanding of the expected course content/grade level standard(s).  The student performs at the level of difficulty, complexity, or fluency that is at the expected course content/grade level standard.   * Meets expected course content/grade level standard * Retains information and applies skills and strategies in familiar situations | | * Graph and write equations of transformed linear and non-linear functions (including absolute value). * Graph absolute value and linear inequalities. * Write an equation given multiple transformations of a parent graph. |
|  | **Basic +**  **(Approaching Proficient)**  **Score 2.5** | The student demonstrates an adequate understanding of the information for the course content/grade level standard(s).  The student performs with partial success at the level of difficulty, complexity, or fluency that is at the expected course content/grade level standard.   * Partially meets expected course content/grade level standard * Retains information and at times applies skills and strategies in familiar situations | |
| **Basic**  **Score 2.0** | The student demonstrates a basic understanding of the information expected for the course content/grade level standard(s).  The student performs the skills required for the course content/grade level standard at a basic level of difficulty, complexity, or fluency.   * Partially meets expected course content/grade level standard * Retains information and simple processes in familiar situations | | * Identify the domain and range of a function given ordered pairs * Identify whether a relation is a function given tables and graphs. * Make a table of values for an absolute value equation. * Describe transformations from a parent graph given an equation. |
| **Approaching Basic**  **Score 1.5** | The student demonstrates some basic understanding of the information expected for the course content/grade level standard(s).  The student struggles to perform the skills required for the course content/grade level standard at a basic level of difficulty, complexity, or fluency.   * Partially meets some of expected course content/grade level standard * Retains some information and simple processes in familiar situations | | |
| **Below Basic**  **Score 1.0** | The student demonstrates difficulty in understanding the information and performing the skills expected for the course/grade level standard(s).   * Performs below expected course content/grade level on the standard. * Has difficulty retaining information and applying skills and strategies | | |
| **Failing**  **Score 0** | The student demonstrates little or no evidence of understanding the information or skills required for the course content/grade level standard(s). | | |

**Unit 3 - Chapter 3: Linear Systems Pacing Guide**

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| --- | --- | --- | --- | --- |
| **Time Frame** | 3 weeks | | | |
| **Lessons**  **Indicators**  **Learning Goals** | |  |  |  | | --- | --- | --- | | **Lesson** | **Indicator** | **Learning Goal** | | 3.1 Solving Systems Using Tables and Graphs | MA 11.2.3.a | Students will solve a linear system using a graph or a table. | | 3.2 Solving Systems Algebraically | MA 11.2.3.a | Students will solve linear systems algebraically. | | 3.3 Systems of Inequalities | MA 11.2.2.h  MA 11.2.3.a | Students will solve systems of linear inequalities. | | 3.4 Linear Programming | MA 11.2.3.a  MA 11.2.2.h | Students will solve problems using linear programming. | | 3.4 Concept Byte: Linear Programming | MA 11.2.2.h | Students will use a graphing calculator to solve a linear programming problem. | | ~~3.5 Concept Byte: Graphs in Three Dimensions~~ | ~~MA 11.2.2.h~~ | ~~Students will graph in coordinate space.~~ | | 3.5 Systems in Three Variables | MA 11.2.2.h | Students will solve systems of three variable equations using both elimination and substitution methods. | | ~~3.6 Solving Systems Using Matrices~~ |  | ~~Students will represent and solve systems of linear equations with matrices.~~ | | | | |
| **Standards and Indicators** | **MA 11.2.2.h** Analyze and solve systems of three linear equations in three variables.  **MA 11.2.3.a** Analyze, model and solve real-world problems using various representations (graphs, tables, linear equations and inequalities, systems of linear equations, quadratic, exponential, square root, and absolute value functions. | | | |
| **Vocabulary**  Academic Vocabulary terms in bold are taught using Marzano’s Six-Step Process | Consistent system  **Constraint**  Dependent system | **Equivalent systems**  **Feasible region**  Inconsistent system | Independent system  **Linear programming**  Linear system | **Objective function**  Solution of a system  System of equations |
| **Common Assessment**  Assessments in **bold** a**re required.** | **Unit 3 – Chapter 3 Summative Assessment** | | | |
| **Additional Notes** | Lessons with strikethrough may be taught as time permits. | | | |

# Unit 3 - Chapter 3: Linear Systems Proficiency Scale

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| --- | --- | --- | --- |
| **Advanced**  **Score 4.0** | The student consistently demonstrates a thorough understanding of linear systems by making in-depth inferences and showing extended applications of the course content/grade level standard(s).  The student performs consistently at a high level of difficulty, complexity, or fluency that is above the expected course content/grade level standard.   * Exceeds expected course content/grade level standard   Applies skills and strategies in new and unfamiliar situations | | |
|  | **Proficient + (Approaching Advanced)**  **Score 3.5** | The student demonstrates partial success at showing a thorough understanding of course content/grade level standard by making in-depth inferences and applications of the course content/grade level standard(s).  The student performs with partial success at a high level of difficulty, complexity, or fluency that is above the expected course content/grade level standard.   * Demonstrates success toward exceeding course content/grade level standard * Applies skills and strategies consistently in familiar situations, and at times, in unfamiliar situations | |
| **Proficient**  **Score 3.0** | The student demonstrates a proficient understanding of the expected course content/grade level standard(s).  The student performs at the level of difficulty, complexity, or fluency that is at the expected course content/grade level standard.   * Meets expected course content/grade level standard * Retains information and applies skills and strategies in familiar situations | | * Solve systems of linear equations in three variables graphically and algebraically. * Solve real-world problems involving linear equations in three variables (e.g., maximum profit, minimum loss). |
|  | **Basic +**  **(Approaching Proficient)**  **Score 2.5** | The student demonstrates an adequate understanding of the information for the course content/grade level standard(s).  The student performs with partial success at the level of difficulty, complexity, or fluency that is at the expected course content/grade level standard.   * Partially meets expected course content/grade level standard * Retains information and at times applies skills and strategies in familiar situations | |
| **Basic**  **Score 2.0** | The student demonstrates a basic understanding of the information expected for the course content/grade level standard(s).  The student performs the skills required for the course content/grade level standard at a basic level of difficulty, complexity, or fluency.   * Partially meets expected course content/grade level standard * Retains information and simple processes in familiar situations | | * Solve systems of linear equations and inequalities in two variables graphically and algebraically. * Classify a system of two linear equations by the number of solutions (consistent independent, consistent dependent, inconsistent). |
| **Approaching Basic**  **Score 1.5** | The student demonstrates some basic understanding of the information expected for the course content/grade level standard(s).  The student struggles to perform the skills required for the course content/grade level standard at a basic level of difficulty, complexity, or fluency.   * Partially meets some of expected course content/grade level standard * Retains some information and simple processes in familiar situations | | |
| **Below Basic**  **Score 1.0** | The student demonstrates difficulty in understanding the information and performing the skills expected for the course/grade level standard(s).   * Performs below expected course content/grade level on the standard. * Has difficulty retaining information and applying skills and strategies | | |
| **Failing**  **Score 0** | The student demonstrates little or no evidence of understanding the information or skills required for the course content/grade level standard(s). | | |

**Unit 4A - Chapter 4: Graphing Quadratic Functions Pacing Guide**

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| --- | --- | --- | --- | --- |
| **Time Frame** | 2 weeks | | | |
| **Lessons**  **Indicators**  **Learning Goals** | |  |  |  | | --- | --- | --- | | **Lesson** | **Indicator** | **Learning Goal** | | 4.1 Quadratic Functions and Transformations | MA 11.2.1.g | Students will identify and graph quadratic functions. | | 4.2 Standard Form of a Quadratic Function | MA 11.2.1.g | Students will graph quadratic functions written in standard form. | | 4.3 Modeling with Quadratic Functions | MA 11.2.1.g  MA 11.2.3.a | Students will model data with quadratic functions. | | ~~4.3 Concept Byte: Identifying Quadratic Data~~ |  | ~~Students will determine whether a data set represents perfect quadratic data.~~ | | 4.6 Completing the Square | MA 11.2.2.n | Students will use completing the square to write equations in vertex form. | | ~~4.9 Concept Byte: Quadratic Inequalities~~ |  | ~~Students will investigate and use different methods to solve quadratic inequalities.~~ | | ~~4.9 Quadratic Systems~~ |  | ~~Students will solve and graph systems of linear and quadratic equations.~~ | | ~~4.9 Concept Byte (Extension): Powers of Complex Numbers~~ | ~~MA 11.1.2.a~~ | ~~Students will investigate powers of complex numbers.~~ | | | | |
| **Standards and Indicators** | **MA 11.2.1.g** Analyze and graph quadratic functions (standard form, vertex form, finding zeros, symmetry, transformations, determine intercepts, and minimums or maximums)  **MA 11.2.2.n** Solve quadratic equations involving real coefficients and real or imaginary roots.  **MA 11.2.3.a** Analyze, model, and solve real-world problems using various representations (graphs, tables, linear equations and inequalities, systems of linear equations, quadratic, exponential, square root, and absolute value functions). | | | |
| **Vocabulary**  Academic Vocabulary terms in bold are taught using Marzano’s Six-Step Process | **Axis of symmetry**  **Completing the square** | **Maximum value**  **Minimum value**  **Parabola** | **Quadratic function**  Standard form | **Vertex form**  **Vertex of a parabola** |
| **Common Assessment**  Assessments in **bold** a**re required.** | **Unit 4A – Chapter 4 Assessment** | | | |
| **Additional Notes** | Lessons with strikethrough may be taught as time permits. | | | |

**Unit 4B - Chapter 4: Solving Quadratic Equations Pacing Guide**

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| --- | --- | --- | --- | --- |
| **Time Frame** | 3 weeks | | | |
| **Lessons**  **Indicators**  **Learning Goals** | |  |  |  | | --- | --- | --- | | **Lesson** | **Indicator** | **Learning Goal** | | 4.4 Factoring Quadratic Expressions | MA 11.2.2.k  MA 11.2.2.n | Students will find common and binomial factors and factor quadratic expressions. | | 4.5 Algebra Review: Square Roots and Radicals | MA 11.2.2.c | Students will simplify radical expressions. | | 4.5 Quadratic Equations | MA 11.2.1.g  MA 11.2.2.k  MA 11.2.2.l  MA 11.2.2.n | Students will solve quadratic equations by factoring and graphing. | | 4.5 Concept Byte: Writing Equations from Roots | MA 11.2.2.l | Students will write a quadratic function, given its zeros, or a quadratic equation, given its roots. | | 4.7 The Quadratic Formula | MA 11.2.2.n | Students will solve and determine the number of solutions of quadratic equations. | | 4.8 Complex Numbers | MA 11.1.2.a  MA 11.1.1.a  MA 11.1.1.b  MA 11.2.2.n | Students will to identify, graph and perform operations with complex numbers. | | | | |
| **Standards and Indicators** | **MA 11.1.1.a** Compare and contrast subsets of the complex number system, including imaginary, rational, irrational, integers, whole and natural numbers.  **MA 11.1.1.b** Recognize that closure properties apply to the subsets of the complex number system, under the standard operations.  **MA 11.1.2.a** Compute with subsets of the complex number system including imaginary, rational, irrational, integers, whole and natural numbers.  **MA 11.2.1.g** Analyze and graph quadratic functions (standard form, vertex form, finding zeros, symmetry, transformations, determine intercepts, and minimums or maximums)  **MA 11.2.2.c** simplify algebraic expressions involving integer and fractional exponents.  **MA 11.2.2.j** Factor polynomials to include factoring out monomial terms and factoring quadratic expressions.  **MA 11.2.2.k** Recognize polynomial multiplication patterns related to factoring patterns (e.g., (a + b)2 = a2 + 2ab + b2, a2 – b2 = (a+b) (a-b)  **MA 11.2.2.l** Make the connection between the factors of a polynomial and the zeros of the polynomial.  **MA 11.2.2.n** Solve quadratic equations involving real coefficients and real or imaginary roots. | | | |
| **Vocabulary**  Academic Vocabulary terms in bold are taught using Marzano’s Six-Step Process | **Absolute value of a complex number**  **Complex conjugates**  **Complex number** | **Complex number plane**  Difference of two squares  **Discriminant**  Factoring | Greatest common factor  **Imaginary number**  **Imaginary unit**  Perfect square trinomial | **Pure imaginary number**  **Quadratic formula**  **Zero of a function**  Zero-product property |
| **Common Assessment**  Assessments in **bold** a**re required** | **Unit 4B – Chapter 4 Summative Assessment** | | | |
| **Additional Notes** |  | | | |

# Unit 4A/B - Chapter 4: Quadratic Functions Proficiency Scale

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| **Advanced**  **Score 4.0** | The student consistently demonstrates a thorough understanding of quadratic functions by making in-depth inferences and showing extended applications of the course content/grade level standard(s).  The student performs consistently at a high level of difficulty, complexity, or fluency that is above the expected course content/grade level standard.   * Exceeds expected course content/grade level standard   Applies skills and strategies in new and unfamiliar situations | | |
|  | **Proficient + (Approaching Advanced)**  **Score 3.5** | The student demonstrates partial success at showing a thorough understanding of course content/grade level standard by making in-depth inferences and applications of the course content/grade level standard(s).  The student performs with partial success at a high level of difficulty, complexity, or fluency that is above the expected course content/grade level standard.   * Demonstrates success toward exceeding course content/grade level standard * Applies skills and strategies consistently in familiar situations, and at times, in unfamiliar situations | |
| **Proficient**  **Score 3.0** | The student demonstrates a proficient understanding of the expected course content/grade level standard(s).  The student performs at the level of difficulty, complexity, or fluency that is at the expected course content/grade level standard.   * Meets expected course content/grade level standard * Retains information and applies skills and strategies in familiar situations | | * Write the equation of a quadratic function in vertex form given multiple transformations * Convert from standard to vertex form by complete the square. * Graph a function given an equation in standard form. * Solve real-world problems using quadratic functions * Solve quadratic equations by completing the square and using the Quadratic Formula |
|  | **Basic +**  **(Approaching Proficient)**  **Score 2.5** | The student demonstrates an adequate understanding of the information for the course content/grade level standard(s).  The student performs with partial success at the level of difficulty, complexity, or fluency that is at the expected course content/grade level standard.   * Partially meets expected course content/grade level standard * Retains information and at times applies skills and strategies in familiar situations | |
| **Basic**  **Score 2.0** | The student demonstrates a basic understanding of the information expected for the course content/grade level standard(s).  The student performs the skills required for the course content/grade level standard at a basic level of difficulty, complexity, or fluency.   * Partially meets expected course content/grade level standard * Retains information and simple processes in familiar situations | | * Identify transformations from parent graph given vertex from of a quadratic. * Identify features (maximum/ minimum, y-intercept, vertex, axis of symmetry, domain and range) of a quadratic function in vertex and standard form. * Graph a function given an equation in vertex form. * Complete the square. * Solve quadratic equations by factoring and square roots.   Simplify expressions with complex numbers. |
| **Approaching Basic**  **Score 1.5** | The student demonstrates some basic understanding of the information expected for the course content/grade level standard(s).  The student struggles to perform the skills required for the course content/grade level standard at a basic level of difficulty, complexity, or fluency.   * Partially meets some of expected course content/grade level standard * Retains some information and simple processes in familiar situations | | |
| **Below Basic**  **Score 1.0** | The student demonstrates difficulty in understanding the information and performing the skills expected for the course/grade level standard(s).   * Performs below expected course content/grade level on the standard. * Has difficulty retaining information and applying skills and strategies | | |
| **Failing**  **Score 0** | The student demonstrates little or no evidence of understanding the information or skills required for the course content/grade level standard(s). | | |

**Unit 5 - Chapter 5: Polynomials and Polynomial Functions Pacing Guide**

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| --- | --- | --- | --- | --- |
| **Time Frame** | 5 weeks | | | |
| **Lessons**  **Indicators**  **Learning Goals** | |  |  |  | | --- | --- | --- | | **Lesson** | **Indicator** | **Learning Goal** | | 5.1 Polynomial Functions | MA 11.2.1.c | Students will graph polynomials functions and describe end behavior. | | 5.2 Polynomials, Linear Factors, and Zeros | MA 11.2.2.l | Students will analyze the factored form of a polynomial and write a polynomial function from its zeros | | 5.3 Solving Polynomial Equations | MA 11.2.2.l | Students will solve polynomial equations by factoring and graphing. | | 5.4 Dividing Polynomials | MA 11.2.2.i | Students will divide polynomials using long division and synthetic division. | | 5.5 Theorems About Roots of Polynomial Equations | MA 11.2.2.n | Students will solve equations using the Rational Root Theorem and use the Conjugate Root Theorem. | | ~~5.5 Concept Byte: Using Polynomial Identities~~ |  | ~~Students will use polynomial identities to describe numerical relationships.~~ | | 5.6 The Fundamental Theorem of Algebra | MA 11.2.2.n | Students will use the Fundamental Theorem of Algebra to solve polynomial equations with complex solutions. | | ~~5.6 Concept Byte: Graphing Polynomials Using Zeros~~ |  | ~~Students will learn how to sketch the graph of a polynomial function by using the zeros, turning points, and end behavior.~~ | | 5.7 The Binomial Theorem | MA 11.2.2.i | Students will expand a binomial using Pascal’s Triangle and use the Binomial Theorem. | | 5.8 Polynomial Models in the Real World | MA 11.2.3.a | Students will fit data to linear, quadratic, cubic or quartic models. | | 5.9 Transforming Polynomial Functions | MA 11.2.3.a | Students will apply transformations to graphs of polynomials. | | | | |
| **Standards and Indicators** | **MA 11.2.1.c** Classify a function given graphs, tables or algebraic notation, as linear, quadratic, or neither.  **MA 11.2.2.i** Perform operations (addition, subtraction, multiplication, and division) on polynomials.  **MA 11.2.2.l** Make the connection between the factors of a polynomial and the zeros of a polynomial.  **MA 11.2.2.n** Solve quadratic equations involving real coefficients and real or imaginary roots.  **MA 11.2.3.a** Analyze, model, and solve real-world problems using various representations (graphs, tables, linear equations and inequalities, systems of linear equations, quadratic, exponential, square root, and absolute value functions). | | | |
| **Vocabulary**  Academic Vocabulary terms in bold are taught using Marzano’s Six-Step Process | **Binomial theorem**  **Conjugate root theorem**  **Constant of proportionality**  **Difference of cubes** | Expand  **Factor theorem**  **Fundamental Theorem of Algebra**  Multiple zero | **Multiplicity**  **Power function**  **Rational root theorem**  **Relative maximum** | **Relative minimum**  **Remainder theorem**  **Sum of cubes**  **Synthetic division** |
| **Common Assessment**  Assessments in **bold** a**re required.** | **Unit 5 – Chapter 5 Summative Assessment** | | | |
| **Additional Notes** | Lessons with strikethrough may be taught as time permits. | | | |

# Unit 5 - Chapter 5: Polynomials & Polynomial Functions Proficiency Scale

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| **Advanced**  **Score 4.0** | The student consistently demonstrates a thorough understanding of polynomials and polynomial functions by making in-depth inferences and showing extended applications of the course content/grade level standard(s).  The student performs consistently at a high level of difficulty, complexity, or fluency that is above the expected course content/grade level standard.   * Exceeds expected course content/grade level standard   Applies skills and strategies in new and unfamiliar situations | | |
|  | **Proficient + (Approaching Advanced)**  **Score 3.5** | The student demonstrates partial success at showing a thorough understanding of course content/grade level standard by making in-depth inferences and applications of the course content/grade level standard(s).  The student performs with partial success at a high level of difficulty, complexity, or fluency that is above the expected course content/grade level standard.   * Demonstrates success toward exceeding course content/grade level standard * Applies skills and strategies consistently in familiar situations, and at times, in unfamiliar situations | |
| **Proficient**  **Score 3.0** | The student demonstrates a proficient understanding of the expected course content/grade level standard(s).  The student performs at the level of difficulty, complexity, or fluency that is at the expected course content/grade level standard.   * Meets expected course content/grade level standard * Retains information and applies skills and strategies in familiar situations | | * Find the solutions of a polynomial degree 3 or higher. * Sketch the graph of any given polynomial function. * Write a polynomial function with rational coefficients with given roots (e.g., -6, 4 + , 7i). * Expand binomials |
|  | **Basic +**  **(Approaching Proficient)**  **Score 2.5** | The student demonstrates an adequate understanding of the information for the course content/grade level standard(s).  The student performs with partial success at the level of difficulty, complexity, or fluency that is at the expected course content/grade level standard.   * Partially meets expected course content/grade level standard * Retains information and at times applies skills and strategies in familiar situations | |
| **Basic**  **Score 2.0** | The student demonstrates a basic understanding of the information expected for the course content/grade level standard(s).  The student performs the skills required for the course content/grade level standard at a basic level of difficulty, complexity, or fluency.   * Partially meets expected course content/grade level standard * Retains information and simple processes in familiar situations | | * Name a polynomial function by its degree and number of terms. * Determine turning points and end behavior using the degree and coefficients of polynomial functions. * Write a polynomial function given its zeros. * Find the multiplicity of a zero. * Find the real or imaginary solutions of a polynomial equation by factoring. * Divide polynomials using long division or synthetic division. |
| **Approaching Basic**  **Score 1.5** | The student demonstrates some basic understanding of the information expected for the course content/grade level standard(s).  The student struggles to perform the skills required for the course content/grade level standard at a basic level of difficulty, complexity, or fluency.   * Partially meets some of expected course content/grade level standard * Retains some information and simple processes in familiar situations | | |
| **Below Basic**  **Score 1.0** | The student demonstrates difficulty in understanding the information and performing the skills expected for the course/grade level standard(s).   * Performs below expected course content/grade level on the standard. * Has difficulty retaining information and applying skills and strategies | | |
| **Failing**  **Score 0** | The student demonstrates little or no evidence of understanding the information or skills required for the course content/grade level standard(s). | | |

**Unit 6 - Chapter 6: Radical Functions & Rational Exponents Pacing Guide**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time Frame** | 4 weeks | | | |
| **Lessons**  **Indicators**  **Learning Goals** | |  |  |  | | --- | --- | --- | | **Lesson** | **Indicator** | **Learning Goal** | | 6.1 Concept Byte: Properties of Exponents | MA 11.2.2.c | Students will review and practice using the properties of exponents in preparation to simplify expressions containing exponents. | | 6.1 Roots and Radical Expressions | MA 11.2.2.c | Students will find *n*th roots. | | 6.2 Multiplying and Dividing Radical Expressions | MA 11.2.2.c | Students will multiply and divide radical expressions. | | 6.3 Binomial Radical Expressions | MA 11.2.2.c | Students will add and subtract radical expressions. | | 6.4 Rational Exponents | MA 11.1.2.b | Students will simplify expressions with rational exponents. | | 6.5 Solving Square Root and Other Radical Equations | MA 11.2.3.a | Students will solve square root and other radical equations. | | 6.6 Function Operations | MA 11.2.2.m | Students will add, subtract, multiply and divide functions and find compositions of two functions. | | ~~6.7 Inverse Relations and Functions~~ | ~~MA 11.2.1.h~~ | ~~Students will find the inverse of a relation or function.~~ | | ~~6.8 Graphing Radical Functions~~ | ~~MA 12.2.1.a~~ | ~~Students will graph square root and other radical functions.~~ | | | | |
| **Standards and Indicators** | **MA 11.1.2.b** Simplify expressions with rational exponents.  **MA 11.2.2.c** Simplify algebraic expressions involving integer and fractional exponents.  **MA 11.2.2.m** Combine functions by composition and perform operations.  **MA 11.2.3.a** Analyze, model, and solve real-world problems using various representations. | | | |
| **Vocabulary**  Academic Vocabulary terms in bold are taught using Marzano’s Six-Step Process | **Composite function**  **Like radicals**  **nth root** | **One-to-one function**  **Principal root**  **Radical equation** | **Radicand**  **Rational exponent**  **Rationalize the denominator** | **Simplest form of a radical**  **Square root equation** |
| **Common Assessment**  Assessments in **bold** a**re required** | **Unit 6 – Chapter 6 Summative Assessment** | | | |
| **Additional Notes** | Lessons with strikethrough may be taught as time permits. | | | |

# Unit 6 - Chap 6: Radical Functions & Rational Exponents Proficiency Scale

|  |  |  |  |
| --- | --- | --- | --- |
| **Advanced**  **Score 4.0** | The student consistently demonstrates a thorough understanding of radical functions and rational exponents by making in-depth inferences and showing extended applications of the course content/grade level standard(s).  The student performs consistently at a high level of difficulty, complexity, or fluency that is above the expected course content/grade level standard.   * Exceeds expected course content/grade level standard   Applies skills and strategies in new and unfamiliar situations | | |
|  | **Proficient + (Approaching Advanced)**  **Score 3.5** | The student demonstrates partial success at showing a thorough understanding of course content/grade level standard by making in-depth inferences and applications of the course content/grade level standard(s).  The student performs with partial success at a high level of difficulty, complexity, or fluency that is above the expected course content/grade level standard.   * Demonstrates success toward exceeding course content/grade level standard * Applies skills and strategies consistently in familiar situations, and at times, in unfamiliar situations | |
| **Proficient**  **Score 3.0** | The student demonstrates a proficient understanding of the expected course content/grade level standard(s).  The student performs at the level of difficulty, complexity, or fluency that is at the expected course content/grade level standard.   * Meets expected course content/grade level standard * Retains information and applies skills and strategies in familiar situations | | * Simplify algebraic expressions with rational exponents. * Simplify radical expressions containing variables. * Multiply binomial radical expressions. * Compose functions. * Solve square root and radical equations. |
|  | **Basic +**  **(Approaching Proficient)**  **Score 2.5** | The student demonstrates an adequate understanding of the information for the course content/grade level standard(s).  The student performs with partial success at the level of difficulty, complexity, or fluency that is at the expected course content/grade level standard.   * Partially meets expected course content/grade level standard * Retains information and at times applies skills and strategies in familiar situations | |
| **Basic**  **Score 2.0** | The student demonstrates a basic understanding of the information expected for the course content/grade level standard(s).  The student performs the skills required for the course content/grade level standard at a basic level of difficulty, complexity, or fluency.   * Partially meets expected course content/grade level standard * Retains information and simple processes in familiar situations | | * Add, subtract, multiply, or divide functions. * Convert between radical and exponential form. * Multiply and simplify radical expressions without variables.   Simplify rational exponents with numeric bases. |
| **Approaching Basic**  **Score 1.5** | The student demonstrates some basic understanding of the information expected for the course content/grade level standard(s).  The student struggles to perform the skills required for the course content/grade level standard at a basic level of difficulty, complexity, or fluency.   * Partially meets some of expected course content/grade level standard * Retains some information and simple processes in familiar situations | | |
| **Below Basic**  **Score 1.0** | The student demonstrates difficulty in understanding the information and performing the skills expected for the course/grade level standard(s).   * Performs below expected course content/grade level on the standard. * Has difficulty retaining information and applying skills and strategies | | |
| **Failing**  **Score 0** | The student demonstrates little or no evidence of understanding the information or skills required for the course content/grade level standard(s). | | |

**Unit 7 - Chapter 8: Rational Functions Pacing Guide**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time Frame** | 3 weeks | | | |
| **Lessons**  **Indicators**  **Learning Goals** | |  |  |  | | --- | --- | --- | | **Lesson** | **Indicator** | **Learning Goal** | | ~~8.1 Inverse Variation~~ | ~~MA 11.2.3.a~~ | ~~Students will recognize and use inverse variation.~~  ~~Students will use joint and other variations.~~ | | ~~8.2 Concept Byte: Graphing Rational Functions~~ | ~~MA 12.2.1.a~~ | ~~Students will graph rational functions.~~ | | ~~8.2 The Reciprocal Function Family~~ | ~~MA 12.2.1.a~~ | ~~Students will graph reciprocal functions.~~  ~~Students will graph translations of reciprocal functions.~~ | | ~~8.3 Rational Functions and Their Graphs~~ | ~~MA 12.2.1.a~~ | ~~Students will identify properties of rational functions.~~  ~~Students will graph rational functions.~~ | | ~~8.3 Concept Byte: Oblique Asymptotes~~ | ~~MA 12.2.1.a~~ | ~~Students will identify and write equations for oblique asymptotes.~~ | | 8.4 Rational Expressions | MA 11.2.2.d | Students will simplify, multiply and divide rational expressions. | | 8.5 Adding and Subtracting Rational Expressions | MA 11.2.2.d | Students will add and subtract rational expressions | | 8.6 Solving Rational Functions | MA 11.2.2.d | Students will solve rational equations.  Students will use rational equations to solve problems. | | ~~8.6 Concept Byte: Systems with Rational Equations~~ |  | ~~Students will show how methods for solving rational equations can be used to solve systems of rational equations.~~ | | ~~8.6 Concept Byte: Rational Inequalities~~ |  | ~~Students will solve rational inequalities.~~ | | | | |
| **Standards and Indicator** | **MA 11.2.2.d** Perform operations on rational expressions (add, subtract, multiply, divide, and simplify). | | | |
| **Vocabulary**  Academic Vocabulary terms in bold are taught using Marzano’s Six-Step Process | **Complex fraction**  **Rational equation** | **Rational expression** | **Rational function** | Simplest form |
| **Common Assessment**  Assessments in **bold** a**re required** | **Unit 7- Chapter 7 Summative Assessment** | | | |
| **Additional Notes** | Lessons with strikethrough may be taught as time permits. | | | |

# Unit 7 - Chapter 8: Rational Functions Proficiency Scale

|  |  |  |  |
| --- | --- | --- | --- |
| **Advanced**  **Score 4.0** | The student consistently demonstrates a thorough understanding of rational functions by making in-depth inferences and showing extended applications of the course content/grade level standard(s).  The student performs consistently at a high level of difficulty, complexity, or fluency that is above the expected course content/grade level standard.   * Exceeds expected course content/grade level standard   Applies skills and strategies in new and unfamiliar situations | | |
|  | **Proficient + (Approaching Advanced)**  **Score 3.5** | The student demonstrates partial success at showing a thorough understanding of course content/grade level standard by making in-depth inferences and applications of the course content/grade level standard(s).  The student performs with partial success at a high level of difficulty, complexity, or fluency that is above the expected course content/grade level standard.   * Demonstrates success toward exceeding course content/grade level standard * Applies skills and strategies consistently in familiar situations, and at times, in unfamiliar situations | |
| **Proficient**  **Score 3.0** | The student demonstrates a proficient understanding of the expected course content/grade level standard(s).  The student performs at the level of difficulty, complexity, or fluency that is at the expected course content/grade level standard.   * Meets expected course content/grade level standard * Retains information and applies skills and strategies in familiar situations | | * Apply rational functions to real-world situations. * Simplify complex fractions. * Add or subtract rational expressions with unlike denominators. * Multiply and divide rational expressions (with factoring) * Solve rational equations. |
|  | **Basic +**  **(Approaching Proficient)**  **Score 2.5** | The student demonstrates an adequate understanding of the information for the course content/grade level standard(s).  The student performs with partial success at the level of difficulty, complexity, or fluency that is at the expected course content/grade level standard.   * Partially meets expected course content/grade level standard * Retains information and at times applies skills and strategies in familiar situations | |
| **Basic**  **Score 2.0** | The student demonstrates a basic understanding of the information expected for the course content/grade level standard(s).  The student performs the skills required for the course content/grade level standard at a basic level of difficulty, complexity, or fluency.   * Partially meets expected course content/grade level standard * Retains information and simple processes in familiar situations | | * Simplify rational expressions and state any restrictions on the variable. * Add or subtract rational expressions with like denominators. * Multiply and divide rational expressions (no factoring) |
| **Approaching Basic**  **Score 1.5** | The student demonstrates some basic understanding of the information expected for the course content/grade level standard(s).  The student struggles to perform the skills required for the course content/grade level standard at a basic level of difficulty, complexity, or fluency.   * Partially meets some of expected course content/grade level standard * Retains some information and simple processes in familiar situations | | |
| **Below Basic**  **Score 1.0** | The student demonstrates difficulty in understanding the information and performing the skills expected for the course/grade level standard(s).   * Performs below expected course content/grade level on the standard. * Has difficulty retaining information and applying skills and strategies | | |
| **Failing**  **Score 0** | The student demonstrates little or no evidence of understanding the information or skills required for the course content/grade level standard(s). | | |

# Unit 8A - Chapter 11: Probability Pacing Guide

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time Frame** | 3 weeks | | | |
| **Lessons**  **Indicators**  **Learning Goals** | |  |  |  | | --- | --- | --- | | **Lesson** | **Indicator** | **Learning Goal** | | 11.1 Permutations and Combinations | MA 11.4.3.b | Students will count permutations and combinations | | 11.2 Probability | MA 11.4.3.a | Students will find the probability of an event using theoretical, experimental and simulation methods. | | 11.3 Probability of Multiple Methods | MA 11.4.3.c | Students will find the probability of A and B in addition to A or B | | 11.4 Conditional Probability | MA 11.4.3.b | Students will find conditional probabilities using tables and tree diagrams. | | 11.5 Probability Models | MA 11.4.2.d | Students will use probabilities to make fair decisions and analyze decisions. | | | | |
| **Standards and Indicators** | **MA 11.4.2.d** Support conclusions with valid arguments.  **MA 11.4.3.a** Construct sample spaces and probability distributions.  **MA 11.4.3.b** Use appropriate counting techniques (e.g., permutations or combinations) to determine the probability of an event.  **MA 11.4.3.c** Determine if events are mutually exclusive and calculate their probabilities in either case. | | | |
| **Vocabulary**  Academic Vocabulary terms in bold are taught using Marzano’s Six-Step Process | Combination  **Conditional probability**  **Contingency table**  **Dependent events** | **Equally likely outcomes**  **Experimental probability**  **Fundamental Counting**  **Principle**  Independent events | Mutually exclusive events  n factorial  **Normal distribution**  **Permutation** | Probability model  Sample Space  Simulation  Theoretical probability |
| **Common Assessment**  Assessments in **bold** a**re required.** | **Unit 8A – Chapter 11 Summative Assessment** | | | |
| **Additional Notes** | **Lessons with strikethrough may be taught as time permits.** | | | |

# Unit 8B - Chapter 11: Statistics Pacing Guide

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time Frame** | 3 weeks | | | |
| **Lessons**  **Indicators**  **Learning Goals** | |  |  |  | | --- | --- | --- | | **Lesson** | **Indicator** | **Learning Goal** | | 11.6 Analyzing Data | MA 11.4.2.f  MA 11.4.2.c  MA 11.4.2.d | Students will calculate of measures of central tendency and draw and interpret box and whisker plots. | | 2.5 Using Linear Models | MA 11.4.2.e | Students will write and make predictions from linear models. | | 11.7 Standard Deviation | MA 11.4.2.f | Students will find and apply the standard deviation and variance of a data set. | | 11.8 Samples and Surveys | MA 11.4.2.g  MA 11.4.2.h  MA 11.4.2.d | Students will identify sampling methods and recognize bias in samples and surveys | | ~~11.9 Binomial Distributions~~ |  | ~~Students will find binomial probabilities and distributions.~~ | | 11.10 Normal Distributions | MA 11.4.2.k  MA 11.1.2.d | Students will use normal distribution | | | | |
| **Standards and Indicators** | **MA 11.1.2.d** Use estimation methods to check reasonableness of real number computations and decide if the problem calls for approximation or an exact number.  **MA 11.4.2.c** Compare data sets and formulate conclusions.  **MA 11.4.2.d** Support conclusions with valid arguments.  **MA 11.4.2.e** Develop linear equations for linear models to predict unobserved outcomes using the regression line and correlation coefficient with technology. Moved from unit 2  **MA 11.4.2.f** Describe the shape, identify any outliers, and determine the spread of a data set.  **MA 11.4.2.g** Explain the impact of sampling methods, bias, and the phrasing of questions asked during data collection, and the conclusions that can rightfully be made.  **MA 11.4.2.h** Explain the differences between a randomized experiment and observational studies.  **MA 11.4.2.k** Interpret data represented by the normal distribution, formulate conclusions, and recognize that some data sets are not normally distributed. | | | |
| **Vocabulary**  Academic Vocabulary terms in bold are taught using Marzano’s Six-Step Process | Bias  **Bimodal**  **Box and whisker plot**  **Controlled experiment**  **Convenience sample**  Interquartile range  Mean | **Measure of central tendency**  **Measure of variation**  Median  Mode  **Quartile**  **Random sample** | Range  **Sample**  **Sample space**  **Observational study**  Outlier  **Percentile** | Population  Self-selected sample  Standard deviation  Survey  Systematic sample  Variance |
| **Common Assessment**  Assessments in **bold** a**re required.** | **Unit 8B – Chapter 11 Summative Assessment** | | | |
| **Additional Notes** | Lessons with strikethrough may be taught as time permits. | | | |

# Unit 8 A/B - Chapter 11: Probability and Statistics Proficiency Scale

|  |  |  |  |
| --- | --- | --- | --- |
| **Advanced**  **Score 4.0** | The student consistently demonstrates a thorough understanding of probability and statistics by making in-depth inferences and showing extended applications of the course content/grade level standard(s).  The student performs consistently at a high level of difficulty, complexity, or fluency that is above the expected course content/grade level standard.   * Exceeds expected course content/grade level standard   Applies skills and strategies in new and unfamiliar situations | | |
|  | **Proficient + (Approaching Advanced)**  **Score 3.5** | The student demonstrates partial success at showing a thorough understanding of course content/grade level standard by making in-depth inferences and applications of the course content/grade level standard(s).  The student performs with partial success at a high level of difficulty, complexity, or fluency that is above the expected course content/grade level standard.   * Demonstrates success toward exceeding course content/grade level standard * Applies skills and strategies consistently in familiar situations, and at times, in unfamiliar situations | |
| **Proficient**  **Score 3.0** | The student demonstrates a proficient understanding of the expected course content/grade level standard(s).  The student performs at the level of difficulty, complexity, or fluency that is at the expected course content/grade level standard.   * Meets expected course content/grade level standard * Retains information and applies skills and strategies in familiar situations | | * Find standard deviation and percentiles for data sets. * Use tables and tree diagrams to determine conditional probabilities. * Find the probability of multiple events. * Use probability to analyze decisions. * Calculate and compare variance and standard deviations of two data sets. * Write the equation of a trend line given a data set or table. |
|  | **Basic +**  **(Approaching Proficient)**  **Score 2.5** | The student demonstrates an adequate understanding of the information for the course content/grade level standard(s).  The student performs with partial success at the level of difficulty, complexity, or fluency that is at the expected course content/grade level standard.   * Partially meets expected course content/grade level standard * Retains information and at times applies skills and strategies in familiar situations | |
| **Basic**  **Score 2.0** | The student demonstrates a basic understanding of the information expected for the course content/grade level standard(s).  The student performs the skills required for the course content/grade level standard at a basic level of difficulty, complexity, or fluency.   * Partially meets expected course content/grade level standard * Retains information and simple processes in familiar situations | | * Evaluate factorial expressions. * Classify a pair of events as mutually exclusive, dependent or independent. * Find experimental and theoretical probabilities. * Determine whether a probability distribution is discrete or continuous. * Draw and interpret box and whisker plots using a given data set. * Identify whether situations involve combinations or permutations * Make a scatter plot and describe the correlation. |
| **Approaching Basic**  **Score 1.5** | The student demonstrates some basic understanding of the information expected for the course content/grade level standard(s).  The student struggles to perform the skills required for the course content/grade level standard at a basic level of difficulty, complexity, or fluency.   * Partially meets some of expected course content/grade level standard * Retains some information and simple processes in familiar situations | | |
| **Below Basic**  **Score 1.0** | The student demonstrates difficulty in understanding the information and performing the skills expected for the course/grade level standard(s).   * Performs below expected course content/grade level on the standard. * Has difficulty retaining information and applying skills and strategies | | |
| **Failing**  **Score 0** | The student demonstrates little or no evidence of understanding the information or skills required for the course content/grade level standard(s). | | |

# Course Standards

**Standards**: At the highest level of generality, content area standards include a set of broad, overarching content-based statements that describe the basic cognitive, affective, or psychomotor expectations of students. They reflect long-term goals for learning. These comprehensive statements are not grade level specific and cover the big ideas of the course.

**Indicators**: Under each standard are indicators, which further describe what a student must know and be able to do to meet the standard. Indicators are performance, based statements that provide educators with a clear understanding of the expected level of student learning and guidance. Indicators provide guidance for an assessment of student learning. Indicators also help to distinguish expectations between grade levels.

Nebraska Department of Education Content Area Standards Reference Guide: <https://www.education.ne.gov/academicstandards/Documents/Nebraska%20Standards%20Reference%20Guide_Final.pdf>

**STRAND: 11.1 NUMBER**

**Comprehensive Standard:**

**MA11.1 NUMBER: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**Grade Level Expectation:**

**MA11.1.1 Numeric Relationships:** Students will demonstrate, represent, and show relationships among the subsets of real numbers and the complex number system.

**Indicators:**

* MA11.1.1.a Compare and contrast subsets of the complex number system, including imaginary, rational, irrational, integers, whole, and natural numbers.
* MA11.1.1.b Recognize that closure properties apply to the subsets of the complex number system, under the standard operations.

**Grade Level Expectation:**

**MA11.1.2 Operations:** Students will compute with real and complex numbers.

**Indicators:**

* MA11.1.2.a Compute with subsets of the complex number system, including imaginary, rational, irrational, integers, whole, and natural numbers.
* MA11.1.2.b Simplify expressions with rational exponents.
* MA11.1.2.c Select, apply, and explain the method of computation when problem solving using real numbers (e.g., models, mental computation, paper-pencil, or technology).
* MA11.1.2.d Use estimation methods to check the reasonableness of real number computations and decide if the problem calls for an approximation (including appropriate rounding) or an exact number.

**STRAND: 11.2 ALGEBRA**

**Comprehensive Standard:**

**MA11.2 ALGEBRA: Students will communicate algebraic concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**Grade Level Expectation:**

**MA11.2.1 Algebraic Relationships:** Students will demonstrate, represent, and show relationships with function.

**Indicators:**

* MA11.2.1.b Analyze a relation to determine if it is a function given graphs, tables, or algebraic notation.
* MA11.2.1.f Analyze and graph absolute value functions (finding the vertex, symmetry, transformations, determine intercepts, and minimums or maximums).
* MA11.2.1.g Analyze and graph quadratic functions (standard form, vertex form, finding zeros, symmetry, transformations, determine intercepts, and minimums or maximums).

**Grade Level Expectation:**

**MA11.2.2 Algebraic Processes:** Students will apply the operational properties when

evaluating rational expressions, and solving linear and quadratic equations, and inequalities.

**Indicators:**

* MA11.2.2.c Simplify algebraic expressions involving integer and fractional exponents.
* MA11.2.2.d Perform operations on rational expressions (add, subtract, multiply, divide, and simplify).
* MA11.2.2.e Evaluate expressions at specified values of their variables (polynomial, rational, radical, and absolute value).
* MA11.2.2.h Analyze and solve systems of three linear equations in three variables.
* MA11.2.2.i Perform operations (addition subtraction, multiplication, and division) on polynomials.
* MA11.2.2 k. Recognize polynomial multiplication patterns and their related factoring patterns (e.g., (a + b)2 = a2 + 2ab + b2, a2 – b2 = (a + b) (a - b)).
* MA11.2.2.l Make the connection between the factors of a polynomial and the zeros of a polynomial.
* MA11.2.2.m Combine functions by composition and perform operations (addition, subtraction, multiplication, division) on functions.
* MA11.2.2.n Solve quadratic equations involving real coefficients and real or imaginary roots.

**Grade Level Expectation:**

**MA11.2.3 Applications**: Students will solve real-world problems involving linear equations and inequalities, systems of linear equations, quadratic, exponential, square root, and absolute value functions.

**Indicators:**

* MA11.2.3.a Analyze, model, and solve real-world problems using various representations (graphs, tables, linear equations and inequalities, systems of linear equations, quadratic, exponential, square root, and absolute value functions).

**STRAND: 11.3 GEOMETRY**

**Comprehensive Standard:**

**MA11.3 GEOMETRY: Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**Grade Level Expectation:**

**MA11.3.1 Characteristics:** Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.

* No additional indicators at this level.

**Grade Level Expectation:**

**MA11.3.2 Coordinate Geometry:** Students will determine location, orientation, and relationships on the coordinate plane.

* No additional indicators at this level.

**Grade Level Expectation:**

**MA11.3.3 Measurement:** Students will perform and compare measurements and apply formulas.

* No additional indicators at this level.

**STRAND: 11.4 DATA**

**Comprehensive Standard:**

**MA11.4 DATA: Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**

**Grade Level Expectation:**

**MA11.4.1 Representations:** Students will create displays that represent data.

* No additional indicators at this level.

**Grade Level Expectation:**

**MA11.4.2 Analysis & Applications:** Students will analyze data to address the situation.

**Indicators:**

* MA11.4.2.c Compare data sets and formulate conclusions.
* MA11.4.2.d Support conclusions with valid arguments.
* MA11.4.2.e Develop linear equations for linear models to predict unobserved outcomes using the regression line and correlation coefficient with technology.
* MA11.4.2.f Describe the shape, identify any outliers, and determine the spread of a data set.
* MA11.4.2.g Explain the impact of sampling methods, bias, and the phrasing of questions asked during data collection, and the conclusions that can rightfully be made.
* MA11.4.2.h Explain the differences between a randomized experiment and observational studies.
* MA11.4.2.j Recognize when arguments based on data confuse correlation with causation.
* MA11.4.2.k Interpret data represented by the normal distribution, formulate conclusions, and recognize that some data sets are not normally distributed.

**Grade Level Expectation:**

**MA11.4.3 Probability:** Students will interpret and apply concepts of probability.

**Indicators:**

* MA11.4.3.a Construct sample spaces and probability distributions.
* MA11.4.3.b Use appropriate counting techniques (e.g., permutations, combinations) to determine the probability of an event.
* MA11.4.3.c Determine if events are mutually exclusive and calculate their probabilities in either case.

# Scope and Sequence

Yellow highlighted indicators differentiate Honors Courses

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Pre-Algebra** | **Algebra1-2** | | **Geometry** | | **Algebra 3-4** | | **Pre-Calculus** | |
| **Strand: Number** | **Comprehensive Standard: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines**  **Grade Level Expectations: MA 8.1.1**  **Numeric Relationships**  **Students will demonstrate, represent, and show relationships among real numbers within the base-ten number system.**  **Indicators**  MA 8.1.1.a Determine subsets of numbers as natural, whole, integer, rational, irrational, or real, based on the definitions of these sets of numbers.  MA 8.1.1.b Represent numbers with positive and negative exponents and in scientific notation.  MA 8.1.1.c Describe the difference between a rational and irrational number.  MA 8.1.1.d Approximate, compare, and order real numbers (both rational and irrational) and order real numbers both off and on the number line.  **Grade Level**  **Expectation MA 8.1.2 Operations:**  **Students will compute with exponents and roots.**  Indicators:  MA 8.1.2.a Evaluate the square roots of perfect squares less than or equal to 400 and cube roots of perfect cubes less than or equal to 125.  MA 8.1.2.b Simplify numerical expressions involving exponents and roots (e.g., 4(-2) is the same as 1/16).  MA 8.1.2.c Simplify numerical expressions involving absolute value.  MA 8.1.2.d Multiply and divide numbers using scientific notation.  MA 8.1.2.e Estimate and check reasonableness of answers using appropriate strategies and tools. | | **Comprehensive Standard: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**  **Grade Level**  **Expectations: MA11.1.1**  **Numeric Relationships**  **Students will demonstrate, represent, and show relationships among the subsets of real numbers and the complex number system.**  **Indicators:**  MA 11.1.1.a Compare and contrast subsets of the real number system, rational, irrational, integers, whole, and natural numbers  MA 11.1.1.c Use drawings, words, and symbols to explain the effects of operations such as multiplication and division on the magnitude of quantities in the real number system, including powers and roots (e.g., if you take the square root of a number, will the result always be smaller than the original number?).  **Grade Level**  **Expectation MA 11.1.2 Operations:**  **Students will compute with real and complex numbers.**  Indicators:  MA 11.1.2.a Compute with subsets of the real number system, including rational, irrational, integers, whole, and natural numbers.  MA 11.1.2.c Select, apply, and explain the method of computation when problem solving using real numbers (e.g., models, mental computation, paper-pencil, or technology).  MA 11.1.2.d Use estimation methods to check the reasonableness of real number computations and decide if the problem calls for an approximation (including appropriate rounding) or an exact number. | | **Comprehensive Standard: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**  **Grade Level**  **Expectations: MA 11.1.1**  **Numeric Relationships**  **Students will demonstrate, represent, and show relationships among the subsets of real numbers and the complex number system.**  **Indicators:**  No additional indicator(s) at this level. Mastery is expected at previous grade levels.  **Grade Level**  **Expectation MA 11.1.2 Operations:**  **Students will compute with real and complex numbers**.  Indicators:  MA 11.1.2.c Select, apply, and explain the method of computation when problem solving using real numbers (e.g., models, mental computation, paper-pencil, or technology).  MA 11.1.2.d Use estimation methods to check the reasonableness of real number computations and decide if the problem calls for an approximation (including appropriate rounding) or an exact number. | | **Comprehensive Standard: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**  **Grade Level**  **Expectations: MA 11.1.1**  **Numeric Relationships**  **Students will demonstrate, represent, and show relationships among the subsets of real numbers and the complex number system.**  **Indicators:**  MA 11.1.1.a Compare and contrast subsets of the real number system, rational, irrational, integers, whole, and natural numbers.  MA11.1.1.b Recognize that closure properties apply to the subsets of the complex number system, under the standard operations.  **Grade Level**  **Expectation MA 11.1.2 Operations:**  **Students will compute with real and complex numbers**  Indicators:  MA 11.1.2.a Compute with subsets of the real number system, including rational, irrational, integers, whole, and natural numbers.  MA11.1.2.b Simplify expressions with rational exponents  MA11.1.2.c Select, apply, and explain the method of computation when problem solving using real numbers (e.g., models, mental computation, paper-pencil, or technology).  MA11.1.2.d Use estimation methods to check the reasonableness of real number computations and decide if the problem calls for an approximation (including appropriate rounding) or an exact number | | **Comprehensive**  **Standard: Students will communicate number sense concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**  **Grade Level**  **Expectations: MA 12.1.1(AT)**  **Numeric Relationships**  **Students will demonstrate, represent, and show relationships among the complex numbers.**  **Indicators:**  MA 12.1.1.a (AT) Graph complex numbers on the complex plane.  MA 12.1.1.b (AT) Determine the magnitude of complex numbers.  MA 12.1.1.c (AT) Use matrices to represent and manipulate data.  MA 12.1.1.d (AT) Recognize the role that additive and multiplicative identities play in matrix operations.  MA 12.1.1.e (AT) Recognize that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.  MA 12.1.1.f (AT) Derive and use the formulas for the general term and summation of finite arithmetic and geometric series.  **Grade Level**  **Expectation MA 12.1.2 Operations:**  **Students will compute with matrices.**  **Indicators:**  MA 12.1.2.a (AT) Multiply matrices by scalars to produce new matrices.  MA 12.1.2.b (AT) Add, subtract, and multiply matrices of appropriate dimensions. | |

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|  | **Pre-Algebra** | **Algebra 1-2** | **Geometry** | **Algebra 3-4** | **Pre-Calculus** |
| **Strand: Algebra** | **Comprehensive Standard: Students will communicate algebraic concepts using multiple representations to reason solve problems, and make connections within mathematics and across disciplines.**  **Grade Level Expectation:**  **MA 8.2.1. Algebraic Relationships Students will demonstrate, represent, and show relationships with expressions, equations, and inequalities.**    Indicators:  MA 8.2.1.a Create algebraic expressions, equations, and inequalities (e.g., two-step, one variable) from word phrases, tables, and pictures.  MA 8.2.1.b Determine and describe the rate of change for given situations through the use of tables and graphs.  MA 8.2.1.c Describe equations and linear graphs as having one solution, no solution, or infinitely many solutions.  MA 8.2.1.d Graph proportional relationships and interpret the slope.  **Grade Level Expectation:**  **MA 8.2.2 Algebraic Processes: Students will apply the operational properties when evaluating expressions and solving expressions, equations, and inequalities.**  Indicators  MA 8.2.2.a Solve multi-step equations involving rational numbers with the same variable appearing on both sides of the equal sign.  MA 8.2.2.b Solve two-step inequalities involving rational numbers and represent solutions on a number line.  **Grade Level**  **Expectation: MA 8.2.3 Applications: Students will solve real-world problems involving multi-step equations and multi-step inequalities.**  Indicators:  MA 8.2.3.a Describe and write equations from words, patterns, and tables.  MA 8.2.3.b Write a multi-step equation to represent real-world problems using rational numbers in any form.    MA 8.2.3.c Solve real-world multi-step problems involving rational numbers in any form.  . | **Comprehensive Standard: Students will communicate algebraic concepts using multiple representations to reason solve problems, and make connections within mathematics and across disciplines.**  **Grade Level Expectation:**  **MA 11.2.1 Algebraic Relationships**  **Students will demonstrate, represent, and show relationships with functions.**  Indicators:  MA 11.2.1.a Define a function and use function notation.  MA 11.2.1.b Analyze a relation to determine if it is a function given graphs, tables, or algebraic notation.  MA 11.2.1.c Classify a function given graphs, tables, or algebraic notation, as linear, quadratic, or neither.  MA 11.2.1.d Identify domain and range of functions represented in either algebraic or graphical form.  MA 11.2.1.e Analyze and graph linear functions and inequalities (point-slope form, slope-intercept form, standard form, intercepts, rate of change, parallel and perpendicular lines, vertical and horizontal lines, and inequalities).  MA 11.2.1.h Represent, interpret, and analyze inverses of linear functions algebraically and graphically  **Grade Level Expectation:**  **MA 11.2.2 Algebraic Processes: Students will apply the operational properties when evaluating rational expressions, and solving linear and quadratic equations, and inequalities**.  Indicators:  MA 11.2.2.a Convert equivalent rates (e.g., miles per hour to feet per second).  MA 11.2.2.b Identify and explain the properties used in solving equations and inequalities.  MA 11.2.2.c Simplify algebraic expressions involving integer and fractional exponents.  MA 11.2.2.e Evaluate expressions at specified values of their variables (polynomial, rational, radical, and absolute value).  MA 11.2.2.f Solve an equation involving several variables for one variable in terms of the others.    MA 11.2.2.g Solve linear and absolute value equations and inequalities.    MA 11.2.2.h Analyze and solve systems of two linear equations and inequalities in two variables algebraically and graphically.  MA 11.2.2.i Perform operations (addition subtraction, multiplication, and division) on polynomials.  MA 11.2.2.j Factor polynomials to include factoring out monomial terms and factoring quadratic expressions.  MA 11.2.2. k Recognize polynomial multiplication patterns and their related factoring patterns  (e.g., (a + b)2 = a2 + 2ab + b2, a2 – b2 = (a + b) (a - b)).  MA 11.2.2.n Solve quadratic equations involving real coefficients and real roots by factoring and the quadratic formula.  **Grade Level Expectation: MA 11.2.3 Applications: Students will solve real-world problems involving linear equations and inequalities, systems of linear equations, quadratic, and exponential functions.**  Indicators:  MA 11.2.3.a Analyze, model, and solve real-world problems using various representations (graphs, tables, linear equations and inequalities, and systems of linear equations and quadratic functions).  **Grade Level Expectation**  **MA 12.2.1 Algebraic Relationships: Students will demonstrate, represent, and show relationships with non-linear and trigonometric functions.**  **Indicators**:  MA 12.2.1.a (AT) Analyze and graph non-linear functions (e.g., quadratic, square root, logarithmic, rational, higher-order polynomials, exponential, and absolute value).  MA 6.2.3.c Solve real-world problems involving percents of numbers. | **Comprehensive Standard: Students will communicate algebraic concepts using multiple representations to reason solve problems, and make connections within mathematics and across disciplines.**  **Grade Level Expectation:**  **MA 11.2.1 Algebraic Relationships**  **Students will demonstrate, represent, and show relationships with functions**.  Indicators:  MA 11.2.1.a Define a function and use function notation.  MA 11.2.1.b Analyze a relation to determine if it is a function given graphs, tables, or algebraic notation.  MA 11.2.1.c Classify a function given graphs, tables, or algebraic notation, as linear, quadratic, or neither.  MA 11.2.1.d Identify domain and range of functions represented in either algebraic or graphical form.  **Grade Level Expectation:**  **MA 11.2.2 Algebraic Processes: Students will apply the operational properties when evaluating rational expressions, and solving linear and quadratic equations, and inequalities**.  Indicators:  No additional indications at this level.  **Grade Level Expectation: MA 11.2.3 Applications: Students will solve real-world problems involving linear equations and inequalities, systems of linear equations, quadratic, and exponential functions**.  No additional Indicators at this level. | **Comprehensive Standard: Students will communicate algebraic concepts using multiple representations to reason solve problems, and make connections within mathematics and across disciplines.**  **Grade Level Expectation:**  **MA 11.2.1 Algebraic Relationships**  **Students will demonstrate, represent, and show relationships with functions**.  Indicators:  MA 11.2.1.b Analyze a relation to determine if it is a function given graphs, tables, or algebraic notation.  MA 11.2.1.c Classify a function given graphs, tables, or algebraic notation, as linear, quadratic, or neither.  MA11.2.1.f Analyze and graph absolute value functions (finding the vertex, symmetry, transformations, determine intercepts, and minimums or maximums using the piecewise definition).  MA11.2.1.g Analyze and graph quadratic functions (standard form, vertex form, finding zeros, symmetry, transformations, determine intercepts, and minimums or maximums).  MA11.2.1.h Represent, interpret, and analyze inverses of functions algebraically and graphically.    **Grade Level Expectation:**  **MA 11.2.2 Algebraic Processes: Students will apply the operational properties when evaluating rational expressions, and solving linear and quadratic equations, and inequalities**  Indicators:  MA 11.2.2.a Convert equivalent rates (e.g., miles per hour to feet per second).  MA 11.2.2.b Identify and explain the properties used in solving equations and inequalities.  MA 11.2.2.c Simplify algebraic expressions involving integer and fractional exponents.  MA11.2.2.d Perform operations on rational expressions (add, subtract, multiply, divide, and simplify).  MA 11.2.2.e Evaluate expressions at specified values of their variables (polynomial, rational, radical, and absolute value).  MA 11.2.2.h Analyze and solve systems of two linear equations and inequalities in two variables algebraically and graphically.  MA 11.2.2.i Perform operations (addition subtraction, multiplication, and division) on polynomials.  MA 11.2.2.j Factor polynomials to include factoring out monomial terms and factoring quadratic expressions.  MA 11.2.2. k Recognize polynomial multiplication patterns and their related factoring patterns  (e.g., (a + b)2 = a2 + 2ab + b2, a2 – b2 = (a + b) (a - b)).  MA11.2.2.l Make the connection between the factors of a polynomial and the zeros of a polynomial.  MA11.2.2.m Combine functions by composition and perform operations (addition, subtraction, multiplication, division) on functions.  MA 11.2.2.n Solve quadratic equations involving real coefficients and real roots by factoring and the quadratic  **Grade Level Expectation: MA 11.2.3 Applications: Students will solve real-world problems involving linear equations and inequalities, systems of linear equations, quadratic, and exponential functions**.  Indicators:  MA 11.2.3.a Analyze, model, and solve real-world problems using various representations (graphs, tables, linear equations and inequalities, and systems of linear equations, quadratic, exponential, square root, and absolute functions).  **Grade Level Expectation**  **MA 12.2.1 Algebraic Relationships: Students will demonstrate, represent, and show relationships with non-linear and trigonometric functions.**  **Indicator:**  MA 12.2.1.a (AT) Analyze and graph non-linear functions (e.g., quadratic, square root, logarithmic, rational, higher-order polynomials, exponential, and absolute value) and systems with linear and quadratics.  . | **Comprehensive**  **Standard: Students will communicate algebraic concepts using multiple representations to reason solve problems, and make connections within mathematics and across disciplines.**  **Grade Level Expectation:**  **MA 11.2.1 Algebraic Relationships**  **Students will demonstrate, represent, and show relationships with functions.**  Indicators:  MA 11.2.1.a Define a function and use function notation.  MA 11.2.1.b Analyze a relation to determine if it is a function given graphs, tables, or algebraic notation.  MA 11.2.1.d Identify domain and range of functions  MA 11.2.1.h Represent, interpret, and analyze inverses of functions algebraically and graphically.  **Grade Level Expectation:**  **MA 11.2.2 Algebraic Processes: Students will apply the operational properties when evaluating rational expressions, and solving linear and quadratic equations, and inequalities**  Indicators:  MA 11.2.2.b Identify and explain the properties used in solving equations and inequalities.  MA 11.2.2.h Analyze and solve systems of two linear equations and inequalities in two variables algebraically and graphically.  MA 11.2.2.i Perform operations (addition subtraction, multiplication, and division) on polynomials.  MA 11.2.2.j Factor polynomials to include factoring out monomial terms and factoring quadratic expressions.  MA11.2.2.l Make the connection between the factors of a polynomial and the zeros of a polynomial.  MA11.2.2.m Combine functions by composition and perform operations (addition, subtraction, multiplication, division) on functions.  **Grade Level Expectation: MA 11.2.3 Applications: Students will solve real-world problems involving linear equations and inequalities, systems of linear equations, quadratic, and exponential functions.**  Indicators:  MA 11.2.3.a Analyze, model, and solve real-world problems using various representations (graphs, tables, linear equations and inequalities, and systems of linear equations, quadratic, exponential, square root, and absolute value functions).  **Grade Level Expectation**  **MA 12.2.1 Algebraic Relationships: Students will demonstrate, represent, and show relationships with non-linear and trigonometric functions.**  MA 12.2.1.a (AT) Analyze and graph non-linear functions (e.g., quadratic, trigonometric, square root, logarithmic, rational, higher-order polynomials, exponential, absolute value, piecewise, and sinusoidal).  MA 12.2.1.b (AT) Use the unit circle to define the trigonometric functions on all real numbers.  MA 12.2.1.c (AT) Evaluate sine, cosine, and tangent functions at positive and negative multiples of 30, and 45 degrees.  MA 12.2.1.d (AT) Create new functions out of existing functions using addition, subtraction, multiplication, division, translation, dilation, and composition.  MA 12.2.1.e (AT) Use limits to describe the behavior of a function near its asymptotes and removable discontinuities  MA 12.2.1.f (AT) Understand that the radian measure of an angle is the length of the arc on the unit circle subtended by that angle.  MA 12.2.1.g (AT) Convert between radian and degree measures of an angle.  **Grade Level Expectation:**  **MA 12.2.2 Algebraic Processes: Students will apply the identities when evaluating and solving trigonometric equations.**  MA 12.2.2.a (AT) Use trigonometric identities to solve trigonometric equations.  MA 12.2.2.b (AT) Explain symmetry (odd and even) and periodicity of trigonometric functions.    MA 12.2.2.c (AT) Create an invertible function from a non-invertible function by restricting the domain (e.g., arcsin, arccos, and arctan).  MA 12.2.2.d (AT) Find the period, amplitude, and midline of a trigonometric function of the form y=A + Bsin (Cx), where A, B, and C are parameters, and identify these properties on a graph of the function.  **Grade Level Expectation**:  **MA 12.2.3 Applications: Students will solve real-world problems involving trigonometric functions**.  MA 12.2.3.a (AT) Model periodic events with specified amplitude, frequency, and shifts.  MA 12.2.3.b (AT) Solve real-world problems using trigonometric and inverse trigonometric functions. |

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|  | **Pre-Algebra** | | **Algebra 1-2** | | **Geometry** | | **Algebra 3-4** | | **Pre-Calculus** | |
| **Strand: Geometry** | **Comprehensive**  **Standard**  **Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines**   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | **Grade Level Expectation:**  **MA 8.3.1 Characteristics: Students will identify and describe geometric characteristics of two-dimensional shapes.**    Indicators:  MA 8.3.1.a Determine and use the relationships of the interior angles of a triangle to solve for missing measures.  MA 8.3.1.b Identify and apply geometric properties of parallel lines cut by a transversal and the resulting corresponding, alternate interior, and alternate exterior angles to find missing measures.  **Grade Level Expectation:**  **MA 8.3.2 Coordinate Geometry: Students will determine location, orientation, and relationships on the coordinate plane**  Indicators:  MA 8.3.2.a Perform and describe positions and orientation of shapes under single transformations including rotations (in multiples of 90 degrees about the origin), translations, reflections, and dilations on and off the coordinate plane.  MA 8.3.2.b Find congruent two-dimensional figures and define congruence in terms of a series of transformations.  MA 8.3.2.c Find similar two-dimensional figures and define similarity in terms of a series of transformations.  **Grade Level Expectation:**  **MA 8.3.3 Measurement: Students will perform and compare measurements and apply formulas.**  Indicators:  MA 8.3.3.a Explain a model of the Pythagorean Theorem.  MA 8.3.3.b Apply the Pythagorean Theorem to find side lengths of triangles and to solve real-world problems.  MA 8.3.3.c Find the distance between any two points on the coordinate plane using the Pythagorean Theorem.  MA 8.3.3.d Determine the volume of cones, cylinders, and spheres, and solve real-world problems using volumes. | | | | | | | |  |  |  |  |  |  | | **Comprehensive**  **Standard**  **Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**  **Grade Level Expectation:**  **MA 11.3.1 Characteristics: Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.**  No additional indicators at this level.  **Grade Level Expectation:**  **MA 11.3.2 Coordinate Geometry: Students will determine location, orientation, and relationships on the coordinate plane.**  Indicators:  MA 11.3.2.b Use coordinate geometry to analyze linear relationships to determine if lines are parallel or perpendicular.    MA 11.3.2.c Given a line, write the equation of a line that is parallel or perpendicular to it.  **Grade Level Expectation:**  **MA 11.3.3 Measurement: Students will perform and compare measurements and apply formulas**.  No additional indicators at this level. | | **Comprehensive**  **Standard**  **Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**  **Grade Level Expectation:**  **MA 11.3.1 Characteristics: Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.**  Indicators:  MA 11.3.1.a Know and use precise definitions of ray, line segment, angle, perpendicular lines, parallel lines, and congruence based on the undefined terms of geometry: point, line and plane.  MA 11.3.1.b Prove geometric theorems about angles, triangles, congruent triangles, similar triangles, parallel lines with transversals, and quadrilaterals using deductive reasoning.  MA 11.3.1.c Apply geometric properties to solve problems involving similar triangles, congruent triangles, quadrilaterals, and other polygons.  MA 11.3.1.d Identify and apply right triangle relationships including sine, cosine, tangent, special right triangles, and the converse of the Pythagorean Theorem.  MA 11.3.1.e Create geometric models to visualize, describe, and solve problems using similar triangles, right triangles, and trigonometry.  MA 11.3.1.f Know and use precise definitions and terminology of circles, including central angle, inscribed angle, arc, intercepted arc, chord, secant, and tangent.  MA 11.3.1.g Apply the properties of central angles, inscribed angles, angles formed by intersecting chords, and angles formed by secants and/or tangents to find the measures of angles related to the circle.  MA 11.3.1.h Sketch, draw, and construct appropriate representations of geometric objects using a variety of tools and methods which may include ruler/straight edge, protractor, compass, reflective devices, paper folding, or dynamic geometric software.  **Grade Level Expectation:**  **MA 11.3.2 Coordinate Geometry: Students will determine location, orientation, and relationships on the coordinate plane**.  Indicators:  MA 11.3.2.a Derive and apply the midpoint formula.  MA 11.3.2.d Derive and apply the distance formula.  MA 11.3.2.e Use coordinate geometry to prove triangles are right, acute, obtuse, isosceles, equilateral, or scalene.  MA 11.3.2.f Use coordinate geometry to prove quadrilaterals are trapezoids, isosceles trapezoids, parallelograms, rectangles, rhombi, kites, or squares.  MA 11.3.2.g Perform and describe positions and orientation of shapes under a single translation using algebraic notation on a coordinate plane.  MA 11.3.2.h Perform and describe positions and orientation of shapes under a rotation about the origin in multiples of 90 degrees using algebraic notation on a coordinate plane.  MA 11.3.2.i Perform and describe positions and orientation of shapes under a reflection across a line using algebraic notation on a coordinate plane.  MA 11.3.2.j Perform and describe positions and orientation of shapes under a single dilation on a coordinate plane.  **Grade Level Expectation:**  **MA 11.3.3 Measurement: Students will perform and compare measurements and apply formulas.**  Indicators:  MA 11.3.3.a Convert between various units of length, area, and volume (e.g., such as square feet to square yards).  MA 11.3.3.b Convert between metric and standard units of measurement.  MA 11.3.3.c Apply the effect of a scale factor to determine the length, area, and volume of similar two- and three-dimensional shapes and solids.  MA 11.3.3.d Find arc length and area of sectors of a circle.  MA 11.3.3.e Determine surface area and volume of spheres, cones, pyramids, and prisms using formulas and appropriate units | | **Comprehensive**  **Standard**  **Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines**  **Grade Level Expectation:**  **MA 11.3.1 Characteristics: Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.**  No additional indicators at this level.  **Grade Level Expectation:**  **MA 11.3.2 Coordinate Geometry: Students will determine location, orientation, and relationships on the coordinate plane.**  Indicators:  MA 11.3.2.k Derive the equation of a circle given the radius and the center.  **Grade Level Expectation: MA 11.3.3 Measurement: Students will perform and compare measurements and apply formulas.**  No additional indicators at this level.  **Grade Level Expectation:**  **MA 12.3.2 Coordinate Geometry:** Students will determine location, orientation, and relationships on the coordinate plane.  Indicators:  MA 12.3.2.f (AT) Derive the equations of parabolas, ellipses, and hyperbolas from a graph or given parameters | | **Comprehensive**  **Standard**  **Students will communicate geometric concepts and measurement concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines**  **Grade Level Expectation:**  **MA 11.3.1 Characteristics: Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.**  Indicators:  MA 11.3.1.d Identify and apply right triangle relationships including sine, cosine, tangent, special right triangles, and the converse of the Pythagorean Theorem.  **Grade Level Expectation:**  **MA 11.3.2 Coordinate Geometry: Students will determine location, orientation, and relationships on the coordinate plane.**  Indicators:  MA 11.3.2.k Derive the equation of a circle given the radius and the center.  **Grade Level Expectation:**  **MA 12.3.1 Characteristics: Students will identify and describe geometric characteristics and create two- and three-dimensional shapes.**  Indicators:  MA 12.3.1.a (AT) Apply the Law of Sines and the Law of Cosines to find unknown measures in triangles.  **Grade Level Expectation:**  **MA 12.3.2 Coordinate Geometry: Students will determine location, orientation, and relationships on the coordinate plane.**  MA 12.3.2.a (AT) Identify features of a function (e.g., local and global maxima and minima, concavity, approximate locations of points of inflection and vertical and horizontal asymptotes) from its graph.  MA 12.3.2.b (AT) Identify symmetry properties of a function (e.g., axis of symmetry of a parabola) and know the connection between its symmetry properties and specific transformations.    MA 12.3.2.c (AT) Recognize that vector quantities have both magnitude and direction and can be represented by directed line segments.  MA 12.3.2.d (AT) Add and subtract vectors graphically and algebraically.  MA 12.3.2.e (AT) Perform scalar multiplication of a vector and show it graphically.  MA 12.3.2.f (AT) Derive the equations of parabolas, ellipses, and hyperbolas from a graph or given parameters.  MA 12.3.2.g (AT) Determine the three-dimensional object created by rotating or revolving a two-dimensional object about an axis.  MA 12.3.2.h (AT) Determine the shape of a two-dimensional cross-section of a three-dimensional object. | |

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|  | **Pre-Algebra** | **Algebra 1-2** | **Geometry** | **Algebra 3-4** | **Pre-Calculus** |
| **Strand: Data** | **Comprehensive Standard: Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**  **Grade Level Expectation: MA 8.4.1 Representations: Students will create displays that represent data.**  Indicators:  MA 8.4.1.a Represent bivariate data (i.e. ordered pairs) using scatter plots.  **Grade Level Expectation:**  **MA 8.4.2 Analysis & Applications: Students will analyze data to address the situation.**  Indicators:  MA 8.4.2.a Solve problems and make predictions using an approximate line of best fit.  **Grade Level Expectation:**  **MA 8.4.3 Probability:** Students will interpret and apply concepts of probability.  Indicators:  No additional indicator(s) at this level. | **Comprehensive Standard: Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**  **Grade Level Expectation: MA 11.4.1 Representations: Students will create displays that represent data.**  Indicators:  No additional indicator(s) at this level.  **Grade Level Expectation:**  **MA 11.4.2 Analysis & Applications: Students will analyze data to address the situation.**  Indicators:  MA 11.4.2.a Identify and compute measures of central tendency (mean, median, mode) when provided data both with and without technology.    MA 11.4.2.b Explain how transformations of data, including outliers, affect measures of central tendency.  MA 11.4.2.c Compare data sets and formulate conclusions.  MA 11.4.2.e Develop linear equations for linear models to predict unobserved outcomes using the regression line (line of best fit).  MA 11.4.2.i Using scatter plots, analyze patterns and describe relationships in paired data.  **Grade Level Expectation:**  **MA 11.4.3 Probability:** Students will interpret and apply concepts of probability.  Indicators:  MA 11.4.3.a Construct sample spaces and probability distributions based upon geometric constructs (e.g., Find the probability of a dart landing in the third ring of a bullseye target). | **Comprehensive Standard: Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**  **Grade Level Expectation: MA 11.4.1 Representations: Students will create displays that represent data.**  Indicators:  No additional indicator(s) at this level.  **Grade Level Expectation:**  **MA 11.4.2 Analysis & Applications: Students will analyze data to address the situation.**  **Indicators:**  MA 11.4.2.i Using scatter plots, analyze patterns and describe relationships in paired data.  **Grade Level Expectation:**  **MA 11.4.3 Probability:** Students will interpret and apply concepts of probability.  Indicators:  MA 11.4.3.a Construct sample spaces and probability distributions based upon geometric constructs (e.g., Find the probability of a dart landing in the third ring of a bullseye target) | **Comprehensive Standard: Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**  **Grade Level Expectation: MA 11.4.1 Representations: Students will create displays that represent data.**  Indicators:  No additional indicator(s) at this level.  **Grade Level Expectation:**  **MA 11.4.2 Analysis & Applications: Students will analyze data to address the situation.**  MA11.4.2.c Compare data sets and formulate conclusions.  MA11.4.2.d Support conclusions with valid arguments.  MA11.4.2.e Develop linear equations for linear models to predict unobserved outcomes using the regression line and correlation coefficient with technology.  MA11.4.2.f Describe the shape, identify any outliers, and determine the spread of a data set.    MA11.4.2.g Explain the impact of sampling methods, bias, and the phrasing of questions asked during data collection, and the conclusions that can rightfully be made.  MA11.4.2.h Explain the differences between a randomized experiment and observational studies.  MA11.4.2.j Recognize when arguments based on data confuse correlation with causation.  MA11.4.2.k Interpret data represented by the normal distribution, formulate conclusions, and recognize that some data sets are not normally distributed.  **MA11.4.3 Probability:** Students will interpret and apply concepts of probability.  MA11.4.3.a Construct sample spaces and probability distributions.  MA11.4.3.b Use appropriate counting techniques (e.g., permutations, combinations) to determine the probability of an event.  MA11.4.3.c Determine if events are mutually exclusive and calculate their probabilities in either case. | **Comprehensive Standard: Students will communicate data analysis/probability concepts using multiple representations to reason, solve problems, and make connections within mathematics and across disciplines.**  **Grade Level Expectation:**  **MA 12.4.2 Analysis & Applications: Students will analyze data to address the situation.**  **Indicators:**  MA 12.4.2.a (AT) Make inferences and justify conclusions from sample surveys, experiments, and observational studies.  **Grade Level Expectation:**  **MA 12.4.3 Probability:** Students will interpret and apply concepts of probability**.**    MA 12.4.3.a (AT) Calculate the expected value of a random variable and interpret it as the mean of a probability distribution.    MA 12.4.3.c (AT) Evaluate and compare strategies on the basis of expected values. |

# Academic Vocabulary

**Six Step Vocabulary**

1. **EXAMPLES** provided by teacher (not dictionary definitions)
2. **RESTATED** by students in their own words (written)

*\*Steps 1 and 2 are done at the beginning of the unit*

1. **PICTURES** (Quick Sketches)
2. **ACTIVITIES** to add additional details (Compare & Contrast Matrix, Frayer Model, Cornell Notes, Foldables)
3. **DISCUSSED** by students (Pair Share, Numbered Heads Together, 4-Corners)

\**Steps 3-5 during the unit*

1. **GAMES** to review (Scattergories, Jeopardy, White Board Games)

*\*Step 6 end of the unit*

| TERM | LOCATION IN PACING GUIDE | DEFINITION |
| --- | --- | --- |
| 1. Absolute value function | Unit 2 | The function that looks like a “V” with a vertex at (0,0) and a slope of 1 on the right side and a slope of -1 on the left side |
| 1. Axis of symmetry | Unit 2/4 | U2: A vertical line that passes through the vertex of the absolute value function  U4: A vertical line that passes through the vertex of a parabola |
| 1. Binomial Theorem | Unit 5 | A theorem that helps expand a binomial expression that has been raised to some power. |
| 1. Boundary | Unit 2 | The line that divides the coordinate plane into two halves in order to graph an inequality. One side contains all the solutions of the inequality. |
| 1. Completing the square | Unit 4 | The process of creating a perfect square trinomial in a quadratic equation |
| 1. Complex fraction | Unit 7 | A fraction formed by two fractional expressions, one on top of the other |
| 1. Composite function | Unit 6 | A function in which one function f(x) is used in another function g(x) and notated as (f ◦g)(x). |
| 1. Conditional probability | Unit 8 | The probability of an event given that another has already occurred. |
| 1. Conjugate Root Theorem | Unit 5 | The theorem that states that if a + bi is a root of P, then a – bi must also be a root. |
| 1. Constant of Proportionality | Unit 5 | The constant, k, in which y = kx in a direct proportion |
| 1. Constraint | Unit 3 | A limitation or restriction on a function |
| 1. Contingency table | Unit 8 | A table used to study the association between two variables |
| 1. Dependent events | Unit 8 | Two events in which the occurrence of the first affects the outcome of the second |
| 1. Difference of cubes | Unit 5 | A rule that allows a difference of cubes to be factored. |
| 1. Equally likely outcomes | Unit 8 | A sample space in which all outcomes are equally likely to occur |
| 1. Equivalent systems | Unit 3 | Systems of equations that contain the same solution set |
| 1. Experimental probability | Unit 8 | The probability that is the ratio of the number of times an event occurred to the number of times the activity was performed. |
| 1. Factor Theorem | Unit 5 | The theorem that links factors to the zeros of a function. If (x – 3) is a factor, then 3 is a zero of that function. |
| 1. Feasible region | Unit 3 | The set of all possible points that satisfy given constraints |
| 1. Function rule | Unit 2 | A rule in which a dependent variable, y, is written in terms of the independent variable, x. |
| 1. Fundamental Counting Principle | Unit 8 | The statement that if one event has M possible outcomes and a second independent event has N possible outcomes, then there are a total of  M x N total possible outcomes for the two events together |
| 1. Fundamental Theorem of Algebra | Unit 5 | The theorem that states that every non-constant single-variable polynomial with complex coefficients has at least one complex root. |
| 1. Half-plane | Unit 2 | A planar region consisting of all points on one side of an infinite straight line and no points on the other side. |
| 1. Like radicals | Unit 6 | Radicals that have the same root number and radicand |
| 1. Linear Programming | Unit 3 | A technique used to maximize or minimize a linear function of several variables. |
| 1. Maximum value | Unit 4 | Largest possible outcome of a function |
| 1. Minimum value | Unit 4 | Smallest possible outcome of a function |
| 1. Multiplicity | Unit 5 | The number of times a root of an equation or zero of a function occurs |
| 1. Normal distribution | Unit 8 | A common, continuous probability distribution which is used in statistics to represent real-valued random variables and is often called the “bell curve” |
| 1. nth root | Unit 6 | The number that must be multiplied times itself n times to equal a given value |
| 1. Objective function | Unit 3 | The function in linear programming that is desired to maximize or minimize |
| 1. One-to-one function | Unit 6 | A function in which every element in the range of the function corresponds to exactly one element of the domain |
| 1. Parabola | Unit 4 | A symmetrical open plane curved formed by the intersection of a cone with a plane parallel to its side. The graph of a quadratic function |
| 1. Permutation | Unit 8 | A way in which a set of number of things can be ordered or arranged |
| 1. Power function | Unit 5 | A function where where n is any real constant number. |
| 1. Principal root | Unit 6 | The unique nonnegative square root of a nonnegative real number |
| 1. Quadratic function | Unit 4 | Function in the form f(x) = where a, b and c are numbers which are not equal to zero |
| 1. Radical equation | Unit 6 | Equations that contain radicals and require isolating the radical in order to solve |
| 1. Radicand | Unit 6 | The expression that is under the radical symbol |
| 1. Rational equation | Unit 7 | Equations in which there are expressions written in ratio form on one or both sides of the equal sign |
| 1. Rational Exponent | Unit 6 | An exponent written as a fraction in which the root is found in the denominator and the exponent is found in the numerator |
| 1. Rational expression | Unit 7 | A fraction in which the numerator and/or the denominator are polynomials |
| 1. Rational function | Unit 7 | An algebraic fraction in which both the numerator and denominator are polynomials |
| 1. Rational Root Theorem | Unit 5 | The rational root theorem states that all possible roots can be found by taking all factors of the constant terms over all possible factors of the leading coefficient |
| 1. Rationalize the denominator | Unit 6 | The process of rewriting a ration so that the denominator will be a rational number. |
| 1. Reflection | Unit 2 | A kind of transformation in which a shape can be folded onto itself over a line of symmetry |
| 1. Relative maximum | Unit 5 | The highest point in a particular section of a graph |
| 1. Relative minimum | Unit 5 | The lowest point in a particular section of a graph |
| 1. Remainder Theorem | Unit 5 | States that if a polynomial f(x) is divided by a linear divisor http://cramster-image.s3.amazonaws.com/definitions/alg-44-eq-2.gif, the remainder is f(a). The factor theorem is used often with the remainder theorem in that, when dividing by a number that is a potential root of the polynomial and arriving at a zero remainder in the synthetic division, the number is a root |
| 1. Simplest form of a radical | Unit 6 | A radical in which the radicand has no factors that can be factored out as squares, cubes, etc. |
| 1. Square root equation | Unit 6 | An equation in which you isolate the square root and then square both sides to get your solution(s) |
| 1. Sum of cubes | Unit 5 | An expression that can easily factor into |
| 1. Synthetic division | Unit 5 | A shorthand, or shortcut, method of polynomial division in the special case of dividing by a linear factor |
| 1. Test point | Unit 2 | A point that is used to determine whether that point and all points in that half-plane are solutions to an inequality |
| 1. Transformation | Unit 2 | A process by which one figure, expression, or function is converted into another that is equivalent in some important respect but is differently expressed or represented. |
| 1. Translation | Unit 2 | A transformation in which every point of the object must be moved in the same direction and for the same distance. |
| 1. Vertex | Unit 2 | The point where two line segments meet or the point on special functions where the line of symmetry intersects the function |
| 1. Vertex form | Unit 4 | f (x) = a(x - h)2 + k, where (h, k) is the vertex of the parabola. f (x) = a(x - h)2 + k, where (h, k) is the vertex of the parabola. |
| 1. Vertex of a parabola | Unit 4 | The point where the parabola crosses its axis of symmetry |
| 1. Vertical compression | Unit 2 | A transformation in which there is a vertical stretch by a factor less than 1. |
| 1. Vertical stretch | Unit 2 | A transformation in which there is a vertical stretch by a factor greater than 1. |
|  |  |  |

# District Adopted Resources

|  |  |
| --- | --- |
| **Student Textbook** | |
| Algebra 2, Pearson  Student Edition  © 2012 |  |
| **Teacher Manuals** | |
| Algebra 2, Pearson  ISBN 9780078952722  CCSS Teacher Edition  © 2012 |  |
| **Materials** | |
|  | |
| **Online Resources** | |
| Online Resources from Publisher:  Pearson SuccessNet  Contact supervisor for account information | |
| **Supplemental Resources** | |
| Calculators: Class set  Individual White Boards: Class Set | |

**Textbook replacements**

Textbooks that have been lost or damaged should be replaced annually by individual buildings. District adopted resources can be purchased through the annual order using district-allocated off-formula funds. No class sets should be used.

# Use of Video in Instruction

The use of video (i.e., DVDs, videotapes, streaming video, YouTube, etc.), when used to judiciously, can effectively promote student learning in the classroom. Brain research shows that students in grades K-7 can generally attend to instruction for 5-12 minutes while older adolescents can attend for approximately 12-15 minutes before their attention lags (Jensen, 1998). Researchers have suggested that students’ focus wanes after 10 minutes of passive viewing of videos (Adams and Hamm, 2001). So, while videos can enrich educational experiences, educators must be conscious of time constraints on a student’s ability to attend and process visual media (Schulz, 2006).

When using video, district best practices must be considered and all of the following conditions must be met:

* + Copyright laws must always be followed.
  + Video may not be used during instructional time for the purpose of entertainment, incentives,  or reward. This is a copyright violation.
  + The video must be previewed by the instructor prior to classroom use.
  + Video that is used in a lesson should be documented in the lesson plan.
  + Excerpts should be generally used along with activities requiring active student involvement  such as discussion or analysis of the media.
  + Complete videos that last more than one instructional period should be used only if they are  approved as part of an established curriculum. These resources should be written into curriculum guides and/or maintained by the content area supervisor.  A public performance license is required when showing video for entertainment purposes and is permitted only during non-instructional time (i.e. after school, during recess, movie nights, etc.) Movie Licensing USA www.movlic.com/ provides public performance license for schools.

Adams, D. and M. Hamm, *Literacy in a Multimedia Age*. Norwood, MA: Christopher-Gordon Publishers, Inc., 2001

Jensen, E. *Teaching with the Brain in Mind.* Alexandria, VA: Association for Supervision and Curriculum Development, 1998.

Schulz, Cynthia D. “Timing Is Everything: Using Videos and DVDs with Students.” *Library Media Connection* 24.4(2006): 14-17.  *Education Research Complete.* Web 19 Mar, 2015.