## Unifying Concept: Functions, Expressions, Equations and Inequalities

### Enduring Understandings:
- The parts of an expression represent quantities in a real-world context. For example, $0.05x + 500$ could represent the base salary plus a commission where the constant term represents the base salary, the linear term represents the amount earned from the commission, and the coefficient represents the percentage rate of the commission.
- Real-world situations can be modeled by algebraic expressions, and parts of the expression describe different aspects of the situation.
- The solutions to real-world problems can be found by modeling them with equations and graphs.
- Constraints are necessary to balance a mathematical model with real-world context. Variable quantities may be able to take on only certain values and expressing these restrictions, or constraints, algebraically is an important part of modeling with mathematics.
- Formulas are equations with specific meaning that show the relationship between two or more quantities. They are rewritten in the same way literal equations are solved for a given variable, by isolating the desired variable on one side of the equation.
- The properties of equality and order of operations can be used to solve an equation by using inverse operations.
- Solving equations and inequalities give all the values of a variable that make the equation or inequality true.
- A graph (or curve) in two variables is a visual representation of an equation. An ordered pair is a solution to the equation if it represents a point on the graph.
- The graph of an inequality in two variables is a visual representation of the inequality. An ordered pair is a solution to the inequality if it is located in the half plane that represents the inequality.

### Essential Questions:
- What do the parts of an expression tell us in a real-world context?
- What are the parts of an algebraic expression?
- How can equations and their graphs be used to model real-world problems?
- What are constraints?
- Why are these constraints necessary in modeling real-world situations?
- How can formulas be rewritten to be useful?
- How do the properties of equality and order of operation extend to support the solving of an equation?
- What are the steps and strategies to justify a solution to a problem?
- What are the solutions to an equation?
- How do these solutions relate to the graph of the equation?
- What are the solutions to an inequality?
- How do these solutions relate to the graph of the inequality?
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<thead>
<tr>
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</tr>
<tr>
<td>SMP 2. Reason abstractly and quantitatively.</td>
</tr>
<tr>
<td>SMP 3. Construct viable arguments and critique the reasoning of others.</td>
</tr>
<tr>
<td>SMP 4. Model with mathematics.</td>
</tr>
<tr>
<td>SMP 6. Attend to precision.</td>
</tr>
<tr>
<td>SMP 7. Look for and make use of structure.</td>
</tr>
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<td>SMP 8. Look for and express regularity in repeated reasoning.</td>
</tr>
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### Highly-Leveraged Standards

<table>
<thead>
<tr>
<th>A1.A-CED.A.1</th>
<th>Create equations and inequalities in one variable and use them to solve problems. Include problem-solving opportunities utilizing real-world context.</th>
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<tbody>
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<td>A1.A-CED.A.2</td>
<td>Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.</td>
</tr>
<tr>
<td>A1.A-CED.A.3</td>
<td>Represent constraints by equations or inequalities and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.</td>
</tr>
<tr>
<td>A1.A-CED.A.4</td>
<td>Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm’s law V=IR to highlight resistance R.</td>
</tr>
<tr>
<td>A1.A-REI.A.1</td>
<td>Explain each step in solving linear and quadratic equations as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.</td>
</tr>
</tbody>
</table>
| A1.A-SSE.A.1 | Interpret expressions that represent a quantity in terms of its context
| a. Interpret parts of an expression, such as terms, factors and coefficients. |
| b. Interpret expressions by viewing one or more of their parts as a single entity. |
| A1.A-SSE.A.2 | Use structure to identify ways to rewrite numerical and polynomial expressions. Focus on polynomial multiplication and factoring patterns. |
| A1.N-Q.A.1  | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays, include utilizing real-world context. |
| A1.N-Q.A.3  | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities utilizing real-world context. |

### Supporting Standards

<table>
<thead>
<tr>
<th>A1.A-APR.A.1</th>
<th>Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract and multiply polynomials.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1.A-REI.B.3</td>
<td>Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.</td>
</tr>
<tr>
<td>A1.A-REI.C.5</td>
<td>Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.</td>
</tr>
</tbody>
</table>
A1.A-REI.D.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve, which could be a line.
A1.A-REI.D.12 Graph the solutions to a linear inequality in two variables as a half-plane, excluding the boundary in the case of a strict inequality, and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

### Constant Standards

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<td>Use structure to identify ways to rewrite numerical and polynomial expressions. Focus on polynomial multiplication and factoring patterns.</td>
</tr>
<tr>
<td>A1.F-IF.C.7</td>
<td>Graph functions expressed symbolically and show key features of the graph, by hand in simple cases, using technology for more complicated cases. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).</td>
</tr>
<tr>
<td>A1.F-IF.C.9</td>
<td>Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).</td>
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<td>A1.N-Q.A.1</td>
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### Social Justice Standards

**High School Anchor Standards and Grade Level Outcomes Page 10-11:**

**Identity:**
- ID.9-12.4 I express pride and confidence in my identity without perceiving or treating anyone else as inferior.

**Diversity:**
- DI.9-12.6 I interact comfortably and respectfully with all people, whether they are similar to or different from me.

**Justice:**
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**Action:**
- AC.9-12.12 I will join with diverse people to plan and carry out collective action against exclusion, prejudice and discrimination, and we will be thoughtful and creative in our actions in order to achieve our goals.

**Teaching Tolerance Website**
[https://www.tolerance.org/](https://www.tolerance.org/)
### Adopted Texts and Materials

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</tr>
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<tbody>
<tr>
<td><strong>Module 1 PDF</strong></td>
<td>These standards are introduced in this quarter; taught in-depth in Quarter 2 (can be found in-depth in Modules 3)</td>
</tr>
<tr>
<td><em>Introduction to Functions:</em></td>
<td>Lessons 1-5</td>
</tr>
<tr>
<td><em>Expressions:</em></td>
<td>Lessons 6-8</td>
</tr>
<tr>
<td><em>Equations:</em></td>
<td>Lessons 10-12, 18-20, 22-24</td>
</tr>
<tr>
<td><em>Inequalities:</em></td>
<td>Lessons 14-16, 21, 24</td>
</tr>
</tbody>
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**Holt McDougal Algebra 1:**

**Directions for Holt Digital**

*Introduction to Functions:*

Holt McDougal Chapter 3 Section 1

*Expressions:*

Holt McDougal Chapter 1 (embedded)

*Equations:*

Holt McDougal Chapter 1, Chapter 5 Sections 2-3

*Inequalities:*

Holt McDougal Chapter 2, Chapter 5 Sections 5-6

### Additional Resources:

- [http://maccss.ncdpi.wikispaces.net/](http://maccss.ncdpi.wikispaces.net/) (Choose your level on the menu on the left)
- [https://www.khanacademy.org](https://www.khanacademy.org)
- [http://achievethecore.org](http://achievethecore.org)
- [https://www.illustrativemathematics.org/](https://www.illustrativemathematics.org/)
- [www.insidemathematics.org](http://www.insidemathematics.org)
- [https://learnzillion.com/resources/75114-math](https://learnzillion.com/resources/75114-math)
- [http://maccss.ncdpi.wikispaces.net/](http://maccss.ncdpi.wikispaces.net/) (Choose your grade level on the left)
- [http://www.pbslearningmedia.org/standards/1](http://www.pbslearningmedia.org/standards/1)
- [http://nrich.maths.org](http://nrich.maths.org)
- [https://www.youcubed.org/week-of-inspirational-math/](https://www.youcubed.org/week-of-inspirational-math/)
- [http://illuminations.nctm.org/Lessons-Activities.aspx](http://illuminations.nctm.org/Lessons-Activities.aspx) (choose grade level and connect to search lessons)
- [https://hcpss.instructure.com/courses/99](https://hcpss.instructure.com/courses/99)
- [https://www.desmos.com/](https://www.desmos.com/)
- [http://cccsmath.org/](http://cccsmath.org/) (Choose the Domain from the Resources tab.)
- [http://www.cpalms.org/Public/ToolkitGradeLevelGroup/Toolkit?id=14](http://www.cpalms.org/Public/ToolkitGradeLevelGroup/Toolkit?id=14)

### Multicultural/Culturally Responsive Connections

**Culturally Responsive Teaching**

- TUSD SPARKS
- SPARKS Strategies

**Modeling in Math Resources:**

- Math Modeling Projects
- Dan Meyer Three Act Tasks
- [http://robertkaplinsky.com/](http://robertkaplinsky.com/)

**Multicultural Math Connections:**

- Global Math Stories
- Lessons from the Mayas
- Multicultural Education and Math
- Multicultural Mathematics
- Teaching Mathematics through Multicultural Literature
- Integrating Mathematics of Worldwide Cultures into K-12 Instruction
- A Course in Multicultural Mathematics
- Critical Multicultural Pavilion: Links to Sites for Multicultural Education and Math
### Instructional and Assessment Guides
- DOK Levels
- DOK Stems
- Hess's Matrix
- Bloom's Taxonomy
- Table 1
- AZMerit
- AZMerit End of Course Resources
- AZMerit Support Materials
- Achieve the Core Assessments
- Mathematics Assessment Project
- orglib
- Balsz District, Formal Exit Ticket Assessment

### Additional Instructional Resources
- The Mathematics Common Core Toolbox
- Inside Mathematics: Tools for Educators
- MARS Lessons
- Achieve the Core
- Standards Toolkit
- Math Vocabulary
- Illustrative Mathematics
- Cpalms Tool Kit
- Inside MathematicsCCSS Tool Box
- ADE Mathematics Glossary
### Unifying Concept: Linear and Exponential Equations and Functions

#### Enduring Understandings:
- The solution for two functions being equal is the point of intersection between the system of equations.
- Functions describe situations where one quantity determines another distinct quantity.
- Functions can be represented by graphs on a coordinate plane and can be recognized graphically by applying the vertical line test.
- Function notation is a way to describe how one quantity is related to another.
- A function may be classified as linear or exponential by looking at differences and ratios over equally-sized intervals.
- Real-world situations in which the rate of change of a quantity is constant may be modeled by linear functions.
- Real-world situations in which the rate of change of a quantity is proportional may be modeled by exponential functions.
- Linear and exponential functions, including arithmetic and geometric sequences, can be created from various forms of information.
- Exponential functions eventually increase at a greater rate than other functions.
- The parameters of linear and exponential equations describe aspects of real-world situations.

### Essential Questions:
- How is a common solution to two equations related to the graphs of equations?
- What makes a relation a function?
- How is a function represented graphically?
- What is the meaning of function notation?
- How do linear and exponential functions change over equally-sized intervals?
- What real-world situations can be modeled by linear functions?
- What real-world situations can be modeled by exponential functions?
- How can linear and exponential functions be constructed?
- How do sequences relate to such functions?
- How does the rate of change of exponential functions compare to the rates of change of other functions?
- How do exponential functions and linear functions describe real-world situations?

### Standards

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<td>SMP 5. Use appropriate tools strategically.</td>
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<td>SMP 6. Attend to precision.</td>
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[Mathematical Practices Poster]
## Highly-Leveraged Standards

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| **A1.A-SSE.B.3** | Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.  
  a. Factor a quadratic expression to reveal the zeros of the function it defines.  
  b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. |
| **A1.F-BF.A.1** | Write a function that describes a relationship between two quantities. Determine an explicit expression, a recursive process, or steps for calculation from real-world context. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). |
| **A1.F-IF.A.1** | Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y=f(x).  
  a. Evaluate a function for inputs in the domain, and interpret statements that use function notation in terms of a context.  
  b. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.  
  c. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Include problem-solving opportunities utilizing real-world context. Key features include: intercepts; intervals where the function is increasing, decreasing, positive or negative; relative maximums and minimums. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).  
  d. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.  
  e. Calculate and interpret the average rate of change of a continuous function (presented symbolically or as a table) on a closed interval. Estimate the rate of change from a graph. Include problem solving opportunities utilizing real-world context. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).  
  f. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases, using technology for more complicated cases. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).  
  g. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).  
  h. Distinguish between situations that can be modeled with linear functions and with exponential functions.  
  i. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.  
  j. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.  
  k. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.  
  l. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or input/output pairs.  
  m. Observe, using graphs and tables, that a quantity increasing exponentially eventually exceeds a quantity increasing linearly or quadratically.  
  n. Interpret the parameters in a linear or exponential function with integer exponents utilizing real-world context. |

## Supporting Standards

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  a. Add, subtract and multiply polynomials. |
| **A1.A-REI.B.4** | Solve quadratic equations in one variable. |
a. Use the method of completing the square to transform any quadratic equation in $x$ into an equation of the form $(x - k)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.

b. Solve quadratic equations by inspection (e.g., $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Focus on solutions for quadratic equations that have real roots. Include cases that recognize when a quadratic equation has no real solutions.

A1.A-REI.D.11 Explain why the $x$-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately (e.g., using technology to graph the functions, make tables of values, or find successive approximations). Focus on cases where $f(x)$ and/or $g(x)$ are linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).

A1.F-BF.B.3 Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, and $f(x+k)$ for specific values of $k$ (both positive and negative); find the value of $k$ given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).

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| A1.N-Q.A.1 | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays, include utilizing real-world context. |
| A1.N-Q.A.3 | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities utilizing real-world context. |

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# 2018-2019 Algebra I, Curriculum Map, Q2

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<tr>
<td>Module 4 PDF (Topic A only)</td>
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<tr>
<td>Chapter 4 – Sections 1, 2, 6, 7</td>
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<tr>
<td>Chapter 8 – Section 5 and Lab</td>
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</tr>
<tr>
<td>Chapter 9 – Sections 2, 3, 4, and 5</td>
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</table>

Instruction must be supplemented to meet the expectations of this standard.

### Breakdown by Topic

#### Linear Functions:
- Eureka Module 3 Lessons 1-3, 8-16
- Holt McDougal Chapter 3 Sections 2-4, Chapter 4 Sections 1-7

#### Exponential Functions:
- Eureka Module Lessons 3-7, 14, 21-24
- Holt McDougal Chapter 6 Sections 1-2 & 6, Chapter 9

### Multicultural/Culturally Responsive Connections

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### Additional Resources:

- [Teaching Tolerance Website](https://www.tolerance.org/)
- [Holt McDougall Algebra I: Directions for Holt Digital](http://www.pbslearningmedia.org/standards/1)
- [Khan Academy](https://www.khanacademy.org)
- [Achieve the Core](https://www.achievethecore.org)
- [Illustrative Mathematics](https://www.illustrativemathematics.org)
- [Inside Mathematics](https://www.insidemathematics.org)
- [Learnzillion](https://learnzillion.com/resources/75114)
- [MACCSS](http://maccss.ncdpi.wikispaces.net/)
- [NCTM Illuminations](http://illuminations.nctm.org/Lessons-Activities.aspx)
- [You Cubed](http://youcubed.org/week-of-inspirational-math/)
- [Map Mathshell](http://map.mathshell.org/tasks.php?collection=9&unit=HE06)
- [Shmoop Common Core Standards](http://www.shmoop.com/common-core-standards/math.html)
- [NJ Core](http://www.njcore.org/standards?processing=true#)
- [HCPSS Instucture](https://hcpss.instructure.com/courses/99)
- [Desmos](http://www.desmos.com/)
- [GeoGebra](http://www.geogebra.org/)
- [CcssMath](http://ccssmath.org/)
- [CPALMS](http://www.cpalms.org/Public/ToolkitGradeLevelGroup/Toolkit?id=14)
## Modeling in Math Resources:
- Math Modeling Projects
- Dan Meyer Three Act Tasks

## Multicultural Mathematics
- Teaching Mathematics through Multicultural Literature
- Integrating Mathematics of Worldwide Cultures into K-12 Instruction
- A Course in Multicultural Mathematics
- Critical Multicultural Pavilion: Links to Sites for Multicultural Education and Math

### Instructional and Assessment Guides

### Additional Instructional Resources

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<td>Inside MathematicsCCSS Tool Box</td>
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<td>Mathematics Assessment Project</td>
<td>ADE Mathematics Glossary</td>
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# 2018-2019 Algebra I, Curriculum Map, Q3

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<tr>
<th>Unifying Concept: Polynomial and Quadratic Expressions, Equations and Functions</th>
<th>Quarter 3</th>
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<tr>
<td><strong>Enduring Understandings:</strong></td>
<td><strong>Essential Questions:</strong></td>
</tr>
<tr>
<td>• Rewriting algebraic expressions in different forms can reveal previously hidden characteristics of the expression.</td>
<td>• How are the solutions of a quadratic represented graphically?</td>
</tr>
<tr>
<td>• Changing the form of a quadratic expression by factoring reveals important attributes about the function and its graph.</td>
<td>• What is the appropriate method to solve a quadratic?</td>
</tr>
<tr>
<td>• Changing the form of a quadratic expression by completing the square reveals important attributes about the function and its graph.</td>
<td>• How can we use factoring to solve a quadratic and polynomial equations?</td>
</tr>
<tr>
<td>• The solutions to real-world problems can be found by modeling them with equations and inequalities.</td>
<td>• How can different characteristics of an algebraic expression be recognized by rewriting it?</td>
</tr>
<tr>
<td>• It is possible to add, subtract and multiply polynomials because their coefficients are defined over the set of real numbers.</td>
<td>• Why is it helpful to change the form of quadratic expression by factoring?</td>
</tr>
<tr>
<td>• Completing the square is a good method when a quadratic equation is difficult to factor or cannot be factored and can be used to derive the quadratic formula.</td>
<td>• Why is it helpful to change the form of quadratic expression by completing the square?</td>
</tr>
<tr>
<td>• Solving quadratics can be done by different techniques (by inspection, factoring, completing the square, quadratic formula, graphing), each more efficient than the others based on the characteristics of the quadratic function. Some quadratics do not have real solutions.</td>
<td>• How can quadratic and polynomial equations and inequalities be used to model real-world problems?</td>
</tr>
<tr>
<td>• A linear function is represented by a line with a constant rate of change and intercepts on one or both axes. A quadratic function is represented by a U-shaped curve called a parabola, intercepts on one or both axes, and has one maximum/minimum value.</td>
<td>• How are the operations of polynomials similar to the operations of integers or real numbers?</td>
</tr>
<tr>
<td>• Piecewise functions have two or more parts, which may be any type of linear or non-linear function, and are used when a single function does not define a real-world situation well.</td>
<td>• How can a quadratic equation that is not factorable be solved?</td>
</tr>
<tr>
<td>• Different forms of a quadratic function reveal different characteristics of the function.</td>
<td>• Where does the quadratic formula come from?</td>
</tr>
<tr>
<td>• It is important to compare linear, quadratic and exponential functions in various forms to see how they are different or similar and assess their properties. It is necessary to recognize these differences and similarities to draw conclusions about these models in real-world situations.</td>
<td>• What are the different ways to solve quadratic equations and which ways are most efficient?</td>
</tr>
<tr>
<td>• There can be at most two solutions to a quadratic equation.</td>
<td>• Do all quadratics have real solutions?</td>
</tr>
<tr>
<td>• There is a connection between factoring and polynomial multiplication</td>
<td>• What are the key features of linear and quadratic functions?</td>
</tr>
<tr>
<td></td>
<td>• How do we model real-world situations when they cannot be described with a single function?</td>
</tr>
<tr>
<td></td>
<td>• How can the zeros, vertex, and axis of symmetry of a quadratic function be located?</td>
</tr>
<tr>
<td></td>
<td>• How are functions different and how are they similar?</td>
</tr>
</tbody>
</table>
Standards for Mathematical Practice

Mathematically proficient students:
SMP 1. Make Sense of problems and Persevere in solving them.
SMP 2. Reason abstractly and quantitatively.
SMP 3. Construct viable arguments and critique the reasoning of others.
SMP 4. Model with mathematics.
SMP 5. Use appropriate tools strategically.
SMP 6. Attend to precision.
SMP 7. Look for and make use of structure.
SMP 8. Look for and express regularity in repeated reasoning.

Highly-Leveraged Standards

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1.A-APR.B.3</td>
<td>Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. Focus on quadratic and cubic polynomials in which linear and quadratic factors are available.</td>
</tr>
<tr>
<td>A1.A-CED.A.1</td>
<td>Create equations and inequalities in one variable and use them to solve problems. Include problem-solving opportunities utilizing real-world context.</td>
</tr>
<tr>
<td>A1.A-CED.A.2</td>
<td>Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.</td>
</tr>
<tr>
<td>A1.A-SSE.A.2</td>
<td>Use structure to identify ways to rewrite numerical and polynomial expressions. Focus on polynomial multiplication and factoring patterns.</td>
</tr>
<tr>
<td>A1.A-SSE.B.3</td>
<td>Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.</td>
</tr>
<tr>
<td>A1.F-IF.B.4</td>
<td>For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Include problem-solving opportunities utilizing real-world context. Key features include: intercepts; intervals where the function is increasing, decreasing, positive or negative; relative maximums and minimums. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).</td>
</tr>
<tr>
<td>A1.F-IF.B.5</td>
<td>Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.</td>
</tr>
<tr>
<td>A1.F-IF.B.6</td>
<td>Calculate and interpret the average rate of change of a continuous function (presented symbolically or as a table) on a closed interval. Estimate the rate of change from a graph. Include problem solving opportunities utilizing real-world context. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).</td>
</tr>
<tr>
<td>A1.F-IF.C.7</td>
<td>Graph functions expressed symbolically and show key features of the graph, by hand in simple cases, using technology for more complicated cases. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).</td>
</tr>
<tr>
<td>A1.F-IF.C.8</td>
<td>Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.</td>
</tr>
<tr>
<td></td>
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</tr>
</tbody>
</table>

1. Mathematical Practices Poster
A1.F-IF.C.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).

**Supporting Standards**

A1.A-APR.A.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract and multiply polynomials.


a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form \((x - k)^2 = q\) that has the same solutions. Derive the quadratic formula from this form.

b. Solve quadratic equations by inspection (e.g., \(x^2 = 49\)), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Focus on solutions for quadratic equations that have real roots. Include cases that recognize when a quadratic equation has no real solutions.

A1.A-REI.D.11 Explain why the x-coordinates of the points where the graphs of the equations \(y=f(x)\) and \(y=g(x)\) intersect are the solutions of the equation \(f(x) = g(x)\); find the solutions approximately (e.g., using technology to graph the functions, make tables of values, or find successive approximations). Focus on cases where \(f(x)\) and/or \(g(x)\) are linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).

A1.S-ID.A.1 Represent real-value data with plots for the purpose of comparing two or more data sets.

A1.S-ID.A.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

A1.S-ID.A.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of outliers if present.

A1.F-BF.B.3 Identify the effect on the graph of replacing \(f(x)\) by \(f(x) + k\), \(k f(x)\), and \(f(x+k)\) for specific values of \(k\) (both positive and negative); find the value of \(k\) given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).

A1.N-RN.B.3 Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.

**Constant Standards**

A1.A-CED.A.1 Create equations and inequalities in one variable and use them to solve problems. Include problem-solving opportunities utilizing real-world context.

A1.A-CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

A1.A-SSE.A.1 Interpret expressions that represent a quantity in terms of its context

a. Interpret parts of an expression, such as terms, factors and coefficients.

b. Interpret expressions by viewing one or more of their parts as a single entity.

A1.A-SSE.A.2 Use structure to identify ways to rewrite numerical and polynomial expressions. Focus on polynomial multiplication and factoring patterns.

A1.F-IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases, using technology for more complicated cases. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).

A1.F-IF.C.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).
A1.N-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays, include utilizing real-world context.
A1.N-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities utilizing real-world context.

Social Justice Standards

High School Anchor Standards and Grade Level Outcomes Page 10-11:
Identity:
- ID.9-12.4 I express pride and confidence in my identity without perceiving or treating anyone else as inferior.
Diversity:
- DI.9-12.6 I interact comfortably and respectfully with all people, whether they are similar to or different from me.
Justice:
- JU.9-12.12 I can recognize, describe and distinguish unfairness and injustice at different levels of society.
Action:
- AC.9-12.12 I will join with diverse people to plan and carry out collective action against exclusion, prejudice and discrimination, and we will be thoughtful and creative in our actions in order to achieve our goals.

Teaching Tolerance Website
https://www.tolerance.org/

Adopted Texts and Materials

Textbook: Eureka Math

Module 4 PDF
(Topics B and C)

Module 2 PDF
(Topics A and B only)

Holt McDougall Algebra I:
Directions for Holt Digital

Chapter 1 – Section 4
Chapter 2 – Sections 1, 2, 6, 7, and 10 extension
Chapter 6 – Section 4, 5, 6
Chapter 7 – Sections 1 to 6

Additional Resources:
http://maccss.ncdpi.wikispaces.net/ (choose your level on the menu on the left)
https://www.khanacademy.org
http://achievethecore.org
https://www.illustrativemathematics.org/
www.insidemathematics.org
https://learnzillion.com/resources/75114-math
http://maccss.ncdpi.wikispaces.net/ (choose your grade level on the left)
http://www.pbslearningmedia.org/standards/
http://nlvm.usu.edu/en/nav/vlibrary.html
http://nrich.maths.org
http://illuminations.nctm.org/Lessons-Activities.aspx (choose grade level and connect to search lessons)
http://www.yummymath.com/birds-eye-of-activities/
http://map.mathshell.org/tasks.php?collection=9&unit=HE06
# 2018-2019 Algebra I, Curriculum Map, Q3

## Chapter 8 – Sections 1 to 10
Chapter 9 – Sections 2, 3, 4
Instruction must be supplemented to meet the expectations of the standards.

http://www.njcore.org/standards?processing=true#
https://hcpss.instructure.com/courses/99
https://www.desmos.com/
http://www.geogebra.org/
http://ccssmath.org/ (choose the Domain from the Resources tab.)
http://www.cpalms.org/Public/ToolkitGradeLevelGroup/Toolkit?id=14

## Multicultural/Culturally Responsive Connections

### Culturally Responsive Teaching
- **TUSD SPARKS**
- **SPARKS Strategies**

### Modeling in Math Resources:
- **Math Modeling Projects**
- **Dan Meyer Three Act Tasks**
  [http://robertkaplinsky.com/les](http://robertkaplinsky.com/les)ons/

### Multicultural Math Connections:
- **Global Math Stories**
- **Lessons from the Mayas**
- **Multicultural Education and Math**
- **Multicultural Mathematics**
- **Teaching Mathematics through Multicultural Literature**
- **Integrating Mathematics of Worldwide Cultures into K-12 Instruction**
- **A Course in Multicultural Mathematics**
- **Critical Multicultural Pavilion: Links to Sites for Multicultural Education and Math**

## Instructional and Assessment Guides

### Instructional and Assessment Guides
- **DOK Levels**
- **DOK Stems**
- **Hess’s Matrix**
- **Bloom’s Taxonomy**
- **Desmos Online Graphing Program**
- **AZMerit**
- **AZMerit End of Course Resources**
- **AZMerit Support Materials**
- **Achieve the Core Assessments**
- **Mathematics Assessment Project**
- **orglib**

### Additional Instructional Resources
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- **Inside Mathematics: Tools for Educators**
- **MARS Lessons**
- **Achieve the Core**
- **Standards Toolkit**
- **Math Vocabulary**
- **Illustrative Mathematics**
- **Cpalms Tool Kit**
- **Inside MathematicsCCSS Tool Box**
- **ADE Mathematics Glossary**
- **Khan Academy - Quadratics**
- **Khan Academy - Intro to Polynomial Expressions**
- **The Quadratic Equation: It’s Hip to Be Squared**
- **9th-11th Grade Math - Quadratic Functions**
- **Quadratic Equations**
- **Linear and Exponential Models 1**

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Office of Curriculum, Instruction, and Professional Development  
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<tr>
<td>Inside Mathematics - Quadratic</td>
<td>Proof Without Words Completing the Square</td>
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<tr>
<td>Functions</td>
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</table>
## Unifying Concept: Modeling with Equations and Functions, and Descriptive Statistics

### Enduring Understandings:
- The way that data is collected, organized and displayed influences interpretation.
- The results of a statistical investigation can be used to refute or support an argument.
- Analyzing data helps make logical interpolations and extrapolations.
- It is important to be able to effectively communicate what the data reveals.
- Expressing information in appropriate units, and with understandable scales on graphs, is important in modeling real-world situations.
- When performing calculations, the precision to which a computation is reported is dependent on the precision of the quantities used.
- Functions describe situations where one quantity determines another.
- The slope and intercept of a linear model describe relationships between the variables.
- Correlation measures how strongly two numerical variables are linearly associated.
- A common error when interpreting paired data is confusing correlation and causation.
- Collecting and analyzing data can be used to answer questions.
- Misuse of data and statistics is common, making it important to be well informed of the appropriate ways to interpret data.
- The context of a question will determine the type of data that needs to be collected and analyzed and will provide insight on the best method for analyzing the data.
- The type of data determines the best choice of representation (equations, tables, charts, graphs or words).

### Essential Questions:
- When and why is data collected and analyzed?
- How do people use data to influence others?
- How can predictions be made based on data?
- What is the best way to display data to communicate important information?
- What do measures of center and spread (variability) reveal about the data?
- What is the difference between correlation and causation?
- Does correlation mean causation?
- Can a model be created to represent a contextual situation?
- What characteristics of a problem lead to determining if a problem should be represented by single count/measurement variables or two categorical/quantitative variables?
- How do you determine the best way to communicate your solutions to problems modeled in the real world?
- Why are significant digits and units important in calculations?
- How can functions be built to describe real-world situations?
- How can the rate of change and the intercept be used to interpret a linear model?
- How can the strength of the linear relationship between two quantitative variables be measured?
- What characteristics of a problem influence the choice of representation and analysis of the data?
- What characteristics of a problem determine the type of function that would serve as an appropriate model for the problem?
- How can data be represented to best communicate important information about a problem?
### Standards

#### Standards for Mathematical Practice

Mathematically proficient students:
- **SMP 1.** Make sense of problems and persevere in solving them.
- **SMP 2.** Reason abstractly and quantitatively.
- **SMP 3.** Construct viable arguments and critique the reasoning of others.
- **SMP 4.** Model with Mathematics.
- **SMP 5.** Use appropriate tools strategically.
- **SMP 6.** Attend to precision.
- **SMP 7.** Look for and make use of structure.

[**Mathematical Practices Poster**](#)

#### Highly-Leveraged Standards

<table>
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<tr>
<th>A1.A-CED.A.1</th>
<th>Create equations and inequalities in one variable and use them to solve problems. Include problem-solving opportunities utilizing real-world context.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1.A-CED.A.2</td>
<td>Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.</td>
</tr>
<tr>
<td>A1.F-BF.A.1</td>
<td>Write a function that describes a relationship between two quantities. Determine an explicit expression, a recursive process, or steps for calculation from real-world context. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).</td>
</tr>
<tr>
<td>A1.F-IF.B.4</td>
<td>For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Include problem-solving opportunities utilizing real-world context. Key features include: intercepts; intervals where the function is increasing, decreasing, positive or negative; relative maximums and minimums. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).</td>
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<td>A1.F-IF.B.5</td>
<td>Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.</td>
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<tr>
<td>A1.F-IF.B.6</td>
<td>Calculate and interpret the average rate of change of a continuous function (presented symbolically or as a table) on a closed interval. Estimate the rate of change from a graph. Include problem solving opportunities utilizing real-world context. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).</td>
</tr>
<tr>
<td>A1.F-LE.A.1</td>
<td>Distinguish between situations that can be modeled with linear functions and with exponential functions.</td>
</tr>
<tr>
<td>b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.</td>
<td></td>
</tr>
<tr>
<td>c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.</td>
<td></td>
</tr>
<tr>
<td>A1.F-LE.A.2</td>
<td>Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or input/output pairs.</td>
</tr>
<tr>
<td>A1.N-Q.A.3</td>
<td>Choose a level of accuracy appropriate to limitations on measurement when reporting quantities utilizing real-world context.</td>
</tr>
<tr>
<td>A1.S-ID.C.7</td>
<td>Interpret the slope as a rate of change and the constant term of a linear model in the context of the data.</td>
</tr>
</tbody>
</table>
### Supporting Standards

<table>
<thead>
<tr>
<th>Standard</th>
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</tr>
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<tbody>
<tr>
<td>A1.S-CP.A.1</td>
<td>Describe events as subsets of a sample space using characteristics of the outcomes, or as unions, intersections, or complements of other events.</td>
</tr>
<tr>
<td>A1.S-CP.A.2</td>
<td>Use the Multiplication Rule for independent events to understand that two events $A$ and $B$ are independent if the probability of $A$ and $B$ occurring together is the product of their probabilities, and use this characterization to determine if they are independent.</td>
</tr>
<tr>
<td>A1.S-ID.B.5</td>
<td>Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data, including joint, marginal, and conditional relative frequencies. Recognize possible associations and trends in the data.</td>
</tr>
</tbody>
</table>
| A1.S-ID.B.6 | Represent data on two quantitative variables on a scatter plot, and describe how the quantities are related.  
  a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Focus on linear models.  
  b. Informally assess the fit of a function by plotting and analyzing residuals. |

### Constant Standards

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>A1.A-CED.A.1</td>
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  a. Interpret parts of an expression, such as terms, factors and coefficients.  
  b. Interpret expressions by viewing one or more of their parts as a single entity. |
| A1.A-SSE.A.2 | Use structure to identify ways to rewrite numerical and polynomial expressions. Focus on polynomial multiplication and factoring patterns. |
| A1.F-IF.C.7 | Graph functions expressed symbolically and show key features of the graph, by hand in simple cases, using technology for more complicated cases. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). |
| A1.F-IF.C.9 | Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). |
| A1.N-Q.A.1 | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays, include utilizing real-world context. |
| A1.N-Q.A.3 | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities utilizing real-world context. |

### Social Justice Standards

**High School Anchor Standards and Grade Level Outcomes Page 10-11:**

**Identity:**
- ID.9-12.4 I express pride and confidence in my identity without perceiving or treating anyone else as inferior.

**Diversity:**
- DI.9-12.6 I interact comfortably and respectfully with all people, whether they are similar to or different from me.

**Justice:**
- JU.9-12.12 I can recognize, describe and distinguish unfairness and injustice at different levels of society.

**Action:**
- AC.9-12.12 I will join with diverse people to plan and carry out collective action against exclusion, prejudice and discrimination, and we will be thoughtful and creative in our actions in order to achieve our goals.
### Adopted Texts and Materials

**Teaching Tolerance Website**
https://www.tolerance.org/

**Textbook:** Eureka Math

- **Module 2 PDF**
  (Topics C and D)
- **Module 5 PDF**

**Holt McDougall Algebra I:**
**Directions for Holt Digital**
- Chapter 1 – Sections 8, 9, 10
- Chapter 4 – Section 8
- Chapter 9 – Sections 1 and 3
- Chapter 10 – Sections 1 and 2

Instruction must be supplemented to meet the expectations of standards.

**Explorations in CORE MATH for Common Core – Holt McDougal:**

Instruction must be supplemented to meet the expectations of standards.

**Eureka Module 2 and Module 5**

**Holt McDougal Algebra I:**
- Chapter 1 – Sections 8, 9, 10
- Chapter 4 – Section 8
- Chapter 9 – Sections 1 and 3
- Chapter 10 – Sections 1 and 2

Instruction must be supplemented to meet the expectations of standards.

**Additional Resources:**
- [http://maccss.ncdpi.wikispaces.net/](http://maccss.ncdpi.wikispaces.net/) (choose your level on the menu on the left)
- [https://www.khanacademy.org](https://www.khanacademy.org)
- [http://achievethecore.org](http://achievethecore.org)
- [https://www.illustrativemathematics.org/](https://www.illustrativemathematics.org/)
- [www.insidemathematics.org](http://www.insidemathematics.org)
- [https://learnzillion.com/resources/7514-math](https://learnzillion.com/resources/7514-math)
- [http://maccss.ncdpi.wikispaces.net/](http://maccss.ncdpi.wikispaces.net/) (choose your grade level on the left)
- [http://www.pbslearningmedia.org/standards/1](http://www.pbslearningmedia.org/standards/1)
- [http://nrich.maths.org](http://nrich.maths.org)
- [https://www.youcubed.org/week-of-inspirational-math/](https://www.youcubed.org/week-of-inspirational-math/)
- [http://illustrations.nctm.org/Lessons-Activities.aspx](http://illustrations.nctm.org/Lessons-Activities.aspx) (choose grade level and connect to search lessons)
- [https://hcpss.instructure.com/courses/99](https://hcpss.instructure.com/courses/99)
- [https://www.desmos.com/](https://www.desmos.com/)
- [http://ccssmath.org/](http://ccssmath.org/) (choose the Domain from the Resources tab.)
- [http://www.cpalms.org/Public/ToolkitGradeLevelGroup/Toolkit?id=14](http://www.cpalms.org/Public/ToolkitGradeLevelGroup/Toolkit?id=14)
- [https://www.illustrativemathematics.org/content-standards/HSS/ID/C/9/tasks/1307](https://www.illustrativemathematics.org/content-standards/HSS/ID/C/9/tasks/1307) (Task for S-ID.C.8 and 9)
### Multicultural/Culturally Responsive Connections

**Culturally Responsive Teaching**
- TUSD SPARKS
- SPARKS Strategies

**Modeling in Math Resources:**
- Math Modeling Projects
- Dan Meyer Three Act Tasks

**Multicultural Math Connections:**
- Global Math Stories
- Lessons from the Mayas
- Multicultural Education and Math
- Multicultural Mathematics
- Teaching Mathematics through Multicultural Literature
- Integrating Mathematics of Worldwide Cultures into K-12 Instruction
- A Course in Multicultural Mathematics
- Critical Multicultural Pavilion: Links to Sites for Multicultural Education and Math

### Instructional and Assessment Guides

- DOK Levels
- DOK Stems
- Hess's Matrix
- Bloom's Taxonomy
- Desmos Online Graphing Program
- AZMerit
- AZMerit End of Course Resources
- AZMerit Support Materials
- Achieve the Core Assessments
- Mathematics Assessment Project
- orglib

### Additional Instructional Resources

- Radical Math - Mean
- Radical Math - Scatterplots
- Radical Math - Statistics
- Radical Math - Data Analysis
- Radical Math - Data
- Radical Math - Correlation
- Khan Academy - Probability
- Khan Academy - Statistics Probability
- Illustrative Mathematics - Golf and Divorce
- Illustrative Mathematics - Identifying Outliers
- Illustrative Mathematics - Restaurant Bill and Party Size
- Shmoop - Statistics and Probability
- Descriptive Statistics
- Modeling with Other Results
- Do Credit Cards Make You Gain Weight? Correlation vs Causation
- NEA - Stats and Short Stories
- [https://www.illustrativemathematics.org/content-standards/tasks/942](https://www.illustrativemathematics.org/content-standards/tasks/942)
- [https://www.illustrativemathematics.org/content-standards/HSS/ID/A/3/tasks/1875](https://www.illustrativemathematics.org/content-standards/HSS/ID/A/3/tasks/1875)
- [https://www.illustrativemathematics.org/content-standards/HSS/ID/B/5/tasks/2044](https://www.illustrativemathematics.org/content-standards/HSS/ID/B/5/tasks/2044)
**Highly-Leveraged Standards** are essential for students to learn because they have endurance (knowledge and skills relevant throughout a student’s lifetime); leverage (knowledge and skills used across multiple content areas); and essentiality (knowledge and skills necessary for success in future courses or grade levels). Specifically for mathematics, the **Highly-Leveraged Standards** are the **Major Content/Clusters** as defined by the Arizona Math Standards Content Emphasis Document. They should encompass a range of at least 65%-75% of instruction. See the Grade Level Focus documents at: [https://cms.azed.gov/home/GetDocumentFile?id=5994c2c53217e11164e2b131](https://cms.azed.gov/home/GetDocumentFile?id=5994c2c53217e11164e2b131)

**Supporting Standards** are emphasized during the quarter as they are integral to achieve mastery of the Highly Leveraged Standards. Mastery of these standards are measured using classroom assessments.

**Constant Standards** are repeatedly addressed to reinforce grade-level mastery.