



Indiana Academic Standards for Mathematics – Algebra 1  
Adopted April 2014 – Standards Resource Guide Document

This Teacher Resource Guide has been developed to provide supporting materials to help educators successfully implement the Indiana Academic Standards for Algebra I- Adopted April 2014. These resources are provided to help you in your work to ensure all students meet the rigorous learning expectations set by the Academic Standards. Use of these resources is optional-teachers should decide which resource will work best in their school for their students.

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This Resource Guide will be updated as necessary.

The examples in this document are for illustrative purposes only, to promote a base of clarity and common understanding. *Each example illustrates a standard but please note that examples are not intended to limit interpretation or classroom applications of the standards.*

The links compiled and posted in this Resource Guide have been provided by the Department of Education and other sources. The DOE has not attempted to evaluate any posted materials. They are offered as samples for your reference only and are not intended to represent the best or only approach to any particular issue. *The DOE does not control or guarantee the accuracy, relevance, timeliness, or completeness of information authorize the use of copyrighted materials contained in linked websites. Users must request such authorization from the sponsor of the linked website.*

**GOOD WEBSITES FOR MATHEMATICS:**

<http://nlvm.usu.edu/en/nav/vlibrary.html>

<http://www.math.hope.edu/swanson/methods/applets.html>

<http://learnzillion.com>

<http://illuminations.nctm.org>

<https://teacher.desmos.com>

<http://illustrativemathematics.org>

<http://www.insidemathematics.org>

<https://www.khanacademy.org/>

<https://www.teachingchannel.org/>

<http://map.mathshell.org/materials/index.php>

<https://www.istemnetwork.org/index.cfm>

<http://www.azed.gov/azccrs/mathstandards/>



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	Indiana Academic Standards for Mathematics Algebra 1 – Adopted April 2014	Highlighted Vocabulary Words from the Standard Defined	Specific Algebra 1 Example for the Standard	Specific Algebra 1 Electronic Resource for the Standard
<b>Real Numbers and Expressions</b>				
MA.AI.RNE.1:	AI.RNE.1: Understand the hierarchy and relationships of numbers and sets of numbers within the <b>real number system</b> .	<b>Real Number System</b> - numbers that are either rational or irrational.	Which set of numbers does each of the following belong?  $5.5, -9, 0, \frac{1}{2}, \sqrt{8}, -\sqrt{100}, \frac{\sqrt{81}}{\sqrt{16}}, \frac{2}{3}$  	<a href="https://www.khanacademy.org/math/arithmetic/fractions/number-sets/v/number-sets">https://www.khanacademy.org/math/arithmetic/fractions/number-sets/v/number-sets</a>  <a href="http://www.softschools.com/math/classifying-numbers/">http://www.softschools.com/math/classifying-numbers/</a>



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MA.AI.RNE.2:	AI.RNE.2: Explain why the sum or product of two rational numbers is <b>rational</b> ; that the sum of a rational number and an irrational number is <b>irrational</b> ; and that the product of a nonzero rational number and an irrational number is irrational.	<p><b>Rational number</b> - a real number that can be written as a ratio of two integers with a non-zero denominator.</p> <p><b>Irrational number</b> - a real number that cannot be expressed as a ratio of two integers.</p>	<p>Determine whether the sum or product of the following will be rational or irrational and explain your answer.</p> <p>a) The sum of two rational numbers.</p> <p>b) The product of a nonzero rational number and an irrational number.</p> <p>c) The product of two rational numbers.</p>	<p><a href="https://learnzillion.com/lessons/2858-predict-the-result-of-adding-and-subtracting-rational-and-irrational-numbers">https://learnzillion.com/lessons/2858-predict-the-result-of-adding-and-subtracting-rational-and-irrational-numbers</a></p>
MA.AI.RNE.3:	AI.RNE.3: Rewrite and evaluate numeric expressions with positive <b>rational exponents</b> using the properties of exponents.	<p><b>Rational exponent</b> - an exponent that can be expressed as <math>\frac{p}{q}</math>, where <math>p</math> and <math>q</math> are integers and <math>q \neq 0</math>.</p>	<p>a) Evaluate: <math>\left(3^{\frac{1}{3}}\right)^9</math></p> <p>b) Write two equivalent expressions of <math>2^{\frac{3}{4}} \cdot 2^{\frac{13}{4}}</math>.</p> <p>c) Evaluate: <math>\frac{7^{-\frac{2}{3}} \cdot 7^{\frac{1}{3}}}{\left(\frac{1}{7^9}\right)^{-3}}</math></p>	<p><a href="http://www.purplemath.com/modules/simpexp3.htm">http://www.purplemath.com/modules/simpexp3.htm</a></p>
MA.AI.RNE.4:	AI.RNE.4: Simplify square roots of non-perfect square integers and algebraic <b>monomials</b> .	<p><b>Monomial</b> - a real number, a variable, or a product of a real number and one or more variables with whole-number exponents.</p>	<p>Simplify <math>\sqrt{50a^5}</math>.</p>	



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MA.AI.RNE.5:	AI.RNE.5: Simplify <b>algebraic rational expressions</b> , with numerators and denominators containing monomial bases with integer exponents, to equivalent forms.	<b>Algebraic Rational Expression</b> - an algebraic expression whose numerator and denominator are polynomials and whose denominator has a degree	Simplify $\frac{14x^{-5}y^2}{4x^8y}$ .	
MA.AI.RNE.6:	AI.RNE.6: Factor common terms from <b>polynomials</b> and factor polynomials completely. Factor the <b>difference of two squares, perfect square trinomials</b> , and other quadratic expressions.	<b>Polynomial</b> - a monomial or the sum or difference of two or more monomials. <b>Difference of Two Squares</b> - an expression of the form $a^2 - b^2$ which can be factored as $(a + b)(a - b)$ . <b>Perfect Square Trinomial</b> - any trinomial of the form $a^2 + 2ab + b^2$ or $a^2 - 2ab + b^2$ .	Factor each expression completely. a) $18x^3 - 50x^2 + 12x - 2$ b) $3w^2 - 12$ c) $16x^2 - 4$ d) $a^2 + 2a - 24$ e) $c^2 - 10c + 25$ f) $3m^2 - 14m - 5$	
MA.AI.RNE.7:	AI.RNE.7: Understand <b>polynomials</b> are closed under the operations of addition, subtraction, and multiplication with integers; add, subtract, and multiply polynomials and divide polynomials by <b>monomials</b> .	<b>Polynomial</b> - A monomial or the sum or difference of two or more monomials. <b>Monomial</b> - A real number, a variable, or a product of a real number and one or more variables with whole-number exponents.	Perform the indicated operation to simplify each expression. a) $(2x^2 + 7x - 11) + (4x^2 - 9)$ b) $(7n^2 - 3n + 5) - (4n - 8)$ c) $-2d^2(3d^3 - 2d + 5)$ d) $(4z - 5)(-7z + 3)$ e) $(15x^3 - 18x^2 + 27x) \div 3x$	<a href="https://betterlesson.com/common_core/browse/582/ccss-math-content-hsa-apr-a-1-understand-that-polynomials-form-a-system-analogous-to-the-integers-namely-they-are-closed-under-t">https://betterlesson.com/common_core/browse/582/ccss-math-content-hsa-apr-a-1-understand-that-polynomials-form-a-system-analogous-to-the-integers-namely-they-are-closed-under-t</a>



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			f) $(3a + 1)(a^2 - 5a + 2)$	
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Functions				
MA.AI.F.1:	AI.F.1: Understand that a function from one set (called the <b>domain</b> ) to another set (called the <b>range</b> ) assigns to each element of the domain exactly one element of the range. Understand that if $f$ is a <b>function</b> and $x$ is an element of its domain, then $f(x)$ denotes the <b>output</b> of $f$ corresponding to the input $x$ . Understand the graph of $f$ is the graph of the equation $y = f(x)$ .	<p><b>Domain</b> - the set of all <math>x</math>-coordinates of the ordered pairs of a relation.</p> <p><b>Range</b> - the set of all <math>y</math>-coordinates of the ordered pairs of a relation.</p> <p><b>Output</b> - a value of the dependent variable.</p> <p><b>Input</b> - a value of the independent variable.</p>	Generate a list of values for the equation $y = x^2$ and draw a graph to represent the equation. Is $y = x^2$ a function? Explain your reasoning.	<a href="https://www.illustrativemathematics.org/illustrations/588">https://www.illustrativemathematics.org/illustrations/588</a>
MA.AI.F.2:	AI.F.2: Describe <b>qualitatively</b> the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear, has a maximum or minimum value). Sketch a graph that exhibits the qualitative features of a function that has been verbally described. Identify <b>independent</b> and <b>dependent variables</b> and make predictions about the relationship.	<p><b>Qualitative</b> – descriptive information not based on numbers</p> <p><b>Independent Variable</b> - a variable that provides the input values.</p> <p><b>Dependent Variable</b> - a variable whose values depend on the values of the independent variable.</p>	Joe ran from his home to school at a constant speed. He took a short break and then ran back home, but at a slower non-constant speed. Joe ran along a straight path to and from school. Sketch a graph to represent Joe’s distance from his home over time. Identify the independent and dependent variables.	<a href="https://www.illustrativemathematics.org/illustrations/637">https://www.illustrativemathematics.org/illustrations/637</a>  <a href="https://www.illustrativemathematics.org/illustrations/639">https://www.illustrativemathematics.org/illustrations/639</a>  <a href="https://www.illustrativemathematics.org/illustrations/649">https://www.illustrativemathematics.org/illustrations/649</a>
MA.AI.F.3:	AI.F.3: Identify the <b>domain</b> and <b>range</b> of relations represented in tables, graphs, verbal descriptions, and equations.	<p><b>Domain</b> - the set of all <math>x</math>-coordinates of the ordered pairs of a relation.</p> <p><b>Range</b> - the set of all <math>y</math>-coordinates of the ordered pairs of a relation.</p>	<p>What is the domain and range of each relation?</p> <p>a) <math>\{(3, 4), (-5, 2), (0, 7), (3, 9)\}</math></p> <p>b) <math>y = -2x</math></p> <p>c) Zach drives his car at a constant</p>	



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			rate of 60 miles per hour for 2 hours. Describe the domain and range of this relation given distance as a function of time.	
MA.AI.F.4:	AI.F.4: Understand and interpret statements that use function notation in terms of a context; relate the domain of the function to its graph and to the <b>quantitative</b> relationship it describes.	<b>Quantitative</b> - Data that measures quantity and can be described numerically.	<p>If <math>P(t)</math> is the population of a country <math>t</math> years after 2000, interpret the statements below.</p> <ul style="list-style-type: none"> <li>• <math>P(0) = 750,000</math></li> <li>• <math>P(10) = 1,250,000</math></li> <li>• <math>P(13) - P(12) = -10</math></li> </ul>	<p><a href="https://www.illustrativemathematics.org/illustrations/634">https://www.illustrativemathematics.org/illustrations/634</a></p> <p><a href="https://www.illustrativemathematics.org/illustrations/625">https://www.illustrativemathematics.org/illustrations/625</a></p> <p><a href="https://www.illustrativemathematics.org/illustrations/626">https://www.illustrativemathematics.org/illustrations/626</a></p> <p><a href="https://www.illustrativemathematics.org/illustrations/598">https://www.illustrativemathematics.org/illustrations/598</a></p>



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**Linear Equations, Inequalities, and Functions**

MA.AI.L.1:	AI.L.1: Understand that the steps taken when solving linear equations create new equations that have the same solution as the original. Solve fluently linear equations and inequalities in one variable with integers, fractions, and decimals as <b>coefficients</b> . Explain and <b>justify</b> each step in solving an equation, starting from the assumption that the original equation has a solution. Justify the choice of a solution method.	<b>Coefficient</b> - the numerical factor of a term that contains a variable. <b>Justify</b> - to prove or show something to be right.	Solve the equation and inequality. a) $\frac{1}{5}(p - 14) = 10 + p$ b) $2.5m - 7(m - 3) \geq 40$	<a href="http://www.engageny.org/resource/algebra-i-module-1">http://www.engageny.org/resource/algebra-i-module-1</a>
MA.AI.L.2:	AI.L.2: Represent real-world problems using linear equations and inequalities in one variable and solve such problems. Interpret the solution and determine whether it is reasonable.		Jenny starts a scarf knitting business. She spends \$160 on supplies to start the business, and she spends \$4.50 to make each scarf. She sells each scarf for \$12. Write an inequality that can be used to determine the number of scarves Jenny must sell in order to make a profit. What is the minimum number of scarves Jenny must sell in order to make a profit?	<a href="https://www.illustrativemathematics.org/illustrations/581">https://www.illustrativemathematics.org/illustrations/581</a>  <a href="https://www.illustrativemathematics.org/illustrations/1010">https://www.illustrativemathematics.org/illustrations/1010</a>





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MA.AI.L.3:	AI.L.3: Represent real-world and other mathematical problems using an <b>algebraic proportion</b> that leads to a linear equation and solve such problems.	<b>Algebraic Proportion</b> – a proportion containing variables (see example b)	a) If 3 lbs. of potato salad serves 10 people, write an equation that can be used to determine the amount of potato salad needed to serve 52 people. How much potato salad is needed to serve 52 people?  b) Solve: $\frac{(3y-8)}{12} = \frac{y}{5}$	
MA.AI.L.4:	AI.L.4: Represent linear functions as graphs from equations (with and without technology), equations from graphs, and equations from tables and other given information (e.g., from a given point on a line and the slope of the line).		a) Write an equation of the line that passes through the points (2, 1) and (5, -8).  b) Graph: $2x - 3y = -12$  c) Graph: $5y = -x$  d) Write an equation of the line that passes through the point (-10, 7) and has a slope of -2/5.	
MA.AI.L.5:	AI.L.5: Represent real-world problems that can be modeled with a linear function using equations, graphs, and tables; translate fluently among these representations, and interpret the <b>slope and intercepts</b> .	<b>Slope</b> - the ratio of the vertical change to the horizontal change. <b>x-intercept</b> - the x-coordinate of a point where the graph crosses the x-axis. <b>y-intercept</b> - the y-coordinate of a point where the graph crosses the y-axis.	A fishing lake was stocked with 300 bass. Each year, the population of bass decreases by 25. Write an equation that can be used to determine the number of bass in the lake after a given number of years since being stocked. Be sure to define your variables. Graph your equation and determine what	<a href="http://www.phschool.com/atschool/academy123/english/academy123_content/wl-book-demo/ph-209s.html">http://www.phschool.com/atschool/academy123/english/academy123_content/wl-book-demo/ph-209s.html</a>



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			the intercepts and slope represent in this problem.	
MA.AI.L.6:	AI.L.6: Translate among equivalent forms of equations for linear functions, including <b>slope-intercept, point-slope, and standard</b> . Recognize that different forms reveal more or less information about a given situation.	<p><b>Slope-Intercept Form:</b> <math>y = mx + b</math>, where <math>m</math> is the slope of the line and <math>b</math> is the y-intercept.</p> <p><b>Point-Slope Form:</b> <math>y - y_1 = m(x - x_1)</math> where the line passes through the point <math>(x_1, y_1)</math> with slope <math>m</math>.</p> <p><b>Standard Form:</b> <math>Ax + By = C</math>, where <math>A</math>, <math>B</math>, and <math>C</math> are real numbers and <math>A</math> and <math>B</math> are not both zero.</p>	<p>a) Write the equation <math>3x - 4y = 12</math> in slope-intercept form.</p> <p>b) Describe how the standard form and slope-intercept form of a linear equation might provide you with information more readily with respect to the graphical representation of the equation or contextual situation being modeled.</p>	<a href="http://quizlet.com/20206979/linear-equations-in-three-forms-standard-point-slope-slope-intercept-flash-cards/">http://quizlet.com/20206979/linear-equations-in-three-forms-standard-point-slope-slope-intercept-flash-cards/</a>
MA.AI.L.7:	AI.L.7: Represent real-world problems using linear inequalities in two variables and solve such problems; interpret the <b>solution set</b> and determine whether it is reasonable. Solve other linear inequalities in two variables by graphing.	<b>Solution Set</b> - the values satisfying the inequality	At a high school football game, tickets cost \$7 per adult and \$4 per student. Write a linear inequality to determine the number of adult and student tickets that need to be sold so that the amount of money taken in at the gate is at least \$280. Be sure to define your variables. Then, graph the inequality and describe three solutions.	



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MA.AI.L.8:	AI.L.8: Solve <b>compound linear inequalities</b> in one variable, and represent and interpret the solution on a number line. Write a compound linear inequality given its number line representation.	<b>Compound Linear Inequality</b> - two or more inequalities joined by the terms “and” or “or”	a) Solve the inequality and graph the solution set on a number line.  $-50 < 7x + 6 < -8$ b) A recipe for baking cookies states that the cookies must be baked greater than or equal to 16 minutes and less than or equal to 20 minutes. Represent this situation on a number line and with a compound inequality.	<a href="http://www.montereyinstitute.org/courses/DevelopmentalMath/TEXTGROUP-1-19_RESOURCE/U10_L3_T1_text_container.html">http://www.montereyinstitute.org/courses/DevelopmentalMath/TEXTGROUP-1-19_RESOURCE/U10_L3_T1_text_container.html</a>
MA.AI.L.9:	AI.L.9: Solve absolute value linear equations in one variable.		a) Solve: $ r - 8  = 5$ b) Solve: $4 x + 1  = 16$ c) Solve: $-2 m  = 5$	<a href="https://www.khanacademy.org/math/algebra/solving-linear-equations-and-inequalities/absolute-value-equations/v/absolute-value-equations">https://www.khanacademy.org/math/algebra/solving-linear-equations-and-inequalities/absolute-value-equations/v/absolute-value-equations</a>
MA.AI.L.10:	AI.L.10: Graph absolute value linear equations in two variables.		a) Graph: $y =  3x  - 6$ b) Graph: $f(x) =  x + 2  + 1$	
MA.AI.L.11:	AI.L.11: Solve equations and formulas for a specified variable, including equations with coefficients represented by variables.		a) Solve for L: $P = 2L + 2W$ b) Solve for y: $ax + \frac{y}{b} = c$ c) A formula to convert degrees	<a href="http://www.purplemath.com/modules/solveit.htm">http://www.purplemath.com/modules/solveit.htm</a>



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			Fahrenheit to degrees Celsius is $C = \frac{5}{9}(F - 32)$ . Solve this formula for $F$ . How is this formula similar/different than the original?	
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**Systems of Equations and Inequalities**

MA.AI.SEI.1:	AI.SEI.1: Understand the relationship between a solution of a pair of linear equations in two variables and the graphs of the corresponding lines. Solve pairs of linear equations in two variables by graphing; approximate solutions when the coordinates of the solution are non-integer numbers.		Graph the system of equations below and determine the solution. Justify your answer.  $-2y + x = -6$ $y = x + 4$	<a href="http://www.westga.edu/~srivera/ca-fall05/7.1.ppt">http://www.westga.edu/~srivera/ca-fall05/7.1.ppt</a>
MA.AI.SEI.2:	AI.SEI.2: Understand 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. Solve pairs of linear equations in two variables using substitution and elimination.		Solve the system of equations below.  $y = -2x + 6$ $3x + 4y = 24$	<a href="http://www.purplemath.com/modules/systlin5.htm">http://www.purplemath.com/modules/systlin5.htm</a>
MA.AI.SEI.3:	AI.SEI.3: Write a system of two linear equations in two variables that represents a real-world problem and solve the problem with and without technology. Interpret the solution and determine whether the solution is		a) Julie has some one-dollar bills and some five-dollar bills. She has a total of 14 bills. The value of the bills is \$30. Write a system of equations that can be used to determine the number of each type of bill Julie has. How many of each bill does Julie have?	<a href="http://education.ti.com/en/us/activity/detail?id=6BC31F27694F44C2B92302917F531253">http://education.ti.com/en/us/activity/detail?id=6BC31F27694F44C2B92302917F531253</a>



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	reasonable.		b) A group of 2 adults and 4 children pay \$95 for admission to a water park. A different group of 3 adults and 7 children pay \$155 for admission to the same water park. Write a system of equations that can be used to determine the admission price to the water park for an adult and a child. Be sure to define your variables. What is the admission price, in dollars, for one child?	
MA.AI.SEI.4:	AI.SEI.4: Represent real-world problems using a system of two linear inequalities in two variables and solve such problems; interpret the solution set and determine whether it is reasonable. Solve other pairs of linear inequalities by graphing with and without technology.		Graph the system of inequalities to represent the solution set.  $y > \frac{2}{3}x - 4$ $-5y - 10x \geq -15$	<a href="http://helpmewithmathproblems.com/algebra1/list-of-topics/modeling-real-world-situations-using-systems-of-linear-inequalities/">http://helpmewithmathproblems.com/algebra1/list-of-topics/modeling-real-world-situations-using-systems-of-linear-inequalities/</a>



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**Quadratic and Exponential Equations and Functions**

MA.AI.QE.1:	AI.QE.1: Distinguish between situations that can be modeled with linear functions and with exponential functions. Understand that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. Compare linear functions and exponential functions that model real-world situations using tables, graphs, and equations.		<p>Identify whether the quantity is changing in a linear or exponential fashion and explain how you know.</p> <ul style="list-style-type: none"> <li>a) Mike earns \$10 per hour.</li> <li>b) The water in a bathtub decreases at a constant rate.</li> <li>c) The value of a car depreciates by 9% each year.</li> <li>d) Sue decreases the selling price of her car by \$50 each week.</li> <li>e) Teah decreases the selling price of her car by 5% each week.</li> </ul>	<p><a href="https://www.illustrativemathematics.org/illustrations/350">https://www.illustrativemathematics.org/illustrations/350</a></p> <p><a href="https://www.illustrativemathematics.org/illustrations/242">https://www.illustrativemathematics.org/illustrations/242</a></p> <p><a href="https://www.illustrativemathematics.org/illustrations/366">https://www.illustrativemathematics.org/illustrations/366</a></p> <p><a href="https://www.illustrativemathematics.org/illustrations/368">https://www.illustrativemathematics.org/illustrations/368</a></p> <p><a href="https://www.illustrativemathematics.org/illustrations/629">https://www.illustrativemathematics.org/illustrations/629</a></p>
MA.AI.QE.2:	AI.QE.2: Represent real-world and other mathematical problems that can be modeled with exponential functions using tables, graphs, and equations of the form $y = ab^x$ (for integer values of $x > 1$ , rational values of $b > 0$ and $b \neq 1$ ); translate fluently among these representations and interpret the values of $a$ and $b$ .		<p>Bill earns a salary of \$35,700. Each year he receives a 3% raise. Make a table of values to show how much Bill will earn each year for the next 5 years. Then represent this situation with an equation and graph. Be sure to define your variables and label your axes.</p>	<p><a href="https://www.explorelearning.com/index.cfm?method=cResource.dspStandardCorrelation&amp;id=2386">https://www.explorelearning.com/index.cfm?method=cResource.dspStandardCorrelation&amp;id=2386</a></p>



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MA.A1.QE.3:	A1.QE.3: Graph exponential and quadratic equations in two variables with and without technology.		a) Graph: $f(x) = x^2 + 4x + 4$ b) Graph: $f(x) = 3^x - 1$	<a href="http://www.virtualnerd.com/algebra-1/quadratic-equations-functions/linear-exponential-comparison/linear-exponential-comparison-graphing-examples/determine-function-type-from-graph">http://www.virtualnerd.com/algebra-1/quadratic-equations-functions/linear-exponential-comparison/linear-exponential-comparison-graphing-examples/determine-function-type-from-graph</a>
MA.AI.QE.4:	AI.QE.4: Solve quadratic equations in one variable by inspection (e.g., for $x^2 = 49$ ), finding square roots, using the quadratic formula, and factoring, as appropriate to the initial form of the equation.		Solve each equation. a) $191 = 3x^2 - 1$ b) $x^2 + 8x = -15$ c) $2x^2 = 5 - x$	
MA.AI.QE.5:	AI.QE.5: Represent real-world problems using quadratic equations in one or two variables and solve such problems with and without technology. Interpret the solution and determine whether it is reasonable.		a) A ball falls so that its distance above the ground can be modeled by the equation $s = -16t^2 + 100$ , where $s$ is the distance above the ground in feet and $t$ represents time in seconds. According to this model, at what time does the ball hit the ground? b) The height ( $h$ ) of a certain insect, in feet, that jumps straight up into the air is modeled by the equation $h = -16t^2 + vt$ , where $t$ is the time in seconds after the insect jumps, and $v$ is the initial upward velocity of the insect. Write an equation that can be used to find after $t$ seconds, if the insect's the	<a href="http://www.mathsisfun.com/algebra/quadratic-equation-real-world.html">http://www.mathsisfun.com/algebra/quadratic-equation-real-world.html</a>



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			height ( $h$ ) of the insect, in feet, initial upward velocity is 4 feet per second. How long will it take for the insect to hit the ground after it jumps?	
MA.AI.QE.6:	AI.QE.6: Use the process of factoring to determine <b>zeros, lines of symmetry, and extreme values</b> in real-world and other mathematical problems involving quadratic functions; interpret the results in the real-world contexts.	<p><b>Zeros of a Function</b> - the x-values that make the function equal to 0.</p> <p><b>Line of Symmetry</b> - for a quadratic function, the axis of symmetry divides the parabola symmetrically.</p> <p><b>Extreme Values</b> - the maximum or minimum value of a function.</p>	What are the zeros of the function $y = x^2 - 8x + 15$ ? Determine the line of symmetry and maximum value of the graph of this function.	
MA.AI.QE.7:	AI.QE.7: Describe the relationships among the solutions of a quadratic equation, the zeros of the function, the x-intercepts of the graph, and the factors of the expression.		Linda's teacher told the class that the solutions to a quadratic equation were 5 and -6. Her teacher asked the class to describe how those solutions relate to the graph, factors, and equation. Linda states that the x-intercepts of the graph are also 5 and -6, the factors are $(x + 5)$ & $(x - 6)$ , and the equation is $y = (x + 5)(x - 6)$ . Is Linda correct? Explain why or why not.	





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<b>Data Analysis and Statistics</b>				
MA.AI.DS.1:	AI.DS.1: Distinguish between <b>random</b> and non-random sampling methods, identify possible sources of <b>bias in sampling</b> , describe how such bias can be controlled and reduced, evaluate the characteristics of a good survey and well-designed experiment, design simple experiments or investigations to collect data to answer questions of interest, and make <b>inferences</b> from sample results.	<p><b>Sample</b> - the part of a population that is surveyed.</p> <p><b>Random Sample</b> - a sample in which every individual or element in the population has an equal chance of being selected.</p> <p><b>Bias</b> - a sampling error that causes one option to seem better than another.</p> <p><b>Infer</b> - to conclude or decide from something known or assumed; draw as a conclusion.</p>	A survey of high school students was conducted to measure teenage use of illegal drugs. How might this sample be biased? [sample does not include teenagers who are home schooled or those that have dropped out of school]	<a href="https://www.illustrativemathematics.org/illustrations/191">https://www.illustrativemathematics.org/illustrations/191</a>
MA.AI.DS.2:	AI.DS.2: Graph <b>bivariate data</b> on a scatter plot and describe the relationship between the variables.	<b>Bivariate Data</b> - a set of data that has two variables.	Lisa lights a candle and records its height in inches after every hour. Some of her data, recorded as (time, height), are: (0, 20), (1, 18.3), (2, 16.5), (3, 14.7), (4, 13.4), (5, 11.4), (7, 8.1), (9, 4.7), and (10, 3). Graph this data and describe the relationship between the variables. [Example continued in next standard.]	<a href="https://www.ixl.com/standards/indiana/math/algebra-1">https://www.ixl.com/standards/indiana/math/algebra-1</a>



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MA.AI.DS.3:	AI.DS.3: Use technology to find a linear function that models a relationship for a bivariate data set to make predictions; interpret the slope and y-intercept, and compute (using technology) and interpret the <b>correlation coefficient</b> .	<b>Correlation Coefficient</b> - a numerical value that reflects the relationship between two variables. This value ranges from -1 to 1. The closer the value is to -1 or 1, the stronger the relationship between the variables.	[Example continued from previous standard.] Express the candle’s height ( $h$ ) as a function of time ( $t$ ) and state the meaning of the slope and intercepts in terms of the burning candle. Then, compute the correlation coefficient and describe the relationship that exists between the two variables.	<a href="http://www.learnnc.org/lp/pages/3830?ref=search">http://www.learnnc.org/lp/pages/3830?ref=search</a>  <a href="https://www.illustrativemathematics.org/illustrations/941">https://www.illustrativemathematics.org/illustrations/941</a>
MA.AI.DS.4:	AI.DS.4: Distinguish between <b>correlation</b> and <b>causation</b> .	<b>Correlation</b> - the degree of relative correspondence, as between two sets of data. <b>Causation</b> - when a change in one quantity causes a change in a second quantity. A correlation between quantities does not always imply causation.	Diane conducted a study to determine the effects of math test scores on students’ physical height. Based on a graph of her data, she found that there was a direct relationship between students’ math test scores and height. She concluded that “doing well on math tests makes you tall.” Explain if this conclusion is valid.	<a href="https://learnzillion.com/lessons/2873-differentiate-between-correlation-and-causation">https://learnzillion.com/lessons/2873-differentiate-between-correlation-and-causation</a>  <a href="https://www.illustrativemathematics.org/illustrations/44">https://www.illustrativemathematics.org/illustrations/44</a>



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MA.AI.DS.5:

AI.DS.5: Understand that patterns of association can also be seen in bivariate categorical data by displaying **frequencies** and **relative frequencies** in a **two-way table**. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns (including **joint**, **marginal**, and **conditional relative frequencies**) to describe possible associations and trends in the data.

**Frequency** - the number of times the value appears in the data set.  
**Relative frequencies** - the ratio of the number of times an event occurs to the number of occasions on which it might occur in the same period.  
**Two-way table** - a table listing two categorical variables whose values have been paired.  
**Joint relative frequency** - found by dividing a frequency that is not in a row total or column total by the grand total.  
**Marginal relative frequency** - found by dividing a row total or column total by the grand total.  
**Conditional relative frequency** - found by dividing a frequency that is not in a row total or column total by the frequency's row total or column total.

A sample of men was taken to study the relationship between age and baldness. The data is summarized in the table.

Bald	Age < 45	Age ≥ 45	Total
Yes	18	34	52
No	41	7	48
Total	59	41	100

- How many men were part of this sample?
- What percent of the men are reported as bald?
- What percent of the men less than 45 years of age are reported as bald?
- What percent of the men greater than or equal to 45 years of age are reported as bald?
- Describe any associations that you notice in the data.

<http://mathbitsnotebook.com/Algebra1/StatisticsReg/ST2TwoWayTable.html>

<https://www.illustrativemathematics.org/illustrations/123>



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<p>MA.AI.DS.6:</p>	<p>AI.DS.6: Understand that <b>statistics</b> and data are non-neutral and designed to serve a particular interest. Analyze the possibilities for whose interest might be served and how the representations might be misleading.</p>	<p><b>Statistics</b> - facts or data of a numerical kind, assembled, classified, and tabulated so as to present significant information about a given subject.</p>	<p>An example of misleading statistics:        At one time, Colgate Toothpaste claimed that 80% of dentists recommend their brand. Based on this claim, some consumers may have been led to believe that 80% of dentists only recommend Colgate while 20% recommend other brands. However, when dentists were surveyed, they were asked to choose and recommend several brands — not just one. So other brands may have been as equally recommended as Colgate. The United Kingdom’s Advertising Standards Authority later warned Colgate not to repeat this claim.</p>	<p><a href="http://faculty.washington.edu/chudler/stat3.html">http://faculty.washington.edu/chudler/stat3.html</a></p>
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