**Algebra 1 Honors will be instructing on the new B.E.S.T. standards, not the Florida Standards.**

### Course Pacing

<table>
<thead>
<tr>
<th>Unit of Instruction</th>
<th># of Days</th>
<th>Dates of Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit 1: Solving Linear Equations &amp; Inequalities</td>
<td>10</td>
<td>8.27-9.10</td>
</tr>
<tr>
<td>Unit 2: Graphing Linear Functions &amp; Inequalities</td>
<td>15</td>
<td>9.11-10.1</td>
</tr>
<tr>
<td>Unit 3: Systems of Equations &amp; Inequalities</td>
<td>13</td>
<td>10.2-10.20</td>
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<tr>
<td><strong>Cycle 1 Assessment (Units 1-3)</strong></td>
<td>1</td>
<td><strong>10.21 (10.7-10.23)</strong></td>
</tr>
<tr>
<td>Unit 4: Exponent Rules and Radicals</td>
<td>14</td>
<td>10.22-11.11</td>
</tr>
<tr>
<td>Unit 5: Exponential Functions</td>
<td>15</td>
<td>11.12-12.9</td>
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<tr>
<td>Thanksgiving Break (11.21-11.29)</td>
<td></td>
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<tr>
<td><strong>Midterm Exam (Units 1-5)</strong></td>
<td>1</td>
<td><strong>(12.14-12.18)</strong></td>
</tr>
<tr>
<td>Unit 6: Financial Literacy</td>
<td>7</td>
<td>1.4-1.12</td>
</tr>
<tr>
<td>Semester 1 Ends on 1.15.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit 7: Polynomials</td>
<td>10</td>
<td>1.13-1.29</td>
</tr>
<tr>
<td>Semester 1 Ends on 1.15.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit 8: Quadratic Equations</td>
<td>10</td>
<td>2.1-2.12</td>
</tr>
<tr>
<td>Unit 9: Quadratic Functions</td>
<td>12</td>
<td>2.16-3.3</td>
</tr>
<tr>
<td>Unit 10: Transformations &amp; Special Cases</td>
<td>8</td>
<td>3.4-3.22</td>
</tr>
<tr>
<td>Spring Break (3.13-3.22)</td>
<td></td>
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<tr>
<td><strong>Cycle 3 Assessment (Units 7-10) OPTIONAL</strong></td>
<td>1</td>
<td><strong>3.22-3.31</strong></td>
</tr>
<tr>
<td>Unit 11: Classifying and Analyzing Functions</td>
<td>10</td>
<td>3.23-4.7</td>
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<tr>
<td>Unit 12: Composition of Functions</td>
<td>5</td>
<td>4.8-4.14</td>
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<tr>
<td>Unit 13: Interpreting Statistics</td>
<td>8</td>
<td>4.15-4.26</td>
</tr>
<tr>
<td>Unit 14: Calculating Statistics</td>
<td>11</td>
<td>4.27-5.11</td>
</tr>
<tr>
<td><strong>Algebra 1 EOC</strong></td>
<td>2</td>
<td><strong>5/3 – 5/27</strong></td>
</tr>
<tr>
<td>August 2020</td>
<td>Building Community in the Math Classroom</td>
<td>Re-Building Community in the Math Classroom</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------------------</td>
<td>------------------------------------------</td>
</tr>
</tbody>
</table>
| 10 11 12 13 14 | **Unit 1: Solving Linear Equations & Inequalities**  
MA.912.AR.1.1 MA.912.AR.2.1 | **Unit 7: Polynomials**  
continued from semester 1  
MA.912.AR.1.3 MA.912.AR.1.7 |
| 17 18 19 20 21 | **Unit 2: Graphing Linear Functions & Inequalities**  
MA.912.AR.2.2 MA.912.AR.2.5 | **Unit 8: Quadratic Equations**  
MA.912.AR.3.1 |
| 24 25 26 27 28 | **Unit 3: Systems of Equations & Inequalities**  
MA.912.AR.9.1 MA.912.AR.9.6 | **Unit 9: Quadratic Functions**  
MA.912.AR.3.4 MA.912.AR.3.7 |
| 31 | **Unit 4: Exponent Rules and Radicals**  
MA.912.NSO.1.1 MA.912.NSO.1.4 | **Unit 10: Transformations & Special Cases**  
MA.912.F.2.1 MA.912.F.2.3 |

*Optional Cycle 3 Assessment (Units 7-10)*  
window: May 3 - May 28

*Unit 6 will likely be zeroed out on the Midterm Exam*
## Semester 1

### Unit 1: Solving Linear Equations and Inequalities

<table>
<thead>
<tr>
<th>Benchmarks</th>
<th>Benchmark Clarifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MA.912.AR.1.1</strong> — Identify and interpret parts of an equation or expression that represent a quantity in terms of a mathematical or real-world context, including viewing one or more of its parts as a single entity.</td>
<td>Clarification 1: Parts of an expression include factors, terms, constants, coefficients, and variables Clarification 2: Within the Mathematics for Data and Financial Literacy course, problem types focus on money and business.</td>
</tr>
<tr>
<td>Example: Derrick is using the formula $P = 1000(1 + .1)^t$ to make a prediction about the camel population in Australia. He identifies the growth factor as $(1+.1)$, or 1.1, and states that the camel population will grow at an annual rate of 10% per year.</td>
<td></td>
</tr>
<tr>
<td>Example: The expression $1.15^t$ can be rewritten as $\left(1.15^{\frac{1}{12}}\right)^{12t}$ which is approximately equivalent to $1.012^{12t}$. This latter expression reveals the approximate equivalent monthly interest rate of 1.2% if the annual rate is 15%.</td>
<td></td>
</tr>
<tr>
<td><strong>MA.912.AR.1.2</strong> — Rearrange equations or formulas to isolate a quantity of interest.</td>
<td>Clarification 1: Instruction includes using formulas for temperature, perimeter, area, and volume; using equations for linear (standard, slope-intercept, and point-slope forms) and quadratic (standard, factored, and vertex forms) functions. Clarification 2: Within the Mathematics for Data and Financial Literacy course, problem types focus on money and business.</td>
</tr>
<tr>
<td>Example: Given the Compound Interest Formula $A = P\left(1 + \frac{r}{n}\right)^{nt}$, solve for $P$.</td>
<td></td>
</tr>
<tr>
<td>Example: Given the Compound Interest Formula $A = P\left(1 + \frac{r}{n}\right)^{nt}$, solve for $t$</td>
<td></td>
</tr>
<tr>
<td><strong>MA.912.AR.2.1</strong> — Given a real world context, write and solve one variable multistep linear equations.</td>
<td></td>
</tr>
<tr>
<td><strong>MA.912.AR.2.6</strong> — Given a mathematical or real world context, write and solve one variable linear inequalities, including compound inequalities. Represent solutions algebraically or graphically.</td>
<td></td>
</tr>
<tr>
<td>Example: The compound inequality $2x \leq 5x + 1 &lt; 4$ is equivalent to $-1 \leq 3x$ \textit{AND} $5x &lt; 3$, which is equivalent to $-\frac{1}{3} \leq x &lt; \frac{3}{5}$.</td>
<td></td>
</tr>
</tbody>
</table>
## Essential Vocabulary

<table>
<thead>
<tr>
<th>Vocabulary</th>
<th>Definition/Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algebraic Expression</td>
<td>A mathematical phrase combining numbers and/or variables.</td>
</tr>
<tr>
<td>Base</td>
<td>In an expression of the form $x^n$, the base is $x$.</td>
</tr>
<tr>
<td>Coefficient</td>
<td>The numerical factor of a term.</td>
</tr>
<tr>
<td>Compound inequality</td>
<td>Two or more inequalities that are connected by the words <strong>and</strong> or <strong>or</strong>.</td>
</tr>
<tr>
<td>Constant</td>
<td>A monomial that is a real number.</td>
</tr>
<tr>
<td>Equation</td>
<td>A mathematical statement that includes an equal sign to demonstrate that two quantities/expressions have the same value.</td>
</tr>
<tr>
<td>Exponent</td>
<td>In an expression of the form $x^n$, the exponent is $n$. It indicates the number of times $x$ is used as a factor.</td>
</tr>
<tr>
<td>Expression</td>
<td>Numbers and symbols group together by operators that represent a quantity.</td>
</tr>
<tr>
<td>Factors</td>
<td>In an algebraic expression, the quantities being multiplied are called factors.</td>
</tr>
<tr>
<td>Inequality</td>
<td>An open sentence that contains the symbol $&lt;, \leq, &gt;, or \geq$.</td>
</tr>
<tr>
<td>Linear</td>
<td>An equation in the form $Ax + By = C$, with a graph that is a straight line.</td>
</tr>
<tr>
<td>Point-Slope Form</td>
<td>An equation of the form $y - y_1 = m(x - x_1)$, where $m$ is the slope and $(x_1, y_1)$ is a given point on a nonvertical line.</td>
</tr>
<tr>
<td>Power</td>
<td>In an expression of the form $x^n$, read $x$ to the $n$th power.</td>
</tr>
<tr>
<td>Product</td>
<td>In an algebraic expression, the result of quantities being multiplied is called the product.</td>
</tr>
<tr>
<td>Slope-Intercept Form</td>
<td>An equation of the form $y = mx + b$, where $m$ is the slope and $b$ is the $y$ intercept.</td>
</tr>
<tr>
<td>Standard Form (linear)</td>
<td>The standard form of a linear equation is $Ax + By = C$, where $A \geq 0$, $A$ and $B$ are not both zero and $A$, $B$, and $C$ are integers with a greatest common factor of 1.</td>
</tr>
<tr>
<td>Term</td>
<td>A number, variable, or a product or quotient of numbers and variables.</td>
</tr>
<tr>
<td>Variable</td>
<td>Symbols used to represent unspecified numbers or values.</td>
</tr>
</tbody>
</table>

### The 2020-2021 school year we are transitioning from the Florida Mathematics Standards (MAFS) to the B.E.S.T. standards (MA)

In the unit guides we have identified which B.E.S.T. standard matches with which MAFS standard(s).

**MA.912.AR.1.1**

**Connections between B.E.S.T. and Florida Standards**

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
</table>
| **MA.912.AR.1.1** Identify and interpret parts of an equation or expression that represent a quantity in terms of a mathematical or real-world context, including viewing one or more of its parts as a single entity. | **MAFS.912.A-SSE.1.1** Interpret expressions that represent a quantity in terms of its context.  
- Interpret parts of an expression, such as terms, factors, and coefficients.  
- Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret $P(1 + r)^n$ as the product of $P$ and a factor not depending on $P$.  
*MAFS.912.A-SSE.1.2* Use the structure of an expression to identify ways to rewrite it. |
<table>
<thead>
<tr>
<th>Instructional Learning Objectives</th>
<th>Instructional Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students will be able to:</td>
<td>McGraw-Hill Algebra 1:</td>
</tr>
<tr>
<td>• Identify parts of an expression within context</td>
<td>Chapter 1, Lesson 1 – Variables and Expressions</td>
</tr>
<tr>
<td>• Interpret parts of an expression within context</td>
<td>• Use questions 34 – 42 (on pages 7-8) to ensure students can manipulate and interpret the parts of an expression.</td>
</tr>
<tr>
<td>• Understand quantities as a single entity</td>
<td>IXL Algebra 1:</td>
</tr>
<tr>
<td>o Example: In point-slope form, students can see $(x - x_1)$, as a single entity.</td>
<td>I.2: Sort factors of variable expressions [ML9]</td>
</tr>
<tr>
<td></td>
<td>H.3: Simplify variable expressions using properties [HHR]</td>
</tr>
<tr>
<td></td>
<td>Z.1: Polynomial vocabulary [MTT]</td>
</tr>
<tr>
<td>Khan Academy:</td>
<td>Algebra 1: [Algebra Foundations]</td>
</tr>
<tr>
<td>Algebra Nation:</td>
<td>2019 – 2020 version:</td>
</tr>
<tr>
<td></td>
<td>Section 1:</td>
</tr>
<tr>
<td></td>
<td>Topic 1 - Using Expressions to Represent Real World Situations</td>
</tr>
<tr>
<td></td>
<td>Topic 2: Understanding Polynomial Expressions</td>
</tr>
<tr>
<td></td>
<td>Topic 3: Algebraic Expressions Using the Distributive Property</td>
</tr>
<tr>
<td></td>
<td>Topic 4: Algebraic Expressions Using the Commutative and Associative Properties</td>
</tr>
<tr>
<td></td>
<td>Topic 5: Properties of Exponents</td>
</tr>
<tr>
<td></td>
<td>Section 2:</td>
</tr>
<tr>
<td></td>
<td>Topic 2: Identifying Properties When Solving Equations</td>
</tr>
<tr>
<td>2020-2021 version:</td>
<td>Section 1:</td>
</tr>
<tr>
<td></td>
<td>Topic 1: Using Expressions to Represent Real World Situations</td>
</tr>
<tr>
<td>Illustrative Mathematics:</td>
<td>Click [here] to get to Algebra 1</td>
</tr>
<tr>
<td></td>
<td>• Teachers will be able to access student resource but will need to set up a (free) account to access lessons with prompts and guiding questions</td>
</tr>
<tr>
<td></td>
<td>• Unit 2 Sections 1.1,1.2</td>
</tr>
<tr>
<td></td>
<td>• [Student Task Card] Scroll to the bottom of the page to access the student task pdf file.</td>
</tr>
</tbody>
</table>
Sample Problem: In the following expression, $\frac{1}{2}x^2 + 3x - \frac{1}{5}x^7 + 8x$, what is the degree of the polynomial?

### MA.912.AR.1.2

**Connections between B.E.S.T. and Florida Standards**

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MA.912.AR.1.2</strong> Rearrange equations or formulas to isolate a quantity of interest.</td>
<td><strong>MAFS.912.A-CED.1.4</strong> Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. <em>For example, rearrange Ohm’s law $V = IR$ to highlight resistance $R$.</em>*</td>
</tr>
</tbody>
</table>

**Instructional Learning Objectives**

Students will be able to:
- Manipulate a formula, or equation, to isolate the variable of interest.

**Instructional Resources**

- **McGraw-Hill Algebra 1:**
  - Chapter 1, Lesson 2 pages 10 -15
    - This lesson is meant to refresh the students’ memory of how to correctly apply order of operations.
  - Chapter 2, lesson 8 pages 126 - 131

- **IXL Algebra 1:**
  - I.9: Rearrange multi-variable equations [WSJ](#)
  - O.4: Rate of travel: word problems [2C8](#)

- **IXL Algebra 2:**
  - B.6: Solve multi-variable equations [LZD](#)

- **Khan Academy:**
  - Algebra 2 – Modeling: [Manipulating Formulas](#)

- **Algebra Nation:**
  - Section 2:
    - Topic 8: Rearranging Formulas

- **Illustrative Mathematics:**
  - Click [here](#) to get to Algebra 1
    - Teachers will be able to access student resource but will need to set up a (free) account to access lessons with prompts and guiding questions
    - Unit 2 Section 8.1
    - **Student Task Card** Scroll to the bottom of the page to access the student task pdf file.

**Sample Problems:**

1) Given the Compound Interest Formula $A = P \left(1 + \frac{r}{n}\right)^{nt}$, solve for $P$. 
2) The volume of a cylinder can be written as \( V = \left( \frac{1}{3} \right) \pi r^2 h \). Solve for \( r \).

## MA.912.AR.2.1

<table>
<thead>
<tr>
<th>Connections between B.E.S.T. and Florida Standards</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>B.E.S.T.</td>
<td>Florida Standard</td>
</tr>
<tr>
<td><strong>MA.912.AR.2.1</strong> Given a real world context, write and solve one variable multistep linear equations</td>
<td><strong>MAFS.912.A-CED.1.1</strong> Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational, absolute, and exponential functions.</td>
</tr>
<tr>
<td></td>
<td><strong>MAFS.912.A-REI.1.1</strong> Explain each step in solving a simple equation 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>
<tr>
<td></td>
<td><strong>MAFS.912.A-REI.2.3</strong> Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.</td>
</tr>
</tbody>
</table>

### Instructional Learning Objectives

Students will be able to:

- Write one variable multi-step linear equations from a real-world word problem.
- Solve one variable multi-step linear equations derived from a real-world word problem.

### Instructional Resources

**McGraw-Hill Algebra 1:**
Chapter 2, Lesson 1 – 5: pages 75 – 110
- Lessons 6 and 7 can also be used to help students master this standard but these two lessons focus on ratios, proportions, and percent change. All of which, should, have been taught in the prior grades.

**IXL Algebra 1:**
- H.4: Properties of Equality [H8Q](#)
- H.5: Identify Equivalent Equations [XNO](#)
- I.5: Write Variable Equations [YVW](#)
- J.2: Write and Solve Equations that Represent Diagrams [GBC](#)
- J.10: Solve linear equations: word problems [UFG](#)

**IXL Algebra 2:**
- B.2: Solve linear equations: word problems [2BG](#)
- B.3: Solve Equations: Complete the solution [N83](#)

**Khan Academy:**
Algebra 1 – [Solving Equations and Inequalities](#):
- Linear equations with variables on both sides
- Linear equations with parentheses
- Analyzing the number of solutions to linear equations
- Linear equations with unknown coefficients
Sample Problem: The Environmental Club at the school took a trip to the water treatment facility. There were 26 students and 4 chaperones on the trip. The total cost of the trip was $320.00. A ticket for a chaperone was $5 more than a student ticket. What was the cost of a student ticket?

MA.912.AR.2.6 Connections between B.E.S.T. and Florida Standards

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA.912.AR.2.6 Given a mathematical or real world context, write and solve one variable linear inequalities, including compound inequalities. Represent solutions algebraically or graphically.</td>
<td>MAFS.912.A-REI.2.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.</td>
</tr>
<tr>
<td></td>
<td>MAFS.912.A-CED.1.1 Create equations and inequalities in one variable and use them to solve problems.</td>
</tr>
</tbody>
</table>

Instructional Learning Objectives

Students will be able to:

- Write one variable multi-step linear inequalities from a math or real-world context.

Instructional Resources

- IXL: Algebra 1:
- Solve one variable multi-step linear inequalities from a math or real-world context.
- Represent solutions to one variable multi-step linear inequalities derived from a math or real-world context algebraically.

<table>
<thead>
<tr>
<th>K.3: Identify solutions to inequalities</th>
<th>K.4: Solve one-step linear inequalities: addition and subtraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>K.5: Solve one-step linear inequalities: multiplication and division</td>
<td>K.6: Solve one-step linear inequalities EEX</td>
</tr>
<tr>
<td>K.8: Solve two-step linear inequalities NPZ</td>
<td>K.10: Solve advanced linear inequalities 9K8</td>
</tr>
<tr>
<td>K.14: Solve compound inequalities GXA</td>
<td></td>
</tr>
</tbody>
</table>

Geometry:
- A.7: Solve linear inequalities 9MX

Algebra 2:
- C.2: Write inequalities from graphs NKA
- C.4: Solve linear inequalities 98Z

Khan Academy:
- Algebra 1 – Solving Equations and Inequalities:
  - Multi-step inequalities
  - Compound inequalities

Algebra Nation:
- Section 2: Topics 5, 6, and 7

Illustrative Mathematics:
- Click [here](#) to get to Algebra 1
  - Teachers will be able to access student resource but will need to set up a (free) account to access lessons with prompts and guiding questions
  - Unit 2 Section 20
  - [Student Task Card](#) Scroll to the bottom of the page to access the student task pdf file.

Sample Problem(s):

1) Solve for x: $1 < 3x + 4 \leq 10$

2) Due to the drought in Florida, many communities have scaled water rates. There are different rates for Conservation Usage, Normal Usage and Excessive Usage. The usage is measured in the number of hundred cubic feet (hcf) the property owner uses. During the summer, a property owner will pay $24.72 plus $1.54 per hcf for Normal Usage. The bill for Normal Usage would be between or equal to $57.06 and $171.02. How many hcf can the owner use if he wants his usage to stay in the normal range?
<table>
<thead>
<tr>
<th>Benchmarks</th>
<th>Benchmark Clarifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MA.912.AR.2.2</strong> - Write a linear two-variable equation to represent relationships between quantities from a graph, a written description or a table of values within a mathematical or real-world context.</td>
<td>Clarification 1: Instruction includes the use of standard form, slope-intercept form and point-slope form, and the conversion between these forms.</td>
</tr>
</tbody>
</table>
| **MA.912.AR.2.3** - Write a linear two-variable equation for a line that is parallel or perpendicular to a given line and goes through a given point. | Clarification 1: Instruction focuses on recognizing that perpendicular lines have slopes that when multiplied result in −1 and that parallel lines have slopes that are the same.  
Clarification 2: Instruction includes representing a line with a pair of points on the coordinate plane or with an equation.  
Clarification 3: Problems include cases where one variable has a coefficient of zero. |
| **MA.912.AR.2.4** - Given a table, equation or written description of a linear function, graph that function, and determine and interpret its key features. | Clarification 1: Key features are limited to domain, range, intercepts and rate of change.  
Clarification 2: Instruction includes the use of standard form, slope-intercept form and point-slope form.  
Clarification 3: Instruction includes cases where one variable has a coefficient of zero.  
Clarification 4: Instruction includes representing the domain and range with inequality notation, interval notation or set-builder notation.  
Clarification 5: Within the Algebra 1 course, notations for domain and range are limited to inequality and set-builder. |
| **MA.912.AR.2.5** - Solve and graph mathematical and real-world problems that are modeled with linear functions. Interpret key features and determine domain constraints in terms of the context. | Clarification 1: Key features are limited to domain, range, intercepts and rate of change.  
Clarification 2: Instruction includes the use of standard form, slope-intercept form and point-slope form.  
Clarification 3: Instruction includes representing the domain, range and constraints with inequality notation, interval notation or set-builder notation. |
Clarification 4: Within the Algebra 1 course, notations for domain and range are limited to inequality and set-builder.

Clarification 5: Within the Mathematics for Data and Financial Literacy course, problem types focus on money and business.

<table>
<thead>
<tr>
<th>Essential Vocabulary</th>
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</thead>
<tbody>
<tr>
<td><strong>Vocabulary</strong></td>
</tr>
<tr>
<td>Boundary</td>
</tr>
<tr>
<td>Closed Half-Plane</td>
</tr>
<tr>
<td>Constant</td>
</tr>
<tr>
<td>Constant Function</td>
</tr>
<tr>
<td>Constraint</td>
</tr>
<tr>
<td>Domain</td>
</tr>
<tr>
<td>Linear Equation</td>
</tr>
<tr>
<td>Open Half-Plane</td>
</tr>
<tr>
<td>Parallel Lines</td>
</tr>
<tr>
<td>Perpendicular Lines</td>
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<tr>
<td>Point-Slope Form</td>
</tr>
<tr>
<td>Range</td>
</tr>
<tr>
<td>Rate of Change</td>
</tr>
<tr>
<td>Set-builder notation</td>
</tr>
<tr>
<td>Slope</td>
</tr>
<tr>
<td>Slope-Intercept Form</td>
</tr>
</tbody>
</table>
Standard Form | The standard form of a linear equation is $Ax + By = C$, where $A \geq 0$, $A$ and $B$ are not both zero, and $A$, $B$, and $C$ are integers with a greatest common factor of 1.
---|---
x-intercept | The $x$-coordinate of a point where a graph crosses the $x$-axis.
y-intercept | The $y$-coordinate of a point where a graph crosses the $y$-axis.

The 2020-2021 school year we are transitioning from the Florida Mathematics Standards (MAFS) to the B.E.S.T. standards (MA).

In the unit guides we have identified which B.E.S.T. standard matches with which MAFS standard(s).

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA.912.AR.2.2</td>
<td>MAFS.912.A-CED.1.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales</td>
</tr>
</tbody>
</table>

Students will be able to:
- Write a linear equation* given a graph
- Write a linear equation* given a written description
- Write a linear equation* given a table of values
- Write a direct variation equation
- Convert standard form and point-slope form to slope-intercept form
- Convert slope-intercept to standard form

*linear equation in standard form, slope-intercept form, and/or point-slope form

### Instructional Learning Objectives

**Mc-Graw-Hill Algebra 1:**
- Chapter 3: Linear Functions
  - Lesson 1: Graphing Linear Equations
  - Lesson 2: Solving Linear Equations by Graphing
  - Lesson 3: Rate of Change and Slope
  - Lesson 4: Direct Variation
- Chapter 4: Equations of Linear Functions
  - Lesson 1: Graphing Equations in Slope Intercept Form
  - Lesson 2: Writing Equations in Slope Intercept Form
  - Lesson 3: Writing Equations in Point-Slope Form

**Algebra Nation:**
- Section 3: Introduction to Functions
  - Topic 7: Key Features of Graphs of Functions - Part 1
  - Topic 8: Key Features of Graphs of Functions - Part 2
  - Topic 9: Average Rate of Change Over and Interval
- Section 4: Linear Equations, Functions & Inequalities
  - Topic 2: Rate of Change of Linear Functions
  - Topic 3: Interpreting Rate of Change and $y$-intercept in a Real-World Context - Part 1
  - Topic 4: Interpreting Rate of Change and $y$-intercept in a Real-World Context - Part 2

**IXL Math Algebra 1:**
You can access problems for these new standards by choosing the Florida’s B.E.S.T. Standards: Algebra 1 skill plan. To access click [here](#).

**Direct variation**
1. Write direct variation equations (Y6M)

**Slope-intercept form**
2. Slope-intercept form: write an equation from a graph (9GW)
3. Slope-intercept form: write an equation (A42)
4. Slope-intercept form: write an equation from a table (SSE)

**Standard form**
5. Write equations in standard form (ESP)

**Point-slope form**
6. Point-slope form: write an equation (PPE)
7. Point-slope form: write an equation from a graph (LBX)

**Virtual Nerd Videos:**
- How Do You Write the Equation of a Line in Slope-Intercept Form if You Have the Slope and y-intercept?
- How Do You Write the Equation of a Line in Slope-Intercept Form if You Have a Graph?
- How Do You Write the Equation of a Line in Slope-Intercept Form if You Have a Table?
- How Do You Write an Equation of a Line in Point-Slope Form Given Slope and a Point?
- How Do You Write an Equation of a Line in Point-Slope Form and Standard for if You Have Two Points?
- How Do You Use Point-Slope Form to Write an Equation from a Table?
- How Do You Put an Equation in Point-Slope Form into Standard or Slope-Intercept Form?

**Khan Academy:**
Courses → Algebra 1 → Forms of Linear Equations
- Intro to slope-intercept form
- Slope and y-intercept from equation
- Worked examples: slope-intercept intro
- Linear equation word problems
- Slope-intercept equation from graph
- Slope-intercept equation from slope & point
- Slope-intercept equation from two points
- Constructing linear equations from context
- Intro to point-slope form
Sample Problems:

1. A pool starts off with 300 liters of water and is being filled at a rate of 25 liters per minute. Let $W$ represent the amount of water in the pool after $T$ minutes of filling it with additional water. Write an equation to represent this situation.

2. Which function is represented by the input-output table below?

<table>
<thead>
<tr>
<th>$x$</th>
<th>$f(x)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>8</td>
<td>26</td>
</tr>
</tbody>
</table>

- A. $f(x) = 3x + 2$
- B. $f(x) = 2x + 3$
- C. $f(x) = 0.5x + 4.5$
- D. $f(x) = 4.5x + 0.5$

**Illustrative Mathematics:**
Click [here](#) to get to Algebra 1

*Teachers will be able to access student resource but will need to set up a (free) account to access lessons with prompts and guiding questions.*

- Unit 2 Lessons 10 & 11

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### MA.912.AR.2.3

**Connections between B.E.S.T. and Florida Standards**

**B.E.S.T.**

| MA.912.AR.2.3 | Write a linear two-variable equation for a line that is parallel or perpendicular to a given line and goes through a given point. |

**Florida Standard**

| Geometry Standard: MAFS.912.G-GPE.2.5 | Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point). |

**Instructional Learning Objectives**

Students will be able to:

- Recognize parallel lines have the same slopes
- Recognize perpendicular lines have slopes whose product is -1
- Write a linear equation for a line perpendicular/parallel to a given line through a given point.

**Instructional Resources**

- **Mc-Graw-Hill Algebra 1:**
  - Chapter 4: Equations of Linear Functions
    - Lesson 4: Parallel and Perpendicular Lines

- **Algebra Nation:**
  - Geometry Section 1: Introduction to Geometry
    - Topic 8: Parallel and Perpendicular Lines – Part 1
    - Topic 9: Parallel and Perpendicular Lines – Part 2
IXL Math Algebra 1:
You can access problems for these new standards by choosing the Florida’s B.E.S.T. Standards: Algebra 1 skill plan. To access click here.
1. Slopes of parallel and perpendicular lines (ADB)
2. Write an equation for a parallel or perpendicular line (SSH)

Virtual Nerd Videos:
• How Do You Know if Two Lines are Parallel?
• How Do You Know if Two Lines are Perpendicular?
• How to Find the Slope of a Line if You Have a Parallel Line?
• How to Find the Slope of a Line if You Have a Perpendicular Line?
• How Do You Write an Equation of a Line in Slope-Intercept Form if You Have One Point and a Parallel Line?
• How Do You Write an Equation of a Line in Slope-Intercept Form if You Have One Point and a Perpendicular Line?

Sample Problems:
1. Determine whether the graphs of the pair of equations are parallel, perpendicular, or neither.
   \[ y = -6x + 8 \]
   \[ 3x + \frac{1}{2}y = -3 \]

2. An archaeologist is comparing the location of a jeweled box she just found to the location of a brick wall. The wall can be represented by the equation \[ y = -\frac{5}{3}x + 13 \]. The box is located at the point (10, 9). Write an equation representing a line that is perpendicular to the wall and that passes through the location of the box.

MA.912.AR.2.4
Connections between B.E.S.T. and Florida Standards

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA.912.AR.2.4</td>
<td>MAFS.912.F-IF.2.4</td>
</tr>
</tbody>
</table>

Given a table, equation or written description of a linear function, graph that function, and determine and interpret its key features.
**Instructional Learning Objectives**

Students will be able to:
- Graph a linear function given a table
- Graph a linear function given an equation
- Graph a linear function given a written description
- Determine and interpret a graph’s key features
- Identify slope, y-intercept, and x-intercept in a given linear function

**Instructional Resources**

**Mc-Graw-Hill Algebra 1:**
- Chapter 3: Linear Functions
  - Lesson 1: Graphing Linear Equations
  - Lesson 2: Solving Linear Equations by Graphing
  - Lesson 3: Rate of Change and Slope
  - Lesson 4: Direct Variation

- Chapter 4: Equations of Linear Functions
  - Lesson 1: Graphing Equations in Slope Intercept Form
  - Lesson 2: Writing Equations in Slope Intercept Form
  - Lesson 3: Writing Equations in Point-Slope Form

**Algebra Nation:**
- Section 3: Introduction to Functions
  - Topic 7: Key Features of Graphs of Functions - Part 1
  - Topic 8: Key Features of Graphs of Functions - Part 2
  - Topic 9: Average Rate of Change Over and Interval

- Section 4: Linear Equations, Functions & Inequalities
  - Topic 2: Rate of Change of Linear Functions
  - Topic 3: Interpreting Rate of Change and y-intercept in a Real-World Context - Part 1
  - Topic 4: Interpreting Rate of Change and y-intercept in a Real-World Context - Part 2

**IXL Math Algebra 1:**
You can access problems for these new standards by choosing the Florida’s B.E.S.T. Standards: Algebra 1 skill plan. To access click [here](#).

- Identify key features
  1. Find the slope of a graph (**E7D**)
  2. Slope-intercept form: find the slope and y-intercept (**R5T**)
  3. Standard form: find x- and y-intercepts (**8SN**)

- Graph linear functions
  4. Slope-intercept form: graph an equation (**UWB**)
  5. Complete a table and graph a linear function (**JFG**)
  6. Standard form: graph an equation (**U6U**)

**MAFS.912.F-IF.3.7** Graph functions expressed symbolically and show **key features of the graph**, by hand in simple cases and using technology for more complicated cases.
7. Point-slope form: graph an equation (F8H)

**Virtual Nerd Videos:**
- How Do You Graph a Linear Equation in Slope-Intercept Form by Making a Table?
- How Do You Graph a Line if You’re Given the Slope and the Intercept?

**SAFARI Montage:**
- Graphing a Linear Equation - worksheet

**Khan Academy:**
Courses → Algebra 1 → Forms of Linear Equations → Graphing slope-intercept equations
  - Graph from slope-intercept equation

Courses → Algebra 1 → Forms of Linear Equations → Standard Form
  - Graphing linear equation: $5x + 2y = 20$

**Illustrative Mathematics:**
Click [here](#) to get to Algebra 1

Teachers will be able to access student resource but will need to set up a (free) account to access lessons with prompts and guiding questions
- Unit 4 Lesson 4, 5, & 6

**Sample Problems:**

1. Graph a linear function with a slope of -4 and the same $y$-intercept as the function below.
   \[ y = \frac{2}{3}x + 3 \]

2. Identify the $x$-intercept, $y$-intercept, slope, and equation of the linear function graphed below.

```
x-intercept: __________
y-intercept: __________
slope: __________
equation: __________
```
**MA.912.AR.2.5**

**Connections between B.E.S.T. and Florida Standards**

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MA.912.AR.2.5</strong> Solve and <strong>graph</strong> mathematical and real-world problems that are modeled with <strong>linear functions</strong>. <strong>Interpret key features</strong> and determine <strong>domain</strong> constraints in terms of the context.</td>
<td><strong>MAFS.912.F-IF.2.4</strong> For a function that models a relationship between two quantities, <strong>interpret key features</strong> of <strong>graphs</strong> and tables in terms of the quantities and sketch <strong>graphs</strong> showing <strong>key features</strong> given a verbal description of the relationship. <strong>Key features</strong> include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. <strong>MAFS.912.F-IF.2.5</strong> Relate the <strong>domain</strong> of a function to its <strong>graph</strong> and, where applicable, to the quantitative relationship it describes.</td>
</tr>
</tbody>
</table>

**Instructional Learning Objectives**

- Students will be able to:
  - Create, solve, and graph equations and inequalities in a real-world relationship
  - explain the steps for solving equations
  - explain the steps for solving inequalities

**Instructional Resources**

- **Mc-Graw-Hill Algebra 1:**
  - Chapter 3: Linear Functions
    - Lesson 1: Graphing Linear Equations
    - Lesson 2: Solving Linear Equations by Graphing
    - Lesson 3: Rate of Change and Slope
    - Lesson 4: Direct Variation
  - Chapter 4: Equations of Linear Functions
    - Lesson 1: Graphing Equations in Slope Intercept Form
    - Lesson 2: Writing Equations in Slope Intercept Form
    - Lesson 3: Writing Equations in Point-Slope Form
  - Chapter 5: Linear Inequalities
    - Lesson 6: Graphing Inequalities in Two Variables

- **Algebra Nation:**
  - Section 2: Equations and Inequalities
    - Topic 5: Solving Inequalities – Part 1
    - Topic 6: Solving Inequalities – Part 2
    - Topic 9: Solutions Sets to Equations with Two Variables

- **IXL Math Algebra 1:**
  - You can access problems for these new standards by choosing the Florida’s B.E.S.T. Standards: Algebra 1 skill plan. To access click [here](#).
  1. Slope-intercept form: write an equation from a word problem (HWM)
  2. Write linear functions to solve word problems (9RQ)
Virtual Nerd Videos:
- How Do You Write the Equation of a Line in Slope-Intercept Form from a Word Problem?
- How Do You Solve and Graph Inequalities from a Word Problem?

SAFARI Montage:
- Graphing and Interpreting Functions - worksheet

Khan Academy:
Courses → Algebra 1 → Linear equations & graphs → Two-variable linear equations intro
  - Two-variable linear equations intro
  - Solutions to two-variable equations
  - Worked example: solutions to 2-variable equations
  - Completing solutions to 2-variable equations
Courses → Algebra 1 → Inequalities (systems & graphs) → Graphing two-variable inequalities
  - Intro to graphing two-variable inequalities

Illustrative Mathematics:
Click here to get to Algebra 1

Teachers will be able to access student resource but will need to set up a (free) account to access lessons with prompts and guiding questions
- Unit 4 Lesson 12
  - Student Task Scroll to the bottom of the page to access the student task pdf file.

Sample Problem:
Lizzy’s mother is planning a 16th birthday party. To help budget for the party she uses the function \( C(p) = 450 + 7.75p \), where \( C(p) \) represents the total cost of a rental space and \( p \) is the number of people attending. Lizzy’s mom wants to spend no more than $850 for the party. Graph the function in terms of the context.
• write two-variable linear inequalities from a written description
• write two-variable linear inequalities from a real-world situation

Algebra Nation:
Section 2: Equations and Inequalities
• Topic 5: Solving Inequalities – Part 1
• Topic 6: Solving Inequalities – Part 2
• Topic 9: Solutions Sets to Equations with Two Variables

IXL Math Algebra 1:
You can access problems for these new standards by choosing the Florida’s B.E.S.T. Standards: Algebra 1 skill plan. To access click here.
1. Linear inequalities: word problems (ZAY)

Khan Academy:
Courses → Algebra 1 → Inequalities (systems & graphs) → Graphing two-variable inequalities
• Two-variable inequalities from their graphs
Courses → Algebra 1 → Inequalities (systems & graphs) → Modeling with linear inequalities
• Writing two-variable inequalities word problem

Illustrative Mathematics:
Click here to get to Algebra 1
Teachers will be able to access student resource but will need to set up a (free) account to access lessons with prompts and guiding questions.
• Unit 2 Lesson 21
  Student Task Scroll to the bottom of the page to access the student task pdf file.
• Unit 2 Section 22
  Student Task Scroll to the bottom of the page to access the student task pdf file.

Sample Problems:
1. Match the following two variable inequalities to their graph.

A. \( y < 2x + 1 \)     B. \( y \geq 2x + 1 \)     C. \( y > 2x + 1 \)     D. \( y \leq 2x + 1 \)
2. Liam is selling tickets to a school jazz concert. Student tickets cost $7.50 each and guest tickets cost $12.00 each. Liam’s goal is to sell at least $120.00 in tickets. Write an inequality that represents the number of student tickets $s$ and guest tickets $g$ that Liam must sell to reach his goal.

<table>
<thead>
<tr>
<th>MA.912.AR.2.8</th>
<th>Connections between B.E.S.T. and Florida Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>B.E.S.T.</strong></td>
<td><strong>Florida Standard</strong></td>
</tr>
<tr>
<td>MA.912.AR.2.8 Given a mathematical or real-world context, graph the solution set to a two-variable linear inequality.</td>
<td>MAFS.912.A-REI.4.12 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.</td>
</tr>
</tbody>
</table>

**Instructinal Learning Objectives**
- model a real-world situation with a two-variable inequality
- interpret the meaning of the solutions and represent them on a graph

**Instructional Resources**

**Mc-Graw-Hill Algebra 1:**
- Chapter 5: Linear Inequalities
  - Lesson 6: Graphing Inequalities in Two Variables

**Algebra Nation:**
- Section 2: Equations and Inequalities
  - Topic 9: Solutions Sets to Equations with Two Variables
- Section 4: Linear Equations, Functions & Inequalities
  - Topic 9: Solution Sets to Inequalities with Two Variables

**IXL Math Algebra 1:**
- You can access problems for these new standards by choosing the Florida’s B.E.S.T. Standards: Algebra 1 skill plan. To access click [here](#).
  - 1. Graph a two-variable inequality (HHP)

**Virtual Nerd Videos:**
- [How Do You Solve and Graph Inequalities from a Word Problem?](#)
- [How Do You Determined a Situation that a Graph Represents?](#)

**Khan Academy:**
- Courses → Algebra 1 → Inequalities (systems & graphs) → Graphing two-variable inequalities
  - Graphing two-variable inequalities
- Courses → Algebra 1 → Inequalities (systems & graphs) → Modeling with linear inequalities
  - Solving two-variable inequalities word problem
  - Graphs of two-variable inequalities word problem
• Interpreting two-variable inequalities word problem

**Illustrative Mathematics:**
Click [here](#) to get to Algebra 1
*Teachers will be able to access student resource but will need to set up a (free) account to access lessons with prompts and guiding questions.*

• Unit 2 Lesson 23
  [Student Task](#) Scroll to the bottom of the page to access the student task pdf file.

**Sample Problem:**
The Drama Club sold cider and donuts to raise money for new costumes. They sold small boxes of donut holes for $1.25 and cider for $2.50 a gallon. To cover their expenses, they needed to raise at least $100. Write and graph an inequality that represents this situation.
**Semester 1**

**Unit 3: System of Equations and Inequalities**

<table>
<thead>
<tr>
<th>Benchmarks</th>
<th>Benchmark Clarifications</th>
</tr>
</thead>
</table>
| **MA.912.AR.9.1** Given a mathematical or real-world context, write and solve a system of two-variable linear equations algebraically or graphically. | Clarification 1: Within this benchmark, the expectation is to solve systems using elimination, substitution and graphing.  
Clarification 2: Within the Algebra 1 course, the system is limited to two equations. |
| **MA.912.AR.9.4** Graph the solution set of a system of two-variable linear inequalities. | Clarification 1: Instruction includes cases where one variable has a coefficient of zero.  
Clarification 2: Within the Algebra 1 course, the system is limited to two inequalities. |
| **MA.912.AR.9.6** Given a real-world context, represent constraints as systems of linear equations or inequalities. Interpret solutions to problems as viable or non-viable options. | Clarification 1: Instruction focuses on analyzing a given function that models a real-world situation and writing constraints that are represented as linear equations or linear inequalities. |

**Essential Vocabulary**

<table>
<thead>
<tr>
<th>Vocabulary</th>
<th>Definition/Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>System of Equations</td>
<td>A set of two or more equations that has a common set of solutions</td>
</tr>
<tr>
<td>Elimination Method</td>
<td>Method of solving a system in which two equations are added together in a manner that will eliminate one of the two variables.</td>
</tr>
<tr>
<td>Substitution Method</td>
<td>Method for solving a system of linear equations in which the equivalent expression of a variable is substituted for that variable into the other equation.</td>
</tr>
<tr>
<td>Inconsistent System</td>
<td>A type of system that does not have a solution</td>
</tr>
<tr>
<td>Consistent system</td>
<td>A type of system that has at least one solution</td>
</tr>
<tr>
<td>Dependent System</td>
<td>A type of system that has infinitely many solution (its graph has only one visible line)</td>
</tr>
<tr>
<td>Independent System</td>
<td>A system with exactly one solution (Its graph has two intersecting lines)</td>
</tr>
<tr>
<td>The point of intersection</td>
<td>The point at which two lines cross</td>
</tr>
<tr>
<td>Solution to a System</td>
<td>The point of intersection for a system of equations</td>
</tr>
<tr>
<td>System of inequalities</td>
<td>A system made up of two or more inequalities</td>
</tr>
</tbody>
</table>

**MA.912.AR.9.1**

**Connections between B.E.S.T. and Florida Standards**

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
</table>
| **MA.912.AR.9.1** Given a mathematical or real-world context, write and **solve a system of** two-variable linear equations algebraically or graphically. | **MAFS.912.A-REI.3.6** **Solve systems of linear equations** exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables  
**MAFS.912.A-REI.3.5** Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equations and a multiple of the other produces a system with the same solutions. |
MAFS.912.A-REI.4.11 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. Include cases where \( f(x) \) and/or \( g(x) \) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.

<table>
<thead>
<tr>
<th>Instructional Learning Objectives</th>
<th>Instructional Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students will be able to:</td>
<td>McGraw-Hill Algebra 1:</td>
</tr>
<tr>
<td>• Write a system of linear equations that represents a real-world problem.</td>
<td>• 6-1 Graphing Systems of Equations</td>
</tr>
<tr>
<td>• Solve system of equations by graphing.</td>
<td>• 6-2 Substitution</td>
</tr>
<tr>
<td>• Solve system of equations by substitution</td>
<td>• 6-3 Elimination Using Addition and Subtraction</td>
</tr>
<tr>
<td>• Solve system of equations by elimination</td>
<td>• 6-4 Elimination Using Multiplication</td>
</tr>
<tr>
<td>• Determine whether a given system has one solution, no solution, or infinitely many solutions</td>
<td>• 6-5 Applying Systems of Linear Equations</td>
</tr>
<tr>
<td>• Determine whether a system is consistent or inconsistent</td>
<td>IXL Math Algebra 1</td>
</tr>
<tr>
<td>• Determine whether a system is dependent or independent</td>
<td>• Classify a system of equations LTA</td>
</tr>
<tr>
<td>• Determine the best method to solve a given system of equations</td>
<td>• Classify a system of equations by graphing T2D</td>
</tr>
<tr>
<td>• Determine whether an ordered pair is a solution of a system of equations</td>
<td>• Is ((x, y)) a solution to the system of equations? LRL</td>
</tr>
<tr>
<td>• Solve application problems by graphing a system of equations</td>
<td>• Find the number of solutions to a system of equations by graphing HIW</td>
</tr>
<tr>
<td></td>
<td>• Find the number of solutions to a system of equations ACN</td>
</tr>
<tr>
<td></td>
<td>• Solve a system of equations by graphing: word problems BVB</td>
</tr>
<tr>
<td></td>
<td>• Solve a system of equations by graphing TSS</td>
</tr>
<tr>
<td></td>
<td>• Solve a system of equations using substitution 8P9</td>
</tr>
<tr>
<td></td>
<td>• Solve a system of equations using substitution: word problems US9</td>
</tr>
<tr>
<td></td>
<td>• Solve a system of equations using elimination: word problems NHR</td>
</tr>
<tr>
<td></td>
<td>• Solve a system of equations using elimination A48</td>
</tr>
<tr>
<td></td>
<td>Khan Academy</td>
</tr>
<tr>
<td></td>
<td>• Introduction to Systems of Equations</td>
</tr>
<tr>
<td></td>
<td>• Solving systems of equations with substitution</td>
</tr>
<tr>
<td></td>
<td>• Equivalent systems of equations and the elimination method</td>
</tr>
<tr>
<td></td>
<td>• Number of solutions to systems of equations</td>
</tr>
<tr>
<td></td>
<td>• Systems of equations word problems</td>
</tr>
<tr>
<td></td>
<td>Algebra Nation</td>
</tr>
<tr>
<td></td>
<td>Section 4 Linear Equations: Functions and Inequalities</td>
</tr>
<tr>
<td></td>
<td>• Topic 5 – Introduction to Systems of Equations</td>
</tr>
</tbody>
</table>
Sample Problem:
Tickets to the Homecoming Game cost $5 for students and $8 for adults. So far, 374 tickets were sold and $2044 were collected. Write and solve a system of equations to determine the number of student tickets, $s$, and the number of adult tickets, $a$, sold.

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**MA.912.AR.9.4**

**Connections between B.E.S.T. and Florida Standards**

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA.912.AR.9.4 <strong>Graph the solution set of a system of two-variable linear inequalities</strong>.</td>
<td>MAFS.912.A-REI.4.12 Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of strict inequality), and <strong>graph the solution set to a system of linear inequalities in two variables</strong> as the intersection of the corresponding half-planes.</td>
</tr>
</tbody>
</table>

**Instructional Learning Objectives**

Students will be able to:
- Graph a system of linear inequalities.
- Determine which region (if any) represents all the solutions to the given system of linear inequalities.
- Determine whether an ordered pair is a solution of a system of inequalities.
- Solve application problems by graphing a system of inequalities.

**Instructional Resources**

- McGraw-Hill Algebra 1:
  - 6-6 Systems of Inequalities
  - Extend 6-6 Using a graphing calculator
- IXL Math
  - Solve systems of linear inequalities by graphing [5GH](#)
- Khan Academy
  - [Inequalities (systems and graphs)](#)
Algebra Nation
Section 4 Linear Equations: Functions and Inequalities
- Topic 10 – Finding Solution Sets to Systems of Linear Inequalities

MFAS Formative Assessments
- Graph a System of Inequalities
- Graphing Linear Inequalities
- Linear Inequalities in the Half-Plane
- Which Graph?

Illustrative Mathematics:
Click here to get to Algebra 1
- Teachers will be able to access student resource but will need to set up a (free) account to access lessons with prompts and guiding questions
- Unit 2 Lesson 24 & 25
Lesson 24, Lesson 25 Scroll to the bottom of the page to access the student task pdf file.

Sample Problem
Graph the solution to the following system of inequalities:
\[
\begin{align*}
  y &< \frac{1}{3}x + 1 \\
  x - 6y &\leq 12
\end{align*}
\]

MA.912.AR.9.5
Connections between B.E.S.T. and Florida Standards

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MA.912.AR.9.6</strong> Given a real-world context, represent constraints as systems of linear equations or inequalities. Interpret solutions to problems as viable or non-viable options.</td>
<td><strong>MAFS.912.A-CED.1.3</strong> Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.</td>
</tr>
</tbody>
</table>

Instructional Learning Objectives
Students will be able to:
- Determine constraints for the given system of equations or inequalities based on the context of a given problem.

Instructional Resources
McGraw-Hill Algebra 1:
- 5-6 Graphing Inequalities in Two Variables
- 6-1 Graphing Systems of Equations
- Explain why these constraints are necessary.
- Determine whether the solution to the given system is viable based on the context of a given problem.

6-5 Applying Systems of Linear Equations and Inequalities

**IXL Math**
- Linear inequalities: word problems [ZAY](#)
- Solve a system of equations by graphing: word problems [BVB](#)
- Solve a system of equations using substitution: word problems [US9](#)
- Solve a system of equations using elimination: word problems [NHR](#)
- Solve a system of equations using any method: word problems [GDQ](#)

**Mathematics Formative Assessments (MFAS)**
- Constraints on Equations
- Sugar and Protein
- The New School

**Illustrative Mathematics**
Click [here](#) to get to Algebra 1
- Teachers will be able to access student resource but will need to set up a (free) account to access lessons with prompts and guiding questions
- Unit 2 Lesson 26
  [Lesson 26](#), Scroll to the bottom of the page to access the student task pdf file.

**Sample Problem**
Which y-values make the ordered pair \((0, y)\) a solution of the system of inequalities represented by the graph?

(A) \(-2 \leq y < 6\)
(B) \(-2 < y \leq 6\)
(C) \(-2 < y \leq 3\)
(D) \(-2 \leq y < 3\)
### Unit 4: Exponent Rules and Radicals

**14 Days**
**Oct. 22 – Nov. 11**

<table>
<thead>
<tr>
<th>Benchmarks</th>
<th>Benchmark Clarifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MA.912.NSO.1.1</strong> - Extend previous understanding of the Laws of Exponents to include rational exponents. Apply the Laws of Exponents to evaluate numerical expressions and generate equivalent numerical expressions involving rational exponents.</td>
<td>Clarification 1: Instruction includes the use of technology when appropriate.</td>
</tr>
<tr>
<td></td>
<td>Clarification 2: Refer to the K-12 Formulas (Appendix E) for the Laws of Exponents.</td>
</tr>
<tr>
<td></td>
<td>Clarification 3: Instruction includes converting between expressions involving rational exponents and expressions involving radicals.</td>
</tr>
<tr>
<td></td>
<td>Clarification 4: Within the Mathematics for Data and Financial Literacy course, it is not the expectation to generate equivalent numerical expressions.</td>
</tr>
<tr>
<td><strong>MA.912.NSO.1.2</strong> - Generate equivalent monomial algebraic expressions using the properties of exponents.</td>
<td></td>
</tr>
<tr>
<td><strong>MA.912.NSO.1.4</strong> - Apply previous understanding of operations with rational numbers to add, subtract, multiply and divide numerical radicals.</td>
<td>Clarification 1: Within the Algebra 1 course, expressions are limited to a single arithmetic operation involving two square roots or two cube roots.</td>
</tr>
</tbody>
</table>

### Essential Vocabulary

<table>
<thead>
<tr>
<th>Vocabulary</th>
<th>Definition/Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base</td>
<td>In an expression of the form $x^n$, the base is $x$.</td>
</tr>
<tr>
<td>Constant</td>
<td>A monomial that is a real number.</td>
</tr>
<tr>
<td>Cube Root</td>
<td>If $a^3 = b$, then $a$ is the cube root of $b$.</td>
</tr>
<tr>
<td>Exponent</td>
<td>In an expression in the form $x^n$, the exponent is $n$. It indicates the number of times $x$ is used as a factor.</td>
</tr>
<tr>
<td>Exponential Equation</td>
<td>An equation in which the variables occur as exponents.</td>
</tr>
<tr>
<td>Monomial</td>
<td>A number, a variable, or a product of a number and one or more variables.</td>
</tr>
<tr>
<td>Power</td>
<td>An expression of the form $x^n$, read $x$ to the $n$th power.</td>
</tr>
<tr>
<td>$n$th Root</td>
<td>If $a^n = b$, then $a$ is the $n$th root of $b$.</td>
</tr>
<tr>
<td>Radical Expression</td>
<td>An expression that contains a radical, such as a square root.</td>
</tr>
<tr>
<td>Radical Function</td>
<td>A function that contains radicals with variables in the radicand.</td>
</tr>
<tr>
<td>Radicand</td>
<td>The expression that is under the radical sign.</td>
</tr>
<tr>
<td>Rational Exponent</td>
<td>For any positive real number $b$ and any integers $m$ and $n&gt;1$, $b^{\frac{m}{n}} = (\sqrt[n]{b})^m$ or $\sqrt[\frac{m}{n}]{b}$. $\frac{m}{n}$ is a rational exponent.</td>
</tr>
<tr>
<td>Rationalizing the Denominator</td>
<td>A method used to eliminate radicals from the denominator of a fraction.</td>
</tr>
<tr>
<td>Square Root</td>
<td>One of two equal factors of a number.</td>
</tr>
<tr>
<td>Square Root Function</td>
<td>A function that contains the square root of a variable.</td>
</tr>
</tbody>
</table>
The 2020-2021 school year we are transitioning from the Florida Mathematics Standards (MAFS) to the B.E.S.T. standards (MA).

In the unit guides we have identified which B.E.S.T. standard matches with which MAFS standard(s).

<table>
<thead>
<tr>
<th>MA.912.NSO.1.1</th>
<th>Connections between B.E.S.T. and Florida Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>B.E.S.T.</strong></td>
<td><strong>Florida Standard</strong></td>
</tr>
<tr>
<td>MA.912.NSO.1.1</td>
<td>Extend previous understanding of the Laws of Exponents to include rational exponents. Apply the Laws of Exponents to evaluate numerical expressions and generate equivalent numerical expressions involving rational exponents</td>
</tr>
<tr>
<td>MAFS.912.A-SSE.2.3</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></td>
<td>a. Use the properties of exponents to transform expressions for exponential functions. For example, the expression $1.15^2$ can be rewritten as $(1.15^{1/2})^{2t} = 1.012^{2t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.</td>
</tr>
<tr>
<td>MAFS.912.F-IF.3.8</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>
<td>a. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{2t}$, $y = (1.2)^{x/3}$, and classify them as representing exponential growth or decay.</td>
</tr>
<tr>
<td>MAFS.912.N-RN.1.1</td>
<td>Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)*3}$ to hold, so $(5^{1/3})^3$ must equal 5.</td>
</tr>
</tbody>
</table>

**Instructional Learning Objectives**

**Instructional Resources**

Students will be able to:

- Evaluate and rewrite expressions involving rational exponents

**Mc-Graw-Hill Algebra 1:**

Chapter 7: Exponents and Exponential Functions

- Lesson 3: Rational Exponents

**Algebra Nation:**

Section 1: Expressions

- Topic 4: Radical Expressions and Expressions with Rational Exponents
- Topic 5: Adding Expressions with Radicals and Rational Exponents
- Topic 6: More Operations with Radicals and Rational Exponents
IXL Math Algebra 1:
You can access problems for these new standards by choosing the Florida’s B.E.S.T. Standards: Algebra 1 skill plan. To access click here.

1. Evaluate integers raised to rational exponents (PQH)
2. Multiplication with rational exponents (YG7)
3. Division with rational exponents (H47)
4. Power rule with rational exponents (QF8)
5. Simplify expressions involving rational exponents (89Q)

Khan Academy:
- Algebra 2 [Intro to Rational Exponents]
- Algebra 2 [Rewriting roots as rational exponents]

Illustrative Mathematics Assessment Tasks:
- [Evaluating Exponential Expressions] This task is to use properties of exponents for whole numbers in order to explain how expression with fractional exponents are defined.
- [Checking a Calculation of a Decimal Exponent] This task is to connect properties of fractional exponents with ordering of real numbers.

MARS/Shell Center:
- [Evaluating Statements about Radicals] In this lesson students will use the properties of exponents, including rational exponents and manipulate algebraic statements involving radicals. Discriminate between equations and identities.

Illustrative Mathematics:
Click [here] to get to Algebra 2
Teachers will be able to access student resource but will need to set up a (free) account to access lessons with prompts and guiding questions
- Unit 3 Lesson 3, 4 & 5
  - Lesson 3, Lesson 4, Lesson 5 Scroll to the bottom of the page to access the student task pdf file.

Sample Problems:
1. Simplify $625^{\frac{1}{4}}$.

   $625^{\frac{1}{4}} = \sqrt[4]{625}$
   $= \sqrt[4]{5 \cdot 5 \cdot 5 \cdot 5}$
   $= 5$

   Simplify
2. Evaluate $27^{\frac{1}{3}} \times 3^{\frac{1}{3}}$

\[
27^{\frac{1}{3}} \times 3^{\frac{1}{3}} = (27 \times 3)^{\frac{1}{3}}
\]

\[
= 81^{\frac{1}{3}}
\]

\[
= \sqrt[3]{81}
\]

\[
= 3
\]

**MA.912.NSO.1.2**

Connections between B.E.S.T. and Florida Standards

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
</table>
| MA.912.NSO.1.2 Generate equivalent monomial algebraic expressions using the properties of exponents. | MAFS.912.A-SSE.2.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.  
   a. Use the properties of exponents to transform expressions for exponential functions. For example, the expression $1.15^t$ can be rewritten as $(1.15^{1/12})^{12t} = 1.012^t$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%. |
| MAFS.912.A-SSE.2.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.  
   a. Use the properties of exponents to transform expressions for exponential functions. For example, the expression $1.15^t$ can be rewritten as $(1.15^{1/12})^{12t} = 1.012^t$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%. | |
| MAFS.912.F-IF.3.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.  
   a. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{12t}$, $y = (1.2)^{t/12}$, and classify them as representing exponential growth or decay. | |
| MAFS.912.F-IF.3.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.  
   a. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{12t}$, $y = (1.2)^{t/12}$, and classify them as representing exponential growth or decay. | |

**Instructional Learning Objectives**

**Instructional Resources**

Students will be able to:
- Multiply and divide monomials using the properties of exponents
- Simplify expressions using the properties of exponents
- Use the properties of exponents to rewrite expressions with integer exponents

**Mc-Graw-Hill Algebra 1:**  
Chapter 7: Exponents and Exponential Functions  
- Lesson 1: Multiplication Properties of Exponents  
- Lesson 2: Division Properties of Exponents

**Algebra Nation:**  
Section 1: Expressions  
- Topic 2: Properties of Exponents

**IXL Math Algebra 1:**  
You can access problems for these new standards by choosing the Florida’s B.E.S.T. Standards: Algebra 1 skill plan. To access click [here](#).  
1. Multiply monomials (S2N)  
2. Divide monomials (B48)
3. Multiply and divide monomials (48P)
4. Powers of monomials (7Q8)

Virtual Nerd Videos:
- How Do You Take the Power of a Monomial?
- How Do You Take a Monomial to a Power?
- How Do You Multiply Monomials?
- How Do You Divide Monomials Using Quotient of Powers?
- How Do You Solve a Word Problem by Dividing Monomials?
- How Do You Solve a Word Problem by Taking a Monomial to a Power?

Khan Academy:
Courses → Algebra 1 → Exponents & radicals → Exponents properties review
- Multiplying and dividing powers (integer exponents)
- Powers of products and quotients (integer exponents)

Illustrative Mathematics:
Click here to get to Algebra 2
Teachers will be able to access student resource but will need to set up a (free) account to access lessons with prompts and guiding questions.
- Unit 3 Lesson 9
  Lesson 9 Scroll to the bottom of the page to access the student task pdf file.

Sample Problems:
1. Simplify \((-2ab^2)^3(a^2)^4\).
\[
\begin{align*}
(-2ab^2)^3(a^2)^4 &= (-2ab^2)^3(a^8) \quad \text{Power of a Power} \\
&= (-2)^3(a^3)(b^2)^3(a^8) \quad \text{Power of a Product} \\
&= (-2)^3(a^3)(a^8)(b^2)^3 \quad \text{Group the coefficients and the variables} \\
&= (-2)^3(a^{11})(b^2)^3 \quad \text{Power of a Product} \\
&= -8a^{11}b^6 \quad \text{Power of a Power}
\end{align*}
\]

2. Simplify \(\frac{4a^{-3}b^6}{16a^2b^6c^{-5}}\). Assume that no denominator equals zero.
\[
\begin{align*}
\frac{4a^{-3}b^6}{16a^2b^6c^{-5}} &= \left(\frac{4}{16}\right)\left(\frac{a^{-3}}{a^2}\right)\left(\frac{b^6}{b^6}\right)\left(\frac{1}{c^{-5}}\right) \quad \text{Group powers with the same base.} \\
&= \frac{1}{4}(a^{-3-2})(b^6-b^6)(c^5) \quad \text{Quotient of Powers and Negative Exponent Properties} \\
&= \frac{1}{4}a^{-5}b^0c^5 \quad \text{Simplify} \\
&= \frac{1}{4}\left(\frac{1}{a}\right)c^5 \quad \text{Negative Exponent and Zero Exponent Properties} \\
&= \frac{c^5}{4a^5} \quad \text{Simplify}
\end{align*}
\]
3. The expression $1.5^{3t+2}$ is equivalent to the expression $2.25(1.5)^{3t}$ which is equivalent to $2.25(3.375)^t$.

### Connections between B.E.S.T. and Florida Standards

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA.912.NSO.1.4</td>
<td>MAFS.912.N-RN.1.1 Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. For example, we define $\sqrt[3]{5}$ to be the cube root of 5 because we want $(\sqrt[3]{5})^3 = 5^{\frac{1}{3}} \times 5^{\frac{2}{3}}$ to hold, so $\sqrt[3]{5}^3$ must equal 5.</td>
</tr>
<tr>
<td>MAFS.912.N-RN.1.2</td>
<td>- Rewrite expressions involving radicals and rational exponents using the properties of exponents.</td>
</tr>
<tr>
<td>MAFS.912.N-RN.2.3</td>
<td>- 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.</td>
</tr>
</tbody>
</table>

### Instructional Learning Objectives

Students will be able to:
- Simplify radical expressions by using the Product Property of Square Roots
- Simplify radical expression by using the Quotient Property of Square Roots
- Add and subtract radical expressions
- Multiply radical expressions
- Divide radical expressions

### Instructional Resources

**Mc-Graw-Hill Algebra 1:**
- Chapter 10: Radical Function and Geometry
  - Lesson 2: Simplifying Radical Expressions
  - Lesson 3: Operations with Radical Expressions

**Algebra Nation:**
- Section 1: Expressions
  - Topic 2: Properties of Exponents
  - Topic 4: Radical Expressions and Expressions with Rational Exponents
  - Topic 5: Adding Expressions with Radicals and Rational Exponents
  - Topic 6: More Operations with Radicals and Rational Exponents

**IXL Math Algebra 1:**
You can access problems for these new standards by choosing the Florida’s B.E.S.T. Standards: Algebra 1 skill plan. To access click [here](#).
1. Simplify radical expressions (ZFF)
2. Add and subtract radical expressions (DLV)
3. Divide radical expressions (TYC)
4. Simplify radicals with fractions (9ND)
5. Multiply radicals (BKA)
**Virtual Nerd Videos:**
- What is the Product Property of Square Roots?
- How Do You Multiply Two Radicals?
- What is the Quotient Property of Square Roots?
- How Do You Simplify a Radical Using the Product Property?
- How Do You Rationalize a Denominator?
- How Do You Subtract Radicals with Unlike Radicands?
- How Do You Subtract Radicals with Like Radicands?
- How Do You Add Radicals with Like Radicands?

**Khan Academy:**
Courses → Algebra 1 → Exponents & radicals → Simplifying square roots
- Simplify square roots
- Simplify square roots (variables)
- Simplify square root expressions

**Illustrative Mathematics:**
Click [here](#) to get to Algebra 2
Teachers will be able to access student resource but will need to set up a (free) account to access lessons with prompts and guiding questions.
- Unit 3 Lesson 10, 11, 12, 13, 14, & 15

**Sample Problems:**

1. Simplify $\sqrt{120a^2b^5c^4}$.

   \[
   \sqrt{120a^2b^5c^4} = \sqrt{120} \cdot \sqrt{a^2} \cdot \sqrt{b^5} \cdot \sqrt{c^4}
   \]

   \[
   = \sqrt{2^2 \cdot 3 \cdot 5} \cdot \sqrt{a^2} \cdot \sqrt{b^5} \cdot \sqrt{c^4}
   \]

   \[
   = 2 \cdot \sqrt{3} \cdot \sqrt{5} \cdot |a| \cdot b^2 \cdot \sqrt{b} \cdot \sqrt{c^2}
   \]

   \[
   = 2|a|b^2c^2\sqrt{30b}
   \]

2. Which expression is equivalent to $(\sqrt[3]{27})^4$?

   A. 12    B. 9$^2$    C. 8$^4$    D. 27$^4$

   Remember the index of a radical can be rewritten as the denominator of a rational exponent.

   \[
   (\sqrt[3]{27})^4 = (27^{1/3})^4 = 27^{4/3}
   \]

3. The expression $\frac{\sqrt{136}}{\sqrt{2}}$ is equivalent to $\frac{\sqrt{136}}{2}$ which is equivalent to $\sqrt{68}$ which is equivalent to $2\sqrt{17}$. 
**Unit 5: Exponential Functions**

<table>
<thead>
<tr>
<th>Benchmarks</th>
<th>Benchmark Clarifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MA.912.AR.5.3</strong> Given a mathematical or real-world context, classify an exponential function as representing growth or decay.</td>
<td>Clarification 1: Within the Algebra 1 course, exponential functions are limited to the forms $f(x) = ab^x$, where $b$ is a whole number greater than 1 or a unit fraction, or $f(x) = a(1 + r)^x$, where $0 &lt; r &lt; 1$.</td>
</tr>
</tbody>
</table>
| **MA.912.AR.5.4** Write an exponential function to represent a relationship between two quantities from a graph, a written description or a table of values within a mathematical or real-world context. | Clarification 1: Within the Algebra 1 course, exponential functions are limited to the forms $f(x) = ab^x$, where $b$ is a whole number greater than 1 or a unit fraction, or $f(x) = a(1 + r)^x$, where $0 < r < 1$.  
Clarity 2: Within the Algebra 1 course, tables are limited to having successive nonnegative integer inputs so that the function may be determined by finding ratios between successive outputs. |
| **MA.912.AR.5.6** Given a table, equation or written description of an exponential function, graph that function and determine its key features. | Clarification 1: Key features are limited to domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; constant percent rate of change; end behavior and asymptotes.  
Clarity 2: Instruction includes representing the domain and range with inequality notation, interval notation or set-builder notation.  
Clarity 3: Within the Algebra 1 course, notations for domain and range are limited to inequality and set-builder.  
Clarity 4: Within the Algebra 1 course, exponential functions are limited to the forms $f(x) = ab^x$, where $b$ is a whole number greater than 1 or a unit fraction, or $f(x) = a(1 + r)^x$, where $0 < r < 1$. |

**Essential Vocabulary**

<table>
<thead>
<tr>
<th>Vocabulary</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Exponential Function</td>
<td>A function that can be described by an equation of the form $y = ab^x$, where $a$ is the initial amount and $b$ is the constant ratio ($a \neq 0$, $b &gt; 0$, and $b \neq 1$)</td>
</tr>
<tr>
<td>Exponential Growth Function</td>
<td>Functions of the form $y = ab^x$, where $a &gt; 0$ and $b &gt; 1$</td>
</tr>
<tr>
<td>Exponential Decay Function</td>
<td>Functions of the form $y = ab^x$, where $a &gt; 0$ and $0 &lt; b &lt; 1$</td>
</tr>
<tr>
<td>Common Ratio</td>
<td>The number by which an exponential function repeatedly multiplies the initial amount.</td>
</tr>
</tbody>
</table>
Growth/Decay rate | The percent (written as a decimal) by which a given function is increasing (growth) or decreasing (decay)
---|---
Growth Factor | Common ratio when $b > 1$. Growth factor of an exponential function is equal to 1 plus growth rate $b = 1 + r$
Decay Factor | Common ratio when $0 < b < 1$. Decay factor of an exponential function is equal to 1 minus decay rate $b = 1 - r$
Asymptote | A line that the graph of a function gets closer to as $x$ gets larger in absolute value
Geometric Sequence | A number sequence in which each term after the first term is found by multiplying the previous term by a common ratio

### MA.912.AR.5.3
Connections between B.E.S.T. and Florida Standards

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
</table>
| MA.912.A.R.5.3 Given a mathematical or real-world context, classify an exponential function as representing growth or decay. | MAFS.912.F-LE.1.1 Distinguish between situations that can be modeled with linear functions and with exponential functions.
  a. Prove that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals.
  c. Recognize situations on which a quantity grows or decays by a constant percent rate per unit interval relative to another. | MAFS.912.F-IF.3.8b Use the properties of exponents to interpret expressions for exponential functions.
MAFS.912.F-LE.2.5 Interpret the parameters in a linear or exponential function in terms on a context. |

### Instructional Learning Objectives

**Students will be able to:**
- Use contextual situations to determine if a situation is exponential and then recognize whether a given situation represents growth or decay
- Identify the growth or decay factor
- Identify the growth or decay rate

### Instructional Resources

**McGraw-Hill Algebra 1**
- 7-5 Exponential Functions
- 7-6 Growth and Decay

**IXL Math**
- Exponential Growth and Decay: word problems [UKG](#)
- Identify Linear and Exponential Functions [CWH](#)
- Describe Linear and Exponential Growth and Decay [KLF](#)
- Exponential Growth and Decay word problems [TYQ](#)

**Algebra Nation**
Section 7: Exponential Functions
- Topic 5 – Growth and Decay Rates of Exponential Functions
Sample Problem:
Determine whether each of the following represents growth or decay (circle the appropriate term). Then identify the value of the growth/decay factor.

1. The population of Pinellas county has been increasing by 0.89% per year
   Growth/Decay Factor ______________

2. The value of a car depreciates at an estimated rate of 10% per year
   Growth/Decay Factor ______________

3. The number of bacteria doubles every hour
   Growth/Decay Factor ______________

---

### Connections between B.E.S.T. and Florida Standards

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA.912.AR.5.4 Write an exponential function to represent a relationship between two quantities from a graph, a written description or a table of values within a mathematical or real-world context.</td>
<td>MAFS.912.F-LE.1.2 Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph and a description of a relationship or two input-output pairs (including reading these from a table).</td>
</tr>
<tr>
<td>MAFS.912.F-LE.2.5 Interpret the parameters in a linear or exponential function in terms of a context.</td>
<td></td>
</tr>
</tbody>
</table>

### Instructional Learning Objectives

- Write an exponential function from a graph
- Write an exponential function given a table
- Write an exponential function given a written description of a real-world situation

### Instructional Resources

- McGraw-Hill Instructional Resource
  - 7-7 Geometric Sequences as Exponential Functions

- IXL Math
  - Evaluate an Exponential Function D6H
• Find the growth/decay factor from a table, graph and verbal description
• Interpret the initial value and the common ratio in an exponential function
• Write a recursive and explicit formula for a geometric sequence

• Write a formula for a geometric sequence Q5V
• Evaluate Exponential Functions LWE

Algebra Nation
Section 7 – Exponential Functions
• Topic 1 – Geometric Sequences
• Topic 2 – Exponential Functions

Khan Academy
• Introduction to Geometric Sequences
• Constructing Geometric Sequences
• Modeling with Sequences
• General Sequences

MFAS Formative Assessments
• What is the Function Rule?
• Writing an Exponential Function from a Description
• Writing an Exponential Function from a Table
• Writing an Exponential Function from Its Graph

Illustrative Mathematics
Click here to get to Algebra 2
• Teachers will be able to access student resource but will need to set up a (free) account to access lessons with prompts and guiding questions
• Unit 4 Lesson 6 & 7
Lesson 6, Lesson 7 Scroll to the bottom of the page to access the student task pdf file.

Sample Problem:

Chantel drew a picture of her dog on a piece of paper that is 12 centimeters long. She used a copy machine to enlarge her drawing. She used the 115% setting to make each new copy. She then used each new copy to generate the next copy, using the same copier setting. 

Enter a recursive formula that will give the length of each new copy.

\[ a_1 = \] 
\[ a_n = \]

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Equation Editor
## Connections between B.E.S.T. and Florida Standards

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA.912.AR.5.6 Given a table, equation or written description of an exponential function, graph the function and determine its key features.</td>
<td>MAFS.912.F.IF.2.4 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. Key features include: intercepts, intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.</td>
</tr>
<tr>
<td>MAFS.912.F.IF.2.5 Relate the domain of a function to its graph and where applicable, to the quantitative relationship it describes.</td>
<td></td>
</tr>
<tr>
<td>MAFS.912.F.IF.3.7 Graph functions expressed symbolically and show key features of the graph by hand in simple cases and using technology for more complicated cases.</td>
<td></td>
</tr>
</tbody>
</table>

### Instructional Learning Objectives

**Students will be able to:**
- Graph an Exponential Function given its equation or a table of values
- Graph an exponential function given a written description or key features
- Determine and interpret the domain and range of an exponential function

### Instructional Resources

- **McGraw-Hill Algebra 1**
  - 7-5 Exponential Functions

- **IXL Math**
  - Match Exponential Functions and Graphs [72J](#)
  - Domain and Range of Exponential Functions: Graphs [ANC](#)
  - Domain and Range of Exponential Functions: Equations [DZE](#)
  - Match Exponential Functions and Graphs [PCX](#)

- **Algebra Nation**
  - Section 7 – Exponential Functions
    - Topic 3 – Graphs of Exponential Functions-Part 1
    - Topic 4 – Graphs of Exponential Functions-Part 2

- **Khan Academy**
  - Exponential functions from tables and graphs

- **MFAS Formative Assessments**
  - Graphing an Exponential Function
Sample Problem
A small ball is dropped from a height of 12 ft and it begins to bounce. The height of each bounce is three-fourths of the height of the previous bounce. Graph the function that represents the height of ball, h, versus the number of bounces, b. Then identify each of the following:

y-intercept ________________
Common ratio ________________
Domain ____________
Range ________________
### Unit 6: Financial Literacy

<table>
<thead>
<tr>
<th>Benchmarks</th>
<th>Benchmark Clarifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MA.912.FL.3.2</strong> – Solve problems involving simple, compound and continuously compounded interest in a real-world context.</td>
<td>Clarification 1: Interest is limited to simple and compound.</td>
</tr>
<tr>
<td>Example: <em>Find the amount of money on deposit at the end of 5 years if you started with $500 and it was compounded quarterly at 6% interest per year.</em></td>
<td></td>
</tr>
<tr>
<td>Example: Joe won $25,000 on a lottery scratch-off ticket. How many years will it take at 6% interest compounded yearly for his money to double?</td>
<td></td>
</tr>
<tr>
<td><strong>MA.912.FL.3.4</strong> – Explain the relationship between simple interest and linear growth. Explain the relationship between compound interest and exponential growth and the relationship between continuously compounded interest and exponential growth.</td>
<td>Clarification 1: Exponential growth is limited to compound interest.</td>
</tr>
</tbody>
</table>

### Essential Vocabulary

<table>
<thead>
<tr>
<th>Vocabulary</th>
<th>Definition/Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compound Interest</td>
<td>Interest paid on both the principal and on accrued interest. A special application of exponential growth.</td>
</tr>
<tr>
<td>Continuously Compound Interest</td>
<td>A principal amount is constantly earning interest because the interest keeps earning on the interest already earned.</td>
</tr>
<tr>
<td></td>
<td>Formula for continuously compounded interest: ( A = P \cdot e^{r \cdot t} ) Where A is the total amount, P is the principal amount (the starting amount), e is the mathematical constant, r is the rate of interest and t is the time in years.</td>
</tr>
<tr>
<td>Exponential Growth</td>
<td>A growth whose rate becomes ever more rapid in proportion to the growing total number or size.</td>
</tr>
<tr>
<td></td>
<td>An exponential function will take the form ( y=ax^b ), where a&gt;0 and b&gt;1.</td>
</tr>
<tr>
<td>Linear Growth</td>
<td>A growth that has a constant rate of change.</td>
</tr>
<tr>
<td>Simple Interest</td>
<td>Interest payable only on the principal. An application of linear growth.</td>
</tr>
</tbody>
</table>
The 2020-2021 school year we are transitioning from the Florida Mathematics Standards (MAFS) to the B.E.S.T. standards (MA).

In the unit guides we have identified which B.E.S.T. standard matches with which MAFS standard(s).

<table>
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<tr>
<th>MA.912.FL.3.2</th>
<th>Connections between B.E.S.T. and Florida Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>B.E.S.T.</strong></td>
<td><strong>Florida Standard</strong></td>
</tr>
<tr>
<td>MA.912.FL.3.2</td>
<td>Solve problems involving simple, compound and continuously compounded interest in a real-world context.</td>
</tr>
<tr>
<td>Example: Find the amount of money on deposit at the end of 5 years if you started with $500 and it was compounded quarterly at 6% interest per year.</td>
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<td></td>
</tr>
<tr>
<td>There are no direct correlations to the past standards, however, this new standard is an application from the previous exponential unit and linear unit (Units 2 and 5).</td>
<td></td>
</tr>
</tbody>
</table>

**Instructional Learning Objectives**

Students will be able to:

- Identify simple, compound and continuously compounded interest.
- Evaluate simple interest problems
- Evaluate compound interest problems
- Evaluate continuously compounded interest problems

**Instructional Resources**

**McGraw-Hill Algebra 1:**
Chapter 7, lesson 6 - Growth and Decay
- This lesson was also suggested for Unit 5
Chapter 7, lesson 6 – Algebra Lab: Transforming Exponential Expressions

**Illustrative Mathematics:**
Click [here](#) to get Algebra 1
- Teachers will be able to access student resource but will need to set up a (free) account to access lessons with prompts and guiding questions
- Unit 5, lesson 16 (all): [Student Task Card](#) Scroll to the bottom of the page to access the student task pdf file.
- This lesson (unit 5, lesson 7 [all]) focuses on compound interest: [Student Task Card](#)

**IXL:**
You can access problems for these new standards as long as you ensure you choose the B.E.S.T. standards to push out to your students. There are only three practice sections for this standard: Simple interest, Compounded interest, and Continuously compounded interest. To access click [here](#).
IXL Codes:
- Simple interest: Q8G
- Compound interest: LVY
- Continuously Compounded: OZG

Khan Academy:
Courses → Economics and Finance --> Finance and capital markets → Microeconomics
– use the first section titled “Interest and Debt” to learn about e, compound interest, and continuously compounded interest basics.

Sample problems:

1. Determine the amount of money on deposit at the end of 5 years if you started with $500 and it was compounded quarterly at 6% interest per year.

2. Joe won $25,000 on a lottery scratch-off ticket. How many years will it take at 6% interest compounded yearly for his money to double?

---

MA.912.FL.3.4

Connections between B.E.S.T. and Florida Standards

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<tr>
<th>B.E.S.T.</th>
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<tr>
<td>MA.912.FL.3.4 Explain the relationship between simple interest and linear growth. Explain the relationship between compound interest and exponential growth and the relationship between continuously compounded interest and exponential growth.</td>
<td>There are no direct correlations to the past standards, however, this new standard is an application from the previous linear function unit (Unit 2) and the exponential unit (Unit 5).</td>
</tr>
</tbody>
</table>

---

**Instructional Learning Objectives**

Students will be able to:

- Identify simple interest
- Identify linear growth
- Determine and explain the relationship between simple interest and linear growth.
- Identify and understand compound interest.
- Identify and understand exponential growth.
- Identify and understand continuously compounded interest.
- Explain the relationship between compound interest and exponential growth.

**Instructional Resources**

**McGraw-Hill Algebra 1:**
Double click the icon below to open a useful pdf document on simple interest.

Adobe Acrobat Document

**Illustrative Mathematics:**
Click [here](#) to get to Algebra 1

- Teachers will be able to access student resource but will need to set up a (free) account to access lessons with prompts and guiding questions
- Explain the relationship between continuously compounded interest and exponential growth.

- **For simple interest:** Unit 5, Section 19 (all)
  - [Student Task Card](#) Scroll to the bottom of the page to access the student task pdf file.
- **For compound interest:** Unit 5, Section 20 (all)
  - [Student Task Card](#) Scroll to the bottom of the page to access the student task pdf file.

**IXL:**
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**IXL Codes:**
- Simple interest: **Q8G**
- Compound interest: **LVY**
- Continuously Compounded: **QZG**

**Khan Academy:**
Courses → Finance and capital markets → Microeconomics
– use the first section titled “Interest and Debt” to learn about $e$, compound interest, and continuously compounded interest basics.

**Sample Problems:**

Savanna and Rachelle are analyzing the chart below. Savanna says the graph below is showing compound interest, however, Rachelle disagrees, she says it’s showing simple interest. Which girl is correct? Justify your answer.
Semester 1 & 2

Unit 7: Polynomials

10 days
Jan. 13-15 and Jan. 21-29

<table>
<thead>
<tr>
<th>Benchmarks</th>
<th>Benchmark Clarifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MA.912.AR.1.3</strong> – Add, subtract and multiply polynomial expressions with rational number coefficients.</td>
<td>Clarification 1: Instruction includes an understanding that when any of these operations are performed with polynomials the result is also a polynomial. Clarification 2: Polynomial expressions are limited to 3 or fewer terms.</td>
</tr>
<tr>
<td><strong>MA.912.AR.1.4</strong> – Divide a polynomial expression by a monomial expression with rational number coefficients.</td>
<td>Clarification 1: Polynomial expressions are limited to 3 or fewer terms.</td>
</tr>
<tr>
<td><strong>MA.912.AR.1.7</strong> – Rewrite a polynomial expression as a product of polynomials over the real number system.</td>
<td>Clarification 1: Within the Algebra 1 course, polynomial expressions are limited to 4 or fewer terms with integer coefficients.</td>
</tr>
</tbody>
</table>

**Essential Vocabulary**

<table>
<thead>
<tr>
<th>Vocabulary</th>
<th>Definition/Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area Model</td>
<td>A rectangular diagram used to model multiplication and division.</td>
</tr>
<tr>
<td>Binomial</td>
<td>An algebraic expression of the sum or the difference of two terms.</td>
</tr>
<tr>
<td>Coefficient</td>
<td>A numerical or constant quantity placed before and multiplying the variable in an algebraic expression (e.g. 4 in $4x^3$)</td>
</tr>
<tr>
<td>Monomial</td>
<td>An algebraic expression consisting of one term.</td>
</tr>
<tr>
<td>Polynomial</td>
<td>An expression of more than two algebraic terms, especially the sum of several terms that contain different powers of the same variable(s).</td>
</tr>
</tbody>
</table>

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In the unit guides we have identified which B.E.S.T. standard matches with which MAFS standard(s).

**MA.912.AR.1.3**

**Connections between B.E.S.T. and Florida Standards**

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MA.912.AR.1.3 Add, subtract and multiply polynomial expressions with rational number coefficients.</strong></td>
<td><strong>MAFS.912.A-APR.1.1</strong> 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.</td>
</tr>
</tbody>
</table>

**Instructional Learning Objectives**

- Students will be able to:
  - Identify when a polynomial is closed (produces another polynomial).
  - Add polynomial expressions.
  - Subtract polynomial expressions.
  - Multiply polynomial expressions using the area model method or the FOIL method.

**Instructional Resources**

- **McGraw-Hill Algebra 1:**
  - Chapter 8: Algebra lab (pg.463)
  - Lessons 1 – 4

- **Illustrative Mathematics:**
  - Click [here](#) to get Algebra 1
  - Teachers will be able to access student resource but will need to set up a (free)
account to access lessons with prompts and guiding questions

- Use *Algebra 2* Unit 2, Lesson 4 (all parts). Click [here](#) and scroll down to the bottom to get the student task card. This is for combining polynomials.
- *For Multiplying polynomials*, use the following lesson ([Algebra 1, Unit 6, lesson 8](#))

**IXL:**
Access Algebra 1 (from the MAFS standards) [here](#) and have students work on *Section Z, 2 – 10.*

**IXL Codes:**
2. Model polynomials with algebra tiles **TYV**
3. Add and subtract polynomials using algebra tiles **J7V**
4. Add and subtract polynomials **5EK**
5. Add polynomials to find perimeter **8AS**
6. Multiply a polynomial by a monomial **G2G**
7. Multiply two polynomials using algebra tiles **WR5**
8. Multiply two binomials **M7Q**
9. Multiply two binomials: special cases **9JN**
10. Multiply polynomials **58A**

**Khan Academy:**
Have students work in the Algebra II course with the *Polynomial Arithmetic.* Students can complete all the sections of that unit with the exception of “Average rate of change of polynomials.”

**Algebra Nation:**
Section 3 – Topics 3, 4, and 5

**Sample problems:**

1) What is the sum of the following polynomials: \((-3x^2 + 12)\) and \([(x - 5)^2 + 7]\)

See next page for sample #2...
2) Determine the area of the envelope \textit{NOT} covered by the address label?

\[(7x + 3) \text{ (envelope)}\]

\[(6x + 4)\]

\[(2x + 3)\]

\[(x + 10)\]

\begin{tabular}{|c|}
\hline
Ms. Math \\
111 Pascal Way \\
Euclid, Greece \\
16180 \\
\hline
\end{tabular}

---

**MA.912.AR.1.4**

**Connections between B.E.S.T. and Florida Standards**

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
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</tr>
</thead>
<tbody>
<tr>
<td>MA.912.AR.1.4 Divide a polynomial expression by a monomial expression with rational number coefficients.</td>
<td>MAFS.912.A-APR.2.2 Know and apply the Remainder Theorem: For a polynomial (p(x)) and a number (a), the remainder on division by (x - a) is (p(a)), so (p(a) = 0) if and only if ((x - a)) is a factor of (p(x)).</td>
</tr>
</tbody>
</table>

---

**Instructional Learning Objectives**

Students will be able to:

- Divide a polynomial expression by a monomial.
- Recognize when a monomial is a factor of an expression
- Correctly write a remainder of a polynomial division problem when necessary.

**Instructional Resources**

- **McGraw-Hill Algebra 1:**
  - Chapter 11, Lesson 4 pg. 698
  - Chapter 11, Lesson 5 pg. 706

- **Illustrative Mathematics:**
  - Click [here](#) to get to Algebra 1
  - Teachers will be able to access student resource but will need to set up a (free) account to access lessons with prompts and guiding questions
  - For dividing polynomials, use the following two lessons: [Algebra 2, Unit 2, Lesson 12](#) and [Algebra 2, Unit 2, Lesson 13](#).
  - To work on the remainder theorem, use the lesson Algebra 2, Unit 2, Lesson 15. Click [here](#) to get to the student task card (scroll to the bottom of the page to get the pdf access).
IXL: 
Access Algebra 1 (from the MAFS standards) here and have students work on Section GG, 5 – 6.

**IXL Codes:**
5. Divide polynomials by monomials 72C
6. Divide polynomials using long division LY7

Khan Academy:
Have students work in the Algebra II course with the Polynomial Division unit. Students should complete all parts of this unit.

**Sample Problems:**
1) Determine the quotient of the following problem: \( \frac{-12a^5 + 30a^4 + 21a^3}{3a^2} \)

2) Let \( f(x) = 2x^3 - 3x^2 - 5x + 6 \). Is \( x - 1 \) a factor?

---

**MA.912.AR.1.7**

**Connections between B.E.S.T. and Florida Standards**

<table>
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<tr>
<th>B.E.S.T.</th>
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</tr>
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<tbody>
<tr>
<td>MA.912.AR.1.7 Rewrite a polynomial expression as a product of polynomials.</td>
<td>MAFS.912.A-APR.4.6 Rewrite simple rational expressions in different forms; write ( a(x)/b(x) ) in the form ( q(x) + r(x)/b(x) ), where ( a(x) ), ( b(x) ), ( q(x) ), and ( r(x) ) are polynomials with the degree of ( r(x) ) less than the degree of ( b(x) ), using inspection, long division, or, for the more complicated examples, a computer algebra system. MAFS.912.A-SSE.1.2 Use the structure of an expression to <strong>identify ways to rewrite it</strong>. For example, see ( x^4 - y^4 ) as ( (x^2)^2 - (y^2)^2 ), thus recognizing it as a <strong>difference of squares</strong> that can be factored as ( (x^2 - y^2)(x^2 + y^2) ).</td>
</tr>
</tbody>
</table>

**Instructional Learning Objectives**

Students will be able to:

- Identify perfect squares
- Recognize a pattern with the difference, or sum, of squares
- Rewrite polynomial expressions as a difference of squares or as the product that leads to the simplified expression.

**Instructional Resources**

**McGraw-Hill Algebra 1:**
Chapter 8, Lesson 8 pg. 516

**Illustrative Mathematics:**
Click here to get to Algebra 1

- Teachers will be able to access student resource but will need to set up a (free) account to access lessons with prompts and guiding questions
IXL:
Access Algebra 1 (from the MAFS standards) here and have students work on Section Z.9, Section AA.6

In Algebra II, students can work on “Factor using a quadratic pattern,” in Section I.4.

IXL Codes:
A1- Z.9: Multiply two binomials: special cases 9JN
A1 – AA.6: Factor quadratics: special cases 56E
A2-I.4: Factor using quadratic pattern QKF

Khan Academy:
Have students work in the Algebra II course with the Special Products of Polynomials unit Students can complete all parts of this unit.

Algebra Nation:
Section 1 - Topics 3, 4, and 5
Section 2 - Topic 2
Section 3 - Topics 3 and 4
Section 5 - Topics 2, 5, and 6

Sample Problems:
Tyreek says that you can re-write the expression \((x - 4)(x + 4)\) as \((x^2 - 16)\). Jenn thinks this is incorrect and that it should be written as \((x^2 + 8x - 16)\). Who is correct and explain why.
<table>
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<tr>
<th>Benchmarks</th>
<th>Benchmark Clarifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MA.912.AR.3.1</strong> - Given a mathematical or real-world context, write and solve one-variable quadratic equations over the real number system.</td>
<td>Clarification 1: Within the Algebra 1 course, instruction includes the concept of non-real answers, without determining non-real solutions. Clarification 2: Within this benchmark, the expectation is to solve by factoring techniques, taking square roots, the quadratic formula and completing the square.</td>
</tr>
</tbody>
</table>

### Essential Vocabulary

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<tbody>
<tr>
<td>Completing the Square</td>
<td>To add a constant term to a binomial of form $x^2 + bx$ so that the resulting trinomial is a perfect square.</td>
</tr>
<tr>
<td>Difference of Two Squares</td>
<td>Two perfect squares separated by a subtraction sign.</td>
</tr>
<tr>
<td>Discriminant</td>
<td>In the Quadratic Formula, the expression under the radical sign, $b^2 - 4ac$.</td>
</tr>
<tr>
<td>Factoring</td>
<td>To express a polynomial as the product of monomials and polynomials. Finding the completely factored form.</td>
</tr>
<tr>
<td>Factoring by Grouping</td>
<td>To use the Distributive Property to factor some polynomials having four or more terms. Terms are put into groups and then factored.</td>
</tr>
<tr>
<td>Perfect Square Trinomial</td>
<td>A trinomial that is the square of a binomial.</td>
</tr>
<tr>
<td>Prime Polynomial</td>
<td>A polynomial that cannot be written as a product of two polynomials with integral coefficients.</td>
</tr>
<tr>
<td>Quadratic Equation</td>
<td>An equation of the form $ax^2 + bx + c = 0$ where $a \neq 0$.</td>
</tr>
<tr>
<td>Quadratic Formula</td>
<td>The solutions of a quadratic equation are given by the formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.</td>
</tr>
<tr>
<td>Zero Product Property</td>
<td>If the product of two factors is 0, then at least one of the factors must be 0.</td>
</tr>
</tbody>
</table>

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### MA.912.AR.3.1

**Connections between B.E.S.T. and Florida Standards**

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<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
</table>
| **MA.912.AR.3.1** Given a mathematical or real-world context, write and solve one-variable quadratic equations over the real number system. | **MAFS.912.A.REI.2.4** 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 $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form. |
b. **Solve quadratic equations** by inspection (e.g., for \(x^2 = 49\)), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as \(a \pm bi\) for real numbers \(a\) and \(b\).

**MAFS.912.A-SSE.2.3** 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.

### Instructional Learning Objectives

<table>
<thead>
<tr>
<th>Instructional Learning Objectives</th>
<th>Instructional Resources</th>
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</thead>
<tbody>
<tr>
<td>Students will be able to:</td>
<td>Mc-Graw-Hill Algebra 1:</td>
</tr>
<tr>
<td>• Solve equations of the form of (ax^2 + bx = 0)</td>
<td>Chapter 8: Quadratic Expressions and Equations</td>
</tr>
<tr>
<td>• Solve equations of the form (x^2 + bx + c = 0)</td>
<td>* Only part 2, Solve Equations by Factoring in these lessons</td>
</tr>
<tr>
<td>• Solve equations of the form (ax^2 + bx + c = 0)</td>
<td>• Lesson 5: Using the Distributive Property *</td>
</tr>
<tr>
<td>• Use the difference of squares to solve equations</td>
<td>• Lesson 6: Solving (x^2 + bx + c = 0) *</td>
</tr>
<tr>
<td>• Solve equations involving perfect squares</td>
<td>• Lesson 7: Solving (ax^2 + bx + c = 0) *</td>
</tr>
<tr>
<td>• Complete the square to write perfect square trinomials</td>
<td>• Lesson 8: Difference of Two Squares *</td>
</tr>
<tr>
<td>• Solve quadratic equations by taking the square root of each side (square root property)</td>
<td>• Lesson 9: Perfect Squares *</td>
</tr>
<tr>
<td>• Solve quadratic equations by completing the square</td>
<td>Chapter 9: Quadratic Functions and Equations</td>
</tr>
<tr>
<td>• Solve quadratic equations by using the Quadratic Formula</td>
<td>• Lesson 4: Solving Quadratic Equations by Completing the Square</td>
</tr>
<tr>
<td>• Use the discriminant to determine the number of solutions to a quadratic equation</td>
<td>• Lesson 5: Solving Quadratic Equations by Using the Quadratic Formula</td>
</tr>
</tbody>
</table>

### Algebra Nation:

<table>
<thead>
<tr>
<th>Section 2: Equations and Inequalities</th>
<th>Topic 4: Solving Equations using the Zero Product Property</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 5: Quadratic Functions – Part 1</td>
<td>Topic 2: Factoring Quadratic Expressions</td>
</tr>
<tr>
<td></td>
<td>Topic 3: Solving Quadratic Equations by Factoring</td>
</tr>
<tr>
<td></td>
<td>Topic 4: Solving Other Quadratic Equations by Factoring</td>
</tr>
<tr>
<td></td>
<td>Topic 5: Solving Quadratic Equations by Factoring - Special Cases</td>
</tr>
<tr>
<td></td>
<td>Topic 6: Solving Quadratic Equations by Taking Square Roots</td>
</tr>
<tr>
<td></td>
<td>Topic 7: Solving Quadratic Equations by Completing the Square</td>
</tr>
<tr>
<td></td>
<td>Topic 8: Deriving the Quadratic Formula</td>
</tr>
</tbody>
</table>
• Topic 9: Solving Quadratic Equations Using the Quadratic Formula
• Topic 10: Quadratic Functions in Action
Section 6: Quadratic Functions – Part 2
• Topic 2: Nature of the Solutions of Quadratic Equations and Functions
section 8: Summary of Functions
• Topic 5: Modeling with Functions

IXL Math Algebra 1:
You can access problems for these new standards by choosing the Florida’s B.E.S.T. Standards: Algebra 1 skill plan. To access click [here](#).

Square roots
1. Solve a quadratic equation using square roots (ERF)

Factoring
2. Solve a quadratic equation using the zero product property (TNM)
3. Solve a quadratic equation by factoring (CSS)

Completing the square
4. Complete the square (RD2)
5. Solve a quadratic equation by completing the square (XCL)

Quadratic formula
6. Solve a quadratic equation using the quadratic formula (XCF)
7. Using the discriminant (SMF)

Virtual Nerd Videos:
• How Do You Solve a Quadratic Equation by Factoring?
• How Do You Solve a Word Problem by Factoring a Quadratic Equation?
• How Do You Use the Square Root Method to Solve a Quadratic Equation with Two Variables?
• How Do You Solve a Quadratic Equation by Completing the Square?
• How Do You Solve a Quadratic Equation by Using the Quadratic Formula?
• How Can You Tell When a Quadratic Equation Has No Real Solutions by Using the Quadratic Formula?
• What is the Discriminant?
• How Do You Use the Discriminant to Determine the Number of Solutions of a Quadratic Equation?
Sample Problems:

1. Which of the quadratic equations below have the solutions of -2 and 5? Select all that apply.
   A. $x^2 - 3x - 10 = 0$
   B. $x^2 + 3x = 10$
   C. $2x^2 - 6x = 20$
   D. $-x^2 + 10 = 3x$
   E. $-x^2 + 3x + 10 = 0$

2. Find the value of x for the figure below by completing the square. Round to the nearest tenth if necessary.

3. A flying squirrel drops 60 feet from a tree before leveling off. A function that approximates this drop is $h = -16t^2 + 60$, where $h$ is the distance it drops in feet and $t$ is the time in seconds. About how many seconds does it take for the squirrel to drop 60 feet?
**Unit 9: Quadratic Functions**

<table>
<thead>
<tr>
<th>Date: Feb. 16 – Mar. 3</th>
<th>12 days</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Benchmarks</th>
<th>Benchmark Clarifications</th>
</tr>
</thead>
</table>
| **MA.912.AR.3.4** - Write a quadratic function to represent the relationship between two quantities from a graph, a written description or a table of values within a mathematical or real-world context. | Clarification 1: Within the Algebra 1 course, a graph, written description or table or values must include the vertex and two points that are equidistant from the vertex.  
Clarification 2: Instruction includes the use of standard form, vertex form, and factored form. |
| **MA.912.AR.3.5** - Given the x-intercepts and another point on the graph of a quadratic function, write the equation for the function. | |
| **MA.912.AR.3.6** - Given an expression or equation representing a quadratic function, determine the vertex and zeros and interpret them in terms of a real-world context. | Clarification 1: Key features are limited to domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; end behavior; vertex; and symmetry.  
Clarification 2: Instruction includes the use of standard form, vertex form, and factored form, and sketching a graph using the zeros and vertex.  
Clarification 3: Instruction includes representing the domain and range with inequality notation, interval notation or set-builder notation.  
Clarification 4: Within the Algebra 1 course, notations for domain and range are limited to inequality and set-builder. |
| **MA.912.AR.3.7** - Given a table, equation or written description of a quadratic function, graph that function, and determine and interpret its key features. | |
| **MA.912.AR.3.8** - Solve and graph mathematical and real-world problems that are modeled with quadratic functions. Interpret key features and determine domain constraints in terms of the context. | Clarification 1: Key features are limited to domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; end behavior; vertex; and symmetry.  
Clarification 2: Instruction includes the use of standard form, vertex form, and factored form.  
Clarification 3: Instruction includes representing the domain, range, and constraints with inequality notation, interval notation, or set-builder notation.  
Clarification 4: Within the Algebra 1 course, notations for domain and range are limited to inequality and set-builder. |
### Essential Vocabulary

<table>
<thead>
<tr>
<th>Vocabulary</th>
<th>Definition/Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quadratic Function</td>
<td>A function of the form $y = ax^2 + bx + c$, where $a \neq 0$</td>
</tr>
<tr>
<td>Parabola</td>
<td>A U-shape curve that opens up or down (the shape of a quadratic function)</td>
</tr>
<tr>
<td>Axis of Symmetry</td>
<td>The vertical line containing the vertex of a parabola</td>
</tr>
<tr>
<td>Vertex</td>
<td>The maximum or minimum point of a parabola</td>
</tr>
<tr>
<td>Minimum</td>
<td>The lowest point on the graph of a parabola</td>
</tr>
<tr>
<td>Maximum</td>
<td>The highest point on the graph of a parabola</td>
</tr>
<tr>
<td>Zeros</td>
<td>The x-intercepts of the graph of a function; the values of $x$ for which $f(x) = 0$</td>
</tr>
<tr>
<td>Discriminant</td>
<td>In the Quadratic Formula, the expression under the radical sign, $b^2 - 4ac$</td>
</tr>
<tr>
<td>Quadratic Formula</td>
<td>$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$</td>
</tr>
<tr>
<td>Standard Form of a Quadratic Function</td>
<td>A quadratic function in the form $y = ax^2 + bx + c$, where $a \neq 0$</td>
</tr>
<tr>
<td>Vertex Form of a Quadratic Function</td>
<td>A quadratic function in the form $f(x) = a(x-h)^2 + k$ where $(h,k)$ represents the vertex</td>
</tr>
<tr>
<td>Factored Form of a Quadratic Function</td>
<td>A quadratic function in the form $f(x) = a(x-r_1)(x-r_2)$ where $r_1$ and $r_2$ represent the roots of the function</td>
</tr>
<tr>
<td>Vertical Motion Model</td>
<td>The equation $h(t) = -16t^2 + v_0x + h_0$ use to represent the height of an object $t$ seconds after it was thrown straight up or dropped.</td>
</tr>
</tbody>
</table>

### MA.912.AR.3.4

**Connections between B.E.S.T. and Florida Standards**

**B.E.S.T.** | **Florida Standard**
--- | ---
MA.912.AR.3.4 Write a quadratic function to represent the relationship between two quantities from a graph, a written description or a table of values within a mathematical or real-world context. | MAFS.912.A-CED.1.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational, absolute, and exponential functions. MAFS.912.A-CED.1.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

### Instructional Learning Objectives

**Students will be able to:**
- Write a quadratic function from a graph
- Write a quadratic function from a written description
- Write a quadratic function from a table

### Instructional Resources

**McGraw-Hill Algebra 1**
- 9-6 Analyzing Functions with Successive Differences

**IXL Math**
- Write a quadratic function from its vertex and another point [YGV](#)

**MFAS Formative Assessments**
- Quilts
- Hotel Swimming Pool
Sample Problem:
Given the table of values below from a quadratic function, write an equation of that function.

<table>
<thead>
<tr>
<th>x</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>f(x)</td>
<td>2</td>
<td>-1</td>
<td>-2</td>
<td>-1</td>
<td>2</td>
</tr>
</tbody>
</table>

MA.912.AR.3.5
Connections between B.E.S.T. and Florida Standards

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA.912.AR.3.5</td>
<td>Given the x-intercepts and another point on the graph of a quadratic function, write the equation for the function.</td>
</tr>
</tbody>
</table>

Instructional Learning Objectives

**Students will be able to:**
- Write the equation of a quadratic function given x-intercepts and another point

Instructional Resources

- IXL Math
  - Write a quadratic function from its zeros [G2Q]

- Algebra Nation
  - Section 6 - Quadratic Functions Part 2
  - Topic 2 – Nature of the Zeros of Quadratic Equations and Functions

Sample Problem:
An arched bridge is 60 ft wide at the base and 40 ft wide 5 ft above the base. Write the equation of a quadratic function that can be used to model the shape of this bridge.
**MA.912.AR.3.6** Given an expression or equation representing a quadratic function, **determine the vertex and zeros** and interpret them in terms of a real-world context.

**B.E.S.T. Florida Standard**

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA.912.AR.3.6</td>
<td>MAFS.912.A-SSE.2.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.</td>
</tr>
</tbody>
</table>

- 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.

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAFS.912.F-IF.3.8a</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>
</tbody>
</table>

- a. Use the process of factoring and completing the square in a quadratic function to **show zeros**, **extreme values**, and symmetry of the graph, and interpret these in terms of a context.

---

**Instructional Learning Objectives**

**Students will be able to:**

- Use vertex form to find the vertex
- Use factored form to find the zeros
- Convert the standard form to vertex form or to factored form (if possible)
- Interpret the vertex and zeros of quadratic function in terms of real-world context

**Instructional Resources**

- **McGraw-Hill Algebra 1**
  - Solving Quadratic Equations by Completing the Square
  - Extend Lesson 9-4 Finding the Maximum or Minimum Value

- **IXL Math Algebra 1 and 2**
  - Characteristics of quadratic functions: equations [YJZ](#)
  - Convert equations of parabolas from general to vertex form [39W](#)

- **Algebra Nation**
  - Section 6 Quadratic Functions – Part 2
    - Topic 1 – Observations from a Graph of a Quadratic Function
    - Topic 4 – Graphing Quadratic Functions Using the Vertex and Intercepts
    - Topic 5 – Graphing Quadratic Functions using Vertex Form – Part 1
    - Topic 6 – Graphing Quadratic Functions Using Vertex Form – Part 2

- **Khan Academy**
  - [Quadratic standard form](#)
  - [Features & forms of quadratic functions](#)

- **MFAS Formative Assessments**
  - [Jumping Dolphin](#)
Sample Problem
During a track practice, Jaylen throws the shot put with initial velocity of 48ft/s. The height above the ground, \( h \), after \( t \) seconds, can be modeled by \( h(t) = -16t^2 + 32t + 5 \).

a. From what height above the ground was the shot put released?
b. What was the maximum height of the shot put?
c. How long did it take for the shot put to fall to the ground?

<table>
<thead>
<tr>
<th>MA.912.AR.3.7</th>
<th>Connections between B.E.S.T. and Florida Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>B.E.S.T.</strong></td>
<td><strong>Florida Standard</strong></td>
</tr>
<tr>
<td>MA.912.AR.3.7 Given a table, equation or written description of a quadratic function, graph that function, and determine and interpret its key features.</td>
<td>MAFS.912.F-IF.2.4 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. Key features include intercepts, intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity</td>
</tr>
</tbody>
</table>

**Instructional Learning Objectives**

Students will be able to:
- Graph quadratic function given a table
- Graph quadratic function given an equation
- Graph quadratic function given a written description
- Identify key features of the graph: domain, range, vertex, axis of symmetry, intercepts, intervals where the function is decreasing or increasing, end behavior
- Interpret key features of the graph in real-world context

**Instructional Resources**

McGraw-Hill Algebra 1
- 9-1 Graphing Quadratic Functions

IXL Math Algebra 1 and 2
- Characteristics of quadratic functions: graphs HW8
- Complete a functions table: quadratic functions LFV
- Graph quadratic functions in vertex form C7T
- Graph quadratic functions in standard form HMW
- Match quadratic functions and graphs AU8

Algebra Nation
Section 6 – Quadratic Functions Part 2
- Topic 1 – Observations from a Graph of a Quadratic Function
- Topic 3 – Graphing Quadratic Functions Using a Table
Sample Problem
Using the graph of a quadratic function shown below, determine each of the following:

- a. Domain
- b. Range
- c. x-intercept(s)
- d. y-intercept
- e. axis of symmetry
- f. minimum
- g. vertex
- h. domain
- i. range
- j. interval on which the function is decreasing
- k. interval on which the function is increasing

MA.912.AR.3.8
Connections between B.E.S.T. and Florida Standards

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA.912.AR.3.8 Solve and graph mathematical and real-world problems that are modeled with quadratic functions. Interpret key features and determine domain constraints in terms of the context.</td>
<td>MAFS.912.A-REI.2.4 Solve quadratic equations in one variable.</td>
</tr>
</tbody>
</table>
  a. Use the method of completing the square to transform any quadratic equation in \( x \) into an equation of the form \( (x - p)^2 = q \) that has the same solutions. Derive the quadratic formula from this form.
  b. Solve quadratic equations by inspection (e.g., for \( x^2 = 49 \)), taking square roots, completing the square, the quadratic formula and factoring, as
appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers $a$ and $b$.

**MAFS.912.F-IF.1.2** Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

**MAFS.912.F-IF.2.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function $h(n)$ gives the number of person-hours it takes to assemble engines in a factory, then the positive integers would be an appropriate domain for the function.

### Instructional Learning Objectives

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<tr>
<th>Instructional Learning Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students will be able to:</td>
</tr>
<tr>
<td>• Model real-world problems with quadratic functions</td>
</tr>
<tr>
<td>• Determine domain and range in context of the real-world problems</td>
</tr>
<tr>
<td>• Solve real-world problems modeled with quadratic functions</td>
</tr>
</tbody>
</table>

### Instructional Resources

<table>
<thead>
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<th>Instructional Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>McGraw-Hill Algebra 1</td>
</tr>
<tr>
<td>• 9-2 Solving Quadratic Equations by Graphing</td>
</tr>
<tr>
<td><strong>Algebra Nation</strong></td>
</tr>
<tr>
<td>Section 5 – Quadratic Functions – Part 1</td>
</tr>
<tr>
<td>• Topic 1 Real-World Examples of Quadratic Functions</td>
</tr>
<tr>
<td>• Topic 10 Quadratic Functions In Action</td>
</tr>
<tr>
<td><strong>Khan Academy</strong></td>
</tr>
<tr>
<td>• Solving Quadratics by Factoring</td>
</tr>
</tbody>
</table>

### Sample Problem

The value of a classic car produced in 1972 can be modeled by the function $V(t) = 19.25t^2 - 440t + 3500$, where $t$ is the number of years since 1972. In what year does the car's value start to increase?
Semester 2

Unit 10: Transformations and Special Cases

8 days
Mar. 4 – Mar. 22

Spring Break Mar. 13 – Mar. 21

**Benchmarks**

**MA.912.F.2.1** - Identify the effect on the graph or table of a given function after replacing \( f(x) \) by \( f(x)+k, kf(x), f(kx) \) and \( f(x+k) \) for specific values of \( k \).

**Clarification 1:** Within the Algebra 1 course, functions are limited to linear, quadratic and absolute value.

**Clarification 2:** Instruction focuses on including positive and negative values for \( k \).

**MA.912.F.2.3** - Given the graph or table of \( f(x) \) and the graph or table of \( f(x)+k, kf(x), f(kx) \) and \( f(x+k) \), state the type of transformation and find the value of the real number \( k \).

**Clarification 1:** Within the Algebra 1 course, functions are limited to linear, quadratic and absolute value.

---

**Essential Vocabulary**

<table>
<thead>
<tr>
<th>Vocabulary</th>
<th>Definition/Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absolute Value function</td>
<td>A type of a piecewise linear function written as ( f(x) = a</td>
</tr>
<tr>
<td>Dilation</td>
<td>A transformation that stretches or compresses the graph of a function.</td>
</tr>
<tr>
<td>Linear function</td>
<td>A function with ordered pairs for which the graph is a line.</td>
</tr>
<tr>
<td>Parent function</td>
<td>The simplest of functions in a family of functions.</td>
</tr>
<tr>
<td>Quadratic function</td>
<td>A non-linear function written in the form of ( f(x) = ax^2 + bx + c ), where ( a \neq 0 ).</td>
</tr>
<tr>
<td>Reflection</td>
<td>A transformation where the graph is flipped across a line.</td>
</tr>
<tr>
<td>Slope-Intercept form</td>
<td>A linear function in the form of ( y = mx + b ), where ( m ) is the slope and ( b ) is the y-intercept.</td>
</tr>
<tr>
<td>Transformation</td>
<td>A movement of a graph on a coordinate plane.</td>
</tr>
<tr>
<td>Translation</td>
<td>A transformation where a figure is slid from one position to another (moves up, down, left, right, or in two directions) without being turned.</td>
</tr>
<tr>
<td>Vertex</td>
<td>The minimum or maximum point of a graph.</td>
</tr>
<tr>
<td>Vertex-form</td>
<td>A quadratic function in the form of ( f(x) = a(x - h)^2 + k ), where ( a, h, ) and ( k ) are constants and ( (h, k) ) is the vertex.</td>
</tr>
</tbody>
</table>

The 2020-2021 school year we are transitioning from the Florida Mathematics Standards (MAFS) to the B.E.S.T. standards (MA)

In the unit guides we have identified which B.E.S.T. standard matches with which MAFS standard(s).

**MA.912.F.2.1**

Identify the effect on the graph or table of a given function after replacing \( f(x) \) by \( f(x)+k, kf(x), f(kx) \) and \( f(x+k) \) for specific values of \( k \).

**B.E.S.T.**

**Florida Standard**

MAFS.912.BF.2.3 Identify the effect on the graph of replacing \( f(x)+k, kf(x), f(kx) \) 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 using technology.
### Instructional Learning Objectives

Students will be able to:
- Identify translations, dilations, and reflections to linear functions
- Identify translations, dilations, and reflections to quadratic functions
- Identify translations, dilations, and reflections to absolute value functions

*Students are expected to recognize an absolute value function and identify transformations to the function*

### Instructional Resources

**Mc-Graw-Hill Algebra 1:**
- Chapter 9: Quadratic Functions and Equations
  - Lesson 3: Transformations of Quadratic Functions
  - Lesson 7: Special Functions (pg. 599-601) *

*Students are expected to recognize an absolute value function and identify transformations to the function*

**Algebra Nation:**
- Section 3: Introduction to Functions
  - Topic 10: Transformations of Functions
- Section 6: Quadratic Equations and Functions – Part 2
  - Topic 7: Transformations of the Dependent Variable of Quadratic Functions
  - Topic 8: Transformations of the Independent Variable of Quadratic Functions

**IXL Math Algebra 1:**
You can access problems for these new standards by choosing the Florida’s B.E.S.T. Standards: Algebra 1 skill plan. To access click [here](https://www.ixl.com/math/algebra-1).
1. Transformations of linear functions (C8G)
2. Transformations of quadratic functions (6YS)
3. Transformation of absolute value functions (9TC)

**Virtual Nerd Videos:**
- What is a Parent Function?
- How Do You Graph the Parent Quadratic Function \( y = x^2 \)?
- How Do You Translate a Function?
- How Do You Graph a Translation of a Function?
- How Do You Reflect a Function?
- How Do You Graph a Reflection of a Function?
- What is an Absolute Value Function?
- How Do You Graph an Absolute Value Function?

**Khan Academy:**
Courses → Algebra 1 → Quadratic functions & equations → Transforming quadratic functions
- Intro to parabola transformations
- Shifting parabolas
- Scaling & reflecting parabolas

Courses → Algebra 1 → Absolute value & piecewise functions → Graphs of absolute value functions
- Shifting absolute value graphs
Scaling & reflecting absolute value function: equation
Scaling & reflecting absolute value function: graph

**desmos**
- Marbleslide: Lines In this activity, students will transform lines so that the marbles go through the stars. Students will test their ideas by launching the marbles and will have a chance to revise before trying the next challenge.
- Marbleslide: Parabolas In this activity, students will transform parabolas so that the marbles go through the stars. Students will test their ideas by launching the marbles and will have a chance to revise before trying the next challenge.

**Sample Problems:**

1. The graph of \( g(x) = a(x - h) \) is a transformation of the graph \( f(x) = x \). If \( a < 0 \) and \( h > 0 \), describe the transformation in \( g(x) \) as relates to the graph of \( f(x) = x \).

2. The graph of \( f(x) = x^2 \) is reflected across the \( x \)-axis and translated to the left 4 units. What is the value of \( h \) when the equation of the transformed graph is written in vertex form?

3. Which transformations of the graph of \( f(x) = |x| \) are needed to produce the graph of \( g(x) = -|x - 1| \)?

### Connections between B.E.S.T. and Florida Standards

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MA.912.F.2.3</strong></td>
<td><strong>MAFS.912.BF.2.3</strong></td>
</tr>
<tr>
<td>Given the graph or table of ( f(x) ) and the graph or table of ( f(x)+k, kf(x), f(kx) ) and ( f(x+k) ), state the type of transformation and find the value of the real number ( k ).</td>
<td>Identify the effect on the graph of replacing ( f(x)+k, kf(x), f(kx) ) 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 using technology.</td>
</tr>
</tbody>
</table>

### Instructional Learning Objectives

Students will be able to:
- Identify and describe the effects of transformations of linear functions from a table or graph
- Identify and describe the effects of transformations of quadratic functions from a table or graph
- Identify and describe the effects of transformations of absolute value functions from a table or graph *

### Instructional Resources

**Mc-Graw-Hill Algebra 1:**
Chapter 9: Quadratic Functions and Equations
- Lesson 3: Transformations of Quadratic Functions
- Lesson 7: Special Functions (pg. 599-601) *
  * Students are expected to recognize an absolute value function and its transformations

**Algebra Nation:**
Section 3: Introduction to Functions
- Topic 10: Transformations of Functions
Section 6: Quadratic Equations and Functions – Part 2
* **Students are expected to recognize an absolute value function and its transformations**

- Interpret the meaning of transformations in real-world situations.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Topic 7: Transformations of the Dependent Variable of Quadratic Functions</td>
<td>• Topic 8: Transformations of the Independent Variable of Quadratic Functions</td>
</tr>
</tbody>
</table>

**IXL Math Algebra 1:**
You can access problems for these new standards by choosing the Florida's B.E.S.T. Standards: Algebra 1 skill plan. To access click [here](#).

- 4. Transformations of linear functions (**C8G**)
- 5. Transformations of quadratic functions (**6YS**)
- 6. Transformation of absolute value functions (**9TC**)

**Virtual Nerd Videos:**
- *How Do You Write an Equation for a Translation of an Absolute Value Function?*
- *What Does the Constant ‘k’ do in y = |x| + k?*
- *What Does the Constant ‘h’ do in y = |x − h|?*

**Khan Academy:**
Courses → Algebra 1 → Quadratic functions & equations → [Transforming quadratic functions](#)
- Intro to parabola transformations
- Shifting parabolas
- Scaling & reflecting parabolas

Courses → Algebra 1 → Absolute value & piecewise functions → [Graphs of absolute value functions](#)
- Shifting absolute value graphs
- Scaling & reflecting absolute value function: equation
- Scaling & reflecting absolute value function: graph

**Sample Problems:**

1. The graph of \( g(x) = (ax) + k \) shown is a transformation of the graph \( f(x) = x \). Describe the transformations across \( g(x) \). What is the value of \( k \) and \( a \)?

![Graph of g(x) = (ax) + k](image-url)
2. Abbie graphed the parent quadratic function as shown. Then, she graphed a second function that is a translation of the parent graph 2 units down and 3 units to the left. What is the equation for the 2nd graph?

3. Use the numbers and symbols in the box to complete the equation for the absolute value function shown in the graph. You may use a number or symbol more than once.

\[ f(x) = |x \square \square | \square \square \]
## Semester 2
### Unit 11: Classifying and Analyzing Functions

<table>
<thead>
<tr>
<th>Benchmarks</th>
<th>Benchmark Clarifications</th>
</tr>
</thead>
</table>
| **MA.912.F.1.1** - Given an equation or graph that defines a function, classify the function type. Given an input-output table, determine a function type that could represent it. | Clarification 1: Within the Algebra 1 course, functions represented as tables are limited to linear, quadratic and exponential. Clarification 2: Within the Algebra 1 course, functions represented as equations or graphs are limited to vertical or horizontal translations or reflections over the x-axis of the following parent functions: 
\[ f(x) = x, f(x) = x^2, f(x) = x^3, f(x) = \sqrt{x}, \]
\[ f(x) = \sqrt[3]{x}, f(x) = |x|, f(x) = 2^x, \text{ and } f(x) = \left(\frac{1}{2}\right)^x \] |
| **MA.912.F.1.2** - Given a function represented in function notation, evaluate the function for an input in its domain. For a real-world context, interpret the output. | Clarification 1: Problems include simple functions in two-variables, such as \( f(x, y) = 3x - 2y \). Clarification 2: Within the Algebra 1 course, functions are limited to one-variable such as \( f(x) = 3x \). |
| **MA.912.F.1.3** - Calculate and interpret the average rate of change of a real-world situation represented graphically, algebraically or in a table over a specified interval. | Clarification 1: Instruction includes making the connection to determining the slope of a particular line segment. |
| **MA.912.F.1.6** - Compare key features of linear and nonlinear functions each represented algebraically, graphically, in tables or written descriptions. | Clarification 1: Key features are limited to domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; end behavior and asymptotes. Clarification 2: Within the Algebra 1 course, functions other than linear, quadratic or exponential must be represented graphically. Clarification 3: Within the Algebra 1 course, instruction includes verifying that a quantity increasing exponentially eventually exceeds a quantity increasing linearly or quadratically. |
| **MA.912.F.1.8** - Determine whether a linear, quadratic or exponential function best models a given real-world situation. | Clarification 1: Key features include domain; range; intercepts; intervals where the function is increasing, decreasing, positive or negative; end behavior and asymptotes. |

### Essential Vocabulary

<table>
<thead>
<tr>
<th>Vocabulary</th>
<th>Definition/Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous function</td>
<td>A function that can be graphed with a line or a smooth curve.</td>
</tr>
<tr>
<td>Constant of variation</td>
<td>The number ( k ) in the equation in the form ( y = kx ).</td>
</tr>
<tr>
<td>Discrete function</td>
<td>A function of points that are not connected.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Domain</td>
<td>The set of the first numbers of the ordered pairs in a relation.</td>
</tr>
<tr>
<td>Function</td>
<td>A relation in which each element of the domain is paired with exactly one element of the range.</td>
</tr>
<tr>
<td>Function notation</td>
<td>A way to name a function that is defined by an equation. In function notation, the equation $y = 3x - 8$ is written as $f(x) = 3x - 8$.</td>
</tr>
<tr>
<td>Nonlinear function</td>
<td>A function with a graph that is not a straight line.</td>
</tr>
<tr>
<td>Range</td>
<td>The set of second numbers of the ordered pairs in a relation.</td>
</tr>
<tr>
<td>Rate of change</td>
<td>How a quantity is changing with respect to a change in another quantity.</td>
</tr>
<tr>
<td>Relation</td>
<td>A set of ordered pairs.</td>
</tr>
<tr>
<td>Slope</td>
<td>The ratio of the change in the $y$-coordinates (rise) to the corresponding change in the $x$-coordinates (run) as you move from one point to another along a line.</td>
</tr>
<tr>
<td>Vertical line test</td>
<td>If any vertical line passes through no more than one point of the graph of a relation, then the relation is a function.</td>
</tr>
</tbody>
</table>

The 2020-2021 school year we are transitioning from the Florida Mathematics Standards (MAFS) to the B.E.S.T. standards (MA).

In the unit guides we have identified which B.E.S.T. standard matches with which MAFS standard(s).

**MA.912.F.1.1**

Connections between B.E.S.T. and Florida Standards

**B.E.S.T.** | **Florida Standard**
---|---
MA.912.F.1.1 Given an equation or graph that defines a function, classify the function type. Given an input-output table, determine a function type that could represent it. | MAFS.912.F-IF.2.4 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.

**Instructional Learning Objectives**

- Determine whether a relation is a function
- Identify linear, quadratic, and exponential functions from given equation, graph, or table

**Instructional Resources**

- **Mc-Graw-Hill Algebra 1:**
  - Chapter 1: Relations
  - Lesson 7: Functions (part 1 pg. 47-49)
  - Chapter 9: Quadratic Functions and Equations
  - Lesson 6: Analyzing Functions with Successive Differences

- **Algebra Nation:**
  - Section 8: Summary of Functions
  - Topic 1: Comparing Linear, Quadratic, and Exponential Functions – Part 1
  - Topic 2: Comparing Linear, Quadratic, and Exponential Functions – Part 2

- **IXL Math Algebra 1:**
  - You can access problems for these new standards by choosing the Florida’s B.E.S.T. Standards: Algebra 1 skill plan. To access click here.

**Identify linear functions**
1. Identify linear functions from graphs and equations (VMQ)
2. Identify linear functions from tables (F5G)

Identify linear, quadratic, and exponential functions
3. Identify linear and exponential functions from graphs (UEC)
4. Identify linear, quadratic, and exponential functions from graphs (DHB)
5. Identify linear and exponential functions from tables (LZF)
6. Identify linear, quadratic, and exponential functions from tables (SP5)

Virtual Nerd Videos:
- How Do You Figure Out if a Relation is a Function?
- How Can You Tell if a Relation is Not a Function?
- How Do You Find f(x) When You Have a Value for x?
- What is Function Notation?

Khan Academy:
Courses → Algebra 1 → Functions → Recognizing functions
- Recognizing functions from graph
- Does a vertical line represent a function?
- Recognizing functions from table
- Recognizing functions from verbal description

Illustrative Mathematics:
Click here to get to Algebra 1
Teachers will be able to access student resource but will need to set up a (free) account to access lessons with prompts and guiding questions.
- Unit 4 Lessons 1-9

Sample Problems:
1. Does the following graph represent a function?

![Graph Image]
2. The table compares the heights (in centimeters) and the weights (in kilograms) of Matt’s friends. Can the weight of Matt’s friends be represented as a function of their height?

<table>
<thead>
<tr>
<th>Height (cm)</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>163</td>
<td>65</td>
</tr>
<tr>
<td>167</td>
<td>70</td>
</tr>
<tr>
<td>154</td>
<td>60</td>
</tr>
<tr>
<td>172</td>
<td>70</td>
</tr>
<tr>
<td>167</td>
<td>68</td>
</tr>
<tr>
<td>159</td>
<td>58</td>
</tr>
<tr>
<td>160</td>
<td>64</td>
</tr>
<tr>
<td>166</td>
<td>69</td>
</tr>
</tbody>
</table>

**MA.912.F.1.2**

**Connections between B.E.S.T. and Florida Standards**

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA.912.F.1.2 Given a function represented in</td>
<td>MAFS.912.F-IF.1.2 Use function notation, evaluate functions for inputs in their</td>
</tr>
<tr>
<td>function notation, evaluate the function for</td>
<td>domains, and interpret statements that use function notation in terms of a</td>
</tr>
<tr>
<td>input in its domain. For a real-world context,</td>
<td>context.</td>
</tr>
<tr>
<td>interpret the output.</td>
<td></td>
</tr>
</tbody>
</table>

**Instructional Learning Objectives**

- Find function values
- Interpret function notation using real world examples
- Determine input and output values from a graph of a function
- Complete a function table from a given graph
- Complete a function table from a given equation or function

**Instructional Resources**

- **Mc-Graw-Hill Algebra 1:** chapter 1: Relations
  - Lesson 7: Functions (part 2 pg. 50)

- **Algebra Nation:**
  - Section 3: Introduction to Functions
    - Topic 1: Input and Output Values
    - Topic 2: Representing, Naming, and Evaluating Functions
  - Section 8: Summary of Functions
    - Topic 6: Understanding Piecewise-Defined Functions

- **IXL Math Algebra 1:**
  - You can access problems for these new standards by choosing the Florida’s B.E.S.T. Standards: Algebra 1 skill plan. To access click here.

**Evaluate a function**

1. Evaluate a function (R96)
2. Evaluate a function: plug in an expression (VNZ)
3. Evaluate an exponential function (D6H)

**Interpret function notation**

4. Interpret functions using everyday language (U98)

**Tables and graphs**

5. Find values using function graphs (QCG)
6. Complete a function table from a graph (HXF)
7. Complete a function table from an equation (Z73)
8. Complete a function table: quadratic functions (LFV)
9. Complete a function table: absolute value functions (2DH)

Virtual Nerd Videos:
- How Do You Solve a Word Problem Using a Function?
- How Can You Tell if a Function is Linear or Nonlinear From a Graph?
- How Can You Tell if a Function is Linear or Nonlinear From a Table?

Sample Problems:
1. The function \( f(x) = \frac{x}{2} - 8 \) models Alicia’s position in miles relative to a water stand \( x \) minutes into a marathon. Evaluate and interpret for a quarter of an hour into the race.

2. The science classroom has a fish tank that holds 10,450 ml of water. The water is leaking at a rate of 270 ml per minute. Define the input and the output for this scenario. Write a function to model this situation.

3. Consider the function \( f(x) = x^2 + 2x - 5 \). Find \( f(-3) \).

MA.912.F.1.3

Connections between B.E.S.T. and Florida Standards

B.E.S.T. | Florida Standard
--- | ---
MA.912.F.1.3 Calculate and interpret the average rate of change of a real-world situation represented graphically, algebraically or in a table over a specified interval. | MAFS.912.F-IF.2.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.

Instructional Learning Objectives

- Use rate of change to solve real-world problems
- Find the constant of variation
- Find the slope of a line

Instructional Resources

Mc-Graw-Hill Algebra 1:
- Section 3: Introduction to Functions
  - Lesson 3: Rate of Change and Slope
  - Lesson 4: Direct Variation

Algebra Nation:
- Section 3: Introduction to Functions
  - Topic 9: Average Rate of Change over an Interval

IXL Math Algebra 1:
You can access problems for these new standards by choosing the Florida’s B.E.S.T. Standards: Algebra 1 skill plan. To access click here.

Rate of change
1. Rate of change: tables (PLA)
2. Rate of change: graphs (BNH)

3. Find the constant of variation (9TD)

Slope

4. Find the slope of a graph (E7D)

5. Find the slope from two points (MDS)

6. Slope-intercept form: find the slope and y-intercept (RST)

Virtual Nerd Videos:

- What is Rate of Change?
- How Do You Find the Rate of Change Between Two Points in a Table?
- How Do You Find the Rate of Change Between Two Points on a Graph?
- How Do You Find the Slope of Line from Two Points?
- How Do You Find the Slope of Line a Graph?

Khan Academy:

Courses → Algebra 1 → Functions → Average rate of change

- Introduction to Average Rate of Change

Illustrative Mathematics:

Click here to get to Algebra 1

Teachers will be able to access student resource but will need to set up a (free) account to access lessons with prompts and guiding questions.

- Unit 4 Lesson 7
  Student Task Scroll to the bottom of the page to access the student task pdf file.

Sample Problems:

1. A pack of gum is on sale for “buy one get one free”. If Anna buys one pack of gum she gets a total of two packs. If she buys 2 packs of gum, she gets 4 packs, etc. What is the rate of change? Write an equation to represent this situation if she buys “x” number of packs of gum?

2. Jackie earns extra spending money by babysitting children in her neighborhood. On Tuesday, she earned $16 for babysitting for two hours. On Saturday, she earned $40 for babysitting for 5 hours. Let x represent the number of hours and y represent the amount earned. What is the rate of change?

<table>
<thead>
<tr>
<th>MA.912.F.1.6</th>
<th>Connections between B.E.S.T. and Florida Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>B.E.S.T.</strong></td>
<td><strong>Florida Standard</strong></td>
</tr>
<tr>
<td>MA.912.F.1.6</td>
<td>Compare key features of linear and nonlinear functions each represented algebraically, graphically, in tables or written descriptions.</td>
</tr>
<tr>
<td>MAFS.912.I-F.3.9</td>
<td>Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).</td>
</tr>
</tbody>
</table>
Students will be able to:
• Identify and compare features of linear, quadratic, and exponential functions from a given table, graph, or written description.

**Algebra Nation:**
- Section 8: Summary of Functions
  - Topic 1: Comparing Linear, Quadratic, and Exponential Functions - Part 1
  - Comparing Linear, Quadratic, and Exponential Functions – Part 2

**Virtual Nerd Videos:**
- How do you determine if a graph represents a linear, exponential, or quadratic function?

**Khan Academy:**
- Courses → Common Core Math → Functions: Linear, Quadratic, and Exponential Models
  - Functions: Linear, Quadratic, and Exponential Models

**CK-12 Foundation Video:**
- Comparing Linear, Exponential, and Quadratic Functions

**MARS/Shell Center:**
- Sorting Functions: In this task students are asked to match each graph with an equation, table, and rule.

**desmos**
- Comparing Linear, exponential, and quadratic

---

**Sample Problems:**
1. Complete the table below so that the data is best modeled by a linear equation. Then write the linear equation that represents the data.

<table>
<thead>
<tr>
<th>x</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>3</td>
<td>0</td>
<td>-3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Compare the two functions. Which function decreases faster?

\[ f(x) = -2x + 10 \]

<table>
<thead>
<tr>
<th>x</th>
<th>g(x)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>1</td>
<td>7.5</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>2.5</td>
</tr>
</tbody>
</table>
## MA.912.F.1.8

### Connections between B.E.S.T. and Florida Standards

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA.912.F.1.8 Determine whether a <strong>linear, quadratic</strong> or <strong>exponential function</strong> best <strong>models</strong> a given real-world situation.</td>
<td>MAFS.912.F-IF.2.4 For a <strong>function</strong> that <strong>models</strong> 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.</td>
</tr>
<tr>
<td>MAFS.912.F-LE.1.3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing <strong>linearly, quadratically</strong>, or (more generally) as a polynomial <strong>function</strong></td>
<td></td>
</tr>
</tbody>
</table>

### Instructional Learning Objectives

Students will be able to:
- Identify linear, quadratic, and exponential functions from a given real-world problem.

### Instructional Resources

- **Algebra Nation:**
  - Section 8: Summary of Functions
    - 1. Topic 1: Comparing Linear, Quadratic, and Exponential Functions - Part 1
    - 2. Topic 2: Comparing Linear, Quadratic, and Exponential Functions – Part 2
    - 3. Topic 3: Comparing Arithmetic and Geometric Sequences
    - 4. Topic 5: Modeling with Functions

- **IXL Math Algebra 1:**
  - You can access problems for these new standards by choosing the Florida’s B.E.S.T. Standards: Algebra 1 skill plan. To access click [here](#).
    - 1. Write linear functions: word problems (9RQ)
    - 2. Exponential growth and decay: word problems (UKG)
    - 3. Identify linear and exponential functions from tables (LZF)
    - 4. Identify linear, quadratic, and exponential functions from tables (SP5)

- **Virtual Nerd Videos:**
  - How do you determine if a graph represents a linear, exponential, or quadratic function?

- **CK-12 Foundation Video:**
  - Comparing Linear, Exponential, and Quadratic Functions

- **MARS/Shell Center:**
  - Representing Functions of Everyday Situations: This lesson develops depth and understanding of functions through interpretation, identifying, and analyzing situations that make up functions.
Sample Problems:

1. The prize for a radio station contest begins with a $100 cash prize. Once a day, a name is announced. The person has 15 minutes to call or the prize increases by 2.5% for the next day.
   - Write an equation to represent the amount of the cash prize in dollars after $t$ days with no winners.
   - How much will the prize be worth if no one wins after 10 days?

2. The table shows the height of a plant for four consecutive weeks. Determine which kind of function best models the height. Then write a function that models the data.

<table>
<thead>
<tr>
<th>Week</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height (in)</td>
<td>3</td>
<td>3.5</td>
<td>4</td>
<td>4.5</td>
<td>5</td>
</tr>
</tbody>
</table>
**Unit 12: Composition of Functions**

<table>
<thead>
<tr>
<th>Benchmarks</th>
<th>Benchmark Clarifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA.912.F.3.1 - Given a mathematical or real-world context, combine two functions, limited to linear and quadratic, using arithmetic operations. When appropriate, include domain restrictions for the new function.</td>
<td>Clarification 1: Instruction includes representing domain restrictions with inequality notation, interval notation or set-builder notation. Clarification 2: Within the Algebra 1 Honors course, notations for domain and range are limited to inequality and set-builder.</td>
</tr>
</tbody>
</table>

**Essential Vocabulary**

<table>
<thead>
<tr>
<th>Vocabulary</th>
<th>Definition/Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domain</td>
<td>The set of the first numbers of the ordered pairs in a relation.</td>
</tr>
<tr>
<td>Inequality (Interval) notation</td>
<td>A way of writing subsets of the real number line. For a closed interval, closed brackets are used []. For an open interval, parentheses are used (). There are also intervals that are half open and half closed which use both the bracket and a parenthesis. For example, the set for the inequality ( {x \mid -3 &lt; x \leq 25} ) would have an interval notation like this: ((-3, 25]).</td>
</tr>
<tr>
<td>Linear function</td>
<td>A function with ordered pairs that satisfy a linear equation</td>
</tr>
<tr>
<td>Quadratic function</td>
<td>An equation of the form ( y = ax^2 + bx + c, \text{where } a \neq 0 )</td>
</tr>
<tr>
<td>Set builder notation</td>
<td>A concise way of writing a solution set. For example, ( {t \mid t &lt; 17} ) represents the set of all numbers ( t ) such that ( t ) is less than 17.</td>
</tr>
</tbody>
</table>

**The 2020-2021 school year we are transitioning from the Florida Mathematics Standards (MAFS) to the B.E.S.T. standards (MA)**

In the unit guides we have identified which B.E.S.T. standard matches with which MAFS standard(s).

**MA.912.AR.1.1 Connections between B.E.S.T. and Florida Standards**

<table>
<thead>
<tr>
<th>Florida Standard</th>
<th>B.E.S.T.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAFS.912.F-BF.1.1 Write a function that describes a relationship between two quantities. ★</td>
<td>MA.912.F.3.1 Given a mathematical or real-world context, <strong>combine two functions</strong>, limited to linear and quadratic, <strong>using arithmetic operations</strong>. When appropriate, include domain restrictions for the new function. <strong>This standard IS NOT the composition of functions (i.e. ( f(g(x)) )) and is missing large parts of the</strong></td>
</tr>
<tr>
<td>a. Determine an explicit expression, a recursive process, or steps for calculation from a context.</td>
<td></td>
</tr>
<tr>
<td>b. <strong>Combine standard function types using arithmetic operations</strong>. For example, <strong>build a function that models the temperature of a cooling body by adding a constant function to a</strong></td>
<td></td>
</tr>
</tbody>
</table>
MAFS.912.F-BF.1.1. standard that is not addressed elsewhere within the B.E.S.T. standards. Therefore, there will be resources for the MAFS standard, as well, as students will still be tested on this MAFS standard for the next two years.

decaying exponential, and relate these functions to the model.
c. **Compose functions.** For example, if $T(y)$ is the temperature in the atmosphere as a function of height, and $h(t)$ is the height of a weather balloon as a function of time, then $T(h(t))$ is the temperature at the location of the weather balloon as a function of time.

<table>
<thead>
<tr>
<th>Instructional Learning Objectives</th>
<th>Instructional Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students will be able to:</td>
<td>McGraw-Hill Algebra 1:</td>
</tr>
<tr>
<td>1) Implement function notation.</td>
<td>Chapter 1, Lesson 6 page 40: Introduces students to relations and what it means to be a domain of a function.</td>
</tr>
<tr>
<td>2) Understand that the combination of two functions creates a new function that has its own domain.</td>
<td>Chapter 3, Lesson 5: Arithmetic Sequences as Linear Functions</td>
</tr>
<tr>
<td>3) Combine functions by adding, subtracting, multiplying, or dividing them.</td>
<td>Chapter 5, Lesson 1 focuses on solving inequalities by adding or subtracting but has students write the solution in set builder notation.</td>
</tr>
<tr>
<td>4) Compose functions.</td>
<td>Chapter 7, Lesson 7: Geometric Sequences as Exponential Functions</td>
</tr>
<tr>
<td>5) Write a domain for a function with set notation.</td>
<td>IXL:</td>
</tr>
<tr>
<td>6) Write a domain for a function with inequality notation.</td>
<td>• Add and subtract functions (A1-Q.) <strong>45B</strong></td>
</tr>
<tr>
<td></td>
<td>• Multiply functions (A1-Q.) <strong>8PM</strong></td>
</tr>
<tr>
<td></td>
<td>• Add and subtract polynomials (A1-Z.4) <strong>5E</strong></td>
</tr>
<tr>
<td></td>
<td>• Multiply polynomials (A1-Z.10) <strong>58A</strong></td>
</tr>
<tr>
<td></td>
<td>• Evaluate a function: plug in an expression (A1-Q.8) <strong>VN</strong></td>
</tr>
</tbody>
</table>

**Khan Academy:**
For practice on combining functions (add, subtract, multiply, and divide), students can use the following link to view all the videos, practice problems, and quizzes to address the current and future standard: **Combining Functions.**
Located in Pre-Calculus is a section on “Composite Functions.” Parts of this section will help students how to compose functions. This section has a video and practice problems on how to evaluate composite functions from a table.

Algebra Nation (2020-2021):
Section 3 - Topic 6: Real-World Combinations and Compositions of Functions
Section 4 - Topic 1: Arithmetic Sequences
Section 7 - Topic 1: Geometric Sequences
Section 8 - Topic 4: Exploring Non-Arithmetic, Non-Geometric Sequences

Illustrative Mathematics:
Click here to get to Algebra 1
- Teachers will be able to access student resource but will need to set up a (free) account to access lessons with prompts and guiding questions
- In Algebra 1, Unit 4 provides many lessons that help with function notation (lessons 2 – 5) and domain (lessons 10 -11). Click here to get to Unit 4.
- In Algebra 2, Unit 1 all the lessons cover different types of sequences. Click here to access.

Sample Problem:

1. Let \( f(x) = 3x^2 - 2x + 8 \) and \( h(x) = 7x - 9 \). Evaluate \( (f - h)(3) \).

2. You are standing in the store trying to decide if you can afford a really awesome pair of sneakers (x).
   Let \( f(x) \) = the discounted price of the sneakers and \( g(x) \) = the 7% tax on the discounted price. The original price of the sneakers is $K and they are now 20% off. Write a composite function to represent the total amount you would pay for the sneakers after the discount and the tax.
## Unit 13: Interpreting Statistics

**Benchmarks**

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA.912.DP.1.1</td>
<td>Given a set of data, select an appropriate method to represent the data, depending on whether it is numerical or categorical data and on whether it is univariate or bivariate.</td>
</tr>
<tr>
<td>MA.912.DP.1.2</td>
<td>Interpret data distributions represented in various ways. State whether the data is numerical or categorical, whether it is univariate or bivariate and interpret the different components and quantities in the display.</td>
</tr>
<tr>
<td>MA.912.DP.1.3</td>
<td>Explain the difference between correlation and causation in the contexts of both numerical and categorical data.</td>
</tr>
<tr>
<td>MA.912.DP.1.4</td>
<td>Estimate a population total, mean or percentage using data from a sample survey; develop a margin of error through the use of simulation.</td>
</tr>
</tbody>
</table>

**8 days**

Apr. 15 – Apr. 26

---

## Essential Vocabulary

<table>
<thead>
<tr>
<th>Vocabulary</th>
<th>Definition/Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Univariate data</td>
<td>Data with one variable</td>
</tr>
<tr>
<td>Bivariate Data</td>
<td>Data with two variables</td>
</tr>
<tr>
<td>Correlation</td>
<td>The degree to which two sets of data are related or linked together.</td>
</tr>
<tr>
<td>Causation</td>
<td>A relationship between two events where one event is affected by the other.</td>
</tr>
<tr>
<td>Margin of error</td>
<td>The range of values below and above the sample statistic.</td>
</tr>
<tr>
<td>Measures of center</td>
<td>Numbers or pieces of data that can represent the whole set of data.</td>
</tr>
<tr>
<td>Positive Association</td>
<td>Two associated sets of data that increase as the other set increases</td>
</tr>
<tr>
<td>Negative Association</td>
<td>Two associated sets of data that decrease as the other set decreases</td>
</tr>
<tr>
<td>No Association</td>
<td>Two sets of data that have no association or pattern to distinguish between the sets.</td>
</tr>
</tbody>
</table>
The 2020-2021 school year we are transitioning from the Florida Mathematics Standards (MAFS) to the B.E.S.T. standards (MA).

In the unit guides we have identified which B.E.S.T. standard matches with which MAFS standard(s).

<table>
<thead>
<tr>
<th>MA.912.DP.1.1</th>
<th>Connections between B.E.S.T. and Florida Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>B.E.S.T.</strong></td>
<td><strong>Florida Standard</strong></td>
</tr>
<tr>
<td><strong>MA.912.DP.1.1</strong> Given a set of data, select an appropriate method to represent the data, depending on whether it is numerical or categorical data and on whether it is univariate or bivariate</td>
<td><strong>MAFS.912.S-ID.1.1</strong> Represent data with plots on the real number line (dot plots, histograms, and box plots)</td>
</tr>
</tbody>
</table>

**Instructional Learning Objectives**

Students will be able to:
- Create and interpret dot plot given data
- Create and interpret histograms
- Create and interpret Box plots

**Instructional Resources**

- **McGraw-Hill Algebra 1:** Chapter 12, Lesson 3: Distributions of Data, p. 765
- **IXL:** Create bar graphs, line graphs, and histograms (A1-N.2) [MHB](#)
  From the BEST standards, you can use this IXL code: Create bar graphs, line graphs, and histograms (A1-N.2) [EF6](#)
- **Khan Academy:** Within the Statistics and Probability course there are two units students can go through: Displaying quantitative data with graphs and Describing and comparing distributions.
- **Algebra Nation:** Section 9 - Topics 1, 2, 3, and 4
- **Illustrative Mathematics:** Click [here](#) to get to Algebra 1
  - Teachers will be able to access student resource but will need to set up a (free) account to access lessons with prompts and guiding questions
  - This lesson is in Grade 8 and can be accessed here: [Student Task Statements](#)

**Sample problem:** Represent the following data using a dot plot, histogram, and box plot

20, 5, 8, 22, 10, 1, 7, 15, 16, 1, 5, 8, 13, 6, 22.
## Connections between B.E.S.T. and Florida Standards

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MA.912.DP.1.2</strong> Interpret data distributions&lt;br&gt;represented in various ways. State whether the data is numerical or categorical, whether it is univariate or bivariate and interpret the different components and quantities in the display.</td>
<td><strong>MAFS.912.S-ID.1.3</strong> Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).</td>
</tr>
<tr>
<td><strong>MAFS.912.S-ID.1.2</strong> 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 set.</td>
<td>The standard listed above has no natural connection to a new BEST standard. However, it will be tested for the next two years on the Algebra 1 EOC and, thus, still needs to be addressed.</td>
</tr>
</tbody>
</table>

## Instructional Learning Objectives

Students will be able to:
1. identify measure centers
2. Interpret the spread of graphs presented in various ways to make real world connection to the data.
3. Properly identify all parts of a graph as it relates to the context.

## Instructional Resources

- **McGraw-Hill Algebra 1:**
  - Chapter 12, Lesson 3: Distributions of Data, p. 765
- **IXL:**
  - Interpret bar graphs, line graphs, and histograms (A1-N.1) **B9A**
  - Interpret circle graphs (A1-N.3) **UHY**
  - Interpret stem-and-leaf plots (A1-N.4) **EBJ**
  - Interpret box-and-whisker plots (A1-N.5) **YE9**
  - Interpret a scatter plot (A1-KK.8) **8BS**
- **Khan Academy:**
  - Within the Statistics and Probability course there are two units students can go through: Displaying quantitative data with graphs and Describing and comparing distributions.
- **Algebra Nation:**
  - Section 9, Topic 9
- **Illustrative Mathematics:**
  - Click [here](#) to get to Algebra 1
  - Teachers will be able to access student resource but will need to set up a (free) account to access lessons with prompts and guiding questions
Sample problem:
Corinne is planning a beach vacation in July and is analyzing the daily high temperatures for her potential destination. She would like to choose a destination with a high median temperature and a small interquartile range. She constructed box plots shown in the diagram below.

Ocean Beach

Serene Shores

Whispering Palms

Pelican Beach

Which destination has a median temperature above 80 degrees and the smallest interquartile range?

<table>
<thead>
<tr>
<th>MA.912.DP.1.3</th>
<th>Connections between B.E.S.T. and Florida Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>B.E.S.T.</strong></td>
<td><strong>Florida Standard</strong></td>
</tr>
<tr>
<td><strong>MA.912.DP.1.3 Explain the difference between correlation and causation in the contexts of both numerical and categorical data.</strong></td>
<td><strong>MAFS.912.S-ID.1.3 Distinguish between correlation and causation.</strong></td>
</tr>
</tbody>
</table>

Students will be able to:
1) Understand correlation between two sets of data.
2) Understand causation between two sets of data.
3) Determine when two sets of data are correlated
4) Determine when there is causality between two sets of data.

Instructional Resources:
- **McGraw-Hill Algebra 1**: Chapter 4, lesson 5: Scatter Plots and Lines of Fit, p. 247 – discusses positive, negative, or no association.
  - Chapter 4, Lesson 5 Algebra Lab: Correlation and Causation, p. 254 fully addresses the standard.
- **Khan Academy**: Within the Statistics and Probability course there is a lesson students can go through: Correlation and Causation | Lesson
**Sample problem:**
There is a strong positive correlation between the number of Nobel prizes won by country and the per capita chocolate consumption by country. Does this mean that increased chocolate consumption in America will increase the United States of America’s chances of a Nobel prize winner?

---

### MA.912.DP.1.4

**Connections between B.E.S.T. and Florida Standards**

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MA.912.DP.1.4</strong> Estimate a population total, mean or percentage using data from a sample survey; develop a margin of error through the use of simulation.</td>
<td><strong>MAFS.912.S–IC.2.4</strong> - Make inferences and justify conclusions from sample surveys, experiments, and observational studies.</td>
</tr>
</tbody>
</table>

**Instructional Learning Objectives**

1. Calculate the measure of center given a real-world scenario.
2. Use a sample survey to justify conclusion for entire population.

**Instructional Resources**

- **McGraw-Hill Algebra 1:**
  - Chapter 12, Lesson 1: Samples and Studies p. 747
  - Chapter 12, Lesson 1 Algebra Lab: Evaluating Published Data, p. 755
  - Chapter 12, Lesson 2: Statistics and Parameters, p. 757

- **IXL:**
  - Find confidence intervals for population means (A2-EE.9) [IVK](#)
  - Find confidence intervals for population proportions (A2-EE.10) [QAD](#)

- **Khan Academy:**
  - Within the Statistics and Probability Course there is a unit entitled “Sampling distribution of a sample mean.”
### Algebra Nation:
Section 9 - Honors Topic 1 (available online)

### Illustrative Mathematics:
Click [here](#) to get to Algebra 2
- Teachers will be able to access student resource but will need to set up a (free) account to access lessons with prompts and guiding questions
- [Unit 7, Lesson 10](#)
- [Unit 7, Lesson 11](#)
- [Unit 7, Lesson 12](#)

### Sample problem:
Based on a survey of 100 households in Twin Lakes, the newspaper reports that the average number of televisions per household is 3.5 with a margin of error of ±0.6. The actual population mean can be estimated to be between 2.9 and 4.1 television per household. Since there are 5,500 households in Twin Lakes the estimated number of televisions is between 15,950 and 22,550.
<table>
<thead>
<tr>
<th>Semester 2</th>
<th>Unit 14: Calculating Statistics</th>
<th>11 days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Apr. 27 – May 11</td>
</tr>
<tr>
<td><strong>Benchmarks</strong></td>
<td><strong>Benchmark Clarifications</strong></td>
<td></td>
</tr>
<tr>
<td><strong>MA.912.DP.2.4:</strong></td>
<td>Fit a linear function to bivariate numerical data that suggests a linear association and interpret the slope and y-intercept of the model. Use the model to solve real-world problems in terms of the context of the data.</td>
<td></td>
</tr>
<tr>
<td>Clarification 1: Instruction includes fitting a linear function both informally and formally with the use of technology.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clarification 2: Problems include making a prediction or extrapolation, inside and outside the range of the data, based on the equation of the line of fit.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MA.912.DP.2.5:</strong></td>
<td>Given a scatter plot that represents bivariate numerical data, assess the fit of a given linear function by plotting and analyzing residuals.</td>
<td></td>
</tr>
<tr>
<td>Clarification 1: Within the Algebra 1 course, instruction includes determining the number of positive and negative residuals; the largest and smallest residuals; and the connection between outliers in the data set and the corresponding residuals.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MA.912.DP.2.6:</strong></td>
<td>Given a scatter plot with a line of fit and residuals, determine the strength and direction of the correlation. Interpret strength and direction within a real-world context.</td>
<td></td>
</tr>
<tr>
<td>Clarification 1: Instruction focuses on determining the direction by analyzing the slope and informally determining the strength by analyzing the residuals.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MA.912.DP.3.1:</strong></td>
<td>Construct a two-way frequency table summarizing bivariate categorical data. Interpret joint and marginal frequencies and determine possible associations in terms of a real-world context.</td>
<td></td>
</tr>
<tr>
<td><strong>MA.912.DP.3.2:</strong></td>
<td>Given marginal and conditional frequencies, construct a two-way relative frequency table summarizing categorical bivariate data.</td>
<td></td>
</tr>
<tr>
<td>Clarification 1: Construction includes cases where not all frequencies are given but enough are provided to be able to construct a two-way relative frequency table.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clarification 2: Instruction includes the use of a tree diagram when calculating relative frequencies to construct tables.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MA.912.DP.3.3:</strong></td>
<td>Given a two-way relative frequency table or segmented bar graph summarizing categorical bivariate data, interpret joint, marginal and conditional relative frequencies in terms of a real-world context.</td>
<td></td>
</tr>
<tr>
<td>Clarification 1: Instruction includes problems involving false positive and false negatives.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Essential Vocabulary

<table>
<thead>
<tr>
<th>Vocabulary</th>
<th>Definition/Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two-way frequency table</td>
<td>A table that displays the relationship between two categorical variables</td>
</tr>
<tr>
<td>Joint frequency</td>
<td>Frequency in the body of the table, joining two categories</td>
</tr>
<tr>
<td>Marginal frequency</td>
<td>Frequency at the margin of the table, representing the total of the row or column</td>
</tr>
<tr>
<td>Two-way relative frequency table</td>
<td>A table that displays relative frequencies (percentage, decimal, or ratios) instead of just frequency counts</td>
</tr>
<tr>
<td>Joint Relative Frequency</td>
<td>The ratio of the joint frequency to the total number of data points.</td>
</tr>
<tr>
<td>Marginal Relative Frequency</td>
<td>The ratio of the marginal frequency to the total number of data points.</td>
</tr>
<tr>
<td>Conditional relative frequency</td>
<td>The ratio of the joint frequency to the related marginal frequency.</td>
</tr>
<tr>
<td>Bivariate data set</td>
<td>Data set with two variables</td>
</tr>
<tr>
<td>Scatter Plot</td>
<td>A plot that shows the relationship between two variables for the set of data</td>
</tr>
<tr>
<td>Association</td>
<td>Relationship between two variables, may be described in terms of strength (strong, weak, or none) and direction (positive, negative, or none)</td>
</tr>
<tr>
<td>Line of Best Fit</td>
<td>The trend line that most closely matches the data</td>
</tr>
<tr>
<td>Correlation</td>
<td>Measure of relationship between two variables.</td>
</tr>
<tr>
<td>Correlation coefficient</td>
<td>A number between -1 and 1, that indicates the strength and direction of a linear relationship between two quantitative variables</td>
</tr>
<tr>
<td>Residual</td>
<td>The difference between the actual y-value and the predicted y-value</td>
</tr>
<tr>
<td>Residual Plot</td>
<td>A plot of residual values that shows how well a linear model fits the data set</td>
</tr>
<tr>
<td>Causation</td>
<td>Describes a cause-and-effect relationship of how change in one variable causes the change in the other variable</td>
</tr>
<tr>
<td>Interpolation</td>
<td>Using a model to estimate a value within the range of known values</td>
</tr>
<tr>
<td>Extrapolation</td>
<td>Using a model to estimate a value outside the range of known values</td>
</tr>
</tbody>
</table>

## Connections between B.E.S.T. and Florida Standards

**MA.912.DP.2.4**

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MA.912.DP.2.4</strong> Fit a linear function to bivariate numerical data that suggests a linear association and interpret the slope and y-intercept of the model. Use the model to solve real-world problems in terms of the context of the data.</td>
<td>MAFS.912.S-ID.2.6 Represent data on two quantitative variables on a scatter plot and describe how the variables are related.</td>
</tr>
</tbody>
</table>

  a. **Fit a function to the data**: use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.

  c. **Fit a linear function** for a scatter plot that suggests a linear association.

  MAFS.912.S-ID.3.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

## Instructional Learning Objectives

**Students will be able to:**

- Fit a linear function for a scatter plot that suggests a linear association

## Instructional Resources

- McGraw-Hill Algebra 1
  - 4-5 Scatter Plots and Lines of Fit
Sample Problem:
The table below shows the predicted annual cost for a middle-income family to raise a child from birth until adulthood. Create a scatter plot of the data and sketch a line of best fit. Then answer questions below.

<table>
<thead>
<tr>
<th>Child's Age</th>
<th>Annual Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>10,700</td>
</tr>
<tr>
<td>6</td>
<td>11,700</td>
</tr>
<tr>
<td>9</td>
<td>12,600</td>
</tr>
<tr>
<td>12</td>
<td>15,000</td>
</tr>
<tr>
<td>15</td>
<td>16,700</td>
</tr>
</tbody>
</table>

a) Write the equation of line of best fit
b) What does the y-intercept represent in context of the data?
c) What does the slope represent in the context of data?
### MA.912.DP.2.5

**Connections between B.E.S.T. and Florida Standards**

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MA.912.DP.2.5</strong> Given a scatter plot that represents bivariate numerical data, <em>assess the fit of a given linear function by plotting and analyzing residuals.</em></td>
<td><strong>MAFS.912.S-ID.2.6</strong> Represent data on two quantitative variables on a <em>scatter plot</em> and describe how the variables are related. b. Informally <em>assess the fit of a function by plotting and analyzing residuals</em></td>
</tr>
</tbody>
</table>

### Instructional Learning Objectives

**Students will be able to:**
- Calculate residuals
- Construct a residual plot for the given data set and the given linear function
- Analyze the residual plot to assess the fit of the given linear function

### Instructional Resources

**Algebra Nation**
- Section 10 – Two-Variable Statistics
  - Topic 5 – Residuals and Residual Plots – Part 1
  - Topic 6 – Residuals and Residual Plots – Part 2

**Khan Academy**
- [Introduction to residuals](#)
- [Calculating and Interpreting residuals](#)

**MFAS Formative Assessments**
- [Residuals](#)

### Sample Problem:

A line of best fit was drawn for the scatter plot below: Determine the residual associated with each point and use it to create a residual plot.

![Scatter Plot](#)

<table>
<thead>
<tr>
<th>$x$</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residual</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Based on the residual plot, state whether the equation is a good fit for the data. Justify your answer.
### Connections between B.E.S.T. and Florida Standards

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MA.912.DP.2.6</strong> Given a scatter plot with a line of fit and residuals, determine the strength and direction of the correlation. Interpret strength and direction within a real-world context.</td>
<td><strong>MAFS.912.S-ID.3.8</strong> Compute (using technology) and interpret the correlation coefficient of a linear fit.</td>
</tr>
<tr>
<td><strong>MAFS.912.S-ID.3.9</strong> Distinguish between correlation and causation.</td>
<td></td>
</tr>
</tbody>
</table>

### Instructional Learning Objectives

**Students will be able to:**
- Determine the strength and direction of correlation when given a scatter plot
- Interpret the strength and direction of correlation within a real-world context
- Distinguish between correlation and causation

### Instructional Resources

**McGraw-Hill Algebra 1**
- Extend 4-5 Correlation and Causation

**IXL Math Algebra 1 and 2**
- Interpret a scatter plot [8BS](#)
- Match correlation coefficients to scatter plots [FQ7](#)

**Algebra Nation**

Section 10 – Two-variable Statistics
- Topic 7 – Examining Correlation

**Khan Academy**
- [Correlation coefficient review](#)

**MFAS Formative Assessments**
- [Correlation for Life Expectancy](#)
- [Correlation Order](#)
- [How Big Are Feet?](#)
- [July December Correlation](#)
- [Sleep and Reading](#)

### Sample Problem

The graph below shows the relationship between the number of hours studied and the test scores.

Sketch a line of best fit and describe the correlation between the number of hours studied and the test scores.

![Graph of test scores vs. number of hours studied](image)
**MA.912.DP.3.1**  
**Connections between B.E.S.T. and Florida Standards**

**B.E.S.T.**  
**MA.912.DP.3.1** Construct a two-way frequency table summarizing bivariate categorical data. Interpret joint and marginal frequencies and determine possible associations in terms of a real-world context.

**Florida Standard**  
MAFS.912.S-ID.2.5 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.

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**Instructional Learning Objectives**

**Students will be able to:**
- Construct and two-way frequency table based on the given bivariate data
- Identify joint and relative frequencies
- Interpret joint and relative frequencies in context of the data
- Determine possible associations within the data

**Instructional Resources**

- McGraw-Hill Algebra 1
  - Extend 12-7 Two Way Frequency Tables
- IXL Math Algebra 1 and 2
  - Find probabilities using two-way frequency tables
- Algebra Nation
  - Section 10 – Two-Variable Statistics
  - Topic 1 – Relationship between Two-Categorical Variables – Marginal and Joint Frequency – Part 1
  - Topic 2 – Relationship between Two-Categorical Variables – Marginal and Joint Frequency – Part 2
- Khan Academy
  - Two-Way Tables
- MFAS Formative Assessments
  - Breakfast Drink Preference

---

**Sample Problem**

Complete the frequency table below.

Based on the information in the table, is there any association between the grade in math class and ability to play an instrument?

<table>
<thead>
<tr>
<th>Plays an instrument</th>
<th>Has an A in math</th>
<th>Doesn’t have an A in math</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20</td>
<td></td>
<td>90</td>
</tr>
<tr>
<td>Doesn’t play an instrument</td>
<td>20</td>
<td></td>
<td>350</td>
</tr>
</tbody>
</table>

---

**MA.912.DP.3.2**  
**Connections between B.E.S.T. and Florida Standards**

**B.E.S.T.**  
**MA.912.DP.3.2** Given marginal and conditional frequencies, construct a two-way relative frequency table summarizing categorical bivariate data.

**Florida Standard**  
MAFS.912.S-ID.2.5 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.
## Instructional Learning Objectives

<table>
<thead>
<tr>
<th>Students will be able to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Construct a two-way relative frequency table</td>
</tr>
<tr>
<td>• Calculate joint relative and marginal relative frequencies</td>
</tr>
<tr>
<td>• Calculate conditional relative frequencies</td>
</tr>
</tbody>
</table>

## Instructional Resources

<table>
<thead>
<tr>
<th>McGraw-Hill Algebra 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 9-2 Solving Quadratic Equations by Graphing</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IXL Math</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Find conditional probabilities using two-way frequency tables <a href="#">BZZ</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Algebra Nation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 10 – Two-Variable Statistics</td>
</tr>
<tr>
<td>• Topic 3 – Two Categorical Variables – Conditional Relative Frequency</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Khan Academy</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Two-way relative frequency tables</td>
</tr>
<tr>
<td>• Distributions in two-way tables</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MFAS Formative Assessments</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Conditional Relative Frequency</td>
</tr>
</tbody>
</table>

## Sample Problem

A study shows that 9% of the population have diabetes and 91% do not. The study also shows that 95% of the people who do not have diabetes, test negative on a diabetes test while 80% who do have diabetes, test positive. Based on the given information, complete the following two-way relative frequency table

<table>
<thead>
<tr>
<th>Has diabetes</th>
<th>Test Positive</th>
<th>Test Negative</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doesn’t have diabetes</td>
<td></td>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MA.912.DP.3.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connections between B.E.S.T. and Florida Standards</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B.E.S.T.</th>
<th>Florida Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA.912.DP.3.3 Given a two-way relative frequency table or segmented bar graph summarizing categorical bivariate data, interpret joint, marginal and conditional relative frequencies in terms of a real-world context.</td>
<td>MAFS.912.S-ID.2.5 Summarize categorical data for two categories in two-way frequency tables.</td>
</tr>
<tr>
<td>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>
<td></td>
</tr>
</tbody>
</table>

## Instructional Learning Objectives

<table>
<thead>
<tr>
<th>Students will be able to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Use a two-way relative frequency to determine relative frequencies</td>
</tr>
</tbody>
</table>

## Instructional Resources

<table>
<thead>
<tr>
<th>MFAS Formative Assessments</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Marginal and Joint Frequency</td>
</tr>
<tr>
<td>• Who is a Vegetarian?</td>
</tr>
</tbody>
</table>
• Interpret joint relative and marginal relative frequencies
• Interpret conditional relative frequencies

**Sample Problem**
Use the given two-way relative frequency table to answer the following questions:

<table>
<thead>
<tr>
<th>Has diabetes</th>
<th>Positive</th>
<th>Negative</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does have diabetes</td>
<td>7.2%</td>
<td>1.8%</td>
<td>9%</td>
</tr>
<tr>
<td>Doesn't have diabetes</td>
<td>4.55%</td>
<td>86.45%</td>
<td>91%</td>
</tr>
</tbody>
</table>

a) What is the ratio of true positives to false positives?

b) What is the likelihood that a person who tested positive has diabetes?

c) What is the probability that a person who tested positive does not have diabetes?