# Unit 1 Relationships Between Quantities and Reasoning with Equations

## Topic 1: Quantities and Expression

**Suggested Number of Days:** 10

### Essential Questions:
- How can you represent quantities, patterns, and relationships?
- Can two algebraic expressions that appear to be different be equivalent?
- How do you represent relationships between quantities that are not equal?

### Vocabulary:
- interpret, units, formula, origin, data, information, scale, data display, reasonable, unreasonable, rounding, estimate, appropriate, decompose, term, factor, coefficient, variable, expression, constant, exponent

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</table>
| N.Q.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **P.1 Make sense of problems and persevere in solving them.** **P. 2 Reason abstractly and quantitatively.** | ▶ Interpret units in the context of a word problem  
▶ Solve a multi-step problem, using units to evaluate the appropriateness of the solution.  
▶ Choose the appropriate units for a specific formula and interpret the meaning of the unit in that context.  
▶ Understand that the origin in a graph or data display is not always zero, zero  
▶ Choose and interpret both the scale and the origin in graphs and data displays | [www.regentsprep.org](http://www.regentsprep.org)  
[www.easyworksheet.com](http://www.easyworksheet.com)  
[www.khanacademy.org](http://www.khanacademy.org) | Home work Quiz Chapter Test |
| N.Q.2 Define appropriate quantities for the purpose of descriptive modeling. **P. 1 Make sense of problems and persevere in solving them.** **P.4 Model with mathematics.** | ▶ Determine typical and reasonable quantities for a given problem  
▶ Determine when a quantity is unreasonable  
▶ Determine the appropriate subset of the real numbers for a given problem (when are negative numbers inappropriate, when are irrational numbers inappropriate, etc...) | [www.regentsprep.org](http://www.regentsprep.org)  
[www.easyworksheet.com](http://www.easyworksheet.com)  
[www.khanacademy.org](http://www.khanacademy.org) | Home work Quiz Chapter Test |
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<td><strong>N.Q.3</strong> Choose a level of accuracy appropriate to limitations on measurement when reporting quantities</td>
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<tr>
<td><strong>P.1 Make sense of a problem and persevere in solving them.</strong></td>
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<td><strong>P.6 Attend to precision.</strong></td>
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<td><strong>Major Cluster – 70%</strong></td>
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<tr>
<td>- Understand that a rounded or unrounded answer may not be appropriate for a given problem</td>
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<td>- Determine when to round</td>
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<td>- Determine when to estimate</td>
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<td>- Determine to what place value rounding is appropriate</td>
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<tr>
<td>- Choose a level of accuracy</td>
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<tr>
<td><strong>A.SSE.1</strong> Interpret expressions that represent a quantity in terms of its context.</td>
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<td>- a. Interpret parts of an expression, such as terms, factors, and coefficients.</td>
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<td>- b. Interpret complicated expressions by viewing one of more of their parts as a single entity. <em>For example: Interpret P(1+r)^n as the product of P and a factor not depending on P. Limit to linear and exponential expressions with integer exponents.</em></td>
</tr>
<tr>
<td><strong>P.2 Reason abstractly and quantitatively.</strong></td>
</tr>
<tr>
<td><strong>P.4 Model with mathematics.</strong></td>
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<tr>
<td><strong>Major Cluster – 70%</strong></td>
</tr>
<tr>
<td>- Identify parts of an algebraic expression</td>
</tr>
<tr>
<td>- Define terms, factors, coefficients, variable, constant, exponent</td>
</tr>
<tr>
<td>- Interpret individual parts of an algebraic expression</td>
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<tr>
<td>- Decompose expressions</td>
</tr>
<tr>
<td>- Explain the meaning of individual parts of an expression</td>
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# Unit 1 Relationships Between Quantities and Reasoning with Equations

## Topic 2: Creating, Understanding and Solving Equations and Inequalities

### Suggested Number of Days: 27

**Essential Question(s):**
- How are properties related to algebra?
- Can equations that appear to be different be equivalent?
- What information does the equation of a line give you?

**Vocabulary:** Assumption, axis, axes, coefficient, coordinate plane, constraint, create, equations, explain, exponential, exponential equation, inequality, justify, linear, literal equation, non-viable solution, represent, scale, solve (different from simplify), solution, variable, viable argument, viable

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</table>
| A.CED.1 Create equations and inequalities in one variable and use them to solve problems. | ❖ Translate verbal expressions into algebraic expressions  
❖ Translate verbal problems into algebraic equations  
❖ Translate verbal problems into algebraic inequalities  
❖ Create a let statement  
❖ Solve linear equations/inequalities in one variable  
❖ Solve simple rational equations  
❖ Solve simple exponential equations in one variable | McDgl Littell Alg 1 Textbk (2004 ed): Section 1.5  
Section 3.1  
Section 3.2 | www.regentsprep.org  
www.easyworksheet.com  
www.khanacademy.org | Home work Quiz Chapter Test |
| Include equations arising from linear, simple rational and exponential functions. |  |  |  |
| P.1 Make sense of problems and preserve in solving them.  
P.4 Model with mathematics.  
P.7 Look for and make use of structure. |  |  |  |
<p>| <strong>Major Cluster – 70%</strong> |  |  |  |</p>
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<th>A.CED.2</th>
<th>A.CED.3</th>
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<tbody>
<tr>
<td>Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. Stress the situations more than the x-y coordinate plane.</td>
<td>Represent constraints by linear equations or linear inequalities, and interpret solutions as viable or non-viable options in a modeling context. For example; represent inequalities describing nutritional and cost constraints on combinations of different foods.</td>
</tr>
<tr>
<td><strong>P.4 Model with mathematics.</strong> <strong>P.6 Attend to precision.</strong> <strong>Major Cluster – 70%</strong></td>
<td><strong>P.4 Model with mathematics</strong> <strong>P.6 Attend to precision.</strong> <strong>Major Cluster – 70%</strong></td>
</tr>
<tr>
<td>Major Cluster – 70%</td>
<td>A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example; rearrange Ohm’s law $V=IR$ to highlight resistance $R$.</td>
</tr>
</tbody>
</table>
A.REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. *Extend work with linear equations to solving inequalities and literal equations in one variable. Include simple exponentials equations that rely only on application of the laws of exponents such as $5^3 = 125$ or $2^{-1} = rac{1}{2}$.  

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P.7 Look for and make use of structure. P.8 Look for and express regularity in repeated reasoning.

**Major Cluster – 70%**

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- McDgl Littell Alg 1 Textbk (2007 ed): Chapter 3, 6 Section 9.1
- [www.regentsprep.org](http://www.regentsprep.org)
- [www.easyworksheet.com](http://www.easyworksheet.com)
- [www.khanacademy.org](http://www.khanacademy.org)
- Home work Quiz Chapter Test
# Unit 2 Linear and Exponential Relationships

## Topic 3: Linear and Exponential Systems

### Suggested Number of Day: 31

**Essential Question(s):**
How can you simplify expressions involving exponents?
What are the characteristics of exponential functions?
Can systems of equations model real-world situations?

**Vocabulary:** Coordinate plane, equivalent, explain, exponent, exponential equation, integer, integral exponent, line, prove, rational exponents, rational number, simplify, simplest form, solution, solution set, system of linear equations, table of values, T-chart, x-coordinates, y-coordinates

<table>
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</table>
| N.RN.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* $5^{1/3}$ *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.* | ✓ Understand that exponents are a shorthand notation for repeated multiplication
✓ Evaluate an expression that contains integral exponents: power times a power, power of a power, power divided by a power
✓ Extend the property rules of exponents to justify that $(a^{1/x})^x = a^1$
✓ Evaluate when both variables or numbers are bases | McDgl Littell Alg 1 Textbk (2004 ed): Chapter 8
www.regentsprep.org
www.easyworksheet.com
www.khanacademy.org | Home work Quiz Chapter Test |
| N.RN.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents. *P.7 Look for and make use of structure.* *P.8 Look for and express regularity in repeated reasoning.* | ✓ Define and identify radicand, root index, exponent, and base
✓ Rewrite rational exponents as radicals including both numbers and variables as bases.
✓ Rewrite radicals as rational exponents | McDgl Littell Alg 1 Textbk (2004 ed): Section 9.1-2 | Home work Quiz Chapter Test |
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| including both numbers and variables as bases. | www.regentsprep.org
| | www.easyworksheet.com
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| A.REI.5 Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. | Prove the elimination method using a balanced scale analogy
| | Prove the elimination method by exploring the graphs of the lines
| | McDgl Littell Alg 1 Textbk (2004 ed): Chapter 7
| | www.regentsprep.org
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<td>P. 4 Model with mathematics.</td>
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<td>P.7 Look for and make use of structure.</td>
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| Home work Quiz Chapter Test |
A.REI.6 Solve systems of linear equations exactly and approximately (e.g. with graphs), focusing on pairs of linear equations in two variables. Justify method used. Show infinite solutions, and no solution as well one solution.

P.5 Use appropriate tools strategically.

P.6 Attend to precision.

**Major Cluster – 70%**

| Graph lines by using the slope-intercept method |
| Solve a system of linear equations graphically |
| Solve a system of linear equations by substitution |
| Solve a system of linear equations by elimination |
| Determine which of the 3 methods is best for a specific problem |
| Determine when a system of linear equations has no solution, 1 solution, infinitely many solutions |

McDgl Littell Alg 1 Textbk (2004 ed):
Chapter 7

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<td>A.REI.10</td>
<td>Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).</td>
<td>Focus on linear and exponential and be able to apply later.</td>
<td>Supporting Cluster – 20%</td>
<td>McDgl Littell Alg 1 Textbk (2004 ed): Chapter 4</td>
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<td>A.REI.11</td>
<td>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.</td>
<td>Include cases where f(x) and g(x) are linear or exponential.</td>
<td>Supporting Cluster – 20%</td>
<td>McDgl Littell Alg 1 Textbk (2004 ed): Chapter 7.1</td>
<td>Home work Quiz Chapter Test</td>
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</tbody>
</table>
A.REI.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.

P.4 Model with mathematics
P.8 Look for and express regularity in repeated reasoning
Supporting Cluster – 20%

Topic 3 – Review & Test

2 – 3 days
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<td><strong>Topic 4: Functions</strong></td>
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**Essential Question(s):**
- How can you represent and describe functions?
- Can functions describe real-world situations?
- What information does the equation of a line give you?

**Vocabulary:** Constant interval, decreasing interval, domain, end behavior, exponential decay, exponential function, exponential growth, \( f(x) \), Fibonacci sequence, function, functional notation, increasing interval, intercepts, intervals, input, negative interval, output, positive interval, range, rate of change, recursive, sequence, symmetry

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<th><strong>Aims I can:</strong></th>
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<tr>
<td>F.IF.1</td>
<td>Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If ( f ) is a function and ( x ) is an element of its domain, then ( f(x) ) denotes the output of ( f ) corresponding to the input ( x ). The graph of ( f ) is the graph of the equation ( y = f(x) ).</td>
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<tr>
<td>P.2</td>
<td>Reason abstractly and quantitatively.</td>
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<tr>
<td>P.4</td>
<td>Model with mathematics.</td>
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<th><strong>Aims I can:</strong></th>
<th><strong>Resources</strong></th>
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<tr>
<td>Define and interpret domain and range given graphs, tables, points, mapping</td>
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<tr>
<td>Define and identify functions</td>
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<td>Understand function notation ( f(x) = y )</td>
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<td>Interpret the graph of a function to identify the domain and range.</td>
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<tr>
<th>F.IF.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. Linear and Exponential Functions ONLY.</th>
<th>✗ Apply functional notation to determine f(x) for any numerical or algebraic value of x ✗ Evaluate functions for inputs in their domains ✗ Interpret functions that represent a situation in context</th>
<th>McDgl Littell Alg 1 Textbk (2004 ed): Section 4.8</th>
<th>P.2 Reason abstractly and quantitatively. P.4 Model with mathematics.</th>
<th>Home work Quiz Chapter Test</th>
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<tr>
<td>Major Cluster – 70%</td>
<td>o Define and identify a sequence o Define and identify an arithmetic sequence o Define and identify a geometric sequence o Recognize that a sequence, whose domain as a subset of integers, is a function o Understand that an arithmetic sequence is a linear function o Understand that a geometric sequence is an exponential function</td>
<td><a href="http://www.regentsprep.org">www.regentsprep.org</a> <a href="http://www.easyworksheet.com">www.easyworksheet.com</a> <a href="http://www.khanacademy.org">www.khanacademy.org</a></td>
<td>Major Cluster – 70%</td>
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<td>F.IF.4</td>
<td>Define intercepts, intervals, increasing intervals, constant interval, decreasing interval, and end behavior</td>
<td>Identify domain of a function based on a graph</td>
<td>McDgl Littell Alg 1 Textbk (2004 ed): Sections 4.2 – 4.3, 4.7, 8.5 – 8.6</td>
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<td>For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; and end behavior. Linear and Exponential functions ONLY.</td>
<td>Interpret intercepts, intervals, increasing intervals, constant interval, decreasing interval, and end behavior for a function that models a relationship between two quantities</td>
<td>Identifying domain of a function based on a graph</td>
<td><a href="http://www.regentsprep.org">www.regentsprep.org</a> <a href="http://www.easyworksheet.com">www.easyworksheet.com</a> <a href="http://www.khanacademy.org">www.khanacademy.org</a></td>
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<td>P.4 Model with mathematics. P.7 Look for and make use of structure.</td>
<td>Interpret key features of graphs and tables in terms of the quantities</td>
<td>Identify appropriate domain based on a situation</td>
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<td><strong>Major Cluster – 70%</strong></td>
<td>Sketch graphs showing key features given a verbal description of the relationship</td>
<td>Relate the domain of a function to its graph and to the quantitative relationship it describes</td>
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</table>
| F.IF.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. Only linear functions, and exponential functions whose domain is subset of integers. | Define the average rate of change 
Understand that a linear function has a constant rate of change 
Understand that an exponential function does not have an average rate of change but has a rate of change over a given interval 
Interpret the average rate of change for a function over a specific interval 
Calculate average rate of change for a function given as: an equation, a table of values, or graph 
Estimate the a rate of change from a linear or exponential graph | McDgl Littell Alg 1 Textbk (2004 ed): Sections 4.2 – 4.3, 4.7, 8.5 – 8.6 | Home work Quiz Chapter Test |
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<tr>
<td><strong>P.6 Attend to precision.</strong></td>
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| F.IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. a. Graph linear functions and show intercepts. b. Graph exponential functions showing intercepts and end behavior. Include the comparisons of two functions presented algebraically. For example, compare the growth of two linear functions or two exponential functions such as \( y = 3^x \) and \( y = 100^x \) | Graph linear functions given in equation form 
Graph linear functions given in equation form by hand or using a technology 
Graph a linear function and identify its intercepts 
Graph an exponential function and identify its intercepts, asymptote and end behavior 
Graph and compare two functions represented algebraically | McDgl Littell Alg 1 Textbk (2004 ed): Sections 4.2 – 4.3, 4.7, 8.5 – 8.6 | Home work Quiz Chapter Test |
| | **Major Cluster – 70%** | | |

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F.IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

For example; given a graph of two algebraic expressions, say which has the larger maximum. Linear and exponential functions ONLY.

P.2 Reason abstractly and quantitatively.
P.4 Model with mathematics.

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Home work Quiz Chapter Test
# Unit 2 Linear and Exponential Relationships

## Topic 5: Building, Modeling and Interpreting Functions

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<th>Essential Question(s):</th>
<th>Suggested Number of Days: 42</th>
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<tr>
<td>How can you represent and describe functions?</td>
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<tr>
<td>Can functions describe real-world situations?</td>
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<tr>
<td>How can you use functions to model real-world situations?</td>
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## Vocabulary:
- Arithmetic sequence
- Constant rate of change
- Construct a function
- Decay
- Determine
- Explicit expression
- Exponential function
- Function
- Functional shifts
- Geometric sequence
- Growth
- Identify
- Interpret
- Linear function
- Parameters
- Recursive process
- Rigid motions
- Sequence

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<tr>
<td>F.BF.1 Write a function that describes a relationship between two quantities. &lt;br&gt;a. Determine an explicit expression, a recursive process, or steps for calculation from a context. &lt;br&gt;b. Combine standard function types using arithmetic operations. &lt;br&gt;For example: build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model. &lt;br&gt;Linear and exponential functions ONLY</td>
<td>❖ Define and identify explicit expressions &lt;br❖ Define and identify a recursive process &lt;br❖ Write a function that describes a relationship between two quantities &lt;br❖ Determine the steps for a calculation from context &lt;br❖ Combine standard function types using arithmetic operations</td>
<td>McDougal Littell &lt;brAlgebra 2 Chapter 12.1 – Define Sequences &lt;brAlgebra 2 Chapter 12.5 – Recursion</td>
<td>Home work Quiz Chapter Test</td>
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<tr>
<td>P.4 Model with mathematics. &lt;brP.2 Reasoning abstractly and quantitatively. &lt;br<strong>Major Cluster – 70%</strong></td>
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<td>F.BF.2 Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms. &lt;brConnect arithmetic to linear and geometric to exponential.</td>
<td>❖ Define and understand arithmetic and geometric sequences &lt;br❖ Determine the recursive formula for an arithmetic or geometric sequence &lt;br❖ Determine the explicit formula for an arithmetic or geometric sequence</td>
<td>McDougal Littell &lt;brAlgebra 2 Chapter 12.2 – Arithmetic Sequences &lt;brAlgebra 2 Chapter 12.2 – Geometric Sequences</td>
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<td>P.1 Make sense of a problem and persevere in solving them.</td>
<td>Convert between a recursive and explicit formula</td>
<td>Recursion</td>
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<tr>
<td>P.2 Reasoning abstractly and quantitatively</td>
<td>Apply arithmetic and geometric sequences to model situations</td>
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<tr>
<td><strong>Major Cluster – 70%</strong></td>
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<td>F.BF.3 Identify the effect on the graph of replacing f(x) by 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. <em>Linear and Exponential Functions</em> Focus on Vertical translations of linear and exponential functions. Relate the vertical translation of a linear function to its y-intercept.</td>
<td>Identify a vertical or horizontal shift by looking at a coordinate plane with the graphs of two exponential functions</td>
<td><strong>McDougal Littell</strong> Algebra 1 Chapter 4.7 – Linear Functions Algebra 2 Chapters 7.1 and 7.2 – Exponential Functions</td>
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<td>Identify a vertical or horizontal shift by looking at two exponential equations</td>
<td><strong><a href="http://www.regentsprep.org">www.regentsprep.org</a></strong> <strong><a href="http://www.easyworksheet.com">www.easyworksheet.com</a></strong> <strong><a href="http://www.khanacademy.org">www.khanacademy.org</a></strong></td>
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<td>Connect shifts in the equation to up/down or left/right movement on the graph of an exponential function</td>
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<td>Transform a graph</td>
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<td>Given two graphs find the value of k</td>
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<td>Explore vertical and horizontal stretches and shrinks on exponential functions</td>
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<td>Identify the effect of shifts on linear functions</td>
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<td><strong>Supporting Cluster – 20%</strong></td>
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<tr>
<td>F.LE.1 Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Prove that linear functions grow by equal</td>
<td>Determine when a situation has a linear model</td>
<td><strong>McDouggall Littell</strong> Algebra 1 Textbook – Sections 4.6, 8.5, 8.6</td>
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<td></td>
<td>Determine when a situation can be modeled by an exponential function</td>
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| differences over equal intervals; and that exponential functions grow by equal factors over equal intervals. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another (linear). c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another (exponential). | Examine a variety of situations and determine which ones are linear and which ones are exponential | www.regentsprep.org  
www.easyworksheet.com  
www.khanacademy.org |
| P.2 Reasoning abstractly and quantitatively. P.3 Construct viable arguments and critique the reasoning of others. P.4 Model with mathematics. | Determine the equation of a linear or exponential function from its graph Determine the equation of a linear or exponential function from two input-output pairs reading from a table Determine the equation of a linear or exponential function from a description of a relationship | McDougall Littell  
Algebra 1 Textbook – Sections 5.1, 8.5, 8.6  
www.regentsprep.org  
www.easyworksheet.com  
www.khanacademy.org |
| F.LE.2 Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship or two input-output pairs (including reading these from a table). Build on grade 8 finding equations for lines and linear functions. | Examine the rate of change of a linear function given a table and/or a graph Determine the arithmetic difference in a linear function Examine the non-constant rate of change in an exponential function, determined by the interval examined, given a table and/or graph | McDougall Littell  
Algebra 1 Textbook – Section 10.8  
www.regentsprep.org  
www.easyworksheet.com  
www.khanacademy.org |
<p>| F.LE.3 Observe using graphs and tables that quantity increasing exponentially exceeds a quantity increasing linearly. Comparison between linear and exponential models. | | Home work Quiz Chapter Test |
| P. 2 Reason abstractly and quantitatively. P.7 Look for and make use of structure. | | Home work Quiz Chapter Test |</p>
<table>
<thead>
<tr>
<th>Topic 5 – Review &amp; Test</th>
<th>2 – 3 days</th>
<th>Determine the geometric ratio in an exponential function</th>
<th>Using a graphing calculator, input a linear and an exponential function and analyze their graphs and tables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>F.LE.5 Interpret the parameters in a linear or exponential function in terms of a context. <em>Limit exponentials to the form: f(x) = b^x + k.</em></td>
<td>Determine if a practical situation has limitations (parameters) Understand that if parameters exist, the domain is effected Define a parameter in terms of domain given a specific application Describe parameters in different contexts</td>
</tr>
<tr>
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<td></td>
<td><em>P.1 Make sense of problems and preserve in solving them.</em></td>
<td><em>P.4 Model with mathematics.</em></td>
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<td>Major Cluster – 70%</td>
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<td>McDougall Littell Algebra 1 Textbook – Sections 4.2, 8.5, 8.6</td>
<td>Home work Quiz Chapter Test</td>
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<td><a href="http://www.regentsprep.org">www.regentsprep.org</a> <a href="http://www.easyworksheet.com">www.easyworksheet.com</a> <a href="http://www.khanacademy.org">www.khanacademy.org</a></td>
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</tbody>
</table>
# Unit 3 Descriptive Statistics

## Chapter 6: Statistics

### Suggested Number of Days: 20

#### Essential Question(s):
What does the slope of a line indicate about the line?
How can collecting and analyzing data help you make decisions or predictions?
How can you make and interpret different representations of data?

#### Vocabulary:
Box plots, causation, center, compute, constant, correlation, data, data distribution, dot plots, extreme data points, histograms, interpret, inter-quartile range, median, mean, outliers, range, rate of change, real number line, represent, residuals, scatter plot, slope, spread, standard deviation

<table>
<thead>
<tr>
<th>Content</th>
<th>Aims I can:</th>
<th>Resources</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.ID.1 Represent data with plots on the real number line (dot plots, histograms, and box plots)</td>
<td>❖ Define data  ❖ Organize data into frequency tables and/or cumulative frequency tables  ❖ Represent data using dot plots  ❖ Represent data using histograms  ❖ Calculate median and of a set of data and its quartiles  ❖ Determine the maximum and minimum values for a set of data  ❖ Represent data as box plot</td>
<td><a href="http://www.regentsprep.org">www.regentsprep.org</a>  <a href="http://www.easyworksheet.com">www.easyworksheet.com</a>  <a href="http://www.khanacademy.org">www.khanacademy.org</a></td>
<td>Home work Quiz Chapter Test</td>
</tr>
</tbody>
</table>

**P.1 Make sense of data and persevere in solving them.**
**P.4 Model with mathematics.**
**P.7 Look for and make use of structure.**

**Major Cluster – 70%**
<table>
<thead>
<tr>
<th>S.ID.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. <strong>Justify which you chose by the data set.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Use appropriate tools strategically.</td>
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<td><strong>Major Cluster – 70%</strong></td>
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<tr>
<td>Define and calculate the range of a set of data</td>
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<tr>
<td>Define and calculate Mean, Median, and Mode</td>
</tr>
<tr>
<td>Define and calculate Outliers</td>
</tr>
<tr>
<td>Choose and justify the best measure of central tendency</td>
</tr>
<tr>
<td>Define and calculate inter-quartile range</td>
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<tr>
<td>Define and determine standard deviation</td>
</tr>
<tr>
<td>Apply the above to compare the center and spread of two or more different data sets</td>
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</tbody>
</table>

[www.easyworksheet.com](http://www.easyworksheet.com)

**Home work Quiz**

**Chapter Test**
<table>
<thead>
<tr>
<th>S.ID.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).</th>
<th>✤ Interpret differences in shape, center, and spread in the context of the data sets ✤ Account for possible effects of outliers to the shape, center, and spread in the context of the data sets ✤ Manipulate the extrema to change shape, center or spread of a data set</th>
<th><a href="http://www.regentsprep.org">www.regentsprep.org</a> <a href="http://www.easyworksheet.com">www.easyworksheet.com</a> <a href="http://www.khanacademy.org">www.khanacademy.org</a></th>
<th>Home work Quiz Chapter Test</th>
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<tr>
<td>P.3 Construct viable arguments and critique the reasoning of others. P.4 Model with mathematics.</td>
<td>Major Cluster – 70%</td>
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<td>S.ID.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.</td>
<td>✤ Summarize data for two categories in a two-way frequency table and vice versa ✤ Define and interpret joint, marginal and conditional relative frequencies ✤ Recognize possible associations and trends in the data by applying the above</td>
<td><a href="http://www.regentsprep.org">www.regentsprep.org</a> <a href="http://www.easyworksheet.com">www.easyworksheet.com</a> <a href="http://www.khanacademy.org">www.khanacademy.org</a></td>
<td>Home work Quiz Chapter Test</td>
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<tr>
<td>P.1 Make sense of data and persevere in solving them. P.4 Model with mathematics.</td>
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<td>S.ID.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.</td>
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<td>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.</td>
<td>b. Informally assess the fit of a function by plotting and analyzing residuals.</td>
<td>c. Fit a linear function for a scatter plot that suggests a linear association.</td>
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<tr>
<td><strong>P.1 Make sense of problems and persevere in solving them.</strong></td>
<td><strong>P.4 Model with mathematics.</strong></td>
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<td><strong>Major Cluster – 70%</strong></td>
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<tr>
<td>S.ID.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.</td>
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<td><strong>P.4 Model with mathematics.</strong></td>
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<td><strong>Supporting Cluster – 20%</strong></td>
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<td></td>
<td>Define and determine slope and y-intercept of a line</td>
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<td></td>
<td>Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data</td>
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<td>McDougal Algebra 1 Pg 235 – 246 Easy Planner Sections 4.4 &amp; 4.5 Algebra 1</td>
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</tbody>
</table>
### S.ID.8 Compute (using technology) and interpret the correlation coefficient of a linear fit.

**Supporting Cluster – 20%**

- Define and understand correlation coefficient
- Compute using the graphing calculator the correlation coefficient
- Interpret the correlation coefficient

McDougall Algebra 1
Pg 333 & 325
Algebra 1 (Amsco Review book) Pg 411

Home work Quiz
Chapter Test

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[www.easyworksheet.com](http://www.easyworksheet.com)
[www.khanacademy.org](http://www.khanacademy.org)

### S.ID.9 Distinguish between correlation and causation.

**Supporting Cluster – 20%**

- Define correlation
- Define positive and negative correlations
- Define causation
- Distinguish between correlation and causation

McDougal Algebra 1
- Pg 325 – 328
- Pg 426 – 427
Easy Planner
- Sections 5.6 & 5.7

Home work Quiz
Chapter Test

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[www.easyworksheet.com](http://www.easyworksheet.com)
[www.khanacademy.org](http://www.khanacademy.org)

| Topic 6 – Review & Test | 2 – 3 days | Final Exam will cover Chapters 1 - 6 |
## Unit 4: Expressions and Equations

### Chapter 7: Interpret and Create Expression

**Essential Question(s):**
- How can you represent quantities, patterns, and relationships?
- How are the properties of real numbers related to polynomials?
- What are the characteristics of quadratic functions?

**Vocabulary:** Binomial, coefficient, complete the square, difference of two perfect squares, equivalent expressions, expression, factors, factor, factor completely, function, greatest common factor, GCF, intercepts, interpret, maximum value of a function, minimum value of a function, monomial, perfect square trinomial, polynomial, quadratic expression, roots, square, term, trinomial, zeros

<table>
<thead>
<tr>
<th>Content Standard &amp; Math Practices</th>
<th>Aims I can:</th>
<th>Resources</th>
<th>Assessment</th>
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</thead>
</table>
| A.SSE.1 Interpret expressions that represent a quantity in terms of its context.  
  a. Interpret parts of an expression, such as terms, factors, and coefficients.  
  b. Interpret 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 $P$.  
  Focus on Quadratic and Exponential. | - Identify parts of an algebraic expression  
  - Interpret expressions  
  - Interpret complicated expressions by viewing one or more of their parts as a single entity  
  - Decompose expressions and make sense of the multiple factors and terms by explaining the meaning of the individual parts. | www.regentsprep.org  
www.easyworksheet.com  
www.khanacademy.org | Home work  
Quiz  
Chapter Test |

**Major Cluster – 70%**

**Resources:**
- www.regentsprep.org
- www.easyworksheet.com
- www.khanacademy.org
### A.SSE.2 Use the structure of an expression to identify ways to rewrite it.

For example; see \(x^4 - y^4\) as \((x^2 - y^2)(x^2 + y^2)\).

**P.1 Look for and make use of structure.**

**P.6 Attend to precision.**

**Major Cluster – 70%**

- Create equivalent algebraic expressions by combining like terms
- Create equivalent algebraic expressions by factoring
- Factor by GCF,
- Factor the difference of two perfect squares
- Factor by grouping (to factor a trinomial)
- Factor the sum or difference of two cubes
- Factor by a combination of methods to factor completely

---

### A.SSE.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.
   - Complete the square in a quadratic expression to reveal the maximum or minimum value 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.

**P.6 Attend to precision.**

**P.8 Look for and express regularity in repeated reasoning.**

**Major Cluster – 70%**

- Apply factoring to determine the zeros of a quadratic function
- Given a quadratic function explain the meaning of the zeros of the function, that is \(f(x) = (x - c)(x-a)\) then \(f(a) = 0\) and \(f(c) = 0\)
- Explain the meaning of the zeros graphically, that is the zeros are the x-intercepts
- Convert a quadratic equation in the form \(y = ax^2 + bx + c\) by completing the square
- Convert a quadratic equation in the form \(y = ax^2 + bx + c\) by completing the square to find the maximum or minimum value
- Convert a quadratic equation in the form \(y = ax^2 + bx + c\) by completing the square and explain the meaning of the vertex

---

A.SSE.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

c. Use the properties of exponents to transform expressions for exponential functions. *For example; the expression* $1.15^t$ *can be re-written as* $(1.15^{1/12})^{12t} = 1.012^{12t}$ *to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*

<table>
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<th>Topic 7 – Review &amp; Test</th>
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<td><strong>Major Cluster – 70%</strong></td>
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**P.4 Model with mathematics.**
*P.7 Look for and make use of structure.*

Apply the properties of exponents to derive an equivalent form of an exponential function to reveal and explain specific information about its approximate rate of growth or decay.

**McDougal Littell Algebra 1 Textbook**
P 489 – 538

**Home work Quiz Chapter Test**

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**www.easyworksheet.com**
**www.khanacademy.org**
Unit 4: Expressions and Equations

Chapter 8: Operations with Polynomials

Suggested Number of Days: 22

**Essential Question(s):**
What are the characteristics of exponential functions?
How are the properties of real numbers related to polynomials?

**Vocabulary:** Binomial, closed system, monomial, polynomial, simplify, system, trinomial

<table>
<thead>
<tr>
<th>Content Standard &amp; Math Practices</th>
<th>Aims I can:</th>
<th>Resources</th>
<th>Assessment</th>
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<tbody>
<tr>
<td>A.APR.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.</td>
<td>✅ Identify and define term, monomial, binomial, trinomial and polynomial ✅ Understand and define a closed system ✅ Explain why polynomials form a closed system ✅ Add polynomials and explain how closure applies ✅ Subtract polynomials and explain how closure applies ✅ Multiply polynomials and explain how closure applies</td>
<td>McDougal Littell Textbook P 554 – 574</td>
<td><a href="http://www.regentsprep.org">www.regentsprep.org</a> <a href="http://www.easyworksheet.com">www.easyworksheet.com</a> <a href="http://www.khanacademy.org">www.khanacademy.org</a></td>
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<tr>
<td>Focus on polynomial expressions that simplify to forms that are linear or quadratic in a positive integer power of $x$.</td>
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<td>P.2 Reason abstractly and quantitatively. P.3 Construct viable arguments and critique the reasoning of others.</td>
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**Topic 8 – Review & Test**

2 – 3 days
## Unit 4: Expressions and Equations

### Chapter 9: Create & Solve Equations & Inequalities

**Suggested Number of Days:** 36

**Essential Question(s):**
- What are the characteristics of quadratic functions?
- How can you use functions to model real-world situations?
- Can systems of equations model real-world situations?

**Vocabulary:** Coordinate axes, complex numbers, create an equation in one variable, create an equation in two variables, derive, equation in one variable, equation in two variables, formula, graph, inequalities in one variable, inequality in two variables, label, intersection of graphs, linear-quadratic system, quadratic equation, quadratic formula, real numbers, scale, solution, solution set, solve, solve by completing the square, solve by factoring, solve by inspection, solve by quadratic formula, solve by taking square roots

<table>
<thead>
<tr>
<th>A.CED.1</th>
<th>Aims I can:</th>
<th>Resources</th>
<th>Assessment</th>
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</thead>
<tbody>
<tr>
<td>Create equations and inequalities in one variable and use them to solve problems. Include equations arising from quadratic functions. Extend work on linear and exponential equations in Unit 1 to quadratic equations.</td>
<td>✤ Determine if a situation can be modeled by a quadratic function ✤ Create a quadratic function that models a quadratics situation ✤ Create quadratic equations and/or inequalities in one variable and use them to solve problems in contextual situations</td>
<td>McDougal Littell Pg 628 – 640 <a href="http://www.regentsprep.org">www.regentsprep.org</a> <a href="http://www.easyworksheet.com">www.easyworksheet.com</a> <a href="http://www.khanacademy.org">www.khanacademy.org</a></td>
<td>Home work Quiz Chapter Test</td>
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</table>

**P.1** Make sense of problems and persevere in solving them.  
**P.2** Reason abstractly and quantitatively.  
**P.4** Model with mathematics.

**Major Cluster – 70%**
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<thead>
<tr>
<th>Major Cluster – 70%</th>
<th>Supporting Cluster – 20%</th>
<th>2 – 3 days</th>
<th>Home work Quiz Chapter Test</th>
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</thead>
<tbody>
<tr>
<td>A.CED.2 Create quadratic equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.</td>
<td>A.REL.4 Solve quadratic equations in one variable.</td>
<td>McDougal Littell Pg 628 – 640</td>
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<tr>
<td></td>
<td>a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form ((x - a)^2 = b) that has the same solutions. Derive the quadratic formula from this form.</td>
<td><a href="http://www.regentsprep.org">www.regentsprep.org</a></td>
<td><a href="http://www.easyworksheet.com">www.easyworksheet.com</a></td>
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<tr>
<td></td>
<td>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.</td>
<td><a href="http://www.easyworksheet.com">www.easyworksheet.com</a></td>
<td><a href="http://www.khanacademy.org">www.khanacademy.org</a></td>
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<tr>
<td>A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm’s law (V = IR) to highlight resistance (R). Extend A.CED.4 to formulas involving squared variables.</td>
<td>A.REL.4 Solve quadratic equations in one variable.</td>
<td>McDougal Littell Pg 184 – 189</td>
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<tr>
<td></td>
<td>a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form ((x - a)^2 = b) by completing the square</td>
<td><a href="http://www.regentsprep.org">www.regentsprep.org</a></td>
<td><a href="http://www.easyworksheet.com">www.easyworksheet.com</a></td>
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<td></td>
<td>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.</td>
<td><a href="http://www.easyworksheet.com">www.easyworksheet.com</a></td>
<td><a href="http://www.khanacademy.org">www.khanacademy.org</a></td>
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www.easyworksheet.com
www.khanacademy.org
Students should learn of the existence of the complex number system, but will not solve quadratics with complex solutions until Algebra II.

P.1 Reason abstractly and quantitatively.
P.6 Attend to precision.
P.7 Look for and make use of structure.

**Major Cluster – 70%**

<table>
<thead>
<tr>
<th><strong>Topic 9 Review &amp; Test #2</strong></th>
<th><strong>2 – 3 days</strong></th>
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</table>
| A.REI.7 Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line $y = -3x$ and the circle $x^2 + y^2 = 3$. *Include systems consisting of one linear and one quadratic equation. Include systems that lead to work with fractions. For example, finding the intersections between $x^2+y^2 = 1$ and $y = (x+1)/2$* | *Justify why a linear quadratic system can have 0, 1 or 2 solutions*  
*Solve a simple system consisting of a linear equation and a quadratic equation in two variables graphically*  
*Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically*  
*Determine which method is best for a specific problem* |

**P.4 Model with mathematics**
**P.6 Attend to precision.**

**Major Cluster – 70%**

<table>
<thead>
<tr>
<th><strong>Topic 9 Review &amp; Test #3</strong></th>
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Home work  
Quiz  
Chapter Test
## Unit 5: Quadratic Functions and Modeling

### Chapter 10: Understanding and Analyzing Functions

**Suggested Number of Days:** 38

### Essential Question(s):
- What are the characteristics of rational functions?
- How are radical expressions represented?
- What are the characteristics of square root functions?

### Vocabulary:
- Absolute value function, average rate of change of a function over a specific period, constant interval, cube root function, decreasing interval, domain of a function, end behavior, explain, exponents, exponential function, extreme values, factoring, function, interpret, intercepts, increasing interval, irrational numbers, linear function, maxima, minima, model, nonzero rational numbers, piecewise function, quadratic function, range of a function, rational numbers, relative maximum, relative minimum, square root functions, step function, symmetry, symmetries, x-intercept, y-intercept, zeros

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<th>Aims I can:</th>
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<tbody>
<tr>
<td>N.RN.3 Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.</td>
<td>❖ Know and can justify that when adding or multiplying two rational numbers that the result is a rational number&lt;br&gt;❖ Know and can justify that when adding a rational and an irrational number the result is an irrational number&lt;br&gt;❖ Know and can justify that when multiplying a non-zero rational and an irrational number the result is an irrational number</td>
<td><a href="http://www.regentsprep.org">www.regentsprep.org</a>, <a href="http://www.easylWorksheet.com">www.easylWorksheet.com</a>, <a href="http://www.khanacademy.org">www.khanacademy.org</a></td>
<td>Home work Quiz Chapter Test</td>
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**Supporting Cluster – 20%**

**Topic 10 Review & Test #1**

2 – 3 days
F.IF.4 For a quadratic 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; and symmetries.

Focus on quadratic functions; compare with linear and exponential functions studied in Unit 2.

P.4 Model with mathematics.

Major Cluster – 70%

| F.IF.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 n engines in a factory, then the positive integers would be an appropriate domain for the function. | Relate the domain of a function to its graph  
|---|---|
| Given a graph, find, label the domain and explain what it represents  
| Relate the domain of a function from its graph to the quantitative relationship it describes  
| Given a graph, find, label the domain and explain the quantitative relationship it describes | www.regentsprep.org  
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Cassia County School District #151

<table>
<thead>
<tr>
<th>F.IF.6 Calculate and interpret the average rate of change of a quadratic function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.</th>
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<tr>
<td><strong>P.2 Reason abstractly and quantitatively.</strong></td>
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<tr>
<td><strong>P.3 Construct viable arguments and critique the reasoning of others.</strong></td>
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<td><strong>Major Cluster – 70%</strong></td>
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<tr>
<td>☑ Define average rate of change as slope</td>
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<tr>
<td>☑ Hypothesize and test the rate of change of a quadratic</td>
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<tr>
<td>☑ Determine the rate of change from a quadratic represented symbolically, as table or on the graphing calculator</td>
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<tr>
<td>☑ Investigate the rate of change using three ordered pairs on each leg of the parabola</td>
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<tr>
<td>☑ Draw conclusions about the rate of change in an interval, being positive or negative, depending upon the function increasing or decreasing</td>
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<td>McDougal Littell Pg 235 – 242</td>
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**Topic 10 Review & Test #2**

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<tr>
<th>F.IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. a. Graph linear and quadratic functions and show intercepts, maxima, and minima. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.</th>
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<tbody>
<tr>
<td><strong>P.2 Reason abstractly and quantitatively.</strong></td>
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<td><strong>P.6 Attend to precision.</strong></td>
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<td>☑ Graph a quadratic in vertex form by hand for simple cases and using a graphing calculator for more complex cases</td>
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<tr>
<td>☑ Given a quadratic in standard form, place in vertex form and graph by hand for simple cases and using a graphing calculator for more complex cases</td>
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<td>☑ Determine the intercepts, vertex and max/min of a quadratic from its graph</td>
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<td>☑ Define square root, cube root, piecewise-defined, step and absolute value functions</td>
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<tr>
<td>☑ Identify from a graph a square root, cube root, piecewise-defined, step and absolute value functions</td>
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<tr>
<td>☑ Graph square root, cube root, piecewise-defined, step and absolute value functions b domain and range by finding</td>
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**Cassia County School District #151**

| Major Cluster – 70% | critical points | F.IF.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 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. 
b. 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/10} and classify them as representing exponential growth or decay.*

*Note that this unit, and in particular in F.IF.8b, extends the work begun in Unit 2 on exponential functions with integer exponents.*

P.3 Construct viable arguments and critique the reasoning of others  
P.7 Look for and make use of structure.  
Major Cluster – 70% |
|---|---|---|
| Determine the domain and range of a square root, cube root, piecewise-defined, step and absolute value functions | Determine which form of a quadratic (standard, factored, vertex) is best used to determine the: vertex, axis of symmetry, intercepts, maximum or minimum and concavity  
Apply factoring or completing the square to determine vertex, axis of symmetry, intercepts, maximum or minimum and concavity  
Use the properties of exponents to interpret expressions for exponential functions | www.regentsprep.org  
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F.IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.

Focus on expanding the types of functions considered to include, linear, exponential, and quadratic.

P.1 Make sense of a problem and persevere in solving them.
P.2 Reasoning abstractly and quantitatively.

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Home work Quiz
Chapter Test
## Unit 5: Quadratic Functions and Modeling

### Chapter 11: Build & Interpret Functions

**Suggested Number of Days:** 20

**Essential Question(s):**
- How can you represent and describe functions?
- Can functions describe real-world situations?
- How can you use functions to model real-world situations?

**Vocabulary:**
- Arithmetic sequence, explicit expression, exponential function, function, f(x), f(x) + k, f(x + k), kf(x), f(kx), geometric sequence, inverse functions, recursive process, recursive rule

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<tr>
<td>F.BF.1 Write a function that describes a relationship between two quantities.</td>
<td>❖ Write a function that describes a quadratic relationship between two quantities</td>
<td>McDougal Littell Algebra 2 Chapter 12.1 – Define Sequences Algebra 2 Chapter 12.5 – Recursion</td>
<td>Home work Quiz Chapter Test</td>
</tr>
<tr>
<td>a. Determine steps for calculation from a context.</td>
<td>❖ Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model</td>
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<tr>
<td>b. Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model</td>
<td>❖ Combine standard function types using the algebra of functions</td>
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<td>Focus on situations that exhibit a quadratic relationship.</td>
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<td>P.4 Model with mathematics. <strong>Major Cluster – 70%</strong></td>
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<tr>
<td>F.BF.3 Identify the effect on the graph of replacing f(x) by f(x) + k, k f(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. Include recognizing even and odd functions from their graphs and algebraic expressions for them.</td>
<td>❖ Identify a vertical or horizontal shift by looking at a coordinate plane with the graphs of two quadratic functions</td>
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<td>❖ Identify a vertical or horizontal shift by looking at two quadratic equations</td>
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<td>❖ Connect shifts in the equation to up/down or left/right movement on the graph of a quadratic function</td>
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**Focus on situations that exhibit a quadratic relationship.**

**P.4 Model with mathematics. Major Cluster – 70%**

**F.BF.3** Identify the effect on the graph of replacing f(x) by f(x) + k, k f(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. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
Focus on quadratic functions, and consider including absolute value functions.

P.2 Reason abstractly and quantitatively.
P.7 Look for and make use of structure.

Major Cluster – 70%

- Transform a graph
- Given two graphs find the value of k
- Explore vertical and horizontal stretches and shrinks on quadratic functions
- Identify the effect of shifts on quadratic functions

F.BF.4 Find inverse functions.
- Define the inverse of a function
- Given a graph of a function, identify or graph the inverse
- Determine whether a relation is a function
- Determine if the inverse of a function is also a function
- Given the equation of a linear function, find its inverse algebraically

Focus on linear functions where the domain of the function must be restricted in order for the inverse to exist, such as \( f(x) = x^2, x > 0 \).

P.2 Reason abstractly and quantitatively.

Major Cluster – 70%

- Compare linear and exponential growth to quadratic growth
- Compare linear and exponential growth to quadratic growth by looking at graphs or tables

F.LE.3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.

Compare linear and exponential growth to quadratic growth.

P.4 Model with mathematics.

Major Cluster – 70%

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Final Exam