MTH214 – Honors Algebra II
A Course of Study for Mathematics

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November 15, 2012
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STATEMENT OF PURPOSE

Honors Algebra II is a course which is the second in a sequence of three college preparatory courses (Geometry, Algebra II and Pre-Calculus) that develops the foundation for success in the future study of mathematics. This course provides experiences with technology, analysis, and discovery in relating a complex mathematical system to the real world.

The advancement to higher mathematics knowledge is based upon the assumption that prior learned concepts have been retained by the student. Thus what was learned in Honors Algebra I cannot be ephemeral, but must form the foundation of the more sophisticated analysis inherent in Honors Algebra II. Consistent with this philosophy will be student accountability for knowledge acquired in the early weeks of Honors Algebra II. Students will be provided with a list of topics to be reviewed. To foster the recall necessary for student success, manipulatives and the graphing calculator will be utilized. Students are expected to demonstrate knowledge above and beyond the recall level. Heavy emphasis will be placed throughout the course on the application of the concepts learned. Students will be expected to use higher level thinking skills to solve problems.

Separately we assess students to gauge progress and inform instruction. Benchmark assessments for students in grades 9 through 12 are administered in the form of a midterm and final exam for full year courses. *Special Note: Only final exams are administered at the end of quarter courses and semester courses.

This revision was undertaken to align with the New Jersey Student Learning Standards for Mathematics and the New Jersey Student Learning Standards for Technology.
THE LIVING CURRICULUM

Curriculum guides are designed to be working documents. Teachers are encouraged to make notes in the margins. Written comments can serve as the basis for future revisions. In addition, the teachers and administrators are invited to discuss elements of the guides as implemented in the classroom and to work collaboratively to develop recommendations for curriculum reforms as needed.

AFFIRMATIVE ACTION

During the development of this course of study, particular attention was paid to material, which might discriminate on the basis of sex, race, religion, national origin, or creed. Every effort has been made to uphold both the letter and spirit of affirmative action mandates as applied to the content, the texts and the instruction inherent in this course.

MODIFICATIONS AND ADAPTATIONS

For guidelines on how to modify and adapt curricula to best meet the needs of all students, instructional staff should refer to the Curriculum Modifications and Adaptations included as an Appendix in this curriculum. Instructional staff of students with Individualized Education Plans (IEPs) must adhere to the recommended modifications outlined in each individual plan.
GENERAL GOALS

The course offers students the opportunity to:

1. apply algebraic problem-solving strategies to non-routine problems involving authenticated data.

2. explore intuitively and examine graphically the relationship between the graph of a basic function; i.e., quadratic, rational, exponential, logarithmic and trigonometric, and its translation and reflection on the co-ordinate plane.

3. acquire the ability to solve equations and systems algebraically, substantiated by technology.

4. demonstrate the usefulness and vitality of algebra, simultaneously making it accessible to every student.

5. promote HSPA and SAT concepts throughout the course.

6. use self-assessment to identify their mathematical strengths and weaknesses and to help foster a better understanding of the concepts being taught.
METHODS

The National Council of Teachers of Mathematics Standards endorse the use of discovery-based, hands-on, group-oriented, non-routine problem solving, and technology dependent lessons. These methodologies are to be used throughout this course.

Real world, non-routine problems will be an important part of the Honors Algebra II curriculum. They will not be grouped separately, but will be integrated throughout the curriculum.

Technology such as computers and graphing calculators will be used for both concrete representation of concepts as well as models for exploring new concepts and conjecturing properties and theorems.

Self-assessment and the use of individual strategies will be used to help students understand the material. Spiraling quizzes and tests will provide opportunities for increased assessment performance. A variety of instructional strategies such as peer instruction, group work and projects will be utilized to encourage investigation and connection of topics.
EVALUATION / ASSESSMENT

The methods of monitoring and evaluating student progress throughout the course shall include, but not be limited to the following combinations of written and oral activities.

1. Written quizzes and comprehensive, cumulative unit tests.
2. Completion of homework assignments.
3. Interaction in cooperative group activities.
4. Multiple task projects (individual and/or cooperative - group)
5. Computer activity projects (individual and/or cooperative - group)
6. Classroom participation.
7. Writing assignments.
8. Oral presentations.
MATHEMATICS | STANDARDS FOR MATHEMATICAL PRACTICE

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council’s report *Adding It Up*: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one’s own efficacy).

1 Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

2 Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.
Mathematics | Standards for Mathematical Practice (cont'd.)

3 Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

4 Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.
5 Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

6 Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

7 Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see \(7 \times 8\) equals the well remembered \(7 \times 5 + 7 \times 3\), in preparation for learning about the distributive property. In the expression \(x^2 + 9x + 14\), older students can see the 14 as \(2 \times 7\) and the 9 as \(2 + 7\). They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see \(5 – 3(x – y)^2\) as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers \(x\) and \(y\).
8 Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation \((y – 2)/(x – 1) = 3\). Noticing the regularity in the way terms cancel when expanding \((x – 1)(x + 1)\), \((x – 1)(x^2 + x + 1)\), and \((x – 1)(x^3 + x^2 + x + 1)\) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Connecting the Standards for Mathematical Practice to the Standards for Mathematical Content

The Standards for Mathematical Practice describe ways in which developing student practitioners of the discipline of mathematics increasingly ought to engage with the subject matter as they grow in mathematical maturity and expertise throughout the elementary, middle and high school years. Designers of curricula, assessments, and professional development should all attend to the need to connect the mathematical practices to mathematical content in mathematics instruction.

The Standards for Mathematical Content are a balanced combination of procedure and understanding. Expectations that begin with the word “understand” are often especially good opportunities to connect the practices to the content. Students who lack understanding of a topic may rely on procedures too heavily. Without a flexible base from which to work, they may be less likely to consider analogous problems, represent problems coherently, justify conclusions, apply the mathematics to practical situations, use technology mindfully to work with the mathematics, explain the mathematics accurately to other students, step back for an overview, or deviate from a known procedure to find a shortcut. In short, a lack of understanding effectively prevents a student from engaging in the mathematical practices. In this respect, those content standards which set an expectation of understanding are potential “points of intersection” between the Standards for Mathematical Content and the Standards for Mathematical Practice. These points of intersection are intended to be weighted toward central and generative concepts in the school mathematics curriculum that most merit the time, resources, innovative energies, and focus necessary to qualitatively improve the curriculum, instruction, assessment, professional development, and student achievement in mathematics.
Mathematics | Standards for Mathematical Practice (cont'd.)

High School Common Core State Standards
The high school standards call on students to practice applying mathematical ways of thinking to real world issues and challenges; they prepare students to think and reason mathematically.

The high school standards set a rigorous definition of college and career readiness, by helping students develop a depth of understanding and ability to apply mathematics to novel situations, as college students and employees regularly do.

The high school standards emphasize mathematical modeling, the use of mathematics and statistics to analyze empirical situations, understand them better, and improve decisions. For example, the draft standards state: Modeling links classroom mathematics and statistics to everyday life, work, and decision-making. It is the process of choosing and using appropriate mathematics and statistics to analyze empirical situations, to understand them better, and to improve decisions. Quantities and their relationships in physical, economic, public policy, social and everyday situations can be modeled using mathematical and statistical methods. When making mathematical models, technology is valuable for varying assumptions, exploring consequences, and comparing predictions with data.
GRADING PROCEDURES

Marking Period Grades:

Long- and Short-Term Assessments
- Publisher-prepared tests, quizzes and/or worksheets 90%
- Teacher-prepared tests, quizzes and/or worksheets
- Authentic Assessments
- Technology Applications
- Projects
- Reports
- Labs

Daily Assessments
- Homework 10%
- Do Now / Exit Questions
- Class Participation
- Journal Writing
- Notebook – checks and open notebook assessments
- Explorations

Final Grade:

<table>
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<tr>
<th>Final Grade – Full Year Course</th>
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<tr>
<td><strong>Full Year Course</strong></td>
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<tr>
<td>• Each marking period shall count as 20% of the final grade (80% total).</td>
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<td><strong>The midterm assessment will count as 10% of the final grade, and the final assessment will count as 10% of the final grade.</strong></td>
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In accordance with district policy as mandated by the New Jersey Administrative Code and the New Jersey Student Learning Standards, the following are proficiencies required for the successful completion of the above named course.

The student will:
1. perform arithmetic operations with complex numbers.
2. use complex numbers in polynomial identities and equations.
3. interpret the structure of expressions.
4. write expressions in equivalent forms to solve problems.
5. perform arithmetic operations on polynomials.
6. understand the relationship between zeros and factors of polynomials.
7. use polynomial identities to solve problems.
8. rewrite rational expressions.
9. understand solving equations as a process of reasoning and explain the reasoning.
10. represent and solve equations and inequalities graphically.
11. analyze functions using different representations.
12. extend the domain of trigonometric functions using the unit circle.
13. model periodic phenomena with trigonometric function.
14. prove and apply trigonometric identities.
15. create equations that describe numbers or relationships.
16. interpret functions that arise in applications in terms of a context.
17. analyze functions using different representations.
18. build a function that models a relationship between two quantities.
19. build new functions from existing functions.
20. construct and compare linear, quadratic, and exponential models and solve problems.
21. summarize, represent, interpret data on single count or measurement variable.
22. understand and evaluate random processes underlying statistical experiments.
23. make inferences and justify conclusions from sample surveys, experiments and observational studies.
24. use probability to evaluate outcomes of decisions.

**Optional:**
25. perform operations on matrices, including finding determinants and inverses.
26. solve matrix equations.
The following topics are incorporated progressively throughout the course as they relate to several different content areas:

<table>
<thead>
<tr>
<th>Content Outline</th>
<th>CCSS</th>
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<tbody>
<tr>
<td>Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.</td>
<td>A.CED.3</td>
</tr>
<tr>
<td>Rearrange formulas to highlight a quantity or interest, using the same reasoning as in solving equations.</td>
<td>A.CED.3</td>
</tr>
<tr>
<td>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.</td>
<td>F.IF.6</td>
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<tr>
<td>Identify the effect on the graph of replacing, $f(x)$ by $f(x) + k$, $k f(x)$, $f(x)$, and $f(x + k)$ for specific value of $k$ (both positive and negative); find the value of $k$ given the graphs. Experiment with cases and illustrate an explanation of the effects of on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.</td>
<td>F.BF.3</td>
</tr>
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</table>
I. **PREREQUISITES**

**Essential Question(s):**

a) How can one determine whether a relation is a function?

b) What techniques are used for solving linear and absolute value equations and inequalities systematically?

c) What is the relationship between a linear equation and its graph?

**Enduring Understanding(s):**

a) Specific steps are used to rewrite linear expressions.

b) Absolute value expressions can be interpreted in pieces.

c) A relation is a function if for every input there is exactly one output.

d) A graph is a visual representation of all points satisfying an equation.

<table>
<thead>
<tr>
<th>CONTENT OUTLINE</th>
<th>STANDARDS</th>
<th>SUGGESTED ACTIVITY</th>
<th>EVALUATION/ASSESSMENT</th>
<th>TEACHER NOTES</th>
</tr>
</thead>
</table>
| I. Prerequisites (3, 4, 9, 10, 11, 15, 16, 17, 18) | A.REI.11 F.IF.7a A.CED.1 A.CED.2 F.IF.5 F.IF.6 F.IF.8 F.IF.9 | • use the Vertical Line Test to determine which graphs are functions. | Verify mastery by completing the following: Solve:
  a. \(|x - 2| = 15\)
  b. \(3x - 2 \leq 12\)
  c. \(2x + 5 > 10\) | Review only as needed through a “Do-Now” or homework exercises.

<table>
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<th>Students will:</th>
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Determine the slope and equation of a line that contains the points \((3, 7)\) and \((4, 12)\).

Find the equation of a line that passes through the points \((-4, -1)\) and \((0, 9)\).
### II. SPECIAL FUNCTIONS

**Essential Question(s):**

a) What techniques can be used to graph piecewise functions (including absolute value and step functions)?
b) What effects do the various parameters in an equation have on the graph?
c) How can one determine whether a function is even or odd?

**Enduring Understanding(s):**

a) Functions can be graphed, one part at a time.
b) Graphs can be translated, dilated, or reflected by changing appropriate parameters in the function.
c) Even and odd functions have specific algebraic and graphical properties and symmetries.

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<tr>
<td>II. Special Functions (3, 10, 11, 9, 15, 16, 17, 18, 19))</td>
<td>A.REI.11 F.IF.7b A.CED.3 F.IF.7b F.IF.5 F.BF.3 8.2.12.C.4</td>
<td>Students will use a calculator to explore how changing the absolute value function changes its graph.</td>
<td>Graph: ( f(x) = \begin{cases} -2x + 3 &amp; x \leq 1 \ x &amp; x &gt; 1 \end{cases} ) ( f(x) = -</td>
<td>x + 3</td>
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<tr>
<td>A. Piecewise Functions</td>
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<td>If Garage rates are posted as shown: $3 per half hour $8 maximum for 12 h</td>
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<tr>
<td>B. Absolute Value Functions</td>
<td></td>
<td>write and graph a piecewise function for these parking charges.</td>
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<tr>
<td>C. Transformations of Functions</td>
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<td>state the domain and range of this function.</td>
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<tr>
<td>D. Step Functions</td>
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<tr>
<td>E. Even and Odd Functions</td>
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III. **SYSTEMS OF LINEAR EQUATIONS**

**Essential Question(s):**

a) What techniques can be used to solve and graph a system of linear equations or inequalities?

b) How can one model and solve real-life situations using a linear system?

c) How many solutions can a linear system have?

**Enduring Understanding(s):**

a) The graph of a system shows how many solutions it has.

b) Substitution and linear combinations are algebraic methods used to solve a system of linear equations.

c) The solution(s) to a linear system are all points that lie in the intersection of the individual solution sets.

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</table>
| III. Systems of Linear Equations (4, 5, 9, 10, 15, 16, 17, 18) | A.REI.11 | • solve a system of linear equations by:  
  a) graphing  
  b) substitution  
  c) linear combination and compare the answers obtained by each method.  
 • use graphing methods to determine:  
  a) vertices of convex region of intersection  
  b) maximum/minimum value of a family of curves on that region when given a system of linear inequalities, | Solve the following system by graphing, linear combination and substitution:  
  \[ \begin{align*} 2x + y &= 5 \\ 2x - 3y &= 4 \end{align*} \] | Chapter 3  
  3.1-3.3 are covered thoroughly in Algebra I and are included here as a lead-in to solving systems using matrices.  
  Use a graphing calculator to form matrices to solve a system of equations. |
IV. **MATRICES AND DETERMINANTS**

**Essential Question(s):**
- a) How are matrix operations performed?
- b) What is the role of determinants and inverses?
- c) How can matrix equations help solve linear systems?

**Enduring Understanding(s):**
- a) Matrix operations are defined under certain circumstances based on their dimensions.
- b) Determinants are related to inverses, which can be used to help solve equations.

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<td><strong>OPTIONAL:</strong></td>
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<tr>
<td>IV. Matrices and Determinants (25, 26)</td>
<td>N.VM.6 N.VM.7 N.VM.8 N.VM.9 N.VM.10 A.REI.8 A.REI.9</td>
<td>• perform basic mathematical operations on matrices. • solve a system of linear equations using: a) Cramer’s Rule b) Inverse Matrices • given a square matrix, evaluate: a) the inverse b) the determinant</td>
<td>Given: $$A = \begin{bmatrix} 3 &amp; 4 \ 5 &amp; 6 \end{bmatrix}$$ $$B = \begin{bmatrix} -1 &amp; -2 \ -3 &amp; 0 \end{bmatrix}$$ Find: $$A + B, A - B, AB, 2A, A^{-1}, \text{det } B.$$ Solve: $$AX = B$$</td>
<td>This topic is <strong>optional</strong>. If time permits, teachers may wish to teach this in conjunction with Systems of Linear Equations (Sec III). Chapter 4 Students should be able to accomplish most tasks, both with and without a calculator. For finding determinants for inverses of matrices 4x4 and larger and inverses of matrices 3x3 and larger, always use a calculator.</td>
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</tbody>
</table>
V. QUADRATIC FUNCTIONS

Essential Question(s):

a) What techniques can be used to graph and solve quadratic equations and inequalities?
b) What is the role of the discriminant?
c) What are the advantages of the various forms of quadratic equations?
d) How are operations performed on complex numbers?

Enduring Understanding(s):

a) Several different methods are available for solving quadratic equations and inequalities.
b) The discriminant can determine the number and nature of the solutions.
c) Various forms of the equation show different information about the function.
d) Complex numbers are an extension of the real number system.

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</table>
| V. Quadratic Functions (1-7, 9-11, 15-20) | A.REI.11  
F.IF.7a  
F.IF.8  
F.IF.9  
F.BF.3  
8.2.12.C.4 | • graph functions of the form:  
$y = ax^2 + bx + c$ and  
$y = a(x-h)^2 + k$ | Graph the following quadratic functions:  
$f(x) = -2x^2 + 8x - 5$  
$f(x) = (x+4)^2 + 3$ | Chapter 5  
Graphing quadratic equations and solving quadratic equation by factoring and by quadratic formula are introduced in Algebra I.  
Review factoring as necessary. |
| A. Graphing Quadratic Functions | 1. Standard Form: find roots vertex  
2. Vertex Form: perform transformations | • use various methods to solve a quadratic equation and compare answers:  
a) factor  
b) complete the square  
c) quadratic formula |  | |
| B. Solving Quadratic Equations | N.CN.7  
A.REI.11  
A.CED.1 |  |  |  |
<table>
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<tr>
<th>Numbering</th>
<th>Standards</th>
<th>Suggested Activity</th>
<th>Evaluation/Assessment</th>
<th>Notes</th>
</tr>
</thead>
</table>
| VI. Quadratic Functions (continued) | N.CN.1 N.CN.2 | **C.** (Complex Numbers
1. Adding
2. Subtracting
3. Multiplying | • simplify: 
(\sqrt{2}+3i)^2
(5-2i)(4+3i) | Simplify: 
(3+2i)^2 |
| | N.CN.7 A.REI.11 | **D.** Use the Discriminant to find the Number and type of Solutions | • create a quadratic function with:
one solution, two solutions, no real solutions | Use the discriminant to classify and then find the roots of the equation
x^2+8x+15=0 |
| | A.CED.1 A.CED.2 F.IF.4 F.IF.5 F.IF.6 8.1.12.C.1 | **E.** Graphing and Solving Quadratic Inequalities | • graphically represent the solution of a quadratic inequality. | Solve the following quadratic inequality:
x^2-7x<-4 |
| | F.IF.6 | **F.** Modeling with Quadratic Functions, Including Regression Curve Fitting | • examine a real-world example by modeling. | Graph the following quadratic inequality:
y<2x^2+12x+15 |
| | F.IF.6 | **G.** Average Rate of Change | • calculate the average speed given a distance function. | Determine how long it takes for water to fall from the top to the bottom of Niagara Falls if Niagara Falls is 167 feet high. ? |
| | | | | Given the trajectory
h=16t^2+4t+3, find the average speed on the interval 0\leq t \leq 2. |
VI. POLYNOMIALS AND POLYNOMIAL FUNCTIONS

Essential Question(s):

a) How are polynomial operations performed?
b) What techniques can be used to factor polynomials?
c) How are polynomial equations solved?
d) What properties to graphs of polynomial functions have?
e) How can a list of roots be produced?

Enduring Understanding(s):

a) Polynomials can (sometimes) be factored in different ways, into a form that is equivalent to the original form.
b) Polynomial functions have predictable algebraic and graphical properties.
c) Several different techniques can be used to find a list of roots of a polynomial function.

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<tbody>
<tr>
<td>VII. Polynomials and Polynomial (1-7, 9-11, 15-19)</td>
<td>F.IF.7.c F.BF.3 8.2.12.C.4 A.APR.1</td>
<td>simplify algebraic expressions using the laws of exponents. create a third degree function whose end behavior is up left and down right given two polynomials, perform algebraic operations to simplify them. Given: $f(x) = x^2 - 5$ and $g(x) = 3x^2 + 2x + 1$ Graph $f(x) + g(x) f(x) - g(x) f(x)g(x) g(f(x))$</td>
<td>Given:</td>
<td>Chapter 6</td>
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</table>
## CONTENT OUTLINE
Numbers in parentheses indicate correlation with the Proficiencies

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<tr>
<td>Students will</td>
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</table>

### VIII. Polynomials and Polynomial (continued)

#### D. Factoring and Solving Polynomial Equations

1. review factoring general trinomials, perfect square trinomials, difference of two squares, common monomial factors

   - apply appropriate factoring method to given polynomial expressions.

2. sum and difference of two cubes

   - use algebraic identities to evaluate expressions or generate Pythagorean Triples.

3. factoring by grouping

   - using long division and synthetic division, determine missing roots.

4. use identities for arithmetic

   - evaluate $51^2 - 49^2$ by using $(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$ with $x = 3$ and $y = 1$ to find a Pythagorean Triple.

   - find the real zeros of: $f(x) = 2x^3 + 7x^2 - 28 + 12$

   - find the polynomial of least degree having real coefficients and a
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<tr>
<td>Numbers in parentheses indicate correlation with the Proficiencies</td>
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<tr>
<td><strong>E. The Remainder and Factor Theorems</strong></td>
<td>N.CN.9 A.ARP.3</td>
<td>• find zeros for several polynomials and discover relationship between the number of solutions of ( f(x) = 0 ) and the degree of ( f(x) ).</td>
<td>leading coefficient of 1 with zeros, 2, 3, and i.</td>
<td></td>
</tr>
<tr>
<td><strong>IX. Polynomials and Polynomial (continued)</strong></td>
<td>A.APR.3 A.REI.11 F.IF.7c F.IF.4 F.IF.5 F.IF.8 F.IF.9 8.1.12.C.1</td>
<td>• write and graph a polynomial function to determine how to create a box of maximum volume from a piece of cardboard.</td>
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</tr>
<tr>
<td><strong>F. Analyzing Graphs of Polynomial Functions</strong></td>
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<td>•</td>
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<td></td>
</tr>
<tr>
<td>1. identify relationship between zeroes, factors, solutions, x-intercepts</td>
<td></td>
<td>•</td>
<td></td>
<td>A review of average rate of change with polynomial functions is suggested.</td>
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<tr>
<td>2. identify maximum number of turns</td>
<td></td>
<td>•</td>
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<tr>
<td>3. use a calculator to approximate turning points</td>
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</table>

Design an open box to be made of a piece of cardboard that is 10 inches by 15 inches. The box will be formed by making the square cuts shown in the diagram and folding up the sides. You want the box to have the greatest volume possible. How long should you make the cuts? What is the maximum volume? What will the dimensions of the finished box be?
VII. **POWERS, ROOTS, AND RADICALS**

**Essential Question(s):**

- a) What does a rational root denote?
- b) How can radical expressions be simplified?
- c) How are operations performed on rational exponents?
- d) How can equations be solved, and how can one tell if solutions are extraneous?

**Enduring Understanding(s):**

- a) Rational exponents and radical notation are interchangeable.
- b) Rules of rational exponents are the same as those for integral exponents.
- c) Inverse functions can be found using techniques similar to solving equations, but domains may require restrictions.

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<tbody>
<tr>
<td>VII. Powers, Roots and Radicals (3, 4, 9-11, 17, 19)</td>
<td>N.RN.1 N.RN.2</td>
<td>• evaluate nth roots of real numbers using both radical notation and rational exponent notation.</td>
<td>Indicate the fourth roots of 16 using both notations.</td>
<td>Use the graphing calculator to solve polynomial functions</td>
</tr>
<tr>
<td>A. nth Roots and Rational Exponents – evaluate nth roots and expressions with rational exponents with and without a calculator</td>
<td>N.RN.1 N.RN.2</td>
<td>Simplify: ( \sqrt[4]{125} ) ( y^6 ) ( (16g^4h^2)^{\frac{1}{2}} )</td>
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<tr>
<td></td>
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<td>Find: ( 2x^2 + 5x - 12 = 0 ) by factoring ( x^2 + 8x + 15 = 0 ) by completing the square and by using the quadratic formula</td>
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<td></td>
<td>Given: ( f(x) = 3x^{-5} ) and ( g(x) = 6x^\frac{3}{4} )</td>
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<td></td>
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<tr>
<td>CONTENT OUTLINE</td>
<td>STANDARDS</td>
<td>SUGGESTED ACTIVITY</td>
<td>EVALUATION/ASSESSMENT</td>
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</tbody>
</table>
| **B. Properties of Rational Exponents – simplify numeric and variable expressions with radicals** | F.BF.1b  
F.BF.1c  
8.12.C.1 | • use properties of rational exponents to evaluate and simplify expressions.  
• perform operations with functions, including power functions.  
• use a graphing calculator to plot functions written as a set of ordered pairs. Then switch lists used for $x$ and $y$ and graph $y=x$ to see the | | |
| **C. Power Functions and Function Operations** | A.CED.4  
F.BF.4a  
F.BF.4b  
F.BF.4d  
F.IF.7b  
F.BF.3  
8.2.12.C.4 | | | |
| 1. add, subtract, multiply, and divide functions | | | | |
| 2. find the composition of functions | | | | |
| **VIII. Powers, Roots and Radicals** | A.CED.4  
F.BF.4a  
F.BF.4b  
F.BF.4d  
F.IF.7b  
F.BF.3  
8.2.12.C.4 | | | |
| (continued) | | | | |
| | | | | |

Write an equation for the inverse of $f(x) = \frac{1}{2}x - 6$, verify that the functions are inverses by graphing and composition.

Solve:
The height at the hip $h$ (in centimeters) of an ornithomimid, a type of dinosaur, can be modeled by $f(l) = 1.5f$ where $f$ is the footprint length (in centimeters). Use composition of functions to find the relationship between height and footprint length. Then find the height of an ornithomimid with a footprint length of 30 centimeters.

Graph:
$f(x) = -\sqrt{x + 2} + 5$

Solve:
$x - 4\sqrt{2x}$  
$2x = 250$
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<tbody>
<tr>
<td>Numbers in parentheses indicate correlation with the Proficiencies</td>
<td>A.REI.2 A.REI.11 A.CED.1</td>
<td>Students will</td>
<td>TEACHER NOTES</td>
</tr>
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</table>

D. Inverse Functions
1. write an equation for the inverse
2. use composition to verify inverse
3. recognize that graph of inverse is reflection over \( y = x \)

- reflection and the inverse function.
- explore transformations of \( f(x) = \sqrt{x} \).
- solve the same equation twice: once written with a radical and once written with radical exponents.
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<tr>
<td>VIII. Powers, Roots and Radicals (continued)</td>
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<tr>
<td>E. Graphing Square Root Functions</td>
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<tr>
<td>1. graph square root with or without a calculator</td>
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<tr>
<td>2. find the domain and range</td>
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<tr>
<td>F. Solving Radical Equations</td>
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</tr>
<tr>
<td>1. Solve equations with radicals and rational exponents</td>
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</tr>
<tr>
<td>2. find the domain and range</td>
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</tbody>
</table>
**VIII. EXPONENTIAL AND LOGARITHMIC FUNCTIONS**

**Essential Question(s):**

- How can an exponential or logarithmic function be graphed?
- How can a growth or decay situation be modeled?
- How can logarithmic expressions be rewritten?
- How are exponential and logarithmic equations solved?

**Enduring Understanding(s):**

- Exponential and logarithmic graphs are similar in shape, and contain asymptotes.
- Rules of percent increase and decrease can be extended to model growth and decay situations.
- Exponential and logarithmic functions are inverses of each other.
- Properties of logarithms can help to evaluate expressions, or change them into a more convenient form.

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<tr>
<td>VII. Exponential and Logarithmic Functions (3, 4, 9-11, 15-20)</td>
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</tr>
<tr>
<td>A. Exponential Growth and Decay</td>
<td>F.IF.4, F.IF.5, F.IF.7e, A.CED.1, A.CED.2, 8.1.12.C.1</td>
<td>use rabbit population as an example of exponential growth.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. graph exponential growth and decay functions</td>
<td></td>
<td>discuss domain and range of exponential functions.</td>
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</tr>
<tr>
<td>2. write and use equations to model exponential growth and decay</td>
<td></td>
<td>compute compound interest for a $1.00 investment at 100% interest for 1 year, compounding more and more frequently (account balance will approach e).</td>
<td></td>
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<tr>
<td>B. The number e</td>
<td>F.IF.8, F.IF.9, F.LE.4</td>
<td></td>
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</tr>
<tr>
<td>1. simplify natural base expressions</td>
<td></td>
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<td></td>
<td>Chapter 8</td>
</tr>
<tr>
<td>2. graph natural base functions</td>
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<td></td>
<td></td>
<td>Use a graphing calculator to compare transformations of exponential functions</td>
</tr>
</tbody>
</table>

• use rabbit population as an example of exponential growth.

Graph: 
\[ y = -3 \cdot 2^{x+1} \]

Determine how much you would have to invest in an account that pays 2.3% interest compounded quarterly to have a balance of $10,000 in 15 years?

Write an exponential decay model for this situation:
An adult takes 400 milligrams of ibuprofen. Each hour, \( h \), the amount, \( I \), of ibuprofen in this is the same as \( \log_a b = x \), and its application to solving equations
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</table>
| VII. Exponential and Logarithmic Functions (continued) | F.IF.7e  
F.BF.3  
F.BF.4a  
8.2.12.C.4 | • solve $10^x = 100,000$ mentally and evaluate $\log 100,000$ on a calculator to discover what a logarithm is.  
• discuss domain, range, and asymptotes of logarithmic functions.  
• graph $y = e^x$ and $y = \ln x$ on the same coordinate plane to observe they are inverses.  
• complete the following table and use the table to make a conjecture about the relationship among $\log_b u$, $\log_b v$ and $\log_b uv$. | | adult’s system decreases by about 29%. |
| C. Logarithmic Functions | F.IF.8  
F.LE.4 | | | Evaluate:  
1) $\log_5 81$ (without a calculator)  
2) $\ln 2.3$ (calculator)  
3) $5^{\log_5 7}$ (without a calculator)  
Graph: $f(x) = \log_2 (x - 3)$  
If $\log_5 3 \approx 0.683$ and $\log_5 7 \approx 1.209$, then find:  
1) $\log_5 \frac{3}{7}$  
2) $\log_5 21$  
3) $\log_5 49$ | | |
| | | | | Expand $\log(4x^5)$  
Condense: $\ln x - (\ln y + 2\ln z)$ | | |
## CONTENT OUTLINE

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<td>A.REI.11</td>
<td>Use different methods to solve the same equation.</td>
<td>Evaluate ( \log_7 75 ) with a calculator:</td>
<td></td>
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<tr>
<td>F.BF.4a</td>
<td>Check for extraneous solutions.</td>
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<tr>
<td>F.LE.4</td>
<td>Solve equations to solve real-life problems such as:</td>
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<tr>
<td></td>
<td>1) ( 10^{x-3} = 10^{1-x-5} )</td>
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<td></td>
<td>2) ( 5^{2t} = 34 )</td>
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<td></td>
<td>3) (-5 + 2 \ln x = 3)</td>
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</table>

### VII. Exponential and Logarithmic Functions (continued)

#### E. Solving Exponential and Logarithmic Equations

1. by converting between logarithmic and exponential form
2. by taking a log or raising both sides to a power

<table>
<thead>
<tr>
<th>( \log_b u )</th>
<th>( \log_b v )</th>
<th>( \log_b uv )</th>
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<tbody>
<tr>
<td>( \log 10 ) =</td>
<td>( \log 100 ) =</td>
<td>( \log 1000 ) =</td>
</tr>
<tr>
<td>( \log 0.1 ) =</td>
<td>( \log 0.01 ) =</td>
<td>( \log 0.001 ) =</td>
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<tr>
<td>( \log_2 4 ) =</td>
<td>( \log_2 8 ) =</td>
<td>( \log_2 16 ) =</td>
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**Enrichment:**

The table below gives the number \( y \) (in millions) of cell phone subscribers from 1988 – 1997 where \( t \) is the number of years since 1987.
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<td>Students will</td>
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<td>a. draw a scatterplot of (\ln y) versus (x) and use it to determine if an exponential model is a good fit for the original data.</td>
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<tr>
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<td></td>
<td>b) find an exponential model for the original data</td>
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</tbody>
</table>

Source: Cellular Telecommunication Industries Association

8.7
## IX. RATIONAL EQUATIONS AND FUNCTIONS

### Essential Question(s):
- a) How are operations on rational expressions performed? When are common denominators necessary?
- b) What are the properties of graphs of rational expressions?
- c) How can the domain be determined?

### Enduring Understanding(s)
- a) Rational functions are continuous everywhere they are defined.
- b) Horizontal and vertical asymptotes are good guides to sketching graphs.
- c) Division by zero is undefined, and causes discontinuities.
- d) Solutions to equations must be checked for validity.

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<td>Chapter 9</td>
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<tr>
<td>A. Inverse Variation</td>
<td>A.CED.1,</td>
<td>• use Boyle’s Law example: The volume of a fixed amount of gas is inversely proportional to the pressure.</td>
<td>Distinguish between direct and inverse variation from an equation, graph, data, and real-life situation.</td>
<td>Important topic for Chemistry and S.A.T.</td>
</tr>
<tr>
<td>1. Classifying direct and inverse variation</td>
<td>A.CED.2,</td>
<td>• graph an inverse variation model, define hyperbola, and discuss asymptotes.</td>
<td></td>
<td>Use a graphing calculator to illustrate the difference between direct and inverse variations.</td>
</tr>
<tr>
<td></td>
<td>F.IF.4,</td>
<td>• Enrichment: Joint Variation</td>
<td></td>
<td>Emphasize the difference between terms and factors to determine how a rational expression may be simplified.</td>
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<td></td>
<td>F.IF.5,</td>
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<td>A.APR.6,</td>
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<td>8.1.12.C.1</td>
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<tr>
<td>2. Writing inverse variation equation</td>
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<tr>
<td>3. Graphing inverse variation models</td>
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<tr>
<td>B. Multiplying and Dividing Rational Expressions</td>
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- A.CED.1
- A.CED.2
- F.IF.4
- F.IF.5
- A.APR.6
- 8.1.12.C.1
### IX. Rational Equations and Functions (continued)

#### C. Operations with Rational Algebraic Expressions and Complex Fractions

- Students will review factoring showing different options for simplifying complex fractions:
  - a) eliminate one denominator at a time
  - b) eliminate all denominators at once
  - c) simplify numerator, simplify denominator and then divide

- Solve same equation in different ways.

#### D. Solving Rational Functions

- Students will solve equations with two solutions.
- Students will find inverse of a simple rational function.
- Students will solve same equation in different ways.

### SUGGESTED ACTIVITY

- Simplify:
  1. \( \frac{x^3 - 2x^2 + x - 2}{3x^2 - 3x - 8} \)
  2. \( \frac{4xy^3 + y}{x^2y - 8x} \)
  3. \( \frac{12x + 18}{3x - 15} \)
  4. \( \frac{x^2 + 6x - 7}{3x^2} \div \frac{x + 7}{6x} \)
  5. \( \frac{5x - 1}{x^2 + 2x - 8} \)
  6. \( \frac{1}{2x^2 - 2} \)

### EVALUATION/ASSESSMENT

- Solve:
  1. \( \frac{3x}{x - 3} = 4 + \frac{10}{x - 3} \)
  2. \( \frac{2x}{x - 3} = \frac{3x}{x^2 - 9} + 2 \)
  3. \( \frac{5}{x^2 - x} = \frac{4}{x - 1} \)

---

*Find the inverse of:*
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<td>Numbers in parentheses indicate correlation with the Proficiencies</td>
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<td>Students will</td>
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<tr>
<td>IX. Rational Equations and Functions (continued)</td>
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<tr>
<td>E. Graphing Rational Functions</td>
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<tr>
<td>sketch rational functions: identify all intercepts, vertical and horizontal asymptotes, and removable discontinuities (holes).</td>
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<tr>
<td>$f(x) = \frac{x+1}{x-1}, x \neq 1$</td>
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<tr>
<td>Sketch:</td>
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<tr>
<td>$f(x) = \frac{2x + 4}{x - 1}$</td>
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<tr>
<td>$g(x) = \frac{x^2 - 25}{x^2 + 10x + 25}$</td>
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</table>
X. TRIGONOMETRY

Essential Question(s):

a) How do trigonometric functions relate to similar triangles?
b) What is the relationship between degree and radian measure? How can radians help in calculations?
c) How can trigonometric functions (and their inverses) be evaluated for special angles?
d) How many solutions does a trigonometric equation have?
e) What are the special properties of graphs of trigonometric functions?
f) How can identities be used?
g) How can triangles be solved?

Enduring Understanding(s):

a) Trigonometric functions model situations whose values are periodic.
b) Graphs have special properties like amplitude and period.
c) Radian measure helps to extend the domain of trigonometric functions to real numbers.
d) Trigonometric equations can have infinitely many solutions, unless the solution interval has been restricted.
e) Identities can be used to change trigonometric expressions into more convenient forms.

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<th>CONTENT OUTLINE</th>
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<tr>
<td>Numbers in parentheses indicate correlation with the Proficiencies</td>
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<tr>
<td>STANDARDS</td>
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<tr>
<td>X. Trigonometry (12-19)</td>
</tr>
<tr>
<td>A. Right Triangle Trigonometry</td>
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</tbody>
</table>
| 1. given two sides of a right triangle, evaluate the six trig functions of \( \theta \). | G.SRT.8 | • evaluate all six trigonometry functions of a specific angle given side measurements of a right triangle. | Given right \( \triangle ABC \) with \( \angle C = 90^\circ \), \( AB = 30 \text{ units} \), and \( AC = 12 \text{ units} \), evaluate all six trig functions of angle \( A \). | Chapter 13
Emphasize conversions between degrees and radians, the signs of functions in each quadrant, and appropriate use of reference angles.

Students should understand how the amplitude and period are changed. |
<table>
<thead>
<tr>
<th>CONTENT OUTLINE</th>
<th>STANDARDS</th>
<th>SUGGESTED ACTIVITY</th>
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<td><strong>Students will</strong></td>
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<tr>
<td>X. Trigonometry (continued)</td>
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<tr>
<td>B. General Angles and Radian Measure</td>
<td>F.TF.1</td>
<td>create a unit circle with angles and their equivalent radian measures.</td>
<td>Draw a 210° angle in standard position and find one positive and one negative angle coterminal with it.</td>
<td>Use a graphing calculator to evaluate trigonometry functions of angles in both degree and radian measure.</td>
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<td></td>
<td>Students should learn the signs of trig functions in each quadrant. (“All Students Take Calculus” is a good mnemonic device.)</td>
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<td></td>
<td>F.TF.2</td>
<td>from a given angle, determine the reference angle, evaluate trig functions for the angle, and determine the sign of the angle.</td>
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<td>F.TF.3</td>
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<td>F.TF.4</td>
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<td>8.2.12.C.4</td>
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<tr>
<td>C. Trigonometric Functions of Any Angle</td>
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<tr>
<td>Trigonometry(continued)</td>
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<tr>
<td>D. Solving Trigonometric Equations Using Right Triangle Trigonometry</td>
<td>F.TF.7</td>
<td>• given a trigonometric equation, isolate the trig. function and determine the reference angle, determine the quadrants based upon the sign (+/-), and then convert to radian measure.</td>
<td>Solve: (2\sin x - 1 = 0), express the answers in both degree and radian measure.</td>
<td>Chapter 14</td>
</tr>
</tbody>
</table>
| E. Graphing Sine and Cosine Functions | F.IF.7e, F.TF.5, F.IF.8, F.IF.9, F.BF.3, 8.2.12.C.4 | • given a trig function, determine all components and graph. • graph reflections, horizontal and vertical transformations of trig functions making note of effects caused by \(h\) and \(k\) in:  
1) \(y = a\sin b(x - h) + k\)  
2) \(y = a\cos b(x - h) + k\) | Graph: \(y = 2\cos x\) and \(y = \sin 2x\) and state amplitude, period, domain and range of these graphs. Use the graphing calculator to determine how the following graphs are geometrically related:  
a. \(\begin{cases} y = \frac{1}{2}\cos x \\ y = -\frac{2}{3}\cos \left(x - \frac{\pi}{3}\right) \end{cases}\)  
b. \(\begin{cases} y = \sin 2x \\ y = 2\sin(2x - \pi) - 1 \end{cases}\) |               |
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<td>Students will</td>
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<tr>
<td>X. Trigonometry(continued)</td>
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<tr>
<td>F. Modeling</td>
<td>F.TF.5</td>
<td>• model a sinusoidal relationship (like temperature over a day) by writing an equation.</td>
<td>Write the equation to model the height of a Ferris Wheel seat if the wheel has a 25-foot radius and takes 60 seconds to make one complete rotation. Assume you board the ride at the lowest point, 5 feet above the ground.</td>
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<td>F.IF.4</td>
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<td>F.IF.5</td>
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<td>8.1.12.C.1</td>
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<tr>
<td>G. Identities</td>
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</tbody>
</table>
| 1. Law of Sines                | G.SRT.10     | • given information about some sides and angles on a triangle, find the measures of the remaining sides and angles. | Solve ΔABC given: a.  $B = 68^o, b = 30, c = 22$  
   b.  $a = 50, b = 34, c = 24$ |               |
<p>| 2. Law of Cosines              | G.SRT.11     | • find the measure of an angle of a triangle given the measure of a trig function of that angle. | Find the measure of $B$ in ΔABC if $C = 90, b = 2, c = 4$ |               |
|                                |              |                                                                                    |                                                                                       |               |
| 3. inverse trigonometric functions | F.TF.6     | • solve trigonometric equations whose answer can be any angle. | Solve: $2 \sin x - 1 = 0$ |               |
|                                |              |                                                                                    |                                                                                       |               |
| 4. solving trigonometric equations | F.TF.7   | • algebraically verify that two expressions are equivalent                      | Prove the following identity: $\cos x + \sin x \tan x = \sec x$ |               |
|                                | F.TF.8       |                                                                                    |                                                                                       |               |</p>
<table>
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<tr>
<td>5. verify trigonometric identities</td>
<td>F.TF.9</td>
<td>• use the sum, difference, double-and half-angle formulas to evaluate trig functions of different angles.</td>
<td></td>
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<tr>
<td>X. Trigonometry(continued)</td>
<td>G.SRT.9</td>
<td>• find the area of a triangle using: a) $A = \frac{1}{2}ab\sin C$ b) Heron’s Formula</td>
<td></td>
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<tr>
<td>6. using sum and difference</td>
<td></td>
<td>Evaluate $\sin 75^\circ$ by the addition formula, $\cos 60^\circ$ by the difference, double-angle, and half-angle formulas.</td>
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<tr>
<td>7. using double- and half-angle formulas</td>
<td></td>
<td>Find the area of $\triangle ABC$ if: $a = 5, b = 7$ and $m\angle C = 38^\circ$.</td>
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<tr>
<td>8. areas of triangles</td>
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</table>
XI. SEQUENCES AND SERIES

**Essential Question(s):**

a) How can one write an algebraic formula to represent a pattern of numbers?
b) How can the summation of sequence be efficiently calculated?

**Enduring Understanding(s):**

a) Different types of patterns require different formulas for a sequence.
b) Different types of sequences involve different formulas for their summations.

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<tr>
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<tbody>
<tr>
<td>XI. Sequences and Series (3, 4, 15-18)</td>
<td>F.BF.1a</td>
<td>• write the terms of a sequence, graph, and write the series with summation notation.</td>
<td>Solve: Each swing of a pendulum is 3 in. shorter than the preceding swing. The first swing is 6 ft. Write a rule for the length of each swing in inches. Graph the sequence.</td>
<td>Chapter 11 Emphasize the use of appropriate summation formulas. This topic has relevance to the HSPA and the SAT.</td>
</tr>
<tr>
<td>A. An introduction to Sequences and Series</td>
<td></td>
<td></td>
<td>Write each series using summation notation.</td>
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</table>

- a. $4 + 8 + 12 + \ldots + 100$
- $2 + \frac{2}{7} + \frac{6}{7} + \frac{5}{10} + \ldots$
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<th>CONTENT OUTLINE</th>
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<td>Students will</td>
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### XI. Sequences and Series (continued)

#### B. Arithmetic Sequences and Series

- Identify an arithmetic sequence and series, write a rule and find the \(n\)th terms given two terms.

Determine whether the following sequences are arithmetic.

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Determination</th>
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</thead>
<tbody>
<tr>
<td>a. -10, -6, -2, 0, 2, 6, 10, ...</td>
<td>a. -10, -6, -2, 0, 2, 6, 10, ... is arithmetic. The common difference is -4.</td>
</tr>
<tr>
<td>b. 5, 11, 17, 23, 29, ...</td>
<td>b. 5, 11, 17, 23, 29, ... is arithmetic. The common difference is 6.</td>
</tr>
</tbody>
</table>

Write a rule for the \(n\)th term of the sequence 28, 43, 58, 73, ... and then find \(a_{12}\).

Write a rule for the \(n\)th term in an arithmetic sequence with \(a_8 = 60\) and a common difference of 0.32.

Write a rule for the \(n\)th term of an arithmetic sequence with \(a_8 = 10\) and \(a_{33} = 110\), and find the value of \(n\) for which \(a_n = -2\).

Chapter 11 Emphasize the use of appropriate summation formulas.

This topic has relevance to the HSPA and the SAT.
<table>
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<th>CONTENT OUTLINE</th>
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<th>EVALUATION/ ASSESSMENT</th>
<th>TEACHER NOTES</th>
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</thead>
</table>
| XI. Sequences and Series (continued) | A.SSE.4  
F.BF.2  
8.1.12.C.1 | • identify a geometric sequence and series, write a rule and find the \( n \)th term given two terms.  
• find the limiting sum of a geometric series. | Determine if the following sequences are geometric.  
a. 3, -9, 27, -81, 243, …  
b. 5, 10, -15, -20, 25, …  
Write a rule for the \( n \)th term of the sequence  
10, 6, .36, .216.  
Write a rule for the \( n \)th term and graph the geometric sequence with  
\( a_5 = 7 \) and a common ratio of \( r = -2 \).  
Find the 30\(^{th} \) term of a geometric sequence with  
\( a_2 = -3 \) and \( a_6 = -729 \).  
Find the total distance traveled by a ball dropped from a height of 6 feet if it bounces to 80% of its | Chapter 11  
Emphasize the use of appropriate summation formulas.  
This topic has relevance to the HSPA and the SAT. |
| C. Geometric Sequences and Series | A.SSE.4  
8.1.12.C.1 | | | |
<table>
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<th>CONTENT OUTLINE</th>
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<td>Numbers in parentheses indicate correlation with the Proficiencies</td>
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<tr>
<td><strong>Students will</strong></td>
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<tr>
<td><strong>E. Recursively-Defined Sequences</strong></td>
<td>F.BF.2</td>
<td>• find the sum of the sequence: $1, \frac{1}{4}, \frac{1}{16}, \ldots$</td>
<td>previous height each time it hits the ground.</td>
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<td></td>
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<td>• write a recursive rule for a sequence.</td>
<td>Write a recursive rule for the sequence $4, 7, 13, 25 \ldots$</td>
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</tbody>
</table>
XII. PROBABILITY AND STATISTICS

Essential Question(s):

a) How can one determine how many different ways there are to group items?
b) How can one compute the probability of an event occurring a certain number of times?
c) What are the key characteristics of a normal distribution?
d) How can an unbiased sample and an unbiased survey be constructed?
e) How can one determine if the outcome to an experiment is significant?

Enduring Understanding(s):

a) Combinations can be used to compute the number of possible groups, as well as to help calculate binomial probabilities.
b) A normal distribution has the majority of its data centered at the mean, with the standard deviation being a measure of its spread.
c) Sample populations and survey questions must be carefully constructed.
d) Simple statistical calculations can be used to evaluate reports based on data.

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<th>CONTENT OUTLINE</th>
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<th>EVALUATION/ ASSESSMENT</th>
<th>TEACHER NOTES</th>
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<td>Students will</td>
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<tr>
<td>XII. Probability and Statistics (21,22,23,24)</td>
<td>S.CP.9</td>
<td>- calculate the number of combinations for a given situation.</td>
<td>In how many ways can 3 students be chosen from a class of 20 to form a committee?</td>
<td>A basic understanding of combinations is all that is required for this section.</td>
</tr>
<tr>
<td>A. Combinations</td>
<td>A.APR.5 S.MD.7 S.CP.9</td>
<td>- calculate the probability of an event happening a certain number of times.</td>
<td>Find the probability that a die will land on 2 exactly 5 times out of 20.</td>
<td>Introducing/reviewing permutations would enhance this topic if time permits.</td>
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<tr>
<td>B. Binomial Probability</td>
<td>S.CP.9</td>
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<td>Teacher will have to use an external reference for some of the topics here. (See Bibliography.)</td>
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<td>CONTENT OUTLINE</td>
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<td>XII. Probability and Statistics (continued)</td>
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<td>C. Normal Curves</td>
<td>S.ID.4</td>
<td>• identify a data set as approximately normal or not.</td>
<td>SAT math scores for a recent year have a mean of 516 and a standard deviation of 116. If you scored 680, what percentage of students scored lower than you?</td>
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<td>S.MD.7</td>
<td>• use the mean standard deviation to fit data to a normal distribution.</td>
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<td>8.2.12.C.4</td>
<td>• interpret areas in context.</td>
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<td>D. Making Predictions From Samples</td>
<td>S.IC.1</td>
<td>• explain the difference between describing a population and a sample.</td>
<td>A coin tossed and lands on heads 4 times in a row. Would you question the “fairness” of this coin?</td>
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<td>S.IC.2</td>
<td>• compare the expected outcome of an experiment with the actual outcome.</td>
<td>How can you pick an unbiased sample?</td>
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<td></td>
<td>S.IC.3</td>
<td>• determine the validity of a statistical mode.</td>
<td>In a survey of 60 people, 35 said they read the newspaper every night. What is the margin of error?</td>
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<tr>
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<td>S.IC.4</td>
<td>• create a simulation of an experiment and develop a margin of error.</td>
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<td>S.IC.6</td>
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<tr>
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<td>S.MD.6</td>
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<td>Students will</td>
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**SUGGESTED ACTIVITY**

- determine whether survey questions are biased.

A certain group of plants is given a new fertilizer, with growth outputs shown in the table.

<table>
<thead>
<tr>
<th>Control</th>
<th>1.4</th>
<th>0.9</th>
<th>1.2</th>
<th>1.3</th>
<th>2.0</th>
<th>1.2</th>
<th>0.7</th>
<th>1.9</th>
<th>1.4</th>
<th>1.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatments</td>
<td>1.4</td>
<td>0.9</td>
<td>1.5</td>
<td>1.8</td>
<td>1.6</td>
<td>1.8</td>
<td>2.4</td>
<td>1.9</td>
<td>1.9</td>
<td>1.7</td>
</tr>
</tbody>
</table>

Determine whether the new fertilizer has significantly increased the yield.

Is the following questions biased:

*Do you brush your teeth twice a day as recommended?*
BIBLIOGRAPHY

TEXTBOOKS

RESOURCES


Smith, Stanley A. et al. *Algebra and Trigonometry*. Addison-Wesley, 1995

WEBSITES
http://commoncoretools.files.wordpress.com
https://www.desmos.com/
www.intmath.com
www.bigideasmath.com
http://parcc.pearson.com/practice-tests/math/
www.illuminations.nctm.org
www.mathforum.org
https://www.kutasoftware.com/
www.nctm.org
www.commoncoretools.files.wordpress.com
https://www.khanacademy.org/
APPENDIX A  SAMPLE AUTHENTIC ASSESSMENT
Sample Authentic Assessment

A. TASK

You want to talk your parents into buying you a car. They tell you that in addition to your college fund they have been saving so you could have at least $2,000 each year for books and the various miscellaneous items you will need to purchase when you go to college. You find a car for $12,500, and tell your parents that the money you will receive from selling this car when you go to college, in two years, will be enough for books and the miscellaneous expenses. Prove to your parents that even though the car will depreciate 12.5% per year, there will be enough money remaining for you after it is sold.

B. TASK

You really want a car and find one you like for $18,000. You have to convince your parents that it would be economical to purchase the car with a loan and sell it at a later date. You recall from the Algebra you have learned, that the payoff amount, after making $n$ monthly payments on a loan can be modeled by the equation:

$$A(n) = (P_r - P) (t + r)^n + \frac{P_r}{r}$$

where $A_0$ is the original amount of the loan, $P$ is the monthly payment and $r$ is the monthly interest rate expressed as a decimal.

The car dealer offers you an 8.5% annual interest rate and because of your after school job, you can afford to make a monthly payment of $280. Your parents are interested in the value of the car each year after it is purchased. Using a model for the payoff amount, with a monthly payment of $280 and the value of the car, will you be able to convince your parents? Explain how you will convince them and when and why it would make sense to sell the car.

C. TASK

You want to have a vegetable garden that is safe from the deer and rabbits! You have 24 meters of fencing to use to enclose a rectangular garden. What should the dimensions of your garden be if you want to maximize the area in which to plant your veggies? Please provide all diagrams, considered, and the final one with reasons for your selection.
APPENDIX B RUBRIC FOR SCORING OPEN-ENDED PROBLEMS
<table>
<thead>
<tr>
<th>Rubric for Scoring Open-Ended Problems</th>
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</table>
| **3-POINT RESPONSE**
Your response showed a complete understanding of the problem’s essential mathematical concepts. You executed procedures completely and gave relevant responses to all parts of the task. Your response contained a few minor errors, if any. Your response was clear and effective, detailing how the problem was solved so that the reader did not need to infer how and why decisions were made. |
| **2 POINT RESPONSE**
Your response showed a nearly complete understanding of the problem’s essential mathematical concepts. You executed nearly all procedures and gave relevant responses to most parts of the task. Your response may have had minor errors. Your explanation detailing how the problem was solved, may not have been clear, causing the reader to make some inferences. |
| **1 POINT RESPONSE**
Your response showed a limited understanding of the problem’s essential mathematical concepts. Your response and procedures may have been incomplete and/or may have contained major errors. An incomplete explanation of how the problem was solved may have contributed to questions as to how and why decisions were made. |
| **0 POINT RESPONSE**
Your response showed an insufficient understanding of the problem’s essential mathematical concepts. Your procedures, if any, contained major errors. There may have been no explanations of the solution or the reader may not have been able to understand the explanation. The reader may not have been able to understand how and why decisions were made. |

SOURCE: New Jersey HSPA
APPENDIX C  SELF-ASSESSMENT
# SELF-ASSESSMENT SHEET FOR STUDENT WORKFOLDER

<table>
<thead>
<tr>
<th>Date</th>
<th>Assessment</th>
<th>Concepts I understand and can explain to someone else</th>
<th>Concepts I need to further develop</th>
</tr>
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<tbody>
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Marking Period _____
ASSESSMENT/WORK FOLDER REFLECTION

After looking over your work folder with all of your assessments, what are your strengths in math? What are your weaknesses?

How can you continue to use your strengths to be successful in math? Be specific and explain.

How can you improve your areas of weakness? Give yourself at least one goal in order to help you improve.

Which assessment(s) are you most proud of? Explain why.

Which assessment(s) do you think you could have done better on? Explain why and how.

We are now half-way through the school year. What will you continue to strive for in math? How do you plan on doing this?
Work Folder Reflection

Look through the various items in your work folder and take a moment to think about this school year. Answer the following questions in the form of a paragraph to reflect on your mathematical progress so far this year.

- What were some of your goals in the beginning of this school year? Have you made progress towards achieving them?

- What are some goals you have for the rest of this school year?

- In what areas did you have the most success? Be specific by indicating the topics in which you feel most confident.

- In what areas did you have difficulty? What are some ways you can improve in those areas?

- What can you do to prepare yourself for the final exam?

- Now that more than half of the year has passed, what are some things that you have learned that will help you next year? (i.e. study skills, putting more effort in homework, etc.)

- What are some things that you enjoy about this class? What are some things you don’t like? Do you have any suggestions as to what would make the class better?
APPENDIX D  NEW JERSEY STUDENT LEARNING STANDARDS
NEW JERSEY STUDENT LEARNING STANDARDS

4 - Mathematics
8 - Technology
9 - 21st Century Life and Careers
APPENDIX E  CURRICULUM MODIFICATIONS & ADAPTATIONS
There is no recipe for adapting general education curriculum to meet each student’s needs. Each teacher, each student, each classroom is unique and adaptations are specific to each situation.

Keep in mind that curriculum does not always need to be modified. By providing multi-level instruction you will find that adapting a lesson may not always be necessary. Differentiating instruction and providing multiple ways assess allows more flexibility for students to meet the standards and requirements of the class. At other times, the curriculum can be made more accessible through accommodations. In addition, supports for one student may not necessarily be the same in all situations, e.g., a student who needs full time support from a paraprofessional for math may only need natural supports from peers for English, and no support for art. And, supports should not be determined by the disability label, instead supports should be used when the instructional or social activity warrants the need for assistance. (Fisher and Frey, 2001).

The forms and examples on the following pages provide information about curriculum and types of adaptations that could be considered in developing the appropriate strategy for a particular student. Examples are provided for both elementary and secondary levels.
A Curricular Adaptation and Decision-making Process

This decision-making flowchart can be used to conceptualize the process of selecting and implementing curricular adaptations. It should be used as a tool for a team in determining an individual student’s needs.

1. Identify the student’s individual educational goals and objectives to be emphasized during general education activities

2. Articulate the expectations for the student’s performance in general education activities

3. Determine what to teach
   - As a team, determine the content of the general education activity, theme or unit study

4. Determine how to teach
   - As a team, determine if, without modification, the student can actively participate and achieve the same essential outcomes as non-disabled classmates. If the student cannot achieve the same outcomes...

5. Select of design appropriate adaptations

   - Select instructional arrangement
   - Select lesson format
   - Employ student-specific teaching strategies
   - Select curricular goals specific to the lesson
   - Engineer the physical and social classroom environment
   - Design modified materials
   - Select natural supports and supervision arrangements

6. If the above adaptation strategies are not effective, design an alternative activity

7. Evaluate effectiveness of adaptations
A Curricular Adaptation and Decision-making Model

Examine the Structure of the Instruction

1. Can the student actively participate in the lesson without modification? Will the same essential outcome he achieved?
2. Can the student’s participation be increased by changing the instructional arrangement?
   - From traditional arrangements to:
     - Cooperative groups
     - Small groups
     - Peer partners
     - Peer or cross-age tutors
3. Can the student’s participation be increased by changing the lesson format?
   - Interdisciplinary/thematic units
   - Activity-based lessons, games, simulations, role-plays
   - Group investigation or discovery learning
   - Experiential lessons
   - Community-referenced lessons
4. Can the Student’s participation and understanding be increased by changing the delivery of instruction or teaching style?

Examine the Demands and Evaluation Criteria of the Task

5. Will the student need adapted curricular goals?
   - Adjust performance standards
   - Adjust pacing
   - Same content but less complex
   - Similar content with functional/direct applications
   - Adjust the evaluation criteria or system (grading)
   - Adjust management techniques

Examine the Learning Environment

6. Can the changes he made in the classroom environment or lesson location that will facilitate participation?
   - Environmental/physical arrangements
• Social rules
• Lesson location

Examine the Materials for Learning

7. Will different materials be needed to ensure participation?
   • Same content but variation in size, number, format
   • Additional or different materials/devices
   • Materials that allow a different mode of input
   • Materials that allow a different mode of output
   • Materials that reduce the level of abstraction of information

Examine the Support Structure

8. Will personal assistance be needed to ensure participation?
   • From peers or the general education instructor?
   • From the support facilitator’?
   • From therapists’?
   • From paraprofessionals?
   • From others?

Arrange Alternative Activities that Foster Participation and Interaction

9. Will a different activity need to be designed and offered for the student and a small group of peers?
   • In the classroom
   • In other general education environments
   • In community-based environments

## Curriculum Adaptations

It is important to correlate adaptations with the IEP. In other words, we are not adapting for adaptations sake but, to meet the student’s needs as identified on an IEP.

### a. Curriculum as is.
This is the type we forget most frequently. We need to constantly be looking at the general education curriculum and asking if the students on IEPs may gain benefit from participating in the curriculum as is. We need to keep in mind that incidental learning does occur. Curriculum as is supports outcomes as identified in standard curriculum.

### b. Different objective within the same activity and curriculum.
The student with an IEP works with all the other students in the classroom participating in the activity when possible but, with a different learning objective from the other students. This is where the principle of partial participation fits. Examples include:

- A student with a short attention span staying on task for 5 minutes.
- Using a switch to activate a communication device to share during a class discussion.
- Expressing one’s thoughts by drawing in a journal instead of writing.
- Holding a book during reading time.
- Understanding the effect World War II has on the present rather than knowing the names and dates of key battles.

### c. Material or environmental adaptations.
The material or environmental changes are utilized so that participation in the general education curriculum by the student with the IEP may occur. Examples include:

- 5 spelling words from the weekly list instead of the standard 20.
- Completing a cooking assignment by following picture directions rather than written directions.
- Changing the grouping of the class from large group to small groups (possible with the additional support staff).
- Changing the instructional delivery from lecture to the cooperative learning format.
- Using a computer to write an assignment instead of paper and pencil.
- Reading a test to a student.
- Highlighting the important concepts in a textbook.
- Having the student listen to a taped textbook.
- Using enlarged print.
- Using an assistive technology device.
- Using visual cues such as picture and/or word schedules for those who have difficulty staying on task.
- Using a note-taking guide listing the key concepts during a lecture.
d. Providing Physical assistance. Assistance from another person may be needed for a student to participate in a classroom activity. If possible, it is better to use natural supports (peers) as these will be the people always present in the student’s life. If the use of peers is not possible, then either the support teacher, the paraprofessional, the classroom teacher, the classroom aide, or a parent volunteer may provide the assistance. Most peers and staff will need training in the correct way of providing physical assistance. In addition, we need to keep in mind the principle of partial participations.
Examples include:

- Starting a computer for an student with an IEP to use.
- Guiding a hand during handwriting.
- Assisting in activating a switch.
- Completing most of the steps of an activity and having a student with an IEP do the remainder
- Pushing a student in a wheelchair to the next activity.

| Move in this direction only when necessary |

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| Move in this direction only when necessary |

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e. Alternative/substitute curriculum. This is sometimes referred to as functional curriculum as it usually involves the acquisition of “life skills.” The decision to use alternative/substitute curriculum is a major change and needs to be reflected on the IEP. This decision should be carefully made after weighing all of the pros and cons of using an alternative curriculum. The alternative curriculum may or may not take place in the general education classroom.
Examples include:

- Community-based instruction (which all students may benefit from!)
- Learning job skills in the school cafeteria.
- Learning how to use a communication device.
- Doing laundry for the athletic department
- Learning cooking/grooming skills at the home.

Overlap does occur among the five types of curriculum adaptations.

## Nine Types of Adaptions

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
<th>Time</th>
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<tbody>
<tr>
<td>Adapt the way instruction is delivered to the learner.</td>
<td>Adapt how the learner can respond to instruction</td>
<td>Adapt the time allotted and allowed for learning, task completion or testing.</td>
</tr>
<tr>
<td>For example: Use different visual aids; plan more concrete examples; provide hands-on activities; place students in cooperative groups.</td>
<td>For example: Allow a verbal vs. written response; use a communication book for students; allow students to show knowledge with hands-on materials.</td>
<td>For example: Individualize a timeline for completing a task; pace learning differently (increase or decrease) for some learners.</td>
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</thead>
<tbody>
<tr>
<td>Adapt the skill level, problem type, or the rules on how the learner may approach the work.</td>
<td>Increase the amount of personal assistance with specific learner.</td>
<td>Adapt the number of items that the learner is expected to learn or compete.</td>
</tr>
<tr>
<td>For example: Allow a calculator for math problems; simplify task directions; change rules to accommodate learner needs.</td>
<td>For example: Assign peer buddies, teaching assistants, peer tutors or cross-age tutors.</td>
<td>For example: Reduce the number of social studies terms a learner must learn at any one time.</td>
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<tr>
<th>Degree of Participation</th>
<th>Alternate Goals</th>
<th>Substitute Curriculum</th>
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<tbody>
<tr>
<td>Adapt the extent to which a learner is actively involved in the task.</td>
<td>Adapt the goals or outcome expectations while using the same materials.</td>
<td>Provide the different instruction and materials to meet a learner’s individual goals.</td>
</tr>
<tr>
<td>For example: In geography, have a student hold the globe, while others point out the locations.</td>
<td>For example: In social studies, expect one student to be able to locate just the states while others learn to locate capitals as well.</td>
<td>For example: Individualize a timeline for completing a task; pace learning differently (increase or decrease) for some learners.</td>
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Adaptations

ADAPTATIONS

Curricular
Adapt what is taught

Supplementary
Add social, communication, study or processing skills to general curriculum

Simplified
Change level of difficulty or include fewer objectives

Alternative
Teach functional skills plus embedded social, communication and motor skills

Instructional
Adapt how it is taught and how learning is demonstrated

Instructional stimulus or input
Difficulty/amount Modality Format/materials

Student response or output
Difficulty/amount Modality Format/materials

Ecological
Adapt the setting—where, when and with whom

When
Adapt the place

Where
Adapt the schedule

Who
Adapt staffing, grouping

Stages of Adaptations

Stage 1
General Adaptations
Blueprints or formats for adapting predictable activities and routines

Stage 2
Specific Adaptations
Time-limited adaptations for a particular lesson, activity or unit

Creating Ways to Adapt Familiar Lessons - Elementary

1. Select the subject area (and grade level) to be taught:
   reading  math  science  social studies  writing  music  health  P.E.  art
   Grade Level:  

2. Select the lesson topic to be taught (on one day):

3. Briefly identify the curricular goal for most learners: By the end of this class, most students will know
   
4. Briefly identify the instructional plan for most learners: As teacher, I will
   
5. Identify the name(s) of the learner(s) who will need adaptations in the curriculum or instructional plan:
   
6. Now use “Nine Types of Adaptations” as a means of thinking about some of the ways you could adapt what
   or how you teach to accommodate this learner in the classroom for this lesson.

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Creating Ways to Adapt Familiar Lessons - Elementary

1. Select the subject area (and grade level) to be taught:
   - Reading
   - Math
   - Science
   - Social Studies
   - Writing
   - Music
   - Health
   - P.E. Art
   Grade Level: 4

2. Select the lesson topic to be taught (on one day): Vocabulary comprehension

3. Briefly identify the curricular goal for most learners: By the end of this class, most students will know the meaning of new vocabulary words from their story.

4. Briefly identify the instructional plan for most learners: As teacher, I will ask students to complete a matching activity in which they match words and definitions on paper. The students will also choose one word and write a sentence using the word on the bottom of their paper.

5. Identify the name(s) of the learner(s) who will need adaptations in the curriculum or instructional plan: Kim

6. Now use “Nine Types of Adaptations” as a means of thinking about some of the ways you could adapt what or how you teach to accommodate this learner in the classroom for this lesson.

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<tbody>
<tr>
<td>Place students in cooperative groups and divide the task between group members. Each member teaches their vocabulary work to team members.</td>
<td>Allow the student to record all or part of the assignment on tape.</td>
<td>Ask the student to complete the assignment at home and return it the next day.</td>
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<tr>
<td>Select different vocabulary words for the student to learn; words that are less difficult or in some cases more difficult.</td>
<td>Ask a classmate, peer tutor or teaching assistant to assist in completing the assignment.</td>
<td>Select fewer (or more) words for the student to learn, but leave the assignment the same as for other students.</td>
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<tr>
<td>Ask the student to check classmates’ definitions against as answer key.</td>
<td>Set the goal as being to write the words only, or being able to pronounce the words, or just listening to the words and definitions.</td>
<td>Choose a different story for the student to read and identify one or several words the learner needs to know.</td>
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</tbody>
</table>
Creating Ways to Adapt Familiar Lessons - Secondary

1. Select the subject area (and grade level) to be taught:
   - math
   - science
   - history
   - literature
   - business
   - P.E.
   - fine arts
   - health

   Grade Level: ......................

2. Select the lesson topic to be taught (on one day):

3. Briefly identify the curricular goal for most learners: By the end of this class, most students will know

4. Briefly identify the instructional plan for most learners: As teacher, I will

5. Identify the name(s) of the learner(s) who will need adaptations in the curriculum or instructional plan:

6. Now use “Nine Types of Adaptations” as a means of thinking about some of the ways you could adapt what or how you teach to accommodate this learner in the classroom for this lesson.

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Center for School & Community Integration, Institute for the Study of Developmental Disabilities, Indiana University, Bloomington, IN
SAMPLE FORM

Creating Ways to Adapt Familiar Lessons - Secondary

1. Select the subject area (and grade level) to be taught:
   math  science  history  literature  business  P.E.  fine arts  health
   Grade Level: 10

2. Select the lesson topic to be taught (on one day): Concept comprehension

3. Briefly identify the curricular goal for most learners: By the end of this class, most students will be able to define and explain the relevance of five concepts from their text chapter.

4. Briefly identify the instructional plan for most learners: As teacher, I will ask the students to read the chapter, identify five key concepts and write a short paragraph describing each concept they have chosen.

5. Identify the name(s) of the learner(s) who will need adaptations in the curriculum or instructional plan:
   John

6. Now use “Nine Types of Adaptations” as a means of thinking about some of the ways you could adapt what or how you teach to accommodate this learner in the classroom for this lesson.

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<tr>
<td>Provide a review of the chapter prior to having the student complete the written work.</td>
<td>Allow the student to use a tape recorder to dictate the assignment instead of having to write the answers.</td>
<td>Allow the student an extra day to complete the task either in study hall or at home.</td>
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<tbody>
<tr>
<td>Identify the key concepts for the student but keep the remainder of the assignment the same.</td>
<td>Place the students in cooperative groups to complete this assignment. Group members can assist the student with reading or writing.</td>
<td>Select fewer or more concepts for the student to learn, but leave the assignment the same as for other students.</td>
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<td>Ask the student to pick out related books from the library that will provide supplementary information for classmates.</td>
<td>Set the goal as being to write the key concept words only, or being able to pronounce the words, or just listening to the words and descriptions.</td>
<td>During this lesson the student can work on keyboarding skills in the computer lab.</td>
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</table>

Center for School & Community Integration, Institute for the Study of Developmental Disabilities, Indiana University, Bloomington, IN
<table>
<thead>
<tr>
<th>School Name</th>
<th>Class:</th>
<th>Unit:</th>
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</table>

| Student Name: |
| Age: |
| Grade: |
| Parent/Guardian: |
| Classroom Teacher: |
| Inclusion Support Teacher: |

| Room: |
| Phone: |

**Thematic Lesson Plan**

Major standards, objectives and expectations for the unit

Materials, books, media, worksheets, software, etc.

Items requiring accommodations and/or modifications

Instructional arrangements. Time and opportunities for large group, small group, core, group, learning centers, individual activities, non-classroom instruction. Does it change day to day? Explain:

Items requiring accommodations and/or modifications

Projects, supplemental activities, and homework

Items requiring accommodations and/or modifications

Assessment(s) and final products. Summarize actual student performance (attach examples as appropriate) on the reverse.

Items requiring accommodations and/or modifications
### Thematic Lesson Plan

- **School Name:** Palm View Elementary
- **Chapter:** Social Studies
- **Unit:** More Alike Than Different

#### Student Information
- **Name:** Corey Santos
- **Age:** 8
- **Grade:** 2
- **Parent/Guardian:** Ms. Anita Santos
- **Phone:** 555-5432
- **Classroom Teacher:** Mr. Sean Garrett
- **Inclusion Support Teacher:** Ms. Tanjela Hunter
- **Room:** 21

#### Major Standards, Objectives, and Expectations for the Unit
1. Understand why personal and civic responsibility are important.
2. Understand the cultural traditions and contributions of various societies and groups.
3. Display appreciation of diversity in our society, including cultural, gender, and ability.

#### Materials, Books, Media, Worksheets, Software, etc.
1. Children's books on topic
2. "Chocolates" posterboard (Activities for a Diverse Classroom)
3. Family interview questions
4. Slides and overheads

#### Items requiring accommodations and/or modifications
1. Some books on tape
2. Highlighted posterboard
3. Audio questions - done on audio tape

#### Instructional Arrangements, Time and Opportunities for Large Group, Small Group, Coop Group, Learning Centers, Individual Activities, Non-Classroom Instruction
- Does it change day to day? Explain:
  1. Large group for read aloud
  2. Interactive lessons using various media
  3. Cooperative groups to complete Hyperstudio project
  4. Small group for chocolate activity

#### Items requiring accommodations and/or modifications
- Modify if necessary
- Paraeducator assistance with computer

#### Projects, Supplemental Activities, and Homework
1. "Box of Chocolates" activity (Activities for a Diverse Classroom)
2. Hyperstudio group project: Are we More Alike Than Different?
3. Homework - family interview

#### Items requiring accommodations and/or modifications
- Highlight posterboard of key points
- Select task items at student's instructional level
- Provide word bank or magazine pictures

#### Assessment and final products:
- Summarize actual student performance (attach examples as appropriate) on the reverse.
1. Completion of group activities
2. Rubric for Hyperstudio presentation
3. Family interview

#### Items requiring accommodations and/or modifications
1. Assess on use of language
2. Modify rubric

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PEAK Parent Center, Inc. 1999
Thematic Lesson Plan

School Name: Palm View Elementary
Class: Language Arts
Unit: One Book, Two Book, Red Book, Blue Book: Author Study of Dr. Seuss

Student Name: Corey Santos
Age: 8
Grade: 2
Parent/Guardian: Ms. Anita Santos
Classroom Teacher: Mr. Sean Garret
Inclusion Support Teacher: Ms. Tangela Hunter

Room: 21

Major standards, objectives and expectations for the unit:
1. Increase comprehension by rereading, retelling, and discussion.
2. Determine the main idea in nonprint communication.
3. Write, question, and make observations about familiar topics, stories, and new experiences.
4. Recognize personal preferences in literature.

Materials, books, media, worksheets, software, etc.
1. Dr. Seuss books;
2. Formatted reflective journal;
3. Semantic sheet to be completed on each book;
4. Family response journal (homework);
5. Video versions of Dr. Seuss books;
6. Computer - Clarisworks program;
7. Biographical source materials

Instructional arrangements, time and opportunities for large group, small group, co-op group, learning centers, individual activities, non-classroom instruction.
Does it change day to day? Explain:
1. Large group for K-W-L chart;
2. Large group read aloud;
3. Read-write-pair-share;
4. Individual journal writing;
5. Partner research in media center;
6. Concept web of themes;
7. Small group editing

Projects, supplemental activities, and homework
1. Read 2 books - parent and child write in response journal (homework);
2. Choose 4 books from list (one must be a video), analyze for common themes;
3. Analyze for a kindergartner, then read aloud to him or her

Assessment(s) and final products. Summarizes actual student performance (attach examples as appropriate) on the reverse:
1. Reflective journal entries;
2. Author project rubric of presentation;
3. Self-assessment of kindergarten reading;
4. Portfolio selection

Items requiring accommodations and/or modifications
1. Preview for prior knowledge;
2. Picture schedule of activity;
3. Design with sentence stems;
4. Create list of materials to locate;
5. Pictures for web;
6. Picture checklist of process

Items requiring accommodations and/or modifications
1. Parent tips for activity;
2. Assistance in selecting books;
3. Reduce rubric to focus on thematic analysis;
4. Use pictures to support self-assessment
### Academic Unit Lesson Plan

<table>
<thead>
<tr>
<th>School Name</th>
<th>Class</th>
<th>Unit</th>
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</table>

<table>
<thead>
<tr>
<th>Student Name:</th>
<th>Class Schedule:</th>
<th>Room</th>
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<tbody>
<tr>
<td>Age:</td>
<td>Phone:</td>
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<th>Advocate Teacher:</th>
<th>Classroom Teacher:</th>
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<table>
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<tr>
<th>Major standards, objectives and expectations for the unit</th>
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| Materials, books, media, worksheets, software, etc. | Items requiring adaptations and/or modifications |

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<tr>
<th>Instructional arrangements: Time and opportunities for large group, small group, corp group, learning centers, individual activities, non-classroom instruction. Does it change day to day? Explain:</th>
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| Projects, supplemental activities, and homework | Items requiring adaptations and/or modifications |

| Assessment(s) and final products: Summarize actual student performance (attach examples as appropriate) on the reverse. | Items requiring adaptations and/or modifications |

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### Academic Unit Lesson Plan

**School Name:** Central  
**Class:** Biology  
**Unit:** The Cell

#### Student Name: Kelley Glass
- **Age:** 15
- **Grade:** 10
- **Parent/Guardian:** Ms. Rebecca Glass  
  **Phone:** 555-1234
- **Preceptor Teacher:** Mr. David Porter  
- **Classroom Teacher:** Ms. Jeannita Fouche

#### Class Schedule:
- **Room:**
  - Block 1: Math  
    - Room: 22
  - Block 2: English  
    - Room: 149
  - Block 3: Biology  
    - Room: 16
  - Block 4: World Geography  
    - Room: 150
  - Block 5: 3-D Art  
    - Room: 17

#### Major standards, objectives, and expectations for the unit:
1. Students will understand the structure and function of the cell.  
2. Students will identify the parts of the cell.  
3. Students will identify how cells are organized in multi-cellular organisms.

#### Materials, books, media, worksheets, software, etc.:
1. Book: Modern Biology
2. Educational videos related to chapter contents
3. Art supplies for Cell projects
4. Chapter worksheets
5. Primary source: Science magazine article on the cell
6. Local biology professor to discuss current research on cells

#### Instructional arrangements:
**Time and opportunities for large group, small group, corral group, learning centers, individual activities, non-classroom instruction:** Does it change day to day? Explain

1. Large group interaction with overheads to introduce the cell
2. Small groups to complete labs, worksheets, mind map, and chapter review
3. Two cell labs will be completed in partners (onion skin & Jell-O)
4. Individual time to complete illustrated vocabulary

#### Projects, supplemental activities, and homework:
1. **Homework:** Complete vocabulary, bring in Jell-O cell food items
2. "Design a cell" and "Parts of the cell" group projects & presentations
3. Write-up for each completed lab with illustrations

#### Assessment(s) and final products:
- **Summarize actual student performance (attach examples as appropriate) on the reverse.**
1. Add illustrated vocabulary words to class portfolio
2. Culminating activity: "Design a cell" and "Parts of the cell" projects
3. Chapter test

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**Items requiring adaptations and/or modifications:**
1. Order textbook from publisher on cassette.
2. Modify worksheets to emphasize key points of chapters.
3. Record science magazine article on audiotape.
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SAMPLE FORM

<table>
<thead>
<tr>
<th>School Name: Central</th>
<th>Academic Unit: Of Mice and Men</th>
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<tbody>
<tr>
<td>Class: Sophomore</td>
<td>Class Schedule:</td>
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<tr>
<td>Sophomore English</td>
<td>Room: Block 1: Math</td>
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<tr>
<td></td>
<td>Room: Block 2: English</td>
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<td>Room: Block 3: Biology</td>
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<td>Room: Block 4: World Geography</td>
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<td></td>
<td>Room: Block 5: 3-D Art</td>
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<table>
<thead>
<tr>
<th>Student Name: Kelley Glass</th>
<th>Grade: 12</th>
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</thead>
<tbody>
<tr>
<td>Parent/Guardian: Ms. Rebecca Glass Phone: 555-1212</td>
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<tr>
<td>Advocate Teacher: Mr. David Porter</td>
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<tr>
<td>Classroom Teacher: Mr. Sam Moore</td>
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</table>

Major standards, objectives and expectations for the unit:
1. Students will evaluate their beliefs related to prejudice and diversity.
2. Students will learn about the plight of the migrant farm worker.
3. Students will learn about the time during the Depression and the time period in which Steinbeck did his writing.

Materials, books, media, worksheets, software, etc.:
1. Copy of the short story "The Circuit" by Francisco Serrano
2. Copy of the novel Of Mice and Men by John Steinbeck.
3. Worksheets for each of the six chapters.
5. Film clip.
6. "I Am" poem to use with "The Circuit".
7. "Open Mind" worksheet (see activity under Projects).
8. Circle of Friends worksheet (see activity under Projects).

Instructional arrangements. Time and opportunities for large group, small group, group, group, learning centers, individual activities, non-classroom instruction. Does it change day to day? Explain:
1. Large group instruction for introduction of the time period, Steinbeck, the Depression and migrant farm workers. Use of opening question in Socratic dialogue format: Am I my brother's keeper?
2. Small groups for "I Am" poem for "The Circuit".
3. Student pairs to complete worksheets.
4. Large group presentation for trial of George (with every student having a part in the trial).

Projects, supplemental activities, and homework:
1. Class completes chapter worksheets.
2. "I Am" poem on short story "The Circuit". Students complete outline of poem format that includes descriptive phrases, parallel structure within lines, and connecting thinking.
3. Student trial of George for killing Lennie.
5. Illumination of vocabulary words.
7. Circle of Friends activity. Students complete circular diagram to identify their relationships with family and friends, students complete similar diagram for Lennie's character (from Of Mice and Men).

Assessment and final products. Summarize actual student performance. (Attach examples as appropriate) on the reverse.
1. Trial presentation/videotaped
2. Objective test
3. Evaluative essay

<table>
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<tr>
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<tbody>
<tr>
<td>1. Audio/visual recording of the short story &quot;The Circuit&quot;</td>
</tr>
<tr>
<td>2. Audio/visual recording of the novel Of Mice and Men</td>
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<tr>
<td>3. Reformatted chapter summary worksheets and comprehension questions using outlines, pictures, or visual formats</td>
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<tr>
<td>4. Peer takes notes in class. Student types notes on computer for both</td>
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<tr>
<td>5. Reformatted worksheets completed on the computer with the peer teacher</td>
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<tr>
<td>6. Give options for responses for completing poems (3 choices for each line of the poem)</td>
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<tr>
<td>4. Listen to audio/visual analogs for family members' novel book</td>
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<tr>
<td>6. Work bank to use for completing &quot;Open Mind&quot; activity</td>
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