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STATEMENT OF PURPOSE

Algebra I is the first in a sequence of four college-preparatory courses that develops the study of high school mathematics in collaboration with the Common Core State Standards. This course will form the basis for students to develop mathematical skills, understandings, and attitudes that they will need to be successful in a competitive twenty-first century. Because it is important for all students to understand and be comfortable with the concepts and application of technology, technology is interwoven throughout this course. This exposure to technology will help prepare students to not only function in today’s complex society but also to become informed and productive adults of tomorrow.

This revision is aligned with the New Jersey Student Learning Standards for Mathematics, the Draft New Jersey Algebra 1 Course Content, and April 14, 2010 and with the 2014 New Jersey Student Learning Standards for Technology.

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.
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 following link - http://njcdd.org/wp-content/uploads/2016/08/tools-teacherspart2.pdf. Instructional staff of students with Individualized Education Plans (IEPs) must adhere to the recommended modifications outlined in each individual plan.
GENERAL GOALS

Through an integration of algebraic and geometric/graphic methods, applied to non-routine real-life situations, this course offers students the opportunity to:
1. develop a sense of number relationships, representations and mathematical structures and systems.
2. understand the unifying concept of a function.
3. acquire the facility necessary to solve equations, inequalities and their systems.
4. acquire a knowledge of polynomials, exponents, and factoring.
5. analyze data, represent relationships among the data, and make predictions based on this data.
6. understand the concepts and application of technology.
7. justify and critique mathematical arguments.
8. reason abstractly and quantitatively.

METHODS

Through an integration of algebraic and geometric/graphic methods, applied to non-routine real-life situations, this course offers students the opportunity to:
1. develop a sense of number relationships, representations and mathematical structures and systems.
2. understand the unifying concept of a function.
3. acquire the facility necessary to solve equations, inequalities and their systems.
4. acquire a knowledge of polynomials, exponents, and factoring.
5. analyze data, represent relationships among the data, and make predictions based on this data.
6. understand the concepts and application of technology.

OUTCOMES

Students who successfully complete this course will be given a basic knowledge of Algebra 1, the study of patterns and functions. Students will understand the big ideas of equivalence and linearity; learn to use a variety of representations, including modeling with variables; begin to build connections between geometric objects and algebraic expressions; and use what they have learned previously about geometry, measurement, data analysis, and probability as applications of Algebra I to build a strong conceptual foundation as they continue the study of mathematics.

The core Algebra I content described in this curriculum follows the outline of the test specifications developed by the Achieve consortium in the production of the Algebra I End of Course Assessment and includes content needed to promote deep understanding of algebraic concepts that builds as students’ progress through higher levels of mathematics.
EVALUATION / ASSESSMENT

“Assessment must be more than testing; it must be a continuous, dynamic, and often informal process,” according to NCTM Curriculum and Evaluation Standards for School Mathematics. With this in mind, the assessment tools for this Algebra I course should include but not be limited to:

Open-Ended Questions
Problem-Solving Experiences using real-life data
Labs - Individual/Partner/Group
Projects - Individual/Group
Concepts and application of technology
Partner Assessments
Notebook Quizzes
Unit Assessments

Utilizing a variety of assessment techniques enables the teacher and the student to understand more fully the mathematical strengths and weaknesses of the student and the program.
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>
<thead>
<tr>
<th>Final Grade – Full Year Course</th>
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<tbody>
<tr>
<td>Full Year Course</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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<tr>
<td>The midterm assessment will count as 10% of the final grade, and the final assessment will count as 10% of the final grade.</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. determine if sets of rational and irrational numbers are closed under operations.
2. determine whether a given relation is a function, and if so, represent it using function notation.
3. solve linear equations with all real numbers.
4. solve linear equations using multiple transformations and correct errors in a given solution to a linear equation.
5. rearrange linear formulas to highlight a quantity of interest.
6. model real life problems using linear equations.
7. use rates, ratios and proportions to model and solve real life problems.
8. graph linear equations using a table.
9. graph vertical and horizontal lines and recognize their equations.
10. find the intercepts of a line and use the intercepts to graph the line.
11. find the slopes of lines and use slopes of given lines to determine whether lines are parallel, perpendicular, intersecting, or coincident.
12. graph a linear equation that is written in slope intercept form.
13. determine the equation of a line given the slope and y-intercept.
14. determine the equation of a line given the slope and a point.
15. determine the equation of a line given two points on the line.
16. use a linear model to predict real life outcomes.
17. solve a system of linear equations by graphing.
18. solve a system of linear equations by substitution.
19. solve a system of linear equations by linear combination.
20. determine the best method to solve a system of linear equations.
21. determine the number of solutions to a system of linear equations.
22. solve real life problems by writing a system of equations and interpret the solutions.
23. graph a linear inequality in two variables.
24. solve systems of linear inequalities.
25. sketch the graph of a quadratic function.
26. solve a system with one or more quadratic functions.
27. solve quadratic equations by taking square root.
28. solve quadratic equations by using the quadratic formula.
29. solve quadratic equations by graphing.
30. solve quadratic equations by completing the square.
31. graph the square root and cube root functions and determine and analyze their key characteristics.
32. multiply and divide exponential expressions.
33. simplify and evaluate expressions with positive, negative, and zero exponent.
34. graph and model exponential functions.
35. analyze a table, numerical pattern, graph, equation, or context to determine whether a linear, exponential, or quadratic relationship could be represented.
36. recognize linear and exponential functions as arithmetic and geometric sequences and construct their formulas.
37. combine and classify polynomials.
38. determine the product of polynomials.
39. perform all basic operations on polynomials.
40. solve polynomial equations in factored form using the zero product property.
41. factor polynomials in the form $ax^2 + bx + c$ \( a=1 \) completely and use the factors to solve equations (use special patterns where appropriate).
42. factor polynomials in the form $ax^2 + bx + c$ \( a \neq 1 \) completely and use the factors to solve equations.
43. factor polynomials using GCF or special patterns.
44. solve quadratic equations by completing the square.
45. solve and graph linear inequalities in one variable.
46. solve and graph compound inequalities.
47. solve absolute value equations.
48. graph the absolute value of a linear function and determine and analyze its key characteristics.
49. graph and write piecewise functions.
50. compare measures of central tendency.
51. represent and analyze data with plots on the real number line (dot plots, histograms, and box and whisker plots).
52. understand the difference between causation and correlation.
Suggested scope and sequence (days spent on topic in parenthesis):

**Marking Period 1: numbers, functions, equations, graphing linear equations**
1. identify whether sets of rational and irrational numbers are closed under operations (3)
2. determine whether a given relation is a function, and if so, represent it using function notation (4)
3. solve linear equations with all real numbers (6)
4. rearrange linear formulas to highlight a quantity of interest (3)
5. model real life problems using linear equations (4)
6. use ratios and proportions to model and solve real life problems (2)
7. graph linear equations using a table (2)
8. graph vertical and horizontal lines and recognize their equations (2)
9. find the intercepts of a line and use the intercepts to make a graph (2)
10. find the slopes of lines and use slopes of given lines to determine whether lines are parallel, perpendicular, intersecting, or coincident (4)
11. graph a linear equation that is written in slope intercept form (2)

**Marking Period 2: Writing linear equations, systems of equations and inequalities, graphing quadratics, systems with quadratics**
12. determine the equation of a line given the slope and y intercept (1)
13. determine the equation of a line given the slope and a point (2)
14. determine the equation of a line given two points on the line (2)
15. use a linear model to predict real life outcomes (2)
16. solve a system of linear equations by graphing, substitution, or linear combinations (8)
17. solve real life problems by writing a system of equations and interpret the solutions (3)
18. graph a linear inequality in two variables (2)
19. solve systems of linear inequalities (2)
20. sketch the graph of a quadratic function (10)
21. solve a system with one or more quadratic functions (3)

**Marking Period 3: Solving quadratics, exponents, exponential functions, operations with polynomials**
22. solve quadratic equations by taking square roots, using the quadratic formula, graphing (5)
23. multiply and divide exponential expressions (3)
24. simplify and evaluate expressions with positive, negative, and zero exponents (5)
25. graph and model exponential functions (6)
26. analyze a table, numerical pattern, graph, equation, or context to determine whether a linear, exponential, or quadratic relationship could be represented (3)
27. recognize linear and exponential functions as arithmetic and geometric sequences and construct their formulas (2)
28. graph the square root and cube root functions and analyze their key characteristics (3)
29. perform all basic operations on polynomials (4)
Marking Period 4: Factoring, solving quadratics, inequalities, absolute value, piecewise, stats

30. solve polynomial equations in factored form using the zero product property (1)
31. solve polynomial equations by factoring polynomials completely (use special patterns where appropriate); solve quadratic equations by completing the square (12)
32. solve and graph linear inequalities in one variable (3)
33. solve and graph compound inequalities (2)
34. solve absolute value equations (3)
35. graph the absolute value of a linear function and determine and analyze its key characteristics (2)
36. graph and write piecewise functions (5)
37. compare measures of central tendency (2)
38. represent and analyze data with plots on the real number line (dot plots, histograms, and box and whisker plots) (5)
39. understand the difference between causation and correlation (3)

Students studying Algebra I should use appropriate tools (e.g., algebra tiles to explore operations with polynomials, including factoring) and technology, such as regular opportunities to use graphing calculators, spreadsheets, Geogebra, Desmos, etc. Technological tools assist in illustrating the connections between algebra and other areas of mathematics, and demonstrate the power of algebra.

EMPLOY THE USE OF TECHNOLOGY WHERE AND WHENEVER APPROPRIATE.
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.

Ask students:

- to explain what the problem is about. Do you all agree? If not, explain.
- how do you plan to solve the problem? How many different plans do you have in your group? Explain them.
- does one plan make more sense than the others? Explain.
- will you draw a picture or use manipulatives to solve it? Explain why.
- to explain why your answer makes sense.
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.

Ask students:

- what do the numbers in the problem mean?
- can you draw a picture to show how they are related? If so, show the picture.
- do you have all the information you need to solve the problem? If not, what is missing?
- is the more than one way to solve the problem? Explain.

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.

Ask students:

- to explain how you solved the problem.
- justify why your solution makes sense. Do you all agree with how the problem was solved? Why or why not?
- how is your strategy different from others in the class? How is it like what they did?
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.

Ask students:

- can you write a number sentence to help you solve the problem?
- what did you do first, before writing the number sentence or equation?
- did other members of your group have a different number sentence? Explain how they are alike/different.
- does one solution make more sense than the other? Why?

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
Mathematics | Standards for Mathematical Practice (cont'd.)

5. Use appropriate tools strategically. (cont’d.)

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.

Ask students:

- what tool or tools (manipulatives, measuring devices, calculators, protractors, etc.) did you use, and why?
- could you have used a different tool? Explain why or why not.
- did everyone in your group use the same tool? If not, did theirs make sense? Why or why not?

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.

Ask students:

- to explain what each number of your number sentence (equation, solution) means.
- did you get the right answer? If not, what did you do wrong?
- did you label the answer?

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
7 Look for and make use of structure. (continued)

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 $y$.

Ask students:

- do you see a pattern that will help you solve the problem? If so, what is it?
- can you break the problem into easier ones to solve? Explain.

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.

Ask students:

- does your answer make sense? Explain.
- have you solved another problem like this before? If yes, explain how it helped you solve this problem.
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.

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.
Unit I: Relationships Between Quantities and Reasoning with Equations

Essential Questions
- What techniques are used for solving linear equations systematically?
- What real-life situations can be solved by writing and graphing linear equations?
- How can patterns, relations, and functions be used as tools to best describe and help explain real-life situations?
- How are functions and their graphs related?
- How can technology be used to investigate properties of linear functions and their graphs?
- What techniques can be used to solve linear equations?
- How can we determine whether an equation or a graph is a function?
- How can we translate verbal models into algebraic models to represent and solve real-life situations?
- How can change be best represented mathematically?
- How can we use mathematical language to describe change?
- How can we use mathematical models to describe change or change over time?
- How are patterns of change related to the behavior of functions?
- What techniques can be used to graph linear equations?
- How can we determine whether an equation or a graph is a function?

Enduring Understanding(s)
- Graphs and equations are alternative (and often equivalent) ways for depicting and analyzing patterns of change.
- Functional relationships can be expressed in real contexts, graphs, algebraic equations, tables, and words; each representation of a given function is simply a different way of expressing the same idea.
- The value of a particular representation depends on its purpose.
- Proportionality involves a relationship in which the ratio of two quantities remains constant as the corresponding values of the quantities change.
- Graphs and equations are alternative (and often equivalent) ways for depicting and analyzing patterns of change.
- The value of a particular representation depends on its purpose.
- A variety of families of functions can be used to model and solve real world situations.

UNIT FOCUS:
Successful students will be able to solve and graph the solution sets of linear equations. In contextual problems students graph and interpret their solutions in terms of the context. Function notation should be introduced and used regularly but not exclusively.
# The student will be able to:

1. determine if given sets of rational and irrational numbers are closed under operations.

   - show that the sum or difference of two rational numbers is rational; a rational number added or subtracted to an irrational is irrational
   
   Show that the set of rational numbers is closed under addition and multiplication.

   **STANDARDS**
   
   N.RN.3, S-ID.1, MP 1, 3, 4, 8

   **SUGGESTED ACTIVITY**


   Is $-5 + \sqrt{7}$ a rational or irrational number? Justify your reasoning.

   **TEACHER NOTES**

   Show that division is not a closed operation. Discuss what means to be a closed operation under a set of numbers.

   Review the number system (rational, irrational, whole, integer, and natural numbers).

2. determine whether a given relation is a function and if so represent it using function notation.

   - describe a function, create an input-output table, and identify the domain and range of the function.
   
   Use the vertical line test to identify graphs that are functions.

   **STANDARDS**

   F.IF.1, F.IF.2, MP 1, 3, 6, 8

   **SUGGESTED ACTIVITY**

   Given the sequence: 5, 7, 9, 11, … If 5 is considered the first term, what linear expression could generate this pattern?

   **TEACHER NOTES**

   Students should re-cognize a pattern from a table.

   Develop the connection between patterns and the $n^{th}$ figure in a pattern. See p.23, Activity 1.4

   Refer to p. 50, #26-29 and include temperature problems.

   Stress function notation. See Section 4.8 in textbook.

3. solve linear equations with all real numbers.

   - solve an equation by simplifying each side of the equation using addition, subtraction, multiplication and/or division rules for real numbers and the distributive property.

   **STANDARDS**

   A.REI.1, MP 1, 2, 3, 6

   **SUGGESTED ACTIVITY**

   Solve:

   - $2x + 5 = 17$
   - $3a - (2a+5) = 9$
   - $11 = 3(x-5) - 4$

   **TEACHER NOTES**

   Review properties of equality.

   Apply properties to equations which contain fractions and/or decimals.
<table>
<thead>
<tr>
<th>PROFICIENCY / OBJECTIVE</th>
<th>STANDARDS</th>
<th>SUGGESTED ACTIVITY</th>
<th>EVALUATION/ ASSESSMENT</th>
<th>TEACHER NOTES</th>
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<tr>
<td>The student will be able to:</td>
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| 4. solve linear equations using multiple transformations and correct errors in given solutions to linear equations | A.REI.1 A.REI.3 MP 1, 2, 7 | • use multiple transformations to solve equations. • identify and correct errors in a given solution to a linear equation | \[
\frac{3}{4}(x+12) - 6 = 1 \\
.2(x-4) + .8 = 3 \\
\frac{x}{2} + \frac{x + 1}{3} = 2
\] | Model equations which have no solution, one solution and all real numbers as their solutions. |
| 5. rearrange linear formulas to highlight a quantity of interest | A.CED.4.1 MP 2, 6, 7 | • Rewrite equations and formulas to solve for a specific variable | Solve the equation for Ohm’s Law \( V = IR \) for the resistance \( R \). Solve the equation for the volume of a cylinder \( V = \pi r^2 h \) for the height \( h \). | Literal equations |
## Relationships Between Quantities and Reasoning with Equations

<table>
<thead>
<tr>
<th>PROFICIENCY / OBJECTIVE</th>
<th>STANDARDS</th>
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<tbody>
<tr>
<td><strong>The student will be able to:</strong></td>
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<tr>
<td>6. model real life problems using linear equations.</td>
<td>N.Q.1 N.Q.2 N.Q.3 A.CED.1 MP 1, 4, 6 8.1.12.C.1</td>
<td>• use student-generated diagrams to write and solve a word problem. Solve the following problem: Jim spent $200 on gifts for his family. He spent the money on toys, clothes, and a $15 DVD. He spent 4 times as much on clothes as he did on toys. Write and solve an equation in one variable that can be used to determine how much money Jim spent on toys.</td>
<td>Determine the measures of the three angles in acute triangle ABC if the measure of angle B is twice the measure of angle A and the measure of angle C is 30° more than the measure of angle A.</td>
<td>Brett’s Race (see Appendix D) Students should use tables and graphs to check results. (Refer to p. 160, ex. 1) Station Activity: Graphing Linear Equations See Appendix C Round Table Activity: Solving Word Problems See Appendix F</td>
</tr>
<tr>
<td>7. use rates, ratios and proportions to model and solve real-life problems.</td>
<td>N.Q.1 N.Q.2 N.Q.3 F.IF.6 MP 1, 2, 4, 6 8.1.12.C.1</td>
<td>• solve real-life problems involving ratios and rates. Use dimensional analysis to find the scale factor of similar shapes and convert units.</td>
<td>Solve the following problems: If a runner runs 3 miles in 15:45 minutes, what is his average time per mile? There are 223 students in the freshman class, 168 in the sophomore class, 173 in the junior class, and 138 in the senior class. The student council has 30 members, with these seats allocated based on the number of students in each class. How many student council members should each class have? Show or explain your work. Convert 60 mph to ft/s.</td>
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</table>
# Relationships Between Quantities and Reasoning with Equations

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<tr>
<td>The student will be able to:</td>
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<td>Students will:</td>
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<tr>
<td>8. graph linear equations using a table.</td>
<td>A.CED.2 A.SSE.1A SSE.2 A.REI.10 MP 1, 2, 6</td>
<td>• create a table of values that satisfies a given linear equation and use the table to graph the line. • Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve</td>
<td>Create a table of values for ( y = 3x - 4 ) and graph the line.</td>
<td>Myla’s Pool (see Appendix D)</td>
</tr>
<tr>
<td>9. graph vertical and horizontal lines and recognize their equations.</td>
<td>A.REI.10 A.CED.2 MP 1, 2, 6, 7</td>
<td>• write equations of vertical and horizontal lines.</td>
<td>Graph vertical and horizontal lines.</td>
<td>Stress the importance of recognizing and graphing the equations of horizontal and vertical lines.</td>
</tr>
<tr>
<td>10. find the intercepts of a line and use the intercepts to graph the line.</td>
<td>F.IF.7 A.CED.2 MP 1, 2, 6</td>
<td>• determine the x and y intercepts of a linear equation and create a graph using the intercepts.</td>
<td>Find the x and y intercepts of the line ( 5x + 2y = 40,000 ) and use these intercepts to graph the line.</td>
<td></td>
</tr>
<tr>
<td>11. find the slopes of lines and use slopes of given lines to determine whether lines are parallel, perpendicular, intersecting or coincident.</td>
<td>A.SSE.1 A.SSE.2 F.IF.6 MP 1, 3, 7, 8</td>
<td>• find the slope or rate of change of a line given two points, a table, or a specified interval.</td>
<td>Find the slope of a line which passes through (4, -3) and (-5, 9). Write a function for the slope of the line that passes through the points (1, 3) and (7, y). What is the domain of this function?</td>
<td>Optional: • Investigate Slope, Group Activity 4.4, p. 225 • Explore zero, +, -, and no slope situations. • Explore parallel lines and perpendicular lines. Sample Activities: Sloping Letters (Slope) See Appendix H</td>
</tr>
<tr>
<td>12. graph a linear equation that is written in slope intercept form.</td>
<td>A.SSE.1 A.SSE.2 F.IF.7 A.CED.2</td>
<td>• translate a linear equation into slope-intercept form and use</td>
<td>Rewrite ( 5x - 2y = 20 ) in slope-intercept form and graph.</td>
<td>Technology: Refer to p. 248, Activity 4.6. Use the graphing calculator to graph a linear equation and find solutions</td>
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</table>
### Relationships Between Quantities and Reasoning with Equations

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<td>Sample Activities: War Time battle (Graphing Linear Equations) See Appendix H</td>
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<td>12. (continued)</td>
<td>MP 1, 2, 5</td>
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<td>The student will:</td>
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<td>Students will:</td>
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<tr>
<td>13. determine the equation of a line given the slope and y-intercept.</td>
<td>A.CED.2 F.BF.1 MP 1, 2</td>
<td>write the equation of the line in slope-intercept form given slope is $-\frac{2}{3}$ and y-intercept is 4.</td>
<td>Create a real life situation with a linear relationship. Explore writing a linear equation in $y = mx + b$ given the graph of the line with an identified point and y-intercept.</td>
<td>Send a Problem Activity See Appendix E</td>
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<tr>
<td>14. determine the equation of a line given the slope and a point.</td>
<td>A.CED.2 F.BF.1 MP 1, 2, 4, 5</td>
<td>determine the equation of a line given the slope of the line and a point on the line.</td>
<td>Write the equation of the line with slope $-3$ that contains (4,6). Write the equation of the line with slope $\frac{2}{3}$ and which passes through (0,4).</td>
<td>Model a real-life situation with a linear function (refer to p. 281, Example 3). Optional: Using the graphing calculator’s Table function to provide a table of values for a linear function and have students determine the slope and use any point to write the linear equation. Use the graphing calculator to draw a graph identify points on a line using the Table function and have students determine the equation of the line.</td>
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<tr>
<td>15. determine the equation of a line given two points on the line.</td>
<td>F.BF.1 MP 1, 2</td>
<td>find the slope of a line given two points and use the slope to write a linear equation of the line in either slope-intercept or standard form.</td>
<td>Write the equation of the line which passes through (2,7) and (-7,5).</td>
<td>Review how to find the slope of a line by the formula, table or graph and how to use the equation, $y = mx + b$, to determine the y intercept.</td>
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</table>
## Relationships Between Quantities and Reasoning with Equations

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<tr>
<td>15. (continued)</td>
<td></td>
<td>Compare and contrast the positions of the graphs for the following three functions and explain how the positions are related to the equations:</td>
<td></td>
<td>Discuss slopes of parallel and perpendicular lines. Explore how to write equations of vertical and horizontal lines by observation. Example: $(3,4)$ $(3,-7)$ Show students how to determine the equation of a line using the point-slope form of a linear equation. Boss/Secretary Activity: Slope See Appendix B Matching Puzzle: Linear Equations See Appendix G Sample Activities: Bulls Eye (Writing Linear Equations Using Two Points) See Appendix H</td>
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<tr>
<td></td>
<td></td>
<td>$f(x) = 5x$</td>
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<td></td>
<td>$g(x) = 5x + 2$</td>
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<td></td>
<td></td>
<td>$h(x) = 5x - 2$</td>
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<td></td>
<td>Discuss slopes of parallel and perpendicular lines. Explore how to write equations of vertical and horizontal lines by observation. Example: $(3,4)$ $(3,-7)$ Show students how to determine the equation of a line using the point-slope form of a linear equation. Boss/Secretary Activity: Slope See Appendix B Matching Puzzle: Linear Equations See Appendix G Sample Activities: Bulls Eye (Writing Linear Equations Using Two Points) See Appendix H</td>
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<tr>
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<td>Use a linear equation that has been fit to given data to predict values. Given the set of data below, plot the points, find the line of best fit, and write the equation of the line of best fit. Using the equation of your line of best fit, predict the winning time (in sec.) in the year 2010. Technology may be used here using the graphing calculator to plot and find the line of best fit. Refer to p. 299, Activity 5.4. Based on the line of best fit make predictions for future events. Give an overview of scatter plots that illustrates a positive, a negative and no correlation.</td>
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<td>16. use a linear model to predict real-life outcomes.</td>
<td>N.Q.1 N.Q.2 N.Q.3 A.PR.2 F.IF.5 S.ID.6 S.ID.7 MP 1, 3, 4, 5 8.1.12.C.1</td>
<td>find a linear equation that approximates a set of data.</td>
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### Relationships Between Quantities and Reasoning with Equations

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<tr>
<td>16. (continued)</td>
<td>Find an equation for the line of best fit given a set of data by and hand and by the use of a graphing calculator. Compute (using technology) and interpret the correlation coefficient of a linear fit.</td>
<td>The winning Olympic times for the 100-meter run from 1928 to 1988 are shown in the table. Approximate the best fitting line for these times. Let $y$ represent the winning time and $x$ the year ($x=0$, corresponding to 1928).</td>
<td>See sections 5.4 and 5.7 in the textbook.</td>
<td></td>
</tr>
</tbody>
</table>

#### 100-Meter Run

<table>
<thead>
<tr>
<th>Year</th>
<th>Winning time (in seconds)</th>
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</thead>
<tbody>
<tr>
<td>1928</td>
<td>12.2</td>
</tr>
<tr>
<td>1932</td>
<td>11.9</td>
</tr>
<tr>
<td>1936</td>
<td>11.5</td>
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<tr>
<td>1948</td>
<td>11.9</td>
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<td>1952</td>
<td>11.5</td>
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<td>1956</td>
<td>11.5</td>
</tr>
<tr>
<td>1960</td>
<td>11.0</td>
</tr>
<tr>
<td>1964</td>
<td>11.4</td>
</tr>
<tr>
<td>1968</td>
<td>11.0</td>
</tr>
<tr>
<td>1972</td>
<td>11.07</td>
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<td>1976</td>
<td>11.08</td>
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<tr>
<td>1980</td>
<td>11.6</td>
</tr>
<tr>
<td>1984</td>
<td>10.97</td>
</tr>
<tr>
<td>1988</td>
<td>10.54</td>
</tr>
</tbody>
</table>

Line of Best Fit Project
See Appendix A
Unit II: Linear Relationships

Essential Questions:
• What techniques can be used to solve and graph a system of linear equations or inequalities in one or two variables?
• How can we model and solve real-life situations using a system of linear equations or inequalities?
• How can functional relationships be used to express real contexts, graphs, algebraic equations, tables and words?
• How is each representation of a function a different way of expressing the same idea?
• How are functions and their graphs related?
• How can systems of equations be used to solve real-life situations?

Enduring Understandings:
• Systems of linear equations or inequalities can be used to model and solve real world situations.
• Systems of equations and inequalities can be solved with a variety of different methods.
• The solutions to a system of linear inequalities can be represented by an intersection of two half planes.

UNIT FOCUS:
Successful students will be able to solve a system of linear equations and interpret the solutions, graphically and algebraically. Use linear functions to model real-life situations.
## Linear Relationships

<table>
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<tr>
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<tbody>
<tr>
<td><strong>The student will be able to:</strong></td>
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<tr>
<td>17. solve a system of linear equations by graphing.</td>
<td>A.REI.6 A.REI.11 MP 1, 2, 5</td>
<td>• graph linear equations using the slopes and y-intercepts and use the graphs to determine the point of intersection.</td>
<td>Solve and graph: $2x + y = 5$ $3x - 2y = 4$</td>
<td>Give an overview of the graphing method from Chapter IV. Technology: Use the graphing calculator (refer to p. 404, Activity 7.1). Include fractional and decimal types.</td>
</tr>
<tr>
<td>18. solve a system of linear equations by substitution.</td>
<td>A.REI.6 MP 1, 2</td>
<td>• solve a 2x2 system of linear equations by substitution.</td>
<td>Solve by substitution: $2x + 3y = 5$ $y = -5x + 6$ $3x + y = 11$ $2x + y = 7$</td>
<td>Include equations where a substitution is made from one problem into the other or where you set each equation to the same variable and set them equal to each other.</td>
</tr>
<tr>
<td>19. solve a system of linear equations by linear combination.</td>
<td>A.REI.5 A.REI.6 MP 1, 2</td>
<td>• solve a 2x2 system of linear equations by linear combination.</td>
<td>Solve by following systems by linear combination: $5x - 3y = 7$ $2x + 4y = 11$ $7a - 4b = 13$ $2a + 4b = 6$</td>
<td>Include equations where multiplication must be used first in order to eliminate a variable and cases where variables eliminate without any manipulation taking place.</td>
</tr>
<tr>
<td>20. determine the best method to solve a system of linear equations</td>
<td>A.REI.5 A.REI.6 A.REI.11 MP 1-3 MP 5</td>
<td>• determine whether to use graphing, linear combination or substitution to solve a system of linear equations and solve the system by the determined method. • reason about the number and nature of solutions to a system of linear equations (no solution, one solution, or infinite number of solutions).</td>
<td>Solve by any method, explaining and justifying your choice of the method used: $x + y = 6$ $x + 2y = 11$ $5x - 7y = 8$ $3x + 7y = 2$ $2x + 6y = 9$ $5x - 4y = 6$ $3x + 7 = 2$ $5y - 1 = 8$ $f(x) = 3x - 1$ $g(x) = -x + 4$</td>
<td>Discuss how to determine the number of solutions. (refer to page 425 Activity 7.5) Technology: Graphing calculator may be used effectively to verify the solution or lack of a solution. Use function notation for systems of equations. Include using graphs to reason about number of solutions.</td>
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</table>
# Linear Relationships

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<td>Students will:</td>
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<tr>
<td>21. determine the number of solutions to a system of linear equations</td>
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<td></td>
<td>A.REI.5 A.REI.6 A.REI.11 MP 1,-2 MP 5 MP 7</td>
<td>• identify whether a system of linear equations has one solution, no solution, or an infinite number of solutions.</td>
<td>Identify the number of solutions for each of the following systems: (4x + 3y = 9) (-8x - 6y = 3) (2x + 5y = 3) (4x + 10y = 6) (5x - 6y = 11) (2x + 3y = 9)</td>
<td>Review rewriting linear equations in (y = mx+b) form for comparison of slopes and (y) intercepts. Boss/Secretary Activity See Appendix B</td>
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<tr>
<td>22. solve real-life problems by writing a system of equations and interpret the solutions.</td>
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<td>A.CED.2 A.CED.3 MP 1 MP 4 8.1.12.C.1</td>
<td>• interpret data to create a system of equations and solve.</td>
<td>John spends $20 on ham and cheese. He buys ham at $4 a pound and cheese at $2 a pound. He buys a total of 7 pounds of ham and cheese. How many pounds of each did he buy?</td>
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<td>23. graph a linear inequality in two variables.</td>
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<td>A.REI.12 F.IF.2 MP 1, 5, 6</td>
<td>• use slope, intercept and shading to graph the solution of a linear inequality in two variables.</td>
<td>Solve and graph: (y \leq 4x - 6) (3y - 7 &lt; 8) (y &gt; 4) (-2 \leq x)</td>
<td>Discuss how the sign , , , , , effects the solution. Include vertical and horizontal cases.</td>
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<tr>
<td>24. solve systems of linear inequalities.</td>
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<td>A.REI.12 A.CED.3 F.IF.2 MP 1, 6, 7</td>
<td>• find the solution region of a system of linear inequalities.</td>
<td>[\begin{align*} y &amp;&lt; 2x + 3 \ 2x + 3y &amp;\geq -6 \end{align*}]</td>
<td>Emphasize solid and dotted lines and discuss special cases such as parallel lines. Sample Activities: Algebra Connect (Solving Linear Systems) See Appendix H</td>
</tr>
</tbody>
</table>
Unit III: Quadratic Functions and Other Non-Linear Relationships

Essential Questions:
- What techniques can we use to solve and graph quadratic equations?
- How can we model and solve real-life situations using quadratic equations?
- How can we use mathematical language to describe non-linear change?
- How can we model situations using quadratics?

Enduring Understandings
- Graphs and equations are alternative (and often equivalent) ways for depicting and analyzing patterns of non-linear change.
- Mathematical models can be used to describe physical relationships; these relationships are often non-linear.
- Real world situations, involving quadratic relationships, can be solved using multiple representations.

UNIT FOCUS:
Successful students will be able to graph and solve quadratic functions by using the quadratic formula, graphing, and taking square roots. They will be able to solve and graph quadratic functions in standard, vertex, and intercept form. Students will be able to determine the domain and relate it to the quantitative relationship it describes for a linear, quadratic, square root, or cube root function.
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| 25. sketch the graph of a quadratic function. | A.IF.7, F.IF.6, F.IF.7, A.PR.3, F.IF.2, F.IF.4, F.BF.3, F.IF.9, A.REI.11, MP 1, MP 3, MP 4-5, MP 7, 8.2.12.C.4, 8.2.12.E.4 | • identify the axis of symmetry and the vertex of a quadratic function and use these components to sketch the graph of the function.  
• find the slope or rate of change of a quadratic function over a specified interval given an equation or a table.  
• express reasoning about transformations of quadratic functions.  
• given the equation of a transformation, create the graph.  

Identify roots from factored form.  
Find the domain and range, min/max values, increasing/decreasing intervals, and end behavior of a given quadratic function. | Identify the axis of symmetry, the vertex and use a table of values to identify several points and graph the following quadratic functions:  
\[ y = x^2 + 6x + 8 \]  
\[ y = -x^2 + 3x - 2 \]  
\[ y = (x + 4) (x - 2) \]  

Graph  
\[ g(x) = -2(x + 2)^2 + 3 \] and compare that graph to the graph of \( f(x) = x^2 \)  
Prove algebraically that the function \( h(t) = t(t - 1) \) has a minimum value of \( \frac{1}{4} \).  
Prove algebraically that the graph of \( g(x) = x^2 - x + \frac{1}{4} \) is symmetric about the line \( x = \frac{1}{2} \).  
Prove that \( x^2 + 1 \) is never less than -2x. (graph both functions and compare) | Michelle’s Conjectures (see Appendix D)  
Give an overview of the tools to identify and graph a quadratic function (Refer to p. 518)  
Technology: Use the Table and Table Set functions on the graphing calculator to graph and identify all components of the graph of a quadratic function  
Explore the graphs of a quadratic function in standard, factored (intercept), and vertex form and identify which form is most appropriate for a given scenario  
\[ y = x^2 + 6x + 8 \]  
\[ y = (x + 4) (x - 2) \]  
\[ y = 2(x - 3)^2 - 4 \]  
Compare properties of two functions each represented in a different way. (algebraically, graphically, numerically in tables, or by verbal descriptions.)  
Quadratic Functions Project  
See Appendix A |
# Quadratic Functions and Other Non-Linear Relationships

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<td><strong>Students will:</strong></td>
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</table>
| 26. solve a system with one or more quadratic functions. | A.REI.7 A.REI.11 MP 2-3 8.2.12.E.4 | • solve systems of linear and quadratic functions by graphing.  
• reason about the number and nature of solutions to a system of quadratic equations (no solution, one solution, or infinite number of solutions). | Solve the system:  
\[
\begin{align*}
y &= x^2 + 1 \\
y &= -2x
\end{align*}
\]  
Determine the number of solutions to the system and explain your reasoning.  
\[
\begin{align*}
g(x) &= \frac{1}{2}x^2 + 3 \\
h(x) &= 3^x
\end{align*}
\] | Use systems including a quadratic and a linear function and systems with two quadratic functions.  
Use technology to solve systems using intersections or tables and reason about the number of solutions. |
| 27. solve quadratic equations by taking the square root. | A.SSE.3 A.REI.4 A.CED.1 MP 1-2 | • solve a quadratic equation algebraically and perform an algebraic check. | Solve and check the following quadratic equations algebraically:  
\[
5x^2 - 7 = 493 \\
x^2 + 12 = 5
\]  
*Include examples with no solutions such as the one given above.  
\[
\frac{1}{2}y^2 = \frac{1}{5}
\] | Leave in simplest, radical form.  
Cross-check solutions using algebraic methods.  
Discuss what it means to take the square root and why taking the square root results in both a positive and negative solution.  
Emphasize and have students understand:  
\[
\sqrt{x^2} = |x| = \begin{cases} 
  x & \text{when } x \geq 0 \\
  -x & \text{when } x < 0
\end{cases}
\] | |
| 28. solve quadratic equations using the quadratic formula. | A.REI.4 MP 1-2 MP 4 MP 7 | • solve a quadratic equation by using the quadratic formula. | Use the quadratic formula to solve:  
\[
f(x) = 2x^2 + x - 6
\] | Give an overview of standard form for a quadratic equation and define the quadratic formula. |
**Quadratic Functions and Other Non-Linear Relationships**

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<tr>
<th>PROFICIENCY/OBJECTIVE</th>
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<td>28. (continued)</td>
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<td>Identify the $x$-intercept(s) if any exist for: $f(x) = x^2 + 7x - 8$</td>
<td>Include real-life problems. Refer to p.535 Example 4 or the following: A company sells steel rods that are painted gold. The steel rods are cylindrical in shape and 6 cm long. Gold paint costs $0.15 per square inch. Find the maximum diameter of a steel rod if the cost of painting a single steel rod must be $0.20 or less.</td>
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<td>Make connection between solutions and $x$-intercepts.</td>
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<td>29. solve quadratic equations by graphing.</td>
<td>F.IF.7 A.REI.11 A.CED.2 A.CED.3 F.IF.4 MP 1-2 MP 4</td>
<td>• solve a quadratic equation having one, two or no solutions. • find the zeroes of a quadratic function.</td>
<td>Solve by graphing: $x^2 - 2x = 3$ $-x^2 + 2x = 1$</td>
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<td>30. solve quadratic equations by completing the square</td>
<td>A.REI.4a</td>
<td>• determine the value of $c$ such that $x^2 - 16x + c$ is a perfect square trinomial</td>
<td>Explain which method you would use to solve each equation below: square root, factor, complete the square, quadratic formula. $x^2 + 16x = 105$ $x^2 + 3x - 4 = 0$ $x^2 + 4x + 4 = 81$</td>
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### Quadratic Functions and Other Non-Linear Relationships

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<td>31. graph the square root, cube root function and determine and analyze its key characteristics.</td>
<td>F.IF.7B MP 1 MP 8 8.2.12.C.4</td>
<td>• graph functions and analyze: domain and range transformations • identify the transformation from the equation.</td>
<td>Graph each of the following using transformation properties: ( f(x) = \sqrt{x+2} ) ( f(x) = -\sqrt{x-4} ) ( f(x) = \sqrt[3]{x} + 2 )</td>
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Unit IV: Expressions and Equations

Essential Questions
• What techniques can be used to simply expressions with exponents?
• How can we use mathematical language to describe non-linear change?
• How can we model situations using exponents?
• How can we use mathematical language to describe exponential change?
• How can we use exponential models for real life situations?
• How can we use algebraic representation to analyze patterns?
• Why are number and algebraic patterns important as rules?
• How can we add, subtract, and multiply polynomials?
• What techniques can be used to factor polynomials and solve polynomial equations?
• What are the similarities and differences between linear, quadratic, and exponential functions?

Enduring Understandings
• Graphs and equations are alternative (and often equivalent) ways for depicting and analyzing patterns of non-linear change.
• Mathematical models can be used to describe physical relationships; these relationships may be linear, quadratic, or exponential.
• Real world situations, involving exponential relationships, can be solved using multiple representations.

UNIT FOCUS:
Successful students will be able to recognize, represent, analyze, graph, solve equations and apply some non-linear functions, including exponential and quadratic functions. In contextual problems students will be required to graph and interpret their solutions in terms of the context. Function notation should be used regularly but not exclusively.
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| 32. multiply and divide exponential expressions. (26) | N.RN.1 N.RN.2 A.SSE.3 MP 1-2, MP 4 | • use properties of exponents to multiply exponential expressions and simplify these expressions completely. | Simplify:  
(-3a^4)^2  
3^2 \cdot 3^3  
(2ab^4)^3 (-3a^2b)^2  
3a^2+6ab \div 3a  
Evaluate each of the following expressions if $x = -2$ and $y = 3$:  
(-x)^3 \cdot y^2  
(xy^2)^3  
(x^2 \cdot x^3) \cdot (y)^2  | Give an overview of the difference between: $-3^2$ and $(-3)^2$ and the results if we extend a pattern:  
$-3^2$ vs $(-3)^2$  
$-3^3$ vs $(-3)^3$  
$-3^4$ vs $(-3)^4$  
$-3^5$ vs $(-3)^5$  
Draw a conclusion.  
Model a real-life problem (refer to p. 452, Ex 5). |
| 33. simplify and evaluate expressions with positive, negative and zero exponents. (27) | N.RN.1 N.RN.2 A.SSE.3 MP 1-2 | • apply appropriate properties of exponents to simplify or evaluate an expression containing positive, negative and zero exponents. | Simplify so all expressions have only positive exponents:  
$(5x)^3$  
$\frac{1}{4x^{-2}} y^3$  
$4^{-3} \cdot 4^3$  
Evaluate:  
$2^3 (2^{-4})^{-2}$  
$4^2$  
$(-40a)^0$  
$3a^2b$ | Give an overview of the definition of zero and negative exponents. |
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<td>33. (continued)</td>
<td>N.RN.1 N.RN.2 A.SSE.3 MP 1-2 MP 5</td>
<td>• simplify rational expressions containing exponents and evaluate when possible.</td>
<td>Simplify:</td>
<td>Give an overview of the division properties of exponents. Review the concept of zero and negative exponents and apply in practice problems. Technology: Use the graphing calculator to evaluate numerical expressions. Discuss rewriting the expression $1.15^{t}$ as $\left(1.15^{\frac{1}{12}}\right)^{12t}$ which is equivalent to $1.012^{12t}$, thereby revealing that a yearly interest rate of 15% equates to a monthly interest rate of 1.2%.</td>
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<td>34. graph and model exponential functions.</td>
<td>A.SSE.3 A.CED.2 F.IF.7 F.IF.8 F.BF.1 F.LE.1 F.LE.2</td>
<td>• graph exponential functions • write, graph, and use models for exponential growth and decay • use compound interest and depreciation models</td>
<td>Graph $f(x) = 2^x$. Graph $3 \cdot \left(\frac{1}{4}\right)^x$.</td>
<td>Compare linear and exponential functions. Monthly Interest (see Appendix D) Observe using graphs and tables that a quantity increasing</td>
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<td>34. (continued)</td>
<td>8.2.12.C.4</td>
<td>• find the slope or rate of change of an exponential function over a specified interval given an equation or table</td>
<td>Identify whether a context or function represents exponential growth, decay, or neither. Answer the following questions: You deposit $500 into an account that pays 8% annual interest compounded yearly. What is the account balance after 6 years? [ y = C(1 + r)^t ] You bought a car for $18,000. The value of the car will be less each year because of depreciation. Estimate the value of the car in 8 years. [ y = C(1 - r)^t ]</td>
<td>exponentially eventually exceeds a quantity increasing linearly. Ex: Would you rather choose a prize of $1000 a day for 30 days or $0.01 day one, doubling per day for 30 days? Given a scenario, identify the most appropriate form of an exponential function.</td>
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| 35. analyze a table, numerical pattern, graph, equation, or context to determine whether a linear, exponential, or quadratic relationship could be represented. | A.CED.2 F.BF.1 F.IF.3 F.IF.6 F.IF.7 F.IF.8 F.LE.1 F.LE.2 F.LE.3 | • express reasoning about whether a function is linear, exponential, or quadratic given a table, numerical pattern, graph, equation, or context | Identify the graphs of \( f(x) = 2x \) and \( g(x) = x^2 \) as linear, quadratic, or exponential and explain your reasoning. | Comparing Linear and Quadratic Functions (see Appendix D) Refer to page 476 activity 8.5. |
# Expressions and Equations

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<td>35. (continued)</td>
<td>F.LE.5, MP 1, MP 3-4, MP 8, 8.2.12.E.4</td>
<td>• compare rate of change associated with various functions over different intervals</td>
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| 36. recognize linear and exponential functions as arithmetic and geometric sequences and construct their formulas | F.IF.3, F.LE.5, F.IF.6, F.BF.2, F.LE.1, F.LE.2, MP 1, MP 3-4, MP 8 | • identify functions as arithmetic or geometric sequences and write their formulas | Given the following increasing numerical pattern, 3, 6, 12, 24, 48,… determine the type of relationship that exists (linear or exponential) and justify your conclusion. Write a formula for the sequence. | Mini-Golf Prices (see Appendix D)
Discuss the definition of a recursive sequences when discussing the pattern of values.
Ex. Fibonacci Sequence |
| 37. combine and classify polynomials | A.APR.1, A.SSE.1, MP 1-2, MP 5-6 | • combine polynomials and classify by type and degree.
• identify the different parts of a polynomial (leading coefficients, number of terms, and degree). | Classify each polynomial by type and degree: 3x² + 5x + 2 -5w + 7
Find the sum or difference:
(3x+5) + (2x-9)
(7a²-3a+2) – (a²+6) | Give an overview of all related terminology.
Explore vertical and horizontal formats to +/- polynomials.
Technology: Use graphing calculator to make graphs of polynomial functions (refer to p. 583, Activity 10.1). |
| 38. determine the product of polynomials. | A.APR.1, MP 1-2, MP 7 | • apply the distributive property to determine the product of polynomials. | Find the product: (4a + 3) (-2a) | Picture Frame Problem (See Appendix D)
Review distributive property and laws of exponents.
(NOTE: FOIL) |
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<td>39. perform all basic operations on polynomials.</td>
<td>A.APR.1 MP 1-2 MP 7</td>
<td>• apply special product patterns to determine the product of:</td>
<td>Find the product of:</td>
<td>Apply to geometric models (refer to p. 588, #52 or # 53).</td>
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<td>a. the sum and the difference of the same two terms.</td>
<td>((a + 5)(a - 5))</td>
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<td>b. a binomial squared.</td>
<td>((2x + 3)^2)</td>
<td>Students should explore using various related sample problems and draw conclusions.</td>
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<td>((w - 4)^2)</td>
<td>Represent areas and perimeters of geometric shapes using polynomials. Refer to p.592 Example 4.</td>
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<td>40. solve polynomial equations in factored form using the zero product property.</td>
<td>A.REI.4 A.APR.3 A.CED.1 MP 1-2</td>
<td>• apply zero product property to:</td>
<td>Solve each:</td>
<td>Give an overview of zero-product property.</td>
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<td>a. solve polynomial equations in factored form.</td>
<td>((x + 7)(x - 1) = 0)</td>
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<td>b. identify zeroes of polynomials.</td>
<td>(2(w - 2)^3 = 0)</td>
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<td>(\text{Find the zeroes of } g(x) = (x+4)(2x–3)(x+7))</td>
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### Expressions and Equations

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| 41. factor polynomials in the form \(a^2 + bx + c\) when \(a = 1\) completely and use the factors to solve equations (use special patterns where appropriate). | A.SSE.3  
A.REI.4  
F.IF.8  
MP 1  
MP 7 | • factor a quadratic expression in the form \(ax^2 + bx + c\) when \(a = 1\) or \(a = -1\). | Factor:  
\(x^2 + 7x + 10\)  
\(x^2 - 6x - 16\)  
\(x^2 + 4x - 5\)  
\(x^2 - 9x + 22\) | Use FOIL to check binomial factors against the original trinomials. |
| | | Solve by factoring:  
\(x^2 + 3x - 18 = 0\) | | Emphasize factoring methods. Solving by factoring will aid future discussion on quadratics and finding x-intercepts |
| | | | | |
| 42. solve polynomials in the form completely (use special patterns where appropriate). | A.SSE.3  
MP 1  
MP 7 | • factor a quadratic expression in the form \(ax^2 + bx + c\) and solve quadratic equations in the form \(ax^2 + bx + c = 0\) by using the quadratic formula, factoring or graphing. | Factor:  
\(4x^2 + 5x + 1\)  
\(3x^2 - 2x - 8\)  
\(5x^2 + 7x - 6\)  
\(7x^2 - 9x + 2\) | Emphasize factoring methods and the fact that solving by factoring will aid in the future with quadratics and x-intercepts |
| | | Solve by factoring:  
\(5x^2 + 8x + 3 = 0\) | | |
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<td>43. factor polynomials completely using GCF or special patterns.</td>
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<td>43. (continued)</td>
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<td>A.SSE.3</td>
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<td>• determine the GCF.</td>
<td>Factor out the GCF:</td>
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<td>• use the GCF to factor a polynomial completely.</td>
<td>$14x^5 - 28x^3$</td>
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<td>• use grouping to factor.</td>
<td>$4a - a^2 + 5$</td>
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<td>Factor each completely:</td>
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<td>$7a^3 - 28a^2$</td>
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<td>$-5a^3 + 10a^2 + 15a$</td>
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<td>Factor completely:</td>
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<td>$x^3 + 4x^2 + 6x + 24$</td>
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<td>$a^3 + 2a^2 - 36a - 72$</td>
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<td>$x^2 - 1 + (x - 1)^2$</td>
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<td>Recognize $53^2 - 47^2$ as a difference of squares and see an opportunity to rewrite it as $(53+47)(53-47)$.</td>
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<td>See an opportunity to rewrite $a^2 + 9a + 14$ as $(a+7)(a+2)$.</td>
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<td>Solve by factoring:</td>
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<td>$\frac{3}{4}c(c - 1) = c$</td>
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<td>Given the function $f(x) = x^2 + x$, find all values of k such that $f(3 - k) = f(3)$.</td>
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<td>Concept of GCF should be explored here and applied in problems such as: $9x^2 + 15x + 6$ which factors completely to $3(3x+2)(x+1)$.</td>
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<td>Emphasize factoring methods but solving by factoring will aid future discussion on quadratics and x-intercepts</td>
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<td>Station Activity: Polynomials and Factoring</td>
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<td>Tic-Tac-Toe Activity: Factoring Polynomials</td>
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<td>Matching Puzzle Activity: Factoring Quadratics</td>
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<td>See Appendix G</td>
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<tr>
<td>44. solve quadratic equations by completing the square.</td>
<td>A.REI.4, F.IF.8, A.SSE.3, A.CED.1, MP 1, 2, 7</td>
<td>• solve quadratic equations by completing the square.</td>
<td>Find the value of $c$ that makes the expression $x^2 + 5x + c$ a perfect square trinomial. Then, write the expression as the square of a binomial. Solve: $x^2 - 16x = -15$ by completing the square.</td>
<td>Review perfect square trinomials Be sure to emphasize plus or minus when taking roots of both sides of an equation. Derive the quadratic formulas using completing the square. Station Activity: Simplifying Radicals/Solving Quadratic Equations See Appendix C</td>
</tr>
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**Unit V: Reasoning with Inequalities and Absolute Value**

Essential Questions:
- How can we use an inequality to describe a real life statement?
- How can we use addition or subtraction to solve an inequality?
- How can we solve a multistep inequality?
- How can we use inequalities to describe intervals on the real number line?
- How can we solve and graph an absolute value equation?

Enduring Understandings:
- Inequalities can be used to model and solve real world situations.
- Inverse operations can be used to solve inequalities.
- There are a variety of techniques used to solve and graph absolute value equations.

**UNIT FOCUS:**
Successful students will be able to solve and graph the solution sets of linear inequalities and absolute value equations. In contextual problems students graph and interpret their solutions in terms of the context.

<table>
<thead>
<tr>
<th>PROFICIENCY/OBJECTIVE</th>
<th>Standards</th>
<th>SUGGESTED ACTIVITY</th>
<th>EVALUATION/ASSESSMENT</th>
<th>TEACHER NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>The student will be able to:</td>
<td>Students will:</td>
<td>Solve and graph:</td>
<td>Give an overview of transformations that produce equivalent inequalities. Pay special attention to changes of signs when dividing or multiplying by a negative number. Give an overview of calibrating the number line to a unit length, especially if your result is a fraction or decimal.</td>
<td></td>
</tr>
<tr>
<td>45. solve and graph linear inequalities in one variable.</td>
<td>A.REI.1 A.REI.3 MP 1-2 MP 6 MP 8</td>
<td>• solve a linear inequality for the value of the variable and graph the solution on a number line.</td>
<td>-3x – 4 ≤ 13 4a + 9 &gt; 3 –</td>
<td>− 6</td>
</tr>
</tbody>
</table>
### REASONING WITH INEQUALITIES AND ABSOLUTE VALUE

<table>
<thead>
<tr>
<th>PROFICIENCY/OBJECTIVE</th>
<th>Standards</th>
<th>SUGGESTED ACTIVITY</th>
<th>EVALUATION/ASSESSMENT</th>
<th>TEACHER NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The student will be able to:</strong></td>
<td></td>
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<tr>
<td>45. (continued)</td>
<td></td>
<td>• solve a linear inequality using addition, subtraction, multiplication, division, and/or the distributive property and graph the solution.</td>
<td>Solve and graph: ( 5a - 2 \leq -7a + 3 ) ( \frac{2}{7}x - 3 \geq \frac{1}{3}x - 2 ) ( .3x + 4 &lt; 2x - .5 )</td>
<td>Include decimal and fractional types and calibrate the number line accordingly. Boss/Secretary Activity See Appendix B</td>
</tr>
<tr>
<td>46. solve and graph compound inequalities.</td>
<td>A.REI.3 MP 1-2</td>
<td>• solve and graph compound inequalities.</td>
<td>Solve and graph: ( 2x + 9 &lt; -3 ) or ( 3x - 10 \geq 5 ) ( -8 \leq x + 2 \leq 7 )</td>
<td>Discuss the relationship between and versus or with respect to the graphs.</td>
</tr>
<tr>
<td>47. solve absolute value equations.</td>
<td>A.CED.1 MP 1-3</td>
<td>• use the definition of absolute value to rewrite an absolute value equation as two equations, solve each, and graph the combined solution on a number line.</td>
<td>Solve and graph: (</td>
<td>x - 4</td>
</tr>
</tbody>
</table>
# REASONING WITH INEQUALITIES AND ABSOLUTE VALUE

## PROFICIENCY/OBJECTIVE

<table>
<thead>
<tr>
<th>The student will be able to:</th>
<th>Standards</th>
<th>SUGGESTED ACTIVITY</th>
<th>EVALUATION/ASSESSMENT</th>
<th>TEACHER NOTES</th>
</tr>
</thead>
</table>
| 48. graph the absolute value of a linear function and determine and analyze its key characteristics. | F.BF.3 F.IF.2 F.IF.4 MP 1 MP 3 MP 5 MP 7 8.2.12.C.4 8.2.12.E.4 | • graph absolute value functions and analyze:  
  - vertex  
  - slope of each branch  
  - intercepts  
  - domain and range  
  - maximum & minimum  
  - opening direction  
• express reasoning about transformations of functions  
• given an equation of a transformation, create the graph | Graph each of the following absolute value equations and compare and contrast with the graph of \( f(x) = |x| \)  
  - \( g(x) = -|x| \)  
  - \( h(x) = |2x| \)  
  - \( j(x) = |x + 2| \)  
  - \( k(x) = |x| + 2 \) | Emphasize transformations of the graph \( f(x) = |x| \).  
Relate the transformations to a change in \( x \) or a change in \( y \), i.e. \( j(x) \) indicates a change in \( x \) which is a horizontal shift (left or right) while \( k(x) \) is a change in \( y \), which is a vertical shift (up or down). |
| 49. graph and write piecewise functions | F.IF.7 MP 1-2 MP 5 MP 7 | • graph and write piecewise functions and identify domain of the function. | Graph:  
  \[ \begin{align*}  
  y &= \begin{cases}  
  x + 1, & \text{if } x < 0 \\
  2x - 1, & \text{if } x \geq 0 
  \end{cases}  
  \end{align*} \] | Use vertical line test to avoid including a point in more than one part of the function.  
*Include examples with quadratic functions later in curriculum. |
Unit VI: Statistical Models

Essential Questions:
- How do you compare measures of central tendency and dispersion?
- How do you find the relative frequency in a two-way table?
- How do you make and interpret stem-and-leaf plots and histograms?
- How do you make and interpret a box-and-whisker plot?

Enduring Understandings
- Dot plots, histograms and box plots are different ways to analyze data.
- Data displays often reveal patterns and trends that may not be obvious.

UNIT FOCUS:
Successful students will be able to determine an appropriate representation of categorical or quantitative data, and summarize and interpret the data and characteristics of the representation(s).

<table>
<thead>
<tr>
<th>PROFICIENCY/OBJECTIVE</th>
<th>Standards</th>
<th>SUGGESTED ACTIVITY</th>
<th>EVALUATION/ASSESSMENT</th>
<th>TEACHER NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>The student will be able to:</td>
<td>S.ID.2 S.ID.3 MP 1-2</td>
<td>• find mean, median, mode and range given a set of data. (The teacher will also introduce and discuss standard deviation.)</td>
<td>Find the measures of central tendency for the data: 14,15,15,14,14,16,18,15</td>
<td>Briefly discuss standard deviation. Use a calculator to find standard deviation given data. Be sure to use the numbers for standard deviation on the calculator.</td>
</tr>
</tbody>
</table>
### Statistical Models

<table>
<thead>
<tr>
<th>PROFICIENCY/OBJECTIVE</th>
<th>Standards</th>
<th>SUGGESTED ACTIVITY</th>
<th>EVALUATION/ASSESSMENT</th>
<th>TEACHER NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The student will be able to:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 51. represent and analyze data with plots on the real number line (dot plots, histograms and box plots.) | S.ID.1  S.ID.2  S.ID.3  S.ID.5  MP 1  MP 4  MP 6  8.2.12.E.4 | - organize data in tables, dot plots, box plots, or histograms and use these tables to interpret data.  
- create a box plot or frequency table to represent a data set.  
- determine the mean, median, and quartiles of data sets.  
- interpret differences in shape, center, and spread in the context of data sets.  
- summarize categorical data in a two-way frequency table. | Use the table given to answer the questions below. | Be sure to encourage students to read questions carefully and only use data represented in the question.  
When creating dot plots, note the highest and lowest data values before deciding on the scale for the dot plot. Be sure the scale on your horizontal axis is in equal increments.  
Data Project  
See Appendix A |
| 53. understand the difference between causation and correlation. | S.ID.8  S.ID.9  MP 1  MP 3-4 | - distinguish the difference between causation and correlation. | Given a set of data, find the correlation coefficient using the graphing calculator. Students will discuss the difference between correlation and causation. | Discuss real-life situations such as: Number of pets vs. number of children in a household can represent a positive correlation, but may not be an example of causation. |

<table>
<thead>
<tr>
<th></th>
<th></th>
<th><strong>APPLES</strong></th>
<th><strong>ORANGES</strong></th>
<th><strong>TOTAL</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Boys</strong></td>
<td>15</td>
<td>18</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td><strong>Girls</strong></td>
<td>21</td>
<td>16</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>36</td>
<td>34</td>
<td>70</td>
<td></td>
</tr>
</tbody>
</table>

a) How many boys prefer oranges?  
b) How many people overall prefer apples?
BIBLIOGRAPHY

TEXTBOOK

RESOURCES


WEBSITES
www.illustrativemathematics.org
www.insidemathematics.org
www.classzone.com
www.domath.org
www.goenc.com
www.illuminations.nctm.org
www.mathforum.org
www.mathgoodies.com
www.nctm.org
www.mcdougallittell.com
www.forum.swarthmore.edu
www.bigideasmath.com
www.parcconlione.org
www.desmos.com/calculator
APPENDIX A  SAMPLE AUTHENTIC ASSESSMENTS
SLOPE AUTHENTIC ASSESSMENT PROJECT
DATA AUTHENTIC ASSESSMENT PROJECT
NAME: ________________________

PERIOD: ____________________

You have just been hired by the Building Department of Parsippany-Troy Hills Township to spot-check three ramps around your school or community to see if they meet the State requirements for slope. Do they meet the State requirements?

YOUR TASK:

- Prepare the following in a written report to the supervisor of the building department.
  - The State regulations concerning the slope of an access ramp is 1 in. : 20 in. (Should be reported in final report)
  - Explain where the ramps are located and how you measured the ramps.
  - Draw a diagram of each ramp, including the measurements. (Use the coordinate plane for your diagram)
  - Draw a conclusion based on your findings. (Don’t forget to include evidence to support your conclusions)

DUE DATE: ________________________
<table>
<thead>
<tr>
<th>Mathematical Concepts</th>
<th>Explanation shows complete understanding of the mathematical concepts used to solve the problem(s).</th>
<th>Explanation shows substantial understanding of the mathematical concepts used to solve the problem(s).</th>
<th>Explanation shows some understanding of the mathematical concepts needed to solve the problem(s).</th>
<th>Explanation shows very limited understanding of the underlying concepts needed to solve the problem(s) OR is not written.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematical Terminology and Notation</td>
<td>Correct terminology and notation are always used, making it easy to understand what was done.</td>
<td>Correct terminology and notation are usually used, making it fairly easy to understand what was done.</td>
<td>Correct terminology and notation are used, but it is sometimes not easy to understand what was done.</td>
<td>There is little use, or a lot of inappropriate use, of terminology and notation.</td>
</tr>
<tr>
<td>Explanation</td>
<td>Explanation is detailed and clear.</td>
<td>Explanation is clear.</td>
<td>Explanation is a little difficult to understand, but includes critical components.</td>
<td>Explanation is difficult to understand and is missing several components OR was not included.</td>
</tr>
<tr>
<td>Diagrams and Sketches</td>
<td>Diagrams and/or sketches are clear and greatly add to the reader's understanding of the procedure(s).</td>
<td>Diagrams and/or sketches are clear and easy to understand.</td>
<td>Diagrams and/or sketches are somewhat difficult to understand.</td>
<td>Diagrams and/or sketches are difficult to understand or are not used.</td>
</tr>
<tr>
<td>Neatness and Organization</td>
<td>The work is presented in a neat, clear, organized fashion that is easy to read.</td>
<td>The work is presented in a neat and organized fashion that is usually easy to read.</td>
<td>The work is presented in an organized fashion but may be hard to read at times.</td>
<td>The work appears sloppy and unorganized. It is hard to know what information goes together.</td>
</tr>
<tr>
<td>Research of regulations</td>
<td>Regulation information is accurate and up-to-date.</td>
<td>Regulation information is not up-to-date.</td>
<td>Regulation information is not accurate.</td>
<td>Regulation information is neither accurate nor up-to-date.</td>
</tr>
</tbody>
</table>
NAME: _______________________

One movie critic claims that the titles of popular movies in the 2000’s were very short (The Patriot, Jersey Girl, etc.) compared to titles of older movies before 1980 (Gone with the Wind, Diary of Anne Frank, etc.). Your present supervisor at Dream Works, a major movie company, has assigned you to research this claim and decide if you agree or disagree with this critic.

YOUR TASK:

Prepare the following in a written report to your supervisor at Dream Works:

- Research and gather data comparing the lengths of old and recent movie titles. Lists should include the year of the movie.

- Display data in two graphs for old and recent movies. (Histogram, Stem and Leaf, Box and Whisker, etc.)

- Draw a conclusion based on your findings.

Due Date: ________________
<table>
<thead>
<tr>
<th>Rubric for Data Project</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mathematical Concepts</strong></td>
</tr>
<tr>
<td>Mathematical Reasoning</td>
</tr>
<tr>
<td>Mathematical Terminology and Notation</td>
</tr>
<tr>
<td>Explanation</td>
</tr>
<tr>
<td><strong>Data Displays</strong></td>
</tr>
<tr>
<td>Neatness and Organization</td>
</tr>
<tr>
<td>Research of regulations</td>
</tr>
<tr>
<td><strong>Explanation</strong></td>
</tr>
<tr>
<td>Uses effective mathematical reasoning Correct terminology and notation are used, making it fairly easy to understand what was done.</td>
</tr>
<tr>
<td><strong>Data displays</strong></td>
</tr>
<tr>
<td>The work is presented in a neat and organized fashion that is usually easy to read.</td>
</tr>
<tr>
<td><strong>Neatness and Organization</strong></td>
</tr>
<tr>
<td>Regulation information is not accurate.</td>
</tr>
<tr>
<td><strong>Research of regulations</strong></td>
</tr>
</tbody>
</table>
SAMPLE PROJECTS
LINE OF BEST FIT PROJECT
QUADRATIC FUNCTIONS PROJECT
LINE OF BEST FIT PROJECT

**Goal:** To be able to use Excel to create a scatter plot, find a line of best fit, and find the equation of the line of best fit.

1. Log on and open Microsoft Office --- Excel
2. Enter the column titles and data into the Excel cells
3. Select title and data. Click on “Insert”, “chart”, “xy scatter”, “Next”, “Next, Next, Finish. This will give you a scatter plot.
4. To give the graph and each axis a title---right click on the background of the graph (not on the grid line and not on the axes), left click “chart Options”, left click on titles tab if not already selected, enter the graph title (see data sheet), enter the title for the x-axis, enter the title for the y-axis, click OK
5. To put in a line of best fit----right click on a data point, left click on “Add Trendline”, “Linear”, OK
6. To delete the legend on the right—select, delete. Or right click, delete.
   Or “chart options”, legend, uncheck show legend.
7. To make the background white---right click on the background of graph, not on gridline. Left click on “format chart area”, click on white for area, ok
8. To add major vertical gridlines—right click on background of graph. Left click on “chart options”, “gridlines” tab, check major grid lines for x-axis., ok
9. To add tick marks for minor values on the axes—Right click on the x-axis, left click “format axis”, select “patterns” tab, check off for major tick mark type “cross”, check off minor tick mark type “outside”, ok. Repeat for y-axis.
10. **To use the line of best fit to predict**—Right click on the line of best fit (not on data point), Left click on “format trendline”, “options” tab, go to “forecast forward” and set to 2, “forecast backward” 2 units. OK. (These extended pieces will be used in question 15.)
11. To put your name on the page in the title—Put your cursor behind the last word in the title making sure you are in the textbox, enter, By Your names, date, click outside the textbox
12. To change the starting value for each axis and change the scale—right click on the x-axis, left click format axis”, select “scale” tab, enter values (see data sheet), repeat for y-axis, ok
13. To get the equation of the line of best fit—Right click on the line (not on a data point). Left click on “Format trend line”, “options” Tab. Check box “Display equation on chart”. Click OK. Select the equation box and move it to just above the chart, so equation can be read easily.
14. To print---select the chart by left clicking on the chart background. File, print preview, Print.
15. Do this on the paper with the graph. (a) Mark a dot somewhere on the extension of the line of best fit and give the coordinates for this point. (b) Explain in words the meaning of the coordinates of the point in part (a). (c) Find the y value for x = 50 using your equation for the line of best fit. Show work. (d) Explain why it would not make sense to extend the line of best fit to an x value of 50.
DATA SET #1

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Height (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>29</td>
</tr>
<tr>
<td>7</td>
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<td>6</td>
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<tr>
<td>2</td>
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<tr>
<td>9</td>
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<td>5</td>
<td>39</td>
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<tr>
<td>9</td>
<td>48</td>
</tr>
<tr>
<td>6</td>
<td>40</td>
</tr>
</tbody>
</table>

Chart Name
FOREARM LENGTH AND FOOT LENGTH

x-axis Name
FOREARM LENGTH (CM)

y-axis Name
FOOT LENGTH (CM)

x-axis
minimum 15
maximum 9
major unit 2
minor unit 0.5

y-axis
minimum 15
maximum 27
major unit 2
minor unit 0.5

DATA SET #2

<table>
<thead>
<tr>
<th>Forearm Length (cm)</th>
<th>Foot Length (cm)</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td>22</td>
<td>22</td>
</tr>
</tbody>
</table>

Chart Name
AGE AND HEIGHT FOR CHILDREN 1-10 YRS. OLD

x-axis Name
AGE (YEARS)

y-axis Name
HEIGHT (INCHES)

x-axis
minimum 0
maximum 14
major unit 2
minor unit 0.5

y-axis
minimum 20
maximum 60
major unit 5
minor unit 1
QUADRATIC FUNCTIONS PROJECT

Goal: To be able to use a calculator to answer questions about quadratic functions

Answer the following questions about parabolas by using the Table function on the graphing calculator.

(1) If \( x = 13 \) and \( y = 2x^2 - 7x + 18 \), find \( y \) from a table on the calculator.

(2) Use the table on the calculator to find the value of \( y \), if \( y = 5x^2 + 18x \) and \( x = -14 \).

(3) For quadratic equation \( y = -4x^2 + 6x + 38 \), find the value of \( y \) for \( x = 9 \).

(4) Find \( y \) if the point \((12, y)\) is on the graph of the parabola \( y = x^2 - 8x - 19 \).

(5) Is \((10, 345)\) on the graph of the quadratic function \( y = 3x^2 + x + 25 \)?

(6) If \( x = 12 \) and \( y = 3x^2 - 10x + 25 \), what is the value of \( y \)

(7) If \( x = 13 \) and \( y = x^2 - 8x - 19 \), find \( y \) from a table.

(8) If \( x = 8 \) and \( y = 10x^2 - 18 \), find \( y \).

(9) Is \((-5, 35)\) on the graph of the parabola \( y = 3x^2 - 8x \)?

(10) If \( y = -2x^2 + 3x + 4 \), what is the value of \( y \) when \( x = 11 \)?
How to find the roots—Roots or x-intercepts always have a y value equal to zero, so look for 0 in the y column of the table. The x coordinate is the root. There could be 2, 1 or no (real) roots. It is also possible to have 1 or 2 roots that are not integer values. In these cases, you will not see y values that are zero, but you can see where the y values change from positive to negative; the roots are somewhere between the corresponding x values. Just state “a root is between ____ and ____.”

How to find the vertex —If “a” is positive, the parabola opens up and the vertex is the lowest point of the parabola. Find the lowest y value in the table; that (x, y) is the vertex. If “a” is negative, the parabola opens down and the vertex is the highest point of the parabola. Find the highest y value in the table; that (x, y) is the vertex. If there are 2 lowest or 2 highest y values in the table, then the vertex is halfway between those two points. Take the x value that is half way. You can use the “calc” button to find the y value.

Find the roots and vertex for each parabola using a table on the calculator.

<table>
<thead>
<tr>
<th>(11)</th>
<th>y = 2x² - 4x + 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>(12)</td>
<td>y = -3x² + 30x - 75</td>
</tr>
<tr>
<td>(13)</td>
<td>y = 3x² + 12x - 36</td>
</tr>
<tr>
<td>(14)</td>
<td>y = -\frac{1}{2}x² + x + 4</td>
</tr>
<tr>
<td>(15)</td>
<td>y = x² - 8x + 22</td>
</tr>
<tr>
<td>(16)</td>
<td>y = 2x² - 16x + 24</td>
</tr>
<tr>
<td>(17)</td>
<td>y = -x² - 10x</td>
</tr>
<tr>
<td>(18)</td>
<td>y = 2x² - 10x + 8</td>
</tr>
<tr>
<td>(19)</td>
<td>y = x² - 10x + 8</td>
</tr>
<tr>
<td>(20)</td>
<td>y = x² - 17x + 70</td>
</tr>
<tr>
<td>(21)</td>
<td>y = x² - 8x + 13</td>
</tr>
<tr>
<td>(22)</td>
<td>y = 2x² + 2x - 24</td>
</tr>
<tr>
<td>(23)</td>
<td>y = 2x² - 14x + 20</td>
</tr>
<tr>
<td>(24)</td>
<td>y = (x - 5)² - 2</td>
</tr>
<tr>
<td>(25)</td>
<td>y = x² + 2x - 4</td>
</tr>
<tr>
<td>(26)</td>
<td>y = -2x² - 8x + 7</td>
</tr>
<tr>
<td>(27)</td>
<td>y = x² - 16x + 58</td>
</tr>
</tbody>
</table>
APPENDIX C   ALGEBRA PRE-ASSESSMENT
ALGEBRA 1 PRE-ASSESSMENT

NO CALCULATOR – Show all work

1. Solve $5 = \frac{1}{2}m + 3$

2. Evaluate $56 - (17 - 9) + 9 ÷ 3$

3. Evaluate $9r^2 - 2p$ for $r = -3$ and $p = -5$

4. Jared worked for $h$ hours at the pay rate of $5 each hour.
   a) Write an algebraic expression to show how much money Jared makes.
   b) If Jared works a total of 12 hours, how much money will he make?

5. Combine like terms. Simplify if possible. $6(5 + n) - 2n$

6. Shade $\frac{5}{8}$ of the box below
7. Solve \(2x + 5 = 2(x - 7)\)

8. Solve \(6x - 8 = 4x + 10\)

9. The legs of a right triangle are 6 and 4. What is the length of the hypotenuse? Leave your answer in simplest radical form.

10. Simplify \(\sqrt[3]{27}\)

11. Simplify \(\sqrt{63}\)

12. Write in decimal form \(3.6 \times 10^{-4}\)

13. Write in scientific notation \(13,780,000,000\)

14. Draw a scatter plot using a data in the table below.
15. Given the following data set: 5, 4, 2, and 5.
   a) Determine the mean.
   b) Determine the median.
   c) Determine the mode.
   d) If an additional data point of 6 is included in the set, would the mean, median, or mode change? Why or why not?

16. Determine if the relation represents a function. Explain your reasoning.

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-5</td>
</tr>
<tr>
<td>1</td>
<td>-1</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>-5</td>
</tr>
</tbody>
</table>

17. What is the solution to the system below?
18. Which equation best describes the line below?

A. \( y = -x - 1 \)
B. \( y = x + 1 \)
C. \( y = x - 1 \)
D. \( y = -x + 1 \)
E. None of these

In this section, choose **only one** open ended question. You will complete problem 19 or 20.

19. As part of a science experiment, Mr. Villalobos asked his class to collect data on grasshopper length and jump height. The class’s data are shown in the table below.

### Grasshopper Length and Jump Height

<table>
<thead>
<tr>
<th>Length (in cm)</th>
<th>Jump Height (in cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5</td>
<td>48</td>
</tr>
<tr>
<td>1.5</td>
<td>30</td>
</tr>
<tr>
<td>3.0</td>
<td>55</td>
</tr>
<tr>
<td>1.0</td>
<td>22</td>
</tr>
<tr>
<td>2.5</td>
<td>51</td>
</tr>
<tr>
<td>3.5</td>
<td>70</td>
</tr>
<tr>
<td>2.0</td>
<td>45</td>
</tr>
<tr>
<td>4.0</td>
<td>75</td>
</tr>
<tr>
<td>1.5</td>
<td>32</td>
</tr>
<tr>
<td>3.0</td>
<td>64</td>
</tr>
</tbody>
</table>

a) Use the data in the scatter plot. Be sure to give the scatter plot a title and to label the axes and scales.

b) Describe the type of association you see between grasshoppers’ lengths and jump heights. Include words such as positive or negative and linear or nonlinear.
c) Use the scatter plot to estimate the jump height of a grasshopper measuring 6 cm. Explain your reasoning.

20. Ania and Allison are standing at a rectangular table with the following dimensions: \( \frac{2}{3} \) in and \( \frac{5}{2} \) in.

a) Draw a diagram of the table with labels. Find the perimeter of the table.

b) Find the area of the table.

c) Which side is longer? Explain your answer.
APPENDIX D  TEACHER RESOURCE
SAMPLE QUESTIONS
PARCC Sample Questions

Type 1: Tasks assessing concepts, skills, and procedures

Picture Frame (Polynomials Operations)

Sam uses one-inch frames for pictures for which the length is 2 inches (in.) longer than the width, as shown.

The area of the frame for a picture that is \( x \) inches wide is given by the expression:

\[
(x + 4)(x + 2) - (x + 2)x
\]

There are four descriptions shown. Drag the correct expression to the appropriate box below the corresponding description.

\[
\begin{align*}
(x + 4) & \quad (x + 2) & \quad (x + 4) \\
(x + 2)x & \quad (x + 4)(x + 2)
\end{align*}
\]

the length of the picture alone, in inches

the length of the frame, in inches

the area of the picture alone, in square inches

the area of the picture and frame together, in square inches

Click on a choice and drag it to a box.
Comparing Linear and Quadratic Functions

A portion of the graph of a quadratic function $f(x)$ is shown in the xy-plane. Selected values of a linear function $g(x)$ are shown in the table.

<table>
<thead>
<tr>
<th>$x$</th>
<th>$g(x)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>-4</td>
<td>7</td>
</tr>
<tr>
<td>-1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>-5</td>
</tr>
<tr>
<td>5</td>
<td>-11</td>
</tr>
</tbody>
</table>

For each comparison below, use the drop-down menu to select a symbol that correctly indicates the relationship between the first and the second quantity.

<table>
<thead>
<tr>
<th>First Quantity</th>
<th>Comparison</th>
<th>Second Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>The y-coordinate of the y-intercept $f(x)$</td>
<td>$f(3)$</td>
<td>The y-coordinate of the y-intercept $g(x)$</td>
</tr>
<tr>
<td>Maximum value of $f(x)$ on the interval $-5 \leq x \leq 5$</td>
<td>$f(5) - f(2)$</td>
<td>Maximum value of $g(x)$ on the interval $-5 \leq x \leq 5$</td>
</tr>
<tr>
<td></td>
<td>5 - 2</td>
<td></td>
</tr>
</tbody>
</table>
Myla's Pool

Myla's swimming pool contains 16,000 gallons of water when it is full. On Thursday, her pool was only partially full. On Friday, Myla decided to fill her pool completely using a hose that flowed at a rate of 10 gallons per minute. It took her 5 hours to completely fill her pool.

Part A

Type a number into each box to complete the sentences.

Before Myla started filling the pool, there were \[ \underline{ } \] gallons of water in the pool.

The rate at which water is being added to the pool is \[ \underline{ } \] gallons per hour.

Part B

Graph the amount of water in the pool in gallons as a function of time in hours.
Type 2: Tasks assessing expressing mathematical reasoning

Monthly Interest

Most savings accounts advertise an annual interest rate, but they actually compound that interest at regular intervals during the year. That means that, if you own an account, you’ll be paid a portion of the interest before the year is up, and, if you keep that payment in the account, you’ll start earning interest on the interest you’ve already earned.

For example, suppose you put $500 in a savings account that advertises 5% annual interest. If that interest is paid once per year, then your balance $B$ after $t$ years could be computed using the equation $B = 500(1.05)^t$, since you’ll end each year with 100% + 5% of the amount you began the year with.

On the other hand, if that same interest rate is compounded monthly, then you would compute your balance after $t$ years using the equation

$$B = 500\left(1 + \frac{.05}{12}\right)^{12t}$$

a. Why does it make sense that the equation includes the term $\frac{.05}{12}$? That is, why are we dividing .05 by 12?

b. How does this equation reflect the fact that you opened the account with $500?

c. What do the numbers 1 and $\frac{.05}{12}$ represent in the expression $\left(1 + \frac{.05}{12}\right)$?

d. What does the “12t” in the equation represent?

Michelle’s Conjectures

Michelle wanted to investigate the effect on the vertex of the graph of $f(x) = x^2 + 6x$ when $f(x)$ is replaced by $f(x + k)$.  

Michelle graphed functions of the form $f(x + k)$ for $k = 1, 2, 3$ and 4. For each of the functions she graphed, the $x$-coordinate of the vertex was negative and different for each value of $k$, but the $y$-coordinate of the vertex was the same for each value of $k$. Michelle made three conjectures based on her results.

1. The $x$-coordinate of the vertex depends on the value of $k$.
2. The $x$-coordinate of the vertex is negative for all values of $k$.
3. The $y$-coordinate of the vertex is independent of the value of $k$.

Determine if each of Michelle’s three conjectures are true. Justify each answer.
Yam in the Oven

You put a yam in the oven. After 45 minutes, you take it out. Let $f(r)$ be the temperature of the yam $r$ minutes after you placed it in the oven.

In (a)–(d), explain the meaning of the statement in everyday language.

a. $f(0) = 65$

b. $f(5) < f(10)$

c. $f(40) = f(45)$

d. $f(45) > f(60)$
Brett’s Race

Brett is on the high school track team and his coach surprises the team by having an Olympic track champion attend a practice. The Olympian challenges Brett to a 100-meter race. To make the race more interesting, the Olympian will not start the race until Brett reaches the 20 meter mark. Brett’s average time in the 100-meter race is 12 seconds, while the Olympian’s average time is 10 seconds. Assume that Brett and the Olympian run at a constant speed throughout the race.

Part A:
Based on each of the runners average time, write an equation for each person that describes the relationship between his distance from the starting line, in meters, and time, in seconds.

Part B:
Based on your equations in part A, who will win the race and by how much? Justify your answer.
Mini-Golf Prices

A local mini-golf course charges $5 per person to play a round of golf, and the course sells 120 rounds of golf per week. The manager of the course studied the effect of raising the price to increase revenue and found the following data.

The table shows the price, number of rounds of golf, and weekly revenue for different numbers of $0.25 increases in price.

<table>
<thead>
<tr>
<th>Number of $0.25 price increases, $n$</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price of a round of golf, $p(n)$</td>
<td>$5.00</td>
<td>$5.25</td>
<td>$5.50</td>
<td>$5.75</td>
<td>$6.00</td>
</tr>
<tr>
<td>Number of rounds of golf sold, $s(n)$</td>
<td>120</td>
<td>117</td>
<td>114</td>
<td>111</td>
<td>108</td>
</tr>
<tr>
<td>Weekly revenue, $r(n)$</td>
<td>$600</td>
<td>$614.25</td>
<td>$627</td>
<td>$638.25</td>
<td>$648</td>
</tr>
</tbody>
</table>

Part A

Based on the data, write a linear function to model the price of one round of golf, $p(n)$, in terms of $n$, the number of $0.25 increases.

Based on the data, write a linear function to model the number of rounds of golf sold in a week, $s(n)$, in terms of $n$, the number of $0.25 increases.

Part B

Based on the data, write a quadratic function for the weekly revenue in a week, $r(n)$, in terms of $n$, the number of $0.25 increases.

Use your quadratic function to determine the weekly revenue in a week when tickets cost $6.25.

Part C

The maximum possible weekly revenue is what percent greater than the weekly revenue with no price increases? Justify your answer graphically or algebraically.
Writing questions which can be used in lessons, warm-ups, homework, assessments

(1) Is \( x = 6 \) a solution to the equation \( 3x + 5 = 23 \)? Show work and explain your answer.

(2) Is \( y = 5 \) a solution to the inequality \( 12 - 2y \geq 4 \)? Show work and explain your answer.

(3) Is division commutative? Show work, explain your answer and give an example.

(4) Is subtraction associative? Explain in words and give an example to support your explanation.

(5) Alisha saw this question on a test and asked the teacher if she had typed something wrong. Explain why Alisha thought that the teacher had typed something wrong.

“State the solution or solutions of the equation \(|x| = -10\)”

(6) The graph of the line \( 2x - 9y = 1 \) is shown at the right.

Would the point with coordinates \((123, 245)\) lie on this line? Explain.

(7) Writing question
   (a) Give the coordinates of 2 points so that the line going through the 2 points has an undefined slope.

   (b) Explain how someone should pick these coordinates to make this happen.

(8) Does the line \( y = \frac{1}{2}x \) pass through the origin? Explain

(9) Are the lines \( y = 3x + 1 \) and \( y = 3x \) parallel? Explain.

(10) Are the lines \( y = 2x + 3 \) and \( y = -2x + 3 \) parallel? Explain.
Writing question: Given the following linear equations:

   Line 1: \( y = \frac{3}{4} x - 6 \)
   
   Line 2: \( y = \frac{4}{3} x + 6 \)

Determine if the lines 1 and 2 are perpendicular and explain why or why not.

Modeling with linear equations:

At the start of a blizzard there was already 4 inches of snow on the ground from a previous storm. The equation \( y = 2x + 4 \) gives the height \( y \), in inches, of the snow on the ground at time \( x \), in hours, after the blizzard started.

(a) What is the value of the y-intercept?
1. Explain the significance of the y-intercept as it relates to the snow situation.

(b) What is the value of the slope?
2. Explain the significance of the slope as it relates to the snow situation.

Modeling with linear equations

A local artist makes color pencil sketches of names and decorates the picture with a chosen theme such as flowers and butterflies, sports, etc…. The sketch is sold in a frame. The price for one of these framed names includes a fee for the frame in addition to a labor charge per letter. The price is given by the following equation:

\[
P = 4L + 12 \quad \text{where } P = \text{price (dollars)}
\]

and \( L = \text{number of letters in the name} \)

Katie wants to buy a gift a personalized framed wall hanging as a gift for her baby cousin named Tiffany. If Katie has $50 to spend, does she have enough money to buy the framed Tiffany wall hanging?

(a) Show all work.
(b) Answer the question.
(c) Explain the answer.
(14) Yael’s grades on her Social Studies tests so far are 83, 90, 85, 79, and 92, what would she need to score on the next test in order to have an 85 average? Is this a reasonable goal? Explain.

(15) Sandra’s grades on his Science tests are 90, 88, 78, and 92, what would she need on the next test to earn an 87? Is this a reasonable goal? Explain.

(16) Is (2,3) a solution to the system shown below? Explain.

\[
\begin{align*}
4x + y &= 11 \\
x - y &= 1
\end{align*}
\]

(17) Which statement is true for the given system of equations? Circle and explain your answer.

\[
\begin{align*}
y &= \frac{39}{46}x + 103 \\
y &= \frac{75}{92}x + 103
\end{align*}
\]

(a) There is exactly one solution to the system.

(b) There are no solutions to the system.

(c) There are an infinite number of solutions.

(d) Every ordered pair is a solution.
(18) Cell phone plan A charges a fixed cost of $45.00 per month, which includes 200 minutes. Each additional minute, or part of a minute, for Plan A costs $0.30.

Cell phone Plan B charges a fixed cost of $65.00 per month, which includes 300 minutes. Each additional minute, or part of a minute, for Plan B costs $0.15.

How many minutes need to be used for the plans to have the same cost? Show or explain your work.
(19) Which statement is true for the given system of equations? Circle your answer and explain.

\[
\begin{align*}
  y &= \frac{57}{85} x \\
  y &= -\frac{57}{85} x - 61
\end{align*}
\]

(a) There is exactly one solution to the system.

(b) There are no solutions to the system.

(c) There are an infinite number of solutions.

(d) Every ordered pair is a solution.

(20) Which of the following is an exponential function? Circle your answer and explain.

(a) \( y = x^2 + 3x \)

(b) \( y = x + \frac{1}{2} \)

(c) \( y = -\frac{1}{3} x + 5 \)

(d) \( y = \left(\frac{1}{2}\right)^x \)

(21) Which exponential function is shown in the graph? Circle your answer and explain.

(a) \( y = 2^x \)

(b) \( y = 3^x \)

(c) \( y = \left(\frac{1}{3}\right)^x \)

(d) \( y = \left(\frac{1}{4}\right)^x \)
(22) Is \( x = 10 \) a solution to the equation \( x^3 + 20x = 12x^2 \)? Show and explain all work.

(23) Is the point \((3, 11)\) on the parabola \( y = x^2 + 2x - 4 \)? Show work and explain your answer.

(24) The axis of symmetry for a parabola is \( x = 5 \). The point \((3, 6)\) lies on the parabola. Which one of the following points also lies on the parabola? \textbf{Circle your choice and explain.} Sketching a picture may be helpful.

(a) \((7, 6)\)
(b) \((5, 3)\)
(c) \((10, 3)\)
(d) \((5, 6)\)

(25) The vertex of a quadratic function, a parabola is \((4, -2)\) and the parabola opens up. Which of the following point cannot lie on the parabola? \textbf{Circle and then explain your choice.} Sketching a graph may be helpful.

(a) \((7, 10)\)
(b) \((-2, 13)\)
(c) \((0, -10)\)
(d) \((12, 20)\)

(26) Which of the points below \textbf{DOES NOT} lie on the parabola \( y = x^2 + x - 30 \)? (Graphing is not necessary.) \textbf{Circle your choice and explain.}

(a) \((4, -10)\)
(b) \((5, 0)\)
(c) \((-6, 0)\)
(d) \((1, 32)\)
APPENDIX E   SHOWCASE PORTFOLIO
Showcase Portfolio Guidelines

All secondary math courses showcase portfolios will contain evidence of the following Common Core Standards in Mathematics:

1. Problem-Solving
2. Reasoning
3. Tools and Technology
4. Patterns, Relationships and Functions

Specifically the student’s showcase portfolio for each subject will display evidence of the following local standards:

Algebra 1:

1. Ability to solve linear equations and inequalities
2. Problem-solving ability
3. Understanding of both the algebraic and graphic concepts of lines, including slope
APPENDIX F  RUBRIC FOR SCORING OPEN-ENDED QUESTIONS
<table>
<thead>
<tr>
<th>RESPONSE LEVEL</th>
<th>DESCRIPTION</th>
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</thead>
<tbody>
<tr>
<td>3-POINT RESPONSE</td>
<td>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.</td>
</tr>
<tr>
<td>2 POINT RESPONSE</td>
<td>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.</td>
</tr>
<tr>
<td>1 POINT RESPONSE</td>
<td>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.</td>
</tr>
<tr>
<td>0 POINT RESPONSE</td>
<td>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.</td>
</tr>
</tbody>
</table>
APPENDIX G  SELF-ASSESSMENT
<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>
</thead>
<tbody>
<tr>
<td></td>
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</table>

Marking Period _____
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 halfway 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 H  NEW JERSEY STUDENT LEARNING STANDARDS
NEW JERSEY STUDENT LEARNING STANDARDS

4 - Mathematics
8 - Technology
9 - 21st Century Life and Careers
APPENDIX I  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.

<table>
<thead>
<tr>
<th>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.</th>
</tr>
</thead>
<tbody>
<tr>
<td>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:</td>
</tr>
<tr>
<td>• A student with a short attention span staying on task for 5 minutes.</td>
</tr>
<tr>
<td>• Using a switch to activate a communication device to share during a class discussion.</td>
</tr>
<tr>
<td>• Expressing one’s thoughts by drawing in a journal instead of writing.</td>
</tr>
<tr>
<td>• Holding a book during reading time.</td>
</tr>
<tr>
<td>• Understanding the effect World War II has on the present rather than knowing the names and dates of key battles.</td>
</tr>
<tr>
<td>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:</td>
</tr>
<tr>
<td>• 5 spelling words from the weekly list instead of the standard 20.</td>
</tr>
<tr>
<td>• Completing a cooking assignment by following picture directions rather than written directions</td>
</tr>
<tr>
<td>• Changing the grouping of the class from large group to small groups (possible with the additional support staff).</td>
</tr>
<tr>
<td>• Changing the instructional delivery from lecture to the cooperative learning format</td>
</tr>
<tr>
<td>• Using a computer to write an assignment instead of paper and pencil.</td>
</tr>
<tr>
<td>• Reading a test to a student.</td>
</tr>
<tr>
<td>• Highlighting the important concepts in a textbook.</td>
</tr>
<tr>
<td>• Having the student listen to a taped textbook.</td>
</tr>
<tr>
<td>• Using enlarged print</td>
</tr>
<tr>
<td>• Using an assistive technology device</td>
</tr>
<tr>
<td>• Using visual cues such as picture and/or word schedules for those who have difficulty staying on task.</td>
</tr>
<tr>
<td>• Using a note taking guide listing the key concepts during a lecture.</td>
</tr>
<tr>
<td>d. Providing Physical assistance.</td>
</tr>
<tr>
<td>----------------------------------</td>
</tr>
</tbody>
</table>
| 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 |

<table>
<thead>
<tr>
<th>e. Alternative/substitute curriculum.</th>
</tr>
</thead>
</table>
| 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><strong>Input</strong></th>
<th><strong>Output</strong></th>
<th><strong>Time</strong></th>
<th><strong>Size</strong></th>
<th><strong>Degree of Participation</strong></th>
<th><strong>Alternate Goals</strong></th>
<th><strong>Substitute Curriculum</strong></th>
</tr>
</thead>
<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>
<td>Adapt the number of items that the learner is expected to learn or compete.</td>
<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><em>For example:</em> Use different visual aids; plan more concrete examples; provide hands-on activities; place students in cooperative groups.</td>
<td><em>For example:</em> Allow a verbal vs. written response; use a communication book for students; allow students to show knowledge with hands-on materials.</td>
<td><em>For example:</em> Individualize a timeline for completing a task; pace learning differently (increase or decrease) for some learners.</td>
<td><em>For example:</em> Reduce the number of social studies terms a learner must learn at any one time.</td>
<td><em>For example:</em> In geography, have a student hold the globe, while others point out the locations.</td>
<td><em>For example:</em> In social studies, expect one student to be able to locate just the states while others learn to locate capitals as well.</td>
<td><em>For example:</em> Individualize a timeline for completing a task; pace learning differently (increase or decrease) for some learners.</td>
</tr>
</tbody>
</table>

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Adaptations

MTH117 ALGEBRA 1

22 | TOOLS FOR TEACHERS | Curriculum Modifications & Adaptations

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.

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulty</td>
<td>Level of Support</td>
<td>Size</td>
</tr>
<tr>
<td>Degree of Participation</td>
<td>Alternate Goal</td>
<td>Substitute Curriculum</td>
</tr>
</tbody>
</table>
Creating Ways to Adapt Familiar Lessons - Elementary

1. Select the subject area (and grade level) to be taught:
   - 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.

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
<th>Time</th>
</tr>
</thead>
<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>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Difficulty</th>
<th>Level of Support</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<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>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Degree of Participation</th>
<th>Alternate Goal</th>
<th>Substitute Curriculum</th>
</tr>
</thead>
<tbody>
<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>
</tr>
</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.

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulty</td>
<td>Level of Support</td>
<td>Size</td>
</tr>
<tr>
<td>Degree of Participation</td>
<td>Alternate Goal</td>
<td>Substitute Curriculum</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<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>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Difficulty</th>
<th>Level of Support</th>
<th>Size</th>
<th>Substitute Curriculum</th>
</tr>
</thead>
<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>
<td>During this lesson the student can work on keyboarding skills in the computer lab.</td>
</tr>
</tbody>
</table>

Center for School & Community Integration, Institute for the Study of Developmental Disabilities, Indiana University, Bloomington, IN
## Thematic Lesson Plan

**MTH117 ALGEBRA 1**

### SAMPLE FORM

**Thematic Lesson Plan**

<table>
<thead>
<tr>
<th>School Name: Palm View Elementary</th>
<th>Social Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Student Name:</strong> Corey Santos</td>
<td></td>
</tr>
<tr>
<td><strong>Age:</strong> 8</td>
<td></td>
</tr>
<tr>
<td><strong>Grade:</strong> 2</td>
<td></td>
</tr>
<tr>
<td><strong>Parent/Guardian:</strong> Ms. Anita Santos Phone: 555-5432</td>
<td></td>
</tr>
<tr>
<td><strong>Classroom Teacher:</strong> Mr. Sean Garrett</td>
<td></td>
</tr>
<tr>
<td><strong>Inclusion Support Teacher:</strong> Ms. Tangela Hunter</td>
<td></td>
</tr>
</tbody>
</table>

**Unit:** More Alike Than Different

**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. "Chocolate" posterboard (Activities for a Diverse Classroom)
3. Family interview questions
4. Slides and overheads

### 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:

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

### 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

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

1. Completion of group activities
2. Rubric for Hyperstudio presentation
3. Family interview

### Items requiring accommodations and/or modifications

1. Some books on tape
2. Highlighted posterboard
3. Fewer questions - done on audio tape

### Items requiring accommodations and/or modifications

2. Modify if necessary
3. Paraeducator assistance with computer

### Items requiring accommodations and/or modifications

1. Highlight posterboard of key points
2. Select task items at student's instructional level
3. Provide word bank or magazine pictures

### Items requiring accommodations and/or modifications

1. Assess on use of language
2. Modify rubric
**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

**Room:** 21

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

**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. Summary 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, core 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:**
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:**

- Pictures available for use in journal  
- Picture vocabulary writing program  
- Taped readings of source material

**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

**Items requiring accommodations and/or modifications:**

- Reduce rubric to focus on thematic analysis  
- Use pictures to support self-assessment
## SAMPLE FORM (Secondary)

### Academic Unit Lesson Plan

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

<table>
<thead>
<tr>
<th>Student Name</th>
<th>Age</th>
<th>Grade</th>
<th>Parent/Guardian</th>
<th>Advocate Teacher</th>
<th>Classroom Teacher</th>
<th>Class Schedule</th>
<th>Phone</th>
<th>Items requiring adaptations and/or modifications</th>
</tr>
</thead>
</table>

| Major standards, objectives and expectations for the unit | |

<table>
<thead>
<tr>
<th>Materials, books, media, worksheets, software, etc.</th>
<th>Items requiring adaptations and/or modifications</th>
</tr>
</thead>
</table>

| Instructional arrangements. Time and opportunities for large group, small group, coreg group, learning centers, individual activities, non-classroom instruction. Does it change day to day? Explain. | Items requiring adaptations and/or modifications |

<table>
<thead>
<tr>
<th>Projects, supplemental activities, and homework</th>
<th>Items requiring adaptations and/or modifications</th>
</tr>
</thead>
</table>

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

---

PEAK Parent Center, Inc. 1999
**Academic Unit Lesson Plan**

**School Name:** MTH117 ALGEBRA 1

**Class:** Biology

**Unit:** The Cell

**Student Name:** Kelley Glass

**Age:** 15

**Grade:** 10

**Parent/Guardian:** Ms. Rebecca Glass

**Phone:** 555-1212

**Advocate Teacher:** Mr. David Porter

**Classroom Teacher:** Ms. Suania Fouche

**Room:** 12

**Block 1:** Math (147)

**Block 2:** English (150)

**Block 3:** Biology (160)

**Block 4:** World Geography (151)

**Block 5:** 3-D Art (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, group, group, learning centers, individual activities, non-classroom instruction. Does it change day to day? Explain.**

1. Large group instruction 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 & cell-O)
4. Individual time to complete illustrated vocabulary

**Projects, supplemental activities, and homework**

1. Homework: Complete vocabulary, bring in cells, 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

**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 audio tape.

**Items requiring adaptations and/or modifications**

1. Copy of teacher's overhead transparencies given to student
2. Peer takes notes and highlights key points; student types on to computer for both
3. Use of "Read, write, pair, share" strategy (see description on page 12) as chapter review

**Items requiring adaptations and/or modifications**

3. Chapter test read orally with additional time given, reducing the number of options for multiple choice questions to focus on major concepts, and providing options for short answer questions.

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PEAK Parent Center, Inc. 1999
SAMPLE FORM

(Example for student Kelley Glass)

School Name: Central  
Class: Sophomore  
English  
Unit: Of Mice and Men

<table>
<thead>
<tr>
<th>Student Name: Kelley Glass</th>
<th>Class Schedule</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age: 15</td>
<td>Block 1: Math</td>
<td>22</td>
</tr>
<tr>
<td>Grade: 10</td>
<td>Block 2: English</td>
<td>147</td>
</tr>
<tr>
<td>Parent/Guardian: Ms. Rebecca Glass Phone: 555-1212</td>
<td>Block 3: Biology</td>
<td>106</td>
</tr>
<tr>
<td>Advocate Teacher: Mr. David Porter</td>
<td>Block 4: World Geography</td>
<td>156</td>
</tr>
<tr>
<td>Classroom Teacher: Mr. Solar Moore</td>
<td>Block 5: 3-D Art</td>
<td>17</td>
</tr>
</tbody>
</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 times 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 Summers
2. Copy of the novel Of Mice and Men by John Steinbeck
3. Worksheets for each of the six chapters
4. Video of the book Of Mice and Men
5. Video camera
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, dup 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 for George (with every student having a part in the trial)

Projects, supplemental activities, and homework
1. Class complete 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 constructivist checking
3. Simulation trial of George for killing Lennie
4. Homework: rehearse role in trial, some reading of novel at home
5. Illustration of vocabulary words
6. "Open Mind" activity students fill in thoughts from the perspective of specified characters
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(s) and final products. Summarize actual student performance (attach examples as appropriate) on the reverse.
1. Trial presentation/video-taped
2. Objective test
3. Evaluative essay

Items requiring adaptations and/or modifications
1. Audio/visual recorder of the short story "The Circuit"
2. Audio/visual recorder of the novel Of Mice and Men
3. Reformatted chapter summary worksheets and comprehension questions using outlines, pictures, or graphic organizer

Items requiring adaptations and/or modifications
1. Peer takes notes in class, student types notes on computer for both

Items requiring adaptations and/or modifications
1. Reformatted worksheets completed on the computer with the peer tutor
2. Care options for responses for completing poem (3 choices for each line of the poem)
3. Listen to audio tape and family members read book
4. Rehearse part in play with picture cues
5. Word bank to use for completing "Open Mind" activity

PEAK Parent Center, Inc. 1999
MTH117 ALGEBRA 1