## UNIT 1
The Number System: Rational and Irrational Numbers
Total Number of Days: 12 days  Grade/Course: 8/Math Inclusion

### ESSENTIAL QUESTIONS

**How can you determine the difference between a rational number and an irrational number?**

**Why is it important to know how to order rational numbers? Why is it important to know how to order irrational numbers on a number line?**

**How can you evaluate the decimal form of a root and find it on the number line?**

### ENDURING UNDERSTANDINGS

Number that cannot be written as a fraction or decimal that terminates or repeats is considered irrational.

Ordering rational/irrational numbers gives you a perspective as to the comparative size of the rational numbers.

You can convert square roots to decimals to easily solve problems in order to place it on a number line.

<table>
<thead>
<tr>
<th>PACING</th>
<th>CONTENT</th>
<th>SKILLS</th>
<th>STAND (CCSS/MP)</th>
<th>RESOURCES</th>
<th>LEARNING ACTIVITIES/ASSESSMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 days</td>
<td>Review of past practices in grade 7</td>
<td>Review of order of operations, Review of integers, Review adding, subtracting, multiplying, and dividing rational numbers</td>
<td>Grade 7, 7.NS.1 order of operations, 7.NS.2 integers/absolute value</td>
<td>Holt McDougal Chapter 1 Pages 6-59, Textbook online <a href="https://my.hrw.com">https://my.hrw.com</a>, Worksheets online <a href="http://www.kutasoftware.com">www.kutasoftware.com</a>, YouTube video for order of operations review song <a href="http://www.youtube.com/watch?v=-jflJKmsAEc">http://www.youtube.com/watch?v=-jflJKmsAEc</a>, Grade 7 MCAS sample questions <a href="http://www.doe.mass.edu/mcas/testitems.html?yr=12">http://www.doe.mass.edu/mcas/testitems.html?yr=12</a></td>
<td>Math opener, Math explorations from textbook 1-3 Properties of Numbers page 14 TE, 1-4 Integers and Abs Value page 18 TE, 1-5 and 1-6 Adding and Subtracting Integers Page 22 and 26 TE, 1-7 Multiplying and Dividing Integers Page 30 TE, Ready to Go On Intervention Section 1A of cd rom from textbook <a href="https://my.hrw.com">https://my.hrw.com</a>, intervention worksheets 1-1</td>
</tr>
</tbody>
</table>
| 1-1.5 days | Pre Diagnostic Assessment | The Real Numbers | 1. Classify real numbers as rational and irrational numbers.  
2. Understand irrational numbers as an opposite sense of rational numbers  
examples  
3.4 = rational  
$\sqrt{4} = 2$ = rational whole integer  
$\sqrt{3}$ = irrational |
|---|---|---|---|
| | | CCSS 8. NS.1 rational and irrational  
MP  
MP 1  
MP 4  
MP 5 | Holt/McDougal  
Chapter 4  
Textbook pages 195-197 |
| | | Interactive Web game:  
| | | Interactive Web quizzes:  
http://www.brainpop.com/math/numbersandoperations/rationalandirrationalnumbers/quiz/ |
| | | Video:  
http://www.brainpop.com/math/numbersandoperations/rationalandirrationalnumbers/  
http://www.mathatube.com/pre-algebra-irrational-numbers.html |
| | | Video  
Holt McDougal video tutorial cd rom section 4-7 or my.hrww.com |
| | | Online Quiz  
Holt McDougal book online  
My.hrww.com |
| | | Irrational numbers:  
| | | Math opener  
Introductory Video on rational and irrational numbers from brain pop:  
http://www.brainpop.com/math/numbersandoperations/rationalandirrationalnumbers/ |
| | | Math Exploration:  
Alternate Opener from 4-7 page 195 in Teacher’s edition (use cd rom from textbook or my.hrww.com) |
| | | Math Lab Practice:  
Graphic organizers and flash cards page 196 of teacher’s edition (Reaching All Learners) |
| | | Project (created by teacher):  
Choice board with 9 activities. All instructions/strategies/rubric:  
https://sites.google.com/site/mscaldero8thgradeclassroom/ |
<table>
<thead>
<tr>
<th>Days</th>
<th>Topic</th>
<th>Resources</th>
</tr>
</thead>
</table>
| 1-1.5 days | Squares and Square Roots Exploring Cube Roots | Finding the square root by identifying perfect squares and cubes  
Compare irrational numbers on a number line.  
**Examples**  
$\sqrt{4} = 2$  
$\sqrt{14} = 4$  
$\sqrt{27} = 9$  
Compare $\sqrt{2}$ and $\sqrt{3}$ on a number line. |
| Holt McDougal Chapter 4  
Sections 4-5 on pages 182-185 | Tic Tac Toe Squares:  
http://www.funbrain.com/cgi-bin/ttt.cgi?A1=s&A2=17&A3=0  
Interactive Web game square roots flash cards  
http://www.quia.com/jfc/65631.html  
square root flash cards  
http://www.quia.com/mc/65631.html  
Video  
http://www.bing.com/videos/search?q=SQUARE+ROOTS+video&mid=B4555A64C1E8BC3892FB4555A64C1E8BC3892FB&view=detail&FORM=VIRE1  
math game tic tac toe advanced learners  
http://www.funbrain.com/cgi-bin/ttt.cgi?A1=s&A2=24&A3=0  
matching game  
http://www.math-play.com/square-root-game.html |
| Math Organizer:  
complete a chart of perfect squares  
complete a chart of cubes  
4-5 Math Exploration:  
Squares and Square roots of 4-5 on page 182 of TE or log onto my.hrw.com  
Calculator Exploration  
Use calculators to demonstrate the use of the square root button.  
Reaching all Learners page 183 of TE  
Students will learn to find the square root index cards where they must solve each problem  
Hands-On Math Lab  
Cube roots on page 192 of TE  
Using cubes  
Math Recreation Problem solving:  
Extra practice placing roots on number line  
Create by teacher |
| 1-2 days | Estimating Square Roots | Estimating Square Roots  
Compare irrational numbers on a number line.  
**Examples**  
Find the | CCSS  
8. NS.2 square roots  
MP  
MP 4  
MP 5  
MP 7  
Holt McDougal Chapter 4  
Section 4-6 on pages 186-189 |
| Who wants to be a millionaire game:  
Square Root Game:  
http://www.math-play.com/square-roots-game.html  
http://my.hrw.com |
| Math Motivation: TE page 186  
number line taped to the floor, place square root on number line  
Math Exploration:  
4-6 Exploration transparency  
Page 186 in TE  
Hands-On Math Lab  
Use Practice A, B, C worksheets from textbook workbook or use my.hrw.com  
Math scavenger hunt: math scavenger hunt of estimating square roots |
<table>
<thead>
<tr>
<th>1-1.5 days</th>
<th>Simplifying Square Roots</th>
<th>To simplify square roots using perfect squares</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Example</td>
<td>Example</td>
</tr>
<tr>
<td></td>
<td>Simplify $\sqrt{12} + \sqrt{75} = 7\sqrt{3}$</td>
<td>Simplify $\sqrt{12} = \sqrt{4\sqrt{3}} = 2\sqrt{3}$</td>
</tr>
</tbody>
</table>

CCSS 8.NS.2 square roots
MP
MP 1
MP 4
MP 5
MP 7

Holt McDougal
Chapter 4 Section 4-6 EXT on pages 190-191

http://my.hrw.com
Video tutorials from Cd rom of Holt McDougal Textbook
Website explanation
http://www.webmath.com/_answer.php

Simplifying square roots Introduction:
Motivate on page 190 of TE
Math Teach:
Use prime factorization or factor trees to help them simplify. Use EXT page 191
Math Stations:
Wiki page/Google site created by the teacher where they must simplify square roots for approximately 20 problems.

INSTRUCTIONAL FOCUS OF UNIT
Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: **Real Numbers, Irrational numbers, Rational numbers, Integers, Whole numbers, Natural numbers, radical, radicand, square roots, perfect squares, cube roots, terminating decimals, repeating decimals, truncate**

PARCC FRAMEWORK/ASSESSMENT
Work with radicals and integer exponents.
In Grade 8 by starting to work systematically with the square root and cube root symbols, writing, for example, square root of 64 = 8. ($3^{rd}$ root of 5) to the $3^{rd}$ power = 5. Since square root of p is defined to mean the positive solution to the equation $x^2 = p$ (when it exists), it is not correct to say (as is common) that square root of 64 = +/-8. Students in Grade 8 are not in a position to prove that these are the only solutions, but rather use informal methods such as guess and check.

EXAMPLES from Model Curriculum aligned with PARCC Framework
Classify each number as rational or irrational by checking the appropriate box in the table below.

<table>
<thead>
<tr>
<th>Number</th>
<th>Rational</th>
<th>Irrational</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\frac{5}{7}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$2\pi$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$(\sqrt{2})^2$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The number $\sqrt{136}$ is approximately how many times $\sqrt{33}$? Give your answer to the nearest integer.

Which of the following points on the number line below best approximates the value of $-\sqrt{7}$?

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Great wiki page for Common Core Assessments

PARCC Framework Assessment questions with Model Curriculum Website for all units
http://www.state.nj.us/education/modelcurriculum/math/8u5.shtml

Wiki page with open ended constructive response questions and UDL lessons
https://grade8commoncoremath.wikispaces.hcps.org/Unit+3+Analyzing+Functions+and+Equations

Videos and Worksheets aligned with Common Core
http://www.buncombe.k12.nc.us/Page/36164

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**21ST CENTURY SKILLS**
(4Cs & CTE Standards)

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**MODIFICATIONS/ACCOMMODATIONS**

Small group instruction
- Review of printed notes from smart board/power point/star board.
- Activities completed in small group for more of an understanding

**Individualized instruction**

**Peer tutoring**
- Team up stronger math skills with lower math skills

**Use of manipulatives**
- White boards
- Dry erase markers
- Reference sheets created by special needs teacher
- Index cards created by student.
- Number line
- Reference charts for classroom
- Graphing calculator
- Web interactive activities
- Video tutorials from textbook or my.hrw.com

**Computer activities for remediation**
- Technology infusion

**Chunking information**
- Chunk up each skill so students can see difference in math algorithm

**Oral questioning**
- IEP modification for summative and formative assessments

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**APPENDIX**

*(Teacher resource extensions)*

**8. NS.1.** Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.

**Connections:** 8.EE.4; 8.EE.7b; 6-8.RST.4; 6-8.RST.7

**Examples and Explanations for 8.NS.1:**

Students can use graphic organizers to show the relationship between the subsets of the real number system.
8.NS.2: Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., \( \pi^2 \)). For example, by truncating the decimal expansion of \( \sqrt{2} \), show that \( \sqrt{2} \) is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations. Connections: 8.G.7; 8.G.8; 6-8.RST.5; ET08-S1C2-01

**Examples and Explanations for 8.NS.2:**

Students can approximate square roots by iterative processes.

**Solution:** Approximate the value of \( \sqrt{6} \) to the nearest hundredth.

\( \sqrt{6} \) falls between 2 and 3 because 6 falls between \( 2^2 = 4 \) and \( 3^2 = 9 \). The value will be closer to 2 than to 3. Students continue the iterative process with the tenths place value falls between 2.2 and 2.3 because 6 falls between \( 2.2^2 = 4.84 \) and \( 2.3^2 = 5.29 \). The value is closer to 2.2. Further iteration shows that the value of \( \sqrt{6} \) is between 2.23 and 2.24 since \( 2.23^2 = 4.9729 \) and \( 2.24^2 = 5.0176 \).

Compare \( \sqrt{2} \) and \( \sqrt{3} \) by estimating their values, plotting them on a number line, and making comparative statements.

**Solution:** Statements for the comparison could include:
- \( \sqrt{2} \) is approximately 0.3 less than \( \sqrt{3} \)
- \( \sqrt{2} \) is between the whole numbers 1 and 2
- \( \sqrt{3} \) is between 1.7 and 1.8

**Math practices**

1. Make sense of problems and persevere in solving them.
   In grade 8, students solve real world problems through the application of algebraic and geometric concepts. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, “What is the most efficient way to solve the problem?”, “Does this make sense?”, and “Can I solve the problem in a different way?”

2. Reason abstractly and quantitatively.
In grade 8, students represent a wide variety of real world contexts through the use of real numbers and variables in mathematical expressions, equations, and inequalities. They examine patterns in data and assess the degree of linearity of functions. Students contextualize to understand the meaning of the number or variable as related to the problem and decontextualize to manipulate symbolic representations by applying properties of operations.

3. Construct viable arguments and critique the reasoning of others.
In grade 8, students construct arguments using verbal or written explanations accompanied by expressions, equations, inequalities, models, and graphs, tables, and other data displays (i.e. box plots, dot plots, histograms, etc.). They further refine their mathematical communication skills through mathematical discussions in which they critically evaluate their own thinking and the thinking of other students. They pose questions like “How did you get that?”, “Why is that true?” “Does that always work?” They explain their thinking to others and respond to others’ thinking.

4. Model with mathematics.
In grade 8, students model problem situations symbolically, graphically, tabularly, and contextually. Students form expressions, equations, or inequalities from real world contexts and connect symbolic and graphical representations. Students solve systems of linear equations and compare properties of functions provided in different forms. Students use scatterplots to represent data and describe associations between variables. Students need many opportunities to connect and explain the connections between the different representations. They should be able to use all of these representations as appropriate to a problem context.

5. Use appropriate tools strategically.
Students consider available tools (including estimation and technology) when solving a mathematical problem and decide when certain tools might be helpful. For instance, students in grade 8 may translate a set of data given in tabular form to a graphical representation to compare it to another data set. Students might draw pictures, use applets, or write equations to show the relationships between the angles created by a transversal.

6. Attend to precision.
In grade 8, students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students use appropriate terminology when referring to the number system, functions, geometric figures, and data displays.

7. Look for and make use of structure.
Students routinely seek patterns or structures to model and solve problems. In grade 8, students apply properties to generate equivalent expressions and solve equations. Students examine patterns in tables and graphs to generate equations and describe relationships. Additionally, students experimentally verify the effects of transformations and describe them in terms of congruence and similarity.

<table>
<thead>
<tr>
<th>4 Cs</th>
<th>Three part learning objective</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Creativity:</strong> projects</td>
<td><strong>TLWBAT:</strong> Complete a menu choice board by picking any activity from the 6 options under three different categories on rational and irrational number for unit 1. Apply skills and knowledge learned on rational and irrational numbers to real world scenarios given in the menu. Complete three out of the six options by receiving at least 60 out of 74 points (80% and higher).</td>
</tr>
<tr>
<td>Menu on Rational and Irrational Numbers</td>
<td></td>
</tr>
</tbody>
</table>
- Point percentage Menu where students will pick any activity from three categories to problem solve in order to reach a certain amount of points for the project. |
**Critical Thinking:**

<table>
<thead>
<tr>
<th>Math Journal</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Define rational numbers versus irrational numbers in your journal</td>
</tr>
<tr>
<td>• Write about the step by step process of estimating square roots with perfect squares</td>
</tr>
<tr>
<td>• What are irrational numbers?</td>
</tr>
<tr>
<td>• How do you determine what is an irrational number?</td>
</tr>
<tr>
<td>• Define how to create a perfect square quilt using 85 squares</td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
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<tr>
<td>One-sentence summary</td>
</tr>
<tr>
<td>• In one sentence tell me the difference between estimating roots and simplifying square roots</td>
</tr>
<tr>
<td>• What is a perfect square?</td>
</tr>
<tr>
<td>• What is the purpose of a cube root?</td>
</tr>
<tr>
<td>Directed paraphrasing</td>
</tr>
<tr>
<td>• summary of skills and vocabulary words</td>
</tr>
<tr>
<td>Short constructed response</td>
</tr>
<tr>
<td>• Skill 6: ask students to give an example of a root that can be</td>
</tr>
</tbody>
</table>

**TLWBAT:** Refine their mathematical communication skills by using clear and precise language in their writing. Develop and enhance appropriate terminology when referring to the number system. Evaluate real world problems through the application of algebraic concepts by completing various critical thinking activities with at least 85% accuracy.
simplified and a root that cannot be simplified.

Do now

- Various open ended questions found in textbook. In the teacher’s edition, you can use the alternative opener or the problem of the days
- Use the for NJASK review questions (see attachments) created by teacher for common core

TESTS (Created by teacher or use textbook assessments)

- Estimating Squares Test (created by teacher)
- Summative assessment

QUIZZES (Created by teacher or use textbook assessments)

- Complete chart of classifying rational and irrational numbers with the given numbers
- Comparing and Ordering from least to greatest
- Estimating square roots formative assessment
- Cube root assessment
- Perfect squares
- Estimating squares
- Irrational numbers

Exit ticket (created by teacher or use my.hrw.com)

- Identify whether each number is rational or irrational, whole, integer, or real numbers
- Estimating square roots between whole numbers
- Identify if numbers are rational, irrational, or not real

POWS (Problem of the Weeks)
- Students will complete POWS (created by the teacher using exam view) in order to create 3 part open ended constructed response questions for each skill of the unit. Please use the 3 point Math Hollistic Scoring Rubric for grading.

Homework
- Handout packet for review (practice a, b, c found in textbook) for each section of chapter 4

Minute paper
- Identify all perfect squares from 1-15

**Collaboration: Teams/Groups/Stations**

Stations work
- Stations created by teacher for movement: find the estimation of squares roots using rational approximations
  - Teacher can use examples from section 4-6 of the Holt/McDougal Textbook
  - Flash cards for identifying rational and irrational numbers using a graphic organizer

Cubing Activities
- Scavenger hunt for estimation of roots

**Communication – Power points/Presentations**

**TLWBAT**: Model and evaluate problem situations symbolically and with a calculator. Demonstrate and evaluate expressions from real world contexts and connect symbolic reasoning. Routinely seek patterns or structures to model and solve problems. Apply properties to generate equivalent expressions and solve expressions for rational and irrational numbers.

**TLWBAT**: Demonstrate their understanding of skills and
<table>
<thead>
<tr>
<th>Power points</th>
<th>Each section in the Holt/McDougal textbook comes with power point lesson notes to teach the students with. They are interactive power points with Problem of the Days and mini quiz lessons for review</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graphic organizer with students</td>
<td>Identifying numbers as rational, irrational, integers, whole, and natural knowledge learned for rational and irrational numbers by communicating skills with clear and precise language in their discussions with others and in their own reasoning. Use appropriate terminology when referring to the number system. Apply properties to generate equivalent expressions and solve equations. Examine patterns in expressions and word problems to generate solutions and describe relationships with at least 80% accuracy</td>
</tr>
</tbody>
</table>
# UNIT 2
Expressions and Equations with Exponents and Scientific Notations

**Total Number of Days:** 15 days  
**Grade/Course:** 8/Math Inclusion

## ESSENTIAL QUESTIONS

**How can writing expressions and equations help you solve real world problems?**

**What is scientific notation?**

**How can you solve expressions and equations with radicals and integer exponents?**

**How can you evaluate expressions and equations with square/cube roots of any given number or variable?**

## ENDURING UNDERSTANDINGS

**Enables mathematical communication precisely by engaging in discussion and reading mathematical comprehension**

**Scientific notation allows you to express a large number as a number with two factors, one factor is greater than or equal to 1 and less than 10 and the other factor is a base 10 with an exponent.**

**Exponents have specific properties that you utilize when solving expressions and equations with exponents.**

**Evaluate expressions and equations with exponents by recognizing he squaring of a number and taking the square root of a number are inverse operations.**

## PACING

<table>
<thead>
<tr>
<th>CONTENT</th>
<th>SKILLS</th>
<th>STAND (CCSS/MP)</th>
<th>RESOURCES</th>
<th>LEARNING ACTIVITIES/ASSESSMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exponents</td>
<td>To review all skills and knowledge previously</td>
<td>8. EE.1: Properties of exponents MP</td>
<td>Holt McDougal Chapter 4 4-1 pages 162-165 of Dice Exponentiation <a href="http://www.ehow.com/list_5914311_activities-exponents.html">http://www.ehow.com/list_5914311_activities-exponents.html</a>;</td>
<td>Math Exploration Alternate opener PDF transparency from section 4-1 of Holt McDougal found in teacher's edition page 162 or my.hrw.com</td>
</tr>
<tr>
<td>1-1.5 days</td>
<td>Integer Exponents</td>
<td>To simplify expressions with negative exponents and to evaluate the zero exponent</td>
<td></td>
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<tr>
<td>------------</td>
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<td>----------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>learned for exponents</td>
<td>$2^4 = 2 \times 2 \times 2 \times 2$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To evaluate expressions with exponents

- MP 1
- MP 2
- MP 3
- MP 4
- MP 7

MP 7

8. EE.1: Properties of exponents

- Holt McDougal
  - Chapter 4
  - 4-2
  - TE pages 166-169

Kuta software for worksheets

- www.kutasoftware.com

Holt McDougal

- Chapter 4
- 4-2
- TE pages 166-169

Kuta software for worksheets

- www.kutasoftware.com

MP 1

MP 2

MP 3

MP 4

MP 5

MP 6

MP 7

Holt McDougal

- Chapter 4
- 4-2
- TE pages 166-169

Kuta software for worksheets

- www.kutasoftware.com

Math Focus Discussion:

- 4-2 Power point from McDougal cd rom or my.hrw.com
- create very own power point to apply the properties of exponents with negative exponents and zero exponent

Math Stations:

- Practice problems from Holt McDougal worksheets

Math Extensions (if needed):

- Write Out Race: how to teach exponents in a different way
  - http://www.ehow.com/list_5914311_activities-exponents.html (modified activity)

Math Lab practice:

- Create Google site or Wiki Page for various math interactive games (located in the technology infusion section). Use pages 164-165 in TE for practice problems

- Study Island questions and create a unique assessment on this website. www.studyisland.com

Math Extensions for IEP learners:

- Students can be given counters (if needed). Ask students to divide the counters into 4 equal groups and to write and addition expression that represents the grouping.
<table>
<thead>
<tr>
<th>1-2.5 days</th>
<th>Properties of Exponents</th>
<th>To apply and evaluate the properties of exponents for multiplying, dividing, and raising a power to a power</th>
</tr>
</thead>
<tbody>
<tr>
<td>$2^{-3} = \frac{1}{8}$</td>
<td>$4^2 = 16$</td>
<td>Holt McDougal Chapter 4-3 TE pages 170-173</td>
</tr>
<tr>
<td></td>
<td>$\sqrt{16} = +/- 4$</td>
<td>Kuta software for worksheets <a href="http://www.kutasoftware.com">www.kutasoftware.com</a></td>
</tr>
<tr>
<td></td>
<td>$(4^3)^2 = 4,096$</td>
<td>multiplying and dividing exponents <a href="http://www.math-play.com/exponent-game.html">http://www.math-play.com/exponent-game.html</a></td>
</tr>
<tr>
<td></td>
<td>$(3^2)(3^4) = 3^6$</td>
<td><strong>Math Warm Up:</strong></td>
</tr>
<tr>
<td></td>
<td>$3^{-2} = \frac{1}{144}$</td>
<td>4-3 Exploration of Properties of exponents page 170 of TE or use my.hrw.com</td>
</tr>
<tr>
<td></td>
<td>$2^n = 2^4$</td>
<td>Problem of the Day from power point 4-3 found in Holt McDougal cd rom or my.hrw.com</td>
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<tr>
<td></td>
<td></td>
<td><strong>Math LAB Focus:</strong></td>
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<tr>
<td></td>
<td></td>
<td>Jeopardy game power point on practice problems from 4-3 (pages 172-173 of TE)</td>
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<td>Also use worksheets from 4-3 A, B, C found in workbooks or my.hrw.com</td>
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<tr>
<td></td>
<td></td>
<td><strong>Math Challenge:</strong> working backwards</td>
</tr>
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<td></td>
<td></td>
<td>Page 173 of TE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A number raised to the $11^{th}$ power divided by the same number to the $8^{th}$ power equals 64. What is the number?</td>
</tr>
<tr>
<td>2 days</td>
<td>Scientific Notation</td>
<td>To express large and small numbers in scientific notation and to compare two numbers written in scientific notation</td>
</tr>
<tr>
<td>--------</td>
<td>---------------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Examples</td>
<td>36,000,000 = 3.6 \times 10^7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.00000067 = 6.7 \times 10^{-7}</td>
</tr>
<tr>
<td></td>
<td>express 3.6 \times 10^7 in standard form</td>
<td></td>
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<td>How much larger is/Which is the larger value 2.5 \times 10^3</td>
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<td>compared to 2 \times 10^3</td>
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</tbody>
</table>

| 8. EE.3: Properties of Scientific Notation | Holt McDougal Chapter 4 4-4 TE pages 174-177 |
| MP 6 | Must find more resources online or other textbooks for further analysis |

| Kuta software for worksheet | http://www.kutasoftware.com/FreeWorksheets/Scientific%20Notation.pdf |
|                            | Video helpful | http://learnzillion.com/lessons/1258-compare-large-numbers-using-scientific-notation |
|                            | Basic Scientific Notation | http://janus.astro.umd.edu/cgi-bin/astro/scinote.pl |
|                            | Converting Large to Small | http://www.xpmath.com/forums/arcade.php?do=play&gameid=21#UdwV2YS8vdk |
|                            | Jeopardy Game review | http://www.supertechertools.com/jeopardy/usergames/Apr201016/game1271859395.php |

| Math Relation/Opener: 4-4 Exploration Alternate opener TE page 174 or my.hrw.com |
| Math notes: Power point from 4-4 on Holt cd rom |
| Students will be shown scientific notation |
| Adapt further slides for comparing and ordering scientific notation |
| Video on comparing scientific notation | http://learnzillion.com/lessons/1258-compare-large-numbers-using-scientific-notation |

| Independent practice: Power point math lab |
| Use practice problems from pages 176-177 or workbook pages 4-4 A, B, C |
| ***Must incorporate comparing large values practice problems (NOT FOUND IN TEXTBOOK) use this website for examples | http://www.quia.com/pp/54767.html?AP_rand=40366501 |

Create power point with US population versus each station population to find which is larger. | http://www.ipl.org/div/stateknow/popchart.html |
| 2 days | Operations with Scientific Notation | Calculate numbers already in scientific notation by multiplying or dividing \((6.45 \times 10^{11}) \times (3.1 \times 10^6)\) \(\frac{3.44 \times 10^{11}}{(3.1 \times 10^6)}\) | 8.EE.4 Scientific Notation Operations MP MP 4 MP 5 MP 7 | Holt McDougal Chapter 4 LAB page 179 TE | Kuta software for worksheet [www.kutasoftware.com](http://www.kutasoftware.com) you tube video tutorial [http://www.youtube.com/watch?v=ciF0lirz4Is](http://www.youtube.com/watch?v=ciF0lirz4Is) practice problems [http://www.khanacademy.org/math/arithmetic/exponents-radicals/scientific-notation/e/multiplying_and_dividing_scientific_notation](http://www.khanacademy.org/math/arithmetic/exponents-radicals/scientific-notation/e/multiplying_and_dividing_scientific_notation) | Math Activity: Use graphing calculator to display scientific notation Page 179 for examples in TE Math power point notes: Google search [http://www.google.com/search?client=safari&rls=en&q=multiplying+and+dividing+scientific+notation&ie=UTF-8&oe=UTF-8#safe=active&client=safari&rls=en&client=psy-ab&q=multiplying+and+dividing+scientific+notation+powerpoint&oq=multiplying+and+dividing+scientific+notation+power&gs_l=serp.1.0.0.206370.207219.0.200896.63.0.3.3.0.108.249.2j1.3.0....0...1c.1.19.psy-ab.mlw-05Muw9k&pbx=1&bav=on.2,or.r_qf.&bvm=bv.48705608d.dmQ&fp=209d7ea90c5d5b63&biw=1024&bih=621&safe=active] Math skills practice: [http://go.hrw.com/resources/go_sc/hst/HSTMW261.PDF](http://go.hrw.com/resources/go_sc/hst/HSTMW261.PDF) PDF worksheet [http://www.lavc.edu/math/math125/Worksheets/M_Dscientific.pdf](http://www.lavc.edu/math/math125/Worksheets/M_Dscientific.pdf) |
|---|---|---|---|---|---|---|---|
| 1-1.5 days | Evaluating square roots and cube roots in equations | To evaluate equations with exponents to represent the same solution for square and cube roots \(3^2 = 9\) and \(\sqrt[3]{9} = +/- 3\) | 8.EE.2 Square and Cube Root solutions MP MP 4 MP 5 MP 7 | Not in Holt Textbook | Math alternate opener: |
### INSTRUCTIONAL FOCUS OF UNIT

Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: **laws of exponents**, **power**, **perfect squares**, **perfect cubes**, **root**, **cube root**, **scientific notation**, **standard form of a number**. Students should also be able to read and use the symbol: ±

### PARCC FRAMEWORK/ASSESSMENT

In Grade 8 students add the properties of integer exponents to their repertoire of rules for transforming expressions. Students have been denoting whole number powers of 10 with exponential notation since Grade 5, and they have seen the pattern in the number of zeros when powers of 10 are multiplied. They express this as $10^a \cdot 10^b = 10^{a+b}$ for whole numbers $a$ and $b$. Requiring this rule to hold when $a$ and $b$ are integers leads to the definition of the meaning of powers with 0 and negative exponents. For example, we define $10^0$ to be 1.

By working with equations such as $x^2 = 2$ and in geometric contexts, students enlarge their concept of number beyond the system of rationales to include irrational numbers. They represent these numbers with radical expressions and approximate these numbers with rationals.

Examples from Model Curriculum related to the PARCC Framework Assessment

The average distance from Venus to the Sun is 108,200,000 kilometers. Which of the following is the number expressed in scientific notation?

The population of Greenville is approximately 75 times the population of Fairview. There are $3.75 \times 10^5$ people living in Greenville. Approximately how many people are living in Fairview?

What is the quotient of $2.408 \times 10^{24}$ divided by $6.02 \times 10^{23}$? Show your work.

Great wiki page for Common Core Assessments


PARCC Framework Assessment questions with Model Curriculum Website for all units

http://www.state.nj.us/education/modelcurriculum/math/8u5.shtml
videos and worksheets aligned with Common Core
http://www.buncombe.k12.nc.us/Page/36165

Wiki page with open ended constructive response questions and UDL lessons
https://grade8commoncoremath.wikispaces.hcpss.org/Unit+3+Analyzing+Functions+and+Equations

| 21ST CENTURY SKILLS  
<table>
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<th>(4Cs &amp; CTE Standards)</th>
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### MODIFICATIONS/ACCOMMODATIONS

**Small group instruction**
- Review of printed notes from smart board/power point/star board.
- Activities completed in small group for more of an understanding

**Individualized instruction**

**Peer tutoring**
- Team up stronger math skills with lower math skills

**Use of manipulatives**
- White boards
- Dry erase markers
- Reference sheets created by special needs teacher
- Index cards created by student.
- Number line
- Reference charts for classroom
- Graphing calculator
- Web interactive activities
- Video tutorials from textbook or my.hrw.com

**Computer activities for remediation**
- Technology infusion

**Chunking information**
- Chunk up each skill so students can see difference in math algorithm

**Oral questioning**
- IEP modification for summative and formative assessments
### APPENDIX
**Teacher resource extensions**

8. EE.1. Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.
- Bases must be the same before exponents can be added, subtracted or multiplied.
- Exponents are subtracted when like bases are being divided.
- A number raised to the zero (0) power is equal to one.
- Negative exponents occur when there are more factors in the denominator. These exponents can be expressed as a positive if left in the denominator.
- Exponents are added when like bases are being multiplied.
- Exponents are multiplied when an exponents is raised to an exponent.
- Several properties may be used to simplify an expression.

8. EE.2 Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where $p$ is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.

8. EE.3. Use numbers expressed in the form of a single digit times a whole-number power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. *For example, estimate the population of the United States as $3 \times 10^8$ and the population of the world as $7 \times 10^9$, and determine that the world population is more than 20 times larger.*

**Example 1:**
Write 75,000,000,000 in scientific notation.
*Solution: $7.5 \times 10^{10}$*

**Example 2:**
Write 0.0000429 in scientific notation.
*Solution: $4.29 \times 10^{-5}$*

**Example 3:**
Express $2.45 \times 10^{-5}$ in standard form.
*Solution: 245,000*

**Example 4:**
How much larger is $6 \times 10^5$ compared to $2 \times 10^3$?
*Solution: 300 times larger since 6 is 3 times larger than 2 and $10^5$ is 100 times larger than $10^3$.*

**Example 5:**
Which is the larger value: $2 \times 10^6$ or $9 \times 10^5$?
8. EE.4. Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.

Example 1:
2.45E+23 is $2.45 \times 10^{23}$ and 3.5E-4 is $3.5 \times 10^{-4}$ (NOTE: There are other notations for scientific notation depending on the calculator being used.) Students add and subtract with scientific notation.

Example 2:
In July 2010 there were approximately 500 million facebook users. In July 2011 there were approximately 750 million facebook users. How many more users were there in 2011. Write your answer in scientific notation. Solution: Subtract the two numbers: $750,000,000 - 500,000,000 = 250,000,000 \rightarrow 2.5 \times 10^8$

Students use laws of exponents to multiply or divide numbers written in scientific notation, writing the product or quotient in proper scientific notation.

Example 3:

$$(6.45 \times 10^{11})(3.2 \times 10^4) = (6.45 \times 3.2)(10^{11} \times 10^4) = 20.64 \times 10^{15} = 2.064 \times 10^{16}$$

Example 4:

$$3.45 \times 10^5 \div \frac{6.3}{10^5} - (-2)$$

$$6.7 \times 10^{-2} \div 1.6 \times 10^x = 0.515 \times 10^7 = 5.15 \times 10^6$$

Example 5:

$$(0.0025)(5.2 \times 10^4) = (2.5 \times 10^{-3})(5.2 \times 10^5) = (2.5 \times 5.2)(10^{-3} \times 10^5) = 13 \times 10^2 = 1.3 \times 10^3$$

Math practices

1. Make sense of problems and persevere in solving them.
   In grade 8, students solve real world problems through the application of algebraic and geometric concepts. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, “What is the most efficient way to solve the problem?”, “Does this make sense?”, and “Can I solve the problem in a different way?”

2. Reason abstractly and quantitatively.
   In grade 8, students represent a wide variety of real world contexts through the use of real numbers and variables in mathematical expressions, equations, and inequalities. They examine patterns in data and assess the degree of linearity of functions. Students contextualize to understand the meaning of the number or variable as related to the problem and decontextualize to manipulate symbolic representations by applying properties of operations.

3. Construct viable arguments and critique the reasoning of others.
In grade 8, students construct arguments using verbal or written explanations accompanied by expressions, equations, inequalities, models, and graphs, tables, and other data displays (i.e. box plots, dot plots, histograms, etc.). They further refine their mathematical communication skills through mathematical discussions in which they critically evaluate their own thinking and the thinking of other students. They pose questions like “How did you get that?”, “Why is that true?” “Does that always work?” They explain their thinking to others and respond to others’ thinking.

4. Model with mathematics.
In grade 8, students model problem situations symbolically, graphically, tabularly, and contextually. Students form expressions, equations, or inequalities from real world contexts and connect symbolic and graphical representations. Students solve systems of linear equations and compare properties of functions provided in different forms. Students use scatterplots to represent data and describe associations between variables. Students need many opportunities to connect and explain the connections between the different representations. They should be able to use all of these representations as appropriate to a problem context.

5. Use appropriate tools strategically.
Students consider available tools (including estimation and technology) when solving a mathematical problem and decide when certain tools might be helpful. For instance, students in grade 8 may translate a set of data given in tabular form to a graphical representation to compare it to another data set. Students might draw pictures, use applets, or write equations to show the relationships between the angles created by a transversal.

6. Attend to precision.
In grade 8, students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students use appropriate terminology when referring to the number system, functions, geometric figures, and data displays.

7. Look for and make use of structure.
Students routinely seek patterns or structures to model and solve problems. In grade 8, students apply properties to generate equivalent expressions and solve equations. Students examine patterns in tables and graphs to generate equations and describe relationships. Additionally, students experimentally verify the effects of transformations and describe them in terms of congruence and similarity.

### 4 Cs

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<th>Creativity: projects</th>
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#### Cross Curriculum project with Science
- Students can find the standard form and the scientific notation form of any number by Life Science applications (i.e. human blood cells diameter, size of protons, neutrons, and electrons, planet’s distance from the Sun, length of particles, atomic mass of an element, mass of insects (butterflies with the quantity of how many there are...))
- Create a menu with topics or create a think tac toe board for various real world scenarios

#### Three part learning objective

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<tr>
<th>TLWBAT:</th>
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- Complete a think tac toe choice board by picking any activity from the 9 options for evaluating exponents and scientific notation. Apply skills and knowledge learned on exponents and scientific notation to real world scenarios given in think tac toe board by completing three in a row and receiving a 3, 2, 1, or 0 on the Hollistic scoring rubric. (80% and higher).
<table>
<thead>
<tr>
<th><strong>Critical Thinking:</strong></th>
<th><strong>TLWBAT:</strong></th>
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<tbody>
<tr>
<td>Math Journal</td>
<td>Refine their mathematical communication skills by using clear and precise language in their writing. Develop and enhance appropriate terminology when referring to exponents and scientific notation. Evaluate real world problems through the application of algebraic concepts by completing various critical thinking activities with at least 85% accuracy.</td>
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<td>Directed paraphrasing</td>
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<tr>
<td>Short constructed response</td>
<td>Create short constructed responses for NJASK review and practice of how to answer open ended questions with the NJ Hollistic 3 point scale.</td>
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<tr>
<td>Do now</td>
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</tbody>
</table>
- Various open ended questions found in textbook. In the teacher's edition, you can use the alternative opener or the problem of the days
- Use the for NJASK review questions created by teacher for common core or use this link: [http://www.doe.mass.edu/mcas/transition/2013MathStandards.html?grade=8](http://www.doe.mass.edu/mcas/transition/2013MathStandards.html?grade=8)

**POWS (Problem of the Weeks)**
- Students will complete POWS (created by the teacher using exam view) in order to create 3 part open ended constructed response questions for each skill of the unit. Please use the 3 point Math Hollistic Scoring Rubric for grading.

**Homework**
- Handout packet for review (practice a, b, c found in textbook) for each section of chapter 4

**Minute paper**
**Scientific notation conversions**
- 6 problems of standard form and scientific notation
- 5 problems of division and 5 of multiplication in under a minute
- 100 exponents of positive and negative exponents

**Quizzes**
- Exponent quiz created by teacher or my.hrw.com under teacher resources
- Scientific notation quiz (my.hrw.com)
- Scientific Notation with operations quiz (exam view creation or my.hrw.com)
- Problem solving quiz (my.hrw.com)
| Test | Summative Assessment  
| Teacher on exam view | Properties of Exponents created by  
| Chapter tests form my.hrwo.com for each chapter |
| Exit ticket | Compare $3 \times 2$, $3^2$, and $2^3$  
| Create exit tickets based on each lesson |

**Collaboration: Teams/Groups/Stations**

- **Stations work**  
  Stations created by teacher for movement: students can work in groups or individually to calculate all contents for scientific notation  
  Each station should be created for each skill

- **Math Labs**  
  Use workbook pages from Holt McDougal to create lab activities for students to evaluate the skills learned for scientific notation

- **Cubing Activities**  
  Jeopardy games found online or created by teacher using jeopardy template

**Communication – Power points/Presentations**

- **Power points**  
  Each section in the Holt/McDougal textbook comes with power point lesson notes to teach the students with. They are interactive power points with Problem of the Days and mini quiz lessons for review.

**TLWBAT**: Model and evaluate problem situations symbolically and with a calculator. Demonstrate and evaluate expressions from real world contexts and connect symbolic reasoning. Routinely seek patterns or structures to model and solve problems for exponents and scientific notation. Apply properties to generate equivalent expressions and solve expressions for evaluating exponents, scientific notation, and square roots with its reciprocal.

**TLWBAT**: Demonstrate their understanding of skills and knowledge learned for scientific notation and exponents by communicating skills with clear and precise language in their discussions with others and in their own reasoning. Use appropriate terminology when
referring to scientific notation. Apply properties of scientific notation to generate equivalent expressions and solve equations. Examine patterns in equations to generate solutions and describe relationships with at least 80% accuracy.
# UNIT 3
Expressions and Equations with Variables, Combining Like Terms, Distributive Property, and System of Equations

Total Number of Days: ___ days  Grade/Course: 8/Math Inclusion

<table>
<thead>
<tr>
<th>ESSENTIAL QUESTIONS</th>
<th>ENDURING UNDERSTANDINGS</th>
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<tbody>
<tr>
<td>How do you determine the solution to a system of linear equations on a graph? Algebraically?</td>
<td>The solution to a system of linear equations in two variables is the point/ordered pair on a graph where the two lines will intersect.</td>
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<tr>
<td>Do all system of linear equations have a solution? How do you know?</td>
<td>The solution to a system of linear equations in two variables is the point/ordered pair that satisfies both equations.</td>
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<tr>
<td>What is an example of a real – world problem that can be solved using a system of linear equations?</td>
<td>Real World problems that use system of linear equations are for scheduling or comparing two situations.</td>
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<td>How do you determine if a given point is a solution to a system of linear equations?</td>
<td>System of linear questions can be solved algebraically to find the point of intersection and then checked graphically.</td>
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<tr>
<th>PACING</th>
<th>CONTENT</th>
<th>SKILLS</th>
<th>STANDARDS (CCCS/MP)</th>
<th>RESOURCES</th>
<th>LEARNING ACTIVITIES/ASSESSMENTS</th>
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<tbody>
<tr>
<td>SIMPLIFYING ALGEBRAIC EXPRESSIONS</td>
<td>Combine terms in an expression</td>
<td>8.EE.7 LINEAR EQUATIONS</td>
<td>HOLT MCDUFFAL CHAPTER 11 TE PAGES 584-623</td>
<td>Examples <a href="http://www.analyzemath.com/middle_school_math/grade_8/algebra.html">http://www.analyzemath.com/middle_school_math/grade_8/algebra.html</a></td>
<td>All lessons should begin with a Do Now All lessons should end with an exit pass</td>
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<td>Evaluate expressions or equations with distributive property</td>
<td>8.EE.7 LINEAR EQUATIONS</td>
<td>Assignment guide for average and advance</td>
<td></td>
<td>Math exploration 11-6 TE page 588 simplifying algebraic expressions</td>
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<td>Examples</td>
<td>8.EE.7 LINEAR EQUATIONS</td>
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<td>Problem of the Day TE page 588 or found in 11-1 power point from cd rom</td>
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<td>Math Guided Instruction 11-1 power point on simplifying expressions</td>
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<td><strong>Solving Multi-Step Equations</strong></td>
<td>Evaluate multi step equations through combining like terms and distributive property</td>
<td>8.EE.7 Solving equations with variables</td>
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<tr>
<td>Solve. $8x + 6 + 3x - 2 = 37$</td>
<td>HOLT MCDOUGAL CHAPTER 11 TE PAGES 584-623</td>
<td><a href="https://sites.google.com/site/evaluatingalgebraicexpressions">https://sites.google.com/site/evaluatingalgebraicexpressions</a></td>
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<td>Solve $\frac{5}{x} + \frac{3}{8} = \frac{10}{24}$</td>
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<td><a href="http://www.quia.com/cb/250454.html">http://www.quia.com/cb/250454.html</a></td>
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<td>Linda is paid double her normal hourly rate for each hour she works over 40 hours in a week. Last week she worked 52 hours and earned $544. What is her hourly rate?</td>
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<td><a href="http://www.softschools.com/quizzes/math/multiply_integers/quiz3215.html">http://www.softschools.com/quizzes/math/multiply_integers/quiz3215.html</a></td>
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<td><a href="http://www.math.com/school/subject1/lessons/S1U1L12GL.html">http://www.math.com/school/subject1/lessons/S1U1L12GL.html</a></td>
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<td>Online Algebra Jeopardy Game website: <a href="http://www.quia.com/c">http://www.quia.com/c</a></td>
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<td>Additional examples</td>
<td>TE page 589 or power point 11-1</td>
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<td>Think and Discuss Problems</td>
<td>Describe the first step in simplifying the expression $2 + 8(3y + 5) - y$</td>
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<td>Math practices</td>
<td>11-1 worksheets A, B, C used for stations and differentiated instruction</td>
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<td>Math Exploration</td>
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<td>Reaching All Learners Guided Practice</td>
<td>Solving Multi Step Equations</td>
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<td>11-2 Power Point from cd rom my.hr.com</td>
<td>Use link for more power points</td>
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<td>or use my.hr.com 11-2</td>
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<td>Math Independent practice for Basic and Intermediate levels</td>
<td>TE pages 594 # 2-30 even</td>
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<td>Workbook pages A, B, C for all levels</td>
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<tr>
<td>Algebra balance scale game website</td>
<td><a href="http://nlvm.usu.edu/en/nav/frames_asid_201_g4_t_2.html?open=instructions&amp;from=grade_g_4.html">http://nlvm.usu.edu/en/nav/frames_asid_201_g4_t_2.html?open=instructions&amp;from=grade_g_4.html</a></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Algebra balance scale game including integers website</td>
<td><a href="http://nlvm.usu.edu/en/nav/frames_asid_324_g4_t_2.html?open=instructions&amp;from=grade_g_4.html">http://nlvm.usu.edu/en/nav/frames_asid_324_g4_t_2.html?open=instructions&amp;from=grade_g_4.html</a></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solve linear equations website</td>
<td><a href="http://mathsnet.net/algebra/l4_equation.html">http://mathsnet.net/algebra/l4_equation.html</a></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math Challenge Open Ended problem</td>
<td>Sports problem TE page 595 # 34</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What's the error? Math Problem</td>
<td>TE page 595 # 36</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Solving Equations with Variables on Both Sides

Calculate equations with variables on both sides of the equal sign through algebraic reasoning.

Examples

Solve.

9b – 6 = 5b + 18

Solve.

3b – 2 = 2b + 12

Solve.

10z – 15 – 4z = 8 – 2z - 15

Daisy's Flowers sell a rose bouquet for $39.95 plus $2.95 for every rose. A competing florist sells a similar bouquet for $26.00 plus $4.50 for every rose. Find the number of roses that would make both florists' bouquets cost the same price.

Solving Inequalities by Multiplying or Dividing

Solve and graph inequalities on a number line by using multiplication and division.

Examples

Solve.

9b – 6 = 5b + 18

Solve.

3b – 2 = 2b + 12

Solve.

10z – 15 – 4z = 8 – 2z - 15

Daisy's Flowers sell a rose bouquet for $39.95 plus $2.95 for every rose. A competing florist sells a similar bouquet for $26.00 plus $4.50 for every rose. Find the number of roses that would make both florists' bouquets cost the same price.
Solve and graph: \(16 \times \frac{2}{5}\)

Solve and graph: \(-9b \leq 45\)

Jared isn’t supposed to carry more than 35 pounds in his backpack. He has 8 textbooks and each book weighs 5 pounds. What is the greatest amount of textbooks he can carry in his backpack at one time?

### Multi Step Inequalities

Evaluate multi step inequalities and graph the solution of the inequality on a number line.

**Examples**

Solve and graph: \(4x + 1 > 13\)

Solve: \(2(x + 4) - 11x \geq 26\) and graph.

Antonio has budgeted an average of $45 a month for entertainment. For the first five months of the year he has

### Intermediate, and Advance Levels

**MP**

8.MP.7

8.MP.8

Intermediate, and Advance Levels

TE page 606


http://education.jlab.org/sminequality/question.php?3811951

http://www.aaamath.com/g725-inequalities.html

### Intermediate, and Advance Levels

TE page 607 #35

Math Focus on Inequalities

Worksheets for basic, intermediate, and advance levels A, B, C

Independent practice PDF file


Review for Mastery

Extra practice page 606 TE worksheet

What’s the Error?

TE page 607 #35

Math Alternate Opener

11-5 TE page 608 transparency

my.hrw.com

Math Motivation Lesson

11-5 power point practice

Additional Examples

TE page 609 in red

Think and Discuss Questionnaire

TE page 609 #1

Description Math Journal

TE page 609 #2

Math Background Work

TE page 610 #1-38 even (present it in group form by levels of difficulty)
| System of Equations | Solve system of equations by identifying one solution, no solutions, or infinitely many solutions. Using substitution or eliminating a variable.  
Examples  
Solve by substitution and determine the solution  
\[ Y = 2x + 9 \]  
\[ Y = -8 + 2x \]  
Solve by substitution and determine the solution  
\[ Y = 3x - 7 \]  
\[ Y = 6 + 3x \] | 8.EE.7  
Solving equations with variables  
MP  
8.MP.1  
8.MP.2  
8.MP.4  
8.MP.7  
8.MP.8 | HOLT  
MCDOUGAL  
CHAPTER 11  
Section 11-6  
TE PAGES 612-615  
For Basic, Intermediate, and Advanced Levels  
11-6 Transparency TE page 612  
use my.hrw.com or cd rom  
Reaching All Learners Guided Practice  
11-6 power point from cd rom or my.hrw.com  
More Power points guided practice  
http://www.slideshare.net/41863226/power-point-solving-system-of-equations-using-substitution  
Math Lab Focus  
Create easel stations using TE page 614-615  
#1-24 even  
Challenge  
Solve the system of equations  
\[ 5x-y-12z = 61 \]  
\[-2x+11y+8z = 4 \]  
\[-12x-8y + 12z = -24 \]  
Geometry Review  
TE page 615 #37 system of equations with perimeter

**INSTRUCTIONAL FOCUS OF UNIT**

Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: intersecting, parallel lines, coefficient, distributive property, like terms, substitution, system of linear equations

**PARCC FRAMEWORK/ASSESSMENT**

Students have been working informally with one-variable linear equations since as early as kindergarten. This important line of development culminates in grade 8 with the solution of general one-variable linear equations, including cases with infinitely many solutions or no solutions as well as cases requiring

---

spent $48, $39, $60, $48, and $33. How much can Antonio spend in the sixth month without exceeding his average budget?
algebraic manipulation using properties of operations. Coefficients and constants in these equations may be any rational numbers.

Analyze and solve linear equations and pairs of simultaneous linear equations. By Grade 8 students have the tools to solve an equation which has a general linear expression on each side of the equal sign.

Examples from Model Curriculum aligned with PARCC Framework Assessment

Tickets for the class show are $3 for students and $10 for adults. The auditorium holds 450 people. The show was sold out and the class raised $2750 in ticket sales. How many students bought tickets?

Solve the equation \(- \frac{2}{3} (4x - 5) = 6\) for \(x\). Show your work.

Indicate if each equation in the table below has no solutions, one solution, or infinitely many solutions by checking the appropriate box in each row.

<table>
<thead>
<tr>
<th>Equation</th>
<th>No Solutions</th>
<th>One Solution</th>
<th>Infinitely Many Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\frac{1}{3} (18 - 6x) = 8 - 2x)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(x + 16 = 16 + 2x - 3x)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(11 + 6x - 14 = \frac{3}{5} (15x - 5))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(-(x - 1) = 1 - x)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Determine the solution to the following system of equations. Show your work.

\[ 3x + 4y = 16 \]
\[ -3x + 2y = -10 \]

PARCC Framework Assessment questions with Model Curriculum Website for all units
http://www.state.nj.us/education/modelcurriculum/math/8u5.shtml

Wiki page with open ended constructive response questions and UDL lessons
https://grade8commoncoremath.wikispaces.hcpss.org/Unit+3+Analyzing+Functions+and+Equations
<table>
<thead>
<tr>
<th>MODIFICATIONS/ACCOMMODATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Small group instruction</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Individualized instruction</strong></td>
</tr>
<tr>
<td><strong>Peer tutoring</strong></td>
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<td></td>
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<tr>
<td><strong>Computer activities for remediation</strong></td>
</tr>
<tr>
<td><strong>Chunking information</strong></td>
</tr>
<tr>
<td><strong>Oral questioning</strong></td>
</tr>
</tbody>
</table>

**APPENDIX**
8.EE.7 Solve linear equations in one variable.

- Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form \( x = a, a = a, \text{ or } a = b \) results (where \( a \) and \( b \) are different numbers).
- Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

Example 1:
Equations have one solution when the variables do not cancel out. For example, \( 10x - 23 = 29 - 3x \) can be solved to \( x = 4 \). This means that when the value of \( x \) is 4, both sides will be equal. If each side of the equation were treated as a linear equation and graphed, the solution of the equation represents the coordinates of the point where the two lines would intersect. In this example, the ordered pair would be \((4, 17)\).

\[
\begin{align*}
10 \cdot 4 - 23 & = 29 - 3 \cdot 4 \\
40 - 23 & = 29 - 12 \\
17 & = 17
\end{align*}
\]

Example 2:
Equations having no solution have variables that will cancel out and constants that are not equal. This means that there is not a value that can be substituted for \( x \) that will make the sides equal.

\[
\begin{align*}
-x + 7 - 6x & = 19 - 7x \\
-7x + 7 & = 19 - 7x \\
7 & \neq 19
\end{align*}
\]

This solution means that no matter what value is substituted for \( x \) the final result will never be equal to each other.

If each side of the equation were treated as a linear equation and graphed, the lines would be parallel.

Examples:
- Solve for \( x \):
  - \(-3(x + 7) = 4\)
  - \(3x - 8 = 4x - 8\)
  - \(3(x + 1) - 5 = 3x - 2\)
- Solve:
  - \(7(m - 3) = 7\)
  - \(\frac{1}{4} - \frac{2}{3}y = \frac{3}{4} - \frac{1}{3}y\)
8.EE.8 Analyze and solve pairs of simultaneous linear equations.

- Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.
- Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. For example, $3x + 2y = 5$ and $3x + 2y = 6$ have no solution because $3x + 2y$ cannot simultaneously be 5 and 6.
- Solve real-world and mathematical problems leading to two linear equations in two variables. For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.

Examples:
- Find $x$ and $y$ using elimination and then using substitution.

\[
\begin{align*}
3x + 4y &= 7 \\
-2x + 8y &= 10
\end{align*}
\]

- Plant A and Plant B are on different watering schedules. This affects their rate of growth. Compare the growth of the two plants to determine when their heights will be the same.

Let $W =$ number of weeks  
Let $H =$ height of the plant after $W$ weeks

<table>
<thead>
<tr>
<th>Plant A</th>
<th>Plant B</th>
</tr>
</thead>
<tbody>
<tr>
<td>$W$</td>
<td>$H$</td>
</tr>
<tr>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
</tr>
</tbody>
</table>

- Given each set of coordinates, graph their corresponding lines.

Solution:
Write an equation that represent the growth rate of Plant A and Plant B.

Solution:
Plant A  \( H = 2W + 4 \)
Plant B  \( H = 4W + 2 \)

At which week will the plants have the same height?

Solution:
The plants have the same height after one week.
Plant A: \( H = 2W + 4 \)
Plant B: \( H = 4W + 2 \)
Plant A: \( H = 2(1) + 4 \)
Plant B: \( H = 4(1) + 2 \)
Plant A: \( H = 6 \)
Plant B: \( H = 6 \)

After one week, the height of Plant A and Plant B are both 6 inches.

Example 2
Solve: Victor is half as old as Maria. The sum of their ages is 54. How old is Victor?

Solution:
Let \( v \) = Victor’s age
Let \( m \) = Maria’s age
\[
\begin{align*}
\frac{1}{2} m + m &= 54 \\
1\frac{1}{2} m &= 54 \\
\frac{3}{2} m &= 54 \\
m &= 36
\end{align*}
\]
If Maria is 36, then substitute 36 into \( v + m = 54 \) to find Victor’s age of 18.

Note: Students are not expected to change linear equations written in standard form to slope-intercept form or solve systems using elimination.

For many real world contexts, equations may be written in standard form. Students are not expected to change the standard form to slope-intercept form. However, students may generate ordered pairs recognizing that the values of the ordered pairs would be solutions for the equation. For example, in the equation above, students could make a list of the possible ages of Victor and Maria that would add to 54. The graph of these ordered pairs would be a line with all the possible ages for Victor and Maria.

<table>
<thead>
<tr>
<th>Victor</th>
<th>Maria</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>34</td>
</tr>
<tr>
<td>10</td>
<td>44</td>
</tr>
<tr>
<td>50</td>
<td>4</td>
</tr>
<tr>
<td>29</td>
<td>25</td>
</tr>
</tbody>
</table>

4 Cs

Creativity: projects

TLWBAT:
<table>
<thead>
<tr>
<th><strong>Critical Thinking:</strong></th>
<th><strong>TLWBAT:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Math Journal</td>
<td>Refine their mathematical communication skills by using clear and precise language in their writing. Develop and enhance appropriate terminology when referring to exponents and scientific notation. Evaluate real world problems through the application of algebraic concepts by completing various critical thinking activities with at least 85% accuracy.</td>
</tr>
<tr>
<td>• has no solution as an answer.</td>
<td></td>
</tr>
<tr>
<td>• write about a real world scenario in which they might use an inequality.</td>
<td></td>
</tr>
<tr>
<td>• Use Model Curriculum problems to create open ended problems they can solve in their math journal.</td>
<td></td>
</tr>
<tr>
<td>One-sentence summary</td>
<td></td>
</tr>
<tr>
<td>• Write a sentence to discuss the first steps in solving the given expressions (given by teacher)</td>
<td></td>
</tr>
<tr>
<td>• Write an expression that can be solved by combining like terms.</td>
<td></td>
</tr>
<tr>
<td>• Write an expression that cannot be solved by combining like terms.</td>
<td></td>
</tr>
<tr>
<td>• 3x – 4 + 2x = 7.</td>
<td></td>
</tr>
<tr>
<td>• Tell how you can clear a fraction in an equation.</td>
<td></td>
</tr>
<tr>
<td>Directed paraphrasing</td>
<td></td>
</tr>
<tr>
<td>• Summary of skills and vocabulary words for chapter 11</td>
<td></td>
</tr>
<tr>
<td>Short constructed response</td>
<td></td>
</tr>
<tr>
<td>• Create short constructed responses for NJASK review and practice of how to answer open ended questions with the NJ Hollistic 3 point scale.</td>
<td></td>
</tr>
<tr>
<td>Do now</td>
<td></td>
</tr>
<tr>
<td>• Various open ended questions found in textbook. In the teacher's edition, you can use the alternative opener or the problem of the days</td>
<td></td>
</tr>
</tbody>
</table>
- Use the for NJASK review questions created by teacher for common core or use this link: [http://www.doe.mass.edu/mcas/transit/2013MathStandards.html?grade=8](http://www.doe.mass.edu/mcas/transit/2013MathStandards.html?grade=8)

**POWS (Problem of the Weeks)**
- Students will complete POWS (created by the teacher using exam view) in order to create 3 part open ended constructed response questions for each skill of the unit. Please use the 3 point Math Hollistic Scoring Rubric for grading.

**Homework**
- Handout packet for review (practice a, b, c found in textbook) for each section

**Minute paper**
- Combining like terms
- Identifying like terms
- Distributive property

**Quizzes**
- Combining Like Terms quiz created by teacher or my.hrw.com under teacher resources
- Distributive Property quiz (my.hrw.com)
- Inequality quiz (exam view creation)
- Problem solving quiz (my.hrw.com)

**Test**
- Summative Assessment
- Properties of Exponents created by teacher on exam view
- Chapter tests form my.hrw.com for each chapter
<table>
<thead>
<tr>
<th>Exit ticket</th>
<th>Create exit tickets based on each lesson</th>
</tr>
</thead>
</table>

**Collaboration: Teams/Groups/Stations**

<table>
<thead>
<tr>
<th>Stations work</th>
<th>Stations created by teacher for movement: students can work in groups or individually to calculate all contents for expressions. Each station should be created for each skill</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Math Labs</th>
<th>Use workbook pages from Holt McDougal to create lab activities for students to evaluate the skills learned for evaluating expressions and equations.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Cubing Activities</th>
<th>Jeopardy games found online or created by teacher using jeopardy template</th>
</tr>
</thead>
</table>

**Communication – Power points/Presentations**

<table>
<thead>
<tr>
<th>Power points</th>
<th>Each section in the Holt/McDougal textbook comes with power point lesson notes to teach the students with. They are interactive power points with Problem of the Days and mini quiz lessons for review</th>
</tr>
</thead>
</table>

**TLWBAT: Model and evaluate problem situations symbolically and with a calculator. Demonstrate and evaluate expressions from real world contexts and connect symbolic reasoning. Routinely seek patterns or structures to model and solve problems for expressions and equations. Apply properties to generate equivalent expressions and solve expressions for system of equations, combining like terms, and distributive property.**

**TLWBAT:** Demonstrate their understanding of skills and knowledge learned for simplify expressions by communicating skills with clear and precise language in their discussions with others and in their own reasoning. Use appropriate terminology when referring to simplifying expressions. Apply properties to generate equivalent expressions and solve equations. Examine patterns in equations to generate solutions and describe relationships with at least 80% accuracy.
# UNIT 4
Expressions and Equations for Proportional Relationships and Slope

Total Number of Days: \( \text{days} \)  
Grade/Course: 8/Math Inclusion

## ESSENTIAL QUESTIONS

<table>
<thead>
<tr>
<th>What is the difference between a proportional and a non-proportional relationship?</th>
</tr>
</thead>
<tbody>
<tr>
<td>How are linear relationships related to consistent rates of change?</td>
</tr>
<tr>
<td>How are proportions and similarity used in the real world?</td>
</tr>
</tbody>
</table>

## ENDURING UNDERSTANDINGS

<table>
<thead>
<tr>
<th>Proportional relationships have equivalent ratios and non-proportional relationships do not have equivalent ratios.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant rates of change when graphed will form a line just as linear relationships when graphed form a line.</td>
</tr>
<tr>
<td>Proportions and similarity are often utilized in real-world situations.</td>
</tr>
</tbody>
</table>

## PACING

<table>
<thead>
<tr>
<th>CONTENT</th>
<th>SKILLS</th>
<th>STANDARDS (CCCS/MP)</th>
<th>RESOURCES</th>
<th>LEARNING ACTIVITIES/ASSESSMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>RATIOS AND PROPORTIONS</td>
<td>Evaluate equivalent ratios to create proportions</td>
<td>8.EE.5 functional relationships</td>
<td>Holt McDougal Chapter 5 TE pages 218-273</td>
<td>Math Opener 5-1 Exploration transparency page 222 TE or my.hrw.com</td>
</tr>
<tr>
<td>1-1.5 days</td>
<td>Examples Find two ratios that are equivalent to each given ratio. ( \frac{4}{15} )</td>
<td>MP 8.MP.1 8.MP.4 8.MP.5 8.MP.7 8.MP.8</td>
<td></td>
<td>Math Warm Up Page 222 TE 5-1 Power point from Textbook</td>
</tr>
<tr>
<td></td>
<td>Simplify to tell whether the ratios form a proportion. ( \frac{16}{20} ) and ( \frac{20}{20} )</td>
<td></td>
<td></td>
<td>Math Lab Independent practice 5-1 page 224 TE 1-20</td>
</tr>
<tr>
<td></td>
<td>Kate poured 8 oz of juice from a 64 oz bottle. Brian poured</td>
<td></td>
<td></td>
<td>Problem Solving 5-1 Problem Solving worksheet create power point or station page 225 TE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Extra practice Page 224-225 TE word problems</td>
</tr>
<tr>
<td>RATIO</td>
<td>16 oz of juice from a 128 oz bottle. What ratio of juice is missing from each bottle? Are the ratios proportional?</td>
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<tr>
<td>-------</td>
<td>--------------------------------------------------------------------------------------------------</td>
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</tr>
</tbody>
</table>

### RATIOS, RATES, AND UNIT RATES

**1-2 days**

- **Compare two quantities (rate) in order to determine the unit rate and price of any given rate**

  Examples
  - Melissa is driving to her grandmother's house. In the first 3 hours of the drive, she travels 159 miles. What is Melissa's average speed?
  - A half dozen carnations for $4.75 or a dozen for $9.24

  - **8.EE.5**
  - **functional relationships**
  - **MP**
  - **8.MP.1**
  - **8.MP.2**
  - **8.MP.4**
  - **8.MP.5**
  - **8.MP.6**

  - **Holt McDougal**
  - **Chapter 5**
  - **TE pages 218-273**

- **PDF file on examples and problems**
  - **http://www.edu.gov.on.ca/eng/studentsuccess/lms/files/tips4rm/gr8unit8.pdf**

- **Math Analysis (Do Now)**
  - 5-2 Exploration TE page 226 transparency on cd rom

- **Math Motivation**
  - TE page 226 comparison of two quantities

- **Guided instruction**
  - Power point 5-2 from cd rom or my.hrw.com

- **Math Lab**
  - Create stations using 5-2 worksheets on pages 228-229 TE
  - Use problems from independent practice 228-229

- **Critical Thinking**
  - Grocery newspaper. Compare two stores and find the unit rate

### PROPORTIONS

**1-2 days**

- **Evaluating proportional relationships in order to determine equivalency**

  Examples
  - Are the ratios proportional?
  - \( \frac{48}{42} = \frac{16}{14} \) Solve the proportion

  - **8.EE.5**
  - **functional relationships**
  - **MP**
  - **8.MP.1**
  - **8.MP.3**
  - **8.MP.4**
  - **8.MP.6**

  - **Holt McDougal**
  - **Chapter 5**
  - **TE pages 218-273**

- **PDF file on examples and problems**
  - **http://www.edu.gov.on.ca/eng/studentsuccess/lms/files/tips4rm/gr8unit8.pdf**

- **Math Exploration**
  - 5-4 Solving Proportions Page 237 TE
  - Transparency from cd rom or my.hrw.com

- **Guided instruction**
  - 5-4 power point on cd rom
  - Modify it according to class

- **Practice and Problem Solving**
  - Page 240 TE 9-31 for beginners, basic, and advanced learners.

- **Problem Solving Worksheet**
  - Create index cards for modifications
<table>
<thead>
<tr>
<th>1-2.5 days</th>
<th>Graphing Proportional Relationships</th>
<th>Graph proportional relationships and interpreting the unit rate as a slope</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Example Determine the unit rate of the given graph and Compare the following proportional relationships</td>
</tr>
<tr>
<td></td>
<td></td>
<td><img src="image" alt="Graph" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Determine the unit rate of the given equation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( y = 50x )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( x = \text{time} )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( y = \text{miles} )</td>
</tr>
</tbody>
</table>

\( \frac{p}{17} = \frac{50}{85} \)

- **8.EE.5 functional relationships**
  - MP
  - 8.MP.1
  - 8.MP.2
  - 8.MP.4
  - 8.MP.7

- **NOT IN TEXTBOOK**
  - Use online resources in the Learning activities and assessment column

- **Power Points for teaching lesson**

- **GREAT VIDEO AND RESOURCES FOR UNIT RATE**

- **Comparing proportional relationships using unit rate and graphs**

- **Math Focus Guided Practice**

- **Second option**

- **Math Lab Videos with practice problems**

- **Independent practice**

- **Intermediate level**
  - “To be or not to be proportional”
**Slope of a Line**

**Short Introduction in collaboration with Proportional Unit rates for graphing**

**Examples**

Find the slope of the line that passes through \((-2, -3)\) and \((4, 6)\).

Find the slope of the data

<table>
<thead>
<tr>
<th>Cost of Fruit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pounds</strong></td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>15</td>
</tr>
</tbody>
</table>

**Find the slope of a line and use the slope to understand and draw graphs**

**Examples**

Find the slope of the data

<table>
<thead>
<tr>
<th><strong>Cost of Fruit</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pounds</strong></td>
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<tr>
<td>0</td>
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<tr>
<td>5</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>15</td>
</tr>
</tbody>
</table>

**Slope of a line**

**Intercept form of an equation**

Use slopes and intercepts to graph linear equations for \(m\) and \(b\)

**Examples**

Write an equation to represent the graph.

**Solution:** \(y = -\frac{3}{2}x\)

**Other resources:**

- **Holt McDougal**
  - Chapter 12
  - Pages 637-641 TE
  - Math Lab
  - Rate of change as a slope
  - Finding the slope of a line worksheet
  - Positive and Negative Slopes video for guided practice
  - Math Stations
  - 12-1 practice problems A, B, C worksheets shown in stations

- **Positive and Negative Slopes**
  - Video for guided practice

- **Save the Zog**
  - http://www.mathplayground.com/SaveTheZogs/SaveTheZogs.html

- **Slope of a line lesson introduction**

- **Math Opener**
  - 12-1 Exploration Transparency page 637 TE or my.hrw.com

- **Math practice lab**
  - Finding the slope of a line

- **Which is a better buy video**

- **Math Stations**
  - 12-1 practice problems A, B, C worksheets shown in stations

- **More activities**
  - http://www.mathplayground.com/SaveTheZogs/SaveTheZogs.html
  - y = mx + b:
  - http://www.ltcconline.net/greenl/java/BasicsAlgebra/LineGraph/LineGraph.html

- **Math Stations**
  - 12-1 practice problems A, B, C worksheets shown in stations

- **Exploration**
  - 12-3 Using slopes and intercepts transparency page 642 TE
  - my.hrw.com website

- **Reaching all learners guided practice**
  - Power point 12-3
  - Edit to your classroom

- **More activities**
Solution: $y = \frac{2}{3} x - 2$

Sing a song to "pop goes the weasel":
"y = mx + b where m is the slope....Y = mx + b where b is the y-intercept...."
For extra credit points, students must sing the song to the teacher one on one while solving an equation as an exit passes.

**FOR MORE ADVANCED STUDENTS:**
- $y = mx + b$
- finding the slope of a line and $y = mx + b$
  - derive $y = mx + b$ using similar triangles
  - Slope of a line:
  - how to find slope of a line:

**Math practice:**
- Graphing lines using slope intercept form
  - Writing slope intercept form
  - Math Challenge Matching game

**Graphing lines using slope intercept form lines worksheet**

**Project**
- Google site for Slope intercept line art
  - [https://sites.google.com/site/slopeinterceptlineart/](https://sites.google.com/site/slopeinterceptlineart/)

**Open ended constructed responses:**
Similar triangles with slopes

Use similar triangles to explain why the slope $m$ is the same between any two distinct points on coordinate plane.

**Examples**

Determine if the triangles are similar

![Diagram of similar triangles]

The triangle between A and B has a vertical height of 2 and a horizontal length of 3. The triangle between B and C has a vertical height of 4 and a horizonal length of 6.

**8.EE.6**

slope of a line

MP

8.MP.1
8.MP.3
8.MP.4
8.MP.5
8.MP.8

NOT IN TEXT

USE ONLINE RESOURCE

S in the Learning activities and assessment column

**Math Opener**


**Math Introduction Problem**

Given a line displayed on smart board, allow students to complete the following as an introduction:

- Find the slope of a line
- What geometric figure is formed by connecting vertices (0, 2), (0, 4), and (3,4)?
- What geometric figure is formed by connecting vertices (6,6), (6,8), and (9,8)?
- How do two figures identified in exercise 3 and 4 relate to each other?
- What geometric figure is formed by connecting the vertices (0,2), (0,6), and (6,6)?
- How do the two figures you identified in exercise 3 and 5 relate to each other?

Triangles identified are congruent triangles. Ratio of the slope of the line of the vertical side length to the horizontal side length of each triangle. Therefore, the ratio of side length is vertical side length/horizontal side length.

**Guided practice**


GREAT VIDEOS OF EACH GUIDED PRACTICE PROBLEM

http://learnzillion.com/lessons?utf8=✓&filters%5Bsubject%5D=mat
horizontal length of 6. Ratio represents a slope of \( \frac{2}{3} \) for the line, indicating that the triangles are similar.

The slope of the line is -3.5. What is the simplified ratio of the vertical side length to the horizontal side length of each triangle formed? Justify your response.

Online quiz questions
http://learnzillion.com/quizzes/2713

Math Problem of the Day: TE page 642 or use power point for 12-3 found in cd rom or my.hrwc.com

Math Guided Practice: 12-3 power point practice problems found in Holt McDougal power point

Math lesson quiz review 12-3 power point (at the end of the power point) or use my.hrwc.com

Graphing lines using standard form worksheet for more advance review http://www.kutasoftware.com/FreeWorkshe
<table>
<thead>
<tr>
<th>Topic</th>
<th>Description</th>
<th>Listed</th>
<th>Additional Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>slope-intercept form</td>
<td>Write the equation of the line that passes through each pair of points in</td>
<td><a href="http://my.hrw.com/tabnav/controller.jsp?isbn=0554007614">http://my.hrw.com/tabnav/controller.jsp?isbn=0554007614</a></td>
<td>Math Solutions TE page 645 independent and practice problems 13-29</td>
</tr>
</tbody>
</table>

**Point Slope Form**

Find the equation of a line given one point and the slope.

**EXAMPLES**

Use the point-slope form of each equation to identify a point the line passes through and the slope of the line.

\[ y - 7 = 3(x - 4) \]

Write the point-slope form of the equation with the given slope that passes through the indicated point with slope 4 passing through (5, -2).

8.EE.6 slope equation of a line
8.MP.1
8.MP.2
8.MP.4
8.MP.7
8.MP.8

Holt McDougal Chapter 12-4 TE pages 648-651
For advanced and average students TE page 650 example problems listed


Math Exploration 12-4 Transparency TE page 648 use my.hrw.com for PDF file or cd rom
Reaching All Learners Guided Practice 12-4 power point from textbook
Additional examples TE page 649
Also available in transparency my.hrw.com

Math Lab FACEing Math workbook with 27 problems of point slope form (teacher can create on their own)

Independent practice Workbook 12-4 A, B, C worksheets for basic, moderate, and advance learners

**Graphing inequalities**

Graph inequalities on a coordinate plane.

**EXAMPLES**

Graph Inequality.

\[ y < x - 1 \]
\[ y > 4x + 4 \]

8.EE.6 slope of a line
8.EE.7 Simultaneous linear equations

Holt McDougal Chapter 12-6 TE pages 659-663
For advanced


Math Introduction 12-6 Math Opener Transparency TE page 659 Use my.hrw.com or cd rom from textbook

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<tbody>
<tr>
<td>Graph system of linear equations to find their solutions (one step)</td>
<td>$4y - 12 = x$</td>
<td>4y = 3x + 1 solution</td>
<td>Multi Step Inequalities <a href="http://www.kutasoftware.com/FreeWorksheets/PreAlgWorksheets/Multi-Step%20Inequalities.pdf">http://www.kutasoftware.com/FreeWorksheets/PreAlgWorksheets/Multi-Step%20Inequalities.pdf</a></td>
<td>Hands-On Lab Guide practice Video <a href="http://www.youtube.com/watch?v=5h6YzRRxzO4">http://www.youtube.com/watch?v=5h6YzRRxzO4</a></td>
</tr>
<tr>
<td>Example Solve the linear system by graphing</td>
<td>$8y = 3x + 1$</td>
<td>$x = y + 2$</td>
<td>Reaching All Learners Strategies Practice problems shown on easel paper for online website created by teacher Use TE pages 662-667 #1-6 basic 8-13 intermediate 18-23 advance</td>
<td></td>
</tr>
<tr>
<td>Simultaneous linear equations</td>
<td>$y = 2x$</td>
<td></td>
<td>Math Intervention Practice worksheets A, B, C from 12-6 cut out and paste as index cards</td>
<td></td>
</tr>
<tr>
<td>For advanced and average students TE page 666 example problems listed</td>
<td></td>
<td></td>
<td>System of linear equations by substitution interactive power point website: <a href="http://www.wisc-online.com/Objects/ViewObject.aspx?ID=gem904">http://www.wisc-online.com/Objects/ViewObject.aspx?ID=gem904</a></td>
<td>Math Modeling 12-7 power point presentation from cd rom or my.hrw.com</td>
</tr>
<tr>
<td>Solving Systems of Equations by any method website:</td>
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<td><a href="http://www.quia.com/ba/33475.html">http://www.quia.com/ba/33475.html</a></td>
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<tr>
<th>Ready to Go On Intervention TE page 668 # 13-19</th>
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<tr>
<td>PDF file upload</td>
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<tr>
<td>Great examples</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Instructional activities</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="http://literacy.kent.edu/eureka/EDR/9/Math%20SolvingSystemsofLinearEquationsGrap%5Ching.pdf">http://literacy.kent.edu/eureka/EDR/9/Math%20SolvingSystemsofLinearEquationsGrap\hing.pdf</a></td>
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</tbody>
</table>

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<thead>
<tr>
<th>Systems of Equations Jeopardy website:</th>
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</thead>
</table>

**INSTRUCTIONAL FOCUS OF UNIT**

Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: **unit rate, proportional relationships, slope, vertical, horizontal, similar triangles, y-intercept**

**PARCC FRAMEWORK/ASSESSMENT**

Students build on previous work with proportional relationships, unit rates, and graphing to connect these ideas and understand that the points \((x, y)\) on a nonvertical line are the solutions of the equation \(y = mx + b\), where \(m\) is the slope of the line as well as the unit rate of the proportional relationship (in the case of \(b = 0\)). Students also formalize their previous work with linear relationships by working with function rules that assign to each input to exactly one output.

Examples from Model Curriculum aligned with PARCC Framework Assessment

The graph below shows the relationship between the number of pounds of apples purchased and the cost of the purchase at an apple orchard. What is the cost per pound of apples at the orchard?
Water flows into two different tanks of the same size. The amount of water, $y$, in ounces, that flows into each tank in $x$ minutes is represented below. Graph and determine which is faster.

**Tank A**

$$y = 25x$$

**Tank B**

<table>
<thead>
<tr>
<th>$x$</th>
<th>$y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>75</td>
</tr>
<tr>
<td>10</td>
<td>150</td>
</tr>
<tr>
<td>15</td>
<td>225</td>
</tr>
<tr>
<td>20</td>
<td>300</td>
</tr>
</tbody>
</table>

Write an equation that represents the graph of the line shown in the coordinate plane below.
PARCC Framework Assessment questions with Model Curriculum Website for all units
http://www.state.nj.us/education/modelcurriculum/math/8u5.shtml

Great wiki page for Common Core Assessments that is aligned with PARCC Assessments

Wiki page with open ended constructive response questions and UDL lessons
https://grade8commoncoremath.wikispaces.hcpss.org/Unit+3+Analyzing+Functions+and+Equations

Worksheets and other videos for Common Core Practice
http://www.buncombe.k12.nc.us/Page/36166

21ST CENTURY SKILLS
(4Cs & CTE Standards)

MODIFICATIONS/ACCOMMODATIONS

Small group instruction
- Review of printed notes from smart board/power point/star board.
- Activities completed in small group for more of an understanding

Individualized instruction

Peer tutoring
- Team up stronger math skills with lower math skills

Use of manipulatives
• White boards
• Dry erase markers
• Reference sheets created by special needs teacher
• Index cards created by student.
• Number line
• Reference charts for classroom
• Graphing calculator
• Web interactive activities
• Video tutorials from textbook or my.hrw.com

Computer activities for remediation
• Technology infusion

Chunking information
• Chunk up each skill so students can see difference in math algorithm

Oral questioning
• IEP modification for summative and formative assessments

APPENDIX
(Teacher resource extensions)

8.EE.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.

Example:
Compare the scenarios to determine which represents a greater speed. Include a description of each scenario including the unit rates in your explanation.

Scenario 1

Scenario 2

\[ y = 50x \]

\[ x \text{ is time in hours} \]

\[ y \text{ is distance in miles} \]
8.EE.6 Use similar triangles to explain why the slope \( m \) is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation \( y = mx \) for a line through the origin and the equation \( y = mx + b \) for a line intercepting the vertical axis at \( b \).

Example

Explain why \( \triangle ACB \) is similar to \( \triangle DFE \), and deduce that \( \overline{AB} \) has the same slope as \( \overline{BE} \). Express each line as an equation.

Math practices

1. Make sense of problems and persevere in solving them.
   In grade 8, students solve real world problems through the application of algebraic and geometric concepts. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, “What is the most efficient way to solve the problem?” “Does this make sense?”, and “Can I solve the problem in a different way?”

2. Reason abstractly and quantitatively.
   In grade 8, students represent a wide variety of real world contexts through the use of real numbers and variables in mathematical expressions, equations, and inequalities. They examine patterns in data and assess the degree of linearity of functions. Students contextualize to understand the meaning of the number or variable as related to the problem and decontextualize to manipulate symbolic representations by applying properties of operations.

3. Construct viable arguments and critique the reasoning of others.
   In grade 8, students construct arguments using verbal or written explanations accompanied by expressions, equations, inequalities, models, and graphs, tables, and other data displays (i.e. box plots, dot plots, histograms, etc.). They further refine their mathematical communication skills through mathematical discussions in which they critically evaluate their own thinking and the thinking of other students. They pose questions like “How did you get that?” “Why is that true?” “Does that always work?” They explain their thinking to others and respond to others’ thinking.

4. Model with mathematics.
   In grade 8, students model problem situations symbolically, graphically, tabularly, and contextually. Students form expressions, equations, or inequalities from real world contexts and connect symbolic and graphical representations. Students solve systems of linear equations and compare properties of functions provided in different forms. Students use scatterplots to represent data and describe associations between variables. Students need many opportunities to connect and explain the connections between the different representations. They should be able to use all of these representations as appropriate to a
problem context.

5. Use appropriate tools strategically.
Students consider available tools (including estimation and technology) when solving a mathematical problem and decide when certain tools might be helpful. For instance, students in grade 8 may translate a set of data given in tabular form to a graphical representation to compare it to another data set. Students might draw pictures, use applets, or write equations to show the relationships between the angles created by a transversal.

6. Attend to precision.
In grade 8, students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students use appropriate terminology when referring to the number system, functions, geometric figures, and data displays.

7. Look for and make use of structure.
Students routinely seek patterns or structures to model and solve problems. In grade 8, students apply properties to generate equivalent expressions and solve equations. Students examine patterns in tables and graphs to generate equations and describe relationships. Additionally, students experimentally verify the effects of transformations and describe them in terms of congruence and similarity.

Notes to teacher (not to be included in your final draft):

<table>
<thead>
<tr>
<th>4 Cs</th>
<th>Three part learning objective</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Creativity:</strong> projects</td>
<td><strong>TLWBAT:</strong> Create a figure on a xy coordinate plane in order to find the slope of any given line and the slope intercept form of an equation. Determine the lines in the figure can give a slope with specific criteria in order to calculate five positive slopes, five negative slopes, five zero slopes, and five undefined slopes with equations for any given line.</td>
</tr>
</tbody>
</table>

**Slope Intercept Line Art Project:**
- Students will complete a project on slope intercept form of an equation
- Students will design a picture of their very own (trace it from an image on Google)
- They will create five positive slopes with equations, 5 negative slopes with equations, 5 zero slopes with equations, and 5 undefined slopes with equations
- All work must be shown on a separate sheet of paper with correct coordinate points
For modified work, reduce the number of equations to solve or allow students to just find the slope

**Find the slope project**
**Mini project: Stain glass Window art**
- Students will complete a project on
finding the slope of a line

- Students will design a picture of their very own (trace it from an image on Google)
- They will calculate the slope of every line using the slope equation.
- All work must be shown on a separate sheet of paper with correct coordinate points

For modified work, reduce the number of equations to solve or allow students to just find the slope

### Critical Thinking:

<table>
<thead>
<tr>
<th>Math Journal</th>
</tr>
</thead>
<tbody>
<tr>
<td>• What is y?</td>
</tr>
<tr>
<td>• What is x?</td>
</tr>
<tr>
<td>• What is m?</td>
</tr>
<tr>
<td>• What is b?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>One-sentence summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use Model Curriculum problems to create one sentence summaries</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Directed paraphrasing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary of skills and vocabulary words for chapter 12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Short constructed response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create short constructed responses for NJASK review and practice of how to answer open ended questions with the NJ Hollistic 3 point scale.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Do now</th>
</tr>
</thead>
<tbody>
<tr>
<td>Various open ended questions found in textbook. In the teacher's edition, you can use the alternative opener or the problem of the days</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TLWBAT:</th>
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<tbody>
<tr>
<td>Refine their mathematical communication skills by using clear and precise language in their writing. Develop and enhance appropriate terminology when referring to exponents and scientific notation. Evaluate real world problems through the application of algebraic concepts by completing various critical thinking activities with at least 85% accuracy</td>
</tr>
</tbody>
</table>

| Use the for NJASK review questions |
created by teacher for common core or use this link: [http://www.doe.mass.edu/mcas/transition/2013MathStandards.html?grade=8](http://www.doe.mass.edu/mcas/transition/2013MathStandards.html?grade=8)

**POWS (Problem of the Weeks)**
- Students will complete POWS (created by the teacher using exam view) in order to create 3 part open ended constructed response questions for each skill of the unit. Please use the 3 point Math Hollistic Scoring Rubric for grading.

**Homework**
- A, B, C worksheets from workbook from Chapter 12

**Quizzes**
- Isolating the Y of any linear equation
- Finding the slope
- Graphing an equation
- Point slope quiz
- Finding b quiz

**Test**
- Summative Assessment
  - Slope equation of a line created by teacher on exam view
  - Chapter tests form my.hrw.com for each chapter

**Exit ticket**
- Identify your slope and y-intercept of the equation $y = mx + b$
- Graph a linear equation using rise over run

<table>
<thead>
<tr>
<th><strong>Collaboration: Teams/Groups/Stations</strong></th>
<th><strong>TLWBAT:</strong> Model and evaluate problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stations work</td>
<td>Math Labs</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>• Stations created by teacher for movement: students can work in groups or individually to calculate all contents for proportional relationships and slopes</td>
<td>• Each station should be created for each skill</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power points</th>
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</thead>
<tbody>
<tr>
<td>• Each section in the Holt/McDougal textbook comes with power point lesson notes to teach the students with. They are interactive power points with Problem of the Days and mini quiz lessons for review.</td>
<td></td>
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</tbody>
</table>
## UNIT 5
Functions

**Total Number of Days:** days  **Grade/Course:** 8/Math Inclusion

<table>
<thead>
<tr>
<th>ESSENTIAL QUESTIONS</th>
<th>ENDURING UNDERSTANDINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What are the characteristics of a function?</strong>&lt;br&gt;<strong>What is the difference between an input and an output of an equation?</strong></td>
<td><strong>A function is a rule that assigns exactly one output to each input.</strong>&lt;br&gt;<strong>Functions can be represented algebraically, graphically, in tables numerically, and verbally.</strong></td>
</tr>
<tr>
<td><strong>In what ways can you represent a function?</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PACING</th>
<th>CONTENT</th>
<th>SKILLS</th>
<th>STANDARDS (CCSS/MP)</th>
<th>RESOURCES</th>
<th>LEARNING ACTIVITIES/ASSESSMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1.5 days</td>
<td>Ordered Pairs</td>
<td>Calculate solutions of equations in two variables as ordered pairs&lt;br&gt;Examples&lt;br&gt;Determine whether each ordered pair is a solution of ( y = 4x - 1 ). ((3, 11)) ((10, 3))&lt;br&gt;Use the given values to make a table of solutions. ( y = x + 3 ) for ( x = 1, 2, 3, 4 )&lt;br&gt;In most states, the price of each item is not the total cost. Sales tax must be added. If sales tax is 7.5%, the equation for total cost is ( c = 1.075p ), where ( p ) is the price before tax.</td>
<td>8.F.1 Understanding Functions&lt;br&gt;MP&lt;br&gt;MP 1&lt;br&gt;MP 2&lt;br&gt;MP 4&lt;br&gt;MP 7</td>
<td>HOLT&lt;br&gt;McDougal&lt;br&gt;Chapter 3&lt;br&gt;TE pages 120-153&lt;br&gt;Section 3-1&lt;br&gt;Average and Advance Learners&lt;br&gt;TE page 122</td>
<td>Worksheet&lt;br&gt;<a href="http://staff.orecity.k12.or.us/jefwells/Site/January_AlgB_files/7.1%20worksheet.pdf">http://staff.orecity.k12.or.us/jefwells/Site/January_AlgB_files/7.1%20worksheet.pdf</a>&lt;br&gt;Worksheet&lt;br&gt;<a href="http://www.lsc.edu/faculty/nancy_s_mcwethy/Documents%20%20%20Downloa">http://www.lsc.edu/faculty/nancy_s_mcwethy/Documents%20%20%20Downloa</a> ds/MAT0028%20Worksheets%20CH%203.pdf&lt;br&gt;video&lt;br&gt;<a href="https://www.youtube.com/watch?v=o3Hb4t3eY">https://www.youtube.com/watch?v=o3Hb4t3eY</a></td>
</tr>
<tr>
<td><strong>Graphing Ordered Pairs</strong></td>
<td><strong>Graph points on the coordinate plane in order to determine the distance of the distinct points</strong></td>
<td><strong>8.F.1 Understanding Functions</strong></td>
<td><strong>HOLT McDougal Chapter 3 TE pages 120-153 Section 3-2</strong></td>
<td><strong>3-2 video tutorial:</strong> <a href="http://my.hrw.com/math06_07/notes/mathsaccessibility6_07/lesson_videos/msm3/player.html?contentSrc=13418/13418.xml">http://my.hrw.com/math06_07/notes/mathsaccessibility6_07/lesson_videos/msm3/player.html?contentSrc=13418/13418.xml</a></td>
<td><strong>Math Exploration Through Discussion 3-2 Transparency TE page 124</strong></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
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<td>---</td>
</tr>
<tr>
<td><strong>Examples</strong></td>
<td>Find the distance between each pair of points K and L (given graph)</td>
<td><strong>MP</strong></td>
<td><strong>Vertical line test:</strong> <a href="http://www.coolmath.com/algebra/15-functions/03-vertical-line-test-01.html">http://www.coolmath.com/algebra/15-functions/03-vertical-line-test-01.html</a></td>
<td><strong>Math Guided Practice 3-2 Power point Focus on Distance Formula</strong></td>
<td><strong>Math Independent Practice TE pages 126-127 Use for basic, intermediate, and advance learners</strong></td>
</tr>
<tr>
<td><strong>Functions</strong></td>
<td><strong>Represent functions with tables, graphs, or equations, and determining if each relation represents a function</strong></td>
<td><strong>MP 2</strong></td>
<td><strong>Creating very own functions using the function machine (alternate)</strong></td>
<td><strong>Problem Solving Workbook pages A, B, C 3-2 from workbook TE pages 126-127</strong></td>
<td><strong>Hands-On Activity Plot points on floor with tape Find the distance using distance formula Created by teacher Use my.hrw.com section 3-2 PDF file for activity <a href="http://highered.mcgraw-hill.com/sites/dl/free/0070988595/44927/mhr_ml7_2e_Ch01_NoGR.pdf">http://highered.mcgraw-hill.com/sites/dl/free/0070988595/44927/mhr_ml7_2e_Ch01_NoGR.pdf</a></strong></td>
</tr>
<tr>
<td><strong>Examples</strong></td>
<td>Make a table and a graph of ( y = 3 - x^2 ). Determine if the relationship represents a function.</td>
<td><strong>MP 3</strong></td>
<td><strong>Math Opener 3-4 Transparency TE page 136 my.hrw.com cd rom for extra handouts</strong></td>
<td><strong>Reaching All Learners Guided Practice 3-4 power point revise it if needed</strong></td>
<td><strong>Guided Math Practice Math Aides for practice <a href="http://www.math-aids.com/Function_Table/">http://www.math-aids.com/Function_Table/</a></strong></td>
</tr>
<tr>
<td>$x$</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>$y$</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

Determine if the relationship represents a function. 
$y = x^3$

Graph the function $y = x^2 - 3$. Is it a function?

外层 | 内层 |
--- | --- |
**Functions as Ordered Pairs** | **Generate different representations of the same data** |
**Examples** | The height $h$ of a helicopter $s$ seconds from take-off is $h = 15s$. Make a table and sketch a graph |
| **HOLT Understanding Functions** | MP | MP 1 | MP 2 | MP 4 | MP 6 |
| **8.F.1** | |
| **McDougal Chapter 3 TE pages 120-153** | Section 3-5 |
| **Textbook online** | **http://my.hrwc.com/tabnav/control.jsp?isbn=0554007614** |
| **Video tutorials** | **http://my.hrwc.com/tabnav/con** |

**Worksheets for Basic, Intermediate, and Advance Learners**

**Wiki page for worksheets**
Website for all functions worksheet [https://grade8commoncoremath.wikispaces.hcpss.org/Unit+3+Analyzing+Functions+and+Equations](https://grade8commoncoremath.wikispaces.hcpss.org/Unit+3+Analyzing+Functions+and+Equations)

**Function Notation notes:**
http://www.coolmath.com/algebra/15-functions/02-function-notation-01.htm

**Vertical line test notes:**

**Math Lab**

**Math Daily Opener**
3-5 Math Exploration TE page 140
Use my.hrwc.com or cd rom

**Math Motivational Guided practice**
3-5 power point from textbook
My.hrwc.com
of the equation.
Use the table to make a graph and to write an equation.

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

Comparing Functions

Compare properties of two functions each represented in a different way.

Example
At Swimmers Unlimited, you will earn a salary of $100 per week as a swim instructor, regardless of how many people sign up for swim lessons.

Write an equation for earnings (E) in terms of the number of people taking swim lessons (p).

Complete the table. Plot the points in your table on the graph below. Then graph the equation of the line that you wrote to represent the expected earnings for this job.

8.F.2 Comparing Functions

NOT IN HOLT TEXTBOOK

MP
MP 2
MP 3
MP 4

CONSTRUCTING functions


Website for all functions worksheet
https://grade8commoncoremath.wikispaces.hcpss.org/Unit+3+Analyzing+Functions+and+Equations
| Slope of a line: http://www.shodor.org/interactivate/activities/SlopeSlider/ |
| Open ended constructed responses: [link](http://www.mathworksheetsgo.com/downloads/algebra/linear_equation/slope/slope-of-a-line-worksheet.pdf) |
| Wiki page for worksheets and open ended questions Website for all functions worksheet [link](https://grade8commoncoremath.wikispaces.hcpss.org/Unit+3+Analyzing+Functions+and+Equations) |
| Cockroach game: [link](http://hotmath.com/hotmath_help/games/kp/kp_hotmath_sounds.swf) |
| Google site for Slope intercept line art [link](https://sites.google.com/site/slopeinterceptlineart/) |

**INSTRUCTIONAL FOCUS OF UNIT**

Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: functions, y-value, x-value, vertical line test, input, output, rate of change, linear function, non-linear function

**PARCC FRAMEWORK/ASSESSMENT**

Work toward meeting this standard repositions previous work with tables and graphs in the new context of input/output rules.

PARCC Framework Assessment questions with Model Curriculum Website for all units [link](http://www.state.nj.us/education/modelcurriculum/math/8u5.shtml)

Great wiki page for Common Core Assessments that is aligned with PARCC Assessments [link](http://maccss.ncdpi.wikispaces.net/file/view/CCSSMathTasks-Grade8.pdf/382798194/CCSSMathTasks-Grade8.pdf)
Examples of PARCC Framework Assessment Questions using Model Curriculum

Indicate whether each statement is true for all functions of $x$ in the $xy$-plane by checking the appropriate box in the table below.

<table>
<thead>
<tr>
<th>True of All Functions</th>
<th>Not True of All Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>No vertical line drawn through the graph of a function will intersect it more than once.</td>
<td></td>
</tr>
<tr>
<td>No horizontal line drawn through the graph of a function will intersect it more than once.</td>
<td></td>
</tr>
<tr>
<td>Each $y$-value of a function is mapped to exactly one $x$-value.</td>
<td></td>
</tr>
<tr>
<td>Each $x$-value of a function is mapped to exactly one $y$-value.</td>
<td></td>
</tr>
</tbody>
</table>

For the values of the slope and the $y$-intercept of the two linear functions of $x$ shown below, indicate if the value for function 1 is greater than, equal to, or less than the corresponding value for function 2 by checking the appropriate box in the table below.

<table>
<thead>
<tr>
<th>Function 1</th>
<th>Function 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$x$</td>
<td>$y$</td>
</tr>
<tr>
<td>-2</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>-1</td>
</tr>
</tbody>
</table>
Alice bought a new cell phone. The cell phone company she bought the phone from charges $50 per month for cell phone service, $200 for the new phone, and a fee of $175 if the contract is terminated before 2 years have expired. Which of the following linear equations models Alice’s total cost in dollars, $y$, as a function of the number of months after she purchased the phone, $x$, if she terminates her contract before 2 years?

### 21ST CENTURY SKILLS

(4Cs & CTE Standards)

#### MODIFICATIONS/ACCOMMODATIONS

**Small group instruction**
- Review of printed notes from smart board/power point/star board.
- Activities completed in small group for more of an understanding

**Individualized instruction**

**Peer tutoring**
- Team up stronger math skills with lower math skills

**Use of manipulatives**
- White boards
- Dry erase markers
- Reference sheets created by special needs teacher
- Index cards created by student.
- Number line
- Reference charts for classroom
- Graphing calculator
- Web interactive activities
- Video tutorials from textbook or my.hrww.com

**Computer activities for remediation**
- Technology infusion
Chunking information
  - Chunk up each skill so students can see difference in math algorithm

Oral questioning
  - IEP modification for summative and formative assessments

APPENDIX
(Teacher resource extensions)

8. F.1 Students understand rules that take $x$ as input and gives $y$ as output is a function. Functions occur when there is exactly one $y$-value is associated with any $x$-value. Using $y$ to represent the output we can represent this function with the equations $y = x^2 + 5x + 4$. Students are not expected to use the function notation $f(x)$ at this level.

Students identify functions from equations, graphs, and tables/ordered pairs.

Graphs
Students recognize graphs such as the one below is a function using the vertical line test, showing that each $x$-value has only one $y$-value; whereas, graphs such as the following are not functions since there are 2 $y$-values for multiple $x$-value.

Tables or Ordered Pairs
Students read tables or look at a set of ordered pairs to determine functions and identify equations where there is only one output ($y$-value) for each input ($x$-value).

<table>
<thead>
<tr>
<th>$x$</th>
<th>$y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>27</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$x$</th>
<th>$y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>4</td>
</tr>
<tr>
<td>16</td>
<td>-4</td>
</tr>
<tr>
<td>25</td>
<td>5</td>
</tr>
<tr>
<td>25</td>
<td>-5</td>
</tr>
</tbody>
</table>

{(0, 2), (1, 3), (2, 5), (3, 6)}

Equations
Students recognize equations such as $y = x$ or $y = x^2 + 3x + 4$ as functions; whereas, equations such as $x^2 + y^2 = 25$ are not functions.

8.F.2 Students compare two functions from different representations. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.

66
Example 1:
Compare the following functions to determine which has the greater rate of change.
Function 1: \( y = 2x + 4 \)
Function 2:

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>-6</td>
</tr>
<tr>
<td>0</td>
<td>-3</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

**Solution:** The rate of change for function 1 is 2; the rate of change for function 2 is 3. Function 2 has the greater rate of change.

Example 2:
Compare the two linear functions listed below and determine which has a negative slope.

Function 1: Gift Card
Samantha starts with $20 on a gift card for the bookstore. She spends $3.50 per week to buy a magazine. Let \( y \) be the amount remaining as a function of the number of weeks, \( x \).

Function 2: Calculator rental
The school bookstore rents graphing calculators for $5 per month. It also collects a non-refundable fee of $10.00 for the school year. Write the rule for the total cost (\( c \)) of renting a calculator as a function of the number of months (\( m \)).

\[ c = 10 + 5m \]

**Solution:** Function 1 is an example of a function whose graph has a negative slope. Both functions have a positive starting amount; however, in function 1, the amount decreases 3.50 each week, while in function 2, the amount increases 5.00 each month.

**NOTE:** Functions could be expressed in standard form. However, the intent is not to change from standard form to slope-intercept form but to use the standard form to generate ordered pairs. Substituting a zero (0) for \( x \) and \( y \) will generate two ordered pairs. From these ordered pairs, the slope could be determined.

Example 3:
\[ 2x + 3y = 6 \]
Let \( x = 0 \):
\[ 2(0) + 3y = 6 \]
\[ 3y = 6 \]
\[ y = 2 \]
Ordered pair: (0, 2)

Let \( y = 0 \):
\[ 2x + 3(0) = 6 \]
\[ 2x = 6 \]
\[ x = 3 \]
Ordered pair: (3, 0)
Using (0, 2) and (3, 0) students could find the slope and make comparisons with another function.

8.F.3 Students understand that linear functions have a constant rate of change between any two points. Students use equations, graphs and tables to categorize functions as linear or non-linear. Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.

Example 1:
Determine if the functions listed below are linear or non-linear. Explain your reasoning.

1. $y = -2x^2 + 3$
2. $y = 0.25 + 0.5(x - 2)$
3. $A = \pi r^2$
4.  

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

Math practices

1. Make sense of problems and persevere in solving them.
   In grade 8, students solve real world problems through the application of algebraic and geometric concepts. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, “What is the most efficient way to solve the problem?” “Does this make sense?” and “Can I solve the problem in a different way?”

2. Reason abstractly and quantitatively.
   In grade 8, students represent a wide variety of real world contexts through the use of real numbers and variables in mathematical expressions, equations, and inequalities. They examine patterns in data and assess the degree of linearity of functions. Students contextualize to understand the meaning of the number or variable as related to the problem and decontextualize to manipulate symbolic representations by applying properties of operations.

3. Construct viable arguments and critique the reasoning of others.
   In grade 8, students construct arguments using verbal or written explanations accompanied by expressions, equations, inequalities, models, and graphs, tables, and other data displays (i.e. box plots, dot plots, histograms, etc.). They further refine their mathematical communication skills through mathematical discussions in which they critically evaluate their own thinking and the thinking of other students. They pose questions like “How did you get that?”, “Why is that true?” “Does that always work?” They explain their thinking to others and respond to others’ thinking.

4. Model with mathematics.
   In grade 8, students model problem situations symbolically, graphically, tabularly, and contextually. Students form expressions, equations, or inequalities from real world contexts and connect symbolic and graphical representations. Students solve systems of linear equations and compare properties of functions
provided in different forms. Students use scatterplots to represent data and describe associations between variables. Students need many opportunities to connect and explain the connections between the different representations. They should be able to use all of these representations as appropriate to a problem context.

5. Use appropriate tools strategically. Students consider available tools (including estimation and technology) when solving a mathematical problem and decide when certain tools might be helpful. For instance, students in grade 8 may translate a set of data given in tabular form to a graphical representation to compare it to another data set. Students might draw pictures, use applets, or write equations to show the relationships between the angles created by a transversal.

6. Attend to precision. In grade 8, students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students use appropriate terminology when referring to the number system, functions, geometric figures, and data displays.

7. Look for and make use of structure. Students routinely seek patterns or structures to model and solve problems. In grade 8, students apply properties to generate equivalent expressions and solve equations. Students examine patterns in tables and graphs to generate equations and describe relationships. Additionally, students experimentally verify the effects of transformations and describe them in terms of congruence and similarity.

<table>
<thead>
<tr>
<th>4 Cs</th>
<th>Three part learning objective</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Creativity:</strong> projects</td>
<td><strong>TLWBAT:</strong></td>
</tr>
<tr>
<td><strong>Critical Thinking:</strong></td>
<td><strong>TLWBAT:</strong> Refine their mathematical communication skills by using clear and precise language in their writing. Develop and enhance appropriate terminology when referring to functions and interpreting functions. Evaluate real world problems through the application of algebraic concepts by completing various critical thinking activities with at least 85% accuracy.</td>
</tr>
</tbody>
</table>

Math Journal
- What are the similarities and differences between a continuous graph and a discrete graph?
- Create a real world scenario using an input and output of ordered pairs (x and y) detailing something that occurs in everyday life
- Create a functional relationship between the number of weeks (time) vs... and graph your function
- Can you tell if a relationship is a function by just looking at the range?

One-sentence summary
<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Where is the x-axis?</td>
<td></td>
</tr>
<tr>
<td>Where is the y-axis?</td>
<td></td>
</tr>
<tr>
<td>What is the first number in a coordinate point?</td>
<td></td>
</tr>
<tr>
<td>What is the second number in the coordinate point?</td>
<td></td>
</tr>
<tr>
<td>Where is the origin located?</td>
<td></td>
</tr>
<tr>
<td>What is a continuous graph?</td>
<td></td>
</tr>
<tr>
<td>What is a discrete graph?</td>
<td></td>
</tr>
</tbody>
</table>

Short constructed response
- Use Model Curriculum for questions
- Create your own using exam view program
- Create short constructed responses for NJASK review and practice of how to answer open ended questions with the NJ Hollistic 3 point scale.

Do now
- Various open ended questions found in textbook. In the teacher's edition, you can use the alternative opener or the problem of the days
- Use the for NJASK review questions created by teacher for common core or use this link: [http://www.doe.mass.edu/mcas/transition/2013MathStandards.html?grade=8](http://www.doe.mass.edu/mcas/transition/2013MathStandards.html?grade=8)

POWS (Problem of the Weeks)
- Students will complete POWS (created by the teacher using exam view) in order to create 3 part open ended constructed response questions for each skill of the unit. Please use the 3 point Math Hollistic Scoring Rubric for grading.

Homework
- 3-1 a, b, c
- 3-2 a, b, c
| **Quizzes (created by teacher using Exam View)** | 3-4 a, b, c  
3-5 a, b, c |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Interpreting graphs quiz</td>
<td>Determining the functional relationship</td>
</tr>
<tr>
<td>Function tables and distance formula quiz</td>
<td>Functions</td>
</tr>
<tr>
<td>Math university stations</td>
<td>Equations</td>
</tr>
<tr>
<td>Test</td>
<td>Summative Assessments</td>
</tr>
<tr>
<td>Teacher creating test from exam view or my.hr.com</td>
<td><strong>Exit ticket</strong></td>
</tr>
<tr>
<td>What is the output?</td>
<td>What is the input of a function?</td>
</tr>
</tbody>
</table>

**Collaboration: Teams/Groups/Stations**

<table>
<thead>
<tr>
<th>Stations work</th>
<th>Stations created by teacher for movement: students can work in groups or individually to calculate all contents for functions.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Each station should be created for each skill</td>
<td></td>
</tr>
</tbody>
</table>

| Math Labs | Use workbook pages from Holt McDougal to create lab activities for students to evaluate the skills learned for functions. |

**TLWBAT:** Model and evaluate problem situations symbolically and with a calculator. Demonstrate and evaluate expressions from real world contexts and connect symbolic reasoning. Routinely seek patterns or structures to model and solve problems for functions. Apply properties to generate equivalent expressions and solve expressions for evaluating functions and graphing them.
<table>
<thead>
<tr>
<th>Jeopardy games found online or created by teacher using jeopardy template</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Communication – Power points/Presentations</strong></td>
</tr>
<tr>
<td>TLWBAT: Demonstrate their understanding of skills and knowledge learned for functions by communicating skills with clear and precise language in their discussions with others and in their own reasoning. Use appropriate terminology when referring to functions. Apply properties to generate equivalent expressions and solve equations. Examine patterns in equations to generate solutions and describe relationships with at least 80% accuracy</td>
</tr>
</tbody>
</table>

- Each section in the Holt/McDougal textbook comes with power point lesson notes to teach the students with. They are interactive power points with Problem of the Days and mini quiz lessons for review

---

**UNIT 6**

**FUNCTIONS: INTERPRETING GRAPHS, VERBAL DESCRIPTIONS**

Total Number of Days: 7 days  
Grade/Course: 8/Math Inclusion

<table>
<thead>
<tr>
<th>ESSENTIAL QUESTIONS</th>
<th>ENDURING UNDERSTANDINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HOW CAN YOU CONSTRUCT A FUNCTION TO MODEL A LINEAR RELATIONSHIP?</strong></td>
<td><strong>IDENTIFY THE RATE OF CHANGE AND THE INITIAL VALUE FROM TABLES, GRAPHS, VERBAL DESCRIPTIONS, AND EQUATIONS</strong></td>
</tr>
<tr>
<td><strong>IN WHAT WAYS CAN YOU DETERMINE THE RATE OF CHANGE AND THE INITIAL VALUE OF THE FUNCTION?</strong></td>
<td><strong>DETERMINE THE RATE OF CHANGE AND THE INITIAL VALUE OF THE FUNCTION BY CREATING TABLES, GRAPHS, AND EQUATIONS WITH THE GIVEN INFORMATION.</strong></td>
</tr>
<tr>
<td>PACING</td>
<td>CONTENT</td>
</tr>
<tr>
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</tr>
<tr>
<td>Rate of change and initial value</td>
<td>Identify the rate of change (slope) and the initial value (y-intercept) from tables, graphs, equations, and verbal descriptions</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1-3 days</td>
<td>Graphing Lines Assess students’ mastery of concepts and skills in graphing linear relationships</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

1-3 days

Graphing Lines
Assess students’ mastery of concepts and skills in graphing linear relationships

8.F.4 Linear Relationships
Holt McDougal Chapter 12 TE page 652 672-673 675

Math lab TE page 670 Roll a die (red and blue) to generate the coordinates of points and plot points to create a line.

Math practice Ready to Go On Intervention
**INSTRUCTIONAL FOCUS OF UNIT**

Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: linear relationship, rate of change, slope, initial value, y-intercept

**PARCC FRAMEWORK/ASSESSMENT**

In 8th grade, Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two \((x, y)\) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g. where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

Worksheets and other videos for Common Core Practice
http://www.buncombe.k12.nc.us/Page/36166

PARCC Framework Assessment questions with Model Curriculum Website for all units
http://www.state.nj.us/education/modelcurriculum/math/8u5.shtml

Great wiki page for Common Core Assessments that is aligned with PARCC Assessments

Wiki page with open ended constructive response questions and UDL lessons
https://grade8commoncoremath.wikispaces.hcpss.org/Unit+3+Analyzing+Functions+and+Equations

Examples of PARCC Framework/Assessments based aligned with Model Curriculum

Diego is planting corn on his farm. He predicts that he will grow 20 tons of corn when he plants 5 acres with corn.
Use the information above to complete the table and then create a graph that represents the number of tons of corn grown for different numbers of acres planted.

<table>
<thead>
<tr>
<th>Number of Acres Planted with Corn</th>
<th>Tons of Corn Grown</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>10</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

Which of the following is an equation of the line whose graph is shown in the coordinate plane below?

Which of the following is an equation of the line that has a slope of \( \frac{1}{3} \) and passes through the point \((-6, 2)\)?

Wayne joins a health club and keeps track of his total club expenses at the end of each month of his membership, as shown in the table. The total expenses consist of a one-time registration fee and a cost per month.

<table>
<thead>
<tr>
<th>Month ( x )</th>
<th>Cumulative Health Club Expenses, ( y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$ 85</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>2</td>
<td>$110</td>
</tr>
<tr>
<td>3</td>
<td>$135</td>
</tr>
<tr>
<td>4</td>
<td>$160</td>
</tr>
<tr>
<td>5</td>
<td>$185</td>
</tr>
</tbody>
</table>

Part A: What is the one-time registration fee?

Part B: How much does Wayne pay each month to be a member of the health club

Part C: Write a function that shows the relationship between Wayne’s cumulative health club expenses, $y$, and the number of months since he joined the health club, $x$.

Jessica takes a road trip. She begins by driving slowly at a constant speed for a short distance and then stopping at a stop sign. After the short stop she drives again at a faster constant speed than before, and then she enters the highway after a short distance. Once on the highway, she drives at an even faster constant speed.

### 21st Century Skills
*(4Cs & CTE Standards)*

- [ ]

### Modifications/ Accommodations

<table>
<thead>
<tr>
<th>Small group instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review of printed notes from smart board/power point/star board.</td>
</tr>
<tr>
<td>Activities completed in small group for more of an understanding</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Individualized instruction</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Peer tutoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team up stronger math skills with lower math skills</td>
</tr>
</tbody>
</table>

| Use of manipulatives |
• White boards
• Dry erase markers
• Reference sheets created by special needs teacher
• Index cards created by student.
• Number line
• Reference charts for classroom
• Graphing calculator
• Web interactive activities
• Video tutorials from textbook or my.hrsw.com

Computer activities for remediation
• Technology infusion

Chunking information
• Chunk up each skill so students can see difference in math algorithm

Oral questioning
• IEP modification for summative and formative assessments

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**APPENDIX**
*(Teacher resource extensions)*

8.F.4 Students identify the rate of change (slope) and initial value (y-intercept) from tables, graphs, equations or verbal descriptions to write a function (linear equation). Students understand that the equation represents the relationship between the x-value and the y-value; what math operations are performed with the x-value to give the y-value. Slopes could be undefined slopes or zero slopes.

**Tables:**

Students recognize that in a table the y-intercept is the y-value when x is equal to 0. The slope can be determined by finding the ratio \( \frac{y}{x} \) between the change in two y-values and the change between the two corresponding x-values.

**Example 1:**
Write an equation that models the linear relationship in the table below.

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
<td>8</td>
</tr>
<tr>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>-1</td>
</tr>
</tbody>
</table>

**Solution:** The y-intercept in the table below would be (0, 2). The distance between 8 and -1 is 9 in a negative direction \( \rightarrow -9 \); the distance between -2 and 1 is 3 in a positive direction. The slope is the ratio of rise to run or \( \frac{y}{x} \) or \( \frac{-9}{3} = -3 \). The equation would be \( y = -3x + 2 \)

**Graphs:**
Using graphs, students identify the $y$-intercept as the point where the line crosses the $y$-axis and the slope as the rise to run.

**Example 2:**
Write an equation that models the linear relationship in the graph below.

![Graph with points (0, 4) and (4, 5)]

**Solution:** The $y$-intercept is 4. The slope is $\frac{1}{4}$, found by moving up 1 and right 4 going from (0, 4) to (4, 5). The linear equation would be $y = \frac{1}{4}x + 4$.

**Equations:**
In a linear equation the coefficient of $x$ is the slope and the constant is the $y$-intercept. Students need to be given the equations in formats other than $y = mx + b$, such as $y = ax + b$ (format from graphing calculator), $y = b + mx$ (often the format from contextual situations), etc.

**Point and Slope:**
Students write equations to model lines that pass through a given point with the given slope.

**Example 2:**
A line has a zero slope and passes through the point (-5, 4). What is the equation of the line?

**Solution:** $y = 4$

**Example 3:**
Write an equation for the line that has a slope of $\frac{1}{2}$ and passes though the point (-2, 5)

**Solution:** $y = \frac{1}{2}x + 6$

Students could multiply the slope $\frac{1}{2}$ by the $x$-coordinate -2 to get -1. Six (6) would need to be added to get to 5, which gives the linear equation.

Students also write equations given two ordered pairs. **Note that point-slope form is not an expectation at this level.** Students use the slope and $y$-intercepts to write a linear function in the form $y = mx + b$.

**Contextual Situations:**
In contextual situations, the $y$-intercept is generally the starting value or the value in the situation when the independent variable is 0. The slope is the rate of change that occurs in the problem. Rates of change can often occur over years. In these situations it is helpful for the years to be “converted” to 0, 1, 2, etc. For example, the years of 1960, 1970, and 1980 could be represented as 0 (for 1960), 10 (for 1970) and 20 (for 1980).

**Example 4:**
The company charges $45 a day for the car as well as charging a one-time $25 fee for the car’s navigation system (GPS). Write an expression for the cost in dollars, $c$, as
a function of the number of days, \( d \), the car was rented.

**Solution:** \( C = 45d + 25 \)

Students interpret the rate of change and the \( y \)-intercept in the context of the problem. In Example 4, the rate of change is 45 (the cost of renting the car) and that initial cost (the first day charge) also includes paying for the navigation system. Classroom discussion about one-time fees vs. recurrent fees will help students model contextual situations.

**8.F.5** Given a verbal description of a situation, students sketch a graph to model that situation. Given a graph of a situation, students provide a verbal description of the situation.

**Example 1:**
The graph below shows a John’s trip to school. He walks to his Sam’s house and, together, they ride a bus to school. The bus stops once before arriving at school.

Describe how each part A – E of the graph relates to the story.

**Solution:**
A John is walking to Sam’s house at a constant rate.
B John gets to Sam’s house and is waiting for the bus.
C John and Sam are riding the bus to school. The bus is moving at a constant rate, faster than John’s walking rate.
D The bus stops.
E The bus resumes at the same rate as in part C.

**Example 2:**
Describe the graph of the function between \( x = 2 \) and \( x = 5 \)?

**Solution:** The graph is non-linear and decreasing.

Math practices

1. Make sense of problems and persevere in solving them.
   In grade 8, students solve real world problems through the application of algebraic and geometric concepts. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, “What is the most efficient way to solve the problem?” “Does this make sense?” and “Can I solve the problem in a different way?”

2. Reason abstractly and quantitatively.
   In grade 8, students represent a wide variety of real world contexts through the use of real numbers and variables in mathematical expressions, equations, and inequalities. They examine patterns in data and assess the degree of linearity of functions. Students contextualize to understand the meaning of the number or variable as related to the problem and decontextualize to manipulate symbolic representations by applying properties of operations.
3. Construct viable arguments and critique the reasoning of others.
In grade 8, students construct arguments using verbal or written explanations accompanied by expressions, equations, inequalities, models, and graphs, tables, and other data displays (i.e. box plots, dot plots, histograms, etc.). They further refine their mathematical communication skills through mathematical discussions in which they critically evaluate their own thinking and the thinking of other students. They pose questions like “How did you get that?”, “Why is that true?” “Does that always work?” They explain their thinking to others and respond to others’ thinking.

4. Model with mathematics.
In grade 8, students model problem situations symbolically, graphically, tabularly, and contextually. Students form expressions, equations, or inequalities from real world contexts and connect symbolic and graphical representations. Students solve systems of linear equations and compare properties of functions provided in different forms. Students use scatterplots to represent data and describe associations between variables. Students need many opportunities to connect and explain the connections between the different representations. They should be able to use all of these representations as appropriate to a problem context.

5. Use appropriate tools strategically.
Students consider available tools (including estimation and technology) when solving a mathematical problem and decide when certain tools might be helpful. For instance, students in grade 8 may translate a set of data given in tabular form to a graphical representation to compare it to another data set. Students might draw pictures, use applets, or write equations to show the relationships between the angles created by a transversal.

6. Attend to precision.
In grade 8, students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students use appropriate terminology when referring to the number system, functions, geometric figures, and data displays.

7. Look for and make use of structure.
Students routinely seek patterns or structures to model and solve problems. In grade 8, students apply properties to generate equivalent expressions and solve equations. Students examine patterns in tables and graphs to generate equations and describe relationships. Additionally, students experimentally verify the effects of transformations and describe them in terms of congruence and similarity.

<table>
<thead>
<tr>
<th>4 Cs</th>
<th>Three part learning objective</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Creativity:</strong> projects</td>
<td><strong>TLWBAT:</strong> Students form equations from real world contexts and connect symbolic and graphical representations. Create graphs based on the information given. Determine the initial value and the constant rate of change based on tables, graphs, linear relationships, and verbal descriptions. Calculate linear relationships and draw graphs based on the initial value and rate of change.</td>
</tr>
</tbody>
</table>

**Interpreting Graphs**

- Students are given 12 scenarios (verbal descriptions). They must construct a graph based on their reading and constant rate of change with the initial value. Students can create small graphs on post its and place it on construction paper. Word problems can be taken form Model curriculum or textbook.
### Linear Relationships
- Students are given word problems, equations, graphs, and tables in a power point. They must construct graphs, tables, and linear relationships based on their math solutions and constant rate of change with the initial value. Students can create small graphs graph paper with tables and place it on poster paper.

### Critical Thinking:
- **TLWBAT:** Refine their mathematical communication skills by using clear and precise language in their writing. Develop and enhance appropriate terminology when referring to functions and linear relationships. Evaluate real world problems through the application of algebraic concepts by completing various critical thinking activities with at least 85% accuracy.

### Math Journal

**One-sentence summary**

**Short constructed response**
- Use Model Curriculum for questions
- Create your own using exam view program
- Create short constructed responses for NJASK review and practice of how to answer open ended questions with the NJ Hollistic 3 point scale.

### Do now
- Various open ended questions found in textbook. In the teacher's edition, you can use the alternative opener or the problem of the days
- Use the for NJASK review questions created by teacher for common core or use this link: [http://www.doe.mass.edu/mcas/transition/2013MathStandards.html?grade=8](http://www.doe.mass.edu/mcas/transition/2013MathStandards.html?grade=8)

### POWS (Problem of the Weeks)
- Students will complete POWS (created by the teacher using exam view) in order to create 3 part open ended constructed response questions for each skill of the unit. Please use the 3 point Math Hollistic Scoring Rubric for grading.
<table>
<thead>
<tr>
<th>Homework</th>
<th>3-1 a, b, c</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3-2 a, b, c</td>
</tr>
<tr>
<td></td>
<td>3-4 a, b, c</td>
</tr>
<tr>
<td></td>
<td>3-5 a, b, c</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quizzes (created by teacher using Exam View)</th>
<th>Use my.hr.com for extra modified quizzes</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Summative Assessments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Teacher creating test from exam view</td>
</tr>
<tr>
<td>or my.hr.com</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exit ticket</th>
<th>Use Model Curriculum questions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Teacher create own exit passes with</td>
</tr>
<tr>
<td></td>
<td>exam view</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Collaboration: Teams/Groups/Stations</strong></th>
<th><strong>TLWBAT:</strong> Model and evaluate problem situations symbolically and with a calculator. Demonstrate and evaluate functions from real world contexts and connect symbolic reasoning. Routinely seek patterns or structures to model and solve problems for linear relationships. Apply properties to generate linear relationships for functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stations work</td>
<td>Stations created by teacher for movement: students can work in groups or individually to calculate all contents</td>
</tr>
<tr>
<td></td>
<td>Each station should be created for each skill</td>
</tr>
</tbody>
</table>

| Math Labs                                | Use workbook pages from Holt McDougal to create lab activities for students to evaluate the skills learned for functions |

<p>| Cubing Activities | Jeopardy games found online or |</p>
<table>
<thead>
<tr>
<th><strong>Communication – Power points/Presentations</strong></th>
<th><strong>TLWBAT:</strong> Demonstrate their understanding of skills and knowledge learned for linear functions by communicating skills with clear and precise language in their discussions with others in their own reasoning. Use appropriate terminology when referring to functions. Apply properties of linear relationships to solve equations. Examine patterns to generate solutions with at least 80% accuracy</th>
</tr>
</thead>
</table>
| Power points  
  • Each section in the Holt/McDougal textbook comes with power point lesson notes to teach the students with. They are interactive power points with Problem of the Days and mini quiz lessons for review | |

**UNIT 7**  
**Geometry: Transformations and Angle Relationships**  
**Total Number of Days:** days  
**Grade/Course:** 8/Math Inclusion
<table>
<thead>
<tr>
<th>ESSENTIAL QUESTIONS</th>
<th>ENDURING UNDERSTANDINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What is the effect of dilations, translations, rotations, and reflections on two-dimensional figures in the coordinate plane?</strong></td>
<td>A two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations.</td>
</tr>
<tr>
<td><strong>How can you determine if a figure is similar to a second figure on the coordinate plane?</strong></td>
<td>A two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations.</td>
</tr>
<tr>
<td><strong>What informal arguments can you make about angles in a triangle and with a transversal?</strong></td>
<td>Use informal arguments to establish facts about the angle sum, exterior angles of triangles, and angles created when parallel lines are cut by a transversal.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PACING</th>
<th>CONTENT</th>
<th>SKILLS</th>
<th>STANDARDS (CCSS/MP)</th>
<th>RESOURCES</th>
<th>LEARNING ACTIVITIES/ASSESSMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3 days</td>
<td>Transformations</td>
<td>Experimentally verify the properties of translations, reflections, and rotations</td>
<td>8.G.1 Properties of Transformations</td>
<td>Holt Chapter 7-7 TE pages 365-371 For basic, intermediate advance use TE page 366</td>
<td>Transtar transformation game: <a href="http://www.mangaigh.com/en_us/games/transtar">http://www.mangaigh.com/en_us/games/transtar</a> Shape modes: <a href="http://www.mathplayground.com/ShapeMods/ShapeMods.html">http://www.mathplayground.com/ShapeMods/ShapeMods.html</a> Post the shapes: <a href="http://www.mathsonline.co.uk/nonmembers/gamesroom/tra">http://www.mathsonline.co.uk/nonmembers/gamesroom/tra</a></td>
</tr>
<tr>
<td>1-2.5 days</td>
<td>Transformations</td>
<td>Understand two dimensional figure is congruent to another by a 8.G.2 Congruency of Transformations 8.G.3 Resulting</td>
<td>Holt TE 7-7 See learning activities and other resources for extra help</td>
<td>Math PBL Opener: Video on an amusement park for a Problem based learning introduction: Scariest roller coasters</td>
<td></td>
</tr>
</tbody>
</table>
sequence of rotations, reflections, and translations and identifying the new coordinates

<table>
<thead>
<tr>
<th>Coordinates of Transformations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students will answer the following questions when viewing videos:</td>
</tr>
<tr>
<td>• What changed with each ride?</td>
</tr>
<tr>
<td>• What does each drop show?</td>
</tr>
<tr>
<td>• How can you use the word image when looking at the roller coasters?</td>
</tr>
</tbody>
</table>

Math Guided Practice:
7-7 power point review with two dimensional figures for transformations ONLY (EDIT IF NEEDED)
Videos
http://learnzillion.com/lessonsets/289-describe-sequences-of-transformations-to-prove-two-figures-are-similar-or-congruent

6 practice problems
http://www.mathsisfun.com/geometry/congruent.html

PDF with great problems

Hands-On Activity
Students will be given three copies of coordinate grids. On the first plane, students will trace the pattern MK. Students use figure given to transform. Students must show a reflection over x and y axes, rotation for 90, 180, and 270 (clockwise and counterclockwise), and a translation. Must identify new coordinates

Mini Project:
take two to three days total (week for special needs)
Students will create their own picture. Guidelines will be given as to what the picture should look like. Students must show a reflection over x and y axes, rotation for 90, 180, and 270 (clockwise and counterclockwise), and a translation. Students will identify the congruency of each transformation. Must identify new coordinates

Project:
Hispanic Heritage Month
Students will pick a flag from the list of Hispanic countries. They
| 1-3 days | Transformations | Similar figures have congruent angles and sides that are proportional from dilations with scale factors | 8.G.3 Resulting Coordinates of Transformations 8.G.4 Similar figures and Dilations | Holt TE 5-6 Pages 250-255 For basic, intermediate advance use TE page 254 | Math Opener TE page 252 Math exploration on dilations Use my.hrw.com or cd rom for download Reaching All Learners Guided Practice 5-6 power point presentation or use cd rom to download Edit power point if needed Videos [http://learnzillion.com/lessonsets/289-describe-sequences-of-transformations-to-prove-two-figures-are-similar-or-congruent](http://learnzillion.com/lessonsets/289-describe-sequences-of-transformations-to-prove-two-figures-are-similar-or-congruent) Math Focus Independent Practice TE page 254-255 problems for practice on graph paper Math Lab TE page 255 #15 Hands-On Lab Use graph paper and ruler to explore dilations of geometric figures TE page 250 PDF with great problems [http://glencoe.mcgraw-hill.com/sites/dl/free/0078884845/634463/geohwp.pdf](http://glencoe.mcgraw-hill.com/sites/dl/free/0078884845/634463/geohwp.pdf) Math Think and Discuss Describe the relationship between the corresponding sides of the image and the original figure of a dilation. Math Stations Use worksheets A, B, C from 5-6 |

then will plot points on a coordinate graph. Students must show a reflection over x and y axes, rotation for 90, 180, and 270 (clockwise and counterclockwise), and a translation. When students translate the figure, they must not let the figures overlap either. Must identify new coordinates All instructions can be found on the Google Site. [https://sites.google.com/site/principlesofgeometry/transformations](https://sites.google.com/site/principlesofgeometry/transformations)
| Day(s)    | Topic                   | Activity                                                                 | Resource                                                                                      | Review Resource                        |
|----------|-------------------------|--------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| 1-2.5 days | Parallel and Perpendicular Lines | Identify parallel and perpendicular lines and the angles formed by a transversal | Holt TE 7-2 pages 336-341<br>TE page 338 for average and advance problems<br>Quizlet: [http://quizlet.com/2821906/parallel-lines-and-transversals-flash-cards/](http://quizlet.com/2821906/parallel-lines-and-transversals-flash-cards/)<br>Google Sites: [https://sites.google.com/site/principlesofgeometry/](https://sites.google.com/site/principlesofgeometry/)<br>Geometry questions: [http://www.mathopolis.com/questions/q.php?id=813&site=1&ref=/geometry/parallel-lines.html&qs=813_814_1783_3298_815_816_1784_1785_3299_3300](http://www.mathopolis.com/questions/q.php?id=813&site=1&ref=/geometry/parallel-lines.html&qs=813_814_1783_3298_815_816_1784_1785_3299_3300) who wants to be a Math Opener 7-3 Exploration Transparency<br>Use cd rom or my.hrw.com to download<br>Math Teach Lesson 7-2 power point from cd rom<br>Use real world problems TE 336<br>Practice problems TE pages 338-339 1-17 guided work<br>Math Stations<br>Use A, B, C worksheets from 7-2 and create stations<br>Hands On Lab Constructions TE page 340 |
### INSTRUCTIONAL FOCUS OF UNIT

Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are: **translations, rotations, reflections, line of reflection, center of rotation, clockwise, counterclockwise, parallel lines, congruence, ≅, reading A’ as “A prime”, similarity, dilations, pre-image, image, rigid transformations, exterior angles, interior angles, alternate interior angles, angle-angle criterion, deductive reasoning, vertical angles, adjacent, supplementary, complementary, corresponding, scale factor, transversal, parallel**

### PARCC FRAMEWORK/ASSESSMENT

#### 21st CENTURY SKILLS

(4Cs & CTE Standards)

### MODIFICATIONS/ACCOMMODATIONS

### APPENDIX

(Teacher resource extensions)

**8.G.1** Verify experimentally the properties of rotations, reflections, and translations:

- a. Lines are taken to lines, and line segments to line segments of the same length.
- b. Angles are taken to angles of the same measure.
- c. Parallel lines are taken to parallel lines.

Example:

**Students use compasses, protractors and rulers or technology to explore figures created from translations, reflections and rotations.** Characteristics of figures, such as lengths of line segments, angle measures and parallel lines, are explored before the transformation (pre-image) and after the transformation (image). Students understand that these transformations produce images of exactly the same size and shape as the pre-image and are known as rigid transformations.
8.G.2 Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.

Students examine two figures to determine congruency by identifying the rigid transformation(s) that produced the figures. Students recognize the symbol for congruency ($\cong$) and write statements of congruency.

Example 1:
Is Figure A congruent to Figure A’? Explain how you know.

**Solution:** These figures are congruent since A’ was produced by translating each vertex of Figure A 3 to the right and 1 down

Example 2:
Describe the sequence of transformations that results in the transformation of Figure A to Figure A’.

**Solution:** Figure A’ was produced by a $90^\circ$ clockwise rotation around the origin.
8.G.3 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

**Translations**
Translations move the object so that every point of the object moves in the same direction as well as the same distance. In a translation, the translated object is congruent to its pre-image. Triangle ABC has been translated 7 units to the right and 3 units up. To get from A (1,5) to A' (8,8), move A 7 units to the right (from $x = 1$ to $x = 8$) and 3 units up (from $y = 5$ to $y = 8$). Points B and C also move in the same direction (7 units to the right and 3 units up), resulting in the same changes to each coordinate.

![Translation Diagram](image)

**Reflections**
A reflection is the “flipping” of an object over a line, known as the “line of reflection”. In the 8th grade, the line of reflection will be the x-axis and the y-axis. Students recognize that when an object is reflected across the y-axis, the reflected x-coordinate is the opposite of the pre-image x-coordinate (see figure below).

![Reflection Diagram](image)

Likewise, a reflection across the x-axis would change a pre-image coordinate (3, -8) to the image coordinate of (3, 8) -- note that the reflected y-coordinate is opposite of the pre-image y-coordinate.

**Rotations**
A rotation is a transformation performed by “spinning” the figure around a fixed point known as the center of rotation. The figure may be rotated clockwise or counterclockwise up to 360º (at 8th grade, rotations will be around the origin and a multiple of 90º). In a rotation, the rotated object is congruent to its pre-image.
Consider when triangle DEF is 180° clockwise about the origin. The coordinate of triangle DEF are D(2,5), E(2,1), and F(8,1). When rotated 180° about the origin, the new coordinates are D'(-2,-5), E'(-2,-1) and F'(-8,-1). In this case, each coordinate is the opposite of its pre-image (see figure below).

Dilations
A dilation is a non-rigid transformation that moves each point along a ray which starts from a fixed center, and multiplies distances from this center by a common scale factor. Dilations enlarge (scale factors greater than one) or reduce (scale factors less than one) the size of a figure by the scale factor. In 8th grade, dilations will be from the origin. The dilated figure is similar to its pre-image.

The coordinates of A are (2, 6); A' (1, 3). The coordinates of B are (6, 4) and B' are (3, 2). The coordinates of C are (4, 0) and C' are (2, 0). Each of the image coordinates is ½ the value of the pre-image coordinates indicating a scale factor of ½.

The scale factor would also be evident in the length of the line segments using the ratio: \( \frac{\text{image length}}{\text{pre-image length}} \)

Students recognize the relationship between the coordinates of the pre-image, the image and the scale factor for a dilation from the origin. Using the coordinates, students are able to identify the scale factor (image/pre-image).

Students identify the transformation based on given coordinates. For example, the pre-image coordinates of a triangle are A(4, 5), B(3, 7), and C(5, 7). The image coordinates are A(-4, 5), B(-3, 7), and C(-5, 7). What transformation occurred?

8.G.4 Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations,
reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

Example 1:
Is Figure A similar to Figure A'? Explain how you know.

Solution: Dilated with a scale factor of $\frac{1}{2}$ then reflected across the x-axis, making Figures A and A' similar.

Students need to be able to identify that triangles are similar or congruent based on given information.

Example 2:
Describe the sequence of transformations that results in the transformation of Figure A to Figure A’.

Solution: 90° clockwise rotation, translate 4 right and 2 up, dilation of $\frac{1}{2}$. In this case, the scale factor of the dilation can be found by using the horizontal distances on the triangle (image = 2 units; pre-image = 4 units)

8.G.5 Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.

Students construct various triangles and find the measures of the interior and exterior angles. Students make conjectures about the relationship between the measure of an exterior angle and the other two angles of a triangle. (the measure of an exterior angle of a triangle is equal to the sum of the measures of the other two interior angles) and the sum of the exterior angles (360º). Using these relationships, students use deductive reasoning to find the measure of missing angles.

Students construct parallel lines and a transversal to examine the relationships between the created angles. Students recognize vertical angles, adjacent angles and supplementary angles from 7th grade and build on these relationships to identify other pairs of congruent angles.
Using these relationships, students use deductive reasoning to find the measure of missing angles.

**Example 1:**
You are building a bench for a picnic table. The top of the bench will be parallel to the ground. If \( \angle 1 = 148^\circ \), find \( \angle 2 \) and \( \angle 3 \). Explain your answer.

**Solution:**
Angle 1 and angle 2 are alternate interior angles, giving angle 2 a measure of 148°. Angle 2 and angle 3 are supplementary. Angle 3 will have a measure of 32° so \( \angle 2 + \angle 3 = 180^\circ \)

**Example 2:**
Show that \( \angle 3 + \angle 4 + \angle 5 = 180^\circ \) if line \( l \) and \( m \) are parallel lines and \( t_1 \) and \( t_2 \) are transversals.

**Solution:** \( \angle 1 + \angle 2 + \angle 3 = 180^\circ \)

\( \angle 5 \cong \angle 1 \) corresponding angles are congruent therefore \( \angle 1 \) can be substituted for \( \angle 5 \)

\( \angle 4 \cong \angle 2 \) alternate interior angles are congruent therefore \( \angle 4 \) can be substituted for \( \angle 2 \)

Therefore \( \angle 3 + \angle 4 + \angle 5 = 180^\circ \)

Students can informally conclude that the sum of the angles in a triangle is 180° (the angle-sum theorem) by applying their understanding of lines and alternate interior angles.
Example 3:
In the figure below Line $X$ is parallel to Line $YZ$. Prove that the sum of the angles of a triangle is $180^\circ$.

Solution: Angle $a$ is $35^\circ$ because it alternates with the angle inside the triangle that measures $35^\circ$. Angle $c$ is $80^\circ$ because it alternates with the angle inside the triangle that measures $80^\circ$. Because lines have a measure of $180^\circ$, and angles $a + b + c$ form a straight line, then angle $b$ must be $65^\circ \Rightarrow 180 - (35 + 80) = 65$. Therefore, the sum of the angles of the triangle is $35^\circ + 65^\circ + 80^\circ$.

Example 4:
What is the measure of angle 5 if the measure of angle 2 is $45^\circ$ and the measure of angle 3 is $60^\circ$?

Solution: Angles 2 and 4 are alternate interior angles, therefore the measure of angle 4 is also $45^\circ$. The measure of angles 3, 4 and 5 must add to $180^\circ$. If angles 3 and 4 add to $105^\circ$ the angle 5 must be equal to $75^\circ$.

Students construct various triangles having line segments of different lengths but with two corresponding congruent angles. Comparing ratios of sides will produce a constant scale factor, meaning the triangles are similar. Students solve problems with similar triangles.

Math practices

1. Make sense of problems and persevere in solving them.
   In grade 8, students solve real world problems through the application of algebraic and geometric concepts. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, “What is the most efficient way to solve the problem?”, “Does this make sense?”, and “Can I solve the problem in a different way?”

2. Reason abstractly and quantitatively.
   In grade 8, students represent a wide variety of real world contexts through the use of real numbers and variables in mathematical expressions, equations, and inequalities. They examine patterns in data and assess the degree of linearity of functions. Students contextualize to understand the meaning of the number or variable as related to the problem and decontextualize to manipulate symbolic representations by applying properties of operations.
3. Construct viable arguments and critique the reasoning of others.
In grade 8, students construct arguments using verbal or written explanations accompanied by expressions, equations, inequalities, models, and graphs, tables, and other data displays (i.e. box plots, dot plots, histograms, etc.). They further refine their mathematical communication skills through mathematical discussions in which they critically evaluate their own thinking and the thinking of other students. They pose questions like “How did you get that?”, “Why is that true?” “Does that always work?” They explain their thinking to others and respond to others’ thinking.

4. Model with mathematics.
In grade 8, students model problem situations symbolically, graphically, tabularly, and contextually. Students form expressions, equations, or inequalities from real world contexts and connect symbolic and graphical representations. Students solve systems of linear equations and compare properties of functions provided in different forms. Students use scatterplots to represent data and describe associations between variables. Students need many opportunities to connect and explain the connections between the different representations. They should be able to use all of these representations as appropriate to a problem context.

5. Use appropriate tools strategically.
Students consider available tools (including estimation and technology) when solving a mathematical problem and decide when certain tools might be helpful. For instance, students in grade 8 may translate a set of data given in tabular form to a graphical representation to compare it to another data set. Students might draw pictures, use applets, or write equations to show the relationships between the angles created by a transversal.

6. Attend to precision.
In grade 8, students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students use appropriate terminology when referring to the number system, functions, geometric figures, and data displays.

7. Look for and make use of structure.
Students routinely seek patterns or structures to model and solve problems. In grade 8, students apply properties to generate equivalent expressions and solve equations. Students examine patterns in tables and graphs to generate equations and describe relationships. Additionally, students experimentally verify the effects of transformations and describe them in terms of congruence and similarity.

<table>
<thead>
<tr>
<th>4 Cs</th>
<th>Three part learning objective</th>
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<tbody>
<tr>
<td><strong>Creativity:</strong> projects</td>
<td><strong>TLWBAT:</strong></td>
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</table>
### Cross Curriculum project with Science

- Students can find the standard form and the scientific notation form of any number by Life Science applications (i.e. human blood cells diameter, size of protons, neutrons, and electrons, planet's distance from the Sun, length of particles, atomic mass of an element, mass of insects (butterflies with the quantity of how many there are...))
- Create a menu with topics or create a think tac toe board for various real world scenarios

### Critical Thinking:

#### Math Journal

- Think of two real world scenarios of parallel lines. Write about how these examples are different from the mathematical concept of parallel lines.
- Explain whether a right triangle can be equilateral. Can it be isosceles? Scalene?
- Write 3 sentences in reference to these math symbols and using prime, image, arrow notation: $A'$ \quad A→A'

#### One-sentence summary

- Tell why an integer raised to the negative exponent can never be greater than 1.
- Write 4 to the second power raised to the 3rd power with a single exponent.
- Show how to represent 5 to the -3 power as a repeated division.
- A student said that 3 to the 5th power/9 to the 5th power is the same as 1/3. What mistake did the student make?

#### Directed paraphrasing

- summary of skills and vocabulary

### TLWBAT:

- Complete a think tac toe choice board by picking any activity from the 9 options for evaluating exponents and scientific notation. Apply skills and knowledge learned on exponents and scientific notation to real world scenarios given in think tac toe board by completing three in a row and receiving a 3, 2, 1, or 0 on the Hollistic scoring rubric. (80% and higher).

- Refine their mathematical communication skills by using clear and precise language in their writing. Develop and enhance appropriate terminology when referring to exponents and scientific notation. Evaluate real world problems through the application of algebraic concepts by completing various critical thinking activities with at least 85% accuracy.
words for chapter 7

Short constructed response
- Create short constructed responses for NJASK review and practice of how to answer open ended questions with the NJ Hollistic 3 point scale.

Do now
- Various open ended questions found in textbook. In the teacher's edition, you can use the alternative opener or the problem of the days
- Use the for NJASK review questions created by teacher for common core or use this link: http://www.doe.mass.edu/mcas/transition/2013MathStandards.html?grade=8

POWS (Problem of the Weeks)
- Students will complete POWS (created by the teacher using exam view) in order to create 3 part open ended constructed response questions for each skill of the unit. Please use the 3 point Math Hollistic Scoring Rubric for grading.

Homework
- Handout packet for review (practice a, b, c found in textbook) for each section of chapter 7

Minute paper
- Name all alternate interior angles, Alternate exterior, Corresponding, Supplementary, Complementary angles

Quizzes
- Parallel lines with Transversals
- Congruent measurements
- Angle Relationships A, B, C (quiz, advanced, and modified)
- Transformations quiz
- Use my.hrw.com to get modified quizzes
- Triangle Sum Theorem

Test
- Summative Assessment
- Properties of geometry created by teacher on exam view
- Chapter tests form my.hrw.com for each chapter

Exit ticket
- 7-2 transparency (page 339 in teacher edition). Name all congruent angles. Name all supplementary angles. Find the measure of angle 3 and 6.
- Solve each equation to determine the missing value:
  - $62 + x + 37 = 180$
  - $x + 90 + 11 = 180$
  - $180 = 3x + 72$
- Find the angle measures in the isosceles triangle
- Find the angle measures in the scalene triangle.
- Graph the translation of triangle ABC 2 units right and 3 units down
- Graph the reflection of quadrilateral ABCD across the y-axis

**Collaboration: Teams/Groups/Stations**

- Stations created by teacher for movement: students can work in groups or individually to calculate all contents for geometry
- Each station should be created for

**TLWBAT:** Model and evaluate problem situations symbolically and with a calculator. Demonstrate and evaluate expressions from real world contexts and connect symbolic reasoning. Routinely seek patterns or structures to model and solve problems for geometric properties.
<table>
<thead>
<tr>
<th>Math Labs</th>
<th>Use workbook pages from Holt McDougal to create lab activities for students to evaluate the skills learned for geometric properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cubing Activities</td>
<td>Jeopardy games found online or created by teacher using jeopardy template</td>
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**Communication – Power points/Presentations**

<table>
<thead>
<tr>
<th>Power points</th>
<th>Each section in the Holt/McDougal textbook comes with power point lesson notes to teach the students with. They are interactive power points with Problem of the Days and mini quiz lessons for review.</th>
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</table>

**TLWBAT:** Demonstrate their understanding of skills and knowledge learned for scientific notation and exponents by communicating skills with clear and precise language in their discussions with others and in their own reasoning. Use appropriate terminology when referring to geometric properties. Apply properties to generate solutions. Examine patterns in geometry to generate solutions and describe relationships with at least 80% accuracy.