MATHEMATICS

Grade 7: Unit 2
Equations, Ratio & Proportion
Course Philosophy/Description

In mathematics, students will learn to address a range of tasks focusing on the application of concepts, skills and understandings. Students will be asked to solve problems involving the key knowledge and skills for their grade level as identified by the NJSLS; express mathematical reasoning and construct a mathematical argument and apply concepts to solve model real world problems. The balanced math instructional model will be used as the basis for all mathematics instruction.

Seventh grade Mathematics consists of the following domains: Ratios and Proportional Relationships (RP), The Number System (NS), Expressions and Equations (EE), Geometry (G), and Statistics and Probability (SP). In seventh grade, instructional time should focus on four critical areas: (1) developing understanding of and applying proportional relationships; (2) developing understanding of operations with rational numbers and working with expressions and linear equations; (3) solving problems involving scale drawings and informal geometric constructions, and working with two- and three-dimensional shapes to solve problems involving area, surface area, and volume; and (4) drawing inferences about populations based on samples.

1) Students extend their understanding of ratios and develop understanding of proportionality to solve single- and multi-step problems. Students use their understanding of ratios and proportionality to solve a wide variety of percent problems, including those involving discounts, interest, taxes, tips, and percent increase or decrease. Students solve problems about scale drawings by relating corresponding lengths between the objects or by using the fact that relationships of lengths within an object are preserved in similar objects. Students graph proportional relationships and understand the unit rate informally as a measure of the steepness of the related line, called the slope. They distinguish proportional relationships from other relationships.

2) Students develop a unified understanding of number, recognizing fractions, decimals (that have a finite or a repeating decimal representation), and percents as different representations of rational numbers. Students extend addition, subtraction, multiplication, and division to all rational numbers, maintaining the properties of operations and the relationships between addition and subtraction, and multiplication and division. By applying these properties, and by viewing negative numbers in terms of everyday contexts (e.g., amounts owed or temperatures below zero), students explain and interpret the rules for adding, subtracting, multiplying, and dividing with negative numbers. They use the arithmetic of rational numbers as they formulate expressions and equations in one variable and use these equations to solve problems.

3) Students continue their work with area from Grade 6, solving problems involving the area and circumference of a circle and surface area of three-dimensional objects. In preparation for work on congruence and similarity in Grade 8 they reason about relationships among two-dimensional figures using scale drawings and informal geometric constructions, and they gain familiarity with the relationships between angles formed by intersecting lines. Students work with three-dimensional figures, relating them to two-dimensional figures by examining cross-sections. They solve real-world and mathematical problems involving area, surface area, and volume of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes and right prisms.

4) Students build on their previous work with single data distributions to compare two data distributions and address questions about differences between populations. They begin informal work with random sampling to generate data sets and learn about the importance of representative samples for drawing inferences.
This ESL framework was designed to be used by bilingual, dual language, ESL and general education teachers. Bilingual and dual language programs use the home language and a second language for instruction. ESL teachers and general education or bilingual teachers may use this document to collaborate on unit and lesson planning to decide who will address certain components of the SLO and language objective. ESL teachers may use the appropriate leveled language objective to build lessons for ELLs which reflects what is covered in the general education program. In this way, whether it is a pull-out or push-in model, all teachers are working on the same Student Learning Objective connected to the New Jersey Student Learning Standard. The design of language objectives are based on the alignment of the World-Class Instructional Design Assessment (WIDA) Consortium’s English Language Development (ELD) standards with the New Jersey Student Learning Standards (NJSLS). WIDA’s ELD standards advance academic language development across content areas ultimately leading to academic achievement for English learners. As English learners are progressing through the six developmental linguistic stages, this framework will assist all teachers who work with English learners to appropriately identify the language needed to meet the requirements of the content standard. At the same time, the language objectives recognize the cognitive demand required to complete educational tasks. Even though listening and reading (receptive) skills differ from speaking and writing (expressive) skills across proficiency levels the cognitive function should not be diminished. For example, an Entering Level One student only has the linguistic ability to respond in single words in English with significant support from their home language. However, they could complete a Venn diagram with single words which demonstrates that they understand how the elements compare and contrast with each other or they could respond with the support of their home language (L1) with assistance from a teacher, para-professional, peer or a technology program.

[Link to State of New Jersey Department of Education website]
<table>
<thead>
<tr>
<th>#</th>
<th>Student Learning Objective</th>
<th>NJSLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Solve multi-step real life and mathematical problems with rational numbers in any form (fractions, decimals) by applying properties of operations and converting rational numbers between forms as needed. Assess the reasonableness of answers using mental computation and estimation strategies.</td>
<td>7.EE.B.3</td>
</tr>
<tr>
<td></td>
<td><img src="instruction.png" alt="Instruction: 8 weeks" /> <img src="assessment.png" alt="Assessment: 1 week" /></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Use variables to represent quantities in a real-world or mathematical problem by constructing simple equations and inequalities to represent problems.</td>
<td>7.EE.B.4a, 4b*</td>
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<tr>
<td>3</td>
<td>Fluently solve equations; solve inequalities, graph the solution set of the inequality and interpret the solutions in the context of the problem (Equations of the form px + q = r and p(x + q) = r and inequalities of the form px + q &gt; r, px + q ≥r, px + q ≤ r, or px + q &lt; r, where p, q, and r are specific rational numbers).</td>
<td>7.EE.B.4a, 4b*</td>
</tr>
<tr>
<td>4</td>
<td>Calculate and interpret unit rates of various quantities involving ratios of fractions that contain like and different units.</td>
<td>7.RP.A.1</td>
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<td>5</td>
<td>Determine if a proportional relationship exists between two quantities e.g. by testing for equivalent ratios in a table or graph on the coordinate plane and observing whether the graph is a straight line through the origin.</td>
<td>7.RP.A.2a</td>
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<tr>
<td>6</td>
<td>Identify the constant of proportionality (unit rate) from tables, graphs, equations, diagrams, and verbal descriptions.</td>
<td>7.RP.A.2b</td>
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<td></td>
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<td>Pacing Chart – Unit 2</td>
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<tr>
<td>7</td>
<td>Write equations to model proportional relationships in real world problems.</td>
<td>7.RP.A.2c</td>
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<tr>
<td>8</td>
<td>Use the graph of a proportional relationship to interpret the meaning of any point ((x, y)) on the graph in terms of the situation - including the points ((0, 0)) and ((1, r)), recognizing that (r) is the unit rate.</td>
<td>7.RP.A.2d</td>
</tr>
<tr>
<td>9</td>
<td>Solve multi-step ratio and percent problems using proportional relationships (simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error)</td>
<td>7.RP.A.3*</td>
</tr>
</tbody>
</table>
| 10 | Solve multi-step ratio and percent problems using proportional relationships including scale drawings of geometry figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. | 7.RP.A.3*  
 7.G.A.1 |
Research about Teaching and Learning Mathematics

Structure teaching of mathematical concepts and skills around problems to be solved (Checkly, 1997; Wood & Sellars, 1996; Wood & Sellars, 1997)

Encourage students to work cooperatively with others (Johnson & Johnson, 1975; Davidson, 1990)

Use group problem-solving to stimulate students to apply their mathematical thinking skills (Artzt & Armour-Thomas, 1992)

Students interact in ways that support and challenge one another’s strategic thinking (Artzt, Armour-Thomas, & Curcio, 2008)

Activities structured in ways allowing students to explore, explain, extend, and evaluate their progress (National Research Council, 1999)

There are three critical components to effective mathematics instruction (Shellard & Moyer, 2002):

- Teaching for conceptual understanding
- Developing children’s procedural literacy
- Promoting strategic competence through meaningful problem-solving investigations

Teachers should be:

- Demonstrating acceptance and recognition of students’ divergent ideas
- Challenging students to think deeply about the problems they are solving, extending thinking beyond the solutions and algorithms required to solve the problem
- Influencing learning by asking challenging and interesting questions to accelerate students’ innate inquisitiveness and foster them to examine concepts further
- Projecting a positive attitude about mathematics and about students’ ability to “do” mathematics

Students should be:

- Actively engaging in “doing” mathematics
- Solving challenging problems
- Investigating meaningful real-world problems
- Making interdisciplinary connections
- Developing an understanding of mathematical knowledge required to “do” mathematics and connect the language of mathematical ideas with numerical representations
- Sharing mathematical ideas, discussing mathematics with one another, refining and critiquing each other’s ideas and understandings
- Communicating in pairs, small group, or whole group presentations
- Using multiple representations to communicate mathematical ideas
- Using connections between pictures, oral language, written symbols, manipulative models, and real-world situations
- Using technological resources and other 21st century skills to support and enhance mathematical understanding
Mathematics is not a stagnate field of textbook problems; rather, it is a dynamic way of constructing meaning about the world around us, generating knowledge and understanding about the real world every day. Students should be metaphorically rolling up their sleeves and “doing mathematics” themselves, not watching others do mathematics for them or in front of them. (Protheroe, 2007)

Balanced Mathematics Instructional Model

Balanced math consists of three different learning opportunities: guided math, shared math, and independent math. Ensuring a balance of all three approaches will build conceptual understanding, problem solving, computational fluency, and procedural fluency. Building conceptual understanding is the focal point of developing mathematical proficiency. Students should frequently work on rigorous tasks, talk about the math, explain their thinking, justify their answer or process, build models with graphs or charts or manipulatives, and use technology.

When balanced math is used in the classroom it provides students opportunities to:

- solve problems
- make connections between math concepts and real-life situations
- communicate mathematical ideas (orally, visually and in writing)
- choose appropriate materials to solve problems
- reflect and monitor their own understanding of the math concepts
- practice strategies to build procedural and conceptual confidence

Teacher builds conceptual understanding by modeling through demonstration, explicit instruction, and think alouds, as well as guiding students as they practice math strategies and apply problem solving strategies. (whole group or small group instruction)

Students practice math strategies independently to build procedural and computational fluency. Teacher assesses learning and reteaches as necessary. (whole group instruction, small group instruction, or centers)

Teacher and students practice mathematics processes together through interactive activities, problem solving, and discussion. (whole group or small group instruction)
## Effective Pedagogical Routines/Instructional Strategies

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<th>Collaborative Problem Solving</th>
<th>Analyze Student Work</th>
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<td>Connect Previous Knowledge to New Learning</td>
<td>Identify Student’s Mathematical Understanding</td>
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<tr>
<td>Making Thinking Visible</td>
<td>Identify Student’s Mathematical Misunderstandings</td>
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<tr>
<td>Develop and Demonstrate Mathematical Practices</td>
<td>Interviews</td>
</tr>
<tr>
<td>Inquiry-Oriented and Exploratory Approach</td>
<td>Role Playing</td>
</tr>
<tr>
<td>Multiple Solution Paths and Strategies</td>
<td>Diagrams, Charts, Tables, and Graphs</td>
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<tr>
<td>Use of Multiple Representations</td>
<td>Anticipate Likely and Possible Student Responses</td>
</tr>
<tr>
<td>Explain the Rationale of your Math Work</td>
<td>Collect Different Student Approaches</td>
</tr>
<tr>
<td>Quick Writes</td>
<td>Multiple Response Strategies</td>
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<tr>
<td>Pair/Trio Sharing</td>
<td>Asking Assessing and Advancing Questions</td>
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<td>Turn and Talk</td>
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<tr>
<td>Charting</td>
<td>Revoicing</td>
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<td>Gallery Walks</td>
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<td>Small Group and Whole Class Discussions</td>
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<td>Student Modeling</td>
<td>Recapping</td>
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<td>Pressing for Accuracy and Reasoning</td>
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<tr>
<td></td>
<td>Maintain the Cognitive Demand</td>
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- Pair/Trio Sharing
- Turn and Talk
- Charting
- Gallery Walks
- Small Group and Whole Class Discussions
- Student Modeling

- Analyze Student Work
- Identify Student’s Mathematical Understanding
- Identify Student’s Mathematical Misunderstandings
- Interviews
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- Multiple Response Strategies
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- Maintain the Cognitive Demand
Educational Technology

Standards

8.1.8.A.1, 8.1.8.A.3, 8.1.8.E.1, 8.2.8.C.8, 8.2.8.E.3

- **Technology Operations and Concepts**
  - Demonstrate knowledge of a real world problem using digital tools.
    - **Example:** Students use Unit Rate game to reinforce finding unit rates in real life problems.
      - [https://www.mathgames.com/skill/7.20-unit-rates](https://www.mathgames.com/skill/7.20-unit-rates)
  
  - Use and/or develop a simulation that provides an environment to solve a real world problem or theory.
    - **Example:** Students can use Algebra tile applets to create simulations for solving one and two-step equations with variables.
      - [http://media.mivu.org/mvu_pd/a4a/homework/index.html](http://media.mivu.org/mvu_pd/a4a/homework/index.html)

- **Research and Information Fluency**
  - Effectively use a variety of search tools and filters in professional public databases to find information to solve a real world problem.
    - **Example:** Students can search through Learnzillion, Imagine Math Facts and other interactive sites for appropriate instructional videos and/or information pertaining to strategies and modeling for solving one and two-step equations with variables.

- **Design**
  - Develop a proposal for a chosen solution that include models (physical, graphical or mathematical) to communicate the solution to peers.
    - **Example:** Students can create graphs using equations or tables and explain whether a proportional relationship exists.
      - [https://www.desmos.com/](https://www.desmos.com/)

- **Computational Thinking: Programming**
  - Develop an algorithm to solve an assigned problem using a specified set of commands and use peer review to critique the solution.
    - **Example:** Students can use conceptual investigations to create algorithms for percent problems using proportional relationships (simple interest, tax, markups and markdowns, percent increase and decrease and percent error).
# Career Ready Practices

Career Ready Practices describe the career-ready skills that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

- **CRP2. Apply appropriate academic and technical skills.**
  Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.

  **Example:** Students will apply prior knowledge when solving real world problems. Students will make sound judgments about the use of specific tools, such as algebra tiles to explore and deepen their understanding of solving one and two-step equations.

- **CRP4. Communicate clearly and effectively and with reason.**
  Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others’ time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

  **Example:** Students will on a daily basis communicate their reasoning behind their solution paths by making connections to the context and the quantities, using proper vocabulary, along with decontextualizing and/or contextualizing the problem. Students will create representations using tables and graphs to determine if a proportional relationship exists between two quantities. They will also explain the meaning behind the quantities and units involved. Students will also ask probing questions to clarify and improve arguments.

- **CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.**
  Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.

  **Example:** Throughout their daily lessons, students will understand the meaning of a problem and look for entry points into solving their problems by analyzing the relationships of the quantities, constraints and goals of the task. Plans for solution paths will be made and have meaning. Students will self-monitor, evaluate and critique their process and progress as they are working and make changes as necessary.
Career Ready Practices

- CRP12. Work productively in teams while using cultural global competence.
  Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.

  **Example:** Students will work in collaborative and whole group settings to develop various solutions to math tasks that are presented to them. They will work together to understand the terms of the problem, ask clarifying and challenging questions among each other, and develop agreed upon solutions using a variety of strategies and models. Students will listen to, read and discuss arguments with each other with respect and courtesy at all times and will be willing to assist those that may need assistance. In this unit students will demonstrate and explain to a peer or small group how to solve and graph the solution sets of inequalities.
## WIDA Proficiency Levels

At the given level of English language proficiency, English language learners will process, understand, produce or use:

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>6- Reaching</strong></td>
<td>Specialized or technical language reflective of the content areas at grade level</td>
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<tr>
<td></td>
<td>• A variety of sentence lengths of varying linguistic complexity in extended oral or written discourse as required by the specified grade level</td>
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<tr>
<td></td>
<td>• Oral or written communication in English comparable to proficient English peers</td>
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<tr>
<td><strong>5- Bridging</strong></td>
<td>Specialized or technical language of the content areas</td>
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<tr>
<td></td>
<td>• A variety of sentence lengths of varying linguistic complexity in extended oral or written discourse, including stories, essays or reports</td>
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<tr>
<td></td>
<td>• Oral or written language approaching comparability to that of proficient English peers when presented with grade level material.</td>
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<tr>
<td><strong>4- Expanding</strong></td>
<td>Specific and some technical language of the content areas</td>
</tr>
<tr>
<td></td>
<td>• A variety of sentence lengths of varying linguistic complexity in oral discourse or multiple, related sentences or paragraphs</td>
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<tr>
<td></td>
<td>• Oral or written language with minimal phonological, syntactic or semantic errors that may impede the communication, but retain much of its meaning, when presented with oral or written connected discourse, with sensory, graphic or interactive support</td>
</tr>
<tr>
<td><strong>3- Developing</strong></td>
<td>General and some specific language of the content areas</td>
</tr>
<tr>
<td></td>
<td>• Expanded sentences in oral interaction or written paragraphs</td>
</tr>
<tr>
<td></td>
<td>• Oral or written language with phonological, syntactic or semantic errors that may impede the communication, but retain much of its meaning, when presented with oral or written, narrative or expository descriptions with sensory, graphic or interactive support</td>
</tr>
<tr>
<td><strong>2- Beginning</strong></td>
<td>General language related to the content area</td>
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<td>• Phrases or short sentences</td>
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<tr>
<td></td>
<td>• Oral or written language with phonological, syntactic, or semantic errors that often impede of the communication when presented with one to multiple-step commands, directions, or a series of statements with sensory, graphic or interactive support</td>
</tr>
<tr>
<td><strong>1- Entering</strong></td>
<td>Pictorial or graphic representation of the language of the content areas</td>
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<tr>
<td></td>
<td>• Words, phrases or chunks of language when presented with one-step commands directions, WH-, choice or yes/no questions, or statements with sensory, graphic or interactive support</td>
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</table>
# Language Development Supports for English Language Learners

## To Increase Comprehension and Communication Skills

### Environment

- Welcoming and stress-free
- Respectful of linguistic and cultural diversity
- Honors students’ background knowledge
- Sets clear and high expectations
- Includes routines and norms
- Is thinking-focused vs. answer-seeking
- Offers multiple modalities to engage in content learning and to demonstrate understanding
- Includes explicit instruction of specific language targets
- Provides participation techniques to include all learners
- Integrates learning centers and games in a meaningful way
- Provides opportunities to practice and refine receptive and productive skills in English as a new language
- Integrates meaning and purposeful tasks/activities that:
  - Are accessible by all students through multiple entry points
  - Are relevant to students’ lives and cultural experiences
  - Build on prior mathematical learning
  - Demonstrate high cognitive demand
  - Offer multiple strategies for solutions
  - Allow for a language learning experience in addition to content

### Sensory Supports*

- Real-life objects (realia) or concrete objects
- Physical models
- Manipulatives
- Pictures & photographs
- Visual representations or models such as diagrams or drawings
- Videos & films
- Newspapers or magazines
- Gestures
- Physical movements
- Music & songs

### Graphic Supports*

- Graphs
- Charts
- Timelines
- Number lines
- Graphic organizers
- Graphing paper

### Interactive Supports*

- In a whole group
- In a small group
- With a partner such as Turn-and-Talk
- In pairs as a group (first, two pairs work independently, then they form a group of four)
- In triads
- Cooperative learning structures such as Think-Pair-Share
- Interactive websites or software
- With a mentor or coach

### Verbal and Textual Supports

- Labeling
- Students’ native language
- Modeling
- Repetitions
- Paraphrasing
- Summarizing
- Guiding questions
- Clarifying questions
- Probing questions
- Leveled questions such as What? When? Where? How? Why?
- Questioning prompts & cues
- Word Banks
- Sentence starters
- Sentence frames
- Discussion frames
- Talk moves, including Wait Time

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# Building Equity in Your Teaching Practice

How do the essential questions highlight the connection between the big ideas of the unit and equity in your teaching practice?

<table>
<thead>
<tr>
<th>CONTENT INTEGRATION</th>
<th>KNOWLEDGE CONSTRUCTION</th>
<th>PREJUDICE REDUCTION</th>
<th>EQUITABLE PEDAGOGY</th>
<th>EMPOWERING SCHOOL CULTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>This unit/lesson is connected to other topics explored with students.</td>
<td>This unit/lesson provides context to the history of privilege and oppression.</td>
<td>This unit/lesson helps students question and unpack biases &amp; stereotypes.</td>
<td>The instruction has been modified to meet the needs of each student.</td>
<td>There are opportunities for students to connect with the community.</td>
</tr>
<tr>
<td>There are multiple viewpoints reflected in the content of this unit/lesson.</td>
<td>This unit/lesson addresses power relationships.</td>
<td>This unit/lesson helps students examine, research and question information and sources.</td>
<td>Students feel respected and their cultural identities are valued.</td>
<td>My classroom is welcoming and supportive for all students?</td>
</tr>
<tr>
<td>The materials and resources are reflective of the diverse identities and experiences of students.</td>
<td>This unit/lesson helps students to develop research and critical thinking skills.</td>
<td>The curriculum encourages discussion and understanding about the groups of people being represented.</td>
<td>Additional supports have been provided for students to become successful and independent learners.</td>
<td>I am aware of and sensitive to the needs of my students and their families.</td>
</tr>
<tr>
<td>The content affirms students, as well as exposes them to experiences other than their own.</td>
<td>This curriculum creates windows and mirrors* for students.</td>
<td>This unit/lesson challenges dominant perspectives.</td>
<td>Opportunities are provided for student to reflect on their learning and provide feedback.</td>
<td>There are effective parent communication systems established. Parents can talk to me about issues as they arise in my classroom.</td>
</tr>
</tbody>
</table>

*Windows and mirrors: A metaphor used to describe educational materials that offer students both familiar and unfamiliar perspectives, helping them broaden their understanding and develop critical thinking skills.

### Culturally Relevant Pedagogy Examples

- **Problem-Based Learning Scenarios:** Present relatable real-world problems for your students to solve, explicitly referencing cultures and communities when applicable.  
  **Example:** Provide students with circulars from two different food stores. Have students choose from advertised items to budget from and plan two meals. By finding the unit rate for each item, the students will determine which store has the better value and decide which store they will buy each item from.

- **Integrate Relevant Word Problems:** Contextualize equations using word problems that reference student interests and cultures.  
  **Example:** Create and use word problems that students relate to, have prior knowledge of and includes their interest. These can include current events and/or relevant real-world situations. Using content that students can relate to adds meaning, value and connection. The following link provides you with a variety of word problems that are current, relevant to real-world and student interests: [https://www.yummymath.com/](https://www.yummymath.com/)

- **Everyone has a Voice:** Create a classroom environment where students know that their contributions are expected and valued.  
  **Example:** Establish norms for sharing that promote discourse and a growth mindset for mathematics. All students are capable of expressing mathematical thinking and contributing to the classroom community. Students learn new ways of looking at problem solving by working with and listening to each other.

- **Use Learning Stations:** Provide a range of material by setting up learning stations.  
  **Example:** Reinforce understandings of concepts and skills by promoting learning through student interests, modalities, experiences and/or prior knowledge. Encourage the students to make content choices based upon their strengths, needs, values and experiences. Providing students with choice boards will give them a sense of ownership to their learning and understanding.
## Differentiated Instruction

### Accommodate Based on Students Individual Needs: Strategies

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<tr>
<th><strong>Time/General</strong></th>
<th><strong>Processing</strong></th>
<th><strong>Comprehension</strong></th>
<th><strong>Recall</strong></th>
<th><strong>Assistive Technology</strong></th>
<th><strong>Tests/Quizzes/Grading</strong></th>
<th><strong>Behavior/Attention</strong></th>
<th><strong>Organization</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Extra time for assigned tasks</td>
<td>Extra Response time</td>
<td>Precise processes for balanced math instructional model</td>
<td>Teacher-made checklist</td>
<td>Computer/whiteboard</td>
<td>Extended time</td>
<td>Consistent daily structured routine</td>
<td>Individual daily planner</td>
</tr>
<tr>
<td>Adjust length of assignment</td>
<td>Have students verbalize steps</td>
<td>Short manageable tasks</td>
<td>Use visual graphic organizers</td>
<td>Tape recorder</td>
<td>Study guides</td>
<td>Simple and clear classroom rules</td>
<td>Display a written agenda</td>
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<tr>
<td>Timeline with due dates for reports and projects</td>
<td>Repeat, clarify or reword directions</td>
<td>Brief and concrete directions</td>
<td>Reference resources to promote independence</td>
<td>Video Tape</td>
<td>Shortened tests</td>
<td>Provide immediate feedback</td>
<td>Note-taking assistance</td>
</tr>
<tr>
<td>Communication system between home and school</td>
<td>Mini-breaks between tasks</td>
<td>Provide immediate feedback</td>
<td>Visual and verbal reminders</td>
<td></td>
<td>Read directions aloud</td>
<td>Small group instruction</td>
<td>Color code materials</td>
</tr>
<tr>
<td>Provide lecture notes/outline</td>
<td>Provide a warning for transitions</td>
<td>Emphasize multi-sensory learning</td>
<td>Graphic organizers</td>
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</tbody>
</table>
### Differentiated Instruction

**Accommodate Based on Students Individual Needs: Strategies**

- Anchor charts to model strategies and use of formulas
- Reference sheets that list formulas, step-by-step procedures and model strategies
- Conceptual word wall that contains definitions, translation, pictures and/or examples
- Graphic organizers (examples include: Venn diagram, 4 square graphic organizers for math word problems, K-W-L etc.)
- Translation dictionary
- Teacher modeling
- Four-function calculator to assist with computations.
- Students can utilize math journals to write notes, copy solution steps, and translate terms and key vocabulary
- Highlight and label the solution steps for multi-step problems in different colors
- Utilize technological programs which provide verbal and visual instruction in native and/or second language
- Use concrete models (counting chips) and interactive technology to explain the reasoning to finding equivalent ratios to a given ratio
- Use interactive technology (Algebra tile applets) to create simulations for solving one and two-step equations with variables
- Use interactive technology to improve multiplication fact fluency and accuracy with positive and negative rational numbers
- Students can graph the solution sets of inequalities on Cartesian planes to support interpreting the meaning of the solution set in context of the problem
- Multiplication charts to assist with multiplication and division automaticity
- Use concrete models (counting chips), drawings (horizontal and vertical number lines), and interactive technology to explain the reasoning used to complete mathematical operations with signed integers
- Tape diagrams, double number line to illustrate equations, ratios and proportional relationships
- Graph paper with labeled drawn figures to support understanding scaled drawings
Interdisciplinary Connections

*Model interdisciplinary thinking to expose students to other disciplines.*

**Science Connection:**

*Geology Rocks Equations (5.4.4.C.1 and ESS2-1)*
- Students will explore linear equations with manipulatives. Students will apply strategies that can be used to model real situations using algebraic expressions and equations.

*Population Equations (MS-LS2-1)*
- Students will apply properties of operations to add, subtract, multiply, and divide rational numbers, rewrite expressions, and solve multistep real-life word problems. Students will find the rate of reproduction and attrition for populations of wildlife.

**Social Studies Connection:**

*Creating a Scale Map (6.1.4.B.1)*
- Students will create a scale map of their school, school grounds, or their yard at home. They will include landmarks, important details, legends, and an accurate scale. Students will determine an appropriate scale (ratio and proportions) and calculate proportional distances.

*Murphy to Manteo (6.1.8.D.2a)*
- Students will compute actual lengths from a scale drawing and fractional parts and use them for real world problems. They will use a map of North Carolina to determine the distance from Murphy to Manteo using various paths.

**ELA Connection:**

*Various Tasks: (RL.7.1 and RI.7.1)*
- Students will be able to read, analyze, and cite informational text to solve problems and explain their reasoning of how the task was solved. Students will also focus on vocabulary, mechanics and grammar in effective writing.
Enrichment

What is the purpose of Enrichment?

- The purpose of enrichment is to provide extended learning opportunities and challenges to students who have already mastered, or can quickly master, the basic curriculum. Enrichment gives the student more time to study concepts with greater depth, breadth, and complexity.
- Enrichment also provides opportunities for students to pursue learning in their own areas of interest and strengths.
- Enrichment keeps advanced students engaged and supports their accelerated academic needs.
- Enrichment provides the most appropriate answer to the question, “What do you do when the student already knows it?”

Enrichment is…

- Planned and purposeful
- *Different*, or differentiated, work – not just *more* work
- Responsive to students’ needs and situations
- A promotion of high-level thinking skills and making connections within content
- The ability to apply different or multiple strategies to the content
- The ability to synthesize concepts and make real world and cross-curricular connections
- Elevated contextual complexity
- Sometimes independent activities, sometimes direct instruction
- Inquiry based or open ended assignments and projects
- Using supplementary materials in addition to the normal range of resources
- Choices for students
- Tiered/Multi-level activities with Flexible groups (may change daily or weekly)

Enrichment is not…

- Just for gifted students (some gifted students may need intervention in some areas just as some other students may need frequent enrichment)
- Worksheets that are more of the same (busywork)
- Random assignments, games, or puzzles not connected to the content areas or areas of student interest
- Extra homework
- A package that is the same for everyone
- Thinking skills taught in isolation
- Unstructured free time
Assessments

**Required District/State Assessments**
- Unit Assessments
- PARCC
- SGO Assessments

**Suggested Formative/Summative Classroom Assessments**
- Describe Learning Vertically
- Identify Key Building Blocks
- Make Connections (between and among key building blocks)
- Short/Extended Constructed Response Items
- Multiple-Choice Items (where multiple answer choices may be correct)
- Drag and Drop Items
- Use of Equation Editor
- Quizzes
- Journal Entries/Reflections/Quick-Writes
- Accountable talk
- Projects
- Portfolio
- Observation
- Graphic Organizers/ Concept Mapping
- Presentations
- Role Playing
- Teacher-Student and Student-Student Conferencing
- Homework
### New Jersey Student Learning Standards

**7.EE.B.3:** Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.

**7.EE.B.4:** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

**7.EE.B.4a:** Solve word problems leading to equations of the form \( px + q = r \) and \( p(x + q) = r \), where \( p, q, \) and \( r \) are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?

**7.EE.B.4b:** Solve word problems leading to inequalities of the form \( px + q > r \) or \( px + q < r \), where \( p, q, \) and \( r \) are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.

**7.RP.A.1:** Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction \( \frac{1/2}{1/4} \) miles per hour, equivalently 2 miles per hour.

**7.RP.A.2:** Recognize and represent proportional relationships between quantities.

**7.RP.A.2.a:** Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.

**7.RP.A.2.b:** Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
New Jersey Student Learning Standards

7.RP.A.2.c: Represent proportional relationships by equations. *For example, if total cost $t$ is proportional to the number $n$ of items purchased at a constant price $p$, the relationship between the total cost and the number of items can be expressed as $t = pn$.*

7.RP.A.2.d: Explain what a point $(x, y)$ on the graph of a proportional relationship means in terms of the situation, with special attention to the points $(0, 0)$ and $(1, r)$ where $r$ is the unit rate.

7.RP.A.3: Use proportional relationships to solve multistep ratio and percent problems. *Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.*

7.G.A.1: Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.
<table>
<thead>
<tr>
<th>Mathematical Practices</th>
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<tbody>
<tr>
<td>1. Make sense of problems and persevere in solving them.</td>
</tr>
<tr>
<td>2. Reason abstractly and quantitatively.</td>
</tr>
<tr>
<td>3. Construct viable arguments and critique the reasoning of others.</td>
</tr>
<tr>
<td>4. Model with mathematics.</td>
</tr>
<tr>
<td>5. Use appropriate tools strategically.</td>
</tr>
<tr>
<td>6. Attend to precision.</td>
</tr>
<tr>
<td>7. Look for and make use of structure.</td>
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<tr>
<td>8. Look for and express regularity in repeated reasoning.</td>
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<td>Grade: Seven</td>
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<tr>
<td><strong>NJSLS:</strong></td>
</tr>
<tr>
<td>7.EE.B.3, 7.EE.B.4 a, b, 7.RP.A.1, 7.RP.A.2a, b, c, d, 7.RP.A.3, 7.G.A.1</td>
</tr>
</tbody>
</table>

**Unit Focus:**
- Solve real-life and mathematical problems using numerical and algebraic expressions and equations.
- Analyze proportional relationships and use them to solve real-world and mathematical problems.
- Draw, construct, and describe geometrical figures and describe the relationships between them.

**New Jersey Student Learning Standard:**

**7.EE.B.3:** Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.

**Student Learning Objective 1:** Solve multi-step real life and mathematical problems with rational numbers in any form (fractions, decimals) by applying properties of operations and converting rational numbers between forms as needed. Assess the reasonableness of answers using mental computation and estimation strategies.

**Modified Student Learning Objectives/Standards:** N/A

<table>
<thead>
<tr>
<th>MPs</th>
<th>Evidence Statement Key/Clarifications</th>
<th>Skills, Strategies &amp; Concepts</th>
<th>Essential Understandings/Questions (Accountable Talk)</th>
<th>Tasks/Activities</th>
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</thead>
<tbody>
<tr>
<td>MP 1</td>
<td>7.EE.B.3</td>
<td>Rational numbers can take different forms.</td>
<td>How can mathematical relationships be represented as expressions or equations?</td>
<td>Discounted Books</td>
</tr>
<tr>
<td>MP 2</td>
<td></td>
<td>Explain the connection between different forms of equivalent rational numbers.</td>
<td></td>
<td>Geology Rocks</td>
</tr>
<tr>
<td>MP 3</td>
<td></td>
<td></td>
<td></td>
<td>Equations</td>
</tr>
<tr>
<td>MP 4</td>
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<tr>
<td>MP 5</td>
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<td></td>
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<tr>
<td>MP 6</td>
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</tr>
</tbody>
</table>
Justify the reasonableness of solutions using mental computation and estimation.

**Students are able to:**
- Solve multi-step real-life problems using rational numbers in any form.
- Solve multi-step mathematical problems using rational numbers in any form.
- Convert between decimals and fractions and apply properties of operations when calculating with rational numbers.
- Estimate to determine the reasonableness of answers.

**SPED Strategies:**
Create and use various tools or graphic organizers to help solve real-life and mathematical problems with rational numbers.

Create and practice solving equations that do not change when rational numbers are used.

Use tools that can enable quick and accurate solutions to equations.

Create and modify steps to performing operations on all forms of rational numbers.

Use tools (e.g., calculator, graph paper, or tables) to solve problems.

Develop step-by-step anchor charts, desk decals, and teacher generated notes to solve...
multi-step problems using positive and negative rational numbers.

Practice adding, subtracting, multiplying and dividing simple fractions using manipulatives, technology and drawings in the context of solving real-world problems.

Create and practice multiplying and dividing two digit numbers by one-digit numbers using manipulatives and drawings in the context of solving a real-world problem.

Practice choosing numbers of objects within 20 that make a number sentence true using manipulatives or drawings in the context of solving real-world problems.

Practice extending simple repeating arithmetic sequences (e.g., create a table to show the following situation: John makes $20 a week for mowing lawn).

Find the unknown number quantity within 10 that makes an equation true (e.g., \( x + 5 = 10 \)).

Create visual, verbal or tactile cues or reminders.

Link new learning to prior learning.

Connect to real-life experiences.

Pre-teach prerequisite skills and concepts.
Embed links to websites for additional knowledge.

Teach and model fundamental skills and procedures explicitly until they become automatic.

Provide a variety of means to assess mastery of materials taught.

Present information through different modalities (i.e. visual, auditory, tactile, kinesthetic).

Adjust color of text, graphs and visual content.

**Resources UDL - Visual and Auditory Learner(s):**

[7.EE.3-2.1] Solve Multi-Step Problems - Common Core Standard  
https://youtu.be/fy3GALRZ5yk

[7.EE.3-2.0] Solve Multi-Step Problems - Common Core Standard  
https://youtu.be/lr6irAGdcF0

**ELL Strategies:**

Develop graphic representations of multi-step equations which show multiple examples of computations.

Discuss if the answer is reasonable using white boards and charts; students can
| visualize.  
Develop word walls with translations side by side.  
Utilize a KWL-chart. Have the parts listed in both their L1 (students’ native language) and L2 (students’ target language) to clarify understanding.  
Provide math word banks and math reference sheet that are translated and copied for students.  
Have students conduct activities in small groups, pairs/triads and share discuss solutions.  
Create math journals for students, who can write meanings and note vocabulary in both languages. |
New Jersey Student Learning Standards:

7.EE.B.4: Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

7.EE.B.4a: Solve word problems leading to equations of the form \( px + q = r \) and \( p(x + q) = r \), where \( p \), \( q \), and \( r \) are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?

7.EE.B.4b: Solve word problems leading to inequalities of the form \( px + q > r \) or \( px + q < r \), where \( p \), \( q \), and \( r \) are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions. *(benchmark)*

Student Learning Objective 2: Use variables to represent quantities in a real-world or mathematical problem by constructing simple equations and inequalities to represent problems.

Modified Student Learning Objectives/Standards:

M.EE.7.EE.B.4: Use the concept of equality with models to solve one-step addition and subtraction equalities.

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<tbody>
<tr>
<td>MP 1</td>
<td>7.EE.B.4a</td>
<td>Students are able to:</td>
<td>How can information from a word problem be translated to create an equation?</td>
<td>IFL Task(s) – Set of Related Lessons named “Investigating Inequalities”</td>
</tr>
<tr>
<td>MP 2</td>
<td>7.EE.B.4b</td>
<td>• Compare an arithmetic solution of a word problem to the algebraic solution of the word problem, identifying the sequence of operations in each solution.</td>
<td>How can building and solving equations from word problems lead to a conclusion and help answer the problem being presented?</td>
<td>PBA(s): eReader Sales</td>
</tr>
<tr>
<td>MP 3</td>
<td></td>
<td>• Write an equation of the form ( px + q = r ) or ( p(x + q) = r ) in order to solve a word problem.</td>
<td></td>
<td>Show It Task</td>
</tr>
<tr>
<td>MP 4</td>
<td></td>
<td>• Fluently solve equations of the form ( px + q = r ) and ( p(x + q) = r ).</td>
<td></td>
<td>Rainfall Task</td>
</tr>
<tr>
<td>MP 5</td>
<td></td>
<td>• Write an inequality of the form ( px + q &gt; r ), ( px + q &lt; r ), ( px + q \geq r ) or ( px + q \leq r ) to solve a word problem.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Tasks may involve, ≤ or ≥. | Graph the solution set of the inequality.  
- Interpret the solution to an inequality in the context of the problem. | How can inequalities be used in order to demonstrate all possible values that are solutions to a given real life situation?  
Because an equation is a statement that two expressions have the same value, certain properties apply.  
a. The addition property of equality indicates that adding the same number to both expressions in the equation maintains the balance in the equation.  
b. The subtraction property of equality indicates that subtracting the same number from both expressions in the equation maintains the balance in the equation.  
c. The multiplication property of equality |
|---|---|---|
| **SPED Strategies:**  
Create and practice fluently writing and solving an equation from given information in a word problem.  
Have students understand why being fluent in this process is important and provide guided step-by-step instructions.  
Create and practice solving equations in the form (e.g. px + q = r).  
Create and practice solve equations in the form (e.g. p(x + q) = r).  
Practice writing equations from information given in a word problem.  
Review analyzing how to read and write word problems.  
Using highlighters or markers to identify key and important information in a word problem.  
Provide a vocabulary word bank and anchor chart to relevant information in a word problem.  
Review the importance of understanding what the solution set to an inequality represents and how a graph visually represents this solution set. | | Additional Tasks/Activities:  
Home Improvement Project  
Population Equations T-Shirts |
Review and practice graphing the solution set of inequalities of the form (e.g. $px + q > r$).

Review and practice interpreting the solution set of an inequality.

Provide graphing paper, markers, highlighters.

Create visual, verbal or tactile cues or reminders.

Link new learning to prior learning.

Connect to real-life experiences.

Pre-teach prerequisite skills and concepts.

Embed links to websites for additional knowledge.

Design web quests to search for background information.

Teach and model fundamental skills and procedures explicitly until they become automatic.

Vary means to assess mastery of materials taught.

Present information through different modalities (i.e. visual, auditory, tactile, kinesthetic).

indicates that multiplying each expression in the equation by the same non-zero number maintains the balance in the equation.

The division property of equality indicates that dividing the same non-zero number into both expressions in the equation maintains the balance in the equation.

An inequality is a statement comparing the relative magnitude of two expressions. The solution set of an inequality contains all of the values of the variable that make the statement true.

The solution set of an inequality in one variable contains infinitely many values because the real numbers are both infinite and dense.
Adjust color of text, graphs and visual content.

Visually, anchor charts and desk decals.

**Resources UDL - Visual and Auditory Learner(s):**
*Solving and Graphing Two-Step Inequalities | 7.EE.B.4b | 7th Grade Math*  
[https://youtu.be/PD8AKEHh1do](https://youtu.be/PD8AKEHh1do)

*Solving Equations (7-EE-B-4)*  
[https://youtu.be/DGl7BEWsGsA](https://youtu.be/DGl7BEWsGsA)

**ELL Strategies:**
Initiate discussions and provide opportunities for collaboration.

Highlight solution steps for inequalities and model examples for students to visualize.

Teacher partially completes the equation and labels essential terms.

Utilize interactive tools that can be used to illustrate solution methods, and build language as well as math skills.

Provide whiteboards for students to write the equations dictated by the teacher.

Utilize pictures and photographs to show ELLs examples of class vocabulary and concepts.

In a given real-world context, not all of the values will make sense.

Some real-world situations have the potential of infinitely many solutions and are therefore more appropriately modeled by inequalities than equations (e.g., situations that involve language such as “at least,” “no more than,” “fewer than,” etc.) However, not all of the values will make sense in the context.

Multiplying or dividing an inequality by a negative number reverses the position of the solutions to the inequality on the number line; therefore, the inequality symbol must be reversed in order to maintain the truth of the inequality.
Describe and explain orally to students in small groups how to graph solutions, and allow them to interpret in their L1 (students’ native language) and/or L2 (students’ target language).

New Jersey Student Learning Standards:
7.EE.B.4: Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

7.EE.B.4a: Solve word problems leading to equations of the form \( px + q = r \) and \( p(x + q) = r \), where \( p, q, \) and \( r \) are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?

7.EE.B.4b: Solve word problems leading to inequalities of the form \( px + q > r \) or \( px + q < r \), where \( p, q, \) and \( r \) are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions. *(benchmark)*

Student Learning Objective 3: Fluently solve equations; solve inequalities, graph the solution set of the inequality and interpret the solutions in the context of the problem (Equations of the form \( px + q = r \) and inequalities of the form \( px + q > r \), \( px + q \geq r \), \( px + q \leq r \) or \( px + q < r \), where \( p, q, \) and \( r \) are specific rational numbers).

Modified Student Learning Objectives/Standards:
M.EE.7.EE.B.4: Use the concept of equality with models to solve one-step addition and subtraction equalities.

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<td>IFL Task(s) – Set of Related Lessons</td>
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<td>7.EE.B.4b</td>
<td></td>
<td></td>
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<tr>
<td>- Comparison of an algebraic solution to an arithmetic solution is not assessed here.</td>
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</tr>
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</table>

Word problem, identifying the sequence of operations in each solution.
- Write an equation of the form $px + q = r$ or $p(x + q) = r$ in order to solve a word problem.
- Fluently solve equations of the form $px + q = r$ and $p(x + q) = r$.
- Write an inequality of the form $px + q > r$, $px + q < r$, $px + q ≥ r$ or $px + q ≤ r$ to solve a word problem.
- Graph the solution set of the inequality.
- Interpret the solution of an inequality in the context of the problem.

**SPED Strategies:**
Create and practice fluently writing and solving an equation from given information in a word problem. Have students understand why being fluent in this process is important and provide guided step-by-step instructions.

Create and practice solving equations in the form (e.g. $px + q = r$).

Create and practice solve equations in the form (e.g. $p(x + q) = r$).

Practice writing equations from information given in a word problem.

Review analyzing how to read and write word problems.

translated to create an equation?

How can building and solving equations from word problems lead to a conclusion and help answer the problem being presented?

How can inequalities be used in order to demonstrate all possible values that are solutions to a given real life situation?

Because an equation is a statement that two expressions have the same value, certain properties apply.

a. The addition property of equality indicates that adding the same number to both expressions in the equation maintains the balance in the equation.

b. The subtraction property of equality indicates that

**PBA(s):**
- eReader Sales
- Show It
- Rainfall Task

**Additional Tasks/Activities:**
- Going Shopping
- Sports Equipment Set

named “Investigating Inequalities”
Use highlighters or markers to identify key and important information in a word problem.

Provide a vocabulary word bank and anchor chart to identify relevant information in a word problem (e.g. add, subtract, multiply and dividing etc.).

Practice graphing the solution set of inequalities in the form (e.g. px + q > r or px + q < r).

Review the importance of understanding what the solution set to an inequality represents and how a graph visually represents this solution set.

Review and practice interpreting the solution set of an inequality.

Teach and model fundamental skills and procedures explicitly until they become automatic.

Vary means to assess mastery of materials taught.

Present information through different modalities (i.e. visual, auditory, tactile, and kinesthetic).

**Resources (UDL - Visual and Auditory Learner(s)):**

*Solving and Graphing Two-Step Inequalities* |
7.EE.B.4b | 7th Grade Math

https://youtu.be/PD8AKEHh1do

An inequality is a statement comparing the relative magnitude of two expressions. The solution set of an inequality contains all of the values of the variable that make the statement true.
Solving Equations (7-EE-B-4)
https://youtu.be/DGi7BEWsGsA

**ELL Strategies:**
Initiate discussions and provide opportunities for collaboration.

Highlight solution steps for inequalities and model examples for students to visualize.

Teacher partially completes the equation and labels essential terms.

Utilize interactive tools that can be used to illustrate solution methods, and build language as well as math skills.

Provide whiteboards for students to write the equations dictated by the teacher.

Utilize pictures and photographs to show ELLs examples of class vocabulary and concepts.

Describe and explain orally to students in small groups how to graph solutions, and allow them to interpret in their L1 (students’ native language) and/or L2 (students’ target language).

The solution set of an inequality in one variable contains infinitely many values because the real numbers are both infinite and dense.

In a given real-world context, not all of the values will make sense.

Some real-world situations have the potential of infinitely many solutions and are therefore more appropriately modeled by inequalities than equations (e.g., situations that involve language such as “at least,” “no more than,” “fewer than,” etc.)

However, not all of the values will make sense in the context.

Multiplying or dividing an inequality by a negative number reverses the position of the solutions to the inequality on the number line; therefore, the inequality symbol must be reversed in order to
New Jersey Student Learning Standard:
7.RP.A.1: Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction $\frac{1/2}{1/4}$ miles per hour, equivalently 2 miles per hour.

Student Learning Objective 4: Calculate and interpret unit rates of various quantities involving ratios of fractions that contain like and different units.

Modified Student Learning Objectives/Standards:
M.EE.7.RP.A.1-3: Use a ratio to model or describe a relationship.

<table>
<thead>
<tr>
<th>MPs</th>
<th>Evidence Statement Key/Clarifications</th>
<th>Skills, Strategies &amp; Concepts</th>
<th>Essential Understandings/Questions (Accountable Talk)</th>
<th>Tasks/Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP 2</td>
<td>7.RP.A.1</td>
<td>Students are able to: Compute unit rates with ratios of fractions. Compute unit rates with ratios of fractions representing measurement quantities in both like and different units of measure. Divide two fractions by taking the reciprocal of the divisor. Compute the unit rate.</td>
<td>How are unit rates represented? How does a unit rate represent a real-world situation? How do I interpret a unit rate (using words and mathematically)? When the ratio of $a$ to $b$ is scaled up or down to the ratio $a/b$ to 1, $a/b$ to 1 is referred to as a unit ratio or rate.</td>
<td>IFL Task(s) – Set of Related Lessons named Proportional Relationships Additional Tasks/Activities: Analyzing and Applying Unit Rate What is the Unit Rate? Which Pizza is the Best Value for My Money?</td>
</tr>
<tr>
<td>MP 4</td>
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<tr>
<td>MP 6</td>
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<tr>
<td>Create and provide mathematical way to quantify and describe relationships.</td>
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<tr>
<td>Review and practice ratios as a comparison of two quantities using division.</td>
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<tr>
<td>Review and provide strategies to identify equivalent ratios.</td>
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</tr>
<tr>
<td>Create and practice creating equivalent ratios.</td>
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<tr>
<td>Create and practice writing a ratio in lowest terms.</td>
<td></td>
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</tr>
<tr>
<td>Create and practice writing ratios to represent practical problems.</td>
<td></td>
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<tr>
<td>Practice using a given ratio to convert a measurement or rate.</td>
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</tr>
<tr>
<td>Review and practice comparing unit rates with ratios.</td>
<td></td>
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</tr>
<tr>
<td>Review and practice identifying factors used to obtain equivalent ratios using manipulatives.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Review and describe the context of a ratio relationship, using “rate language”, (e.g., this recipe has 4 cups of flour to 2 cups of sugar, so there are 2 cups of flour for each cup of sugar).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Practice finding equivalent ratios to a given ratio in a real-life problem, using manipulatives.</td>
<td></td>
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</tr>
</tbody>
</table>

| How do numbers compare and relate to one another? |
| What is the difference between a unit rate and a ratio? |

| Paterson Public Schools |
| Preparing All Children for College and Career Together We Can |
Create and practice graphing pairs of values displayed in ratio tables on coordinate grid (first quadrant only).

**Resources UDL - Visual and Auditory Learner(s):**

*Ratios*
https://youtu.be/1T2rAw6DsyM

*Ratios and Unit Rates*

**ELL Strategies:**

Use a translation dictionary or software for vocabulary and word problems.

Implement strategy groups, group high-level with low-level students.

Allow arranged groups to confer frequently with each other and share feedback.

Provide tables with different unit rates and representations of mathematical solutions.

Have students listen to and take notes on videos about fractions (students’ native language videos if available).

Pre-teach to ELLs specific mathematical terms prior to the lesson, and provide translations for words.
Website: **LEARNZILLION**: Find unit rates in situations involving fractions


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**New Jersey Student Learning Standards:**

7.RP.A.2: Recognize and represent proportional relationships between quantities.

7.RP.A.2a: Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.

**Student Learning Objective 5:** Determine if a proportional relationship exists between two quantities e.g. by testing for equivalent ratios in a table or graph on the coordinate plane and observing whether the graph is a straight line through the origin.

**Modified Student Learning Objectives/Standards:**

M.EE.7.RP.A.1-3: Use a ratio to model or describe a relationship.

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<th>Tasks/Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP 1</td>
<td>7.RP.A.2a</td>
<td>Graph ratios on a coordinate plane to determine if the ratios are proportional by observing if the graph is a straight line through the origin.</td>
<td>Testing for proportionality involves determining if one quantity is a constant multiple of the other. When the values that describe the relationship appear in a table or as discrete points on a graph, all such values must be tested. Proportionality tests include: Testing to see if the ratio of y to x or x to y</td>
<td>IFL Task(s) – Set of Related Lessons named “Proportional Relationships”</td>
</tr>
<tr>
<td>MP 2</td>
<td></td>
<td></td>
<td></td>
<td>PBA(s): Babysitting Fees</td>
</tr>
<tr>
<td>MP 3</td>
<td></td>
<td></td>
<td></td>
<td>Deshawn’s Run</td>
</tr>
<tr>
<td>MP 4</td>
<td></td>
<td></td>
<td></td>
<td>Basketball Scores</td>
</tr>
</tbody>
</table>
Students are able to:

- Use tables and graphs to determine if two quantities are in a proportional relationship.

**SPED Strategies:**
Create, review and provide a table to show equivalency.

Review and practice identifying factors used to obtain equivalent ratios using manipulatives.

Review and describe the context of a ratio relationship, using "rate language", (e.g., this recipe has 4 cups of flour to 2 cups of sugar, so there are 2 cups of flour for each cup of sugar).

Practice finding equivalent ratios to a given ratio in a real-life problem, using manipulatives.

Create and practice graphing pairs of values displayed in ratio tables on coordinate grid first quadrant only.

**Resources UDL - Visual and Auditory Learner(s):**
*Roosevelt Middle School Math Team -- Common Core Tutorial Videos - 7.RP.A.2.B*
https://youtu.be/Wh0-knZdl54

simplifies to a constant value.

- Testing to see if the ratio of y to x or x to y for each (x,y) pair produces equivalent ratios.

- Determining if y = kx is a true statement for all quantities of x and y in the relationship.

- Graphing and determining that the graph of the quantities forms a straight line and passes through (0, 0), since (0, 0) makes the equation y = kx a true statement.

When two quantities, x and y, vary in such a way that one of them is a constant multiple of the other, a model for that situation is y = kx or y = k, where k, whether positive or negative, is the constant of proportionality (y/x) or the constant ratio of y to x.

The equation y = mx + b describes a proportional relationship only when b = 0. When b ≠ 0, y is not a

**Additional Tasks/Properties:**

- Art Class
- Miguel’s Milkshakes
**ELL Strategies:**
Outline, Label and highlight with different colors various proportional relationships.

Provide partially completed solutions, have students work in groups to complete, share and discuss.

Word/picture wall with translations side by side.

Utilize resources with L1 (students’ native language) text and/or support for lesson objectives.

Present information utilizing tape diagrams, double number line and illustrations of equations, ratios and proportional relationships.

Utilize technological programs which provide verbal and visual instruction in native and/or second language.

**Website:**
**KHAN ACADEMY:** *Proportional Relationships*
https://www.khanacademy.org/commoncore/grade-7-RP

**LEARNZILLION:** *Proportional Relationships*
New Jersey Student Learning Standards:
7.RP.A.2: Recognize and represent proportional relationships between quantities.

7.RP.A.2b: Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.

Student Learning Objective 6: Identify the constant of proportionality (unit rate) from tables, graphs, equations, diagrams, and verbal descriptions.

Modified Student Learning Objectives/Standards:
M.EE.7.RP.A.1-3: Use a ratio to model or describe a relationship.

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</tr>
</thead>
<tbody>
<tr>
<td>MP 1</td>
<td>7.RP.A.2b</td>
<td>Calculate the constant of proportionality/unit rate from a table or diagram.</td>
<td>When two quantities, x and y, vary in such a way that one of them is a constant multiple of the other, a model for that situation is ( y = kx ) or ( \frac{y}{x} = k ), where ( k ), whether positive or negative, is a constant of proportionality( ( \frac{y}{x} ) ), or the constant ratio of ( y ) to ( x ).</td>
<td>IFL Task(s) – Set of Related Lessons named “Proportional Relationships”</td>
</tr>
<tr>
<td>MP 2</td>
<td></td>
<td>Compute the rate of change from a graph or equation.</td>
<td>What is the difference between a unit rate and ratio?</td>
<td>IFL PBA Task(s): Babysitting Fees</td>
</tr>
<tr>
<td>MP 3</td>
<td>• Tasks may or may not have a context.</td>
<td>Students are able to:</td>
<td></td>
<td>Deshawn’s Run Task</td>
</tr>
<tr>
<td>MP 3</td>
<td>• Tasks sample equally across the listed representations (graphs, equations, diagrams, and verbal descriptions).</td>
<td>• Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.</td>
<td></td>
<td>Additional Tasks/Activities: The Equation Competition</td>
</tr>
<tr>
<td>MP 4</td>
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</tbody>
</table>
### Example:
The graph below represents the price of the bananas at one store. What is the constant of proportionality?

![Graph of Cost of Bananas](image)

Solution: From the graph, it can be determined that 4 pounds of bananas is $1.00; therefore, 1 pound of bananas is $0.25, which is the constant of proportionality for the graph. Note: Any point on the line will yield this constant of proportionality.

**SPED Strategies:**
Create, review and provide a table to show equivalency.

Review and practice identifying factors used to obtain equivalent ratios using manipulatives.

Review and describe the context of a ratio relationship, using “rate language”, (e.g., this recipe has 4 cups of flour to 2 cups of sugar, so there are 2 cups of flour for each cup of sugar).

<table>
<thead>
<tr>
<th>What are the types/varieties of situations in life that depend on or require the application of ratios and proportional reasoning?</th>
</tr>
</thead>
<tbody>
<tr>
<td>How do I represent proportional relationships between quantities?</td>
</tr>
<tr>
<td>The constant of proportionality is also considered to be the unit rate.</td>
</tr>
</tbody>
</table>

**Walkathon 2**
<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Practice finding equivalent ratios to a given ratio in a real-life problem, using manipulatives.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Create and practice graphing pairs of values displayed in ratio tables on coordinate grid first quadrant only.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>ELL Strategies:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Outline, label and highlight with different colors various proportional relationships.</td>
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<td>Provide partially completed solutions and have students work in groups to complete, share and discuss.</td>
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<td></td>
<td>Word/picture wall with translations side by side should be provided.</td>
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<td></td>
<td></td>
<td>Utilize resources with L1 (students’ native language) text and/or support for lesson objectives.</td>
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<tr>
<td></td>
<td></td>
<td>Present information utilizing tape diagrams, double number lines and illustrations of equations, ratios and proportional relationships.</td>
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<tr>
<td></td>
<td></td>
<td>Utilize technological programs which provide verbal and visual instruction in native and/or second language.</td>
</tr>
</tbody>
</table>
New Jersey Student Learning Standards:

7.RP.A.2: Recognize and represent proportional relationships between quantities.

7.RP.A.2c: Represent proportional relationships by equations. For example, if total cost $t$ is proportional to the number $n$ of items purchased at a constant price $p$, the relationship between the total cost and the number of items can be expressed as $t = pn$.

Student Learning Objective 7: Write equations to model proportional relationships in real world problems.

Modified Student Learning Objectives/Standards:

M.EE.7.RP.A.1-3 Use a ratio to model or describe a relationship.

<table>
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<th>Tasks/Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP 1</td>
<td>7.RP.A.2c</td>
<td>Solve equations created from proportional relationships.</td>
<td>How can you identify and represent proportional relationships?</td>
<td>IFL Task(s) – Set of Related Lessons named “Proportional Relationships”</td>
</tr>
<tr>
<td>MP 2</td>
<td></td>
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<td>MP 3</td>
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<tr>
<td>MP 4</td>
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<tr>
<td>MP 5</td>
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<tr>
<td>MP 6</td>
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<tr>
<td>MP 7</td>
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<tr>
<td>MP 8</td>
<td></td>
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</tbody>
</table>

Website:

Khan Academy: Proportional Relationships
https://www.khanacademy.org/commoncore/grade-7-RP

LearnZillion: Proportional Relationships
http://learnzillion.com/lessons/1867-analyze-a-graph-to-find-proportional-relationships
Represent the relationship using a table and an equation.

### Solution Table:

<table>
<thead>
<tr>
<th>Number of Packs of Gum (g)</th>
<th>Cost in Dollars (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
</tr>
</tbody>
</table>

Equation: \( d = 2g \), where \( d \) is the cost in dollars and \( g \) is the packs of gum. A common error is to reverse the position of the variables when writing equations. Students may find it useful to use variables specifically related to the quantities rather than using \( x \) and \( y \).

Constructing verbal models can also be helpful. A student might describe the situation as “the number of packs of gum times the cost for each pack is the total cost in dollars”. They can use this verbal model to construct the equation. Students can check their equation by substituting values and comparing their results to the table. The checking process helps student revise and recheck their model as necessary. The number of packs of gum times the cost for each pack is the total cost. \( (g \times 2 = d) \)

**SPED Strategies:**
Create, review and provide a table to show equivalency.
Review and practice identifying factors used to obtain equivalent ratios using manipulatives.

Review and describe the context of a ratio relationship, using “rate language”, (e.g., this recipe has 4 cups of flour to 2 cups of sugar, so there are 2 cups of flour for each cup of sugar).

Practice finding equivalent ratios to a given ratio in a real-life problem, using manipulatives.

**Resources UDL - Visual and Auditory Learner(s):**
*Roosevelt Middle School Math Team -- Common Core Tutorial Videos- 7.RP.A.2.B* [https://youtu.be/Wh0-knZdl54](https://youtu.be/Wh0-knZdl54)

**ELL Strategies:**
Outline, label and highlight with different colors various proportional relationships.

Provide partially completed solutions, have students work in groups to complete, share and discuss.

Provide word/picture wall with translations of key words side by side.
| **Utilize resources with L1 (students’ native language) text and/or support for lesson objectives.** |
| Present information utilizing tape diagrams, double number line and illustrations of equations, ratios and proportional relationships. |
| Utilize technological programs which provide verbal and visual instruction in native and/or second language. |

**Website:**

**KHAN ACADEMY**

*Proportional Relationships*

[https://www.khanacademy.org/commoncore/grade-7-RP](https://www.khanacademy.org/commoncore/grade-7-RP)

**LEARNZILLION**

*Proportional Relationships*

**New Jersey Student Learning Standards:**

7.RP.A.2: Recognize and represent proportional relationships between quantities.

7.RP.A.2d: Explain what a point \((x, y)\) on the graph of a proportional relationship means in terms of the situation, with special attention to the points \((0, 0)\) and \((1, r)\) where \(r\) is the unit rate.

**Student Learning Objective 8:** Use the graph of a proportional relationship to interpret the meaning of any point \((x, y)\) on the graph in terms of the situation - including the points \((0, 0)\) and \((1, r)\), recognizing that \(r\) is the unit rate.

**Modified Student Learning Objectives/Standards:** N/A

<table>
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</thead>
<tbody>
<tr>
<td>MP 1</td>
<td>7.RP.A.2d</td>
<td>Interpret the origin and ((1, r)) on the graph of a proportional relationship in context.</td>
<td>How do I interpret a distance time graph and determine a point of intersection?</td>
<td>Animals of Rhomaar</td>
</tr>
<tr>
<td>MP 2</td>
<td></td>
<td>Interpret a point on the graph of a proportional relationship in context.</td>
<td>How can I use tables, graphs or equations to determine whether a relationship is proportional?</td>
<td>Buses</td>
</tr>
<tr>
<td>MP 3</td>
<td></td>
<td>Calculate the unit rate by identifying that on a graph when the (x)-coordinate is 1, the (y)-coordinate is the unit rate.</td>
<td>How is the unit rate represented in tables, graphs, equations and diagrams?</td>
<td>Nate &amp; Natalie’s Work Photos</td>
</tr>
<tr>
<td>MP 4</td>
<td></td>
<td>Explain the meaning of the point on a graph (y=mx).</td>
<td></td>
<td>The Equation Competition</td>
</tr>
<tr>
<td>MP 5</td>
<td></td>
<td>7.RP.A.2d SPED Strategies:</td>
<td></td>
<td>Leaky Faucets</td>
</tr>
<tr>
<td>MP 6</td>
<td></td>
<td>Create, review and provide a table to show equivalency.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MP 7</td>
<td></td>
<td>Review and practice identifying factors used to obtain equivalent ratios using manipulatives.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MP 8</td>
<td></td>
<td></td>
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</tbody>
</table>
Review and describe the context of a ratio relationship, using “rate language”, (e.g., this recipe has 4 cups of flour to 2 cups of sugar, so there are 2 cups of flour for each cup of sugar).

Practice finding equivalent ratios to a given ratio in a real-life problem, using manipulatives.

Create and practice graphing pairs of values displayed in ratio tables on coordinate grid (first quadrant only).

**ELL Strategies:**
Outline, label and highlight with different colors various proportional relationships.

Provide partially completed solutions; have students work in groups to complete, share and discuss.

Utilize resources with L1 (native language) text and/or support for lesson objectives.

Present information utilizing tape diagrams, double number line and illustrations of equations, ratios and proportional relationships.
Utilize technological programs which provide verbal and visual instruction in native and/or second language.

**Website: KHAN ACADEMY**
*Proportional Relationships*
https://www.khanacademy.org/commoncore/grade-7-RP

**Website: LEARNZILLION**
*Proportional Relationships*
http://learnzillion.com/lessons/1867-analyze-a-graph-to-find-proportional-relationships

**New Jersey Student Learning Standard:**
7.RP.A.3: Use proportional relationships to solve multistep ratio and percent problems. *Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.* *(benchmark)*

**Student Learning Objective 9:** Solve multi-step ratio and percent problems using proportional relationships (simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error).

**Modified Student Learning Objectives/Standards:**
M.EE.7.RP.A.1-3 Use a ratio to model or describe a relationship.

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</tr>
</thead>
<tbody>
<tr>
<td>MP 1</td>
<td>7.RP.A.3</td>
<td>Recognize percent as a ratio indicating the quantity per one hundred.</td>
<td>How do you use ratios and proportions to solve problems?</td>
<td>7th Grade Dance</td>
</tr>
<tr>
<td>MP 2</td>
<td>Tasks will include proportional relationships that only</td>
<td>Make tables of equivalent ratios relating quantities with whole-number</td>
<td></td>
<td>Comparing Years</td>
</tr>
<tr>
<td>MP 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| MP 7 | involve positive numbers. | measurements, finding missing values in the tables, and plot the pairs of values on the coordinate plane.  
Use tables to compare ratios.  
Use ratio reasoning to convert measurement units; manipulate and transform unit appropriately when multiplying or dividing quantities.  
Use proportions to solve multistep percent problems including simple interest, tax, markups, discounts, gratuities, commissions, fees, percent increase, percent decrease, percent error.  
Use proportions to solve multistep ratio problems.  
**SPED Strategies:**  
Review and practice understanding percent as it relates to practical situations (e.g. interest, taxes, and sales).  
Provide use of calculators.  
Create and practice solving percent problems.  
Create and practice solving problems involving percent of change. | How can proportions be used to solve problems?  
How can proportions increase our understanding of the real world?  
How do you verify if two quantities are directly proportional?  
How do you represent proportional relationships with equations? | Friends Meeting on Bikes  
Multi-Step Ratio Problems  
Music Companies |
<table>
<thead>
<tr>
<th><strong>ELL Strategies:</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide ELL students with additional language support through the use of sentence frames and starters.</td>
<td></td>
</tr>
<tr>
<td>Highlight and label in different colors, the solution steps for multi-step problems.</td>
<td></td>
</tr>
<tr>
<td>Students can utilize math journals to write notes, copy solution steps, translate terms and key vocabulary.</td>
<td></td>
</tr>
<tr>
<td>Have students practice math procedures utilizing technical programs.</td>
<td></td>
</tr>
<tr>
<td>Provide students with graph paper, drawn figures labeled, translated, with a bilingual dictionary.</td>
<td></td>
</tr>
</tbody>
</table>
New Jersey Student Learning Standards:
7.RP.A.3: Use proportional relationships to solve multistep ratio and percent problems. *Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.*
7.G.A.1: Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

**Student Learning Objective 10:** Use ratio and proportion to solve problems involving scale drawings of geometric figures.

**Modified Student Learning Objectives/Standards:**
M.EE.7.RP.A.1-3 Use a ratio to model or describe a relationship.
M.EE.7.G.A.1 Match two similar geometric shapes that are proportional in size and in the same direction.

<table>
<thead>
<tr>
<th>MPs</th>
<th>Evidence Statement Key/Clarifications</th>
<th>Skills, Strategies &amp; Concepts</th>
<th>Essential Understandings/Questions (Accountable Talk)</th>
<th>Tasks/Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP 1</td>
<td>7.R.P.A.3</td>
<td>Students develop understanding of scale factor and proportionality.</td>
<td>What are the steps for solving problems involving scale drawings of geometric figures?</td>
<td>Cookies for the Bake Sale</td>
</tr>
</tbody>
</table>
| MP 2 | Tasks will include proportional relationships that only involve positive numbers. | Students are able to:  
  - Use ratios and proportions to create scale drawings.  
  - Reproduce a scale drawing at a different scale.  
  - Computing actual lengths and areas from a scale drawing. | What are the steps for computing actual lengths and areas from a scale drawing? | Creating a Scale Map |
| MP 4 |                                      |                              | How does one reproduce a scale drawing at a different scale? | Lawn Mowing |
| MP 5 |                                      |                              |                                                        | Murphy to Manteo |
| MP 6 | 7.G.A.1                              |                              |                                                        | Orange Fizz Experiment |
| MP 7 | Tasks may or may not have context.    |                              |                                                        | Park Area         |
- Solve problems involving scale drawings using proportions.

**SPED Strategies:**
Review and practice understanding percent as it relates to practical situations (e.g. interest, taxes, and sales).

Provide use of calculators.

Create and practice solving percent problems.

Create and practice solving problems involving percent of change.

Create and practice solving simple interest problems.

Draw scale drawings of objects.

Practice fluency in multiplication, division facts.

Provide multiplication chart.

Review introductory standard to scaling and scale drawings, but is based on the understanding of ratio reasoning.

**ELL Strategies:**
Provide ELL students with additional language support through the use of sentence frames and starters.

<table>
<thead>
<tr>
<th>Patterns &amp; Percents</th>
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<tbody>
<tr>
<td><strong>Scale Drawing Challenge</strong></td>
</tr>
<tr>
<td>How do you use ratios and proportions to solve problems?</td>
</tr>
<tr>
<td>How can proportions be used to solve problems?</td>
</tr>
<tr>
<td>How can proportions increase our understanding of the real world?</td>
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<td>How do you verify if two quantities are directly proportional?</td>
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<tr>
<td>How do you represent proportional relationships with equations?</td>
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</tbody>
</table>
Highlight and label in different colors, the solution steps for multi-step problems.

Students can utilize math journals to write notes, copy solution steps, translate terms and key vocabulary.

Have students practice math procedures utilizing technical programs.

Provide students with graph paper, drawn figures labeled, translated, with a bilingual dictionary.

**Website:**
*Math is Fun*
*The Language of Mathematics*
Integrated Evidence Statements

7.C.4: Base explanations/reasoning on a coordinate plane diagram (whether provided in the prompt or constructed by the student in her response).
   - Tasks use only coordinates in Quadrant 1 and use only a positive constant of proportionality.

7.C.5: Given an equation, present the solution steps as a logical argument that concludes with the set of solutions (if any).

7.C.6.1: Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures.
   - Tasks use only coordinates in Quadrant 1 and use only a positive constant of proportionality.

7.C.7.1: Present solutions to multi-step problems in the form of valid chains of reasoning, using symbols such as equals signs appropriately (for example, rubrics award less than full credit for the presence of nonsense statements such as $1 + 4 = 5 + 7 = 12$, even if the final answer is correct), or identify or describe errors in solutions to multi-step problems and present corrected solutions.
   - Tasks use only coordinates in Quadrant 1 and use only a positive constant of proportionality.

7.C.7.4: Present solutions to multi-step problems in the form of valid chains of reasoning, using symbols such as equals signs appropriately (for example, rubrics award less than full credit for the presence of nonsense statements such as $1 + 4 = 5 + 7 = 12$, even if the final answer is correct), or identify or describe errors in solutions to multi-step problems and present corrected solutions.

7.D.1: Solve multi-step contextual word problems with degree of difficulty appropriate to Grade 7, requiring application of knowledge and skills articulated in Type I, Sub-Claim A Evidence Statements
   - Tasks may have scaffolding, if necessary, in order to yield a degree of difficulty appropriate to grade 7.
   - Tasks involving writing or solving an equation should not go beyond the equation types described in 7.EE.4a. ($px + q = r$ and $p(x + q) = r$ where $p$, $q$, and $r$ are specific rational numbers.

7.D.2: Solve multi-step contextual problems with degree of difficulty appropriate to grade 7, requiring application of knowledge and skills articulated in 6.RP.A, 6.EE.C, 6.G.
   - Tasks may have scaffolding, if necessary, in order to yield a degree of difficulty appropriate to grade 7.
7.D.3: Micro-models: Autonomously apply a technique from pure mathematics to a real-world situation in which the technique yields valuable results even though it is obviously not applicable in a strict mathematical sense (e.g., profitably applying proportional relationships to a phenomenon that is obviously nonlinear or statistical in nature).

- Tasks may have scaffolding, if necessary, in order to yield a degree of difficulty appropriate to grade 7.


- Tasks may have scaffolding, if necessary, in order to yield a degree of difficulty appropriate to grade 7.
# Unit 2 Vocabulary

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Percent</th>
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<tbody>
<tr>
<td>Commissions</td>
<td>Percent of Error</td>
</tr>
<tr>
<td>Complex Fractions</td>
<td>Percent Rate of Change</td>
</tr>
<tr>
<td>Constant</td>
<td>Principal</td>
</tr>
<tr>
<td>Constant of Proportionality</td>
<td>Proportion</td>
</tr>
<tr>
<td>Dimensions</td>
<td>Proportional Relationships</td>
</tr>
<tr>
<td>Discount</td>
<td>Rate</td>
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<tr>
<td>Equivalent Fractions</td>
<td>Ratio</td>
</tr>
<tr>
<td>Fees</td>
<td>Scale Drawing</td>
</tr>
<tr>
<td>Fractions</td>
<td>Scale Factor</td>
</tr>
<tr>
<td>Gratuity</td>
<td>Similar Figures</td>
</tr>
<tr>
<td>Inequality</td>
<td>Simple Interest</td>
</tr>
<tr>
<td>Markdown</td>
<td>Simple Interest</td>
</tr>
<tr>
<td>Markup</td>
<td>Tax</td>
</tr>
<tr>
<td>Maximum</td>
<td>Unit Rates</td>
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<tr>
<td>Minimum</td>
<td>Variable</td>
</tr>
<tr>
<td>Multiplicative Inverse</td>
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</tr>
</tbody>
</table>
## References & Suggested Instructional Websites

- [www.internet4classrooms.com](http://www.internet4classrooms.com)
- [www.illustrativemathematics.org/](http://www.illustrativemathematics.org/)
- [http://www.katm.org/flipbooks/7%20FlipBook%20Final%20CCSS%202014.pdf](http://www.katm.org/flipbooks/7%20FlipBook%20Final%20CCSS%202014.pdf)
- [https://www.georgiastandards.org/Common-Core/Pages/Math-6-8.aspx](https://www.georgiastandards.org/Common-Core/Pages/Math-6-8.aspx)
- [https://learnzillion.com/](https://learnzillion.com/)
- [http://www.insidemathematics.org/](http://www.insidemathematics.org/)
- [https://www.engageny.org/](https://www.engageny.org/)
Field Trip Ideas

Buehler Challenger & Science Center – http://www.bcsc.org/5-9th-grade/

- Participants work as a team as they take on the role of astronauts and mission controllers to *Rendezvous with Comet Halley*, *Return to the Moon*, or *Voyage to Mars*. Students use team-building and hands-on learning with a focus on STEM to complete their mission goal.

Liberty Science Center (Jersey City, NJ) – http://lsc.org/plan-your-visit/

- An interactive science museum and learning center with math connections. There is a math guidebook for teachers to make connections with math.


- For more than 20 years, educators from around the country have been bringing students to the Museum to help them understand how finance impacts their daily lives. The Museum offers discounted admission for pre-booked groups of eight or more, as well as a variety of classes for students in middle school through college.


- Mathematics illuminates the patterns and structures all around us. Our dynamic exhibits, gallery, and programs will stimulate inquiry, spark curiosity, and reveal the wonders of mathematics. MoMath has innovative exhibits that will engage folks from 105 to 5 years old (and sometimes younger), but with a special emphasis on activities for 4th through 8th graders.