

Unit 1: Ratios and Proportional Reasoning

Content Area: **Template**
Course(s):
Time Period: **Full Year**
Length: **9 Weeks**
Status: **Published**

Module 1: Identify and Represent Proportional Relationships

Unit Rationale

Proportional relationships form a critical foundation for students' success in middle school mathematics and beyond. In this module, students learn to identify and represent proportional relationships using various tools, including tables, graphs, equations, diagrams, and verbal descriptions. By exploring these multiple representations, students begin to develop a deep conceptual understanding of proportionality and how it connects across mathematical domains.

This module is intentionally introduced at the beginning of the accelerated 7th-grade curriculum to prepare students for more advanced applications of proportional reasoning, such as solving multi-step percent problems, working with scale drawings, and understanding linear relationships in algebra. Recognizing proportional relationships and determining the constant of proportionality empower students to solve problems efficiently and to reason quantitatively about the relationships between variables.

The real-world relevance of proportional reasoning is emphasized through scenarios involving recipes, unit pricing, map scales, and speed. These contexts not only increase student engagement but also demonstrate the usefulness of mathematics in everyday decision-making and problem-solving.

Throughout the module, students will also engage with key Standards for Mathematical Practice, including:

- **MP2: Reason abstractly and quantitatively**
- **MP4: Model with mathematics**
- **MP7: Look for and make use of structure**

By the end of this module, students will be able to recognize and represent proportional relationships with confidence, interpret the meaning of proportionality in a variety of contexts, and apply these skills to solve complex problems. This foundational knowledge will support students as they progress through accelerated mathematical content with increasing rigor and sophistication.

Essential Questions

- What makes a relationship proportional, and how can I recognize it?
- How can I represent a proportional relationship using tables, graphs, equations, and verbal

descriptions?

- What does the constant of proportionality tell me about a situation?
- How do proportional relationships help me solve real-world problems?

Pre-Assessments

Benchmark assessments are given within the first semester using HMH Into Math.

1. Readiness Check (Diagnostic Assessment)

- Found at the beginning of each module/unit.
- Assesses prerequisite skills necessary for success in the upcoming lessons.
- Usually includes a mix of multiple-choice and short answer items.
- Great for determining small-group needs or identifying which students might benefit from additional support.

2. Diagnostic Assessments in Ed: Your Friend in Learning

- Online assessments tied to Into Math.
- Adaptive in nature (depending on your district's setup) and aligned with the lesson standards.
- Can provide recommendations for intervention or enrichment based on results.

3. Module Quizzes (Pre-Use)

- While designed for post-instruction, some teachers use the Module Quiz or Mid-Module Checkpoint as a pre-assessment to gauge student background knowledge.
- Use selectively, focusing on concepts that build directly on prior grades' standards.

4. Lesson-Specific Checks

- Some lessons include "Are You Ready?" sections or warm-ups that can double as informal pre-assessments.
- Often appear in the Teacher Edition or digital platform and can be used as bell-ringers or exit tickets.

Instructional Plan

Lesson 1: Explore Relationships

Student Learning Intentions (WALT)

- **We are learning to** recognize proportional relationships in real-world and mathematical situations.
 - **We are learning to** represent proportional relationships using tables, graphs, and verbal descriptions.
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Student Success Criteria (I Can Statements)

- **I can** identify proportional relationships by analyzing ratios in tables and graphs.
 - **I can** explain what makes a relationship proportional using math vocabulary.
 - **I can** represent proportional relationships in different ways (table, graph, equation, verbal).
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Instructional Strategies and Activities

Engage (10 min)

- Launch the lesson with a real-world example (e.g., price per item, miles per hour).
- Think-Pair-Share: Is this a proportional relationship? Why or why not?

Explore (20 min)

- **Three Rotations:**
 1. **Table Station** – Identify constant ratios.
 2. **Graph Station** – Plot points; decide if the line goes through the origin.
 3. **Scenario Station** – Use word problems to describe relationships.

Explain (10 min)

- Class discussion synthesizing patterns observed in each representation.
- Teacher models determining the constant of proportionality (k).

Elaborate (15 min)

- Partner or individual practice: Mixed problem set with table, graph, and verbal examples.

Closure (5 min)

- **Exit Ticket:** One table problem and one graph problem – students must decide if the relationship is proportional and justify their answer.
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Formative Assessments

- Observation and questioning at stations
 - Partner practice responses
 - Exit ticket responses
 - Student explanations during whole-class discussion
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Instructional Materials and Resources

- HMH Into Math Grade 7 Accelerated Teacher Edition and Student Book
 - Graph paper
 - Pre-prepared station task cards or slides
 - Exit tickets
 - Whiteboards and markers
 - Desmos or other online graphing tools (optional)
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Reflections and Suggested Modifications

Reflections (post-lesson):

- Which students were able to explain the constant of proportionality?
- Were students more confident with tables or graphs?
- Did students engage actively in all stations?

Suggested Modifications:

- For students needing support, provide partially completed tables/graphs.
- Offer sentence starters to guide written and verbal explanations.
- Enrich early finishers with a challenge: create their own proportional situation to share with peers.
- Use real-life contexts (sports stats, recipes, travel rates) to boost engagement.

Lesson 2: Recognize Proportional Relationships in Tables

Student Learning Intentions (WALT)

- **We are learning to** identify proportional relationships using ratio tables.
 - **We are learning to** determine if values in a table represent a constant rate of change.
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Student Success Criteria (I Can Statements)

- **I can** decide if a relationship is proportional by examining a table of values.
 - **I can** find the constant of proportionality from a table.
 - **I can** explain why a relationship is or is not proportional using math reasoning.
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Instructional Strategies and Activities

Engage (5–10 min)

- Present a real-world scenario (e.g., number of books rented vs. total cost).
- Ask students: “How can you tell if this relationship is proportional?”

Explore (15 min)

- **Interactive Mini-Lesson:** Walk through a sample ratio table with the class. Model how to check for a constant rate (value of $y \div x$).
- Use color coding to highlight how the same ratio appears across rows.

Explain (15 min)

- **Guided Practice:** Students work in pairs or small groups to complete 3–4 example tables, identifying whether each is proportional and finding the constant of proportionality when applicable.

Elaborate (10–15 min)

- **Collaborative Activity:** “Table Detective” – students rotate through stations with different ratio tables (some proportional, some not) and record evidence for their conclusion.

Closure (5 min)

- **Exit Slip:** Provide a table and ask students to determine if it's proportional and justify their reasoning in one or two sentences.
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Formative Assessments

- Think-pair-share responses during the mini-lesson
 - Group work responses from “Table Detective” activity
 - Exit slip analysis
 - Student explanations during guided practice
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Instructional Materials and Resources

- HMH Into Math Grade 7 Accelerated Student and Teacher Editions
 - Pre-made ratio table task cards or slides
 - Table Detective handouts
 - Whiteboards or graphic organizers
 - Exit slips
 - Document camera or interactive whiteboard for modeling
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Reflections and Suggested Modifications

Reflections:

- Did students understand how to apply division consistently to check for proportionality?
- Which misconceptions were most common (e.g., confusing additive vs. multiplicative reasoning)?

Suggested Modifications:

- Provide scaffolded examples with the first ratio filled in.
- Use manipulatives or visuals (e.g., pattern blocks or bar models) for kinesthetic learners.
- Allow students to create their own ratio tables and swap with a partner to analyze.
- Challenge extension: Have students convert a non-proportional table into a proportional one and explain the changes.

Lesson 3: Compute Unit Rates Involving Complex Fractions

Student Learning Intentions (WALT)

- **We are learning to** compute unit rates that involve complex fractions.
 - **We are learning to** solve real-world problems by applying unit rates.
-

Student Success Criteria (I Can Statements)

- **I can** simplify complex fractions.
 - **I can** calculate unit rates using division.
 - **I can** apply unit rates to compare scenarios and solve problems.
 - **I can** explain my reasoning using mathematical language.
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Instructional Strategies and Activities

Engage (5–7 min)

- Pose a real-world problem: *"If a faucet drips $\frac{1}{2}$ gallon every $\frac{1}{4}$ hour, how many gallons per hour is that?"*
- Discuss: *What makes this more complicated than a simple unit rate?*

Explore (15 min)

- **Direct Instruction:** Review how to divide fractions (keep-change-flip).
- Model how to calculate unit rates when both the numerator and denominator are fractions.
- Emphasize interpreting what the unit rate represents in context.

Explain (15 min)

- **Guided Practice:** Work through 2–3 examples with the class. Include scenarios like speed (miles per $\frac{2}{3}$ hour), cost per ounce, or productivity (pages read in $\frac{3}{4}$ hour).
- Use number lines or visual models to support understanding for visual learners.

Elaborate (10–12 min)

- **Partner Activity:** Students receive task cards with different complex fraction scenarios.
- Partners solve the problems, compare answers, and explain their steps.
- Encourage them to write their own real-world example for a peer to solve.

Closure (5 min)

- Exit Slip: Given a complex fraction scenario, students compute the unit rate and write one sentence explaining how they solved it.
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Formative Assessments

- Observation during guided and partner practice
 - Student explanations in pair-share discussions
 - Exit slips assessing independent understanding
 - Quick checks during instruction (thumbs up/down, mini-whiteboards)
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Instructional Materials and Resources

- HMH Into Math Student & Teacher Editions (Grade 7 Accelerated)
 - Complex fraction task cards
 - Visual models or anchor charts for dividing fractions
 - Whiteboards and markers
 - Fraction bars or manipulatives (optional)
 - Exit slips or digital form submission (Google Form, etc.)
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Reflections and Suggested Modifications

Reflections:

- Did students demonstrate a solid understanding of fraction division before applying it to unit rates?
- Were students able to make real-world connections to the concept of unit rates?

Modifications:

- **For struggling learners:** Provide a step-by-step checklist for dividing fractions. Use simpler problems before increasing complexity.
- **For advanced learners:** Introduce multi-step problems involving unit conversions (e.g., feet per second to miles per hour).
- Allow calculators for checking work after initial manual practice.

Lesson 4: Recognize Proportional Relationships in Graphs

Student Learning Intentions (WALT)

- **We are learning to** identify proportional relationships represented in graphs.
 - **We are learning to** explain how the constant of proportionality is shown in a graph.
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Student Success Criteria (I Can Statements)

- **I can** determine if a graph represents a proportional relationship.
 - **I can** identify the constant of proportionality (unit rate) from a graph.
 - **I can** explain why a graph is or is not proportional using characteristics like a straight line through the origin.
 - **I can** apply my understanding to solve real-world problems using graphs.
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Instructional Strategies and Activities

Engage (5–7 min)

- Display two graphs side-by-side: one showing a proportional relationship, and one that doesn't.
- Ask: “*Which graph shows a proportional relationship? How do you know?*”
- Use student responses to activate prior knowledge and guide today's learning.

Explore (15 min)

- **Direct Instruction:** Review that proportional graphs are straight lines that go through the origin (0,0).
- Model reading and interpreting graphs to identify the constant of proportionality ($k = y/x$).
- Show examples from real-life contexts, like distance-time or cost-quantity graphs.

Explain (15 min)

- **Guided Practice:** Use the textbook or graph worksheets to examine various graphs.
- Students identify whether each graph is proportional and justify their reasoning.
- Emphasize explaining the *why*, not just labeling yes or no.

Elaborate (10–12 min)

- **Collaborative Activity:** In pairs, students create their own graph of a proportional relationship using a table of values (e.g., earning \$12 per hour).
- Exchange graphs with another pair to analyze and determine the constant of proportionality.

Closure (5 min)

- Quick write: *“A graph passes through (0, 0) and (3, 9). Is this a proportional relationship? Explain how you know.”*
 - Share responses and clarify misconceptions.
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Formative Assessments

- Class discussion and student observations
 - Responses during guided practice
 - Peer feedback during partner graph analysis
 - Exit quick-write assessing conceptual understanding
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Instructional Materials and Resources

- Graph paper or digital graphing tools (Desmos, Google Sheets)
 - HMH Into Math Student & Teacher Editions (Grade 7 Accelerated)
 - Markers, rulers, calculators
 - Sample graphs (correct and incorrect examples)
 - Task cards or problem sets for graph interpretation
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Reflections and Suggested Modifications

Reflections:

- Were students able to consistently apply the "straight line through the origin" rule?
- Did they connect the graph to real-world meaning?

Modifications:

- **For struggling learners:** Use color coding or graphic organizers to break down parts of a graph.

Scaffold with sentence stems for justifications.

- **For advanced learners:** Challenge with non-proportional relationships (e.g., linear but not proportional) and ask them to compare and contrast. Introduce contexts with piecewise or curved graphs.

Lesson 5: Use Proportional Relationships to Solve Rate Problems

Student Learning Intentions (WALT)

- **We are learning to** use proportional relationships to solve real-world rate problems.
 - **We are learning to** understand and apply the concept of unit rate in solving problems involving speed, price, and other ratios.
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Student Success Criteria (I Can Statements)

- **I can** identify and apply the unit rate to solve rate problems.
 - **I can** set up and solve proportions to find unknown values in rate problems.
 - **I can** explain the solution process clearly using appropriate mathematical language.
 - **I can** check my solutions to ensure they are reasonable in the context of the problem.
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Instructional Strategies and Activities

Engage (5–7 min)

- Show a real-world example of a rate problem (e.g., “A car travels 240 miles in 4 hours. How fast is it going?”)
- Ask students: “*What do we need to figure out in this problem? How do you think we could approach it?*”
- Connect the question to the idea of unit rates.

Explore (15 min)

- **Direct Instruction:** Explain that a rate is a ratio comparing two quantities with different units, and unit rates are a way to express the comparison with a denominator of 1.
- Teach how to set up a proportion for rate problems (e.g., distance/time = rate).
- Model how to solve problems step-by-step using proportions.

Example: *If 240 miles is traveled in 4 hours, the unit rate would be $240 \text{ miles} \div 4 \text{ hours} = 60 \text{ miles per hour}$.*

Explain (15 min)

- **Guided Practice:** Work through additional rate problems as a class (e.g., finding the cost per item, speed, or productivity rate).
- Walk students through setting up and solving proportions for each problem.
- Encourage students to explain the steps they took in solving the problem.
Example: *If 12 apples cost \$6, what is the cost per apple?*

Elaborate (10–12 min)

- **Independent Practice:** Provide students with a set of rate problems (e.g., price comparisons, speed, etc.).
- Students will work individually or in pairs to solve the problems, applying their understanding of proportional relationships.
- For challenge, provide multi-step problems involving unit rates and proportional relationships.

Closure (5 min)

- Quick review: Ask students to explain in a few sentences how to solve a rate problem using proportional relationships.
- Have a few students share their explanations with the class.

Formative Assessments

- Observation of student participation during guided practice
- Responses during class discussions
- Completed independent practice problems
- Quick formative exit ticket asking students to solve a simple rate problem

Instructional Materials and Resources

- HMH Into Math Student & Teacher Editions (Grade 7 Accelerated)
- Graph paper, markers, and rulers for drawing diagrams (optional)
- Whiteboard and markers for problem-solving examples

- Calculators for multi-step problems (optional)
 - Problem sets (rate word problems and proportional problems)
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Reflections and Suggested Modifications

Reflections:

- Were students able to set up and solve proportions correctly?
- Did they understand how to convert the rate into unit rate form?
- Did students engage well with the real-world contexts of the problems?

Modifications:

- **For struggling learners:** Break down the problems into smaller, more manageable parts. Provide additional visual aids (like bar models) to represent the problem.
- **For advanced learners:** Provide multi-step word problems that require them to set up and solve more complex ratios and proportional relationships. Challenge them to create their own rate problems for others to solve.

Lesson 6: Practice Proportional Reasoning with Scale Drawings

Student Learning Intentions (WALT)

- **We are learning to** use proportional reasoning to solve problems involving scale drawings.
 - **We are learning to** understand how to create and interpret scale drawings by applying proportional relationships between the real-world object and its scaled representation.
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Student Success Criteria (I Can Statements)

- **I can** identify the scale factor in a scale drawing.
 - **I can** use proportional reasoning to find missing dimensions in a scale drawing.
 - **I can** draw a scaled version of a real object using proportional relationships.
 - **I can** explain how scale and proportional relationships are used to create accurate representations.
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Instructional Strategies and Activities

Engage (5–7 min)

- Show students an image of a map or blueprint (such as a map with a scale of 1 inch = 10 miles).
- Ask: *“How can we use this scale to figure out the actual distance between two points on the map?”*
- Introduce the concept of scale drawings and the need for proportional reasoning to make accurate measurements.

Explore (15 min)

- **Direct Instruction:** Explain what scale drawings are and how the scale represents the ratio between the dimensions in the drawing and the actual size of the object.
- Show how to set up a proportion to calculate missing dimensions based on the scale (e.g., *Scale: 1 inch = 5 feet. If a drawing is 3 inches tall, how tall is the actual object?*).
- **Example:** If the scale is 1:100, and the drawing of a building is 5 cm, the real building height is $5 \times 100 = 500$ cm.

Explain (15 min)

- **Guided Practice:** Provide students with a set of scale drawing problems.
- Work through problems as a class, where students identify the scale and set up proportions to find missing dimensions (e.g., length, width, height).
- Encourage students to model the scale and its relationship to the actual dimensions using visual aids, such as drawing lines and labeling them on the board.

Elaborate (10–12 min)

- **Independent Practice:** Give students scale drawing problems where they need to solve for missing dimensions using proportional reasoning.
- Have students create their own scale drawings based on a real-world object or location (e.g., a floor plan or map).
- Students can use graph paper to draw scaled versions of objects, practicing setting up proportions to determine accurate measurements.

Closure (5 min)

- Quick review: Ask students to summarize how they use proportional reasoning to work with scale drawings.
- Pose a reflection question: *“Why is proportional reasoning important when creating or interpreting scale drawings?”*

- Allow students to share their reflections with the class.
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Formative Assessments

- Observation of student participation during guided and independent practice
 - Responses to reflection questions
 - Completed practice problems, checking for correct application of proportions
 - Quick formative exit ticket asking students to solve a scale drawing problem
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Instructional Materials and Resources

- HMH Into Math Student & Teacher Editions (Grade 7 Accelerated)
 - Graph paper, rulers, and colored pencils for drawing scale models
 - Whiteboard and markers for demonstrations
 - Problem sets with scale drawing word problems
 - Calculators (optional) for solving proportions in multi-step problems
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Reflections and Suggested Modifications

Reflections:

- Did students successfully apply proportional reasoning to solve scale drawing problems?
- Were students able to create their own scale drawings accurately?
- Were there any specific concepts or problems that caused confusion for students?

Modifications:

- **For struggling learners:** Provide additional scaffolding by using visual aids, such as step-by-step guides for setting up proportions. Break down complex problems into simpler steps.
- **For advanced learners:** Challenge them to work with non-linear scales or introduce them to maps with different units of measurement. They can also create a detailed scale drawing of a more complex object or space.

Modifications and/or Accommodations

English Language Learners (ELL)

- **Native Language Support:**

- The teacher provides auditory or written content to students in their native language.

- **Adjusted Speech:**

- The teacher changes speech patterns to increase student comprehension. This could include facing the students, paraphrasing, clearly indicating the most important ideas, and speaking more slowly.

- **Visuals:**

- The teacher uses graphics, pictures, visuals, and manipulatives. This helps ELL students better understand and comprehend the subject matter.

- **Front-Loading Vocabulary:**

- The teacher front-loads vocabulary by providing students with a list of important vocabulary words they will need to know for a lesson before it is taught. Including pictures with vocabulary words is also beneficial for students.
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Special Education Students

- **Chunking:**

- The teacher presents information in a way that is easy for students to understand and remember. Chunking organizes information into meaningful units to prevent working memory overload, which can be helpful for students with special needs.

- **Checking for Understanding:**

- It is important to consistently check for understanding, especially for students who have accommodations, to ensure they comprehend the concepts in a way that makes sense to them.

- **Extra Time:**

- The teacher provides students with special needs extra time to complete work or answer questions, giving them adequate time to process their thoughts.

- **Oral Reading:**

- The teacher will read work aloud to students, which can include class work, tests, and literature circles.

- **Timers:**

- The teacher uses timers to help students manage time when completing tasks, especially for

students who struggle to finish tasks within time limits.

Students with 504 Plans

- **Chunking:**

- The teacher organizes information into manageable units to ensure students with 504 plans are not overwhelmed by excessive detail.

- **Checking for Understanding:**

- Teachers will continuously check for understanding, ensuring students with accommodations comprehend the lesson content.

- **Extra Time:**

- Students with 504 plans are given extra time to complete assignments, ensuring they have ample time to process information.
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Gifted & Talented Strategies

- **Extensions/Enrichments:**

- Teachers provide gifted and talented students with enrichment projects that challenge them to deepen their understanding, apply knowledge, or produce something in relation to what they have learned.

- **Modify/Change Activities:**

- Teachers monitor and adjust activities for students who need more of a challenge. This may involve additional reading, problem-solving, writing, or project work, allowing gifted students to progress at an accelerated rate compared to their peers.
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Students at Risk of School Failure

- **Directions or Instructions:**

- Directions/instructions are provided in limited numbers, both verbally and in simple written format. Teachers may ask students to repeat the instructions to ensure understanding and check back to ensure they haven't forgotten.

- **Peer Support:**

- Peers can build confidence by helping others. Teachers can set up a system where specific students are assigned to assist at-risk students with clarification before approaching the teacher.

- **Alternate or Modified Assignments:**

- Teachers should consider modifying assignments for students at risk by simplifying tasks, reducing length, or offering alternative delivery modes (e.g., oral reports instead of written assignments).

- **Increase One-on-One Time:**

- Teachers should check in with at-risk students regularly, even for brief periods, to offer support and guidance as needed.

- **Contracts:**

- A working contract helps prioritize tasks and ensures completion. Students and teachers can track progress together by marking off completed tasks with checkmarks or symbols, encouraging accountability.

- **Hands-On Tasks:**

- Provide concrete, hands-on activities to support at-risk students. This may include using tools like calculators or counters in math or having students use audio recordings for comprehension tasks instead of reading themselves.

- **Tests/Assessments:**

- Tests can be administered orally, or broken into smaller sections. Teachers may administer parts of a test in the morning, after lunch, and on subsequent days if necessary.

- **Seating:**

- Seat students near a helping peer or with quick access to the teacher. For students with hearing or vision issues, seat them at the front for better access to instruction.

Integration of Diversity, Equity and Inclusion; Climate Change; Informational and Media Literacy

Provide students with opportunities to give feedback to teachers about the classroom and instruction

- **Verbal Example:**

- Fist to five: "How well do you understand what we talked about today?"
- Fist to five: "How well did I teach this today?"

- **Classroom Activity:**

- Exit tickets or surveys asking students to identify how well teachers taught, what helped them learn, what got in the way of their learning, etc.

Treat mathematics as a language that everyone is learning while authentically centering students' home languages

- **Classroom Strategies:**
 - Color-coding ideas
 - Learning vocabulary in student languages
 - Visual and kinesthetic learning
 - Representations of learning without words
- **Classroom Activity:**
 - Multilingual Frayer Models for definitions or concepts

Incorporate true culturally relevant pedagogy, practice, and curriculum

- **Verbal Example:**
 - "What are some of your family traditions that you are proud of? Would you be okay if we brought some of those into the classroom?"
- **Classroom Activity:**
 - Use Ankara fabric to teach mathematical concepts such as tessellations, fractions, area, percentages, etc.

Incorporate the history of mathematics into lessons

- **Verbal Example:**
 - "Why do you think we call it Pythagorean's theorem, when it was used before he was even born? What should we call it instead?"
- **Classroom Activity:**
 - Learn about different bases and numerical ideas:
 - Base 2 (binary) and connections to computer programming
 - How the Yoruba of Nigeria used base 20
 - How the Mayans conceptualized the number 0 before the first recording of it

Solicit student ways of thinking and processing

- **Verbal Example:**

- "How might you all go about this?"
- "What do you notice?"

- **Classroom Activity:**

- Incorporate explorations where students interact with mathematics in a way that allows them to “discover” or experience mathematics.
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Reorganize your classroom teaching around concepts, and teach them more like a web rather than discrete sets of knowledge

- **Verbal Example:**

- "How does this connect to what you’ve learned in the past?"
- "How can you use that knowledge today?"

- **Classroom Activity:**

- Learning webs that connect content
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Start with more complex math problems and scaffold as necessary

- **Verbal Example:**

- "If we wanted to build a rocket, what are all the things we might need to know before we get started? Along the way, we decided that we want the rocket to reach the moon. What do we need to consider now?"

- **Classroom Activity:**

- When solving equations, start with the most complex problem, generate ideas for how to solve it, and use the simpler equations as examples to support those ideas.
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Offer a variety of ways to demonstrate thinking and knowledge

- **Verbal Example:**

- "Show your thinking with words, pictures, symbols."

Ask other questions that will demonstrate learning when it is not clear to you how students know the answer

- **Verbal Example:**

- "If you were working with a fellow mathematician who was absent this day, what might you tell them to help them learn it?"

Learn about, engage with, and incorporate ethnomathematics

- **Verbal Example:**

- "Reflect on your day so far. What math have you already used today?"

- **Classroom Activity:**

- Community walks to engage with slope.

Co-construct knowledge in the classroom

- **Verbal Example:**

- "Let's get into partners and do a think-pair-share. We will incorporate everyone's ideas and try to synthesize them."

- **Classroom Activity:**

- Have students create mathematical definitions in their own words in groups, and bring the groups together to co-construct mathematical definitions as a class.

Choose problems that have complex, competing, or multiple answers

- **Verbal Example:**

- "Come up with at least two answers that might solve this problem."

- **Classroom Activity:**

- Challenge standardized test questions by getting the "right" answer, but justify other answers by unpacking the assumptions that are made in the problem.

- **Classroom Activity:**

- Deconstructed Multiple Choice: Given a set of multiple-choice answers, students

discuss why these answers may have been included. This can also be used to highlight common mistakes.

Identify what is right about the thinking, and highlight the mistake in what is factually or procedurally accepted

- **Verbal Example:**

- "You recognized that you had to combine the constants 27 and 9, could you explain your thinking?"

- **Classroom Activity:**

- Error Analysis worksheets that highlight what is the right idea behind the mistake.
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Use thoughtful questioning to solicit mathematical thoughts rather than telling

- **Verbal Example:**

- "What would a mathematician who is confused ask about this question?"

- **Classroom Activity:**

- After students demonstrate knowledge of a topic, have them play a game where they have to explain their topic to a fellow mathematician and a skeptic. Develop their own reflective questioning/explaining in all three roles.
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Create multiple ways of participating that honor myriad ways of thinking and being

- **Verbal Example:**

- "For this section, feel free to work alone, in pairs, trios, or quads (let them choose)."

- **Classroom Activity:**

- Community circles or storytelling circles, incorporating dance, music, song, call and response, and other cultural ways of communicating.
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Math Climate Change Companion Guide

- **G.MG.A.2 Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).**

- **Climate Change Example:**

- Students may apply the concept of population density of different urban areas, including calculations of population density, and discuss different environmental factors (e.g., air and water quality, waste disposal, energy consumption) that might be exacerbated by increased population density.

New Jersey Student Learning Standards: Content Area

MATH.9-12.A.REI

Reasoning with Equations and Inequalities

Integration of Career Readiness. Life Literacies and Key Skills

CRP.K-12.CRP2

Apply appropriate academic and technical skills.

CRP.K-12.CRP4

Communicate clearly and effectively and with reason.

CRP.K-12.CRP6

Demonstrate creativity and innovation.

CRP.K-12.CRP7

Employ valid and reliable research strategies.

CRP.K-12.CRP8

Utilize critical thinking to make sense of problems and persevere in solving them.

CRP.K-12.CRP11

Use technology to enhance productivity.

21st Century Life and Career

CRP.K-12.CRP4

Communicate clearly and effectively and with reason.

CRP.K-12.CRP6

Demonstrate creativity and innovation.

CRP.K-12.CRP8

Utilize critical thinking to make sense of problems and persevere in solving them.

Integration of Computer Science and Design Thinking

CS.9-12.8.1.12.AP.1 Design algorithms to solve computational problems using a combination of original and existing algorithms.

CS.9-12.8.1.12.AP.5 Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.

Interdisciplinary Connections: NJSL for ELA, Social Studies, Science and/or Math

LA.RH.9-10.8	Assess the extent to which the reasoning and evidence in a text support the author's claims.
LA.RST.9-10.5	Analyze the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
LA.RST.9-10.7	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
LA.RST.9-10.8	Determine if the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.

Module 2: Proportional Reasoning with Percents

Unit Rationale

Understanding proportional reasoning with percents is essential for solving real-world problems involving discounts, taxes, interest rates, and other percent-based calculations. In this unit, students will explore how percents are related to fractions and decimals and develop the ability to apply proportional reasoning to solve problems involving percent increase and decrease.

This unit is designed to build on students' prior knowledge of ratios and proportions, allowing them to apply these concepts to everyday situations where percentages are used to describe parts of a whole. Understanding percents is fundamental for success not only in mathematics but also in fields such as finance, economics, and data analysis.

Placed early in the curriculum, this unit provides a strong foundation for more advanced mathematical concepts such as compound interest, probability, and other algebraic applications. By the end of the unit, students will have a clear understanding of how to compute percentages, solve percent problems, and use proportions to determine unknown values in percent-related problems.

The relevance of percent calculations is reinforced through real-life examples such as calculating sale prices, determining the tax on a purchase, or figuring out tips in a restaurant. These concrete applications ensure that students understand the importance of percents and their role in various mathematical and real-world contexts.

Throughout this unit, students will also engage with the following **Standards for Mathematical Practice**:

- **MP2:** Reason abstractly and quantitatively
- **MP4:** Model with mathematics
- **MP6:** Attend to precision
- **MP7:** Look for and make use of structure

By the end of the unit, students will be proficient in solving problems involving percentages and will have

developed a strong conceptual understanding of how proportional reasoning applies to percent problems. This foundation will enable students to solve real-world problems and approach more complex mathematical topics with confidence.

Essential Questions

- **How can we represent and calculate percentages in various real-world contexts?**
- **What is the relationship between fractions, decimals, and percents, and how can we convert between them?**
- **How can we use proportional reasoning to solve problems involving percent increase and decrease?**
- **What strategies can we use to apply percents to solve problems like discounts, taxes, and interest rates?**
- **How do proportional relationships help us make predictions or solve real-life problems involving percents?**
- **In what ways can we model percent problems using tables, equations, or graphs?**
- **How does understanding percents contribute to making informed decisions in daily life, such as budgeting or shopping?**
- **Why is it important to attend to precision when solving percent-related problems?**
- **How can we determine unknown values in a percent problem using proportional reasoning?**
- **How can understanding percents help us analyze and interpret data in various fields, such as finance and science?**

Pre-Assessments

Benchmark assessments are given within the first semester using HMH Into Math.

1. Readiness Check (Diagnostic Assessment)

- Found at the beginning of each module/unit.
- Assesses prerequisite skills necessary for success in the upcoming lessons.
- Usually includes a mix of multiple-choice and short answer items.

- Great for determining small-group needs or identifying which students might benefit from additional support.

2. Diagnostic Assessments in Ed: Your Friend in Learning

- Online assessments tied to Into Math.
- Adaptive in nature (depending on your district's setup) and aligned with the lesson standards.
- Can provide recommendations for intervention or enrichment based on results.

3. Module Quizzes (Pre-Use)

- While designed for post-instruction, some teachers use the Module Quiz or Mid-Module Checkpoint as a pre-assessment to gauge student background knowledge.
- Use selectively, focusing on concepts that build directly on prior grades' standards.

4. Lesson-Specific Checks

- Some lessons include "Are You Ready?" sections or warm-ups that can double as informal pre-assessments.
- Often appear in the Teacher Edition or digital platform and can be used as bell-ringers or exit tickets.

Instructional Plan

Lesson 1: Percent Change

Student Learning Intentions or We are learning to ... (WALT):

- We are learning to calculate percent change and understand its real-world applications.
- We are learning to solve problems involving percent increase and percent decrease.

Student Success Criteria ... "I can statements":

- I can define percent change and explain its meaning.
 - I can calculate the percent increase and percent decrease between two quantities.
 - I can solve real-world problems that involve percent change.
-

Instructional Strategies and Activities:

1. Introduction to Percent Change:

- **Direct Instruction:** Begin with a clear explanation of percent change. Define percent increase as the amount something has grown compared to its original amount and percent decrease as the amount something has reduced. Use simple examples like price increase or decrease in a store sale.
- **Visual Models:** Display a visual model (e.g., a number line or bar graph) showing an increase and decrease. Show the relationship between the original value and the final value.

2. Guided Practice:

- Work through several examples on the board, calculating percent change step by step. Engage students by asking questions such as:
 - What do you notice when the value increases or decreases?
 - How do you identify the original and new values in a word problem?
- Use a real-world scenario (e.g., a price increase of a product) to make the concept relatable.

3. Independent Practice:

- Students work on a set of problems where they calculate percent change in various contexts, such as sales tax, discounts, or population growth. Provide a worksheet with problems that include both percent increase and percent decrease.
- For extra practice, give them real-life examples, such as calculating the percent change in the population of a city from one year to the next.

4. Peer Collaboration:

- Have students pair up and share their solutions with a partner. They should explain their steps and reasoning, ensuring they understand the process.

Formative Assessments:

1. Exit Ticket:

- After the lesson, have students complete a short exit ticket with 2-3 percent change problems to assess their understanding. The problems should involve both increase and decrease scenarios.

2. Observation and Questioning:

- During the independent practice and peer collaboration, observe students' problem-solving strategies. Ask students to explain how they arrived at their answers to ensure understanding.

3. Quick Check-in:

- Periodically check for understanding by asking students to explain how they would find the percent change in a new scenario, using either percentage increase or decrease.
-

Instructional Materials and Resources:

- **Whiteboard/Smartboard:** For modeling and demonstrating percent change problems.
- **Worksheets/Problem Sets:** A set of practice problems involving real-life percent change examples.
- **Interactive Tools (Optional):** Online calculators or digital tools for calculating percent change, such as interactive whiteboards or tablet apps that allow students to manipulate variables and see how percent change works dynamically.
- **Handouts/Reference Sheets:** A step-by-step guide on how to calculate percent change, including the formula:

$$\text{Percent Change} = \frac{\text{New Value} - \text{Original Value}}{\text{Original Value}} \times 100$$
$$100 \text{Percent Change} = \text{Original Value} \frac{\text{New Value} - \text{Original Value}}{\text{Original Value}} \times 100$$

Reflections and Suggested Modifications:

- **Reflection:**
 - Reflect on how students responded to the real-world examples. Did they engage with the scenarios effectively? Were they able to connect the concept of percent change to their own experiences, such as shopping or saving money?
 - Did students struggle more with percent increase or percent decrease? Consider which part of the lesson needs reinforcement in future classes.
- **Suggested Modifications:**
 - **Differentiation:** For students who may struggle, provide additional practice with simpler numbers and work through the problems with them step by step. Use visual aids, such as number lines or charts, to help them visualize the change.
 - **Enrichment:** For students who grasp the concept quickly, challenge them with more complex real-world problems involving multiple steps, such as calculating percent change across several items in a shopping cart or combining percent change with other mathematical concepts (e.g., compound interest).
 - **Group Work:** For peer collaboration, group students with varying abilities so they can support each other. You could also implement a “think-pair-share” strategy, allowing students time to reflect individually before discussing with a partner.

Lesson 2: Markups and Discounts

Student Learning Intentions or We are learning to ... (WALT):

- We are learning to calculate markups and discounts and apply them to real-world situations.
- We are learning to solve problems involving markups and discounts, understanding their real-life applications in pricing.

Student Success Criteria ... "I can statements":

- I can define markup and discount and explain how they are applied in real-world situations.
 - I can calculate the amount of markup or discount based on a given percentage and the original price.
 - I can apply my understanding of markups and discounts to solve real-world problems involving price changes.
-

Instructional Strategies and Activities:

1. Introduction to Markups and Discounts:

- **Direct Instruction:** Explain the concepts of markup and discount. A markup is the increase in the price of an item, usually added as a percentage of the original price. A discount is the reduction in the price of an item, also given as a percentage of the original price. Discuss how businesses use markups to make a profit and how consumers benefit from discounts during sales.
- **Real-Life Context:** Use examples such as store sales, restaurant bills, and online shopping to illustrate these concepts. For example, "If a shirt costs \$50 and the store adds a 20% markup, what will the selling price be?" or "A jacket originally costs \$100 but is on sale for 25% off. How much will the jacket cost after the discount?"

2. Guided Practice:

- Solve examples together with the class, showing how to find the amount of the markup or discount and then how to calculate the final price:
 - **Markup Example:** If an item costs \$80 and the markup is 15%, first calculate the markup amount ($80 \times 0.15 = 12$), then add the markup to the original price ($80 + 12 = 92$).
 - **Discount Example:** If an item costs \$150 and there is a 30% discount, first calculate the discount amount ($150 \times 0.30 = 45$), then subtract the discount from the original price ($150 - 45 = 105$).
- Use a visual chart or a price list with different products for students to identify markups and discounts.

3. Independent Practice:

- Students complete practice problems involving both markups and discounts, using various percentages and original prices. Include problems with both fixed amounts and percentage-

based markups/discounts to provide variety.

○ Example Problems:

- A toy costs \$40 and has a 25% markup. What is the selling price of the toy?
- A laptop is priced at \$1,200, but it is offered with a 15% discount. How much will the laptop cost after the discount?

4. Peer Collaboration:

- Pair students up and have them discuss and solve problems together. Encourage them to explain their reasoning and how they calculate the markup or discount.
 - You could also introduce a “Price Challenge” where each pair receives a set of items with different markups or discounts and must solve for the final price.
-

Formative Assessments:

1. Exit Ticket:

- Have students complete a short exit ticket with one markup problem and one discount problem. This can be done individually to assess their understanding of both concepts.

2. Observation and Questioning:

- During the independent practice and peer collaboration, observe students’ problem-solving strategies. Ask guiding questions such as:
 - What happens to the price if the markup increases? If the discount increases?
 - How do you determine the final price after applying the markup or discount?

3. Quick Check-in:

- Ask students to solve a problem on the board or in small groups. For example: "A jacket originally costs \$120. It is on sale for 30% off. What is the sale price?" Observe their work and provide feedback on the correct methods.
-

Instructional Materials and Resources:

- **Whiteboard/Smartboard:** For modeling problems and demonstrating how to calculate markups and discounts.
- **Worksheets/Problem Sets:** A set of practice problems with various markup and discount scenarios, including both percentage and fixed amounts.
- **Visual Aids:** Use charts or price lists with example products for students to identify markups or

discounts.

- **Interactive Tools (Optional):** Use online price calculators or apps that demonstrate real-world scenarios of markups and discounts, like shopping apps or websites with sales percentages.
-

Reflections and Suggested Modifications:

- **Reflection:**

- Reflect on how students responded to the real-life scenarios. Were they able to apply the concepts of markup and discount effectively in context? Were there any common misunderstandings?
- Did students struggle more with markups or discounts, and which step in the process seemed most challenging for them?

- **Suggested Modifications:**

- **Differentiation:** For students who may struggle, provide simpler problems with smaller percentages and guide them through the calculations more closely. You can also use more visual aids like pictures of items with marked prices.
- **Enrichment:** For advanced students, provide more complex scenarios involving multiple items with different markups and discounts, or have them calculate total costs with taxes added.
- **Group Work:** Organize group work around a "shopping challenge," where students compare the total cost of items with and without discounts or markups in a mock store scenario. Students can present their findings to the class.

Lesson 3: Taxes and Gratuities

Student Learning Intentions or We are learning to ... (WALT):

- We are learning to calculate sales tax and gratuity (tips) and understand how they are applied in real-life situations.
- We are learning to solve problems involving sales tax and gratuities, helping us calculate total costs in real-world scenarios like dining out and shopping.

Student Success Criteria ... "I can statements":

- I can define sales tax and gratuity and explain their applications in real-world scenarios.
- I can calculate the amount of sales tax and gratuity based on a percentage and the original price.
- I can determine the total cost of an item or service, including tax and gratuity.

- I can apply my understanding of taxes and gratuities to solve real-world problems.
-

Instructional Strategies and Activities:

1. Introduction to Sales Tax and Gratuity:

- **Direct Instruction:** Explain the concepts of sales tax and gratuity. Sales tax is a percentage of the purchase price added to the total cost, while gratuity (or tip) is an amount given to service workers, usually as a percentage of the total bill. Discuss how these apply in everyday life, such as when shopping or dining out.
- **Real-Life Context:** Use examples from real life, such as shopping at a store or dining at a restaurant. For instance, "If you go to a restaurant and your bill is \$40, and the gratuity is 18%, how much tip would you leave?" or "If a shirt costs \$25 and the sales tax is 7%, what is the total price of the shirt?"

2. Guided Practice:

- Solve examples together with the class. Show how to calculate the sales tax and gratuity by following these steps:
 - **Sales Tax Example:** If an item costs \$50 and the sales tax rate is 8%, first calculate the sales tax amount ($50 \times 0.08 = 4$), then add the tax to the original price ($50 + 4 = 54$).
 - **Gratuity Example:** If the bill at a restaurant is \$60 and the gratuity is 15%, calculate the tip ($60 \times 0.15 = 9$), then add the tip to the total bill ($60 + 9 = 69$).
- Work through these examples on the board, demonstrating how to use percentages to calculate both tax and gratuity.

3. Independent Practice:

- Provide students with practice problems involving sales tax and gratuity. Students will calculate the total cost of items and services after tax and tips are added.
- Example Problems:
 - A pair of shoes costs \$80, and the sales tax is 7%. What is the total cost after tax?
 - You dine at a restaurant, and your bill is \$45. If the gratuity is 20%, how much tip will you leave, and what is the total amount you need to pay?
 - A \$100 item is purchased, and the sales tax is 6.5%. Calculate the total cost including the sales tax.

4. Group Work:

- Organize students into small groups and give them a scenario to solve together. For example, provide a menu with various items and ask students to calculate the total cost of a meal,

including tax and gratuity, based on a specified tip percentage. This will encourage collaboration and reinforce the real-world applications of these concepts.

5. Reflection and Discussion:

- After the group activity, ask students to discuss how calculating tax and gratuity is important in everyday life and share their answers with the class. Encourage them to think about other situations where these calculations might be useful (e.g., hotel bills, renting services, etc.).
-

Formative Assessments:

1. Exit Ticket:

- At the end of the lesson, have students complete a short exit ticket where they calculate both tax and gratuity for a given item or service. This will allow you to assess individual understanding.

2. Observation and Questioning:

- During independent and group practice, observe students as they solve problems and ask guiding questions:
 - How do you find the total cost after tax?
 - What is the first step in calculating gratuity?
 - How does the percentage affect the total cost?

3. Peer Review:

- After the group work, have students pair up and check each other's calculations. They can explain their process to each other, helping to reinforce the concepts and correct any misunderstandings.
-

Instructional Materials and Resources:

- **Whiteboard/Smartboard:** To model examples of calculating sales tax and gratuity.
 - **Worksheets/Problem Sets:** Practice problems with varying scenarios for students to calculate sales tax and gratuity.
 - **Menu (Optional):** A sample restaurant menu with prices for the group work activity, to simulate a real-life situation where students must calculate the total cost of a meal.
 - **Online Calculators (Optional):** Use a percentage calculator or app to demonstrate how tax and gratuity calculations work.
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Reflections and Suggested Modifications:

- **Reflection:**

- Reflect on the students' understanding of tax and gratuity concepts. Did they understand the process of calculating these amounts? Were any students confused about how percentages work in this context? Did they apply the method correctly in different scenarios?

- **Suggested Modifications:**

- **Differentiation:** For students who may struggle, offer problems with smaller amounts and easier percentages (e.g., 5% tax or 10% gratuity). You could also provide visual aids, such as pie charts or simple step-by-step guides, to help students follow the process.
- **Enrichment:** For students who grasp the concept quickly, provide more complex problems, such as multi-item purchases with varying tax rates or gratuity percentages, and have them calculate the total amount.
- **Group Work:** Ensure that all students are actively participating in group activities. Some students may need more guidance, so pairing them with stronger students for collaborative problem-solving could be beneficial.

Lesson 4: Commission and Fees

Student Learning Intentions or We are learning to ... (WALT):

- We are learning to calculate commission and fees in real-world scenarios.
- We are learning to solve problems involving commission and fees and understand their impact on total earnings or costs.

Student Success Criteria ... “I can statements”:

- I can define commission and fees and explain how they are applied in various situations.
- I can calculate commission based on a given percentage of total sales.
- I can calculate fees based on a given percentage or fixed amount and apply these concepts to solve real-life problems.
- I can analyze the impact of commission and fees on total earnings or costs.

Instructional Strategies and Activities:

1. Introduction to Commission and Fees:

- **Direct Instruction:** Explain the concepts of commission and fees. Commission is a payment made to an employee based on a percentage of sales they make, often used in sales jobs. Fees, on the other hand, are charges for services or products, such as a bank fee for an account or a service fee for using a website.
- **Real-Life Context:** Use examples that involve commission and fees, such as:
 - A real estate agent earning 5% commission on a house sale.
 - A bank charging a \$15 fee for monthly account maintenance.
 - A salesperson receiving 10% commission on a \$500 sale.
 - A service provider charging a 5% fee for processing a payment or booking a reservation.

2. Guided Practice:

- Walk through a couple of examples:
 - **Commission Example:** If a car salesperson sells a car for \$20,000 and receives a 7% commission, how much commission does the salesperson earn?
 - Solution: $20,000 \times 0.07 = 1,400$
The salesperson earns \$1,400.
 - **Fee Example:** If a bank charges a \$10 fee for account maintenance and someone has a balance of \$500, how much would they have left after the fee is deducted?
 - Solution: $500 - 10 = 490$
The customer has \$490 left in their account after the fee is deducted.

3. Independent Practice:

- Provide students with practice problems that involve calculating both commission and fees. Students will be asked to find the commission or fee based on a percentage, and then calculate the remaining amount (if applicable).
- Example Problems:
 - A travel agent books a vacation package for a customer worth \$3,500. The agent earns a 12% commission. How much commission will the agent make?
 - A membership fee for a gym is \$80 per month. If there is a 5% service fee added each month, how much will the customer pay in total for the first month?
 - A restaurant server sells \$250 worth of food and receives a 15% commission. How much commission will the server earn?

4. Group Work:

- Organize students into small groups and provide them with a scenario in which they must calculate commission or fees for a real-world situation. For example:

- A salesperson sells \$500 worth of merchandise, and their company pays them a 6% commission. What will the salesperson's commission be?
- A student buys a concert ticket for \$60, and there is a 10% service fee. What is the total cost of the ticket, including the fee?

5. Reflection and Discussion:

- After the independent and group practice, ask students to reflect on how commission and fees affect total earnings or costs. Discuss with the class how understanding these concepts can help with budgeting or evaluating payment structures in different careers or services.
-

Formative Assessments:

1. Exit Ticket:

- At the end of the lesson, have students complete an exit ticket where they solve a problem involving commission or fees, such as:
 - "A real estate agent sells a house for \$250,000, and their commission is 3%. How much commission do they earn?"
- This will provide a quick check of individual understanding.

2. Peer Review:

- In the group activity, have students exchange their answers with a partner and explain how they arrived at their solutions. This will allow for peer feedback and help reinforce learning.

3. Observations:

- During independent and group practice, observe students as they work. Are they able to correctly calculate commission and fees? Are they making connections between percentages and real-life applications?
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Instructional Materials and Resources:

- **Whiteboard/Smartboard:** To model examples and solve problems together.
 - **Worksheets/Problem Sets:** Practice problems involving commission and fees with varying percentages and amounts.
 - **Real-Life Scenarios (Optional):** Examples of commission and fees from different professions, such as real estate agents, salespeople, or service providers.
 - **Online Calculators (Optional):** Use a percentage calculator or app to demonstrate how commission and fees are calculated in real-time.
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Reflections and Suggested Modifications:

- **Reflection:**

- Reflect on how well students grasped the concept of commission and fees. Did they understand how these affect earnings or costs? Were there any areas of confusion, particularly with percentage calculations?

- **Suggested Modifications:**

- **Differentiation:** For students who need extra support, simplify the percentage calculations by using smaller amounts or more straightforward percentages (e.g., 5% or 10%). Visual aids such as charts or step-by-step guides can also be helpful.
- **Enrichment:** For students who grasp the concept quickly, provide more complex scenarios with multiple fees or commission rates involved. For example, include a situation where a service has both a flat fee and a percentage-based fee.
- **Group Work:** Ensure students are actively participating in group work. If some students struggle with the concepts, pair them with peers who can offer additional support and explanation.

Lesson 5: Simple Interest

Student Learning Intentions or We are learning to ... (WALT):

- We are learning to calculate simple interest and understand its application in real-world situations.
- We are learning to apply the formula for simple interest to solve problems involving loans, savings, and investments.

Student Success Criteria ... “I can statements”:

- I can define simple interest and explain how it is calculated.
- I can apply the simple interest formula to find the interest earned or paid on a principal amount.
- I can solve real-world problems involving simple interest and understand how interest impacts the total amount owed or earned.

Instructional Strategies and Activities:

1. Introduction to Simple Interest:

- **Direct Instruction:** Introduce the concept of simple interest and explain that simple interest is the amount earned or paid on a principal (initial) amount of money at a specific interest rate

over a period of time.

○ **Formula for Simple Interest:**

$$I = P \times r \times t$$

Where:

- I = Interest
 - P = Principal (initial amount)
 - r = Annual interest rate (as a decimal)
 - t = Time (in years)
- **Example:** If a person invests \$1,000 at an interest rate of 5% for 3 years, how much interest will they earn?

2. Guided Practice:

- Work through a few examples together:
 - **Example 1:** A student invests \$500 in a savings account with a 4% interest rate for 2 years. How much interest will the student earn?
 - Using the formula: $I = 500 \times 0.04 \times 2 = 40$
 $I = 500 \times 0.04 \times 2 = 40$. The student will earn \$40 in interest.
 - **Example 2:** A car loan of \$5,000 is taken out with an interest rate of 6% for 3 years. How much interest will be paid on the loan?
 - Using the formula: $I = 5000 \times 0.06 \times 3 = 900$
 $I = 5000 \times 0.06 \times 3 = 900$. The total interest paid on the loan is \$900.

3. Independent Practice:

- Provide students with practice problems that require them to calculate simple interest, using the formula provided.
 - **Example Problems:**
 - A student borrows \$1,200 at an interest rate of 8% for 4 years. How much interest will the student pay?
 - A savings account earns 3% interest on a deposit of \$2,500. If the account is left for 5 years, how much interest will be earned?
 - A loan for \$3,000 has a 7% interest rate. How much interest will be paid after 6 years?

4. Group Work:

- Break students into small groups and give each group a scenario involving simple interest. Each

group will calculate the interest and present their solution to the class.

- **Example Scenario:** A family takes out a loan of \$10,000 to pay for home repairs. The interest rate is 5% per year, and the loan is paid off in 3 years. What is the total amount of interest paid on the loan? What is the total amount to be paid after 3 years (including the principal)?

5. Reflection and Discussion:

- After practicing problems, hold a class discussion about the significance of interest in real life. How does simple interest affect savings accounts, loans, or credit cards? What are the advantages and disadvantages of simple interest compared to compound interest?
-

Formative Assessments:

1. Exit Ticket:

- At the end of the lesson, give students an exit ticket with one problem on simple interest, such as:
 - "A person invests \$2,000 at an interest rate of 3% for 2 years. How much interest will they earn?"
- This will help gauge student understanding of the simple interest formula.

2. Peer Review:

- During group work, have students check each other's work and explain how they arrived at their answers. This peer-to-peer explanation can help reinforce concepts and provide opportunities for correction.

3. Observations:

- Walk around the classroom during independent and group activities to assess student understanding. Look for students who may need additional support, especially with applying the formula correctly.
-

Instructional Materials and Resources:

- **Whiteboard/Smartboard:** To model examples and solve problems with the class.
- **Worksheets/Problem Sets:** Practice problems for students to work through on their own or in small groups.
- **Simple Interest Calculator (Optional):** To show students how interest is calculated and compare the manual process with a digital tool.
- **Real-Life Examples:** Use scenarios that involve savings accounts, car loans, or personal loans to make

the concept of simple interest more relatable.

Reflections and Suggested Modifications:

- **Reflection:**

- After the lesson, reflect on how well students understood the concept of simple interest. Were they able to apply the formula correctly? Were there any areas where they struggled with the concept or calculations?

- **Suggested Modifications:**

- **Differentiation:** For students who need extra support, provide a step-by-step guide for using the formula or use smaller numbers to simplify the calculations. Additionally, visual aids such as interest tables may be helpful.
- **Enrichment:** For students who grasp the concept quickly, introduce problems with larger values or varying time periods (e.g., 6 months instead of 1 year) or compare simple interest with compound interest.
- **Group Work:** Ensure that each student in the group has a chance to explain their reasoning. Encourage collaboration and discussion, which can help deepen their understanding.

Modifications and/or Accommodations

English Language Learners (ELL)

- **Native Language Support:**

- The teacher provides auditory or written content to students in their native language.

- **Adjusted Speech:**

- The teacher changes speech patterns to increase student comprehension. This could include facing the students, paraphrasing, clearly indicating the most important ideas, and speaking more slowly.

- **Visuals:**

- The teacher uses graphics, pictures, visuals, and manipulatives. This helps ELL students better understand and comprehend the subject matter.

- **Front-Loading Vocabulary:**

- The teacher front-loads vocabulary by providing students with a list of important vocabulary words they will need to know for a lesson before it is taught. Including pictures with

vocabulary words is also beneficial for students.

Special Education Students

- **Chunking:**

- The teacher presents information in a way that is easy for students to understand and remember. Chunking organizes information into meaningful units to prevent working memory overload, which can be helpful for students with special needs.

- **Checking for Understanding:**

- It is important to consistently check for understanding, especially for students who have accommodations, to ensure they comprehend the concepts in a way that makes sense to them.

- **Extra Time:**

- The teacher provides students with special needs extra time to complete work or answer questions, giving them adequate time to process their thoughts.

- **Oral Reading:**

- The teacher will read work aloud to students, which can include class work, tests, and literature circles.

- **Timers:**

- The teacher uses timers to help students manage time when completing tasks, especially for students who struggle to finish tasks within time limits.
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Students with 504 Plans

- **Chunking:**

- The teacher organizes information into manageable units to ensure students with 504 plans are not overwhelmed by excessive detail.

- **Checking for Understanding:**

- Teachers will continuously check for understanding, ensuring students with accommodations comprehend the lesson content.

- **Extra Time:**

- Students with 504 plans are given extra time to complete assignments, ensuring they have ample time to process information.
-

Gifted & Talented Strategies

- **Extensions/Enrichments:**

- Teachers provide gifted and talented students with enrichment projects that challenge them to deepen their understanding, apply knowledge, or produce something in relation to what they have learned.

- **Modify/Change Activities:**

- Teachers monitor and adjust activities for students who need more of a challenge. This may involve additional reading, problem-solving, writing, or project work, allowing gifted students to progress at an accelerated rate compared to their peers.
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Students at Risk of School Failure

- **Directions or Instructions:**

- Directions/instructions are provided in limited numbers, both verbally and in simple written format. Teachers may ask students to repeat the instructions to ensure understanding and check back to ensure they haven't forgotten.

- **Peer Support:**

- Peers can build confidence by helping others. Teachers can set up a system where specific students are assigned to assist at-risk students with clarification before approaching the teacher.

- **Alternate or Modified Assignments:**

- Teachers should consider modifying assignments for students at risk by simplifying tasks, reducing length, or offering alternative delivery modes (e.g., oral reports instead of written assignments).

- **Increase One-on-One Time:**

- Teachers should check in with at-risk students regularly, even for brief periods, to offer support and guidance as needed.

- **Contracts:**

- A working contract helps prioritize tasks and ensures completion. Students and teachers can track progress together by marking off completed tasks with checkmarks or symbols, encouraging accountability.

- **Hands-On Tasks:**

- Provide concrete, hands-on activities to support at-risk students. This may include using tools like calculators or counters in math or having students use audio recordings for comprehension tasks instead of reading themselves.

- **Tests/Assessments:**

- Tests can be administered orally, or broken into smaller sections. Teachers may administer parts of a test in the morning, after lunch, and on subsequent days if necessary.

- **Seating:**

- Seat students near a helping peer or with quick access to the teacher. For students with hearing or vision issues, seat them at the front for better access to instruction.

Integration of Diversity, Equity and Inclusion; Climate Change; Informational and Media Literacy

Provide students with opportunities to give feedback to teachers about the classroom and instruction

- **Verbal Example:**

- Fist to five: "How well do you understand what we talked about today?"
- Fist to five: "How well did I teach this today?"

- **Classroom Activity:**

- Exit tickets or surveys asking students to identify how well teachers taught, what helped them learn, what got in the way of their learning, etc.

Treat mathematics as a language that everyone is learning while authentically centering students' home languages

- **Classroom Strategies:**

- Color-coding ideas
- Learning vocabulary in student languages
- Visual and kinesthetic learning
- Representations of learning without words

- **Classroom Activity:**

- Multilingual Frayer Models for definitions or concepts
-

Incorporate true culturally relevant pedagogy, practice, and curriculum

- **Verbal Example:**

- "What are some of your family traditions that you are proud of? Would you be okay if we brought some of those into the classroom?"

- **Classroom Activity:**

- Use Ankara fabric to teach mathematical concepts such as tessellations, fractions, area, percentages, etc.
-

Incorporate the history of mathematics into lessons

- **Verbal Example:**

- "Why do you think we call it Pythagorean's theorem, when it was used before he was even born? What should we call it instead?"

- **Classroom Activity:**

- Learn about different bases and numerical ideas:
 - Base 2 (binary) and connections to computer programming
 - How the Yoruba of Nigeria used base 20
 - How the Mayans conceptualized the number 0 before the first recording of it
-

Solicit student ways of thinking and processing

- **Verbal Example:**

- "How might you all go about this?"
- "What do you notice?"

- **Classroom Activity:**

- Incorporate explorations where students interact with mathematics in a way that allows them to "discover" or experience mathematics.
-

Reorganize your classroom teaching around concepts, and teach them more like a web rather than discrete sets of knowledge

- **Verbal Example:**

- "How does this connect to what you've learned in the past?"
- "How can you use that knowledge today?"

- **Classroom Activity:**

- Learning webs that connect content
-

Start with more complex math problems and scaffold as necessary

- **Verbal Example:**

- "If we wanted to build a rocket, what are all the things we might need to know before we get started? Along the way, we decided that we want the rocket to reach the moon. What do we need to consider now?"

- **Classroom Activity:**

- When solving equations, start with the most complex problem, generate ideas for how to solve it, and use the simpler equations as examples to support those ideas.
-

Offer a variety of ways to demonstrate thinking and knowledge

- **Verbal Example:**

- "Show your thinking with words, pictures, symbols."
-

Ask other questions that will demonstrate learning when it is not clear to you how students know the answer

- **Verbal Example:**

- "If you were working with a fellow mathematician who was absent this day, what might you tell them to help them learn it?"
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Learn about, engage with, and incorporate ethnomathematics

- **Verbal Example:**

- "Reflect on your day so far. What math have you already used today?"

- **Classroom Activity:**
 - Community walks to engage with slope.
-

Co-construct knowledge in the classroom

- **Verbal Example:**
 - "Let's get into partners and do a think-pair-share. We will incorporate everyone's ideas and try to synthesize them."
 - **Classroom Activity:**
 - Have students create mathematical definitions in their own words in groups, and bring the groups together to co-construct mathematical definitions as a class.
-

Choose problems that have complex, competing, or multiple answers

- **Verbal Example:**
 - "Come up with at least two answers that might solve this problem."
 - **Classroom Activity:**
 - Challenge standardized test questions by getting the "right" answer, but justify other answers by unpacking the assumptions that are made in the problem.
 - **Classroom Activity:**
 - Deconstructed Multiple Choice: Given a set of multiple-choice answers, students discuss why these answers may have been included. This can also be used to highlight common mistakes.
-

Identify what is right about the thinking, and highlight the mistake in what is factually or procedurally accepted

- **Verbal Example:**
 - "You recognized that you had to combine the constants 27 and 9, could you explain your thinking?"
 - **Classroom Activity:**
 - Error Analysis worksheets that highlight what is the right idea behind the mistake.
-

Use thoughtful questioning to solicit mathematical thoughts rather than telling

- **Verbal Example:**

- "What would a mathematician who is confused ask about this question?"

- **Classroom Activity:**

- After students demonstrate knowledge of a topic, have them play a game where they have to explain their topic to a fellow mathematician and a skeptic. Develop their own reflective questioning/explaining in all three roles.
-

Create multiple ways of participating that honor myriad ways of thinking and being

- **Verbal Example:**

- "For this section, feel free to work alone, in pairs, trios, or quads (let them choose)."

- **Classroom Activity:**

- Community circles or storytelling circles, incorporating dance, music, song, call and response, and other cultural ways of communicating.
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Math Climate Change Companion Guide

- **G.MG.A.2 Apply concepts of density based on area and volume in modeling situations** (e.g., persons per square mile, BTUs per cubic foot).

- **Climate Change Example:**

- Students may apply the concept of population density of different urban areas, including calculations of population density, and discuss different environmental factors (e.g., air and water quality, waste disposal, energy consumption) that might be exacerbated by increased population density.

New Jersey Student Learning Standards: Content Area

MATH.7.RP

Ratios and Proportional Relationships

MATH.7.RP.A

Analyze proportional relationships and use them to solve real-world and mathematical problems

MATH.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.
MATH.7.RP.A.2	Recognize and represent proportional relationships between quantities.
MATH.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.
MATH.7.RP.A.3	Use proportional relationships to solve multistep ratio and percent problems.

21st Century Life and Career

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.

Integration of Career Readiness. Life Literacies and Key Skills

PFL.9.1.4.E	Becoming a Critical Consumer
PFL.9.1.4.F	Civic Financial Responsibility

Integration of Computer Science and Design Thinking

CS.CS	Computing Systems
CS.K-2.AP	Algorithms & Programming
CS.K-2.DA	Data & Analysis

Interdisciplinary Connections: NJSLs for ELA, Social Studies, Science and/or Math

SOC.K-12.6	Engaging in Civil Discourse and Critiquing Conclusions
SCI.9-12.5.1.12	All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.
TECH.8.1.P.D	Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.