

Unit 03: Ratio and Proportion

Content Area: **Template**
Course(s):
Time Period: **Full Year**
Length: **8 Weeks**
Status: **Published**

Standards Alignment

New Jersey Student Learning Standards

MA.7.RP	Ratios and Proportional Relationships
MA.7.RP.A	Analyze proportional relationships and use them to solve real-world and mathematical problems.
MA.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.
MA.7.RP.A.2	Recognize and represent proportional relationships between quantities.
MA.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.
MA.7.RP.A.2b	Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
MA.7.RP.A.2c	Represent proportional relationships by equations.
MA.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.
MA.7.RP.A.3	Use proportional relationships to solve multistep ratio and percent problems.
MA.7.G	Geometry
MA.7.G.A	Draw, construct, and describe geometrical figures and describe the relationships between them.
MA.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.

Integration of Career Readiness, Life Literacies and Key Skills

CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP3	Attend to personal health and financial well-being.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
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.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP10	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.

Technology / Integration of Computer Science and Design Thinking

TECH.8.1.8	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.8.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.8.A.1	Demonstrate knowledge of a real world problem using digital tools.
TECH.8.1.8.D	Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
TECH.8.1.8.D.1	Understand and model appropriate online behaviors related to cyber safety, cyber bullying, cyber security, and cyber ethics including appropriate use of social media.
TECH.8.1.8.D.5	Understand appropriate uses for social media and the negative consequences of misuse.

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

Capacities of the Literate Individual Students Who are College and Career Ready in Reading, Writing, Speaking, Listening, & Language

They demonstrate independence.

They build strong content knowledge.

They respond to the varying demands of audience, task, purpose, and discipline.

They comprehend as well as critique.

They value evidence.

They use technology and digital media strategically and capably.
They come to understand other perspectives and cultures.

MATH.K-12.1	Make sense of problems and persevere in solving them
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LA.K-12.NJSLSA.R	Reading
	Key Ideas and Details
LA.RL.7.1	Cite several pieces of textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.
LA.K-12.NJSLSA.R1	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
MATH.K-12.2	Reason abstractly and quantitatively
MATH.K-12.3	Construct viable arguments and critique the reasoning of others
MATH.K-12.4	Model with mathematics
MATH.K-12.5	Use appropriate tools strategically
MATH.K-12.6	Attend to precision
MATH.K-12.7	Look for and make use of structure
MATH.K-12.8	Look for and express regularity in repeated reasoning
LA.K-12.NJSLSA.W	Writing
	Text Types and Purposes
LA.K-12.NJSLSA.W1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
LA.W.7.1	Write arguments to support claims with clear reasons and relevant evidence.
LA.W.7.1.A	Introduce claim(s), acknowledge alternate or opposing claims, and organize the reasons and evidence logically.
LA.W.7.1.B	Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text.
LA.W.7.1.C	Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), reasons, and evidence.
LA.W.7.1.D	Establish and maintain a formal style/academic style, approach, and form.
	Comprehension and Collaboration
LA.K-12.NJSLSA.SL1	Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
LA.W.7.1.E	Provide a concluding statement or section that follows from and supports the argument presented.
LA.SL.7.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.
LA.SL.7.1.A	Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
LA.SL.7.1.B	Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed.
LA.SL.7.1.C	Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed.
LA.SL.7.1.D	Acknowledge new information expressed by others and, when warranted, modify their own views.

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

see Crosswalks

21st Century Life and Careers

Stage I: Desired Results

Transfer/Overview/Rationale

Transfer / Overview / Rationale

Unit Rationale

The purpose of this unit...

The purpose of this unit is to expand student knowledge of ratio and proportion in order to solve real-world problems including percent scenarios, rate of change between two points, and scale drawings.

Meaning

Essential Questions

Essential Questions

- How can we compare two quantities using ratios, rates, and unit rates?
- How can we create and solve a proportion in order to compare two sets of quantities?

- What are the different representations we can use to compare real-world rates and ratios?
- How are percents related to proportional reasoning and how can they be applied to solving real-world problems?
- Why is it important to use proportional reasoning when enlarging or reducing a figure to create an appropriately sized scale drawing/model?

Enduring Understanding/Indicators of Understanding

Enduring Understanding/Indicators of Understanding

- Ratios, rates, and more specifically, unit rates can be used to compare two quantities with different units.
- Proportions are two equivalent ratios and can be used to compare two sets of quantities by use of the Cross Products Property.
- Real-world rates can be compared in a variety of ways including proportions, graphically by use of slope, or by creating a direct variation linear equation.
- Percents are ratios that compare a value to 100 and can be used to solve a variety of real-world problems including percent of a total, percent change, discounts and markups, and simple interest.
- Proportions can be used to create a scale drawing/model to represent a reduced or enlarged figure with proportional dimensions.

Acquisition (Student Learning Objectives)

Knowledge

Knowledge

Students will know...

- Ratios, rates, and unit rates
- How proportions can be used to compare sets of quantities
- How proportions can be written in order to solve real-world scenarios
- Slopes of lines can graphically show the rate among quantities
- Direct variation shown graphically and by use of an equation ($y = kx$ where k is the rate) creates a proportional relationship between two quantities
- Conversion of percents to their decimal and fraction equivalents
- How to order fractions, decimals, and percents
- The percent proportion and the percent equation
- Formulas for finding percent change, discounts and markups, and simple interest
- Simple interest formula and the meaning of its components ($I = prt$)

- Proportions can be used to create scale drawings/figures
- How to apply the GIWAR method or other problem solving strategies to investigate real-world problems

Skills

Skills

Student will be skilled at ...

- Establish rates, ratios, and unit rates given a verbal description, table comparing two quantities, or a graph
- Compare two ratios by use of a table, graph, or by creating proportions
- Create two ratios based on a real-world scenario and write a proportion in order to compare the two ratios as equal or unequal
- Determine the greater ratio in a proportion by use of mental math, Multiplication Property of Equality, or the Cross Products Property
- Calculate and interpret the slope between two data points on a graph as the rate
- Establish whether two quantities show direct variation from a table, graph, or equation and then conclude that the slope of the line is the rate
- Compare and order percents, decimals, and fractions
- Evaluate an unknown portion of a percent scenario (part, whole, or the percent) by use of the percent proportion or percent equation

- Given two quantities determine the percent increase or decrease

- Determine the final price of an item given a percentage mark-up or discount using the percent proportion or equation

- Given three of the four components in the simple interest formula ($\text{Interest} = \text{principle} \times \text{rate} \times \text{time}$) determine the missing component by solving the equation for the unknown and by converting the rate from a percent to a decimal

- Create the dimensions of a scale drawing/model using proportional reasoning

- Interpret the question and solution of a real-world problem by applying strategies such as GIWAR or other problem solving methods.

Stage 3: Learning Plan

Resource and Mentor Texts

Resources and Mentor Texts

[Unit 3 activities.docx](#)

[Unit 3-Cycle 1 unit rate war.docx](#)

[Unit 3-PARCC.docx](#)

Formative Assessment Strategies

Formative Assessment Strategies

- ixl.com scores
- tenmarks.com scores
- teacher center observation
- STEM projects

Learning Activities/Unit of Study

Learning Activities/Unit of Study

Ratio and Proportion: Approximately 8 Cycles

Cycle 1: Topics Covered

- Create rates and ratios
- Unit rates
- Rate from a graph

- Activities/Centers
 - IXL.com centers
 - J.1 Understanding ratios
 - J.2 Equivalent ratios
 - J.3 Equivalent ratios: word problems
 - J.4 Compare ratios: word problems
 - J.5 Unit rates
 - Tenmarks centers
 - 7.RP.1 Calculating Unit Rate
 - Hands-On/Creative Centers
 - Unit rate “war”—partner game*
 - Online games
 - Ratio and rates http://www.mathplayground.com/ASB_RatioBlaster.html
 - Xtramath: review flashcards
 - Teacher Directed Stations

- Bellringers: Week 30—page 239-240
- Bellringers: Week 30—page 237-238
- STEM activity: sugar activity <http://threeacts.mrmeyer.com/sugarpackets/>

Cycle 2: Topics Covered

- Writing proportions
- Solving proportions
- Activities/Centers
 - IXL.com centers
 - J.7 Do the ratios form a proportion: word problems
 - J.8 Solve proportions
 - J.9 Solve proportions: word problems
 - Tenmarks centers
 - 7.RP.2a Identifying Proportional Relationships
 - 7.RP.2c Representing Proportional Relationships Algebraically
 - Hands-On/Creative Centers
 - (activity may take multiple days) <http://www.appliedmathpractices.com/wp-content/uploads/2014/06/ExerciseAway.pdf>
 - Online games
 - Solving proportions dunk tank <http://www.pbslearningmedia.org/resource/f9dbedd6-b4ed-47b4-bdd1-69ab5c73deae/f9dbedd6-b4ed-47b4-bdd1-69ab5c73deae/>
 - Xtramath: review flashcards
 - Teacher Directed Stations
 - Bellringers: Week 30—page 235-236
 - Bellringers: Week 30—page 233-234
 - Teacher created problems for solving proportions on white boards
- STEM activity—students become detectives <https://illuminations.nctm.org/Lesson.aspx?id=3128>

Cycle 3: Topics Covered

- Slope
- Activities/Centers
 - IXL.com centers
 - J.11 Rate of change
 - J.12 Constant rate of change
 - W.1 Find the slope from a graph
 - W.2 Find the slope from two points
 - W.3 Find a missing coordinate using slope
 - W.4 Find the slope from an equation
 - W.5 Graph a line using slope
 - Tenmarks centers
 - 7.RP.2d Representing Proportional Relationships Graphically
 - Hands-On/Creative Centers
 - (may take multiple days) <http://www.thoughtfulclassroom.com/Lorain/SampleUnits/SlopeLesson.pdf>

- Online games
 - Slope from a graph <https://campus.mangahigh.com/en-us/px/238/0/0>
- Xtramath: review flashcards
- Teacher Directed Stations
 - Bellringers: Week 29—page 231-232
 - Bellringers: Week 29—page 229-230
 - Teacher created problems for finding slope from two points on white boards

Cycle 4: Topics Covered

- Direct variation

- Activities/Centers
 - IXL.com centers
 - K.1 Find the constant of proportionality from a table
 - K.2 Identify graphs of proportional relationships
 - K.3 Find the constant of proportionality from a graph
 - K.4 Write equations for proportional relationships
 - K.5 Graph proportional relationships
 - K.6 Identify proportional relationships
 - K.7 Find the constant of proportionality: word problems
 - K.8 Solve problems involving proportional relationships
 - Tenmarks centers
 - 7.RP.2b Identifying the Constant of Proportionality
 - Hands-On/Creative Centers
 - Continue activity from cycle 2: <http://www.appliedmathpractices.com/wp-content/uploads/2014/06/ExerciseAway.pdf>
 - Xtramath: review flashcards
 - Teacher Directed Stations
 - Bellringers: Week 29—page 227-228
 - Bellringers: Week 29—page 225-226
 - Teacher created problems for finding the constant of variation given an x and y value on white boards
- STEM activity—Students choose one story to investigate (use multiple weeks groups choosing a different story) <http://www.yummymath.com/tag/proportion/>

Cycle 5: Topics Covered

- Converting percents to decimals and vice versa
- Ordering fractions, decimals, and percents

- Activities/Centers
 - IXL.com centers
 - L.1 What percentage is illustrated?
 - L.2 Convert between percents, fractions, and decimals
 - L.3 Compare percents to fractions and decimals
 - Hands-On/Creative Centers
 - Matching cards—decimals, fractions, and percents

<http://www.fortheloveofteachingmath.com/wp-content/uploads/2012/03/Memory-Match-Decimals-Fractions-Percents.pdf>

- Online games
 - Ordering game
http://www.sheppardsoftware.com/mathgames/percentage/BalloonPopPercentFraction_1.htm
- Xtramath: review flashcards
- Teacher Directed Stations
 - Bellringers: Week 28—page 223-224
 - Bellringers: Week 28—page 221-222
 - Teacher created problems for converting percent to decimals and vice versa on white boards

Cycle 6: Topics Covered

- Percent proportion
- Percent equation

- Activities/Centers

- IXL.com centers
 - L.5 Percents of numbers and money amounts
 - L.6 Percents of numbers: word problems
 - L.7 Solve percent equations
 - L.8 Solve percent equations: word problems
- Tenmarks center
 - 7.RP.3 Proportional Reasoning with Percents
 - 7.RP.3 Calculating Percent
- Hands-On/Creative Centers
 - Have students as a group or in partners match the question with its correct answer
file:///C:/Users/KKemeny/Downloads/Percent_concentration_2.pdf
- Xtramath: review flashcards
- Teacher Directed Stations
 - Bellringers: Week 28—page 219-220
 - Bellringers: Week 28—page 217-218
 - Teacher created problems for finding the missing percent, part, or whole on white boards

Cycle 7: Topics Covered

- Percent increase and decrease
- Discounts and mark-ups

- Activities/Centers

- IXL.com centers
 - L.10 Percent of change: word problems
 - M.6 Percent of a number: tax, discount, and more
 - M.7 Find the percent: tax, discount, and more
 - M.8 Sale prices: find the original price
- Tenmarks centers
 - 7.RP.3 Proportional Reasoning with Percents
 - 7.RP.3 Calculating Percent

- Hands-On/Creative Centers
 - Work with a partner to figure out the final price of different items
file:///C:/Users/KKemeny/Downloads/The_bargain_store.pdf
- Online games
 - Math at the mall <http://www.mathplayground.com/mathatthemall2.html>
- Xtramath: review flashcards
- Teacher Directed Stations
 - Bellringers: Week 27—page 215-216
 - Bellringers: Week 27—page 213-214
 - Teacher created problems for discounts on items on white boards

Cycle 8: Topics Covered

- Simple interest
- Scale drawings/figures

- Activities/Centers

- IXL.com centers
 - M.11 Simple interest
 - J.13 Scale drawings and scale factors
- Hands-On/Creative Centers
 - Enlarging a candy bar/comic
<http://www.rcboe.org/cms/lib010/GA01903614/Centricity/Domain/4360/Candy%20Bar%20Englargement%20Scale%20Drawing%20MASTER.pdf>
- Online games
 - Play simple interest battleship <https://www.quia.com/ba/108800.html>
- Xtramath: review flashcards
- PARCC practice*
- Teacher Directed Stations
 - Bellringers: Week 27—page 211-212
 - Bellringers: Week 27—page 209-210
 - Stem activity-Being an architect <http://www.discoveryeducation.com/teachers/free-lesson-plans/architects-in-action.cfm>

Modifications and/or Accommodations

Suggested Modifications (ELL, Sp. Ed, Gifted, At-risk of Failure)

English Language Learners

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 subjects at hand.

Front-Loading Vocabulary: The teacher front loads vocabulary. This means providing students with a list of important vocabulary words they will need to know for a book, lesson, etc. prior to the lesson being taught. Including pictures to go with the vocabulary words is also very beneficial for the students.

Special Education Students

Chunking: The teacher presents information in a way that makes it easy for students to understand and remember. Chunking is based on the presumption that our working memory is easily overloaded by excessive detail. The best way to deliver information is to organize it into meaningful units. Because students with special needs get overloaded easily, chunking is an effective strategy to use with them.

Checking for Understanding: It is important to constantly check for understanding, especially for students who have accommodations. Teachers want to make sure students understand the concepts being covered 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. It is important to give students enough time to process their thoughts.

Oral Reading: The teacher will read work orally to students. Class work such as tests and literature circles may need to be read aloud to the student.

Timers: The teacher will use timers as an instructional tool. The use of timers is beneficial for students who have trouble completing tasks. Timers can be helpful so the student is aware of how much time they have to complete an assignment.

Students with 504 Plans

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Gifted & Talented Strategies

Extensions/Enrichments: Teachers will provide gifted and talented students with extension/enrichment projects. Students will be challenged to further their understanding, to apply acquired knowledge, and/or to produce something in reference to acquired knowledge.

Modify/Change Activities: Teachers will monitor and modify activities to accommodate those students who need to be challenged further. Additional reading, problem-solving, writing, or project work is necessary for those students who are ready to move on at a rate more accelerated than their peers. In this way, G & T students are provided the same opportunity for support as special needs students.

Students at Risk of School Failure

Directions or Instructions: Make sure directions and/or instructions are given in limited numbers. Give directions/instructions verbally and in simple written format. Ask students to repeat the instructions or directions to ensure understanding occurs. Check back with the student to ensure he/she hasn't forgotten.

Peer Support: Peers can help build confidence in other students by assisting in peer learning. Many teachers use the 'ask 3 before me' approach. This is fine, however, a student at risk may have to have a specific student or two to ask. Set this up for the student so he/she knows who to ask for clarification before going to you.

Alternate or Modified Assignments: Always ask yourself, "How can I modify this assignment to ensure the students at risk are able to complete it?" Sometimes you'll simplify the task, reduce the length of the assignment or allow for a different mode of delivery. For instance, many students may hand something in, the at-risk student may jot notes and give you the information verbally. Or, it just may be that you will need to assign an alternate assignment.

Increase One to One Time: When other students are working, always touch base with your students at risk and find out if they're on track or needing some additional support. A few minutes here and there will go a long way to intervene as the need presents itself.

Contracts: It helps to have a working contract between you and your students at risk. This helps prioritize the tasks that need to be done and ensure completion happens. Each day write down what needs to be completed, as the tasks are done, provide a checkmark or happy face. The goal of using contracts is to eventually have the student come to you for completion sign-offs.

Hands On: As much as possible, think in concrete terms and provide hands-on tasks. This means a child doing math may require a calculator or counters. The child may need to tape record comprehension activities instead of writing them. A child may have to listen to a story being read instead of reading it him/herself.

Tests/Assessments: Tests can be done orally if need be. Break tests down in smaller increments by having a portion of the test in the morning, another portion after lunch and the final part the next day.

Seating: Seat students near a helping peer or with quick access to the teacher. Those with hearing or sight issues need to be close to the instruction which often means near the front.

