

COMMON CORE

A Story of Ratios

Grade 7 Module 1
Lesson Study and Instructional Sequence

Session Objectives

- Examine the sequence of concepts across the module.
- Study mathematical models and instructional strategies from *A Story of Ratios*.
- Prepare to implement this and subsequent modules of *A Story of Ratios*.

Agenda

Lesson Structure Instructional Sequence Module Review Preparation for Implementation

A Story of Ratios

	Grade 6	Grade 7	Grade 8	
20 days	M1: Ratios and Unit Rates (35 days)	M1: Ratios and Proportional Relationships (30 days)	M1: Integer Exponents and the Scientific Notation (20 days)	20 days
20 days	M2: Arithmetic Operations Including Dividing by a Fraction (25 days)	M2: Rational Numbers (30 days)	M2: The Concept of Congruence (25 days)	20 days
20 days	M3: Rational Numbers (25 days)	M3: Expressions and Equations (35 days)	M3: Similarity (25 days)	20 days
20 days	M4: Expressions and Equations (45 days)	M4: Percent and Proportional Relationships (25 days)	M4: Linear Equations (40 days)	20 days
20 days	M5: Area, Surface Area, and Volume Problems (25 days)	M5: Statistics and Probability (25 days)	M5: Examples of Functions from Geometry (15 days)	20 days
20 days	M6: Statistics (25 days)	M6: Geometry (35 days)	M6: Linear Functions (20 days)	20 days
20 days			M7: Introduction to Irrational Numbers Using Geometry (35 days)	20 days

Curriculum Overview

Progression Study

- What are the Progressions?
- Explore: 6-7, Ratios and Proportional Relationships
 - Read pages 2-4
 - Read last paragraph of page 8
 - Read second paragraph of page 10
 - Scan pages 11-15
- Highlight the information relevant to the content of this module.

Module Structure

Module Overview

Topic A

Topic B

Topic C

Topic D

L1

L2

L3-

L4

L5-

L6

L7

L8-

L9

L10

L11-

L12

L13

L14

L15

L16

L17

L18

L19

L20

L21-

L22

Module Overview Structure

- Table of Contents
- Narrative
- Focus Standards
- Foundational Standards
- Focus Standards for Mathematical Practice
- Terminology
- Suggested Tools and Representations
- Assessment Summary

[Module Overview](#)

Table of Contents

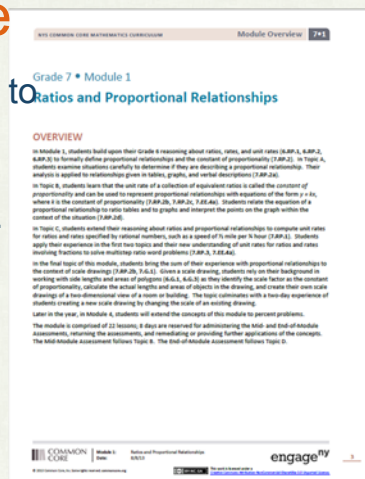
How does Module 1 break down Ratios and Proportional Relationships?

The screenshot shows a table of contents for the 'Ratios and Proportional Relationships' section of the Mathematics Curriculum. The table lists various topics and their corresponding page numbers. The topics include: Module Overview (1), Topic 1: An Equation or Relationship as a Measuring Tool (1), Lesson 1-1: An Equation or Relationship (1), Lesson 1-2: Identifying Proportional and Non-Proportional Relationships in Tables (1), Lesson 1-3: Identifying Proportional and Non-Proportional Relationships in Graphs (1), Topic 2: Unit Rate and the Constant of Proportionality (2), Lesson 2-1: Unit Rate as the Constant of Proportionality (2), Lesson 2-2: Representing Proportional Relationships with Equations (2), Lesson 2-3: Interpreting Slopes of Proportional Relationships (2), Mid-Module Assessment and Rubric (2), Topic 3: Properties of Proportions (3), Lesson 3-1: Properties of Proportions (3), Lesson 3-2: Properties of Proportions (3), Lesson 3-3: Properties of Proportions (3), Lesson 3-4: Properties of Proportions (3), Lesson 3-5: Properties of Proportions (3), Lesson 3-6: Properties of Proportions (3), Lesson 3-7: Properties of Proportions (3), Lesson 3-8: Properties of Proportions 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Proportions (3), Lesson 3-100: Properties of Proportions (3).

[Module Overview / Pages 1-2](#)

Overview Narrative

Examine the overview narrative to uncover how Module 1 unfolds. Highlight any major concepts and/or questions for discussion.



Module Overview / Page 3

Overview Narrative

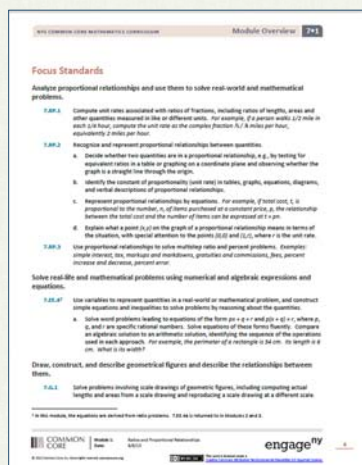
- Topic A: Explore what it means to be *proportional to* and how to determine if two types of quantities are in a *proportional relationship*, examining both tables and graphs.
- Topic B: Define the constant of proportionality and use it to represent proportional relationships with an equation, interpret the meaning of key points $(0,0)$ and $(1,r)$ where r is the unit rate.
- Topic C: Compute unit rates involving fractions, find equivalent ratios of two partial quantities given a part-to-part ratio and the total of the quantities, solve multi-step ratio problems including markup, markdown, and commission.
- Topic D: Explore scale drawings and recognize the term scale factor as the constant of proportionality.

Module Overview / Page 3

Focus Standards

Which Common Core State Standards will be covered in Module 1?

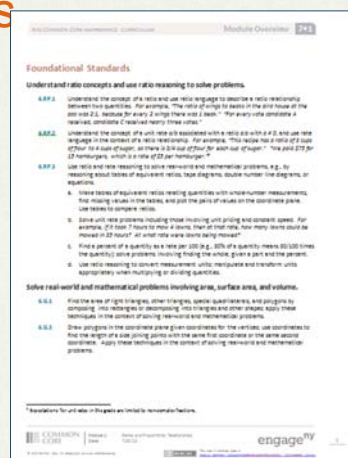
Module Overview / Page 4



Foundational Standards

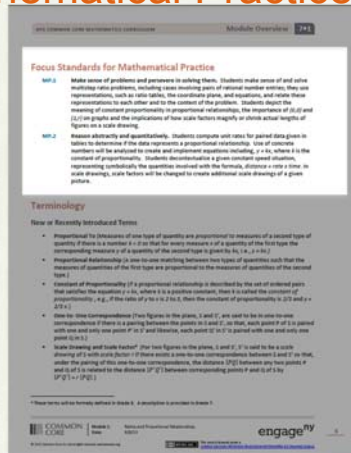
What are students expected to know under the Common Core Standards as they enter Grade 7 Module 1?

Module Overview / Page 5



Focus Standards for Mathematical Practice

What specific mathematical practices will be evident in Module 1?

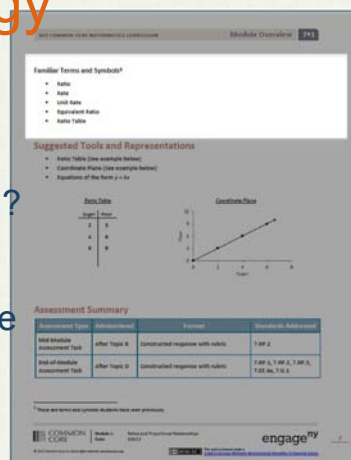


Module Overview / Page 6

Familiar Terminology

What terminology are students expected to know under the Common Core State Standards as they enter Grade 7 Module 1?

We'll look at these terms in more detail as we examine Lesson 1.



Module Overview / Page 7

New Terminology

What new mathematical language will be introduced in Module 1?

Focus Standards for Mathematical Practice

MP.1 Make sense of problems and persevere in solving them. Students make sense of and solve problems and persevere, steadily seeking entry points to understand a problem, they use representations, such as ratio tables, the coordinate plane, and equations, and relate these representations to each other and to the context of the problem. Students clarify the meaning of constant proportionality in proportional relationships, the importance of k (k or k' for graphs) and the importance of the scale factors (regularly or non-regular lengths) of figures on a scale drawing.

MP.2 Reason abstractly and quantitatively. Students compare and contrast the general idea given in tables to determine if the data represents a proportional relationship. Use of unit rate is central to the problem-solving and proportional reasoning. k is a unit in the context of proportionality. Students discuss a given constant speed situation, representing kinetically the quantities involved with the terms, distance d (in miles) in scale drawings, scale factors will be changed to create additional scale drawings of a given plane.

Terminology

New or Recently Introduced Terms

- Proportional (two measures of one type of quantity are proportional to measures of a second type of quantity if there is a number k such that for every measure x of a quantity of the first type the corresponding measure y of a quantity of the second type is given by ky , $k > 0$.)
- Proportional relationship (a relationship between two quantities such that the measures of quantities of the first type are proportional to the measures of quantities of the second type.)
- Constant of proportionality (of a proportional relationship is described by the set of ordered pairs that satisfies the equation $y = kx$, where k is a positive constant, then k is called the constant of proportionality, e.g., if the table of y to x is 2 to 3, then the constant of proportionality is 2/3 and $y = (2/3)x$.)
- One-to-One Correspondence (Two figures in the plane, S and T , are said to be in one-to-one correspondence if there is a pairing between the points in S and T , such that each point of S is paired with one and only one point of T and likewise, each point of T is paired with one and only one point of S .)
- Scale Drawing and Scale Factor* (For two figures in the plane, S and T , T is said to be a scale drawing of S with scale factor k if there is a one-to-one correspondence between S and T so that, under the pairing of this one-to-one correspondence, the distance ST between any two points s and t of S is related to the distance ST' between corresponding points s' and t' of T by $ST' = kST$.)

*These terms will be formally defined in Lesson 1. A description is provided in Lesson 1.

Module Overview / Page 6

Suggested Tools and Representations

What types of tools and mathematical representations will be seen in Module 1?

Familiar Terms and Symbols*

- Ratio
- Rate
- Unit Rate
- Equivalent Ratio
- Ratio Table

Suggested Tools and Representations

- Ratio Table (See example below)
- Coordinate Plane (See example below)
- Equations of the form $y = kx$

Ratio Table

Order #	Hour
1	1
2	2
3	3
4	4
5	5

Coordinate Plane

Assessment Summary

Assessment Type	Assessment	Position	Standards Addressed
Mid-Module Assessment Task	After Topic 8	Contextual response with ratios	7.MP.2
End-of-Module Assessment Task	After Topic 8	Contextual response with ratios	7.MP.1, 7.MP.2, 7.MP.3, 7.EE.1A, 7.EE.1B, 7.EE.1C

*These are terms and symbols students need when studying.

Module Overview / Page 7

Assessment Summary

Mid-Module and End-of-Module Assessments

Familiar Terms and Symbols*

- Ratio
- Rate
- Unit Rate
- Equivalent Ratio
- Ratio Table

Suggested Tools and Representations

- Ratio Table (See example below)
- Coordinate Plane (See example below)
- Equations of the form $y = kx$

Ratio Table

Order	Hour
1	1
2	2
3	3
4	4
5	5

Coordinate Plane

Assessment Summary

Assessment Type	Administrative	Formative	Standards Addressed
Mid-Module Assessment Task	after Topic 8	Constructed response with rubric	7.SP.2
End-of-Module Assessment Task	after Topic 8	Constructed response with rubric	7.SP.2, 7.SP.3, 7.SP.5, 7.EE.4A, 7.EE.5

* These are terms and symbols students have seen previously.

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Module Overview / Page 7

Topic Openers

- Read the concept chart and the descriptive narrative.
- Make note of the important information that will help teachers implement these lessons.



Topic A:
Proportional Relationships

7.SP.2a

Key Standard: 7.SP.2a Recognize and represent proportional relationships between quantities.
• 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.

Mathematical Practices: 6

Lesson 1: An Experience in Relationships as Measuring Rate (P)
Lesson 2: Proportional Relationships (P)
Lesson 3: Identifying Proportional and Non-Proportional Relationships in Tables (P)
Lesson 3-8: Identifying Proportional and Non-Proportional Relationships in Graphs (P)

At the end of Topic A, students are introduced to the meaning of rates of a ratio, equivalent ratios, rates, and unit rates through a collaborative work task where they record their rates, drawing an appropriate unit of rate measurement. In lesson 3, students investigate how two quantities are proportional to each other when there exists a constant such that each measure in the first quantity multiplied by this constant gives the corresponding measure in the second quantity (7.SP.2). They then apply this basic understanding in lesson 3-4 by exploring situations to decide whether two quantities are in a proportional or non-proportional relationship by first checking for a constant multiple between measures of the two quantities, when given a table, and then by graphing on a coordinate plane. Students recognize that the graph of a proportional relationship must be a straight line through the origin (7.SP.2a).

* Lesson 3-8 Unit Key | * Practice Set Lesson, * Mini-Workshop Lesson, * Exit Ticket Lesson, * Student Lesson

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Topic A Opener / Page 8

Types of Lessons



Problem Set

Students and teachers work through examples and complete exercises to develop or reinforce a concept or procedure.



Socratic

Teacher leads students in a conversation to develop a specific concept or proof.



Exploration

Independent or small group work on a challenging problem followed by debrief to clarify, expand or develop math knowledge



Modeling

Students and teacher practice part of the modeling cycle with problems that are ill-defined and have a real world context.

Topic A Opener / Page 8

Lesson Structure

Teacher Materials

- Student Outcomes
- Lesson Notes (in select lessons)
- Classwork
 - General directions and guidance, including timing guidance
 - Discussion points with expected student responses
 - Student classwork with solutions
 - Scaffolding Boxes
- Closing
- Exit Ticket
- Problem Set (with solutions)

Student Materials

- Classwork
 - Space provided for student work
- Problem Set
 - Without solutions

Lesson Structure

Agenda

Lesson Structure
Instructional Sequence
Module Review
Preparation for Implementation

An Experience in Relationships as Measuring Rate

Paper Passing Directions

- One participant at each table, remove the stack of papers from the large envelope labeled A.
- On my command, take one and pass the remaining stack to the left. Continue passing the stack until all participants at your table have a paper.
- If you are the last person to receive a paper, raise your hand to indicate that all participants at your table have a paper. Please leave your hand in the air and await further instructions.

Lesson 1 / Example 1

Ratio and Rate from Grade 6

Ratio: An ordered pair of non-negative numbers that are not both 0. (Note that there are no units involved in a ratio.)

Value of a Ratio: For the ratio $A:B$, the value of the ratio is the quotient $\frac{A}{B}$, as long as $B \neq 0$.

Rate: A rate indicates, for a proportional relationship between two quantities, how many units of one quantity there are for every 1 unit of the second quantity. For a ratio of $A:B$ between two quantities, the rate is A/B units of the first quantity per unit of the second quantity.

Lesson 1 / Example 1

Ratio and Rate from Grade 6

Unit rate: The numerical portion of the rate.

Rate's unit: The unit of measure of the rate, e.g. mph.

Equivalent Ratios: Two ratios $A:B$ and $C:D$ are equivalent ratios if there is a positive number, c , such that $C = cA$ and $D = cB$. Students understand equivalent ratios to have the same value.

Lesson 1 / Example 1

An Experience in Relationships as Measuring Rate

Paper Passing

- Why this problem?



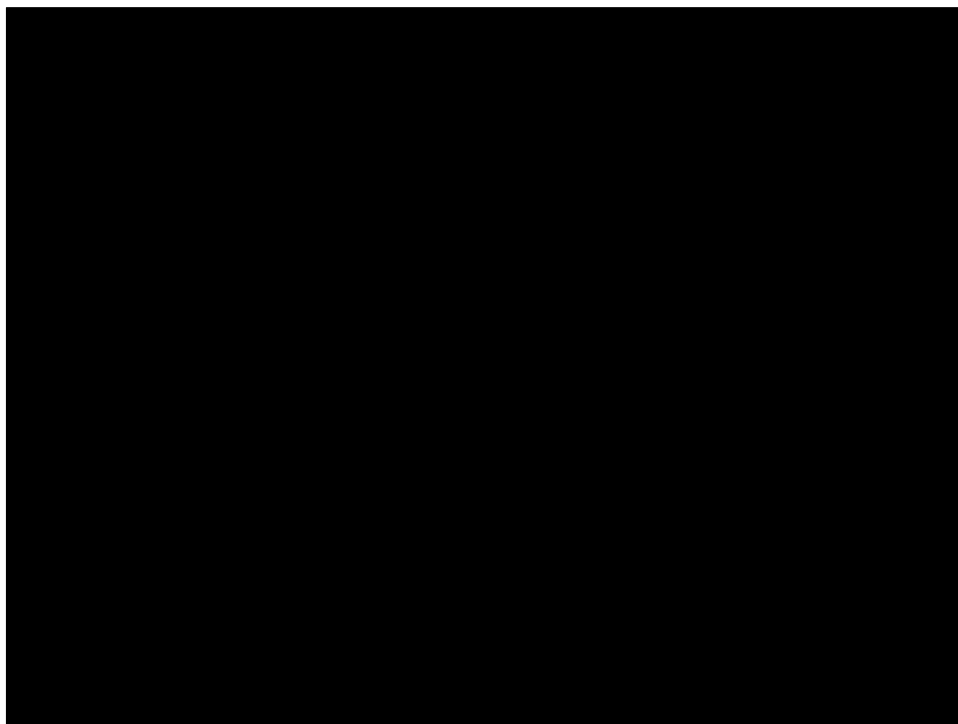
Lesson 1 / Example 1

An Experience in Relationships as Measuring Rate

Tillman the English Bulldog

1. At the conclusion of the video, your classmate takes out his or her calculator and says, "Wow that was amazing! That means the dog went about 5 meters in 1 second!" Is your classmate correct, and how do you know?

Lesson 1 / Exit Ticket



An Experience in Relationships as Measuring Rate

2. After seeing this video, another dog owner trained his dog, Lightning, to try to break Tillman's skateboarding record. Lightning's fastest recorded time was on a 75-meter stretch where it took him 15.5 seconds. Based on this data, did Lightning break Tillman's record for fastest dog on a skateboard? Explain how you know.

Lesson 1 / Exit Ticket

Exit Ticket Reflection

What do you notice about the exit ticket?

How does it compare to what you have seen teachers use in the past?

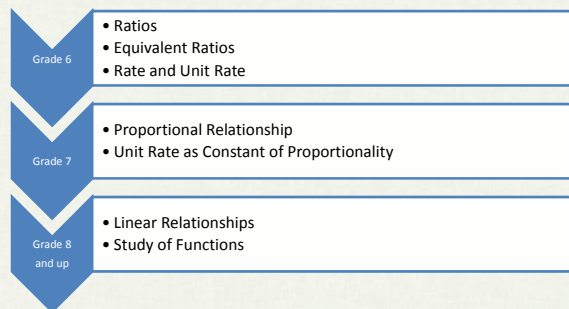
Take 2 minutes to talk about this at your table.



Lesson 1 / Exit Ticket

Proportional Relationships

- This lesson introduces the notion of Proportional Relationship
- Serves as the connecting piece from Grade 6 to Grade 8



Concept Development

Proportional Relationships

Pay by the Ounce Frozen Yogurt!

A new self-serve frozen yogurt store opened this summer that sells its yogurt at a price based upon the total weight of the yogurt and its toppings in a dish. Each member of Isabelle's family weighed their dish and this is what they found. Determine if the cost is proportional to the weight.

Weight (ounces)	12.5	10	5	8
Cost (\$)	5	4	2	3.20

The cost _____ the weight.

Lesson 2 / Example 1

Proportional Relationships

Pay by the Ounce Frozen Yogurt!

x, Weight (ounces)	12.5	10	5	8
y, Cost (\$)	5	4	2	3.20

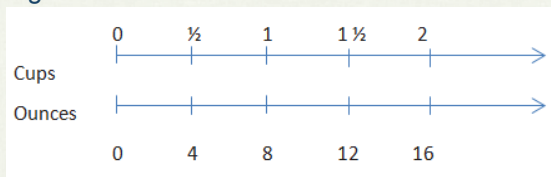
Note: In the original image, blue arrows point from each weight value to its corresponding cost value, with a multiplier of 0.4 indicated next to each arrow.

Lesson 2 / Example 1

Proportional Relationships

A Cooking Cheat Sheet!

In the back of a recipe book, a diagram provides easy conversions to use while cooking.

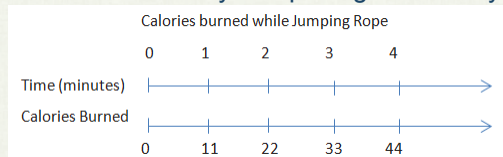


The ounces _____ the cups.

Lesson 2 / Example 2

Proportional Relationships

During Jose's physical education class today, students visited activity stations. Next to each station was a chart depicting how many calories (on average) would be burned by completing the activity.



- Is the number of Calories burned proportional to time? How do you know?
- If Jose jumped rope for 6.5 minutes, how many calories would he expect to burn?

Lesson 2 / Exercise 1

Proportional Relationships

How do we know if two quantities are proportional to each other?

Two quantities are proportional to each other if there is one constant number that is multiplied by each measure in the first quantity to give the corresponding measure in the second quantity.

How can we recognize a proportional relationship when looking at a table or a set of ratios?

If each of the measures in the second quantity is divided by its corresponding measure in the first quantity and it produces the same number, called a constant, then the two quantities are proportional to each other.

Lesson 2 / Closing



Identifying Proportional and Non-Proportional Relationships in Tables

You have been hired by your neighbor to babysit their children on Friday night. You are paid \$8 per hour. Complete the table relating your pay to the number of hours you worked.

Based on the table, is pay proportional to hours worked? How do you know?

Hours Worked	Pay
1	
2	
3	
4	
4 $\frac{1}{2}$	
5	
6	
6.5	

Lesson 3 / Example

Identifying Proportional and Non-Proportional Relationships in Tables

Read through Exercises 1 and 2.

Compare and Contrast the two Exercises.

Share your observations with a neighbor.



Lesson 3 / Exercises 1 and 2

Identifying Proportional and Non-Proportional Relationships in Tables

Mark recently moved to a new state. During the first month he visited 5 state parks. Each month after he visited two more. Complete the table below.

Number of Months	Number of State Parks
1	5
2	7
3	9
10	23

Lesson 4 / Exercise 2

Identifying Proportional and Non-Proportional Relationships in Graphs

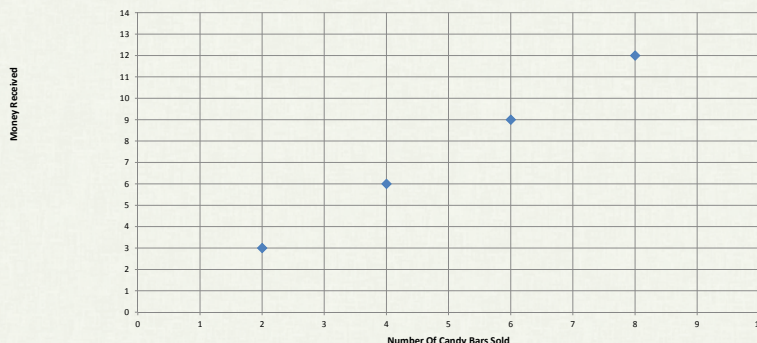
From a Table to Graph

Use the ratio provide, create a table that shows money received is proportional to the number of candy bars sold.

x Candy Bars Sold	y Money Received (\$)
2	3
4	6
6	9
8	12

Lesson 5 / Example 1

Identifying Proportional and Non-Proportional Relationships in Graphs



Lesson 5 / Example 1

Identifying Proportional and Non-Proportional Relationships in Graphs

- How are proportional quantities represented on a graph?
- What is a common mistake a student might make when deciding whether a graph of two quantities shows that they are proportional to each other?

Lesson 5 / Closing

Groups Exploration

What are some benefits of group exploration?

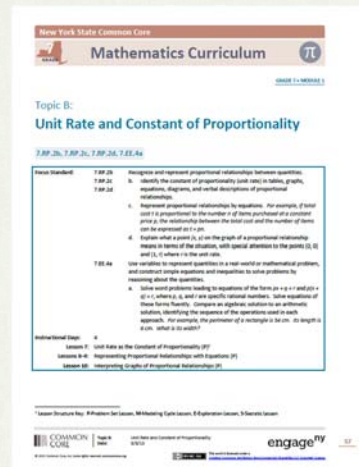


Problem	Table
Graph	Proportional or Not Explain.

Lesson 6 / Exploratory Challenge

Topic B

- Read the concept chart and the descriptive narrative.
- Make note of the important information that will help teachers implement these lessons.



Topic B Opener / Pages 57-58

Unit Rate as the Constant of Proportionality

- Haven't we already learned about the constant of proportionality?
- Why is this lesson here?

Unit Rate as the Constant of Proportionality

Brandon came home from school and informed his mother that he had volunteered to make cookies for the entire grade level. He needs 3 cookies for each of the 96 students in 7th grade. Unfortunately, he needs to cookies the very next day! Brandon and his mother determined that they can fit 36 cookies on two cookie sheets.

Is the number of cookies proportional to the number of cookie sheets used in baking? Create a table that shows data for the number of sheets needed for the total number of cookies baked.

Lesson 7 / Example 2

Unit Rate as the Constant of Proportionality

Closing Questions

- What is another name for the number that relates the measures of two quantities? (How do I get from x to y ?)
- How is the constant of proportionality related to the unit rate of $\frac{y}{x}$?

Lesson 7 / Closing

Representing Proportional Relationships with Equations

- Look at the Student Materials for Lesson 8
- Complete Examples 1 and 2
- Compare your answers with your neighbor



Lesson 8

Representing Proportional Relationships with Equations

Discuss at your table:

- What is the main idea of this lesson?
- How do the Examples prepare students for success with the Problem Set?



Lesson 8

Representing Proportional Relationships with Equations

Oscar and Maria each wrote an equation that they felt represented the proportional relationship between distance in km and distance in miles. One entry in the table paired 150 *km* with 95 *miles*. If k represents the number of kilometers and m represents number of miles, who wrote the correct equation that would relate miles to kilometers? Explain why.

Oscar wrote the equation $k = 1.6m$, and he said that the rate $\frac{1.6}{1}$ represents kilometers per mile.

Maria wrote the equation $k = 0.625m$ as her equation, and she said that 0.625 represents kilometers per mile.

Lesson 9 / Exit Ticket

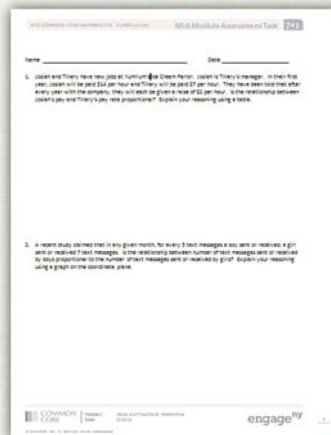
Interpreting Graphs of Proportional Relationships

- Look at the Student Pages for Lesson 10
- Complete Examples 1 and 2
- How do you anticipate students will respond to this lesson?

Lesson 10 / Example 1 and 2

Understanding the Mid-Module Assessment

- Assessments are developed directly from the CCSS.
- Developed prior to the corresponding lessons.



Mid-Module Assessment

A Progression Toward Mastery

- The rubric is not a “grading” rubric.
- What are the levels?

The image shows a rubric for the 'Mid-Module Assessment Task' for Grade 7 Mathematics. The rubric is organized into a table with four columns representing different steps (STEP 1, STEP 2, STEP 3, STEP 4) and two rows representing different tasks (Task 1 and Task 2). Each cell in the table contains a description of the student's performance level for that specific step and task. The rubric is designed to assess students' understanding and application of mathematical concepts, with a focus on the progression toward mastery. The EngageNY logo and the Common Core State Standards logo are also visible on the page.

Engagement/Understanding	STEP 1	STEP 2	STEP 3	STEP 4
Assessment Task Name	Making or Interpreting a Graph	Making or Interpreting a Graph	Making or Interpreting a Graph	Making or Interpreting a Graph
1	Student understands the relationship between the number of messages sent and the number of minutes for two different rates.	Student understands the relationship between the number of messages sent and the number of minutes for two different rates.	Student understands the relationship between the number of messages sent and the number of minutes for two different rates.	Student understands the relationship between the number of messages sent and the number of minutes for two different rates.
2	Student understands the relationship between the number of messages sent and the number of minutes for a single rate.	Student understands the relationship between the number of messages sent and the number of minutes for a single rate.	Student understands the relationship between the number of messages sent and the number of minutes for a single rate.	Student understands the relationship between the number of messages sent and the number of minutes for a single rate.

Remainder of G7-M1

Topic C: Compute unit rates involving fractions, find equivalent ratios of two partial quantities given a part-to-part ratio and the total of the quantities, solve multi-step ratio problems including markup, markdown, and commission

Topic D: Explore scale drawings and recognize the term scale factor as the constant of proportionality

Topic C

- Read the concept chart and the descriptive narrative.
- Make note of the important information that will help teachers implement these lessons.

The screenshot shows the 'New York State Common Core Mathematics Curriculum' page for 'Grade 7, Module 1, Lesson 1'. The title is 'Topic C: Ratios and Rates Involving Fractions'. Below the title, it lists standards: 7.RP.1, 7.RP.3, 7.EE.4. The 'Essential Standard' section contains three items: 7.RP.1 (Compute unit rates...), 7.RP.3 (Use proportional relationships...), and 7.EE.4a (Use variables to represent... and construct simple equations and inequalities...). Below this is the 'Instructional Days' section, which lists: Lesson 11-12: Ratios of Fractions and Their Unit Rates (2); Lesson 13: Finding Equivalent Ratios Given the Total Quantity (2); Lesson 14: Multi-Step Ratio Problems (2); Lesson 15: Equations and Graphs of Proportional Relationships Involving Fractions (2). At the bottom, there are logos for 'COMMON CORE STATE STANDARDS for MATHEMATICS', 'engageNY', and 'NYSED'.

Topic C Opener / Page 101

Ratios of Fractions and Their Unit Rates

Student Outcomes

- Students use ratio tables and ratio reasoning to compute unit rates associated with ratios of fractions in the context of measured quantities such as recipes, lengths, areas, and speed.
- Students work collaboratively to solve a problem while sharing their thinking process, strategies, and solutions with the class.

Lesson 11 / Student Outcomes

Ratios of Fractions and Their Unit Rates

During their last workout, Izzy ran $2\frac{1}{4}$ miles in 15 minutes, and her friend Julia ran $3\frac{3}{4}$ miles in 25 minutes. Each girl thought she was the faster runner. Based on their last run, which girl is correct? Use any approach to find the solution.

Answer the question independently. Be ready to explain your solution.

Lesson 11 / Example 1

Ratios of Fractions and Their Unit Rates

Solution:

Both girls ran 9 miles per hour so they ran the same speed.

Possible Approaches:

- Complete a table
- Equation or formula substitution
- Visual (clock, double number line)
- Other?

Lesson 11 / Example 1 (cont'd)

Become an Expert

Examine the student and teacher materials with your group.

- Read through the lesson at least once
- Complete the Examples/Exercises
- Complete the Exit Ticket
- Complete the Problem Set
- Become an Expert! You and your group will create a poster that summarizes your group's lesson and present your summation to the whole group. YOU select which discussion(s), examples, exercises to present.

Lessons 13-15

Gallery Walk

Walk around the room and examine the posters that summarize Lessons 13 – 15.

What stands out to you?

Where might students struggle?

Did you notice anything different about different posters that represent the same lesson?

Topic D

- Read the concept chart and the descriptive narrative.
- Make note of the important information that will help teachers implement these lessons.

The screenshot shows a page from the New York State Mathematics Curriculum. At the top, it says "New York State Common Core Mathematics Curriculum" with a "Grade 7 - Module 1" label. The main heading is "Topic D: Ratios of Scale Drawings" with a sub-heading "7.GP.26, 7.G.1". Below this, there is a table with columns for "New Standard", "7.GP.2", and "7.G.1". The table lists various standards and their descriptions. Below the table, there is a section titled "Instructional Steps" with a list of lessons: Lesson 26: Relating Scale Drawings to Ratios and Rates (27); Lesson 27: The Scale Factor as the Scale Factor (28); Lesson 28: Comparing Actual Lengths from a Scale Drawing (29); Lesson 29: Computing Actual Area from a Scale Drawing (30); Lesson 30: An Exercise in Creating a Scale Drawing (31); Lesson 31-32: An Exercise in Changing Scales (32). Below the table, there is a paragraph of text: "In the first lesson of Topic D, students are introduced to scale drawings; they determine if the drawing is a reduction or enlargement of a two-dimensional picture. Sets of figures are presented for students to match corresponding points. In Lesson 27, students learn the term scale factor and recognize it as the constant of proportionality. With a given scale factor, students make scale drawings of pictures or diagrams. In lessons 28 and 29, students compare the actual dimensions of objects shown in pictures given the scale factor. They recognize that area scale is the square of the scale factor that relates lengths. In the final lessons, students engage in their own scale factor projects—first, to produce a scale drawing of the top view of a furnished room or building, and second, given one scale drawing, to produce one scale drawing using a different scale factor." At the bottom, there are logos for "COMMON CORE STATE STANDARDS for Mathematics", "engageNY", and "NYSED".

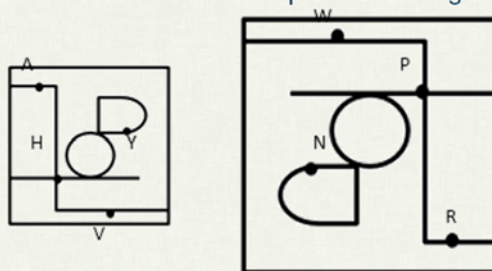
Topic D Opener / Page 139

Modeling Lessons 16-19

Put your student hat back on...

Relating Scale Drawings to Ratios and Rates

Derek's family took a day trip to a modern public garden. Derek looked at his map of the park that was a reduction of the map located at the garden entrance. The dots represent the placement of rare plants. The diagram below is the top-view as Derek held his map while looking at the posted map.



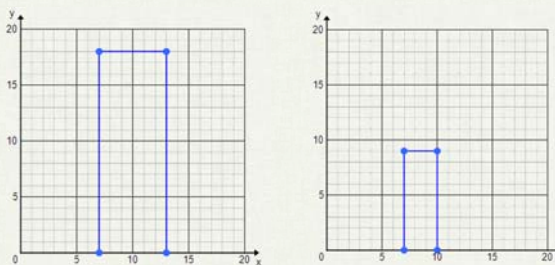
Lesson 16 / Example 2

Terminology

Scale Drawing: Refers to a reduced-size or enlarged-sized 2-dimensional picture of another 2-dimensional picture.

One-to-One Correspondence: A pairing between the points in one picture/drawing and the points in a scale drawing so that each point is paired with one and only one point in the scale drawing.

Relating Scale Drawings to Ratios and Rates



Lengths of the original drawing (in units)		
Lengths of the second drawing (in units)		

Lesson 16 / Example 3

The Unit Rate as the Scale Factor

Use a scale factor of 3 to draw a scale drawing of the Columbian Flag.



Lesson 17 / Examples 2 and 3

The Unit Rate as the Scale Factor



Computing Actual Lengths from a Scale Drawing

Student Outcomes:

- Given a scale drawing, students compute the lengths in the actual picture using the scale. Students identify the scale factor in order to make intuitive comparisons of size, and then devise a strategy for efficiently finding actual lengths using the scale.

Lesson 18 / Student Outcomes

Computing Actual Lengths from a Scale Drawing

A drawing of a surfboard in a catalog shows its length as $8\frac{4}{9}$ inches. Find the actual length of the surfboard if $\frac{1}{2}$ inch length on the drawing corresponds to $\frac{3}{8}$ foot of actual length.

Lesson 18 / Exit Ticket

Computing Actual Areas from a Scale Drawing

Take 5 minutes to complete Examples 1-3 from Lesson 19.

The big moment of the lesson...

Reflect upon how we arrived at this “big moment”. What do students gain from this type of approach?

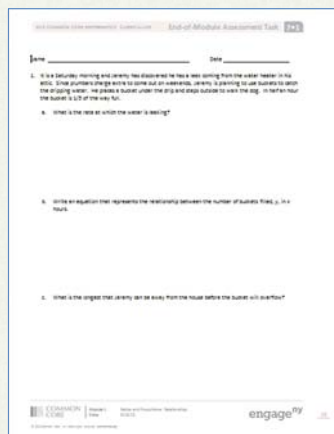
Lesson 19 / Examples 1-3

What's in Store for Lessons 20-22?

- Students create their own scale drawing of the top-view of a furnished room of building.
- Students reproduce a scale drawing using a different scale.
- Students recognize that a scale drawing drawn with a different scale is actually a scale drawing of the scale drawing using the first scale.
- For the scale factor of a different scale, students compute the scale factor for the original scale drawing.

End of Module Assessment

- Spend a few moments examining the problems on the End-of-Module Assessment.
- Choose 1 problem to complete from a student's perspective.



End-of-Module Assessment

A Progression Toward Mastery

Item	Item Description	Item Description	Item Description	Item Description
1	Student answers all questions and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.
2	Student answers all questions and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.
3	Student answers all questions and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.
4	Student answers all questions and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.
5	Student answers all questions and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.
6	Student answers all questions and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.
7	Student answers all questions and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.
8	Student answers all questions and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.
9	Student answers all questions and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.
10	Student answers all questions and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.	Student uses all information and uses the information to solve the problem.

End-of-Module Assessment

Standards for Mathematical Practice

What Standards for Mathematical Practice are evident in the End-of-Module Assessment? Provide your evidence.

End-of-Module Assessment

Agenda

Lesson Structure
Instructional Sequence
Module Review
Preparation for Implementation

Progression Study

Study Lessons 8 through 10 and Lessons 11 & 12.

Then, turn and talk:

- How do these lessons engage students in the work described in the Progression?

Agenda

Lesson Structure
Instructional Sequence
Module Review
Preparation for Implementation

Practice a Planning Protocol

- With any topic from *A Story of Ratios*, read the module overview and the topic opener.
- Study the module assessment, paying particular attention to the sample responses provided.

Practice a Planning Protocol

- Read through the first lesson of the topic.
- Then, take note of the lesson objective and re-examine the exit ticket with the objective in mind. What major concept is necessary to successfully complete the exit ticket?
- Study the concept development and problem set. How do the CD/PS develop the major concept that is required in the exit ticket? What parts of the CD/PS go beyond this major concept?

Practice a Planning Protocol

- How will this knowledge empower teachers to support specific groups of learners?
- Turn to the subsequent lesson, and examine the exit ticket. How does this exit ticket build on the last? How are the two exit tickets similar and how are they different?
- Will students have an opportunity in the second lesson to continue development of the first lesson's objective? What level of mastery of the first lesson's objective is necessary in preparation for the second lesson?

Practice a Planning Protocol

- How does the new plan for implementation impact the student debrief?
- Are any adjustments needed to the fluency and/or application components of the lesson?

Practice a Planning Protocol

Repeat this process for each lesson.

- Read lesson.
- Study exit ticket. Identify critical portions of concept development and problem set.
- Consider needs of specific students.
- Refer to subsequent exit ticket. Revise implementation plan as needed.
- Make adjustments to the student debrief as needed.
- Consider the other lesson components, ensuring a balance of rigor.

Biggest Takeaway

What was your biggest takeaway from today's session?

What questions or concerns do you still have?



Key Points

- Lessons designed for students to be active learners.
- Teacher questioning guides students to explore ideas, investigate natural questions, and develop the big ideas that are the focus of the module.
- Students use the study of Ratios in Grade 6 as a foundation to examine the characteristics of a Proportional Relationship in Grade 7.
- Students make connections between multiple representations of proportional relationships (verbal, diagram, table, graph) to develop a deeper understanding of a proportional relationship.

Key Points

- Students use the study of Ratios in Grade 6 as a foundation to examine the characteristics of a Proportional Relationship in Grade 7.
- Students make connections between multiple representations of proportional relationships (verbal, diagram, table, graph) to develop a deeper understanding of a proportional relationship.
- The second half of lessons focuses on applying proportional reasoning to solve real-world and mathematical problems.
- Lessons are designed to guide students to ask natural next questions and discover different approaches to solving problems, analyzing what they learned in earlier grades along with the first half of the module to find the approach that makes the most sense.

Key Points – Assessments

Assessments:

- Directly from the CCSSM standards
- Assess deeper conceptual understanding
- Address multiple learning standards and practice standards simultaneously

Assessment Rubrics

- Assess student progress toward mastery of standards
- Do not focus on deficiencies

Next Step

The first thing I'll do to prepare is...



