Lesson 12

Navigating a Table of Equivalent Ratios

Goals

- Choose multipliers strategically while solving multi-step problems involving equivalent ratios.
- Describe (orally and in writing) how a table of equivalent ratios was used to solve a problem about prices and quantities.
- Remember that dividing by a whole number is the same as multiplying by an associated unit fraction.

Learning Targets

- I can solve problems about situations happening at the same rate by using a table and finding a "1" row.
- I can use a table of equivalent ratios to solve problems about unit price.

Lesson Narrative

This lesson develops students' ability to work with a table of equivalent ratios and to compare and contrast different ways of solving equivalent ratio problems.

Students see that a table accommodates different ways of reasoning about equivalent ratios, with some being more direct than others. They notice that to find an unknown quantity, they can:

Find the multiplier that relates two corresponding values in different rows (for instance, "What times 5 equals 8?") and use that multiplier to find unknown values. (This follows the multiplicative thinking developed in previous lessons.)

Find an equivalent ratio with one quantity having a value of 1 and use that ratio to find missing values.

	amount earned (dollars)	time worked (hours)	
	90	5	
$\cdot \frac{1}{5}$	18	1	$\cdot \frac{1}{5}$
$\cdot 8$	144	8	$\cdot 8$

Access for Students with Diverse Abilities

- Representation (Activity 2)
- Action and Expression (Warm-up, Activity 3)

Access for Multilingual Learners

- MLR5: Co-Craft Questions (Activity 1)
- MLR8: Discussion Supports (Activity 3)

Instructional Routines

- Math Talk
- MLR5: Co-Craft Questions

Required Materials

Materials to Gather

- Math Community Chart: Activity 1

Lesson Timeline

Warm-up	Activity 1	Activity 2	Activity 3	Lesson Synthesis	Assessment: Cool-down
10 mins	15 mins	15 mins	15 mins	10 min	5 mins

Lesson 12

Navigating a Table of Equivalent Ratios

Lesson Narrative (continued)

All tasks in the lesson aim to strengthen students' understanding of the multiplicative relationships between equivalent ratios—that given a ratio $a:b$, an equivalent ratio may be found by multiplying both a and b by the same factor. They also aim to build students' awareness of how a table can facilitate this reasoning to varying degrees of efficiency, depending on one's approach.

Ultimately, the goal of this unit is to prepare students to make sense of situations involving equivalent ratios and solve problems flexibly and strategically, rather than to rely on a procedure (such as "set up a proportion and cross multiply") without an understanding of the underlying mathematics.

To reason using ratios in which one of the quantities is 1, students are likely to use division. In the example here, they are likely to divide the 90 by 5 to find the amount earned per hour. Remind students that dividing by a whole number is the same as multiplying by its reciprocal (a unit fraction) and encourage the use of multiplication (as shown in the activity about hourly wages) whenever possible. Doing so will better prepare students to scale down or find equivalent ratios involving values that are smaller than the given ones.

The optional activity presents a situation where ratios are considerably scaled down, highlighting one limit of double number lines.

As they relate the values in a table to the quantities in the situation being represented, students practice reasoning quantitatively and abstractly.

Student Learning Goal

Let's use a table of equivalent ratios like a pro.

Instructional Routines

Math Talk

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Access for Students with Diverse Abilities (Warm-up, Student Task)

Action and Expression: Internalize Executive Functions.
To support working memory, provide students with sticky notes or mini whiteboards.

Supports accessibility for: Memory, Organization

Warm-up

Math Talk: Multiplying by a Unit Fraction

10 min

Activity Narrative

This *Math Talk* focuses on multiplication involving unit fractions. It encourages students to rely on the meaning of fractions and the properties of operations to find the product of a unit fraction and a whole number or a decimal.

In grade 4, students learned that a non-unit fraction can be expressed as a product of a whole number and a fraction. For instance, $\frac{5}{3}$ can be expressed as $5 \times \frac{1}{3}$. In grade 5, they interpreted a fraction such as $\frac{5}{3}$ as a quotient, $5 \div 3$, and connected the two interpretations of $\frac{5}{3}$ (as $5 \times \frac{1}{3}$ and $5 \div 3$). They also observed the commutative property of multiplication and saw that $5 \times \frac{1}{3}$ and $\frac{1}{3} \times 5$ have the same value. In both grades, students relied on contexts to reason about and represent problems involving multiplication of a whole number and a fraction.

Two ideas that build on these prior understandings will be relevant to future work in the unit and are important to emphasize during discussions:

- Dividing by a number is the same as multiplying by its reciprocal.
- The commutative property of multiplication can help us solve a problem regardless of the context.

Launch

Tell students to close their books or devices (or to keep them closed). Reveal one problem at a time. For each problem:

Give students quiet think time and ask them to give a signal when they have an answer and a strategy.

- Invite students to share their strategies and record and display their responses for all to see.
- Use the questions in the activity synthesis to involve more students in the conversation before moving to the next problem.

Keep all previous problems and work displayed throughout the talk.

Student Task Statement

Find the value of each product mentally.

A. $\frac{1}{3} \cdot 21$

7

Sample reasoning:

- $21 \div 3$ or $3 \cdot 7$.
- $\frac{1}{3} \cdot 21$ is equal to $21 \cdot \frac{1}{3}$ or 21 groups of $\frac{1}{3}$, which is 7.

B. $\frac{1}{6} \cdot 21$

3.5

Sample reasoning:

- $\frac{1}{6} \cdot 21$ has the same value as $21 \div 6$, which is 3.5.
- Divide the product of the first expression by 2 because $\frac{1}{6}$ is half of $\frac{1}{3}$.

C. $(5.6) \cdot \frac{1}{8}$

0.7

Sample reasoning: $(5.6) \cdot \frac{1}{8}$ has the same value as $5.6 \div 8$ and $8 \cdot (0.7)$ is 5.6.

D. $\frac{1}{4} \cdot (5.6)$

1.4

Sample reasoning:

- $\frac{1}{4} \cdot (5.6)$ has the same value as $5.6 \div 4$.
- Double the value of the previous expression because $\frac{1}{4}$ is twice as much as $\frac{1}{8}$.

Activity Synthesis

To involve more students in the conversation, consider asking:

"Who can restate ___'s reasoning in a different way?"

"Did anyone use the same strategy but would explain it differently?"

"Did anyone solve the problem in a different way?"

"Does anyone want to add on to ___'s strategy?"

"Do you agree or disagree? Why?"

"What connections to previous problems do you see?"

Activity 1

Comparing Taco Prices

15 min

Activity Narrative

The purpose of this activity is to encourage students to use a table to find the price for one taco for two different situations. Students are likely to divide the cost of the tacos by the number of tacos to find the cost for one taco, which is appropriate. Use the opportunity to remind students that dividing by a whole number is the same as multiplying by its reciprocal (a unit fraction). This insight will come in handy in future activities and lessons.

Access for Multilingual Learners (Warm-up, Synthesis)

MLR8: Discussion Supports. Display sentence frames to support students when they explain their strategy. For example, "First, I _____ because...." or "I noticed _____ so I...." Some students may benefit from the opportunity to rehearse what they will say with a partner before they share with the whole class.

Advances: Speaking, Representing

Instructional Routines

MLR5: Co-Craft Questions

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Access for Multilingual Learners

MLR5: Co-Craft Questions

If students did not complete the "Two Tents" activity in an earlier unit, this is the first time Math Language Routine 5: *Co-Craft Questions* is suggested in this course. In this routine, students are given a context or situation, often in the form of a problem stem (for example, a story, image, video, or graph) with or without numerical values. Students develop mathematical questions that can be asked about the situation. A typical prompt is: "What mathematical questions could you ask about this situation?" The purpose of this routine is to allow students to make sense of a context before feeling pressure to produce answers, and to develop students' awareness of the language used in mathematics problems.

Launch

Math Community

Display the Math Community Chart for all to see.

Give students a brief quiet think time to read the norms or invite a student to read them out loud.

Tell students that during this activity they are going to practice looking for their classmates putting the norms into action. At the end of the activity, students can share what norms they saw and how the norm supported the mathematical community during the activity.

Arrange students in groups of 2. Use *Co-Craft Questions* to give students an opportunity to familiarize themselves with the context, and to practice producing the language of mathematical questions.

Display only the statement "Noah bought 4 tacos and paid $6," without revealing the question. Ask students,

"What mathematical questions could you ask about this situation?"

Give students 1–2 minutes to write a list of mathematical questions that could be asked about the situation before comparing questions with a partner.

Support students in using conversation and collaboration skills to generate and refine their questions by, for instance, revoicing a question, seeking clarity, or referring to their written notes. Listen for how students use language about equivalent ratios.

Invite several groups to share one question with the class and record responses. Ask the class to make comparisons among the shared questions and their own. Ask,

"What do these questions have in common? How are they different?"

Listen for and amplify questions about the cost of different numbers of tacos sold at the same rate, or the number of tacos that could be bought with different amounts of money.

Reveal the question: "At this rate, how many tacos could he buy for $15?"

Give students a couple of minutes to compare it to their own question and those of their classmates.

Identify similarities and differences. Consider asking:

"Which of your questions is most similar to or different from the one provided? Why?"

After co-crafting questions, prompt students to proceed with the activity. Remind students that we use tables to show equivalent ratios, but because we don't know in advance whether the ratio of number of tacos to price in Jada's purchase will be the same as in Noah's, we might want to keep track of them in two separate tables.

Student Task Statement

Use the table to help you solve these problems. Explain or show your reasoning.

1. Noah bought 4 tacos and paid \$6. At this rate, how many tacos could he buy for \$15?

   10 tacos

   Sample reasoning:

   - Noah paid \$3 for every 2 tacos and \$15 is 5 times \$3, so he could buy 5 times 2 or 10 tacos.
   - Using a table:

number of tacos	price in dollars
4	6
2	3
1	1.50
10	15

2. Jada's family bought 50 tacos for a party and paid \$72. Were Jada's tacos the same price as Noah's tacos?

   no

   Sample reasoning:

   - Noah's tacos cost \$1.50 each. Jada's cost \$1.44 each.
   - Noah would pay \$15 for 10 tacos, which means 15 × 5 or \$75 for 50 tacos. Jada's family paid only \$72 for 50 tacos.

Activity Synthesis

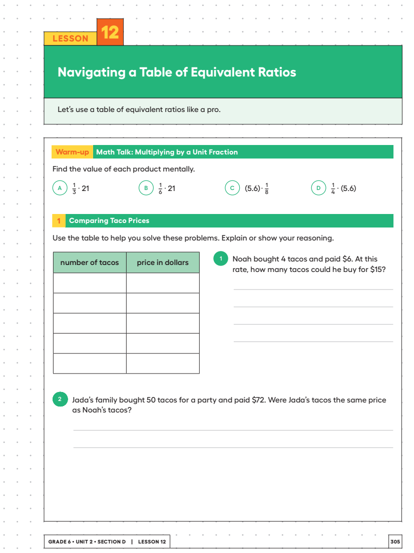
While there are different ways to reason about the costs of tacos, focus the discussion on how students found the cost of a single taco in each situation. Remind students that dividing by a whole number is the same as multiplying by its reciprocal (a unit fraction). If students use a table and division to find the cost of one taco, consider annotating the table to show the number being multiplied to the values in one row to find the values in the next row.

Math Community

Conclude the discussion by inviting 2–3 students to share a norm they identified in action. Provide this sentence frame to help students organize their thoughts in a clear, precise way:

"I noticed our norm "___" in action today and it really helped me/my group because ___."

Student Workbook


LESSON 12

Navigating a Table of Equivalent Ratios

Let's use a table of equivalent ratios like a pro.

Warm-up Math Talk: Multiplying by a Unit Fraction

Find the value of each product mentally.

A $\frac{1}{3} \cdot 21$ B $\frac{1}{6} \cdot 21$ C $(5.6) \cdot \frac{1}{8}$ D $\frac{1}{4} \cdot (5.6)$

1 Comparing Taco Prices

Use the table to help you solve these problems. Explain or show your reasoning.

number of tacos	price in dollars

1. Noah bought 4 tacos and paid \$6. At this rate, how many tacos could he buy for \$15?

2. Jada's family bought 50 tacos for a party and paid \$72. Were Jada's tacos the same price as Noah's tacos?

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Activity 2

Hourly Wages

15 min

Activity Narrative

This activity introduces students to the strategy of using an equivalent ratio with one quantity having a value of 1 to find other equivalent ratios. Students look at a worked-out example of the strategy, make sense of how it works, and later apply it to solve other problems.

There are two key insights to uncover here:

- The ratios we deal with do not always have corresponding quantities that are multiples of each other. (For example, in the activity, 5 is not a multiple of 8, or vice versa).
- In those situations, finding an equivalent ratio where one of the quantities is 1 can be a helpful intermediate step.

Also reinforced here is an idea from grade 5, that dividing by a whole number is equivalent to multiplying by its reciprocal. (For instance, dividing by 5 is the same as multiplying by $\frac{1}{5}$.)

Expect some students to initially overlook the benefit of using a ratio involving a “1,” to rely on methods from previous work, and to potentially get stuck (especially when dealing with a decimal value in the last row). For example, since the table shows an arrow and a multiplication from the first to the second row and from the second to third, students may try to do the same to find the missing value in the fourth row. While finding a factor that can be multiplied to 8 to obtain 3 is valid, encourage students to consider an alternative, given what they already know about the situation (namely, how much the person earned in 1 hour). If needed, support their thinking by asking how much Lin would earn in 2 hours and *then* in 3 hours.

Monitor for students who can:

- articulate why $\frac{1}{5}$ is used as a multiplier
- reason why using a ratio with one of the values being 1 helps to find other equivalent ratios
- reason about equivalent ratios in other ways

Invite these students to share later.

Launch

This may be some students' first time reasoning about money earned by the hour. Take a minute to ensure everyone understands the concept. Ask if anyone has earned money based on the number of hours doing a job. Some students may have experience being paid by the hour for helping with house cleaning, a family business, babysitting, dog walking, or doing other jobs.

Give students quiet think time to complete the activity and a minute to share their responses (especially to the last two questions) with a partner before discussing as a class.

Student Task Statement

Lin is paid $90 for 5 hours of work. She used the table to calculate how much she would be paid at this rate for 8 hours of work.

	amount earned (dollars)	time worked (hours)	
	90	5	
$\cdot \frac{1}{5}$	18	1	$\cdot \frac{1}{5}$
$\cdot 8$	144	8	$\cdot 8$

1. What is the meaning of the 18 that appears in the table?

   Lin earned $18 for 1 hour of work or for every hour of work.

2. Why was the number $\frac{1}{5}$ used as a multiplier?

   Sample response: $\frac{1}{5}$ is used because $5 \cdot \frac{1}{5} = 1$, and then the 1 could be multiplied by 8.

3. Explain how Lin used this table to solve the problem.

   Sample response: First, she found the pay for 1 hour by multiplying both the 90 and the 5 by $\frac{1}{5}$ (or dividing them both by 5). Then, she multiplied both the 18 and the 1 by 8 to find that she earned $144 in 8 hours.

4. At this rate, how much would Lin be paid for 3 hours of work? $54

   For 2.1 hours of work? $37.80

Activity Synthesis

Select a few students to share about the use of $\frac{1}{5}$ as a multiplier and to explain the reasoning process shown in the table. If different approaches are used, take the opportunity to compare and contrast the efficacy of each.

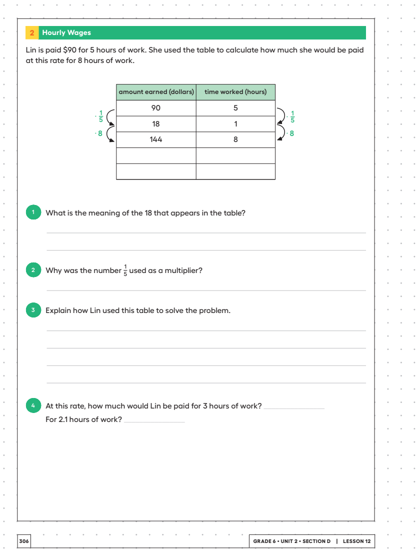
If students had trouble reasoning to find the pay for 2.1 hours of work, help them articulate what they have done in each preceding case and urge them to think about the 2.1 the same way. If they are unsure whether multiplying 18 by 2.1 would work, encourage them to check whether the answer makes sense. (For 2 hours of work, Lin would earn $36, so it stands to reason that she would earn a bit more than $36 for 2.1 hours.) In doing so, students practice decontextualizing and contextualizing their reasoning and solutions.

Access for Students with Diverse Abilities (Activity 2, Student Task)

Representation: Develop Language and Symbols.
Make connections between representations visible. Ask students to describe or show how the information that we know about Lin's pay and the information we want to verify is represented in the table.

Supports accessibility for: Language, Conceptual Processing

Student Workbook


2 Hourly Wages

Lin is paid $90 for 5 hours of work. She used the table to calculate how much she would be paid at this rate for 8 hours of work.

	amount earned (dollars)	time worked (hours)	
	90	5	
$\cdot \frac{1}{5}$	18	1	$\cdot \frac{1}{5}$
$\cdot 8$	144	8	$\cdot 8$

1 What is the meaning of the 18 that appears in the table?

2 Why was the number $\frac{1}{5}$ used as a multiplier?

3 Explain how Lin used this table to solve the problem.

4 At this rate, how much would Lin be paid for 3 hours of work? ______

For 2.1 hours of work? ______

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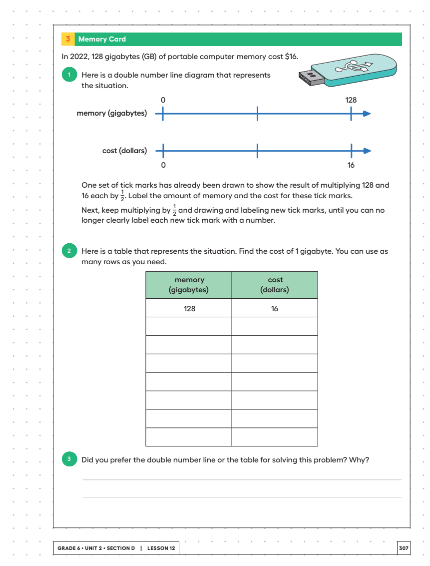
Access for Students with Diverse Abilities (Activity 3, Student Task)

Action and Expression: Provide Access for Physical Action.
Give students the option of representing the situation in the activity kinesthetically on a larger scale. For example, use tape to construct a double number line diagram on the classroom floor and allow students to partition the lines by placing smaller pieces of tape as tick marks. Ask students how they might demonstrate the process of multiplying the memory size and cost by half repeatedly. (They may repeatedly position themselves halfway between two consecutive tick marks.)

Supports accessibility for: Fine Motor Skills, Organization, Visual-Spatial Processing

Student Workbook


3 Memory Card

In 2022, 128 gigabytes (GB) of portable computer memory cost $16.

1. Here is a double number line diagram that represents the situation.

One set of tick marks has already been drawn to show the result of multiplying 128 and 16 each by $\frac{1}{2}$. Label the amount of memory and the cost for these tick marks.

Next, keep multiplying by $\frac{1}{2}$ and drawing and labeling new tick marks, until you can no longer clearly label each new tick mark with a number.

2. Here is a table that represents the situation. Find the cost of 1 gigabyte. You can use as many rows as you need.

memory (gigabytes)	cost (dollars)
128	16

3. Did you prefer the double number line or the table for solving this problem? Why?

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Activity 3: Optional
Memory Card

15 min

Activity Narrative

Previously, students explored the limitation of a double number line when dealing with greatly scaled-up ratios. They saw that extending the number lines can be impractical. Here, they encounter a situation involving significantly scaled-down ratios, in which a double number line is likewise impractical (that is, there is not enough room to fit relevant information) and see that a table is clearly preferable.

The given table deliberately includes more rows than necessary to answer the question. Some students may realize that it is not necessary to fill in all the rows if they use a different factor in finding equivalent ratios. Monitor for students who take such shortcuts so they can share later. Their reasoning can further highlight the flexibility of a table.

Launch

Ask students if they have heard of memory cards for electronic devices and invite students to share what they know.

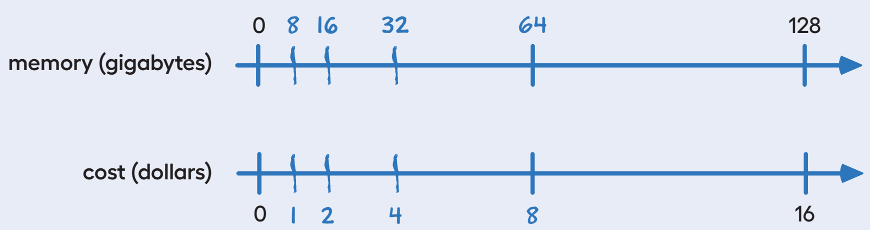
Explain that digital devices such as phones, tablets, and computers use memory cards to store data such as documents, pictures, and videos. The data can be stored temporarily or permanently, and then retrieved as needed—not unlike how we hold on to information and then retrieve it from our memory.

Tell students that the data that a memory can store is often measured in megabytes (MB) or gigabytes (GB). One byte is the amount of memory needed to store one letter of the English alphabet. (More than 1 byte may be needed for a letter or character of another language.)

Student Task Statement

In 2022, 128 gigabytes (GB) of portable computer memory cost $16.

1. Here is a double number line diagram that represents the situation.

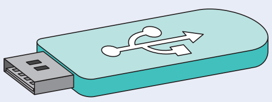


One set of tick marks has already been drawn to show the result of multiplying 128 and 16 each by $\frac{1}{2}$. Label the amount of memory and the cost for these tick marks.

Next, keep multiplying by $\frac{1}{2}$ and drawing and labeling new tick marks, until you can no longer clearly label each new tick mark with a number.

2. Here is a table that represents the situation. Find the cost of 1 gigabyte. You can use as many rows as you need.

memory (gigabytes)	cost (dollars)
128	16
64	8
32	4
16	2
8	1
4	0.5
2	0.25
1	0.125



Note: It's not actually necessary to write all of these rows. Bigger jumps could be made by multiplying by a number other than $\frac{1}{2}$.

3. Did you prefer the double number line or the table for solving this problem? Why?

Answers vary. The purpose of this question is to give students a chance to prepare for the discussion that follows.

Are You Ready for More?

Here is another question about finding half of something repeatedly. A question like this was originally posed by Zeno of Elea, a Greek philosopher who lived around 490–430 BCE.

Suppose you stand in the middle of the classroom and move toward the door to exit. Every time you make a move toward the door, you travel only half the distance between you and the door.

1. Can you reach the door and get out? Make a prediction and be prepared to explain your reasoning.

   Sample responses:

   - Yes, because eventually the halfway point between the door and me would be so small that I'd be at the door already.
   - No, because if I'm going only halfway each time, there'd always be a distance between the door and me, even if that distance gets really small.

2. Compare your prediction with those of your classmates. Do you all agree one way or the other?

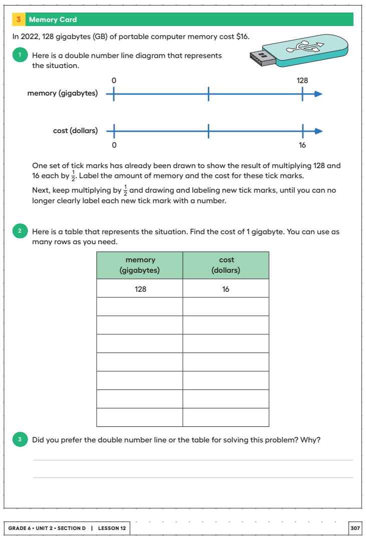
   If it seems helpful, consider using objects to demonstrate your thinking.

   Answers vary.

Building on Student Thinking

Watch out for students being overly precise or wildly imprecise with drawing tick marks on their double number line diagram. We want them to eyeball approximately half the distance, but it would be too time-consuming to measure precisely.

Student Workbook



3 Memory Card

In 2022, 128 gigabytes (GB) of portable computer memory cost $16.

1 Here is a double number line diagram that represents the situation.

memory (gigabytes): 0, 128

cost (dollars): 0, 16

One set of tick marks has already been drawn to show the result of multiplying 128 and 16 each by $\frac{1}{2}$. Label the amount of memory and the cost for these tick marks.

Next, keep multiplying by $\frac{1}{2}$ and drawing and labeling new tick marks, until you can no longer clearly label each new tick mark with a number.

2 Here is a table that represents the situation. Find the cost of 1 gigabyte. You can use as many rows as you need.

memory (gigabytes)	cost (dollars)
128	16

3 Did you prefer the double number line or the table for solving this problem? Why?

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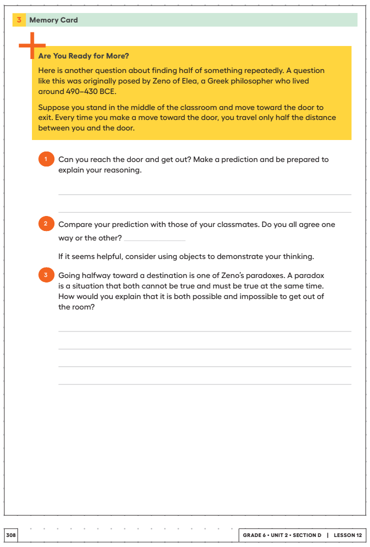
Student Workbook



3 Memory Card

Are You Ready for More?

Here is another question about finding half of something repeatedly. A question like this was originally posed by Zeno of Elea, a Greek philosopher who lived around 490–430 BCE.

Suppose you stand in the middle of the classroom and move toward the door to exit. Every time you make a move toward the door, you travel only half the distance between you and the door.

1 Can you reach the door and get out? Make a prediction and be prepared to explain your reasoning.

2 Compare your prediction with those of your classmates. Do you all agree one way or the other?

If it seems helpful, consider using objects to demonstrate your thinking.

3 Going halfway toward a destination is one of Zeno's paradoxes. A paradox is a situation that both cannot be true and must be true at the same time. How would you explain that it is both possible and impossible to get out of the room?

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Access for Multilingual Learners (Activity 3, Synthesis)

MLR8: Discussion Supports. Provide students with the opportunity to rehearse what they will say with a partner before they share with the whole class which representation was easier to use to find the cost of 1 gigabyte. Ask students to describe how they used the double number line and how they used the table. Display sentence frames such as, "_____ was easier to use because …" or "I prefer _____ because …"

Advances: Speaking

3. Going halfway toward a destination is one of Zeno's paradoxes. A paradox is a situation that both cannot be true and must be true at the same time. How would you explain that it is both possible and impossible to get out of the room?

Sample response: At some point the length of our feet would be larger than the distance to the door so we're pretty much at the door, so it's possible to get out. If we think about a point traveling halfway each time, then we can say that there's always going to be a gap between the point and the door, so it's not possible to get out.

Activity Synthesis

The discussion should center around why the table was easier to use for this problem: the numbers we started with were so large that there wasn't enough room to locate 1 gigabyte on the number line.

If any students multiplied the ratios by a fraction other than $\frac{1}{2}$ so that they did not have to fill all the rows, consider highlighting this shortcut. (They could even divide 128 and 16 by 128 to arrive at an answer directly, using what they have learned about unit price.) It shows how the table enables reasoning with numbers (rather than with lengths) and is more flexible.

Lesson Synthesis

This lesson is about using a table of equivalent ratios in an efficient way. To wrap up, highlight a few important points:

- In problems with equivalent ratios, finding an equivalent ratio containing a "1" is often a good strategy.
- To create a new row in a table of equivalent ratios, take an existing row and multiply both values by the same number.
- We can multiply whole numbers by unit fractions to get smaller numbers.

Lesson Summary

Finding a row containing a "1" is often a good way to work with tables of equivalent ratios. For example, the price for 4 lbs of granola is \$5. At that rate, what would be the price for 62 lbs of granola?

Here are tables showing two different approaches to solving this problem. Both of these approaches are correct. However, one approach is more efficient.

Less efficient

	granola (lbs)	price (dollars)	
	4	5	
$\cdot 2$	8	10	$\cdot 2$
$\cdot 2$	16	20	$\cdot 2$
$\cdot 2$	32	40	$\cdot 2$
$\cdot 2$	64	80	$\cdot 2$
− 2 lbs	62	77.50	− \$2.50

- More efficient

	granola (lbs)	price (dollars)	
	4	5	
$\cdot \frac{1}{4}$	1	1.25	
$\cdot 62$	62	77.50	

Notice how the more efficient approach starts by finding the price for 1 lb of granola.

Remember that dividing by a whole number is the same as multiplying by a unit fraction. In this example, we can divide by 4 or multiply by $\frac{1}{4}$ to find the unit price.

Cool-down

Price of Bagels

5 min

Student Task Statement

A shop sells bagels for \$5 per dozen.

For each question, explain or show your reasoning. You can use the table if you find it helpful.

1. At this rate, how much would 6 bagels cost? \$2.50

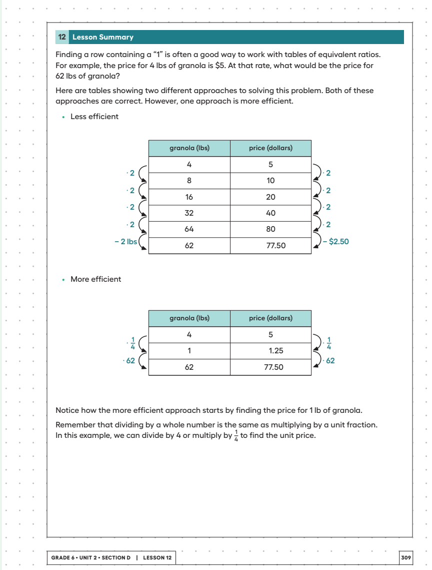
   Sample reasoning: Twelve bagels cost \$5 and 6 is half of 12, so 6 bagels cost half of \$5, which is \$2.50.

2. How many bagels can you buy for \$50? 120 bagels

   Sample reasoning:

number of bagels	price in dollars
12	5
6	2.5
120	50

Student Workbook



Responding To Student Thinking

More Chances

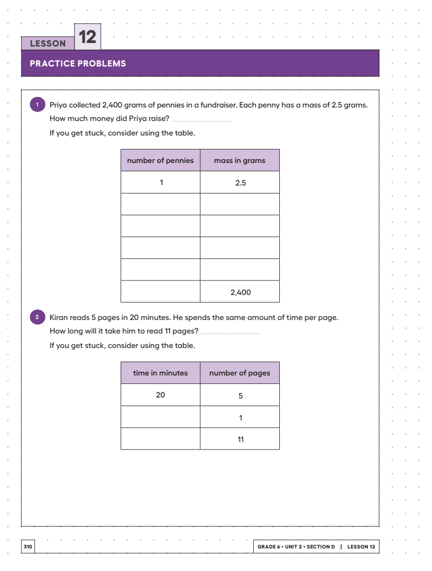
Students will have more opportunities to understand the mathematical ideas addressed here. There is no need to slow down or add additional work to the next lessons.

Lesson 12

Practice Problems

7 Problems

Student Workbook


LESSON 12

PRACTICE PROBLEMS

1 Priya collected 2,400 grams of pennies in a fundraiser. Each penny has a mass of 2.5 grams. How much money did Priya raise?

If you get stuck, consider using the table.

number of pennies	mass in grams
1	2.5
	2,400

2 Kiran reads 5 pages in 20 minutes. He spends the same amount of time per page. How long will it take him to read 11 pages?

If you get stuck, consider using the table.

time in minutes	number of pages
20	5
	1
	11

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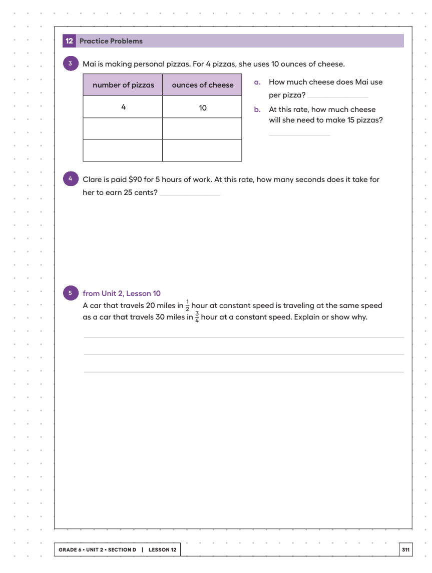
Student Workbook


12 Practice Problems

3 Mai is making personal pizzas. For 4 pizzas, she uses 10 ounces of cheese.

number of pizzas	ounces of cheese
4	10

a. How much cheese does Mai use per pizza?

b. At this rate, how much cheese will she need to make 15 pizzas?

4 Clare is paid \$90 for 5 hours of work. At this rate, how many seconds does it take for her to earn 25 cents?

5 from Unit 2, Lesson 10

A car that travels 20 miles in $\frac{1}{3}$ hour at constant speed is traveling at the same speed as a car that travels 30 miles in $\frac{1}{2}$ hour at a constant speed. Explain or show why.

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Problem 1

Priya collected 2,400 grams of pennies in a fundraiser. Each penny has a mass of 2.5 grams. How much money did Priya raise? \$9.60

If you get stuck, consider using the table.

number of pennies	mass in grams
1	2.5
1,000	2,500
4	10
40	100
960	2,400

Problem 2

Kiran reads 5 pages in 20 minutes. He spends the same amount of time per page. How long will it take him to read 11 pages? 44 minutes

If you get stuck, consider using the table.

time in minutes	number of pages
20	5
4	1
44	11

Problem 3

Mai is making personal pizzas. For 4 pizzas, she uses 10 ounces of cheese.

number of pizzas	ounces of cheese
4	10

a. How much cheese does Mai use per pizza?

2.5 ounces, because $10 \div 4 = 2.5$

b. At this rate, how much cheese will she need to make 15 pizzas?

37.5 ounces, because $2.5 \cdot 15 = 37.5$

Problem 4

Clare is paid \$90 for 5 hours of work. At this rate, how many seconds does it take for her to earn 25 cents?

50 seconds

Sample reasoning: She earns \$18 per hour, and an hour has 3,600 seconds. There are 72 quarters in \$18, and $3,600 \div 72 = 50$.

Problem 5

from Unit 2, Lesson 10

A car that travels 20 miles in $\frac{1}{2}$ hour at constant speed is traveling at the same speed as a car that travels 30 miles in $\frac{3}{4}$ hour at a constant speed. Explain or show why.

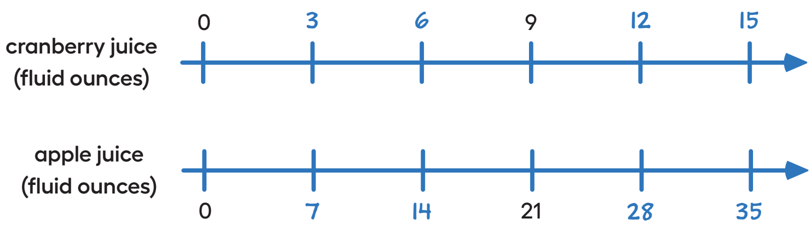
Sample responses:

- Both cars go 10 miles in $\frac{1}{4}$ of an hour, so they are traveling at the same speed.
- In 1 hour, both cars travel 40 miles, so they are both traveling at the same speed.

Problem 6

from Unit 2, Lesson 6

Lin makes her favorite juice blend by mixing cranberry juice with apple juice in the ratio shown on the double number line. Complete the diagram to show smaller and larger batches that would taste the same as Lin's favorite blend.



Problem 7

from Unit 2, Lesson 5

Each of these is a pair of equivalent ratios. For each pair, explain why they are equivalent ratios or draw a representation that shows why they are equivalent ratios.

a. 600 : 450 and 60 : 45

Sample responses: $60 \cdot 10 = 600$ and $45 \cdot 10 = 450$.

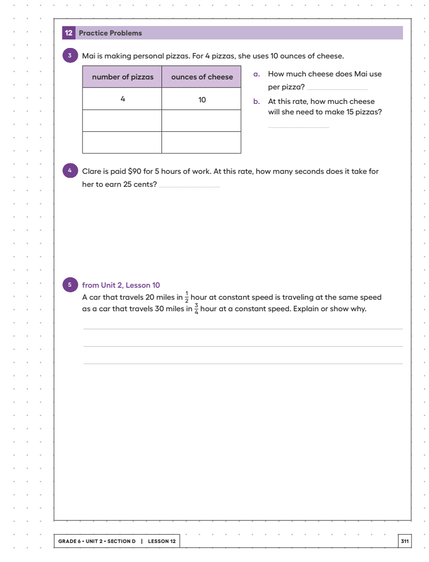
b. 60 : 45 and 4 : 3

Multiplying 4 and 3 by 15 gives 60 and 45.

c. 600 : 450 and 4 : 3

- Multiplying 4 by 150 gives 600 and multiplying 3 by 150 gives 450.
- The first problem shows that 600 : 450 is equivalent to 60 : 45 and the second problem shows that 60 : 45 is equivalent to 4 : 3. This means that 600 : 450 is equivalent to 4 : 3.

Student Workbook



12 Practice Problems

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number of pizzas	ounces of cheese
4	10

a. How much cheese does Mai use per pizza?

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4 Clare is paid \$90 for 5 hours of work. At this rate, how many seconds does it take for her to earn 25 cents?

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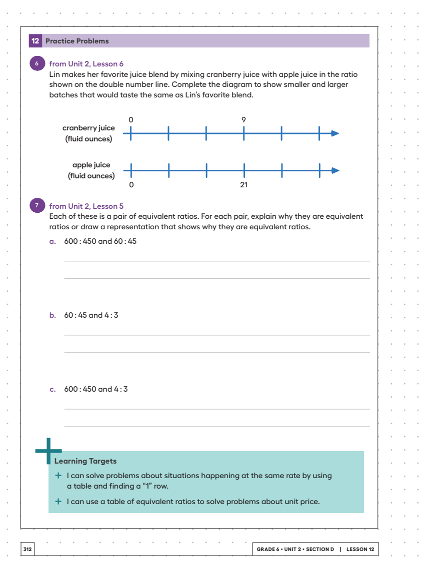
Student Workbook



12 Practice Problems

6 from Unit 2, Lesson 6
Lin makes her favorite juice blend by mixing cranberry juice with apple juice in the ratio shown on the double number line. Complete the diagram to show smaller and larger batches that would taste the same as Lin's favorite blend.

7 from Unit 2, Lesson 5
Each of these is a pair of equivalent ratios. For each pair, explain why they are equivalent ratios or draw a representation that shows why they are equivalent ratios.

a. 600 : 450 and 60 : 45

b. 60 : 45 and 4 : 3

c. 600 : 450 and 4 : 3

Learning Targets
+ I can solve problems about situations happening at the same rate by using a table and finding a "1" row.
+ I can use a table of equivalent ratios to solve problems about unit price.

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