Lesson 4

Color Mixtures

Goals

- Comprehend and respond (orally and in writing) to questions asking whether two ratios are equivalent, in the context of color mixtures.
- Draw and label a discrete diagram with circled groups to represent multiple batches of a color mixture.
- Explain equivalent ratios (orally and in writing) in terms of the amounts of each color in a mixture being multiplied by the same number to create another mixture that is the same shade.

Learning Targets

- I can explain the meaning of equivalent ratios using a color mixture as an example.
- I can use a diagram to represent a single batch, a double batch, and a triple batch of a color mixture.
- I know what it means to double or triple a color mixture.

Lesson Narrative

This is the second of two lessons that help students make sense of equivalent ratios through physical experiences.

In this lesson, students mix different numbers of batches of a color mixture and compare the results. In the main activity, they combine blue and yellow water (created ahead of time with food coloring) to see if they produce the same shade of green. They also change the ratio of blue and yellow water to see how doing so changes the result. In an optional activity, students apply their understanding of equivalent ratios to predict the shades of purple mixtures without actually combining red and blue water. Students continue to use discrete diagrams as a tool to represent a situation.

The experiences here reinforce the idea that scaling a recipe up (or down) requires scaling the amount of each ingredient by the same factor. Students continue to use discrete diagrams as a tool to represent a situation.

Access for Students with Diverse Abilities

- Representation (Activity 1, Activity 2)

Access for Multilingual Learners

- MLR3: Critique, Correct, Clarify (Activity 2)

Instructional Routines

- MLR3: Critique, Correct, Clarify

Required Materials

Materials to Gather

- Beakers: Activity 1
- Food coloring: Activity 1
- Graduated cylinders: Activity 1
- Markers: Activity 1
- Paper cups: Activity 1

Required Preparation

Activity 1:
To make blue water and yellow water, add 1 teaspoon of food coloring to 1 cup of water. If possible, put the colored water in beakers or containers with a pour spout and conduct the lesson in a room with a sink.

For the mixing demonstration, prepare:

- blue water and yellow water
- a graduated cylinder
- an opaque cup (styrofoam, paper, or plastic) with white interior
- a craft stick for stirring

For their experiments, each group of 2–4 students will need:

- a cup of blue water and a cup of yellow water
- a graduated cylinder
- a permanent marker
- a craft stick for stirring
- 3 opaque cups (styrofoam, paper, or plastic) with white interior
- a single batch of the original recipe (20 ml of green water) in an opaque cup labeled with the ratio of blue water to yellow water (5 to 15)

Lesson Timeline

Warm-up	Activity 1	Activity 2	Lesson Synthesis	Assessment: Cool-down
5 min	30 min	10 min	10 min	5 min

Lesson 4

Color Mixtures

Lesson Narrative (continued)

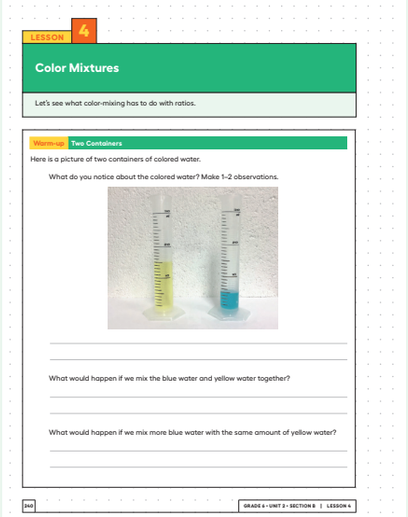
A note about seeing color:

For students who do not see color, consider having students make batches of dough with flour and water. Using 1 cup of flour to 5 tablespoons of water makes a very stiff dough, and 1 cup of flour to 6 tablespoons of water makes a soft (but not sticky) dough. In this case, doubling a recipe yields dough with the same tactile properties, just as doubling a colored-water recipe yields a mixture with the same color. The invariant property is stiffness rather than color. The principle that equivalent ratios yield products that are identical in some important way applies to both types of experiments.

Student Learning Goal

Let's see what color-mixing has to do with ratios.

Student Workbook


LESSON 4

Color Mixtures

Let's see what color-mixing has to do with ratios.

Warm-up Two Containers

Here is a picture of two containers of colored water.

What do you notice about the colored water? Make 1–2 observations.

What would happen if we mix the blue water and yellow water together?

What would happen if we mix more blue water with the same amount of yellow water?

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Warm-up

Two Containers

5 min

Activity Narrative

This *Warm-up* familiarizes students with the context and materials for the color-mixing experiments in the next activity. Students first observe the amounts of liquid in graduated cylinders. They then predict the result of mixing the given amounts of blue water and yellow water and mixing more blue than given.

Students who are colorblind can access the activity by using the labels in the image and by describing their observations and predictions in terms of dark and light instead of hue.

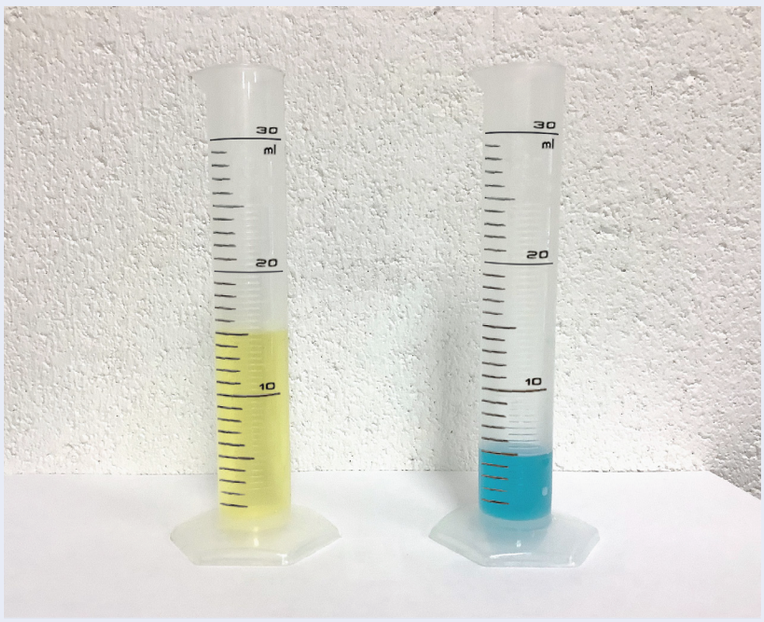
Launch

Display the image in the *Task Statement* for all to see, or if desired, display graduated cylinders with 5 ml of blue water and 15 ml of yellow water.

Give students 1–2 minutes of quiet think time to make observations and predictions about the water in the cylinders.

Student Task Statement

Here is a picture of two containers of colored water.



1. What do you notice about the colored water? Make 1–2 observations.

   Sample responses:

   - There is less blue water than yellow water.
   - There are 5 ml of blue water and 15 ml of yellow water.
   - Each container has marks and numbers that show how much liquid is in it.

2. What would happen if we mix the blue water and yellow water together?
   - We would have green water.
   - We would have 20 ml of mixture.
3. What would happen if we mix more blue water with the same amount of yellow water?
   - The mixture would be bluer or be a darker green.

Activity Synthesis

Invite students to share their observations and predictions. When students mention the amounts of blue and yellow water, ask them how they know. If no students mention the amounts, ask students about them.

Tell students that in the next activity they will perform some experiments that involve mixing colored water and using cylinders as shown in the image or display. Explain to students that these containers are called "graduated cylinders" and that they measure in milliliters.

Activity 1

Turning Green

30 min

Activity Narrative

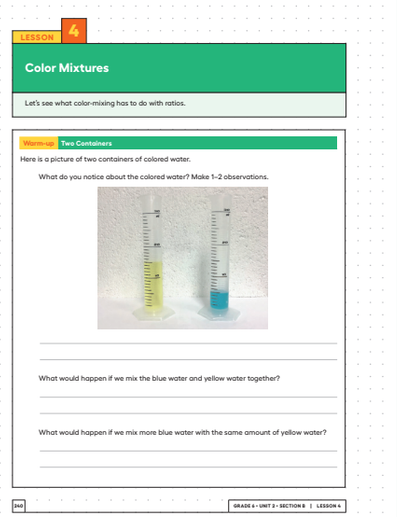
There is a digital version of this activity.

In this activity, students mix different numbers of batches of a color recipe to obtain a certain shade of green. They observe how multiple batches of the same recipe produce the same shade of green as a single batch produces, which suggests that the ratios of blue to yellow for the two situations are equivalent. They also come up with a ratio that is not equivalent which will produce a mixture that is a different shade of green.

As students make the mixtures, ensure that they measure accurately so they will get accurate outcomes. As students work, note the different diagrams that students use to represent their recipes. Select a few examples that could be highlighted in discussion later.

In the digital version of the activity, students use an applet to mix different amounts of blue and yellow. The applet allows students to add each color in increments of 1 or 5 units and to start over as needed. Consider using the digital version if there isn't enough available physical equipment for students to experiment in small groups, or if time is limited and students can access the applet readily on devices.

Student Workbook


LESSON 4

Color Mixtures

Let's see what color-mixing has to do with ratios.

Warm-up Two Containers

Here is a picture of two containers of colored water.

What do you notice about the colored water? Make 1–2 observations.

What would happen if we mix the blue water and yellow water together?

What would happen if we mix more blue water with the same amount of yellow water?

Access for Students with Diverse Abilities (Activity 1, Launch)

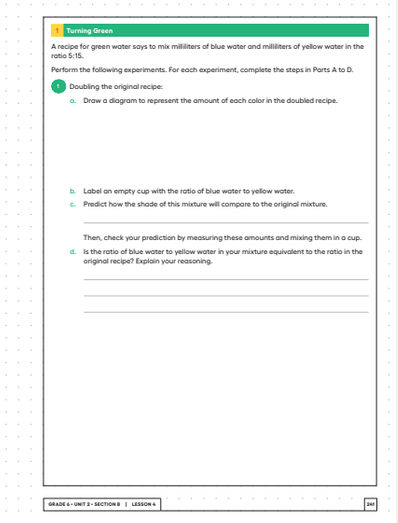
Representation: Access for Perception.
Provide appropriate reading accommodations and supports to ensure student access to written directions, word problems, and other text-based content.

Supports accessibility for: Language

Building on Student Thinking

If any students come up with an incorrect recipe, consider letting this play out. A different shade of green shows that the ratio of blue to yellow in their mixture is not equivalent to the ratio of blue to yellow in the other mixtures. Rescuing the incorrect mixture to display during discussion may lead to meaningful conversations about what equivalent ratios mean.

Student Workbook


1 Turning Green

A recipe for green water says to mix milliliters of blue water and milliliters of yellow water in the ratio 5:15.

Perform the following experiments. For each experiment, complete the steps in Parts A to D.

1. Doubling the original recipe:
   a. Draw a diagram to represent the amount of each color in the doubled recipe.
   b. Label an empty cup with the ratio of blue water to yellow water.
   c. Predict how the shade of this mixture will compare to the original mixture.

   Then, check your prediction by measuring these amounts and mixing them in a cup.
   d. Is the ratio of blue water to yellow water in your mixture equivalent to the ratio in the original recipe? Explain your reasoning.

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Launch

Read aloud the first sentence of the activity statement. Demonstrate how to pour liquid from the beakers into the graduated cylinder to measure 5 ml of blue water and 15 ml of yellow water. Show students how to get an accurate reading on the graduated cylinder by working on a level surface and by reading the measurement at eye level. Next, label an empty cup with the ratio of blue water and yellow water. Then, pour the colored water from the cylinders into the cup and mix. Tell students this is a single batch of the recipe, and that they will experiment with different mixtures of green water—doubling the recipe, tripling the recipe, and inventing a new recipe—and observe the resulting shades.

Arrange students in groups of 2–4. (Smaller groups are preferable, but group size might depend on available equipment.) Each group needs a beaker of blue water and one of yellow water, one graduated cylinder, a permanent marker, a craft stick, and 3 opaque cups (styrofoam, paper, or plastic) with a white interior. Each group also needs a cup with a single batch of the original recipe (20 ml of green water) for comparison purposes.

Before students begin, point out that for each experiment, there are several steps to take before mixing the blue and yellow water, and one step to complete afterward. Briefly review the directions for doubling the original recipe. When discussing how to draw a diagram, ask students how they might represent the amounts of blue water and yellow water in the single batch that was just mixed.

Student Task Statement

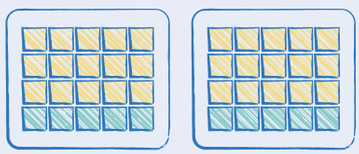
A recipe for green water says to mix milliliters of blue water and milliliters of yellow water in the ratio 5:15.

Perform the following experiments. For each experiment, complete the steps in Parts A to D.

1. Doubling the original recipe:

   a. Draw a diagram to represent the amount of each color in the doubled recipe.

   Students may arrange the groups differently or use different symbols to represent 1 ml of water. Sample response:



   b. Label an empty cup with the ratio of blue water to yellow water.

   Students labeled a cup or recorded 10:30 or "10 to 30."

   c. Predict how the shade of this mixture will compare to the original mixture. Then, check your prediction by measuring these amounts and mixing them in a cup.

   If the recipe is correct, the shade of green is identical to the teacher's.

   d. Is the ratio of blue water to yellow water in your mixture equivalent to the ratio in the original recipe? Explain your reasoning.

   10:30 is equivalent to 5:15 because it is 2 batches of the same recipe. It creates an identical shade of green.

2. Tripling the original recipe:

a. Draw a diagram to represent the amount of each color in the tripled recipe.

Like the previous diagram, except showing 3 batches.

b. Label an empty cup with the ratio of blue water to yellow water.

Students labeled a cup or recorded 15:45 or "15 to 45."

c. Predict how the shade of this mixture will compare to the original mixture. Then, check your prediction by measuring these amounts and mixing them in a cup.

If the recipe is correct, the shade of green is identical to the teacher's.

d. Is the ratio of blue water to yellow water in your mixture equivalent to the ratio in the original recipe? Explain your reasoning.

15:45 is equivalent to 5:15 because it is 3 batches of the same recipe. It creates an identical shade of green.

3. Inventing your own recipe for a *bluer* shade of green water.

a. Draw a diagram to represent the amount of each color in your recipe.

Students might use more blue for the same amount of yellow, or less yellow for the same amount of blue.

Sample response:

b. Label an empty cup with the ratio of blue water to yellow water.

Sample responses:

- 10:15 (more blue for the same amount of yellow)
- 5:10 (less yellow for the same amount of blue)

c. Check if your recipe makes a bluer shade by mixing one batch in a cup.

If a correct ratio is used, the mixture should be a bluer shade of green than the other mixtures.

d. Is the ratio of blue water to yellow water in your mixture equivalent to the ratio in the original recipe? Explain your reasoning

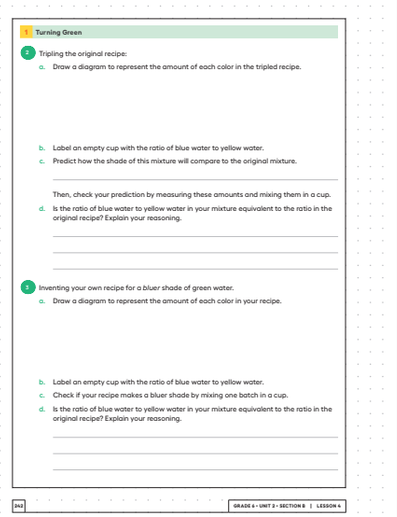
Sample response: No, it was not the same shade of green. The amounts of blue and yellow were not, respectively, obtained by multiplying 5 and 15 by the same number.

Are You Ready for More?

Someone has made a shade of green by using 17 ml of blue and 13 ml of yellow. They are sure it cannot be turned into the original shade of green by adding more blue or yellow. Either explain how more can be added to create the original green shade, or explain why this is impossible.

Sample response: We could add 3 ml of blue to get 20 ml of blue, and 47 ml of yellow to get 60 ml of yellow. The blue to yellow ratio of 20:60 will make the same shade of green as 5:15. It's a quadruple batch.

Student Workbook


1 Turning Green

2 Tripling the original recipe:
a. Draw a diagram to represent the amount of each color in the tripled recipe.
b. Label an empty cup with the ratio of blue water to yellow water.
c. Predict how the shade of this mixture will compare to the original mixture.
Then, check your prediction by measuring these amounts and mixing them in a cup.
d. Is the ratio of blue water to yellow water in your mixture equivalent to the ratio in the original recipe? Explain your reasoning.

3 Inventing your own recipe for a *bluer* shade of green water.
a. Draw a diagram to represent the amount of each color in your recipe.
b. Label an empty cup with the ratio of blue water to yellow water.
c. Check if your recipe makes a bluer shade by mixing one batch in a cup.
d. Is the ratio of blue water to yellow water in your mixture equivalent to the ratio in the original recipe? Explain your reasoning.

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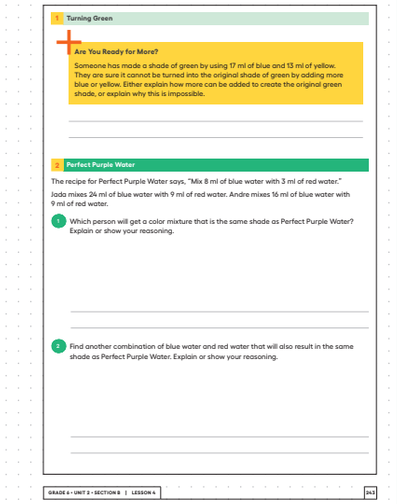
Student Workbook


1 Turning Green

+ Are You Ready for More?
Someone has made a shade of green by using 17 ml of blue and 13 ml of yellow. They are sure it cannot be turned into the original shade of green by adding more blue or yellow. Either explain how more can be added to create the original green shade, or explain why this is impossible.

2 Perfect Purple Water
The recipe for Perfect Purple Water says, "Mix 8 ml of blue water with 3 ml of red water."
Jada mixes 24 ml of blue water with 9 ml of red water. Andre mixes 16 ml of blue water with 9 ml of red water.
1 Which person will get a color mixture that is the same shade as Perfect Purple Water? Explain or show your reasoning.
2 Find another combination of blue water and red water that will also result in the same shade as Perfect Purple Water. Explain or show your reasoning.

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Instructional Routines

MLR3: Critique, Correct, Clarify

ilclass.com/r/10695504

Please log in to the site before using the QR code or URL.

Access for Multilingual Learners (Activity 2)

MLR2: Critique, Correct, Clarify. This activity uses the *Critique, Correct, Clarify* math language routine to give students an opportunity to critique and revise mathematical arguments.

Activity Synthesis

After each group has completed the task, have the students rotate through each group's workspace to observe the mixtures and diagrams. As students circulate, pose some guiding questions. (For students using the digital version, these questions refer to the mixtures on their computers.)

- *"Are each group's results of the first two experiments the same shade of green? How do you know?"*
- *"In the first two experiments, are the ratios of blue water to yellow water equivalent?"*
- *"Is each group's result of the third experiment the same shade of green as the first two?"*
- *"Is the ratio of blue water to yellow water in the third experiment equivalent to the ratios in the first two? How do you know?"*
- *"What are some different diagrams created to represent the ratios?"*

Highlight the idea that a ratio is equivalent to another if the two ratios describe different numbers of batches of the same recipe.

Activity 2: Optional

Perfect Purple Water

10 min

Activity Narrative

Students revisit color mixing—this time by producing purple-colored water—to further understand equivalent ratios. They recall that doubling, tripling, or halving a recipe for colored water yields the same resulting color, and that equivalent ratios can represent different numbers of batches of the same recipe.

As students work, monitor for students who use different representations to answer both questions, as well as students who come up with different ratios for the second question.

Launch

Arrange students in groups of 2. Remind students of the previous "Turning Green" activity. Ask students to discuss the following questions with a partner. Then, discuss responses together as a whole class:

- *"Why did the different mixtures of blue and yellow water result in the same shade of green?"*

  If mixed correctly, the amount of the ingredients were all doubled or all tripled. The ratio of blue water to yellow water was equivalent within each recipe.

- *"How were you able to get a darker shade of green?"*

  We changed the ratio of ingredients, so there was more blue for the same amount of yellow.

Explain to students that the task involves producing purple-colored water, but they won't actually be mixing colored water. Ask students to use the ideas just discussed from the previous activity to predict the outcomes of mixing blue and red water.

Ensure that students understand that the abbreviation for milliliters is ml.

Student Task Statement

The recipe for Perfect Purple Water says, "Mix 8 ml of blue water with 3 ml of red water."

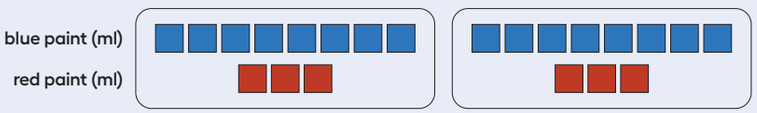
Jada mixes 24 ml of blue water with 9 ml of red water. Andre mixes 16 ml of blue water with 9 ml of red water.

1. Which person will get a color mixture that is the same shade as Perfect Purple Water? Explain or show your reasoning.

   Jada's mixture will result in the same shade of purple, because both ingredients are tripled. $8 \cdot 3 = 24$ and $3 \cdot 3 = 9$. Andre's mixture will not result in the same shade of purple, because the amount of red water is doubled, but the amount of blue water is tripled.

2. Find another combination of blue water and red water that will also result in the same shade as Perfect Purple Water. Explain or show your reasoning.

   Sample response: 16:6. Each ingredient is doubled or multiplied by 2. $8 \cdot 2 = 16$, so there are 16 ml of blue. $3 \cdot 2 = 6$, so there are 6 ml of red.



Access for Students with Diverse Abilities (Activity 2, Launch)

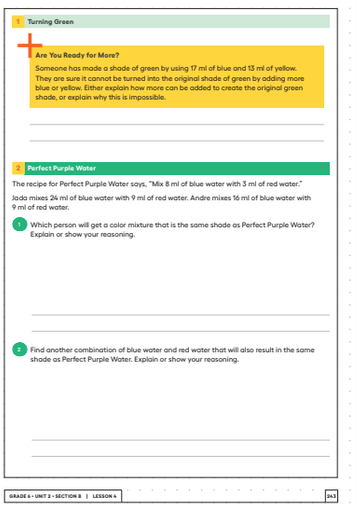
Representation: Internalize Comprehension.
Represent the same information about the ratios of red and blue water through different modalities by using snap cubes, blocks, diagrams, or virtual manipulatives.

Supports accessibility for: Conceptual Processing, Visual-Spatial Processing

Building on Student Thinking

At a quick glance, students may think that because Andre is mixing a multiple of 8 with a multiple of 3, it will also result in Perfect Purple Water. If this happens, ask them to take a closer look at how the values are related or to draw a diagram showing batches.

Student Workbook


1 Turning Green

Are You Ready for More?

Someone has made a shade of green by using 17 ml of blue and 13 ml of yellow. They are sure it cannot be turned into the original shade of green by adding more blue or yellow. Either explain how more can be added to create the original green shade, or explain why this is impossible.

2 Perfect Purple Water

The recipe for Perfect Purple Water says, "Mix 8 ml of blue water with 3 ml of red water."

Jada mixes 24 ml of blue water with 9 ml of red water. Andre mixes 16 ml of blue water with 9 ml of red water.

1. Which person will get a color mixture that is the same shade as Perfect Purple Water? Explain or show your reasoning.

2. Find another combination of blue water and red water that will also result in the same shade as Perfect Purple Water. Explain or show your reasoning.

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Activity Synthesis

Select students to share their answers to the questions.

- For the first question, emphasize that not only did Jada triple each amount of red and blue, but this means that the amount of each color is being *multiplied by the same value,* in this case, 3.
- For the second question, list (for all to see) all of the different ratios that students brought up. Discuss how each ratio differed from that for the original mixture. Point out that as long as both terms are multiplied by the same quantity, the resulting ratio will be *equivalent* and will yield the same shade of purple.

If time permits, use *Critique, Correct, Clarify* to give students an opportunity to improve a sample response by correcting errors, clarifying meaning, and adding details.

Display and read:

> *"Andre says, 'Mixing 18 ml of blue water with 13 ml of red water would result in the same shade of purple. This is because the same amount, 10 ml of each color, is added to the recipe.'"*

Ask,

> *"What parts of this response are unclear, incorrect, or incomplete?"*

As students respond, annotate the display with 2–3 ideas to indicate the parts of the writing that could use improvement.

Give students 2–4 minutes to work with a partner to revise the first draft.

Ask them to use complete sentences and include diagrams and labels if helpful for clarifying their thinking.

Select 1–2 students or groups to read their revised draft aloud, slowly enough to record for all to see. Scribe as each student shares, then invite the whole class to contribute additional language and edits to make the final draft even more clear and convincing.

Lesson Synthesis

Remind students of the work done and observations made in this lesson. Ask questions such as:

> *"How did you decide the amounts that would make 2 batches of 5 ml blue and 15 ml yellow?"*

Multiply each part by 2.

> *"How did you decide the amounts that would make 3 batches?"*

Multiply each part by 3.

> *"How did we know that 5:15, 10:30, and 15:45 were equivalent?"*

They created the same shade of green. Also, 10:30 has both parts of the original recipe multiplied by 2, and 15:45 has both parts of the original recipe multiplied by 3.

The important takeaways from this lesson are:

To create more batches of a color recipe that will result in the same shade of the color, multiply each ingredient by the same number.

We can think of ratios that are equivalent as representing different numbers of batches of the same recipe.

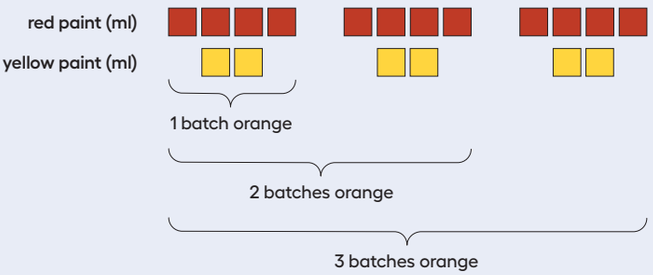
Lesson Summary

When mixing colors, doubling or tripling the amount of each color will create the same shade of the mixed color. In fact, you can always multiply the amount of *each* color by *the same number* to create a different amount of the same mixed color.

For example, a batch of dark orange paint uses 4 ml of red paint and 2 ml of yellow paint.

- To make two batches of dark orange paint, we can mix 8 ml of red paint with 4 ml of yellow paint.
- To make three batches of dark orange paint, we can mix 12 ml of red paint with 6 ml of yellow paint.

Here is a diagram that represents 1, 2, and 3 batches of this recipe.



We say that the ratios 4:2, 8:4, and 12:6 are *equivalent* because they describe the same color mixture in different numbers of batches, and they make the same shade of orange.

Cool-down

Orange Water

5 min

Student Task Statement

A recipe for orange water says, "Mix 3 teaspoons of yellow water with 1 teaspoon red water." For this recipe, we might say: "The ratio of teaspoons of yellow water to teaspoons of red water is 3:1."

1. Write a ratio for 2 batches of this recipe.

   The ratio of teaspoons of yellow to teaspoons of red is 6:2 (or any sentence that accurately states this ratio).

   Note: A statement like "The ratio of yellow to red is 6:2" describes the association between the colors but does not indicate the amount of stuff in the mixture.

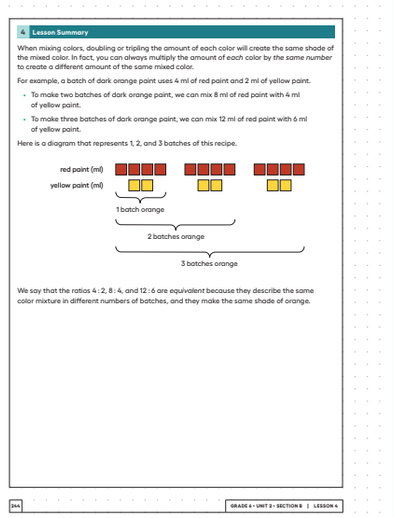
2. Write a ratio for 4 batches of this recipe.

   The ratio of teaspoons of yellow to teaspoons of red is 12:4 (or any sentence that accurately states this ratio).

3. Explain why we can say that any two of these three ratios are equivalent.

   Sample response: These are equivalent ratios because they describe different numbers of batches of the same recipe. To make 2 batches, multiply the amount of each color by 2. To make 4 batches, multiply the amount of each color by 4. As long as we multiply the amounts for both colors by the same number, we will get a ratio that is equivalent to the ratio in the recipe.

Student Workbook



Responding To Student Thinking

Points to Emphasize

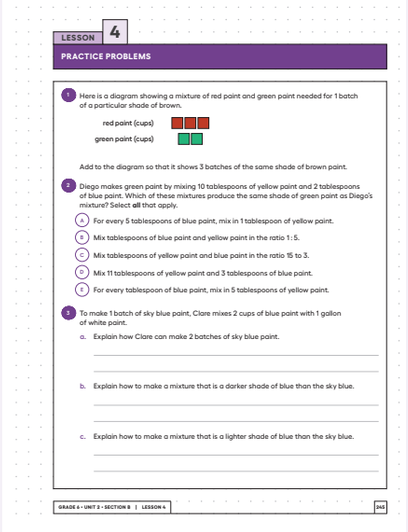
If students struggle with writing ratios for different numbers of batches of a recipe, highlight the idea of multiplying all quantities by the same number and to illustrate that using diagrams. For example, discuss practice problems that prompt students to generate equivalent ratios and create diagrams for multiple batches of a recipe, such as in this problem: Unit 2, Lesson 4, Practice Problem 1

Lesson 4

Practice Problems

7 Problems

Student Workbook


LESSON 4

PRACTICE PROBLEMS

1. Here is a diagram showing a mixture of red paint and green paint needed for 1 batch of a particular shade of brown.

red paint (cups)

green paint (cups)

Add to the diagram so that it shows 3 batches of the same shade of brown paint.

2. Diego makes green paint by mixing 10 tablespoons of yellow paint and 2 tablespoons of blue paint. Which of these mixtures produce the same shade of green paint as Diego's mixture? Select **all** that apply.

A. For every 5 tablespoons of blue paint, mix in 1 tablespoon of yellow paint.

B. Mix tablespoons of blue paint and yellow paint in the ratio 1:5.

C. Mix tablespoons of yellow paint and blue paint in the ratio 15 to 3.

D. Mix 11 tablespoons of yellow paint and 3 tablespoons of blue paint.

E. For every tablespoon of blue paint, mix in 5 tablespoons of yellow paint.

3. To make 1 batch of sky blue paint, Clare mixes 2 cups of blue paint with 1 gallon of white paint.

a. Explain how Clare can make 2 batches of sky blue paint.

b. Explain how to make a mixture that is a darker shade of blue than the sky blue.

c. Explain how to make a mixture that is a lighter shade of blue than the sky blue.

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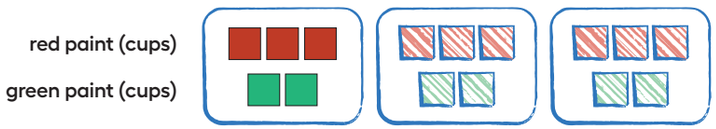
Problem 1

Here is a diagram showing a mixture of red paint and green paint needed for 1 batch of a particular shade of brown.

Add to the diagram so that it shows 3 batches of the same shade of brown paint.

Sample response:



Problem 2

Diego makes green paint by mixing 10 tablespoons of yellow paint and 2 tablespoons of blue paint. Which of these mixtures produce the same shade of green paint as Diego's mixture? Select **all** that apply.

A. For every 5 tablespoons of blue paint, mix in 1 tablespoon of yellow paint.

B. Mix tablespoons of blue paint and yellow paint in the ratio 1:5.

C. Mix tablespoons of yellow paint and blue paint in the ratio 15 to 3.

D. Mix 11 tablespoons of yellow paint and 3 tablespoons of blue paint.

E. For every tablespoon of blue paint, mix in 5 tablespoons of yellow paint.

Problem 3

To make 1 batch of sky blue paint, Clare mixes 2 cups of blue paint with 1 gallon of white paint.

a. Explain how Clare can make 2 batches of sky blue paint.

Mix 4 cups of blue paint and 2 gallons of white paint.

b. Explain how to make a mixture that is a darker shade of blue than the sky blue.

Sample response: 3 cups of blue paint and 1 gallon of white paint. Mixing the same amount of white paint with *more* blue paint will make a darker shade of blue.

c. Explain how to make a mixture that is a lighter shade of blue than the sky blue.

Sample response: 2 cups of blue paint and 2 gallons of white paint. Mixing the same amount of blue paint with *more* white paint will make a lighter shade of blue.

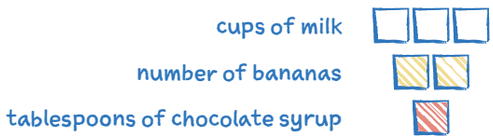
Problem 4

from Unit 2, Lesson 2

A smoothie recipe calls for 3 cups of milk, 2 frozen bananas, and 1 tablespoon of chocolate syrup.

a. Create a diagram to represent the quantities of each ingredient in the recipe.

Sample response:



b. Write 3 different sentences that use a ratio to describe the recipe.

Sample response: The ratio of cups of milk to number of bananas is 3:2, the ratio of bananas to tablespoons of chocolate syrup is 2 to 1, for every tablespoon of chocolate syrup, there are 3 cups of milk.

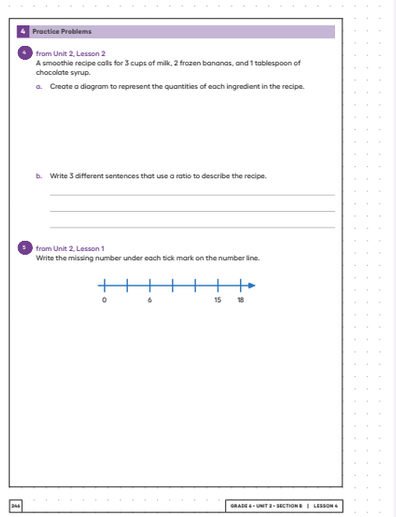
Problem 5

from Unit 2, Lesson 1

Write the missing number under each tick mark on the number line.

intervals of 3

Student Workbook


4 Practice Problems

4 from Unit 2, Lesson 2
A smoothie recipe calls for 3 cups of milk, 2 frozen bananas, and 1 tablespoon of chocolate syrup.
a. Create a diagram to represent the quantities of each ingredient in the recipe.

b. Write 3 different sentences that use a ratio to describe the recipe.

5 from Unit 2, Lesson 1
Write the missing number under each tick mark on the number line.

0 6 15 18

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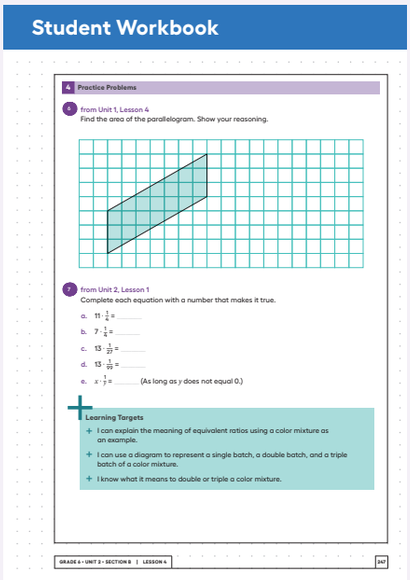
Student Workbook


4 Practice Problems

6 from Unit 1, Lesson 4
Find the area of the parallelogram. Show your reasoning.

7 from Unit 2, Lesson 1
Complete each equation with a number that makes it true.
a. $11 \cdot \frac{1}{4} =$ _____
b. $7 \cdot \frac{1}{4} =$ _____
c. $13 \cdot \frac{1}{27} =$ _____
d. $13 \cdot \frac{1}{99} =$ _____
e. $x \cdot \frac{1}{y} =$ _____ (As long as y does not equal 0.)

Learning Targets
+ I can explain the meaning of equivalent ratios using a color mixture as an example.
+ I can use a diagram to represent a single batch, a double batch, and a triple batch of a color mixture.
+ I know what it means to double or triple a color mixture.

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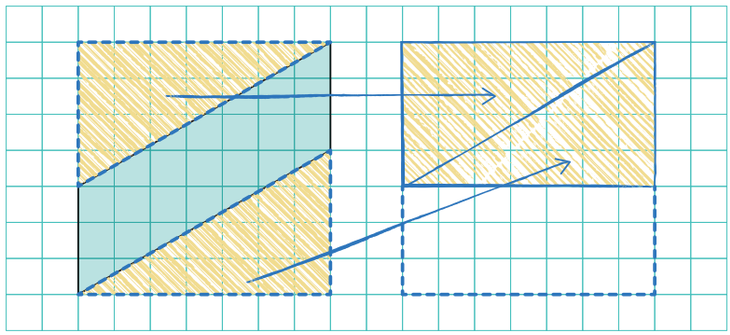
Problem 6

from Unit 1, Lesson 4

Find the area of the parallelogram. Show your reasoning.



21 square units

Sample reasoning: Draw a square around the parallelogram; its area is 49 square units, because $7 \cdot 7 = 49$. Rearrange the triangles above and below the parallelogram to form a rectangle; the area of this rectangle is 28 square units, because $4 \cdot 7 = 28$. Subtracting the area of the triangles from the area of the square, we have 21 square units. $49 - 28 = 21$.

Problem 7

from Unit 2, Lesson 1

Complete each equation with a number that makes it true.

a. $11 \cdot \frac{1}{4} =$ _____

$\frac{11}{4}$ (or equivalent)

b. $7 \cdot \frac{1}{4} =$ _____

$\frac{7}{4}$ (or equivalent)

c. $13 \cdot \frac{1}{27} =$ _____

$\frac{13}{27}$ (or equivalent)

d. $13 \cdot \frac{1}{99} =$ _____

$\frac{13}{99}$ (or equivalent)

e. $x \cdot \frac{1}{y} =$ _____

(As long as y does not equal 0.)

$\frac{x}{y}$ (or equivalent)