Fraction Equivalence

Focus Question

How can I use equivalent fractions to help me compare fractions?

Hi, I'm Malik.

I want to be a photonics engineer and design lasers. A laser show uses different fractions of red, yellow, orange, and green lasers. I can compare the fractions and use fraction equivalence to do my job!

STEM video GO

Name _____

Folds and Fractions

Directions

Take a large square piece of paper. Label the square as shown in the figure below.

a. Fold edge AB to edge DE. Make a crease, then open it up again.

b. Fold edge AD to edge BE. Make a crease, then open it up again.

c. Fold corner A diagonally to corner E. Make a crease, then open it up again.

d. Fold corner D diagonally to corner B. Make a crease, then open it up again.

e. Fold corners A, B, D, and E to center C. Make creases, then open it up again.
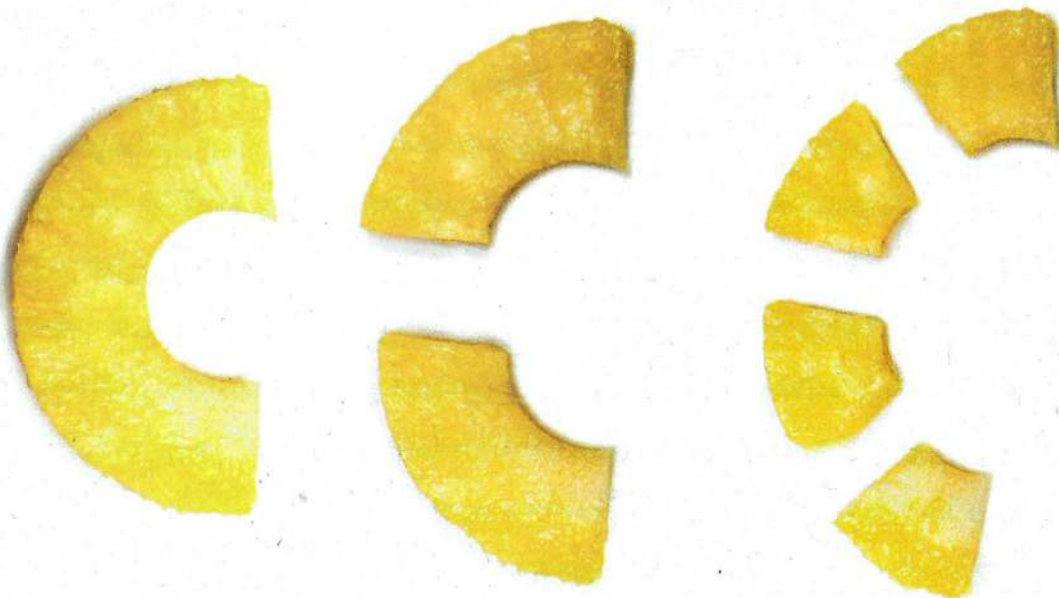
A ┌──────────────────────────┐ B
  │   │
  │   │
  │   C   │
  │   │
D └──────────────────────────┘ E
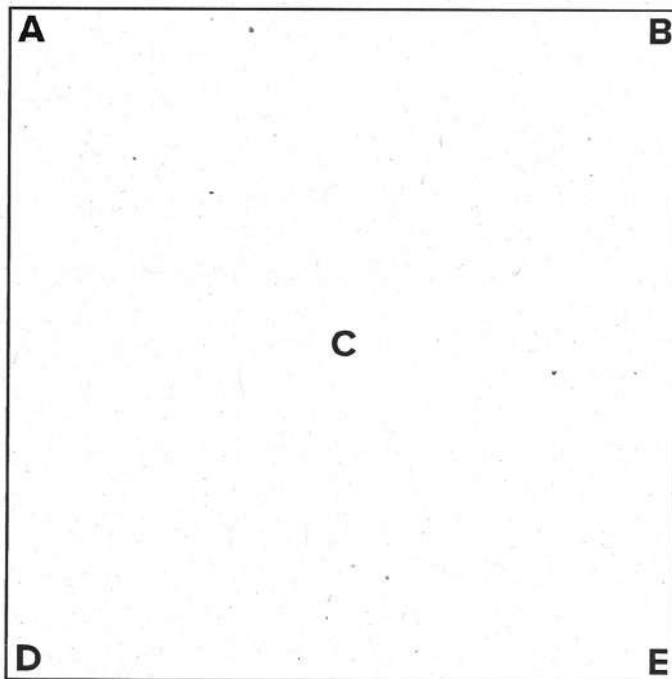
Equivalent Fractions

Be Curious

How are they the same?
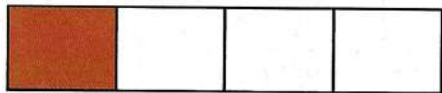### How are they different?

Math is... **Mindset**

How do you show that you are listening attentively?

Learn

Marcy and Xavier are reading the same book. Marcy says she read $\frac{1}{4}$ of the book. Xavier says he read $\frac{3}{12}$ of the book.

How can you determine whether they read the same amount?
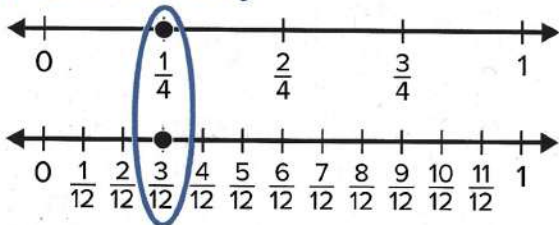
▶ **One Way** Use Fraction Strips

$\frac{1}{4}$ and $\frac{3}{12}$ represent the same amount.
They are **equivalent fractions**.

> **Math is...** Patterns
>
> What patterns do you see in the representations?
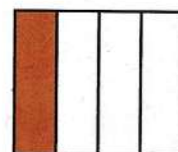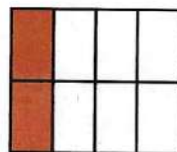
▶ **Another Way** Use Number Lines

$\frac{1}{4}$ and $\frac{3}{12}$ are at the same point on the number line.

Marcy and Xavier read the same amount of the book.

Equivalent fractions represent the same part of the whole or the same point on a number line.

🗨 Work Together

Are $\frac{2}{8}$ and $\frac{1}{4}$ equivalent fractions? Use the fraction models to explain.

On My Own

Name _____

Are the fractions equivalent?

1. $\frac{2}{6}$ and $\frac{4}{12}$

_____

2. $\frac{4}{10}$ and $\frac{3}{6}$
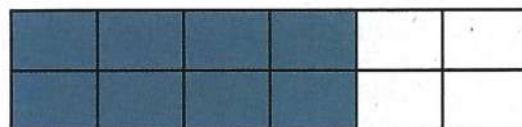
_____

3. $\frac{3}{8}$ and $\frac{1}{3}$

_____

4. $\frac{8}{10}$ and $\frac{4}{5}$

_____

Use the representation to find the missing number in the equivalent fractions.

5. $\frac{2}{4} = \frac{\square}{8}$

6. $\frac{8}{12} = \frac{\square}{6}$

7. Kathy lives $\frac{2}{4}$ mile from the park. Charles lives $\frac{6}{12}$ mile from the park. Do they live the same distance from the park? Explain.

8. Faye and Omar ate the same amount of a small quesadilla. Faye's quesadilla was cut into 4 pieces and Omar's was cut into 8 pieces. How many pieces might they each have eaten? Explain your reasoning.

9. Eva used a number line to represent a fraction equivalent to $\frac{1}{2}$. The point on Eva's number line is 5 intervals from 0. What equivalent fraction does her point represent? Explain.

10. **STEM Connection** Malik uses a laser to make a $\frac{2}{10}$ millimeter cut. What unit fraction is equivalent to $\frac{2}{10}$?

11. Bus A and Bus B start their routes at 7:00 a.m. Bus A stops at Second Street every $\frac{1}{3}$ hour. Bus B stops at Second Street every $\frac{1}{6}$ hour. Will the buses ever stop at Second Street at the same time within an hour? Use a representation to justify your answer.

12. **Extend Your Thinking** Cora's mug holds $\frac{1}{8}$ gallon of water. She will use her mug to fill a container that holds $\frac{3}{4}$ gallon of water. How many times will Cora fill and empty her mug to fill the container? Explain your reasoning.

🔁 Reflect

How can a representation help you determine whether two fractions are equivalent?

Math is... Mindset

How did you show that you were listening attentively today?

Generate Equivalent Fractions Using Models

Be Curious

Which Doesn't Belong?

$$\frac{1}{4} \qquad \frac{3}{12} \qquad \frac{2}{5} \qquad \frac{2}{8}$$

Math is... Mindset

Why is it useful to consider different possible solutions to a problem?

Learn

Alexa and Sari got pizzas that are the same size. Alexa cut her pizza into 6 equal-sized pieces and ate $\frac{4}{6}$ of her pizza. Sari ate the same amount of her pizza, but cut her pizza into smaller equal-sized pieces.

What fraction of her pizza could Sara have eaten?

You can find fractions that are equivalent to $\frac{4}{6}$.

▶ **One Way** Use fraction models.

Alexa   Sari
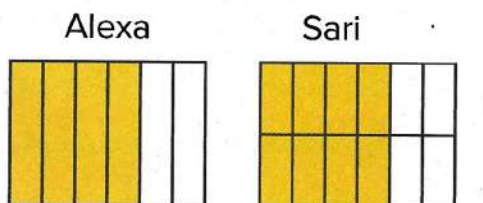
6 equal parts.   12 equal parts.

4 are shaded.   8 are shaded.

$\frac{4}{6}$ $\frac{8}{12}$

Sari could have eaten $\frac{8}{12}$ of her pizza.

▶ **Another Way** Rewrite $\frac{4}{6}$ with a different denominator.

To generate an equivalent fraction, multiply the numerator and denominator by a fraction equal to 1.

$$\frac{4 \times 2}{6 \times 2} = \frac{8}{12}$$

$\boxed{\frac{2}{2} = 1}$

$$\frac{4 \times 3}{6 \times 3} = \frac{12}{18}$$

$\boxed{\frac{3}{3} = 1}$

Sari could have eaten $\frac{12}{18}$ of her pizza.

You can multiply the numerator and denominator by a fraction equal to 1 to find an equivalent fraction.

Math is... Modeling

What other operations could you use to generate equivalent fractions?

🔍 Work Together

What fraction is missing from the pattern? Explain how you can find the equivalent fraction.

$$\frac{3}{4} = \frac{6}{8} = \frac{?}{?} = \frac{12}{16}$$
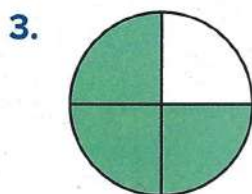
On My Own

Name _____
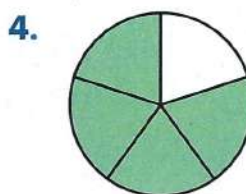
Use the representation to find an equivalent fraction.

1.

$$\frac{2}{3} = \frac{\square}{\square}$$

2.

$$\frac{6}{10} = \frac{\square}{\square}$$

3.

$$\frac{3}{4} = \frac{\square}{\square}$$

4.

$$\frac{4}{5} = \frac{\square}{\square}$$

Find the missing number in the equivalent fraction.
Explain how you determined the number.

5. $\frac{1}{5} = \frac{2}{\square}$

6. $\frac{3}{4} = \frac{75}{\square}$

7. $\frac{14}{12} = \frac{\square}{6}$

8. $\frac{12}{9} = \frac{\square}{3}$

9. Sanjay bought a half gallon of green tea. He pours all the tea into 4 glasses so that each glass has the same amount. How much of a gallon is in each glass? Explain your thinking.

10. Name two fractions that are represented by the model. Explain your reasoning.

11. **Error Analysis** Theo says $\frac{2}{4}$ and $\frac{4}{6}$ are equivalent fractions. How would you respond to Theo?

12. **Extend Your Thinking** Are the fractions $\frac{6}{4}$ and $\frac{9}{6}$ equivalent? Explain your reasoning.

⏺ **Reflect**

How did patterns between equivalent fractions help you solve problems in the lesson?

Math is... Mindset
How was it useful to consider different possible solutions to a problem?

Generate Equivalent Fractions Using Number Lines

Be Curious

What do you notice?
What do you wonder?

Math is... **Mindset**

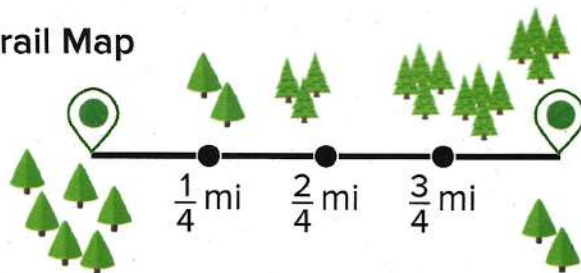How can you organize your work to be successful?

Learn

Evan has hiked $\frac{9}{12}$ mile on a trail.

Carlos has hiked $\frac{1}{2}$ mile on the same trail.
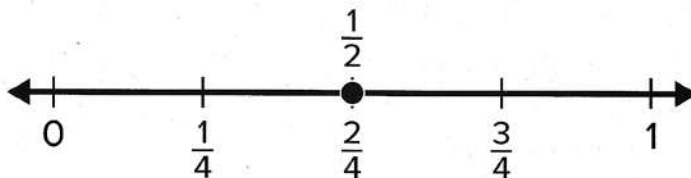
How can you determine where each person is on the trail?

Trail Map

$\frac{1}{4}$ mi $\frac{2}{4}$ mi $\frac{3}{4}$ mi

You can multiply the numerator and denominator by 2 to generate an equivalent fraction for $\frac{1}{2}$.
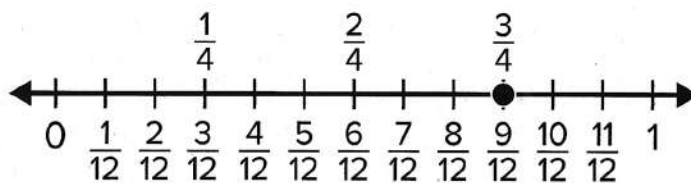
$$\frac{1 \times 2}{2 \times 2} = \frac{2}{4}$$

Carlos is at $\frac{2}{4}$ mile on the trail.

You can divide the numerator and denominator by 3 to generate an equivalent fraction for $\frac{9}{12}$.

$$\frac{9 \div 3}{12 \div 3} = \frac{3}{4}$$

Evan is at $\frac{3}{4}$ mile on the trail.

You can multiply or divide the numerator and denominator of a fraction by a fraction equal to 1 to generate equivalent fractions.

Math is... Modeling

How are the number lines and the equations related?

Work Together

What fraction is equivalent to $\frac{8}{10}$? Use the number line and multiplication or division to explain your answer.
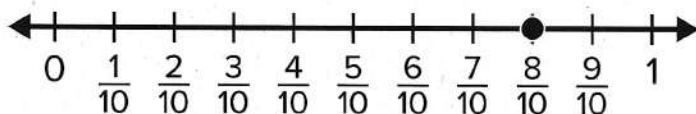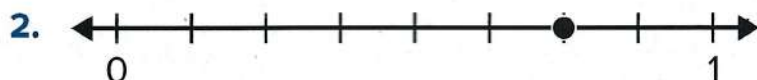
Name _____

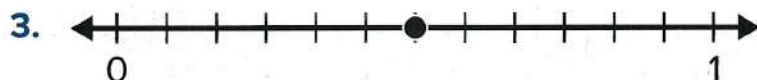**Use the number line to find an equivalent fraction.**

1. [number line from 0 to 1 with point marked] $\quad \dfrac{1}{3} = \dfrac{\square}{\square}$

2. [number line from 0 to 1 with point marked] $\quad \dfrac{6}{8} = \dfrac{\square}{\square}$

3. [number line from 0 to 1 with point marked] $\quad \dfrac{6}{12} = \dfrac{\square}{\square}$

4. [number line from 0 to 1 with point marked] $\quad \dfrac{5}{6} = \dfrac{\square}{\square}$

Find the missing number in the equivalent fraction.
Explain how you used multiplication or division to determine the number.

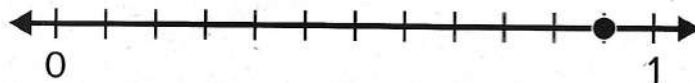5. $\dfrac{4}{3} = \dfrac{\square}{12}$

6. $\dfrac{4}{12} = \dfrac{2}{\square}$
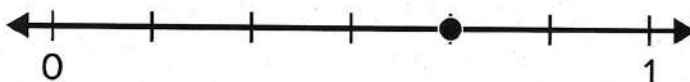
7. $\dfrac{10}{8} = \dfrac{5}{\square}$

8. $\dfrac{1}{4} = \dfrac{\square}{12}$

9. Kurt placed the point on the number line for $\frac{3}{4}$. Do you agree with Kurt? Explain why or why not.

10. A race has water stations set up every $\frac{1}{3}$ mile. Ashwin has run $\frac{3}{12}$ mile in the race so far. Has Ashwin run past a water station? Explain your reasoning.

11. Nina says the point on the number line represents the fraction $\frac{4}{6}$.

a. How can you use the number line to find an equivalent fraction?

b. How can you use multiplication or division to explain the equivalence?

12. Extend Your Thinking What fraction can be written as an equivalent number of fourths and an equivalent number of sixths? Justify your answer.

🕐 Reflect

What patterns did you notice when you found equivalent fractions on the number line?
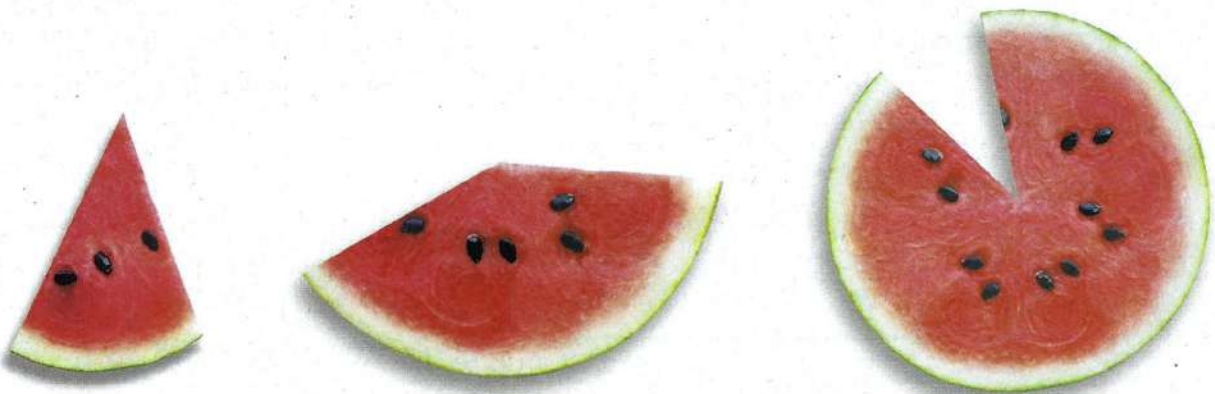
Math is... Mindset

How has organizing your work helped you to be successful?

Compare Fractions Using Benchmarks

Be Curious

What do you see?

Math is... **Mindset**

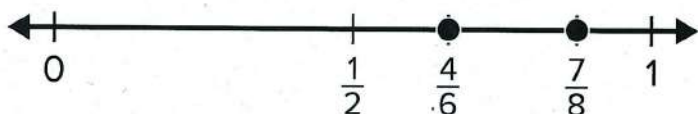What strengths will you rely on to be successful today?

Learn

Jade used different colors of ribbon to decorate a board.

How can Jade compare the amount of red ribbon she used to the amounts she used for the other colors?

You can compare fractions to a benchmark number.

Ribbon Color	Amount Used
Red	$\frac{4}{6}$ yard
Green	$\frac{7}{8}$ yard
Blue	$\frac{5}{12}$ yard

Math is... Thinking

How do benchmark numbers help you determine how two fractions are related?

$\frac{7}{8}$ is close to 1.

$\frac{4}{6}$ is close to $\frac{1}{2}$. $\frac{7}{8} > \frac{4}{6}$.

Jade used more green than red ribbon.
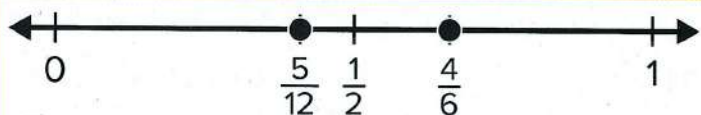
$\frac{4}{6}$ is greater than $\frac{1}{2}$ and $\frac{5}{12}$ is less than $\frac{1}{2}$. $\frac{4}{6} > \frac{5}{12}$. Jade used more red than blue ribbon.

You can use the benchmark numbers 0, $\frac{1}{2}$, and 1 to compare fractions.

Work Together

How can you use benchmark numbers to compare $\frac{2}{10}$ and $\frac{4}{5}$? Use a fraction model to justify your comparison.

On My Own

Name _____

How can you compare the fractions using benchmark numbers? Write >, <, or = to record the comparison.

1. $\frac{4}{6}$ ◯ $\frac{9}{10}$

2. $\frac{6}{12}$ ◯ $\frac{4}{8}$

3. $\frac{3}{4}$ ◯ $\frac{4}{10}$

4. $\frac{4}{3}$ ◯ $\frac{7}{8}$

5. Which fractions are greater than $\frac{7}{12}$? Choose all that apply.

   A. $\frac{2}{10}$ B. $\frac{6}{5}$

   C. $\frac{3}{6}$ D. $\frac{8}{10}$

6. Which fractions are less than $\frac{5}{8}$? Choose all that apply.

   A. $\frac{2}{6}$ B. $\frac{3}{2}$

   C. $\frac{9}{10}$ D. $\frac{4}{12}$

7. Oscar ran $\frac{7}{8}$ mile on Tuesday and $\frac{6}{10}$ mile on Thursday. On which day did Oscar run a greater distance? Explain your thinking.

8. Ron is comparing two fractions. He says he knows which fraction is greater by comparing them to the benchmark fraction $\frac{1}{2}$. What two fractions could Ron be comparing? Explain your reasoning.

9. Aldwin and Rashika each cut their sub sandwich into fifths. They each ate about half of their sandwich but ate a different number of pieces. How many pieces of their sandwich did each person eat?

10. **STEM Connection** Three-fifths of the materials a welder needs for a project are aluminum and $\frac{2}{6}$ are stainless steel. Does the welder need more steel or more aluminum? Explain your reasoning.

11. Jacob has finished $\frac{1}{2}$ of today's reading assignment. Anushka has finished more of the assignment than Jacob. What fraction of the assignment could Anushka have finished? Explain your reasoning.

12 Malai and Nina are each doing the same puzzle. Malai finished $\frac{10}{12}$ of his puzzle. Nina finished $\frac{5}{8}$ of her puzzle. Did Malai finish more or less of the puzzle than Nina? Explain your reasoning.

13. **Extend Your Thinking** Stella says she can compare the fractions $\frac{5}{6}$ and $\frac{7}{8}$ using their closeness to 1. What reasoning can Stella use to compare the fractions?

Reflect

How did you think like a mathematician when comparing fractions?

Math is... Mindset

What strengths helped you to be successful today?

Other Ways to Compare Fractions

Be Curious

How are they the same?
How are they different?

Lisa's garden   Linda's garden   Trevor's garden

Math is... Mindset

How can you show others that you value their ideas?

Learn

Marta's father made two pasta dishes. The table shows how much cheese and sauce he used in the dishes.

How can you compare the amounts of cheese he used?

How can you compare the amounts of sauce he used?

Ingredient	Amount
Parmesan Cheese	$\frac{3}{4}$ cup
Mozzarella Cheese	$\frac{5}{8}$ cup
Marinara Sauce	$\frac{2}{3}$ liter
Meat Sauce	$\frac{4}{5}$ liter

You can compare $\frac{3}{4}$ and $\frac{5}{8}$ using an equivalent fraction so the fractions have **like denominators.**

$$\frac{3}{4} \qquad \frac{5}{8}$$
$$\downarrow \qquad \downarrow$$
$$\frac{6}{8} > \frac{5}{8}$$

Six $\frac{1}{8}$ parts > five $\frac{1}{8}$ parts
Marsha used more parmesan cheese then mozzarella cheese.

You can compare $\frac{2}{3}$ and $\frac{4}{5}$ using an equivalent fraction so the fractions have **like numerators.**

$$\frac{2}{3} \qquad \frac{4}{5}$$
$$\downarrow \qquad \downarrow$$
$$\frac{4}{6} < \frac{4}{5}$$

Four $\frac{1}{6}$ parts < four $\frac{1}{5}$ parts
Marsha used less marinara sauce than meat sauce.

Fractions are easier to compare when the numerators or denominators are the same. You can use equivalent fractions to create like numerators or like denominators.

Math is... Thinking

What other numbers could be used as denominators?

Work Together

Hannah ate $\frac{3}{4}$ of a small apple. Her brother ate $\frac{7}{12}$ of a large apple. Hannah says she ate more than her brother because $\frac{3}{4} = \frac{9}{12}$ and $\frac{9}{12} > \frac{7}{12}$. How would you respond to Hannah?

On My Own

Name _____

Write >, <, or = to compare the fractions. Explain your reasoning for each comparison.

1. $\frac{3}{5}$ ◯ $\frac{8}{10}$

2. $\frac{2}{6}$ ◯ $\frac{1}{3}$

3. $\frac{4}{12}$ ◯ $\frac{2}{5}$

4. $\frac{3}{4}$ ◯ $\frac{6}{10}$

5. $\frac{2}{4}$ ◯ $\frac{5}{10}$

6. $\frac{7}{12}$ ◯ $\frac{2}{3}$

7. Russel and Toby each bought a medium box of popcorn. Russel ate $\frac{3}{5}$ of his popcorn and Toby ate $\frac{6}{8}$ of his popcorn. Did Russel eat more popcorn than Toby? Explain your reasoning.

8. Klaya compares two fractions. She writes one of the fractions as an equivalent fraction so the fractions have like denominators. What fractions might Klaya be comparing? Explain your reasoning.

9. Ethan and Petra have the same number of raffle tickets to sell. Ethan sold $\frac{1}{4}$ of his raffle tickets. Petra sold $\frac{3}{8}$ of her raffle tickets. Who sold more tickets? Explain your reasoning.

10. Lilliana compares $\frac{4}{10}$ and $\frac{8}{12}$ by finding equivalent fractions. Brad compares the same fractions using a benchmark fraction. Which strategy do you think is more efficient to compare the fractions? Explain your reasoning.

11. **Error Analysis** Janet's family eats $\frac{4}{8}$ of a large pizza. Julie's family eats $\frac{3}{6}$ of a small pizza. Julie says her family ate the same amount as Janet's family because $\frac{4}{8} = \frac{3}{6}$. Is Julie correct? Explain.

12. **Extend Your Thinking** How can you use equivalent fractions to compare $\frac{2}{3}$ and $\frac{3}{4}$?

🔄 Reflect

How do you determine which strategy to use when comparing fractions with different numerators and denominators?

Math is...	Mindset

How have you shown others that you value their ideas?

Unit 8
Comparing Fractions

Name _____

For each problem, use >, <, or = symbol to show how the fractions compare.

1. $\frac{3}{8}$ ☐ $\frac{4}{7}$

    Circle the symbol that goes in the ☐.

    > < =

    Explain or show why you chose that symbol.

2. $\frac{2}{3}$ ☐ $\frac{4}{6}$

    Circle the symbol that goes in the ☐.

    > < =

    Explain or show why you chose that symbol.

For each problem, use >, <, or = symbol to show how the fractions compare.

3. $\dfrac{4}{5}$ ☐ $\dfrac{7}{8}$

Circle the symbol that goes in the ☐.

>   <   =

Explain or show why you chose that symbol.

---

4. $\dfrac{3}{5}$ ☐ $\dfrac{2}{9}$

Circle the symbol that goes in the ☐.

>   <   =

Explain or show why you chose that symbol.

Reflect On Your Learning

I'm confused.   I'm still learning.   I understand.   I can teach someone else.

◯———————◯———————◯———————◯

Unit Review

Vocabulary Review

Choose the correct word(s) to complete the sentence.

benchmark fraction   like denominators

equivalent fractions   numerator

denominator

1. _____ represent the same part of a given whole. (Lesson 8-1)

2. When two or more fractions have the same denominators, they have _____. (Lesson 8-5)

3. The _____ is the number in the fraction that tells you how many equal-sized parts are in the whole. (Lesson 8-2)

4. The part of the fraction that tells how many of the equal parts are being used is the _____. Lesson 8-2)

5. You can use a _____ to help you compare the size of fractions. (Lesson 8-4)
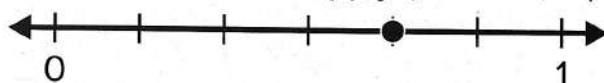
Review

6. Which fractions are equivalent to $\frac{3}{6}$? Choose all that apply. (Lessons 8-1, 8-2)

A. $\frac{1}{2}$

B. $\frac{2}{3}$

C. $\frac{2}{5}$

D. $\frac{6}{12}$

E. $\frac{5}{8}$
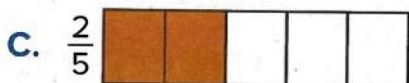
7. Which fractions are equivalent to the point on the number line? Choose all that apply. (Lessons 8-1, 8-3)

A. $\frac{2}{4}$ **B.** $\frac{2}{3}$

C. $\frac{1}{3}$ **D.** $\frac{8}{12}$

E. $\frac{8}{10}$ **F.** $\frac{6}{8}$

8. Which fraction is equivalent to $\frac{4}{10}$? (Lesson 8-1)
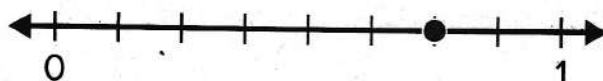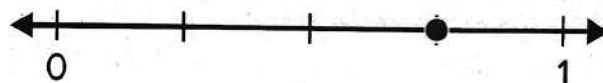
A. $\frac{2}{5}$ **B.** $\frac{6}{12}$

C. $\frac{2}{8}$ **D.** $\frac{4}{5}$

9. Look at the points on the number line.

Use the number lines to explain why the two fractions are equivalent. (Lessons 8-1, 8-3)

Would $\frac{5}{6}$ be an equivalent fraction to the fractions shown? Explain your answer. (Lessons 8-1, 8-3)

10. What is the unknown number in the equation? (Lesson 8-1)

$$\frac{16}{12} = \frac{\square}{3}$$

11. Match each fraction to the benchmark number it is closest to. (Lesson 8-4)

Closest to 0

Closest to $\frac{1}{2}$

Closest to 1

$\frac{2}{4}$

$\frac{2}{10}$

$\frac{3}{5}$

$\frac{1}{8}$

$\frac{5}{6}$

$\frac{7}{8}$

12. Complete the comparisons using >, <, and =. (Lessons 8-4, 8-5)

$\frac{3}{4}$ ◯ $\frac{10}{12}$

$\frac{2}{6}$ ◯ $\frac{4}{5}$

$\frac{7}{8}$ ◯ $\frac{6}{10}$

13. Which fractions are greater than $\frac{3}{8}$? Choose all that apply.

(Lessons 8-4, 8-5)

A. $\frac{1}{6}$ **B.** $\frac{1}{4}$

C. $\frac{2}{3}$ **D.** $\frac{4}{5}$

E. $\frac{2}{12}$ **F.** $\frac{5}{10}$

14. Tonya reads $\frac{5}{8}$ of the book. Christina reads $\frac{3}{4}$ of the same book.

Part A. Who read more of the book? Explain your reasoning. (Lesson 8-5)

Part B. By the end of the following week, Tonya read $\frac{9}{12}$ of the book. Christina did not have time to read any more of the book. How does the amount Tonya read compare to the amount Christina read? Explain your reasoning. (Lesson 8-5)

15. Gilda plants tomatoes in $\frac{3}{10}$ of her garden and lettuce in $\frac{2}{5}$ of her garden. Did Gilda plant more tomatoes or lettuce in her garden? Explain your answer.

(Lesson 8-5)

Performance Task

Two laser shows at a concert include red, blue, and green light. The table gives the fraction of the total that each color is used at each show.

Laser Color	Amount in First Show	Amount in Second Show
Red	$\frac{5}{12}$	$\frac{1}{3}$
Blue	$\frac{1}{5}$	$\frac{5}{12}$
Green	$\frac{3}{10}$	$\frac{1}{4}$

Part A. Which color was used the most in the first show? Which color was used the least? Explain your answers.

Part B. Which color(s) were used less in the second show than in the first show? Explain your answer(s).

Part C. Which color(s) were used more in the second show than in the first show? Explain your reasoning.

🕑 Reflect

What are some different strategies that you can use to compare fractions?

Unit 8
Fluency Practice

Name _____

Fluency Strategy

You can use an **algorithm** to subtract two whole numbers.

$6{,}784 - 1{,}253 = ?$

Subtract from right to left. Subtract the ones, tens, hundreds, then thousands.

$$
\begin{array}{r}
6{,}784 \\
-\ 1{,}253 \\
\hline
5{,}531
\end{array}
$$

1. How can you use an **algorithm** to subtract $586 - 214 = ?$

Fluency Flash

Write the difference in the place-value chart.

2.

thousands	hundreds	tens	ones
4	8	3	9
− 2	0	1	3

3.

thousands	hundreds	tens	ones
9	7	6	8
− 3	2	2	5

Fluency Check

Find the sum, difference, or product.

4. $2,546 - 1,234 =$ _____

5. $7 \times 6 =$ _____

6. $3,782 + 4,016 =$ _____

7. $857 - 234 =$ _____

8. $5,796 - 2,482 =$ _____

9. $52,140 + 6,527 =$ _____

10. $8 \times 7 =$ _____

11. $8 \times 9 =$ _____

12. $6,986 - 872 =$ _____

13. $34,765 - 13,410 =$ _____

14. $45,316 - 3,201 =$ _____

15. $9 \times 4 =$ _____

16. $257,884 - 53,612 =$ _____

17. $9,542 + 315 =$ _____

Fluency Talk

How would you subtract two numbers that have a different number of digits?

How is the addition algorithm like the subtraction algorithm? How is it different?