Compare Fractions

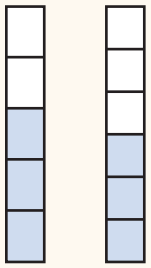
LESSON 18

Dear Family,

This week your child is learning to compare fractions.

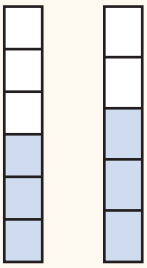
There are different ways to compare fractions.

One way to compare fractions, such as $\frac{3}{5}$ and $\frac{3}{6}$, is to use models. You must use the same-sized whole for both. If the wholes are different sizes, it does not make sense to compare the parts. Each whole model below is the same size.



$\frac{3}{5} > \frac{3}{6}$

$\frac{3}{5}$ is greater than $\frac{3}{6}$.



$\frac{3}{6} < \frac{3}{5}$

$\frac{3}{6}$ is less than $\frac{3}{5}$.

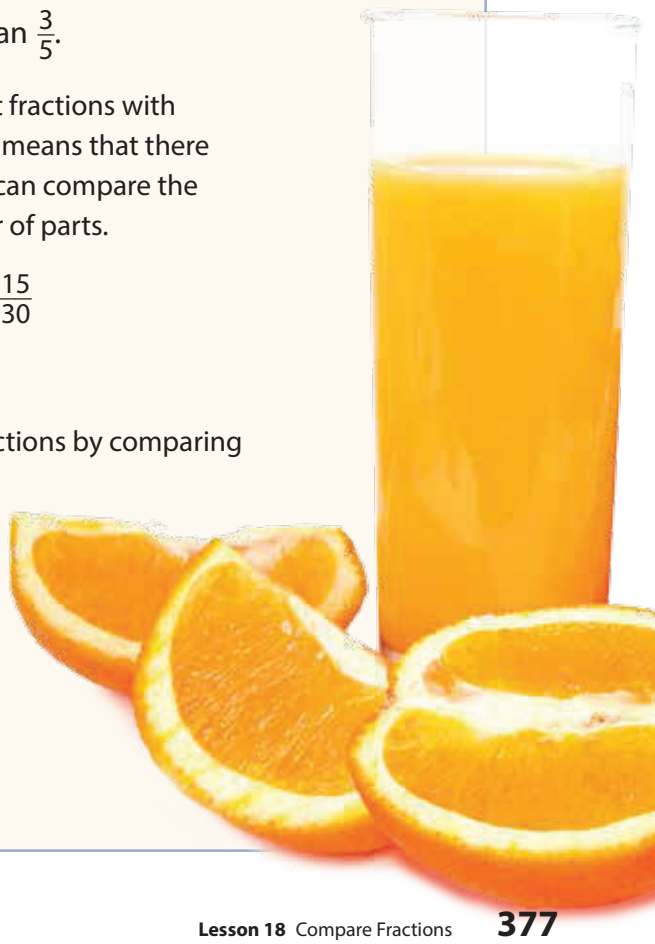
Another way to compare fractions is to write equivalent fractions with the same denominators. Using the same denominators means that there are the same number of parts in each whole. Then you can compare the numerators to find which fraction has a greater number of parts.

$$\frac{3 \times 6}{5 \times 6} = \frac{18}{30} \qquad \frac{3 \times 5}{6 \times 5} = \frac{15}{30}$$

$$\frac{18}{30} > \frac{15}{30}, \text{ so } \frac{3}{5} > \frac{3}{6}.$$

Your child might also use a number line to compare fractions by comparing each fraction to a **benchmark fraction,** such as $\frac{1}{2}$.

Invite your child to share what he or she knows about comparing fractions by doing the following activity together.



ACTIVITY COMPARING FRACTIONS

Do this activity with your child to compare fractions.

Materials 4 same-sized clear glasses, colored liquid

- Fill one glass to the top with colored liquid. This glass represents 1 whole. Fill another glass half full to represent $\frac{1}{2}$. Leave a third glass empty to represent 0.
- Pour any amount of liquid into the fourth glass. Compare the fourth glass to the full glass and the empty glass to determine if the amount of liquid represents a fraction that is closer to 0 or to 1.
- Then determine if the amount of liquid in the fourth glass represents a fraction that is greater than or less than $\frac{1}{2}$. You can check your answer by comparing the fourth glass to the glass that is half full.
- Now empty the fourth glass. Take turns filling it with various amounts of colored liquid and describing the quantity as representing a fraction that is greater than or less than $\frac{1}{2}$.
- Talk with your child about why it is important that the four glasses are the same size and shape. (Half of a tall glass is a different amount of liquid than half of a short glass.)

Explore Comparing Fractions

Previously, you learned to compare fractions using models. Use what you know to try to solve the problem below.

Adriana and June have granola bars that are the same size. Adriana eats $\frac{2}{4}$ of her granola bar. June eats $\frac{2}{5}$ of her granola bar. Which girl eats more of her granola bar?

Learning Target

- Compare two fractions with different numerators and different denominators. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions.

SMP 1, 2, 3, 4, 5, 6, 7

TRY IT

Math Toolkit

- fraction circles
- fraction tiles
- number lines
- fraction bars
- index cards
- fraction models

DISCUSS IT

Ask your partner: Do you agree with me? Why or why not?

Tell your partner: I agree with you about . . . because . . .

CONNECT IT

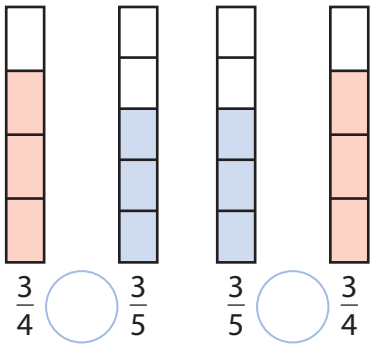
1 LOOK BACK

Who eats more of her granola bar, Adriana or June? Explain.

2 LOOK AHEAD

Deciding who eats more of her granola bar means comparing the fractions $\frac{2}{4}$ and $\frac{2}{5}$. To compare fractions, you must use the same-sized whole.

a. Suppose you have two more granola bars that are the same size. Compare the fractions $\frac{3}{4}$ and $\frac{3}{5}$ using the area models to know who ate more. Use $>$, $<$, or $=$ to compare, just as with whole numbers.



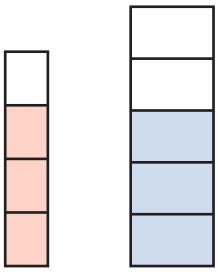
b. You can use equivalent fractions to compare fractions with different denominators. Compare $\frac{3}{4}$ and $\frac{3}{5}$. Rewrite one or both of the fractions so they have the same denominator, or a **common denominator**. Use $>$, $<$, or $=$ to compare.

$\frac{3 \times \square}{4 \times \square} = \frac{15}{\square}$ $\quad$ $\frac{3 \times \square}{5 \times \square} = \frac{\square}{20}$

$\frac{15}{\square} \bigcirc \frac{\square}{20}$, so $\frac{3}{4} \bigcirc \frac{3}{5}$.

3 REFLECT

Suppose the granola bars were different sizes. Could you still compare $\frac{3}{4}$ and $\frac{3}{5}$ in the same way? Explain.



Prepare for Comparing Fractions

1 Think about what you know about common denominators. Fill in each box. Use words, numbers, and pictures. Show as many ideas as you can.

In My Own Words	My Illustrations
common denominator	
Examples	Non-Examples

2 Compare $\frac{2}{3}$ and $\frac{2}{5}$. Rewrite the fractions so they have a common denominator.

Use $>$, $<$, or $=$ to compare.

$\frac{2 \times \square}{3 \times \square} = \frac{10}{\square}$ $\quad\quad$ $\frac{2 \times \square}{5 \times \square} = \frac{\square}{15}$

$\frac{10}{\square} \bigcirc \frac{\square}{15}$, so $\frac{2}{3} \bigcirc \frac{2}{5}$.

3 Solve the problem. Show your work.

Donato and Aman have bottles of juice that are the same size. Donato drinks $\frac{3}{4}$ of his juice. Aman drinks $\frac{3}{6}$ of his juice. Which boy drinks more juice?

Solution

4 Check your answer. Show your work.

Develop Using Common Numerators and Denominators

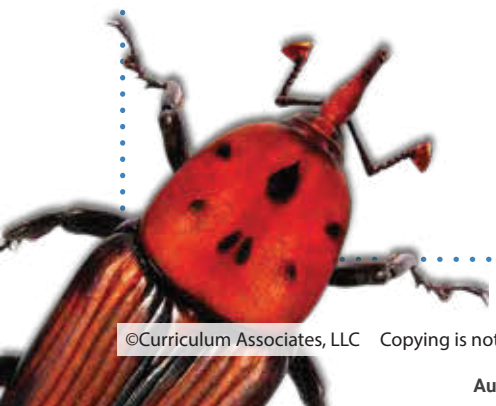
Read and try to solve the problem below.

A grasshopper weighs $\frac{2}{100}$ of an ounce. A beetle weighs $\frac{8}{10}$ of an ounce. Which weighs more?

TRY IT

Math Toolkit

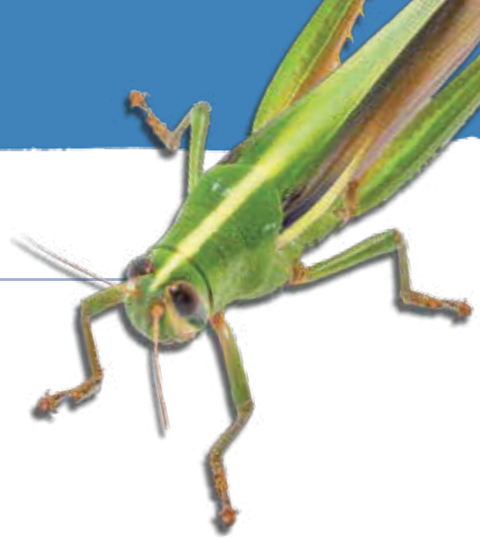
- number lines
- hundredths grids
- tenths grids
- index cards
- fraction models



DISCUSS IT

Ask your partner: How did you get started?

Tell your partner: I started by . . .



Explore different ways to understand comparing fractions.

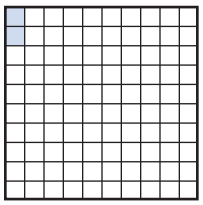
A grasshopper weighs $\frac{2}{100}$ of an ounce. A beetle weighs $\frac{8}{10}$ of an ounce. Which weighs more?

MODEL IT

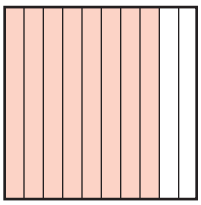
You can use models to help compare fractions.

The models show the fractions of an ounce that the grasshopper and beetle weigh.

Grasshopper



Beetle



MODEL IT

You can use a common denominator to help compare fractions.

When you compare two fractions, it helps if they have a common denominator. Fractions with the same denominator are made up of parts of the same size. The numerators tell how many of those parts each fraction has. When two fractions have the same denominator, you can compare the numerators.

Compare $\frac{2}{100}$ and $\frac{8}{10}$.

The fractions are not written with a common denominator. Find a fraction equivalent to $\frac{8}{10}$ that has a denominator of 100.

$$\frac{8 \times 10}{10 \times 10} = \frac{80}{100}$$

Now, compare the numerators of $\frac{2}{100}$ and $\frac{80}{100}$.

$$80 > 2$$

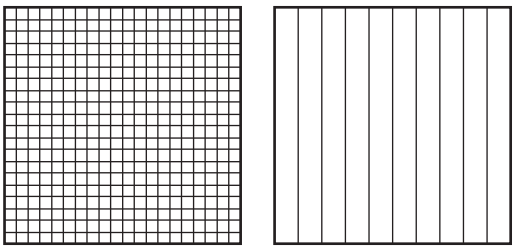
So, $\frac{80}{100} > \frac{2}{100}$ and $\frac{8}{10} > \frac{2}{100}$.

CONNECT IT

Now you will use the problem from the previous page to help you understand how to compare fractions by finding a common numerator.

1. What is an equivalent fraction for $\frac{2}{100}$ that has a numerator of 8? .....

2. One model is divided into 400 equal parts, and the other is divided into 10 equal parts. Which model has smaller parts?



3. Shade 8 parts of each model.

4. Which model has a greater area shaded?

5. Which fraction is greater, $\frac{8}{400}$ or $\frac{8}{10}$? .....

6. Which weighs more, the grasshopper or the beetle? .....

7. Look at the denominators of $\frac{8}{400}$ and $\frac{8}{10}$. When two fractions have the same numerator and different denominators, how do you know which fraction is greater? Explain.

8 REFLECT

Look back at your **Try It**, strategies by classmates, **Model Its**, and the **Connect It** problems on this page. Which models or strategies do you like best for comparing fractions? Explain.

.....

.....

.....

APPLY IT

Use what you just learned to solve these problems.

9 Mel's tomato plant is $\frac{8}{12}$ of a foot tall. Her pepper plant is $\frac{3}{4}$ of a foot tall. Compare the heights of the plants using $<$, $>$, or $=$. Use a model to show your comparison. Show your work.

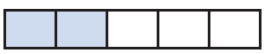
Solution

10 Compare the fractions $\frac{4}{6}$ and $\frac{2}{5}$ using $<$, $>$, or $=$. Use a model to show your comparison. Show your work.

Solution

11 Morgan has the two fraction models shown. Morgan shades Model B to show a fraction less than the fraction shown by Model A. How many parts of Model B could she have shaded? Explain.

Model A



Model B

Practice with Common Numerators and Denominators

Study the Example showing how to compare fractions by finding a common denominator. Then solve problems 1–7.

EXAMPLE

A length of ribbon is $\frac{3}{4}$ of a foot. Another length of ribbon is $\frac{5}{6}$ of a foot. Compare the lengths using a symbol.

Find a common denominator. $\frac{3 \times 3}{4 \times 3} = \frac{9}{12}$ $\frac{5 \times 2}{6 \times 2} = \frac{10}{12}$

Write the equivalent fractions. $\frac{3}{4} = \frac{9}{12}$ $\frac{5}{6} = \frac{10}{12}$

Compare the numerators. $\frac{9}{12} < \frac{10}{12}$

Since $9 < 10$, that means $\frac{9}{12} < \frac{10}{12}$.

$\frac{3}{4} < \frac{5}{6}$

1 Shade the models to show $\frac{3}{4}$ and $\frac{5}{6}$. Compare the fractions. Write <, >, or =.

$\frac{3}{4}$ ◯ $\frac{5}{6}$

2 Divide each model in problem 1 into 12 equal parts to show an equivalent fraction. Write the equivalent fractions and symbol to show the comparison.

$\frac{\square}{12}$ ◯ $\frac{\square}{12}$

3 Compare $\frac{2}{3}$ and $\frac{9}{12}$ by finding a common denominator.

a. Write a fraction equivalent to $\frac{2}{3}$ with a denominator of 12.

$\frac{2 \times \square}{3 \times \square} = \frac{\square}{12}$

b. Compare the fractions.

$\frac{\square}{12}$ ◯ $\frac{9}{12}$. So, $\frac{2}{3}$ ◯ $\frac{9}{12}$.

4 Compare $\frac{1}{5}$ and $\frac{2}{12}$ by finding a common numerator.

a. Write a fraction equivalent to $\frac{1}{5}$ with a numerator of 2.

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

b. Compare the fractions.

$\frac{2}{\square}$ ◯ $\frac{2}{12}$. So, $\frac{1}{5}$ ◯ $\frac{2}{12}$.

5 Compare the fractions. Use the symbols $<$, $>$, and $=$.

a. $\frac{2}{5}$ ◯ $\frac{8}{10}$

b. $\frac{5}{12}$ ◯ $\frac{1}{3}$

c. $\frac{3}{5}$ ◯ $\frac{60}{100}$

d. $\frac{9}{100}$ ◯ $\frac{9}{10}$

6 Tell whether each comparison is *True* or *False*.

	True	False
$\frac{2}{3} > \frac{5}{6}$	Ⓐ	Ⓑ
$\frac{4}{10} < \frac{4}{5}$	Ⓒ	Ⓓ
$\frac{70}{100} = \frac{7}{10}$	Ⓔ	Ⓕ
$\frac{1}{3} > \frac{3}{1}$	Ⓖ	Ⓗ
$\frac{3}{4} < \frac{2}{3}$	Ⓘ	Ⓙ

7 Can two fractions with the same numerator and different denominators be equal? Use words and numbers to explain.

Vocabulary

common denominator a number that is a common multiple of the denominators of two or more fractions.

denominator the number below the line in a fraction that tells the number of equal parts in the whole.

numerator the number above the line in a fraction that tells the number of equal parts that are being described.

Develop Using a Benchmark to Compare Fractions

Read and try to solve the problem below.

Jasmine's swimming lesson lasts for $\frac{2}{3}$ of an hour. It takes her $\frac{1}{6}$ of an hour to do her homework. Does Jasmine spend more time on her homework or at her swimming lesson?

TRY IT

Math Toolkit

- fraction circles
- fraction tiles
- number lines
- fraction bars
- index cards
- fraction models

DISCUSS IT

Ask your partner: Why did you choose that strategy?

Tell your partner: I knew . . . so I . . .

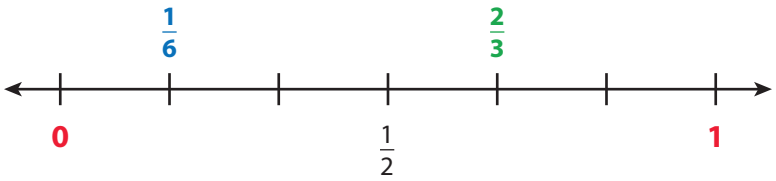
Explore different ways to understand using benchmarks to compare fractions.

Jasmine's swimming lesson lasts for $\frac{2}{3}$ of an hour. It takes her $\frac{1}{6}$ of an hour to do her homework. Does Jasmine spend more time on her homework or at her swimming lesson?

MODEL IT

You can use a number line to help you compare fractions.

The number line shows where the fractions $\frac{2}{3}$ and $\frac{1}{6}$ are compared to 0 and 1.

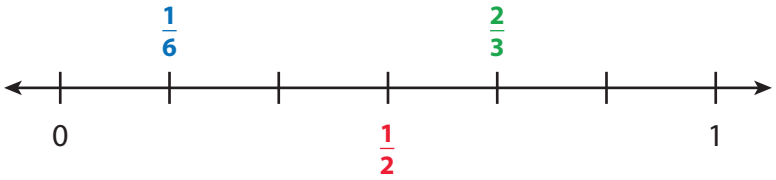


The number line shows that $\frac{1}{6}$ is closer to 0 than $\frac{2}{3}$ is.
It also shows that $\frac{2}{3}$ is closer to 1 than $\frac{1}{6}$ is.
This means that $\frac{1}{6} < \frac{2}{3}$ and $\frac{2}{3} > \frac{1}{6}$.

SOLVE IT

You can use a benchmark fraction to solve the problem.

Another way to compare fractions is by using a benchmark fraction.
Use $\frac{1}{2}$ as a benchmark to compare $\frac{1}{6}$ and $\frac{2}{3}$.



The number line shows that $\frac{1}{6}$ is less than $\frac{1}{2}$ and $\frac{2}{3}$ is greater than $\frac{1}{2}$.
So, $\frac{1}{6} < \frac{2}{3}$ and $\frac{2}{3} > \frac{1}{6}$.

Jasmine spends more time at her swimming lesson than on homework.

CONNECT IT

Now you will solve a similar problem using 1 as a benchmark. Think about the two fractions $\frac{11}{10}$ and $\frac{7}{8}$.

1. Which fraction, $\frac{11}{10}$ or $\frac{7}{8}$, is greater than 1?

2. Which fraction, $\frac{11}{10}$ or $\frac{7}{8}$, is less than 1?

3. Which fraction, $\frac{11}{10}$ or $\frac{7}{8}$, is greater? Explain.

4. Write $<$, $>$, or $=$ to show the comparison. $\frac{11}{10}$ ◯ $\frac{7}{8}$

5. Explain how you can use benchmarks to compare fractions.

6 REFLECT

Look back at your **Try It**, strategies by classmates, and **Model It** and **Solve It**. Which models or strategies do you like best for using benchmarks to compare fractions? Explain.

APPLY IT

Use what you just learned to solve these problems.

7 Tell which fraction is greater, $\frac{4}{8}$ or $\frac{3}{4}$. Use the benchmark fraction $\frac{1}{2}$ to explain your answer. Show your work.

Solution

8 Nathan walks $\frac{10}{10}$ of a mile. Sarah walks $\frac{11}{12}$ of a mile. Who walks a greater distance? Explain. Use a benchmark number in your explanation.

Solution

9 Use the benchmark fraction $\frac{1}{2}$ to compare the two fractions below.

Which symbol correctly compares the fractions?

$\frac{4}{6}$ ◯ $\frac{3}{8}$

Ⓐ $<$

Ⓑ $>$

Ⓒ $=$

Ⓓ $+$

Practice Using a Benchmark to Compare Fractions

Study the Example showing how to use 1 as a benchmark to compare fractions. Then solve problems 1–4.

EXAMPLE

Carol compares $\frac{3}{4}$ and $\frac{2}{1}$. She says $\frac{3}{4} > \frac{2}{1}$ because both the numerator and the denominator in $\frac{3}{4}$ are greater than the numerator and denominator in $\frac{2}{1}$. $3 > 2$ and $4 > 1$. Is Carol correct?

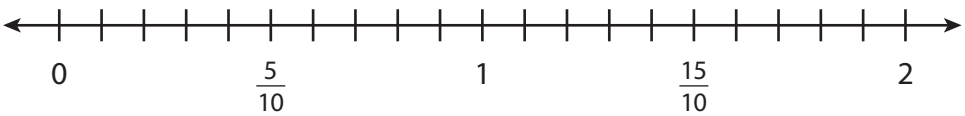
Compare each fraction to the benchmark 1.

$\frac{3}{4} < 1$ and $\frac{2}{1} > 1$

$\frac{3}{4} < \frac{2}{1}$ and $\frac{2}{1} > \frac{3}{4}$. Carol is not correct.

1 Compare $\frac{9}{10}$ and $\frac{3}{2}$.

a. Label $\frac{9}{10}$ and $\frac{3}{2}$ on the number line below.



b. Which fraction is greater than 1? .....

c. Which fraction is less than 1? .....

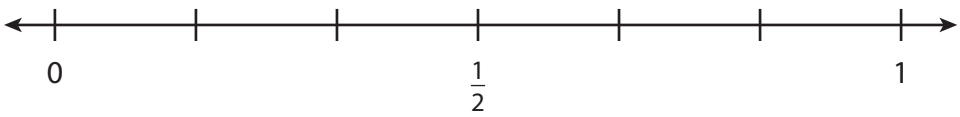
d. Write $<$, $>$, or $=$ to show the comparison. Explain how you found your answer. $\frac{9}{10}$ ◯ $\frac{3}{2}$

Vocabulary

benchmark fraction a common fraction that you might compare other fractions to. For example, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{2}{3}$, and $\frac{3}{4}$ are often used as benchmark fractions.

2 Compare $\frac{5}{6}$ and $\frac{1}{3}$ using the benchmark fraction $\frac{1}{2}$.

a. Label $\frac{5}{6}$ and $\frac{1}{3}$ on the number line below.



b. Which fraction is greater than $\frac{1}{2}$? .....

c. Which fraction is less than $\frac{1}{2}$? .....

d. Write $<$, $>$, or $=$ to show the comparison. Explain how you found your answer.

$\frac{5}{6}$ ◯ $\frac{1}{3}$

3 Use a benchmark fraction to compare the fractions $\frac{7}{10}$ and $\frac{5}{12}$. Explain how you found your answer.

4 Write *True* or *False* for each comparison. Then write the benchmark you could use to compare the fractions.

	True* or *False	**Benchmark**
$\frac{9}{8} > \frac{11}{12}$		
$\frac{2}{5} < \frac{5}{6}$		
$\frac{7}{10} < \frac{2}{4}$		
$\frac{4}{5} > \frac{2}{2}$		
$\frac{3}{2} < \frac{9}{10}$		

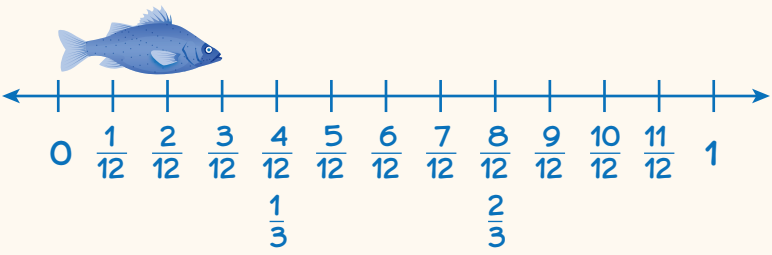
Refine Comparing Fractions

Complete the Example below. Then solve problems 1–9.

EXAMPLE

Becker catches a fish that is $\frac{3}{12}$ of a yard long. The fish has to be longer than $\frac{1}{3}$ of a yard in order to keep it. Can Becker keep the fish?

Look at how you could show your work using a number line.



Solution

It is important that both measurements use the same unit!

PAIR/SHARE
How else could you solve this problem?

APPLY IT

1 Myron and Jane work on the same set of homework problems. Myron finishes $\frac{5}{6}$ of the problems, and Jane finishes $\frac{2}{3}$ of the problems. Who finishes more of their homework problems? Show your work.

Which strategy for comparing do you think works best with these fractions?

Solution

PAIR/SHARE
How did you and your partner decide what strategy to use to solve the problem?

2 Compare the fractions $\frac{3}{10}$ and $\frac{7}{12}$ using the benchmark fraction $\frac{1}{2}$. Show your work.

You already know about how big $\frac{1}{2}$ is!

PAIR/SHARE
Draw a model to check your answer.

Solution

3 Janelle walks $\frac{3}{6}$ of a mile. Pedro walks $\frac{6}{10}$ of a mile. Which statement shows how to find the greater fraction?

Ⓐ $\frac{3}{6} = \frac{6}{12}$ and $\frac{6}{12} < \frac{6}{10}$

Ⓑ $\frac{3}{6} = \frac{6}{12}$ and $\frac{6}{12} > \frac{6}{10}$

Ⓒ $\frac{6}{10} = \frac{3}{5}$ and $\frac{3}{5} < \frac{3}{6}$

Ⓓ $\frac{3}{6} < \frac{1}{2}$ and $\frac{6}{10} > \frac{1}{2}$

Tina chose Ⓑ as the correct answer. How did she get that answer?

There are several ways to compare fractions!

PAIR/SHARE
How can you find the answer using a benchmark fraction?

4 Grant uses $\frac{2}{3}$ of a cup of raisins and $\frac{3}{4}$ of a cup of almonds to make trail mix. Which statement can be used to find out if there are more raisins or almonds in the trail mix?

Ⓐ $\frac{2}{3} = \frac{8}{12}$ and $\frac{3}{4} = \frac{9}{12}$

Ⓑ $\frac{2}{3} = \frac{4}{6}$ and $\frac{3}{4} = \frac{4}{5}$

Ⓒ $\frac{2}{3} = \frac{6}{9}$ and $\frac{3}{4} = \frac{6}{12}$

Ⓓ $\frac{2}{3} = \frac{6}{9}$ and $\frac{3}{4} = \frac{6}{7}$

5 Select $>$, $<$, or $=$ to complete a true comparison for each pair of fractions.

	>	<	=
$\frac{8}{3} \square \frac{9}{4}$	Ⓐ	Ⓑ	Ⓒ
$\frac{7}{10} \square \frac{7}{8}$	Ⓓ	Ⓔ	Ⓕ
$\frac{1}{2} \square \frac{3}{8}$	Ⓖ	Ⓗ	Ⓘ
$\frac{2}{4} \square \frac{4}{6}$	Ⓙ	Ⓚ	Ⓛ
$\frac{7}{5} \square \frac{140}{100}$	Ⓜ	Ⓝ	Ⓞ

6 Sam's music teacher tells him to practice his trombone for $\frac{5}{10}$ of an hour. Sam practices for $\frac{2}{6}$ of an hour. Does he practice long enough? Show your work.

Sam ..... practice long enough.

7 Compare the fractions $\frac{5}{10}$ and $\frac{5}{8}$. Write the symbol $>$, $<$, or $=$.

$\frac{5}{10}$ ◯ $\frac{5}{8}$

8 Rachel and Sierra have the same number of boxes of fruit to sell for a fundraiser. Each box is the same size. Rachel sells $\frac{9}{10}$ of her boxes, and Sierra sells $\frac{5}{8}$ of her boxes. Which girl sells a greater fraction of her boxes of fruit? Draw a model to show your answer. Show your work.

..... sells a greater fraction of her boxes of fruit.

9 MATH JOURNAL

Jeff says $\frac{3}{4}$ of a small pizza is more than $\frac{1}{3}$ of a large pizza. Alicia disagrees. Who is right? Do you have enough information to know who is right? Explain.

SELF CHECK Go back to the Unit 4 Opener and see what you can check off.