



Core Knowledge<sup>®</sup> MATHEMATICS

# Fraction Equivalence and Comparison



Student Workbook

$$2 \times 2 = 4$$

$$4 \times 2 = 8$$

$$8 : 4 = 2$$

$$4 - 2 = 2$$



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# Fraction Equivalence and Comparison

## Table of Contents

Lesson 1	<b>Representations of Fractions (Part 1)</b> .....	1
Lesson 2	<b>Representations of Fractions (Part 2)</b> .....	4
Lesson 3	<b>Same Denominator or Numerator</b> .....	7
Lesson 4	<b>Same Size, Related Sizes</b> .....	11
Lesson 5	<b>Fractions on Number Lines</b> .....	14
Lesson 6	<b>Relate Fractions to Benchmarks</b> .....	18
Lesson 7	<b>Equivalent Fractions</b> .....	23
Lesson 8	<b>Equivalent Fractions on the Number Line</b> ....	26
Lesson 9	<b>Explain Equivalence</b> .....	29
Lesson 10	<b>Use Multiples to Find Equivalent Fractions</b> ....	32
Lesson 11	<b>Use Factors to Find Equivalent Fractions</b> ....	35
Lesson 12	<b>Ways to Compare Fractions</b> .....	40
Lesson 13	<b>Use Equivalent Fractions to Compare</b> .....	44
Lesson 14	<b>Fraction Comparison</b> .....	47
Lesson 15	<b>Common Denominators to Compare</b> .....	50
Lesson 16	<b>Compare and Order Fractions</b> .....	53
Lesson 17	<b>Paper Clip Games (optional)</b> .....	57
<b>Cumulative Practice Problems</b>		
Section A:	<b>Size and Location of Fractions</b> .....	61
Section B:	<b>Equivalent Fractions</b> .....	67
Section C:	<b>Fraction Comparison</b> .....	71





# **Fraction Equivalence and Comparison Student Workbook**

Core Knowledge Mathematics™



# Lesson 1: Representations of Fractions (Part 1)

- Let's name some fractions and represent them visually.

## Warm-up: What Do You Know About $\frac{1}{2}$ ?

What do you know about  $\frac{1}{2}$ ?

# 1.1: Fraction Strips

Your teacher will give you strips of paper. Each strip represents 1.



1. Use the strips to represent halves, fourths, and eighths.

Use one strip for each fraction and label the parts.

2. What do you notice about the number of parts or the size of the parts? Make at least two observations.

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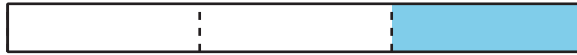
## 1.2: Fractions, Represented

1. If each full diagram represents 1, what fraction does each shaded part represent?

a.



b.



c.



2. Here are four blank diagrams. Each diagram represents 1. Partition each diagram and shade one part so that the shaded part represents the given fraction.

a.  $\frac{1}{6}$



b.  $\frac{1}{8}$



c.  $\frac{1}{10}$



d.  $\frac{1}{12}$



3. Suppose you are creating a representation of  $\frac{1}{20}$  using the same blank diagram. Would the shaded part be larger or smaller than the shaded part in the diagram of  $\frac{1}{10}$ ? Explain how you know.

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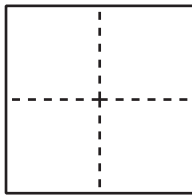
# Lesson 2: Representations of Fractions (Part 2)

- Let's name some other fractions and represent them with diagrams.

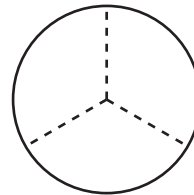
## Warm-up: Which One Doesn't Belong: All Cut Up

Which one doesn't belong?

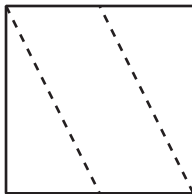
A



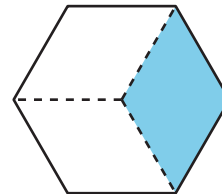
B



C



D



## 2.1: A Diagram for Each Fraction

Each full diagram represents 1. Match each fraction to a diagram whose shaded parts represents it.

Two of the fractions are not represented. Create a representation for each of them.

$$\frac{2}{3} : \underline{\hspace{2cm}} \quad \frac{3}{8} : \underline{\hspace{2cm}} \quad \frac{4}{10} : \underline{\hspace{2cm}} \quad \frac{4}{6} : \underline{\hspace{2cm}} \quad \frac{6}{6} : \underline{\hspace{2cm}}$$

$$\frac{3}{5} : \underline{\hspace{2cm}} \quad \frac{4}{8} : \underline{\hspace{2cm}} \quad \frac{6}{12} : \underline{\hspace{2cm}} \quad \frac{6}{10} : \underline{\hspace{2cm}} \quad \frac{3}{4} : \underline{\hspace{2cm}}$$

$$\frac{5}{6} : \underline{\hspace{2cm}} \quad \frac{2}{5} : \underline{\hspace{2cm}} \quad \frac{5}{12} : \underline{\hspace{2cm}} \quad \frac{7}{10} : \underline{\hspace{2cm}} \quad \frac{7}{8} : \underline{\hspace{2cm}}$$

**A**



**I**



**B**



**J**



**C**



**K**



**D**



**L**



**E**



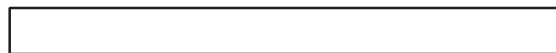
**M**



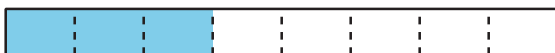
**F**



**N**



**G**



**O**

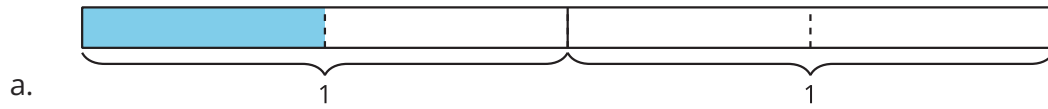


**H**



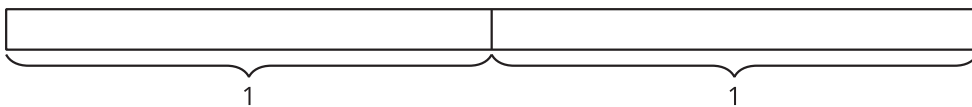
## 2.2: Diagrams for Some Other Fractions

1. What fraction do the shaded parts represent?



2. Here are four fractions and four blank diagrams. Partition each diagram and shade the parts to represent the fraction.

a.  $\frac{2}{2}$



b.  $\frac{4}{2}$



c.  $\frac{5}{4}$



d.  $\frac{10}{8}$



## Lesson 3: Same Denominator or Numerator

- Let's compare fractions with the same numerator or the same denominator.

### Warm-up: Number Talk: Hundreds More

Find the value of each expression mentally.

- $136 + 100$

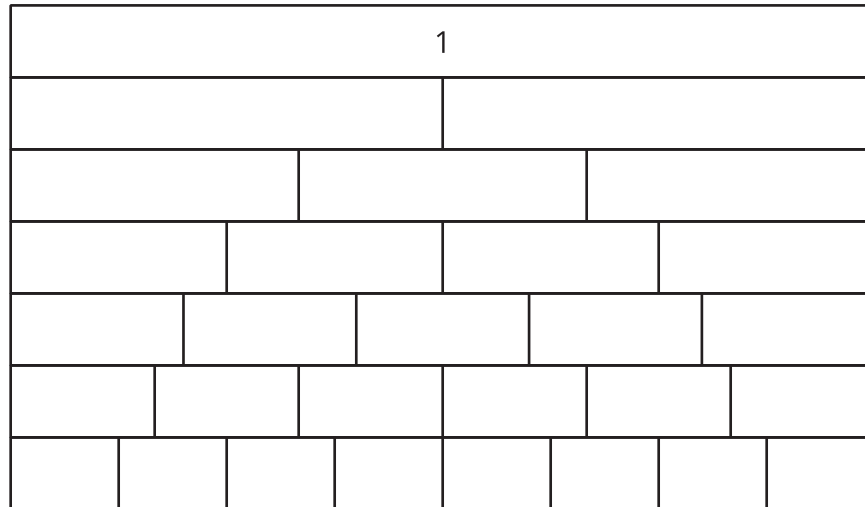
- $136 + 300$

- $136 + 370$

- $136 + 378$

### 3.1: Fractions with the Same Denominator

1. This diagram shows a set of fraction strips. Label each rectangle with the fraction it represents.



2. Circle the greater fraction in each of the following pairs. If helpful, use the diagram of fraction strips.

- a.  $\frac{3}{4}$  or  $\frac{5}{4}$
- b.  $\frac{3}{5}$  or  $\frac{5}{5}$
- c.  $\frac{3}{6}$  or  $\frac{5}{6}$
- d.  $\frac{3}{8}$  or  $\frac{5}{8}$
- e.  $\frac{3}{10}$  or  $\frac{5}{10}$

3. What pattern do you notice about the circled fractions? How can you explain the pattern?

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4. Which one is greater:  $\frac{7}{3}$  or  $\frac{10}{3}$ ? Explain your reasoning.

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## 3.2: Fractions with the Same Numerator

1. Circle the greater fraction in each of the following pairs. If helpful, use the diagram of fraction strips.

a.  $\frac{1}{3}$  or  $\frac{1}{5}$

b.  $\frac{2}{3}$  or  $\frac{2}{5}$

c.  $\frac{3}{3}$  or  $\frac{3}{5}$

d.  $\frac{4}{3}$  or  $\frac{4}{5}$

e.  $\frac{9}{3}$  or  $\frac{9}{5}$

2. What pattern do you notice about the circled fractions? How can you explain the pattern?

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3. Which one is greater:  $\frac{70}{100}$  or  $\frac{70}{20}$ ? Explain your reasoning.

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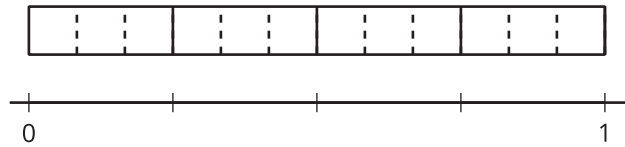
4. Tyler is comparing  $\frac{4}{10}$  and  $\frac{4}{6}$ . He says, "Ten is greater than 6, so  $\frac{4}{10}$  is greater than  $\frac{4}{6}$ ." Explain or show why Tyler's conclusion is incorrect.

## Lesson 4: Same Size, Related Sizes

- Let's find some fractions that are the same size.

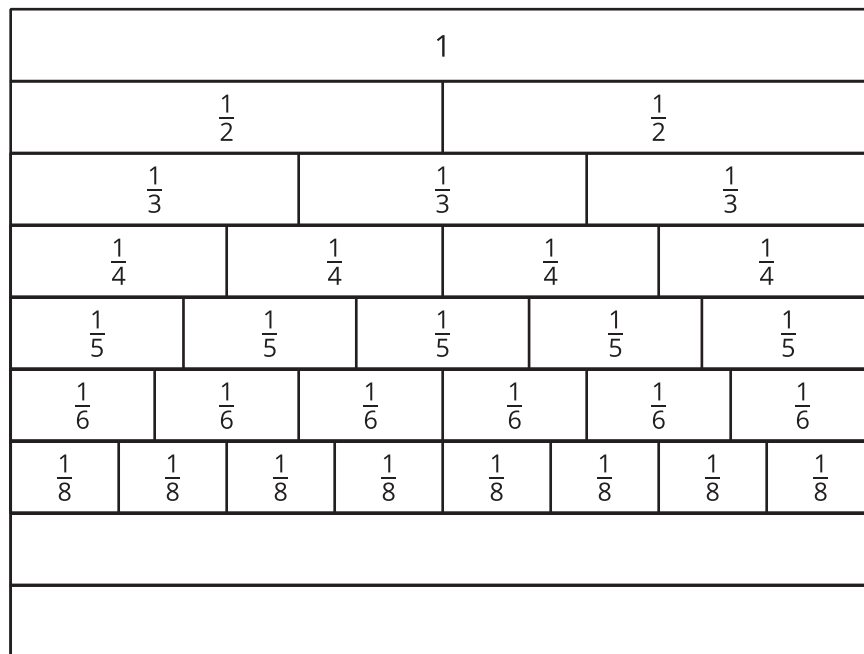
### Warm-up: Notice and Wonder: A Fraction Strip and a Number Line

What do you notice? What do you wonder?



## 4.1: Same Size, Different Numbers

Here's a diagram of fraction strips, with two strips added for tenths and twelfths.



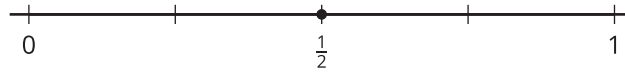
1. Use a blank strip to show tenths. Label the parts. How did you partition the strip?
2. Use a blank strip to show twelfths. Label the parts. How did you partition the strip?
3. Jada says, "I noticed that one part of  $\frac{1}{2}$  is the same size as two parts of  $\frac{1}{4}$  and three parts of  $\frac{1}{6}$ . So  $\frac{1}{2}$ ,  $\frac{2}{4}$ , and  $\frac{3}{6}$  must be **equivalent**."

Find a fraction that is equivalent to each of the following fractions. Be prepared to explain your reasoning.

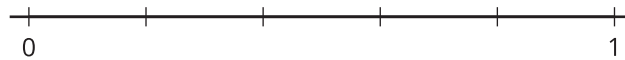
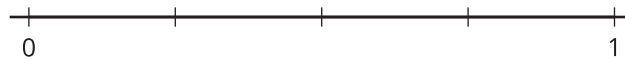
- a.  $\frac{1}{6}$
- b.  $\frac{2}{10}$
- c.  $\frac{3}{3}$

## 4.2: Fractions on Number Lines

1. Here are some number lines. The point on this number line shows the fraction  $\frac{1}{2}$ .



Label the tick marks on each number line.



2. Suppose you are to locate  $\frac{1}{6}$ ,  $\frac{1}{8}$ , and  $\frac{1}{10}$  on one of the number lines.
- a. Which number line would you use for each fraction? Be prepared to explain your reasoning.

b. Locate and label each fraction ( $\frac{1}{6}$ ,  $\frac{1}{8}$ , and  $\frac{1}{10}$ ) on a different number line.

3. Locate and label each of the following fractions on one of the number lines.

$$\frac{2}{3}$$

$$\frac{2}{8}$$

$$\frac{2}{5}$$

$$\frac{3}{5}$$

$$\frac{4}{6}$$

$$\frac{4}{8}$$

$$\frac{4}{10}$$

$$\frac{6}{6}$$

$$\frac{6}{10}$$

$$\frac{8}{8}$$

## Lesson 5: Fractions on Number Lines

- Let's investigate equivalent fractions on a number line.

### Warm-up: Number Talk: A Number Times Twelve

Find the value of each expression mentally.

- $2 \times 12$

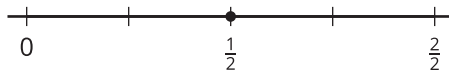
- $4 \times 12$

- $8 \times 12$

- $16 \times 12$

## 5.1: All Lined Up

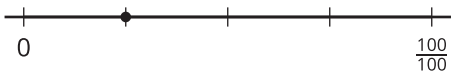
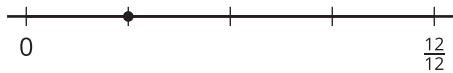
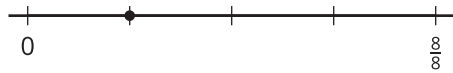
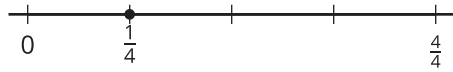
1. These number lines have different labels for the tick mark on the far right.



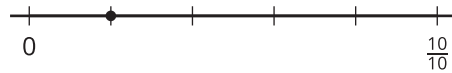
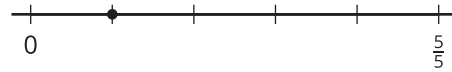
- Explain to your partner why the tick mark on the far right can be labeled with fractions with different numbers.
- Label each point with a number it represents (other than  $\frac{1}{2}$ ).
- Explain to your partner why the fractions you wrote are equivalent.

2. Label the point on each number line with a number it represents. Be prepared to explain your reasoning.

a.



b.



c.

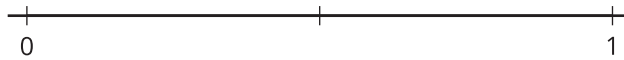
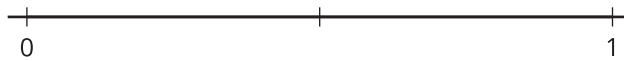


## 5.2: How Far to Run?

1. Han and Kiran plan to go for a run after school. They are deciding how far to run.

- Han says, "Let's run  $\frac{3}{4}$  of a mile. That's how far I run to my soccer practice."
- Kiran says, "I can only run  $\frac{9}{12}$  of a mile."

Which distance should they run? Explain your reasoning. Use one or more number lines to show your reasoning.



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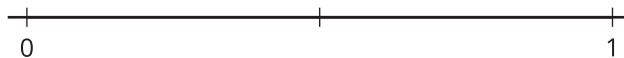
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2. Tyler wants to join Han and Kiran on their run.

He says, "How about we run  $\frac{7}{8}$  of a mile?"



Is the distance Tyler suggested the same as what his friends wanted to run? Explain or show your reasoning.

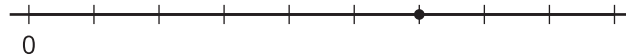


## Lesson 6: Relate Fractions to Benchmarks

- Let's compare the size of fractions to  $\frac{1}{2}$  and to 1.

### Warm-up: Notice and Wonder: A Point on a Number Line

What do you notice? What do you wonder?



## 6.1: Greater Than or Less Than 1?

For each diagram:

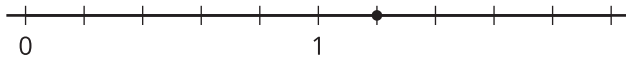
- Name a fraction the point represents.
- Is that fraction greater than or less than 1?
- How far is it from 1?

1.



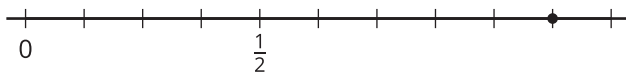
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- 
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2.



- 
- 
- 

3.



- 
- 
- 

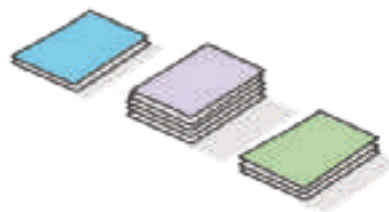
4.



- 
- 
-

## 6.2: Card Sort: Where Do They Belong?

Sort the cards from your teacher into three groups: less than  $\frac{1}{2}$ , equal to  $\frac{1}{2}$ , and greater than  $\frac{1}{2}$ . Be prepared to explain how you know.



Record your sorting results here after you have discussed them with another group.

less than $\frac{1}{2}$	equal to $\frac{1}{2}$	greater than $\frac{1}{2}$

Complete the following sentences after class discussion:

- A fraction is less than  $\frac{1}{2}$  when ...

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- A fraction is greater than  $\frac{1}{2}$  when ...

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- A fraction is between  $\frac{1}{2}$  and 1 when ...

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## 6.3: Greater Than or Less Than $\frac{1}{2}$ ?

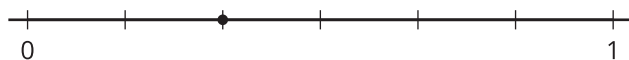
For each diagram:

a. Name a fraction the point represents.

b. Is that fraction greater than or less than  $\frac{1}{2}$ ?

c. How far is it from  $\frac{1}{2}$ ?

1.

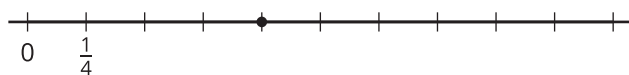


a.

b.

c.

2.

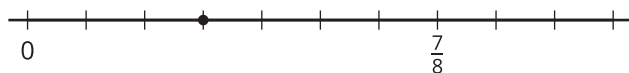


a.

b.

c.

3.



a.

b.

c.

4.



a.

b.

c.

## Section Summary

### Section Summary

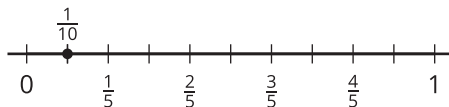
In this section, we used fraction strips to represent fractions with denominators of 2, 3, 4, 5, 6, 8, 10, and 12. We also used the strips to reason about relationships between fifths and tenths, and between sixths and twelfths.

1									
$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$
$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$

1											
$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$
$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$

We learned that 2 tenths are equivalent to 1 fifth, or that splitting 5 fifths into two will produce 10 equal parts or tenths. When the denominator is larger, there are more parts in a whole.

We used what we learned about fraction strips to partition number lines and represent different fractions.



# Lesson 7: Equivalent Fractions

- Let's find some equivalent fractions.

## Warm-up: True or False: Equivalence

Decide if each statement is true or false. Be prepared to explain your reasoning.

- $\frac{4}{8} = \frac{7}{8}$

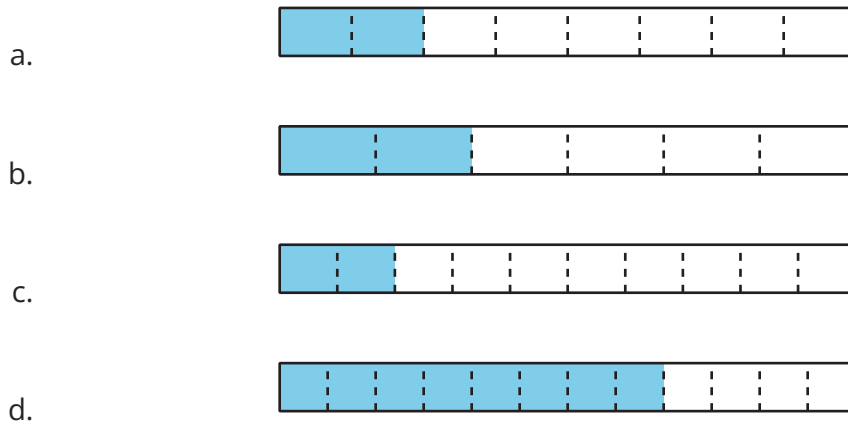
- $\frac{3}{4} = \frac{6}{8}$

- $\frac{2}{6} = \frac{2}{8}$

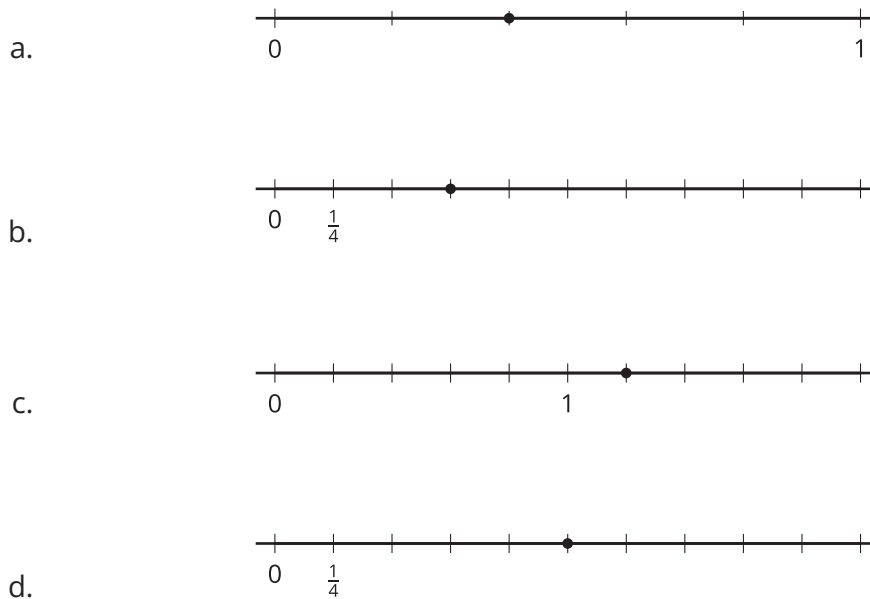
- $\frac{6}{3} = \frac{4}{2}$

## 7.1: Two or More Fractions

1. Each entire diagram represents 1 whole. Write two or more fractions that the shaded part of each diagram represents. Be prepared to explain your reasoning.



2. Write two or more fractions that the point on each number line represents. Be prepared to explain your reasoning.



3. Place a new point on a tick mark on one of the last two number lines (in part c or d). Then, write two fractions that the point represents.

## 7.2: Equivalent for Sure?

For each fraction, find two equivalent fractions.

Partner A

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

2.  $\frac{10}{6}$

Partner B

1.  $\frac{4}{3}$

2.  $\frac{14}{10}$

Next, show or explain to your partner how you know that the fractions you wrote are equivalent to the original. Use any representation that you think is helpful.

# Lesson 8: Equivalent Fractions on the Number Line

- Let's use number lines to reason about equivalent fractions.

## Warm-up: Estimation Exploration: A Shaded Portion

If the entire diagram represents 1 whole, about what fraction is shaded?



Make an estimate that is:

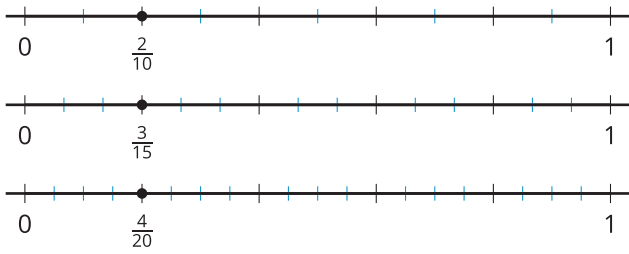
too low	about right	too high

# 8.1: Handy Number Lines

Andre used number lines to find fractions that are equivalent to  $\frac{1}{5}$ . He drew this number line:



Then, he drew three more lines and wrote a fraction for the point on each line:



1. How did Andre use the number lines to find fractions equivalent to  $\frac{1}{5}$ ? Explain your thinking to a partner.
2. How can number lines be used to show whether the following fractions are equivalent?

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

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b.  $\frac{14}{20}$  and  $\frac{4}{5}$

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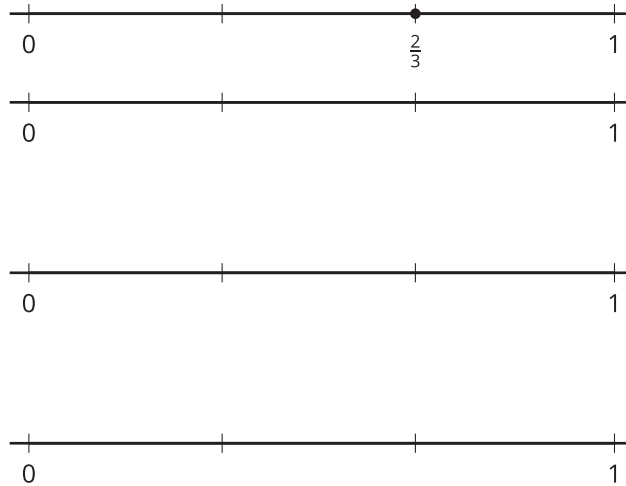
3. Find three fractions that are equivalent to  $\frac{6}{5}$ . Explain or show how Andre's number lines can help.

## 8.2: Can It Be Done?

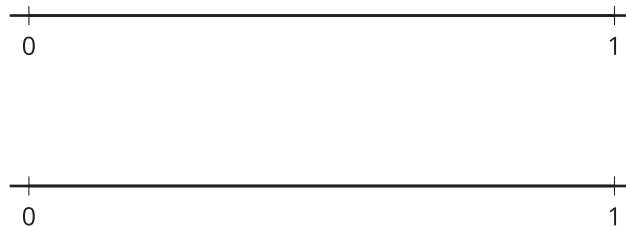
1. Priya wants to find fractions that are equivalent to  $\frac{2}{3}$ , other than  $\frac{4}{6}$ . She wonders if she can find equivalent fractions with denominator 9, 10, and 12.

$$\frac{\quad}{9} \quad \frac{\quad}{10} \quad \frac{\quad}{12}$$

Can it be done? Use number lines to show your reasoning.



2. Represent  $\frac{1}{10}$  on a number line. Then, find two fractions that are equivalent to  $\frac{1}{10}$ . How would you use the number line to show that they are equivalent to  $\frac{1}{10}$ ?

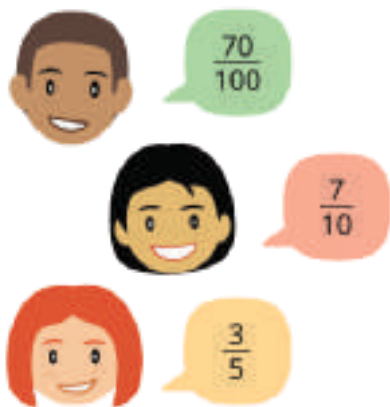


3. Can you find an equivalent fraction for  $\frac{1}{10}$  with 100 for the denominator? Explain or show your reasoning.



## 9.1: Pointed Discussion

Andre, Lin, and Clare are representing  $\frac{70}{100}$  on a number line.



- Andre said, "Oh, no! We'll need to partition the line into 100 equal parts and count 70 parts just to mark one point!"
- Lin said, "What if we mark  $\frac{7}{10}$  instead? We could partition the line into just 10 parts and count 7 parts."
- Clare said, "What if we partition the line into 5 parts and mark  $\frac{3}{5}$ ?"

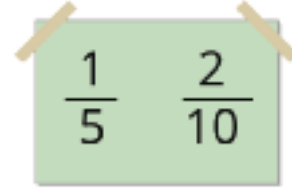
Do you agree with any of them? Explain or show your reasoning.



## 9.2: How Do You Know?

Around the room you will find six posters, each showing either two or three fractions.

With your group, visit at least two posters: one with two fractions and one with three fractions.



For the set of 2 fractions:

- Explain or show how you know the fractions are equivalent.
- Write a new equivalent fraction on a sticky note and add it to the poster. Think of a fraction that hasn't already been written by someone else.

We visited poster \_\_\_\_\_, which shows \_\_\_\_\_ and \_\_\_\_\_.

New equivalent fraction: \_\_\_\_\_

For the set of 3 fractions:

- Identify 2 fractions that are equivalent. Explain your reasoning.

We visited poster \_\_\_\_\_, which shows \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.

# Lesson 10: Use Multiples to Find Equivalent Fractions

- Let's look at a way to find equivalent fractions without using diagrams.

## Warm-up: Notice and Wonder: Four Equations

What do you notice? What do you wonder?

- $\frac{1}{3} = \frac{2}{6}$

- $\frac{2}{3} = \frac{4}{6}$

- $\frac{3}{3} = \frac{6}{6}$

- $\frac{4}{3} = \frac{8}{6}$

# 10.1: Elena's Way

Elena thought of another way to find equivalent fractions. She wrote:

$$\frac{1 \times 2}{5 \times 2} = \frac{2}{10}$$

$$\frac{1 \times 3}{5 \times 3} = \frac{3}{15}$$

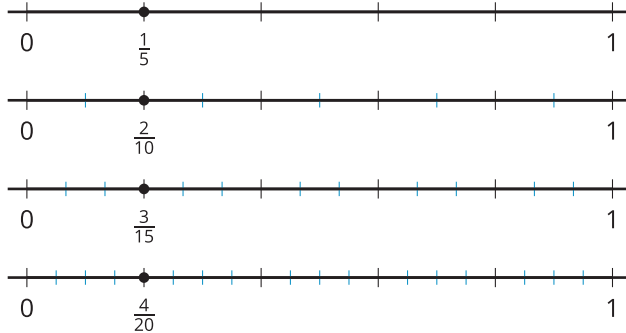
$$\frac{1 \times 4}{5 \times 4} = \frac{4}{20}$$

$$\frac{1 \times 5}{5 \times 5} = \frac{5}{25}$$

$$\frac{1 \times 10}{5 \times 10} = \frac{10}{50}$$

1. Analyze Elena's work. Then, discuss with a partner:

a. How are Elena's equations related to Andre's number lines?



b. How might Elena find other fractions that are equivalent to  $\frac{1}{5}$ ? Show a couple of examples.

2. Use Elena's strategy to find five fractions that are equivalent to  $\frac{1}{8}$ . Use number lines to check your thinking, if they help.

## 10.2: Equivalence Hunting

Look at Elena's strategy from an earlier activity.

1. Could her strategy help us know whether two fractions are equivalent? Try using it to check the equivalence of these fractions:

a.  $\frac{5}{2}$  and  $\frac{10}{8}$

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

For any two fractions that are equivalent, write an equation.

2. Find all fractions in the list that are equivalent to  $\frac{3}{4}$ . Be prepared to explain or show how you know.

$$\frac{2}{10}$$

$$\frac{6}{8}$$

$$\frac{12}{15}$$

$$\frac{30}{40}$$

$$\frac{8}{9}$$

$$\frac{12}{20}$$

$$\frac{12}{16}$$

$$\frac{15}{20}$$

$$\frac{8}{10}$$

$$\frac{24}{32}$$

$$\frac{75}{100}$$

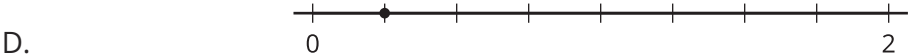
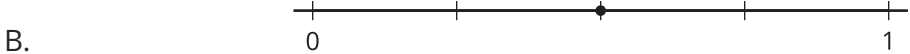
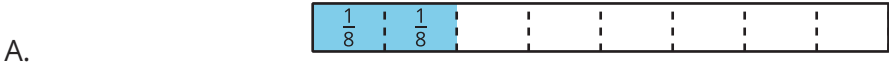
$$\frac{60}{80}$$

# Lesson 11: Use Factors to Find Equivalent Fractions

- Let's find equivalent fractions by working with numerators and denominators.

## Warm-up: Which One Doesn't Belong: Four Representations

Which one doesn't belong?



## 11.1: The Other Way Around

1. Andre drew a number line and marked a point on it. Label the point with the fraction it represents.



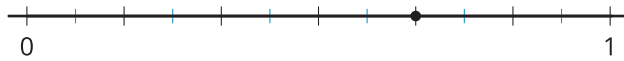
2. To find other fractions that the point represents, Andre made copies of the number line. He drew darker marks on some of the existing tick marks.

Label the darker tick marks Andre made on each number line.

a.



b.



3. Kiran wrote the same fractions for the points but used a different strategy, as shown. Analyze his reasoning.

$$\frac{8 \div 4}{12 \div 4} = \frac{2}{3}$$

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

How do you think Andre's and Kiran's strategies are related?

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4. Try using Kiran's strategy to find one or more fractions that are equivalent to  $\frac{10}{12}$  and  $\frac{18}{12}$ .

## 11.2: How Would You Find Them?

Find at least two fractions that are equivalent to each fraction. Show your reasoning.

1.  $\frac{16}{8}$

2.  $\frac{40}{10}$

3.  $\frac{7}{6}$

4.  $\frac{90}{100}$

5.  $\frac{5}{4}$

### 11.3: Card Sort: Fractions Galore

Your teacher will give you a set of cards. Find as many sets of equivalent fractions as you can. Be prepared to explain or show your reasoning.

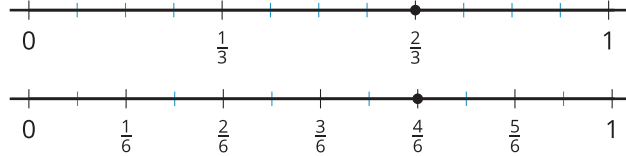
Record the sets of equivalent fractions here.


Record fractions that do not have an equivalent fraction here.


## Section Summary

### Section Summary

In this section, we learned to identify and write equivalent fractions. We placed fractions on number lines and saw that two fractions that occupy the same spot on a number line are equivalent.



We also looked at strategies for finding equivalent fractions and learned that multiplying or dividing the numerator and denominator by the same number will result in an equivalent fraction. Here are some examples:

$$\frac{1 \times 2}{5 \times 2} = \frac{2}{10}$$

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

$$\frac{1 \times 4}{5 \times 4} = \frac{4}{20}$$

$$\frac{8 \div 4}{12 \div 4} = \frac{2}{3}$$

$\frac{1}{5}$  is equivalent to  $\frac{2}{10}$  and  $\frac{4}{20}$ .

$\frac{8}{12}$  is equivalent to  $\frac{4}{6}$  and  $\frac{2}{3}$ .

# Lesson 12: Ways to Compare Fractions

- Let's compare some fractions.

## Warm-up: Estimation Exploration: What's That Point?

What is the value represented by the point on the number line?



Make an estimate that is:

too low	about right	too high

## 12.1: The Greatest of Them All

Here are 25 fractions in a table.

	A	B	C	D	E
1	$\frac{2}{3}$	$\frac{2}{5}$	$\frac{2}{10}$	$\frac{2}{12}$	$\frac{2}{100}$
2	$\frac{4}{3}$	$\frac{4}{5}$	$\frac{4}{10}$	$\frac{4}{12}$	$\frac{4}{100}$
3	$\frac{7}{3}$	$\frac{7}{5}$	$\frac{7}{10}$	$\frac{7}{12}$	$\frac{7}{100}$
4	$\frac{11}{3}$	$\frac{11}{5}$	$\frac{11}{10}$	$\frac{11}{12}$	$\frac{11}{100}$
5	$\frac{26}{3}$	$\frac{26}{5}$	$\frac{26}{10}$	$\frac{26}{12}$	$\frac{26}{100}$

For each question, be prepared to explain your reasoning.

1. Identify the greatest fraction in each column (A, B, C, D, and E).

2. Identify the greatest fraction in each row (1, 2, 3, 4, and 5).

3. Which fraction is the greatest fraction in the entire table?

## 12.2: Relative to $\frac{1}{2}$ and 1

Here is the same table you saw earlier.

	A	B	C	D	E
1	$\frac{2}{3}$	$\frac{2}{5}$	$\frac{2}{10}$	$\frac{2}{12}$	$\frac{2}{100}$
2	$\frac{4}{3}$	$\frac{4}{5}$	$\frac{4}{10}$	$\frac{4}{12}$	$\frac{4}{100}$
3	$\frac{7}{3}$	$\frac{7}{5}$	$\frac{7}{10}$	$\frac{7}{12}$	$\frac{7}{100}$
4	$\frac{11}{3}$	$\frac{11}{5}$	$\frac{11}{10}$	$\frac{11}{12}$	$\frac{11}{100}$
5	$\frac{26}{3}$	$\frac{26}{5}$	$\frac{26}{10}$	$\frac{26}{12}$	$\frac{26}{100}$

1. Which fractions are less than  $\frac{1}{2}$ ? Circle each one of them. Then, complete this sentence:

I know a fraction is less than  $\frac{1}{2}$  when . . .

2. Which are greater than  $\frac{1}{2}$  but less than 1? Circle each of them with a pencil of a different color (or draw a triangle around each one). Then, complete this sentence:

I know a fraction is greater than  $\frac{1}{2}$  but less than 1 when . . .

3. Circle the remaining fractions with a pencil of a third color (or draw a square around each one). How would you describe the size of these fractions?

4. Next to the table, create a legend or key to show what each color (or each shape) represents.

5. Here are some pairs of fractions from the table. In each pair, which fraction is greater?

a.  $\frac{2}{5}$  or  $\frac{7}{10}$

b.  $\frac{4}{10}$  or  $\frac{7}{12}$

c.  $\frac{11}{100}$  or  $\frac{4}{3}$

d.  $\frac{26}{10}$  or  $\frac{11}{12}$

# Lesson 13: Use Equivalent Fractions to Compare

- Let's compare fractions by writing an equivalent fraction.

## Warm-up: Notice and Wonder: Pairs of Numbers

What do you notice? What do you wonder?

$$5 < 8$$

$$\frac{9}{2} > 4\frac{1}{2}$$

$$4 = \frac{3}{2}$$

$$\frac{1}{3} < \frac{1}{2}$$

## 13.1: Pairs to Compare

Here are some pairs of fractions sorted into three groups. Circle the greater fraction in each pair. Explain or show your reasoning.

1. Group 1:

a.  $\frac{2}{10}$  or  $\frac{26}{100}$

b.  $\frac{2}{5}$  or  $\frac{11}{100}$

2. Group 2:

a.  $\frac{2}{3}$  or  $\frac{7}{12}$

b.  $\frac{4}{5}$  or  $\frac{7}{10}$

3. Group 3:

a.  $\frac{11}{5}$  or  $\frac{26}{10}$

b.  $\frac{11}{3}$  or  $\frac{26}{12}$

## 13.2: New Pairs to Compare

1. Decide whether each statement is true or false. Be prepared to show how you know.

a.  $\frac{5}{12} = \frac{2}{6}$

b.  $\frac{10}{3} < \frac{44}{12}$

c.  $\frac{1}{4} > \frac{25}{100}$

d.  $\frac{8}{15} < \frac{3}{5}$

2. Compare each pair of fractions. Use the symbols  $<$ ,  $=$ , and  $>$  to make each statement true.

a.  $\frac{6}{12}$  \_\_\_\_\_  $\frac{4}{6}$

b.  $\frac{4}{3}$  \_\_\_\_\_  $\frac{7}{6}$

c.  $\frac{8}{5}$  \_\_\_\_\_  $\frac{400}{100}$

d.  $\frac{12}{10}$  \_\_\_\_\_  $\frac{35}{5}$

e.  $\frac{11}{4}$  \_\_\_\_\_  $\frac{17}{8}$

f.  $\frac{7}{12}$  \_\_\_\_\_  $\frac{4}{3}$

# Lesson 14: Fraction Comparison Problems

- Let's solve different kinds of fraction comparison problems.

## Warm-up: Number Talk: Multiples of Ten

Find the value of each expression mentally.

- $119 + 119$

- $139 + 139$

- $159 + 159$

- $199 + 199$

## 14.1: Mystery Fractions

Six friends are each given a list of 5 fractions. They each chose one fraction quietly and wrote clues about their choice. Use their clues to identify the fractions they chose.

Andre:  $\frac{8}{12}$   $\frac{3}{6}$   $\frac{3}{4}$   $\frac{3}{2}$   $\frac{2}{12}$

- less than 1
- greater than  $\frac{1}{3}$
- less than  $\frac{2}{3}$

Tyler:  $\frac{2}{6}$   $\frac{2}{2}$   $\frac{2}{4}$   $\frac{2}{3}$   $\frac{2}{5}$

- greater than  $\frac{1}{3}$
- less than 1
- less than  $\frac{1}{2}$

Clare:  $\frac{4}{3}$   $\frac{4}{2}$   $\frac{3}{4}$   $\frac{1}{4}$   $\frac{2}{10}$

- greater than  $\frac{2}{8}$
- less than  $\frac{11}{6}$
- greater than 1

Diego:  $\frac{2}{8}$   $\frac{6}{12}$   $\frac{6}{8}$   $\frac{12}{10}$   $\frac{11}{12}$

- greater than  $\frac{1}{2}$
- less than 1
- greater than  $\frac{3}{4}$

Elena:  $\frac{2}{12}$   $\frac{50}{100}$   $\frac{4}{10}$   $\frac{3}{5}$   $\frac{7}{5}$

- greater than  $\frac{2}{10}$
- less than 1
- greater than  $\frac{3}{6}$

Noah:  $\frac{18}{10}$   $\frac{7}{8}$   $\frac{2}{5}$   $\frac{18}{5}$   $\frac{150}{100}$

- greater than  $\frac{1}{2}$
- less than  $\frac{25}{10}$
- greater than  $\frac{8}{5}$

## 14.2: Distances on Foot

In China and some East Asian countries, the unit “li” is used for measuring distance.

Here are the walking distances between the home of a student in China and the places he visits regularly.

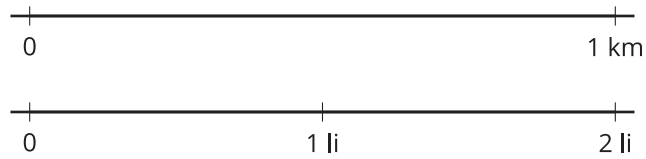
- school:  $\frac{7}{5}$  li
- library:  $\frac{23}{10}$  li
- market:  $\frac{7}{4}$  li
- badminton club:  $\frac{23}{12}$  li



1. Which is a shorter distance from the student’s home:

- His school or the library?
- The market or the badminton club?
- The library or the market?

2. A student in America walks  $\frac{4}{5}$  kilometer (km) to school. These number lines show how 1 kilometer compares to 1 li.



Which student walks a longer distance to school? Use the number lines to show your reasoning.

3. Explain why we can’t just compare the fractions  $\frac{4}{5}$  and  $\frac{7}{5}$  to see which student walks a longer distance.

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# Lesson 15: Common Denominators to Compare

- Let's compare fractions by writing equivalent fractions with the same denominator.

## Warm-up: What Do You Know about 15 and 30?

What do you know about 15 and 30?

## 15.1: Tricky Fractions?

1. In each pair of fractions, which fraction is greater? Explain or show your reasoning.

a.  $\frac{4}{3}$  or  $\frac{13}{12}$

b.  $\frac{4}{3}$  or  $\frac{7}{5}$

2. Han says he can compare  $\frac{4}{3}$  and  $\frac{13}{12}$  by writing an equivalent fraction for  $\frac{4}{3}$ . He says he can't use that strategy to compare  $\frac{4}{3}$  and  $\frac{7}{5}$ . Do you agree? Explain your reasoning.

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3. Priya and Lin showed different ways for comparing  $\frac{4}{3}$  and  $\frac{7}{5}$ . Make sense of what they did. How are their strategies alike? How are they different?

Priya:  $\frac{4 \times 5}{3 \times 5} = \frac{20}{15}$        $\frac{7 \times 3}{5 \times 3} = \frac{21}{15}$

$\frac{21}{15}$  is greater than  $\frac{20}{15}$ , so  $\frac{7}{5}$  is greater than  $\frac{4}{3}$ .

Lin:  $\frac{4 \times 10}{3 \times 10} = \frac{40}{30}$        $\frac{7 \times 6}{5 \times 6} = \frac{42}{30}$

$\frac{42}{30}$  is greater than  $\frac{40}{30}$ , so  $\frac{7}{5}$  is greater than  $\frac{4}{3}$ .

## 15.2: Use a Common Denominator, or Not

1. For each pair of fractions, write a pair of equivalent fractions with a common denominator.

a.  $\frac{5}{6}$  and  $\frac{3}{4}$

b.  $\frac{2}{3}$  and  $\frac{5}{8}$

c.  $\frac{2}{6}$  and  $\frac{4}{10}$

d.  $\frac{7}{4}$  and  $\frac{17}{10}$

2. For each pair of fractions, decide which fraction is greater. Be prepared to explain your reasoning.

a.  $\frac{5}{12}$  or  $\frac{3}{8}$

b.  $\frac{13}{5}$  or  $\frac{11}{6}$

c.  $\frac{71}{10}$  or  $\frac{34}{5}$

d.  $\frac{7}{12}$  or  $\frac{49}{100}$

# Lesson 16: Compare and Order Fractions

- Let's put some fractions in order.

## Warm-up: Number Talk: Multiples of 6 and 12

Find the value of each expression mentally.

- $5 \times 6$

- $5 \times 12$

- $6 \times 12$

- $11 \times 12$

## 16.1: Compare Fractions Game

Play Compare Fractions with 2 players:

- Split the deck between the players.
- Each player turns over a card.
- Compare the fractions. The player with the greater fraction keeps both cards.
- If the fractions are equivalent, each player turns over one more card. The player with the greater fraction keeps all four cards.
- Play until you run out of cards. The player with the most cards at the end of the game wins.

fraction cards



Play Compare Fractions with 3 or 4 players:

- The player with the greatest fraction wins the round.
- If 2 or more players have the greatest fraction, those players turn one more card over. The player with the greatest fraction keeps all the cards.

Record any sets of fractions that are challenging to compare here.

\_\_\_\_\_ and \_\_\_\_\_

\_\_\_\_\_ and \_\_\_\_\_

\_\_\_\_\_ and \_\_\_\_\_

\_\_\_\_\_ and \_\_\_\_\_

## 16.2: Fractions in Order

Put each set of fractions in order, from least to greatest. Be prepared to explain your reasoning.

1.  $\frac{3}{12}$     $\frac{2}{4}$     $\frac{2}{3}$     $\frac{1}{8}$

2.  $\frac{8}{5}$     $\frac{5}{6}$     $\frac{11}{12}$     $\frac{11}{10}$

3.  $\frac{21}{20}$     $\frac{9}{10}$     $\frac{6}{5}$     $\frac{101}{100}$

4.  $\frac{5}{8}$     $\frac{2}{5}$     $\frac{3}{7}$     $\frac{3}{6}$

## Section Summary

### Section Summary

In this section, we compared fractions using what we know about the size of fractions, benchmarks such as  $\frac{1}{2}$  and 1, and equivalent fractions. For example, to compare  $\frac{3}{8}$  and  $\frac{6}{10}$ , we can reason that:

- $\frac{4}{8}$  is equivalent to  $\frac{1}{2}$ , so  $\frac{3}{8}$  is less than  $\frac{1}{2}$ .
- $\frac{5}{10}$  is equivalent to  $\frac{1}{2}$ , so  $\frac{6}{10}$  is more than  $\frac{1}{2}$ .

This means that  $\frac{6}{10}$  is greater than  $\frac{3}{8}$  (or  $\frac{3}{8}$  is less than  $\frac{6}{10}$ ).

We can also compare by writing equivalent fractions with the same denominator. For example, to compare  $\frac{3}{4}$  and  $\frac{4}{6}$ , we can use 12 as the denominator:

$$\frac{3}{4} = \frac{9}{12} \qquad \frac{4}{6} = \frac{8}{12}$$

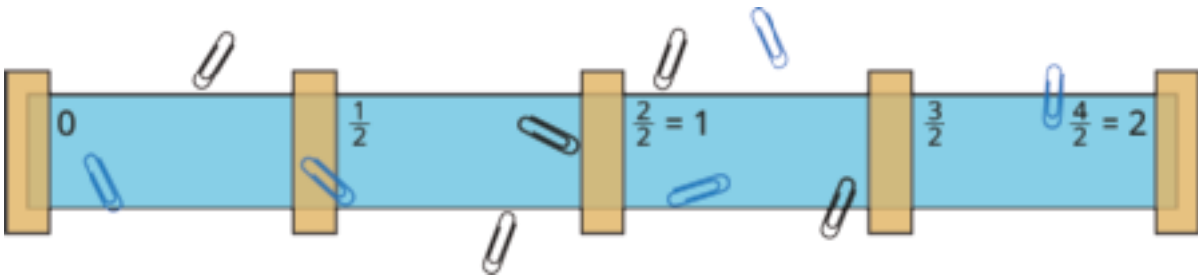
Because  $\frac{9}{12}$  is greater than  $\frac{8}{12}$ , we know that  $\frac{3}{4}$  is greater than  $\frac{4}{6}$ .

# Lesson 17: Paper Clip Games

- Let's create a game about locating and comparing fractions on the number line.

## Warm-up: Notice and Wonder: Lots of Paper Clips

What do you notice? What do you wonder?



## 17.1: Paper Clip Tossing Game

Let's prepare a game board and figure out how to toss paper clips and record the results!

1. Make your game board:

- Tape the paper strip to your workspace. Place the tape at these benchmarks:  $0$ ,  $\frac{1}{2}$ ,  $1$ ,  $\frac{3}{2}$ , and  $2$ .
- Label the benchmark fractions  $0$ ,  $\frac{1}{2}$ ,  $1$ ,  $\frac{3}{2}$ , and  $2$  on the paper strip.

2. Play the game:

- Take turns tossing the paper clips onto the game board.
- Label the fraction where each paper clip lands.

Be prepared to share your strategies for tossing the paper clips and for finding out the fractions for their locations.

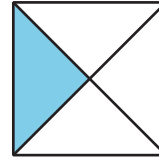
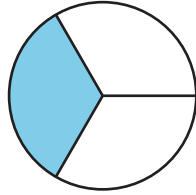




## Section A: Practice Problems

### 1. Pre-unit

What fraction of each figure is shaded?



### 2. Pre-unit

Explain why the shaded portion represents  $\frac{1}{8}$  of the full rectangle.

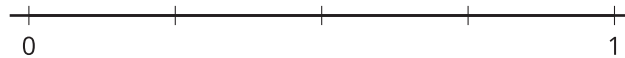


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### 3. Pre-unit

Label each tick mark with the number it represents. Explain your reasoning.



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### 4. Pre-unit

Explain or show why  $\frac{1}{2}$  and  $\frac{2}{4}$  are equivalent fractions.

5. a. The entire diagram represents 1 whole. Shade the diagram to represent  $\frac{1}{4}$ .



- b. To represent  $\frac{1}{6}$  on the tape diagram, would we shade more or less than what we did for  $\frac{1}{4}$ ? Explain your reasoning.

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(From Unit 2, Lesson 1.)

6. a. The entire diagram represents 1 whole. What fraction does the shaded portion represent? Explain your reasoning.



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- b. Shade this diagram to represent  $\frac{2}{10}$ .



(From Unit 2, Lesson 2.)

7. For each pair of fractions, decide which is greater. Explain or show your reasoning.

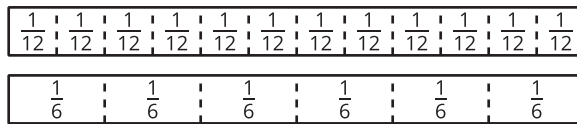
a.  $\frac{1}{8}$  or  $\frac{1}{10}$

b.  $\frac{4}{10}$  or  $\frac{7}{10}$

c.  $\frac{4}{5}$  or  $\frac{5}{4}$

(From Unit 2, Lesson 3.)

8. Use the fraction strips to name three pairs of equivalent fractions. Explain how you know the fractions are equivalent.



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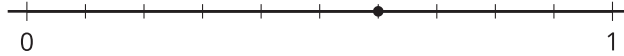
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(From Unit 2, Lesson 4.)

9. a. Explain or show why the point on the number line describes both  $\frac{3}{5}$  and  $\frac{6}{10}$ .



- b. Explain why  $\frac{6}{10}$  and  $\frac{3}{5}$  are equivalent fractions.

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(From Unit 2, Lesson 5.)

10. For each question, explain your reasoning. Use a number line if you find it helpful.

- a. Is  $\frac{4}{5}$  more or less than  $\frac{1}{2}$ ? 

- b. Is  $\frac{4}{5}$  more or less than 1? 

(From Unit 2, Lesson 6.)

**11. Exploration**

Make fraction strips for each of these fractions. How did you fold the paper to make sure you have the right-size parts?

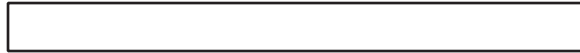
a.  $\frac{1}{3}S$



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b.  $\frac{1}{5}S$



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c.  $\frac{1}{10}S$

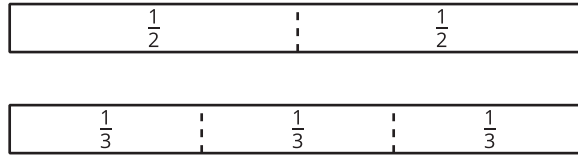


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12. **Exploration**

a. Andre looks at these fraction strips and says “Each  $\frac{1}{2}$  is  $\frac{1}{3}$  and another half of  $\frac{1}{3}$ ”. Do you agree with Andre? Explain your reasoning.




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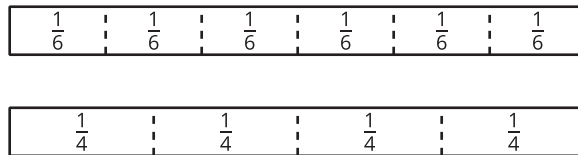


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b. What relationship do you see between  $\frac{1}{6}$  and  $\frac{1}{4}$ ? Explain your reasoning.




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c. Can you find a relationship between  $\frac{1}{6}$  and  $\frac{1}{8}$  using fraction strips?

## Section B: Practice Problems

1. Name three fractions that are equivalent to  $\frac{2}{5}$ . Explain or show your reasoning.

(From Unit 2, Lesson 7.)

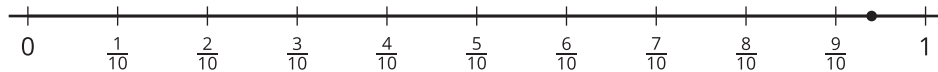
2. Which of these could be the fraction that the point represents? Explain your reasoning.

$$\frac{86}{100}$$

$$\frac{90}{100}$$

$$\frac{94}{100}$$

$$\frac{101}{100}$$



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(From Unit 2, Lesson 8.)

3. Explain why the fractions  $\frac{10}{3}$  and  $\frac{40}{12}$  are equivalent.

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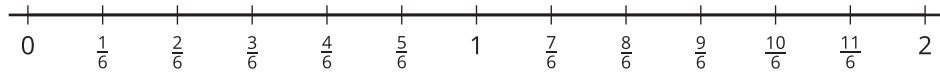
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(From Unit 2, Lesson 9.)

4. Find two fractions equivalent to  $\frac{10}{6}$ . Explain or show why they are equivalent to  $\frac{10}{6}$ . Use the number line if you think it is helpful.



(From Unit 2, Lesson 10.)

5. Jada says that  $\frac{7}{5}$  is equivalent to  $\frac{14}{10}$  because the numerator and denominator of  $\frac{14}{10}$  are each 2 times the numerator and denominator of  $\frac{7}{5}$ .

a. Explain why Jada's reasoning is correct.

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b. Use Jada's method to find another fraction equivalent to  $\frac{7}{5}$ .

(From Unit 2, Lesson 11.)

## 6. Exploration

Jada is thinking of a fraction. She gives several clues to help you guess her fraction. Try to guess Jada's fraction after each clue.

- a. My fraction is equivalent to  $\frac{2}{3}$ .
- b. The numerator of my fraction is greater than 10.
- c. 8 is a factor of my numerator.
- d. 8 and 5 are a factor pair of my numerator.

## 7. Exploration

Think of a fraction: \_\_\_\_\_

Write several clues so a friend or family member can guess your fraction. Then, present the clues one at a time and ask them to make a guess after each one.

- a. My fraction is equivalent to \_\_\_\_\_.
- b. The numerator of my fraction is less than \_\_\_\_\_.
- c. One multiple of my numerator is \_\_\_\_\_.
- d. A factor pair of my denominator is \_\_\_\_\_ and \_\_\_\_\_.

**8. Exploration**

- a. Diego says he shaded  $\frac{10}{20}$  of the diagram. Do you agree with Diego? Explain your reasoning.



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- b. Shade  $\frac{18}{24}$  of the diagram. Explain how you know  $\frac{18}{24}$  is shaded.



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## Section C: Practice Problems

1. For each pair of fractions, decide which fraction is greater. Explain or show your reasoning.

a.  $\frac{2}{5}$  or  $\frac{2}{6}$

b.  $\frac{5}{8}$  or  $\frac{7}{8}$

c.  $\frac{9}{10}$  or  $\frac{103}{100}$

(From Unit 2, Lesson 12.)

2. Use a  $<$ ,  $=$ , or  $>$  to make each statement true. Explain or show your reasoning.

a.  $\frac{2}{3}$  \_\_\_\_\_  $\frac{10}{15}$

b.  $\frac{1}{5}$  \_\_\_\_\_  $\frac{22}{100}$

c.  $\frac{10}{4}$  \_\_\_\_\_  $\frac{45}{20}$

(From Unit 2, Lesson 13.)

3. There is a water fountain  $\frac{7}{10}$  mile from the start of a hiking trail. There is a pond  $\frac{3}{5}$  mile from the start of the trail. If a hiker begins walking at the start of the trail, which will they come across first, the water fountain or the pond? Explain your reasoning.

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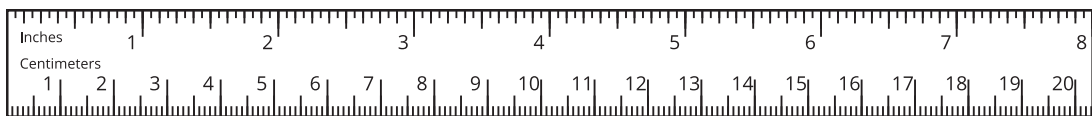
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(From Unit 2, Lesson 14.)

4. Tyler said he grew  $\frac{3}{2}$  centimeters since his height was measured six months ago.

Diego said, "Oh, you grew more than I did! My height went up only by  $\frac{7}{8}$  inch in the past six months."

Explain why Tyler may not have grown more than Diego did, even though  $\frac{3}{2}$  is greater than  $\frac{7}{8}$ .



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(From Unit 2, Lesson 14.)

5. List these fractions from least to greatest. Explain or show your reasoning.

$$\frac{1}{3} \quad \frac{5}{12} \quad \frac{2}{10}$$

(From Unit 2, Lesson 15.)

6. List these fractions from least to greatest. Explain or show your reasoning.

$$\frac{15}{8} \quad \frac{215}{100} \quad \frac{7}{4} \quad \frac{21}{10}$$

(From Unit 2, Lesson 16.)

**7. Exploration**

Jada lists these fractions that are all equivalent to  $\frac{1}{2}$ :  $\frac{2}{4}, \frac{3}{6}, \frac{4}{8}, \frac{5}{10}$

She notices that each time the numerator increases by 1 and the denominator increases by 2. Will the pattern Jada notices continue? Explain your reasoning.

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**8. Exploration**

Find a fraction that is between  $\frac{2}{5}$  and  $\frac{3}{8}$ . Explain or show your reasoning.

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