5.2 Using Other Models to Add Fractions

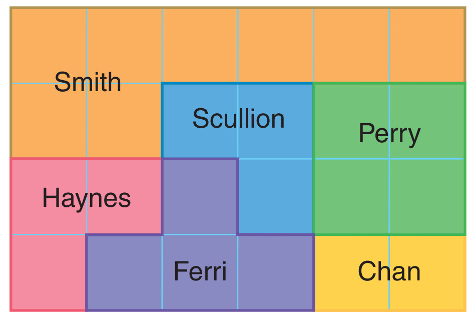
Focus Use fraction strips and number lines to add fractions.

We can use an area model to show fractions of one whole.

Explore

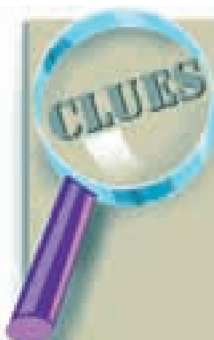
Your teacher will give you a copy of the map.
The map shows a section of land owned by 6 people.

- What fraction of land did each person own?
  What strategies did you use to find out?



Three people sold land to the other 3 people.

- Use the clues below to draw the new map.
- Write addition equations, such as $\frac{1}{2} + \frac{1}{4} = \frac{3}{4}$, to keep track of the land sales.



1. When all the sales were finished, four people owned all the land — Smith, Perry, Chan, and Haynes.
2. Smith now owns $\frac{1}{2}$ of the land.
3. Perry kept $\frac{1}{2}$ of her land, and sold the other half.
4. Chan bought land from two other people. He now owns $\frac{1}{4}$ of the land.
5. Haynes now owns the same amount of land as Perry started with.

Reflect & Share

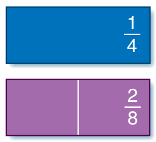
Did you find any equivalent fractions? How do you know they are equivalent?
Which clues helped you most to draw the new map? Explain how they helped.

Connect

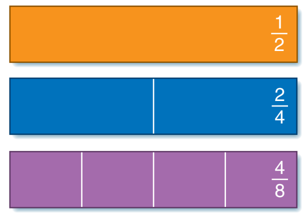
You can model fractions with strips of paper called **fraction strips**.

Here are more fraction strips and some equivalent fractions they show.

Recall that equivalent fractions show the same amount.



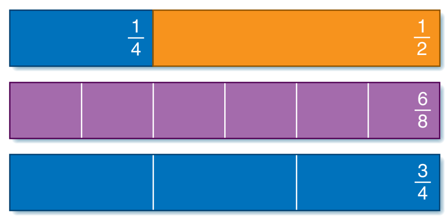
$\frac{1}{4} = \frac{2}{8}$



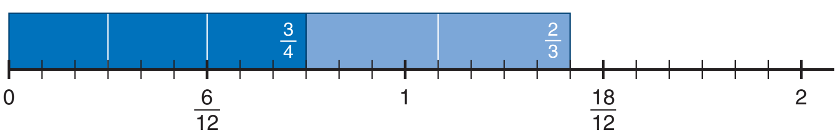
$\frac{1}{2} = \frac{2}{4} = \frac{4}{8}$

This strip represents 1 whole.

To add $\frac{1}{4} + \frac{1}{2}$, align the strips for $\frac{1}{4}$ and $\frac{1}{2}$.
Find a single strip that has the same length as the two strips.
There are 2 single strips: $\frac{6}{8}$ and $\frac{3}{4}$
So, $\frac{1}{4} + \frac{1}{2} = \frac{6}{8}$
And, $\frac{1}{4} + \frac{1}{2} = \frac{3}{4}$
$\frac{3}{4}$ and $\frac{6}{8}$ are equivalent fractions.
The fraction $\frac{3}{4}$ is in simplest form.
A fraction is in **simplest form** when the numerator and denominator have no common factors other than 1.



When the sum is greater than 1, we could use fraction strips and a number line.



$\frac{3}{4} + \frac{2}{3} = \frac{17}{12}$

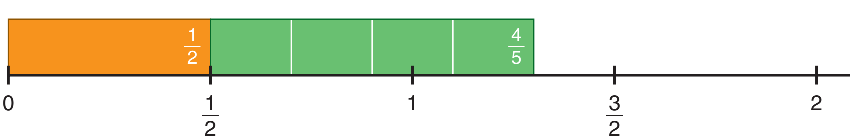
Example

Add. $\frac{1}{2} + \frac{4}{5}$

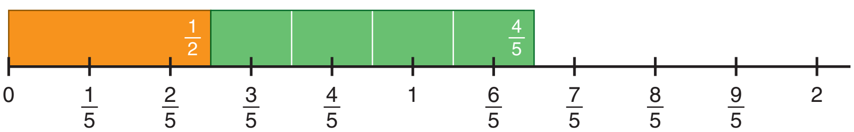
A Solution

$\frac{1}{2} + \frac{4}{5}$

Place both strips end-to-end on the halves line.
The right end of the $\frac{4}{5}$-strip does not line up with a fraction on the halves line.

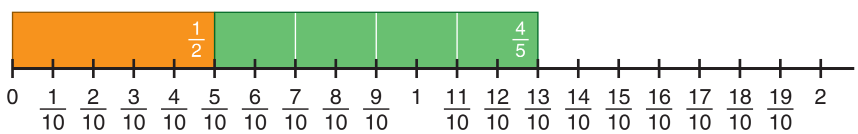


Place both strips on the fifths line.



The right end of the $\frac{4}{5}$-strip does not line up with a fraction on the fifths line. Find a line on which to place both strips so the end of the $\frac{4}{5}$-strip lines up with a fraction.

Another Strategy
We could add these fractions using fraction circles.



The end of the $\frac{4}{5}$-strip lines up with a fraction on the tenths line. The strips end at $\frac{13}{10}$. So, $\frac{1}{2} + \frac{4}{5} = \frac{13}{10}$

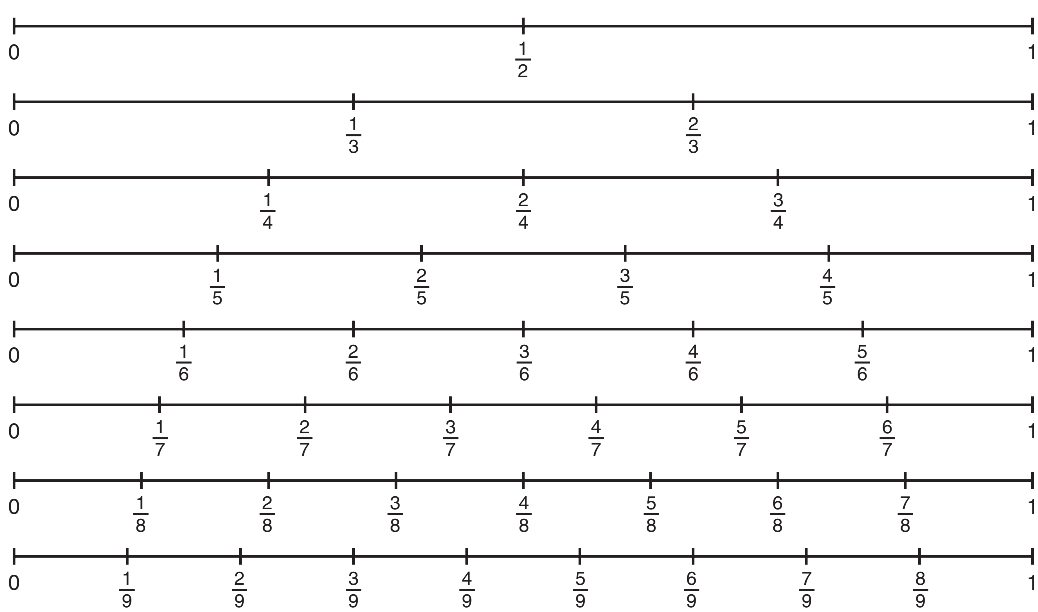
Practice

Use fraction strips and number lines.

1. Use the number lines below. List all fractions equivalent to:

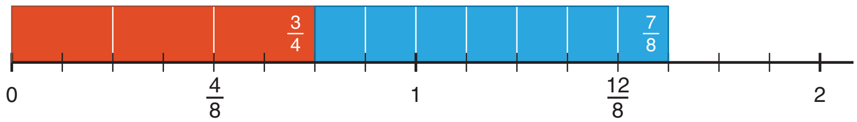
a) $\frac{1}{2}$ **b)** $\frac{1}{4}$ **c)** $\frac{2}{3}$

Use a ruler to align the fractions if it helps.

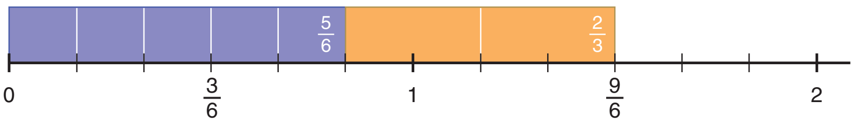


2. Write an addition equation for each picture.

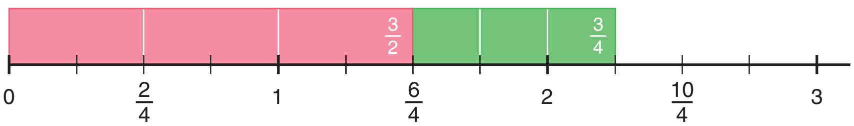
a)



b)



c)



3. Use your answers to question 2.

a) Look at the denominators in each part, and the number line you used to get the answer. What patterns do you see?

b) The denominators in each part of question 2 are **related denominators**. Why do you think they have this name?

4. Add.

a) $\frac{1}{3} + \frac{5}{6}$ b) $\frac{7}{12} + \frac{1}{3}$ c) $\frac{3}{5} + \frac{1}{10}$ d) $\frac{1}{6} + \frac{1}{12}$

5. Add.

a) $\frac{1}{3} + \frac{1}{2}$ b) $\frac{3}{4} + \frac{5}{6}$ c) $\frac{3}{5} + \frac{1}{2}$ d) $\frac{2}{3} + \frac{1}{5}$

6. Look at your answers to question 5.

a) Look at the denominators in each part, and the number line you used to get the answer. What patterns do you see?

b) The denominators in each part of question 5 are called **unrelated denominators**. Why do you think they have this name?

c) When you add 2 fractions with unrelated denominators, how do you decide which number line to use?

7. Add.

a) $\frac{1}{3} + \frac{2}{7}$ b) $\frac{3}{4} + \frac{2}{9}$ c) $\frac{4}{5} + \frac{5}{8}$ d) $\frac{2}{5} + \frac{3}{7}$

8. Abey and Anoki are eating chocolate bars.
The bars are the same size.
Abey has $\frac{3}{4}$ left. Anoki has $\frac{5}{6}$ left.
How much chocolate is left altogether? Show your work.

9. **Assessment Focus** Use any of the digits 1, 2, 3, 4, 5, 6 only once. Copy and complete. Replace each □ with a digit.

$$\frac{\square}{\square} + \frac{\square}{\square}$$

a) Find as many sums as you can that are between 1 and 2.
b) Find the least sum that is greater than 1.
Show your work.

10. Find 2 fractions with a sum of $\frac{3}{2}$. Try to do this as many ways as you can. Record each way you find.

11. **Take It Further** A jug holds 2 cups of liquid. A recipe for punch is $\frac{1}{2}$ cup of orange juice, $\frac{1}{4}$ cup of raspberry juice, $\frac{3}{8}$ cup of grapefruit juice, and $\frac{5}{8}$ cup of lemonade.
Is the jug big enough for the punch? Explain how you know.

12. **Take It Further** A pitcher of juice is half empty. After $\frac{1}{2}$ cup of juice is added, the pitcher is $\frac{3}{4}$ full.
How much juice does the pitcher hold when it is full?
Show your thinking.

Math Link

Music
Musical notes are named for fractions.
The type of note shows a musician how long to play the note. In math, two halves make a whole — in music, two half notes make a whole note!

whole note | half note | quarter note | eighth note | sixteenth note

Reflect

What do you now know about adding fractions that you did not know at the beginning of the lesson?