Subtract Fractions

LESSON 13

Dear Family,

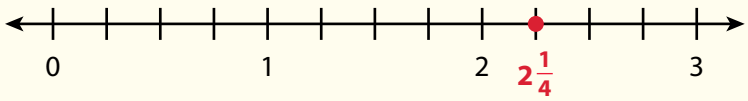
This week your child is learning to subtract fractions with unlike denominators.

Your child might see a problem like this:

> *Sierra needs $2\frac{1}{4}$ cups of almond milk for a recipe. She has $\frac{1}{2}$ cup. How much more almond milk does Sierra need?*

One way to model subtracting $\frac{1}{2}$ from $2\frac{1}{4}$ is with a number line.

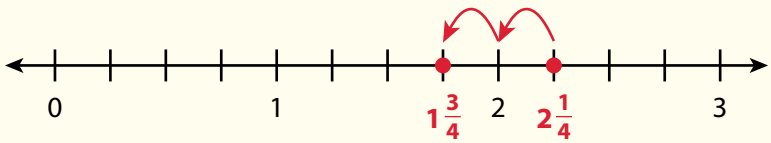
Start at the point $2\frac{1}{4}$.



Each whole on the number line is divided into 4 equal parts.

To subtract $\frac{1}{2}$, you need to find a common denominator with the fraction in $2\frac{1}{4}$. The number 4 is a multiple of 2 and 4, so 4 is a common denominator.

Because $\frac{1}{2}$ is equivalent to $\frac{2}{4}$, you can start at $2\frac{1}{4}$ and jump back (left) $\frac{2}{4}$.



Each jump back is $\frac{1}{4}$.

The number line shows that $2\frac{1}{4} - \frac{1}{2} = 1\frac{3}{4}$. Sierra needs $1\frac{3}{4}$ cups of almond milk.

Some other ways your child can think about subtracting fractions include using fraction bars or using multiplication to replace the given fractions with equivalent fractions that have the same denominator.

Invite your child to share what they know about subtracting fractions by doing the following activity together.

Learning Games

- Cupcake
- Cloud Machine

Math Tools

- Number Line
- Fraction Models

ACTIVITY SUBTRACTING FRACTIONS

Do this activity with your child to subtract fractions.

Materials ruler, yardstick, or measuring tape, and a variety of household objects

Work with your child to compare the lengths or heights of various objects around your home.

- Find two objects and measure their lengths. Measure the length of one object to the nearest $\frac{1}{2}$ inch and the length of the second object to the nearest $\frac{1}{8}$ or $\frac{1}{16}$ inch.

  Examples: lengths of fork and spoon, heights of chair and table

- Determine how much longer one object is than the other.

- Continue to practice adding fractions by finding the combined length of two or more objects and then comparing the combined length to another length.

- Find the combined length of a large spoon and a small spoon. Next, find the combined length of a fork and a spoon. Then find the difference between the two combined lengths.

Look for other real-world examples of subtracting fractions with your child.

Explore Subtracting Fractions

In the previous lesson, you learned about adding fractions. Now you will learn about subtracting fractions. Use what you know to try to solve the problem below.

Inés makes a wooden tongue drum with her brother. The top of the drum is $\frac{3}{4}$-inch thick with an "H" cut out to make two "tongues" for different sounds. One tongue is $\frac{1}{8}$ inch thicker than the top and the other tongue is $\frac{1}{8}$ inch thinner. What are the thicknesses of the two tongues?

TRY IT

Math Toolkit

- fraction tiles
- fraction circles
- fraction bars
- fraction models
- grid paper
- number lines

DISCUSS IT

Ask your partner: Can you explain that again?

Tell your partner: I started by . . .

Learning Targets SMP 1, SMP 2, SMP 3, SMP 4, SMP 5, SMP 6, SMP 7, SMP 8

- Subtract fractions with unlike denominators.
- Subtract mixed numbers with unlike denominators.

CONNECT IT

1 LOOK BACK

Explain how to find the thicknesses of the two tongues of the drum.

2 LOOK AHEAD

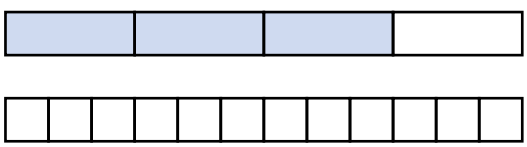
Just like with adding fractions, you must find a common denominator to subtract fractions with unlike denominators, such as $\frac{3}{4} - \frac{1}{3}$.

a. Write the first four multiples of each denominator. Then circle the common multiple to find a common denominator.

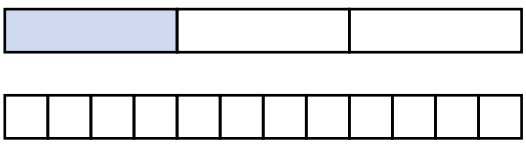
Multiples of 4: ....., ..., ..., ...

Multiples of 3: ....., ..., ..., ...

b. Complete the models and equations to show the equivalent fractions for $\frac{3}{4}$ and $\frac{1}{3}$ using the common multiple as the common denominator.



$\frac{3}{4} = \frac{\square}{12}$



$\frac{1}{3} = \frac{\square}{12}$

c. Use the equivalent fractions to subtract.

$\frac{3}{4} - \frac{1}{3} = \frac{\square}{12} - \frac{\square}{12} = \frac{\square}{12}$

3 REFLECT

How is subtracting fractions like adding fractions?

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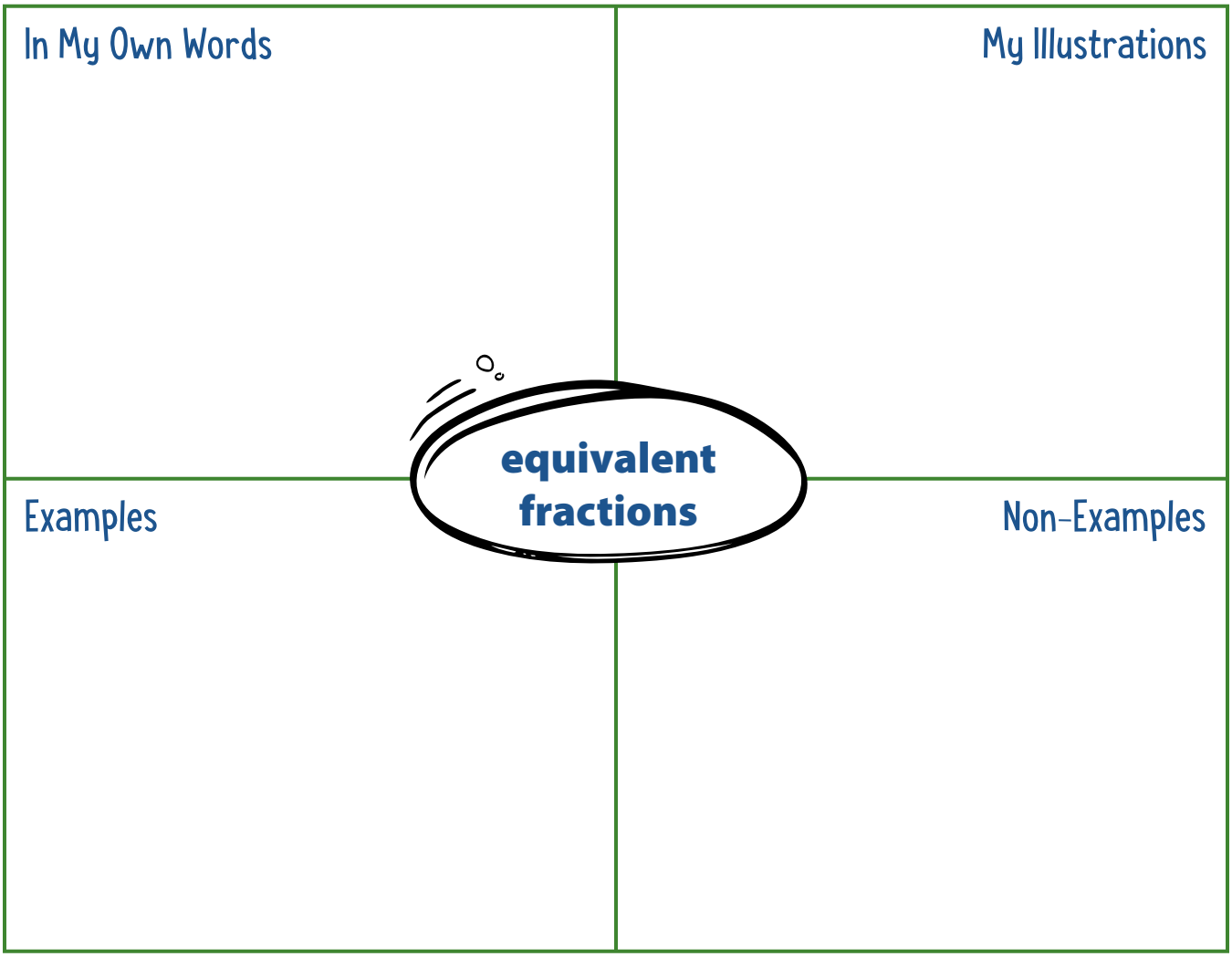
Prepare for Subtracting Fractions

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



2 Kama says that the fraction $\frac{7}{8}$ is equivalent to $\frac{3}{4}$. Is she right? Explain.

3 Solve the problem. Show your work.

Darin and his mom go camping. The trail to the campground is $\frac{5}{8}$ mile long. The trail to the overlook is $\frac{1}{4}$ mile longer and the trail to the river is $\frac{1}{4}$ mile shorter than the $\frac{5}{8}$-mile trail to the campground. What are the lengths of the trails to the overlook and the river?

Solution

4 Check your answer. Show your work.

Develop Subtracting Fractions with Unlike Denominators

Read and try to solve the problem below.

Chaska has $\frac{2}{3}$ pint of water left in his water bottle.

He drinks $\frac{1}{2}$ pint. How much water is left in the bottle now?

TRY IT

Math Toolkit

- fraction tiles
- fraction circles
- fraction bars
- fraction models
- grid paper
- number lines

DISCUSS IT

Ask your partner: How did you get started?

Tell your partner: I am not sure how to find the answer because . . .

Explore different ways to understand subtracting fractions with unlike denominators.

Chaska has $\frac{2}{3}$ pint of water left in his water bottle. He drinks $\frac{1}{2}$ pint. How much water is left in the bottle now?

PICTURE IT

You can use a picture to model subtracting fractions.

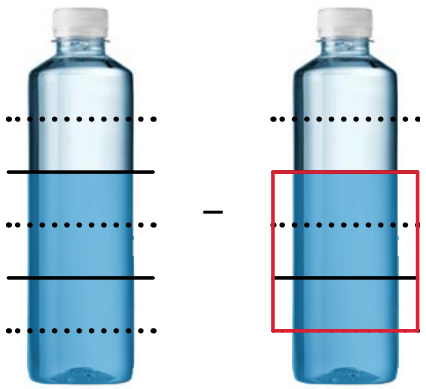
The water bottle is marked to show that it has $\frac{2}{3}$ pint of water in it. Chaska drinks $\frac{1}{2}$ pint of water.

Use equivalent fractions to find a common denominator.

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

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

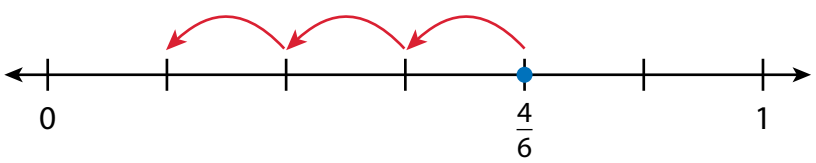
Now the water bottle is marked to show sixths. You can subtract $\frac{3}{6}$ from $\frac{4}{6}$.



MODEL IT

You can use a number line to model subtracting fractions.

The number line below is divided into sixths, the common denominator.



Start at $\frac{4}{6}$ and jump left $\frac{3}{6}$. ($\frac{3}{6}$ is three $\frac{1}{6}$ units on the number line.)

CONNECT IT

Now you will use the problem from the previous page to help you understand how to use equivalent fractions to subtract.

1 Look at **Picture It** and **Model It** from the previous page. Why is $\frac{2}{3}$ rewritten as $\frac{4}{6}$? Why is $\frac{1}{2}$ rewritten as $\frac{3}{6}$?

2 Why are sixths chosen as a common denominator?

3 Use sixths as a common denominator. Write an equation to show the difference of $\frac{2}{3}$ and $\frac{1}{2}$.

4 How much water is left in the bottle?

5 Could you have subtracted with a different common denominator? Provide an example.

6 Explain how to subtract two fractions with unlike denominators.

7 REFLECT

Look back at your **Try It**, strategies by classmates, and **Picture It** and **Model It**. Which models or strategies do you like best for subtracting fractions with unlike denominators? Explain.

APPLY IT

Use what you just learned to solve these problems.

8 What is $\frac{7}{8} - \frac{1}{6}$? Show your work.

Solution

9 On winter days, Rachel feeds each of her chickens $\frac{3}{4}$ cup of food. On summer days, she feeds each chicken $\frac{2}{3}$ cup of food. How much more food does Rachel feed each chicken on winter days? Show your work.

Solution

10 What is the value of the expression $\frac{9}{10} - \frac{3}{5}$? Show your work.

Solution

Practice Subtracting Fractions with Unlike Denominators

Study the Example showing one way to subtract fractions with unlike denominators. Then solve problems 1–5.

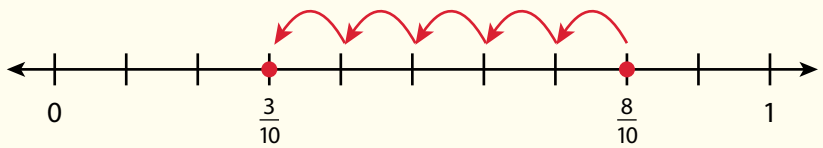
EXAMPLE

Lieu lives $\frac{4}{5}$ mile from school and $\frac{3}{10}$ mile from the soccer field. How much closer does she live to the soccer field than to school?

You can show $\frac{4}{5} - \frac{3}{10}$ using a number line. Use a common multiple to find the common denominator.

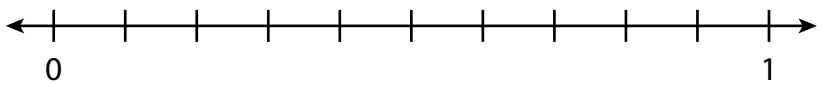
Rewrite the fractions as needed. $\frac{4}{5} = \frac{8}{10}$

Show the difference between the distance from school, $\frac{8}{10}$ mile, and the distance from the soccer field, $\frac{3}{10}$ mile, on a number line.



Lieu lives $\frac{5}{10}$, or $\frac{1}{2}$, mile closer to the soccer field than to school.

1 How could you count back on a number line to find the difference between $\frac{4}{5}$ and $\frac{5}{10}$? Show your work.



The difference is _____.

2 Salvador added up on a number line to find $\frac{4}{5} - \frac{5}{10}$. Use equivalent fractions and an addition equation to show how Salvador found the difference.

3 What is the difference between $\frac{5}{6}$ and $\frac{1}{4}$? Show your work.

$\frac{5}{6} - \frac{1}{4} =$ .....

4 Show how you can use the visual model to subtract $\frac{3}{4} - \frac{5}{8}$.

$\frac{3}{4} - \frac{5}{8} =$ .....

5 On Saturday, Destiny spends $\frac{1}{6}$ of the day playing in a soccer tournament. She spends $\frac{1}{8}$ of the day volunteering with her parents at the community garden. The rest of the day she spends at home. A day has 24 hours. What fraction of Saturday does Destiny spend at home? Show your work.

Solution .....

Develop Subtracting with Mixed Numbers

Read and try to solve the problem below.

An adult California condor has a wingspan of $3\frac{1}{4}$ yards. A young California condor has a wingspan of $1\frac{2}{3}$ yards. How much wider is the adult condor's wingspan than the young condor's wingspan? Give your answer as a number of yards.

Wingspan is the length of a bird's open wings from tip to tip.

TRY IT

Math Toolkit

- fraction tiles
- fraction circles
- fraction bars
- fraction models
- grid paper
- number lines

DISCUSS IT

Ask your partner: Why did you choose that strategy?

Tell your partner: A model I used was . . . It helped me . . .

Explore different ways to understand subtracting with mixed numbers.

An adult California condor has a wingspan of $3\frac{1}{4}$ yards. A young California condor has a wingspan of $1\frac{2}{3}$ yards. How much wider is the adult condor's wingspan than the young condor's wingspan? Give your answer as a number of yards.

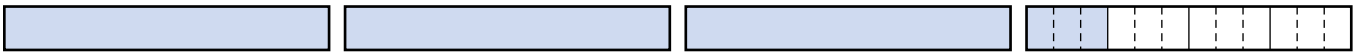
PICTURE IT

You can use fraction bars to picture subtracting with mixed numbers.

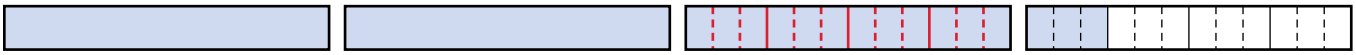
The adult condor's wingspan is $3\frac{1}{4}$ yards wide. To subtract $1\frac{2}{3}$ yards, find a common denominator.

Adult condor's wingspan: $3\frac{1}{4} = 3\frac{3}{12}$ Young condor's wingspan: $1\frac{2}{3} = 1\frac{8}{12}$

Model $3\frac{3}{12}$.



You need **more twelfths** to subtract $1\frac{8}{12}$.



$3\frac{3}{12} = 2\frac{15}{12}$

MODEL IT

You can use equations to subtract mixed numbers.

You can regroup one whole and break apart the mixed numbers to find $3\frac{3}{12} - 1\frac{8}{12}$.

3 wholes and $\frac{3}{12}$ is the same as 2 wholes and $\frac{15}{12}$.

$2 - 1 = 1$ and $\frac{15}{12} - \frac{8}{12} = \frac{7}{12}$

CONNECT IT

Now you will use the problem from the previous page to help you understand how to subtract mixed numbers with regrouping.

1. Look at the first set of fraction bars in **Picture It**. Why is the last bar split into 12 pieces instead of 4 pieces?

2. Now look at the second set of fraction bars in **Picture It**. Explain why $3\frac{3}{12}$ is now shown as $2\frac{15}{12}$.

3. Look at **Model It**. How does the regrouping of $3\frac{3}{12}$ as $2\frac{15}{12}$ help you find how much wider the adult condor's wingspan is than the young condor's wingspan?

4. How much wider is the adult condor's wingspan? ..... yard(s)

5. Show how you can use addition to check your answer.

6. Do you always need to regroup when you subtract mixed numbers with unlike denominators? Explain.

7 REFLECT

Look back at your **Try It**, strategies by classmates, and **Picture It** and **Model It**. Which models or strategies do you like best for subtracting mixed numbers? Explain.

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.....

.....

APPLY IT

Use what you just learned to solve these problems.

8 What is $7\frac{3}{5} - \frac{9}{10}$? Show your work.

Solution

9 What is the difference between $2\frac{5}{8}$ and $1\frac{1}{4}$? Show your work.

Solution

10 Jules practices the pole vault. His first jump is $10\frac{5}{6}$ feet high. His second jump is $12\frac{2}{3}$ feet high. How much higher is Jules's second jump?

Ⓐ $1\frac{1}{6}$ feet

Ⓑ $1\frac{5}{6}$ feet

Ⓒ $2\frac{1}{6}$ feet

Ⓓ $2\frac{5}{6}$ feet

Practice Subtracting with Mixed Numbers

Study the Example showing how to subtract mixed numbers. Then solve problems 1–5.

EXAMPLE

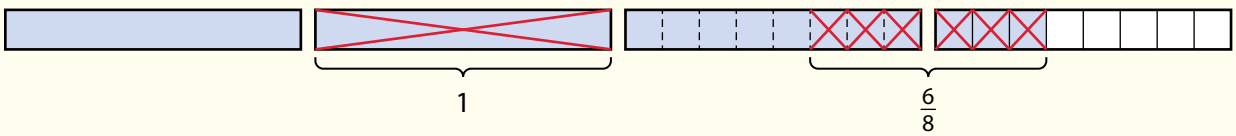
What is the difference between $3\frac{3}{8}$ and $1\frac{3}{4}$?

You can show $3\frac{3}{8} - 1\frac{3}{4}$ using fraction bars.

Rewrite the mixed numbers using common denominators. $3\frac{3}{8} - 1\frac{6}{8}$

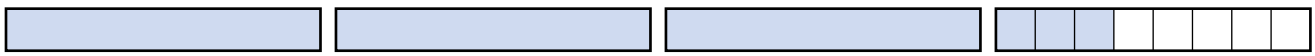
Model $3\frac{3}{8}$. Divide the last fraction bar into eighths.

Divide one more fraction bar into eighths so there are enough eighths to subtract.



Find the difference: $2\frac{11}{8} - 1\frac{6}{8} = 1\frac{5}{8}$.

1 Now use the fraction bars to find $3\frac{3}{8} - 1\frac{1}{4}$. Show your work.

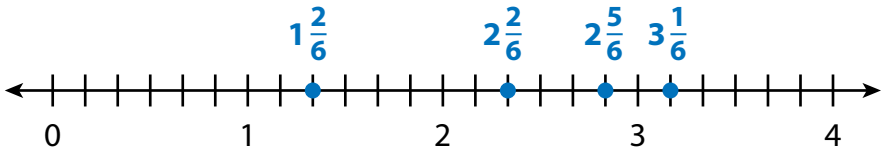


$3\frac{3}{8} - 1\frac{1}{4} =$ .....

2 What is $6\frac{5}{6} - 4\frac{1}{3}$? Show your work.

Solution .....

3 Sometimes it is helpful to rewrite mixed numbers in a form that includes a fraction greater than 1. Use the number line to write the missing numbers.



a. $1\frac{2}{6} = \frac{\square}{6}$

b. $2\frac{5}{6} = 1\frac{\square}{6}$

c. $2\frac{2}{6} = 1\frac{\square}{\square}$

d. $3\frac{1}{6} = \square\frac{\square}{\square}$

4 What is $3\frac{1}{3} - 1\frac{1}{2}$? Show your work.

Solution

5 Arturo's backpack weighs $6\frac{3}{8}$ pounds. He removes a book that weighs $\frac{3}{4}$ pound. Then he removes a book that weighs $\frac{1}{2}$ pound. How much does Arturo's backpack weigh now? Show your work.

Solution

Refine Subtracting Fractions

Study the Example below. Then solve problems 1–8.

EXAMPLE

The passenger elevator in Raúl's apartment building opens to a width of $3\frac{1}{2}$ feet. The freight elevator opens to a width of $5\frac{2}{5}$ feet. How much wider does the freight elevator open?

Look at how you could show your work using equations.

$$3\frac{1}{2} = 3 + \left(\frac{1 \times 5}{2 \times 5}\right) = 3\frac{5}{10}$$

$$5\frac{2}{5} = 5 + \left(\frac{2 \times 2}{5 \times 2}\right) = 5\frac{4}{10} = \left(4 + \frac{10}{10}\right) + \frac{4}{10} = 4\frac{14}{10}$$

$$\begin{array}{r} 4\frac{14}{10} \\ -3\frac{5}{10} \\ \hline 1\frac{9}{10} \end{array}$$

Solution

After finding a common denominator, the student wrote the problem vertically to subtract.

PAIR/SHARE

Explain why $5\frac{4}{10}$ is regrouped as $4\frac{14}{10}$.

APPLY IT

1 What is $5\frac{4}{5} - 1\frac{9}{10}$? Show your work.

Should you regroup $5\frac{4}{5}$ before you subtract?

Solution

PAIR/SHARE

Explain how your model shows regrouping.

2 What number do you add to $\frac{3}{4}$ to get $\frac{5}{6}$? Show your work.

What common multiple of 6 and 4 can you use as a common denominator?

PAIR/SHARE

Explain why you chose the model you did to solve this problem.

Solution

3 Finn's bathroom floor has an area of $3\frac{2}{3}$ square yards. He lays down a rug that covers an area of $1\frac{1}{4}$ square yards. What is the uncovered area of Finn's bathroom floor?

What equivalent mixed number could you subtract?

Ⓐ 2 square yard

Ⓑ $2\frac{1}{12}$ square yards

Ⓒ $2\frac{5}{12}$ square yards

Ⓓ $2\frac{3}{7}$ square yards

Naomi chose Ⓓ as the correct answer. How did she get that answer?

PAIR/SHARE

Does a denominator of 7 make sense?

4 What is the value of the expression $\frac{3}{5} - \frac{1}{3}$?

Ⓐ $\frac{2}{2}$

Ⓑ $\frac{4}{15}$

Ⓒ $\frac{2}{5}$

Ⓓ $\frac{6}{15}$

5 When Halima started karate lessons, she could kick $\frac{7}{12}$ yard high. Now Halima can kick $1\frac{1}{6}$ yards high. Can the equation be used to find how much higher Halima can kick now? Choose *Yes* or *No* for each equation.

	Yes	No
$1\frac{2}{12} - \frac{7}{12} = ?$	Ⓐ	Ⓑ
$\frac{7}{12} + 1\frac{1}{6} = ?$	Ⓒ	Ⓓ
$1\frac{1}{6} - \frac{2}{3} = ?$	Ⓔ	Ⓕ
$\frac{14}{12} - \frac{7}{12} = ?$	Ⓖ	Ⓗ

6 The sum of $4\frac{1}{2}$ and what number is $12\frac{5}{7}$? Show your work.

Solution

7 Fadil has an older sister and a younger brother.

Part A Fadil's sister is $17\frac{1}{3}$ years old. Fadil is $2\frac{1}{2}$ years younger than his sister. What is Fadil's age in years? Show your work.

Solution

Part B Fadil's brother is $5\frac{3}{4}$ years younger than their sister. How much older is Fadil than his brother? Show your work.

Solution

8 MATH JOURNAL

Find the difference between $1\frac{2}{5}$ and $\frac{9}{10}$. Explain how you solved the problem.

SELF CHECK Go back to the Unit 2 Opener and see what you can check off.