ADDING AND SUBTRACTING FRACTIONS

5.3H

The student is expected to represent and solve addition and subtraction of fractions with unequal denominators referring to the same whole using objects and pictorial models and properties of operations.

TELL ME MORE...

A **fraction** is a number that expresses a certain part of a whole quantity. The **denominator** tells you the number of equal-sized parts into which the whole is divided and the **numerator** tells you the number of those parts to which the fraction refers.

$\frac{5}{6}$

The fraction refers to 5 of those 6 parts

The whole is broken into 6 equal-sized parts.

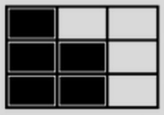
The fraction $\frac{5}{6}$ describes 5 parts of a whole (1 unit) that is broken into 6 equal-sized parts. You can use a model such as a fraction circle to see 5 out of the 6 equal-sized parts. The model shows you how much of the whole unit that $\frac{5}{6}$ represents.

Add or Subtract: Different Denominator

- Both fractions represent a whole broken into different numbers of equal-sized parts.

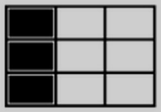
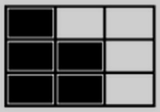
$\frac{1}{3}$ =  $\frac{5}{9}$ = 

- You need a common denominator. In this case, break the first rectangle into 9 equal-sized parts rather than 3 and write an equivalent fraction.

$\frac{3}{9}$ =  $\frac{5}{9}$ = 

Add or Subtract: Same Denominator

- Both fractions represent a whole broken into the same number of equal-size parts.

$\frac{3}{9}$ =  $\frac{5}{9}$ = 

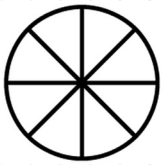
- Combine (or remove) the number of parts represented by each fraction.
- Add (or subtract) the numerators.

Once both wholes are broken into 9 equal-sized parts (that is, both fractions have a common denominator), you can add or subtract the fractions.

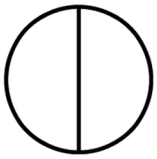
EXAMPLES

EXAMPLE 1: Kazumi tied two pieces of ribbon together. One piece was $\frac{3}{8}$ yard long. The second piece was $\frac{1}{2}$ yard long. What is the combined length of ribbon?

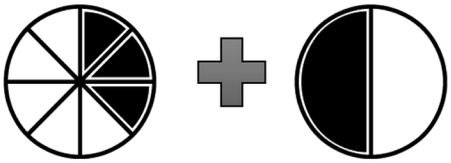
STEP 1 Represent $\frac{3}{8}$ using a fraction circle model. The circle has 8 equal parts (the denominator is 8). Shade 3 of those parts (the numerator is 3) to show 3 out of 8 parts for $\frac{3}{8}$.



STEP 2 Represent $\frac{1}{2}$ using a fraction circle model. The circle has 2 equal parts (the denominator is 2). Shade 1 of those parts (the numerator is 1) to show 1 out of 2 parts for $\frac{1}{2}$.



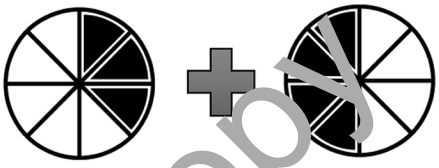
STEP 3 Use the two models to replace the fractions in your original number sentence.



STEP 4 Determine the common denominator.

The circle representing $\frac{3}{8}$ has two halves with 4 parts in each. So you can break the circle representing $\frac{1}{2}$ into 8 parts.

The common denominator is 8.



STEP 5 Combine the two circles (add the fractions). Record the sum as a fraction.

$\frac{7}{8}$, so the combined length of ribbon is $\frac{7}{8}$ yards

EXAMPLE 2: Marla walked $\frac{5}{6}$ of a mile on Monday and $\frac{7}{12}$ of a mile on Tuesday. How much farther did Marla walk on Monday than Tuesday.

STEP 1 Determine whether the problem is an addition or a subtraction problem.

- Draw a strip diagram.

$\frac{7}{12}$ on Tuesday	?
$\frac{5}{6}$ on Monday	

- You are looking for one of the parts so use subtraction.

The problem requires subtraction.

STEP 2 Write the subtraction sentence.

- Monday − Tuesday = Difference

$\frac{5}{6} - \frac{7}{12} = ?$

STEP 3 Determine the common denominator.

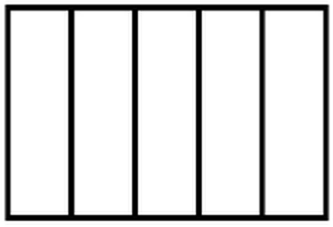
- $6 \times 2 = 12$ and $1 \times 12 = 12$

The common denominator will be 12.

YOU TRY IT!

Use a model to subtract $\frac{2}{5} - \frac{3}{10}$.

Shade 2 out of 5 parts to represent $\frac{2}{5}$.



To subtract $\frac{3}{10}$, you will need to remove 3 parts that are $\frac{1}{10}$. Break the model into tenths by drawing a horizontal line through the model.

To show the subtraction (removal) of $\frac{3}{10}$, cross out 3, $\frac{1}{10}$ pieces.

Subtract. $\square$

10

STEP 4 Rewrite $\frac{5}{6}$ and $\frac{7}{12}$ with a common denominator of 12 and then add the fractions.

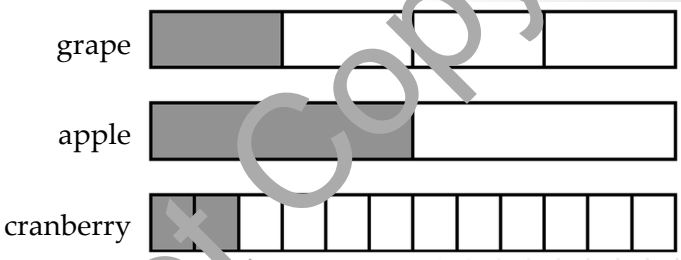
- $\frac{5}{6} = \frac{5 \times 2}{6 \times 2} = \frac{10}{12}$
- $\frac{5}{6} - \frac{7}{12} = \frac{10}{12} - \frac{7}{12} = \frac{3}{12}$

Marla walked $\frac{3}{12}$ miles farther on Monday than Tuesday.

MAKE A NOTE . . .

How could you rewrite $\frac{3}{12}$ as a fraction in lowest terms with a denominator of 4?

EXAMPLE 3: Roberto had some friends over to watch a baseball game on television. He made his favorite fruit punch. The models are shaded to show the fraction of a gallon of different types of juice that Roberto combined to make the fruit punch. What fraction of a gallon of fruit punch did Roberto make?



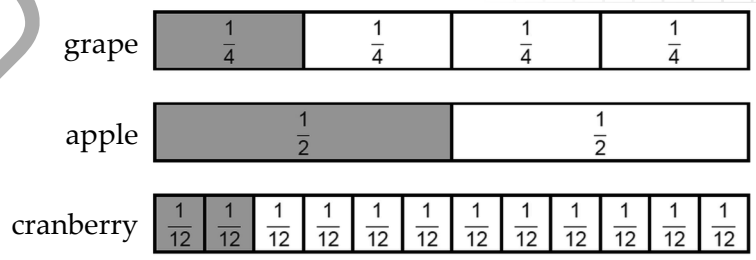
STEP 1 Determine whether the problem is an addition or a subtraction problem.

- Roberto combined three different juices.
- If you combine things then you are adding them together.

The problem requires addition.

STEP 2 Identify the fraction of a gallon of each juice that Roberto used.

- The denominator represents the number of equal-sized parts into which the whole gallon is broken.
- The numerator represents the number of parts of juice that were used.

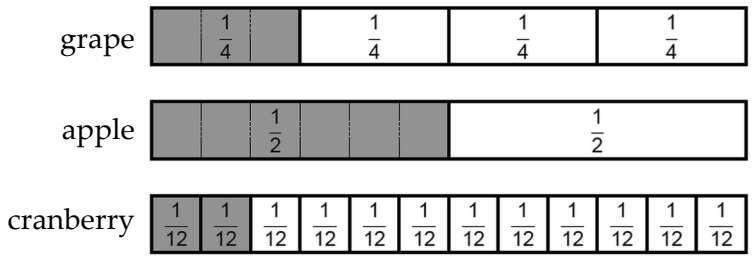


Roberto used $\frac{1}{4}$ gallon of grape juice, $\frac{1}{2}$ gallon of apple juice, and $\frac{2}{12}$ gallon of cranberry juice.

STEP 3 Use the models to determine a common denominator for the three fractions.

- $\frac{1}{4}$ is equivalent to 3, $\frac{1}{12}$ pieces.
- $\frac{1}{2}$ is equivalent to 6, $\frac{1}{12}$ pieces.

The common denominator is 12.

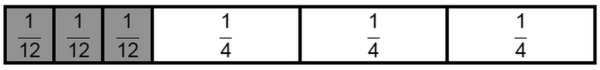


STEP 4 Break each bar into $\frac{1}{12}$ pieces.

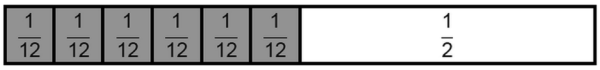
STEP 5 Add the fractions by counting the total number of $\frac{1}{12}$ pieces.

There are 11, $\frac{1}{12}$ pieces, so Roberto used $\frac{11}{12}$ gallons of juice to make fruit punch.

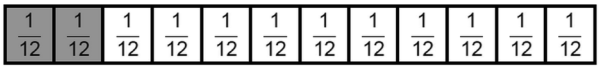
grape



apple



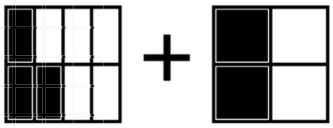
cranberry



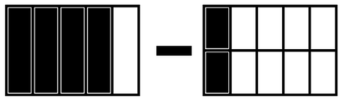
PRACTICE

Write the number sentence represented by each fraction model.

1.



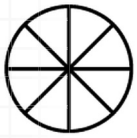
2.



3.

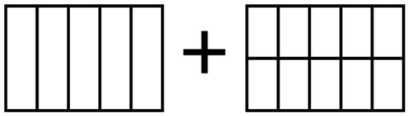
Shade the fraction model to represent each number sentence.

4. $\frac{7}{8} - \frac{1}{2}$



5. $\frac{2}{3} + \frac{5}{9}$

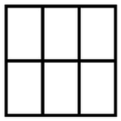
6. $\frac{3}{5} + \frac{6}{10}$



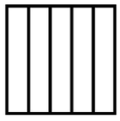
Use the fraction models to determine the sum or difference.

7. $\frac{7}{8} + \frac{1}{4}$

8. $\frac{5}{6} - \frac{1}{3}$



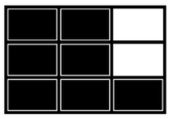
9. $\frac{4}{5} - \frac{3}{10}$



10. $\frac{2}{4} + \frac{3}{8}$

11. $\frac{7}{10} - \frac{2}{5}$

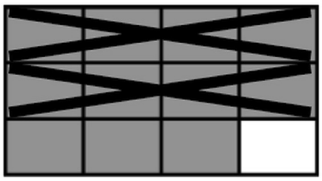
12. Mrs. Smith's homeroom and Mr. Gonzales's homeroom classes each ate a portion of one of two identical cakes. The diagram is shaded to show the portion of each cake that was eaten. What fraction of one cake did the two classes eat together?



Mrs. Smith's homeroom

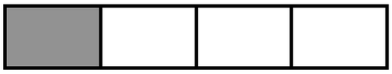
Mr. Gonzales's homeroom

13. The diagram below represents $\frac{11}{12} - \frac{2}{3}$. What is the difference shown in the diagram?



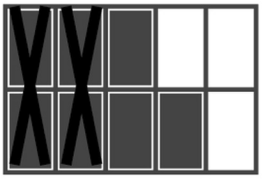
14. Mrs. Marinopolous used the models below to record the fraction of one tank of gasoline that she used last week and this week. How much more of a tank of gasoline did Mrs. Marinopolous use this week than last week?

Last week



This week

15. The shaded part of the model represents a fraction. Another fraction was subtracted from the first fraction. Which expression does the model represent?



A $\frac{7}{12} - \frac{2}{5}$

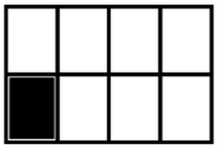
B $\frac{7}{10} - \frac{4}{5}$

C $\frac{7}{12} - \frac{4}{5}$

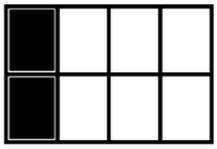
D $\frac{7}{10} - \frac{2}{5}$

16. The fraction models below show the portion of the total points scored by the volleyball team by the three leading athletes. What fraction of the total points did the three athletes score altogether?

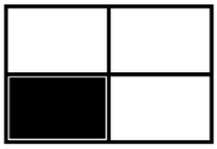
Brianne:



Tosha:



Yesenia:



F $\frac{4}{20}$

G $\frac{5}{8}$

H $\frac{4}{8}$

J $\frac{5}{10}$