Pre-Algebra: **Notes**
- Adding and Subtracting with Fractions and Mixed Numbers -

Knowing how to combine and separate quantities is helpful in understanding the world around you. The mathematical names for combining and separating quantities are adding and subtracting.

For example, if you own two acres of land and you buy another half-acre lot, you will have $2 + \frac{1}{2}$, or $2\frac{1}{2}$, acres of land. The number sentence that shows this relationship is

$$2 + \frac{1}{2} = 2\frac{1}{2}$$

The sum refers to the $2\frac{1}{2}$ acres of land you own.

If you sell $\frac{3}{4}$ of an acre of your land, you will own $2\frac{1}{2} - \frac{3}{4}$ acres of land. The **number sentence** that shows this relationship is:

$$2\frac{1}{2} - \frac{3}{4} = 1\frac{3}{4}$$

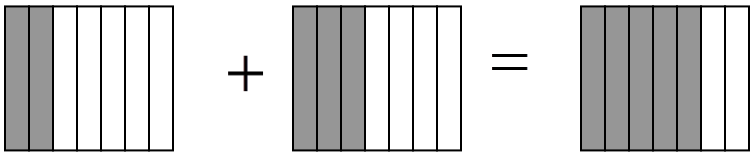
The difference refers to the $1\frac{3}{4}$ acres of land you will own.

The problems in this section require you to add and subtract fractions. As you work, use what you have learned in our last unit about fractions and finding equivalent fractions. Practice writing number sentences to communicate your strategies for solving the problems.

Big Ideas:

When adding and subtracting fractions (mixed numbers) we must have the same sized pieces. Which number in a fraction refers to the size of each piece? (yes, the denominator)

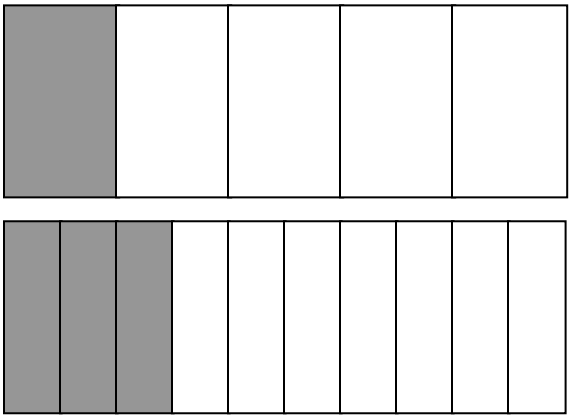
How would you represent in pictures the addition of $\frac{2}{7} + \frac{3}{7}$?



$\frac{2}{7}$ $\frac{3}{7}$ $\frac{5}{7}$

Since we are counting (or adding) pieces of the same size, we can simply add the numerators. This same idea applies if we are subtracting fractions with the same sized pieces (the denominators are the same).

But what do we do if the sizes of the pieces are different (the denominators are different). For example, what if we want to add $\frac{1}{5}+\frac{3}{10}$? Let's look at a picture representation.



Here we see a representation of $\frac{1}{5}$

Here we see a representation of $\frac{3}{10}$

How can we add these two fractions together?

If you ate $\frac{2}{3}$ of a pizza and your little brother ate $\frac{1}{4}$ of the same sized pizza, how much of that sized pizza did you eat altogether?

The important thing to remember when you are solving today's problem is that when you are adding or subtracting fractions, we need to be working with the same sized pieces – how can we do that?

Also, make sure you know what a number sentence is and the related fact families that you can make from a number sentence.

number sentence: $8+6=14$

$6+8=14$

$14-8=6$

$14-6=8$

} Fact Family (number bonds)

You can also set up number sentences and fact families for fraction addition and subtraction as well.

The BIG PICTURE: When subtracting mixed numbers it is easiest to rename the fraction part of the mixed numbers to equivalent fractions with common denominators. You then subtract the fraction parts and then you subtract the whole number parts. *YOU <u>MAY</u> NEED TO RENAME THE FRACTION PART BY "BORROWING" 1 WHOLE FROM THE WHOLE NUMBER PART.*

Example		Explanation
$3\frac{3}{5}$ $-1\frac{1}{3}$		The common denominator in this case is 15 $\frac{3}{5} \rightarrow \frac{9}{15}$ $\frac{1}{3} \rightarrow \frac{5}{15}$
So the problem can be rewritten as $3\frac{9}{15}$ $-1\frac{5}{15}$		You can now subtract $\frac{9}{15} - \frac{5}{15} = \frac{4}{15}$ $3-1=2$
So the final answer is: $2\frac{4}{15}$		

Example		Explanation
$5\frac{1}{3}$ $-2\frac{3}{4}$		The common denominator in this case is 12 $\frac{1}{3} \rightarrow \frac{4}{12}$ $\frac{3}{4} \rightarrow \frac{9}{12}$
So the problem can be rewritten as $5\frac{4}{12}$ $-2\frac{9}{12}$		But…just like you can't subtract **4−9** (unless you go into negative numbers) You can't subtract $\frac{4}{12} - \frac{9}{12}$
So you need to RENAME $5\frac{4}{12}$		You take 1 whole from the whole number part of the number and add it to the fraction part of the mixed number.
$4 \quad 5\frac{4}{12} \quad \frac{16}{12}$ $-2\frac{9}{12}$		Take 1 whole away from 5 and make it a 4. Now we want to add that 1 whole to the fraction. Since the fraction is named with $\frac{1}{12}$'s, 1 whole is the same as $\frac{12}{12}$'s
		So $5\frac{4}{12}$ becomes $4\frac{16}{12}$
Here is our new subtraction problem: $4\frac{16}{12}$ $-2\frac{9}{12}$		We can now subtract as normal $\frac{16}{12} - \frac{9}{12} = \frac{7}{12}$ $4-2=2$
So the final answer is: $2\frac{7}{12}$		

On Your Own

$$8\frac{1}{8} \qquad 7\frac{3}{5}$$

$$-2\frac{2}{3} \qquad -5\frac{3}{4}$$

$$12\frac{1}{6} \qquad 1\frac{5}{8}$$

$$-8\frac{4}{5} \qquad -\frac{2}{5}$$