

# Chapter 6

## FRACTION BASICS:



## TYPES OF FRACTIONS, AND ADDING AND SUBTRACTING FRACTIONS

### FRACTION BASICS

Fractions are real numbers that represent a part of a whole. A fraction bar separates the part from the whole like so:

$\frac{\text{PART}}{\text{WHOLE}}$

The "part" is the **NUMERATOR**, and the "whole" is the **DENOMINATOR**.

For example, suppose you cut a whole pizza into 6 pieces and eat 5 of the pieces. The "part" you have eaten is 5, and the "whole" you started with is 6. Therefore, the amount you ate is  $\frac{5}{6}$  of the pizza.



If 3 people shared a pizza cut into 8 slices, each person would get 2 pieces, and 2 pieces would be left over. These leftover two are called the **REMAINDER**.

### REMAINDER

part, quantity, or number left over after division

There are 3 types of fractions:

**1. Proper fractions:** The numerator is smaller than the denominator.

**EXAMPLES:**  $\frac{5}{6}$ ,  $\frac{2}{3}$ ,  $\frac{1}{1,000}$ ,  $-\frac{4}{27}$

**2. Improper fractions:** The numerator is bigger than, or equal to, the denominator.

**EXAMPLES:**  $\frac{10}{3}$ ,  $\frac{8}{8}$ ,  $-\frac{25}{5}$

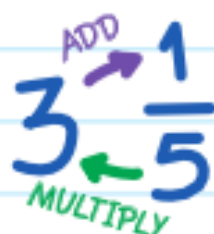
**3. Mixed numbers:** There is a whole number and a fraction.

**EXAMPLES:**  $2\frac{2}{3}$ ,  $18\frac{1}{8}$ ,  $-9\frac{5}{7}$

## CONVERTING MIXED NUMBERS and IMPROPER FRACTIONS

Remember! To **CHANGE A MIXED NUMBER TO AN IMPROPER FRACTION**, you will first multiply and then add.

**EXAMPLE:** To change the mixed number  $3\frac{1}{5}$  to an improper fraction, we first calculate  $3 \times 5 = 15$  and then  $+1$ , so that the improper fraction is  $\frac{16}{5}$ .



To **CHANGE AN IMPROPER FRACTION TO A MIXED NUMBER**, you divide the numerator by the denominator. Ask yourself: "How many times does the denominator go into the numerator? What remainder do I have left over?"

**EXAMPLE:** To change the improper fraction  $\frac{23}{8}$  to a mixed number, we calculate:

$23 \div 8 = 2 R 7$ , so the mixed number is  $2\frac{7}{8}$ .

"R" STANDS FOR REMAINDER.

If you get an answer that is an improper fraction, always convert it into a mixed number for your final answer. Some teachers take off points if you don't!



## SIMPLIFYING FRACTIONS

Sometimes, the numerator and denominator will have common factors. You can **SIMPLIFY** them by dividing the numerator and the denominator by the greatest common factor. Some teachers call this "**CROSS-REDUCING**," "simplifying," or "**CANCELING**." Whatever you call it, it's a shortcut!

**EXAMPLE:**  $\frac{6}{10}$  can be simplified to  $\frac{3}{5}$  because **2** is the GCF of **6** and **10**.

$$\frac{6}{10} = \frac{6 \div 2}{10 \div 2} = \frac{3}{5}$$

**EXAMPLE:**  $\frac{20}{8}$  can be simplified to  $\frac{5}{2}$  because the GCF of **20** and **8** is **4**.

$$\frac{20}{8} = \frac{20 \div 4}{8 \div 4} = \frac{5}{2}$$

Most teachers want you to simplify your answers if possible, so get in the habit!

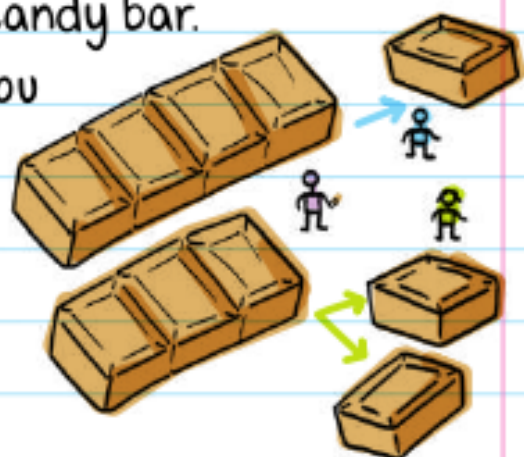
## ADDING FRACTIONS

If we want to add fractions together, the denominators must be the same.

**EXAMPLE:**  $\frac{1}{5} + \frac{3}{5} = \frac{4}{5}$

In the sum, the denominator stays the same and you add the numerator. For example, you have two identical candy

bars, and you cut each into **5** pieces. You give your little brother **1** piece from the first candy bar, and you give your sister **2** pieces from the second candy bar. How much of a whole candy bar did you give away?



You gave **1** of the **5** pieces of the first candy bar to your brother =  $\frac{1}{5}$ .

You gave **2** of the **5** pieces of the second candy bar to your sister =  $\frac{2}{5}$ .

Now, add them together:  $\frac{1}{5} + \frac{2}{5} = \frac{3}{5}$  (The denominator stays the same, and you add the numerators.)



Because both candy bars are the same size and are cut into the same number of pieces, you keep the denominator as **5** and add the numerators to get the answer of  $\frac{3}{5}$ .

**YOU CAN REMEMBER WITH THIS RHYME:**  
Denominator's the same—keep it in the game!  
Add up the top, simplify, and stop!



## SUBTRACTING FRACTIONS

The same idea applies to subtraction—the denominators must be the same (both wholes must be the same size) in order to subtract.

**EXAMPLE:**  $\frac{8}{9} - \frac{7}{9} = \frac{1}{9}$  (The denominator stays the same, and you subtract the numerators.)

## ADDING and SUBTRACTING FRACTIONS with DIFFERENT DENOMINATORS

In order to add or subtract fractions with different denominators, you just have to make their denominators the same! We can do that by finding the LCM of the denominators.

How to add or subtract fractions with unlike denominators:

1. Find the LCM of both denominators. (Some teachers call this the **LEAST COMMON DENOMINATOR**, or **LCD** for short.)

**EXAMPLE:**  $\frac{2}{5} + \frac{1}{4}$

The LCM of 5 and 4 is 20.

2. Convert the numerators. (Some teachers call this **RENAMING** the numerators.)

$$\frac{2 \cdot 4}{5 \cdot 4} = \frac{8}{20}$$

5 times what number equals 20? 4. So, you must also multiply the numerator by 4 to convert the numerator.

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

4 times what number equals 20? 5. So, you must also multiply the numerator by 5 to convert the numerator.

3. Add or subtract, and simplify if necessary.

$$\frac{2}{5} + \frac{1}{4} = \frac{8}{20} + \frac{5}{20} = \frac{13}{20}$$

**EXAMPLE:**  $\frac{4}{7} - \frac{1}{3}$

The LCM of 7 and 3 is 21.

$$\frac{4 \times 3}{7 \times 3} = \frac{12}{21}$$

$$\frac{1 \times 7}{3 \times 7} = \frac{7}{21}$$

$$\frac{4}{7} - \frac{1}{3} = \frac{12}{21} - \frac{7}{21} = \frac{5}{21}$$





# CHECK YOUR KNOWLEDGE

Calculate. Simplify each answer if possible.

1.  $\frac{1}{8} + \frac{2}{8}$

2.  $\frac{7}{11} - \frac{4}{11}$

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

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

5.  $\frac{13}{15} - \frac{4}{15}$

6.  $\frac{3}{5} - \frac{1}{2}$

7.  $\frac{4}{5} - \frac{1}{10}$

8.  $\frac{8}{9} - \frac{3}{6}$

9.  $\frac{1}{2} - \frac{3}{8}$

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

ANSWERS

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# CHECK YOUR ANSWERS



1.  $\frac{3}{8}$

2.  $\frac{3}{11}$

3.  $\frac{6}{5} = 1\frac{1}{5}$

4.  $\frac{5}{10} = \frac{1}{2}$

5.  $\frac{9}{15} = \frac{3}{5}$

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

7.  $\frac{7}{10}$

8.  $\frac{7}{18}$

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

10.  $\frac{11}{24}$