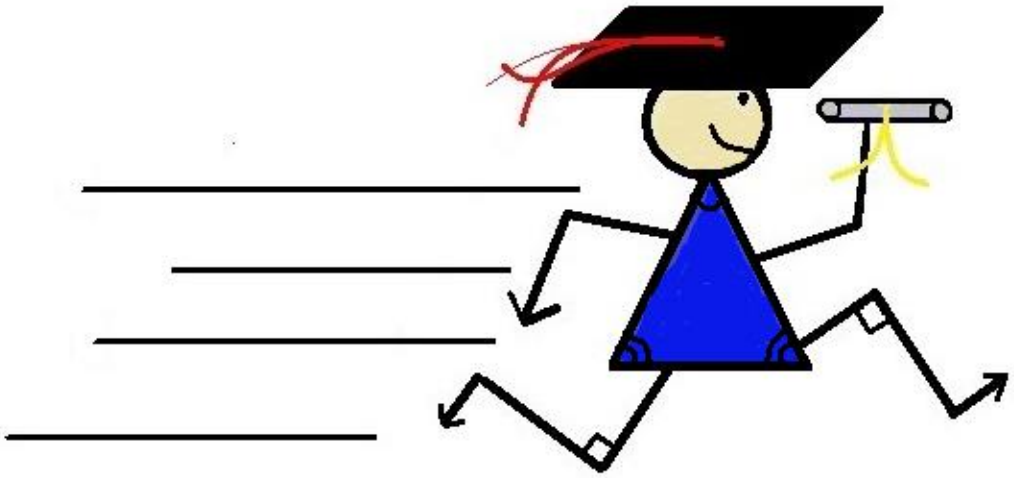
# CHAPTER 1

## FRACTIONS



Learn Math Fast

# LESSON 1: WHAT ARE FRACTIONS?

Fractions are a stumbling block for a lot of math students. Everyone gets confused when it comes to learning fractions. I will teach you how to write, understand, add, subtract, multiply and divide fractions, in a *fraction* of the time that you might expect.

Can you solve these problems?

9/16 - 2/8 =
4/10 + 1/5 =
3/9 x 2/5 =

Read this chapter and in about an hour not only will these problems be easy for you, but you'll be able to solve them in your head.

First of all, what is a fraction? A fraction is a piece of something. If I broke a vase into 100 pieces and then picked up one of those pieces, I would be holding a *fraction* of the vase.

You can also look at a fraction as a number between zero and one. A fraction is a piece of one whole something. Here are a few more fractions you will recognize:

- A penny is a *fraction* of one dollar.
- A second is a *fraction* of one minute.
- A slice of pizza is a *fraction* of the whole pizza.
- An inch is a *fraction* of one foot.
- Your leg is a *fraction* of you!

Let's start with a dollar bill because it has a "1" written right on it, so it will represent ONE.


Do you know of four coins that equal one dollar? That's right, four QUARTERS equal one dollar.


In math, "one quarter" is written $\frac{1}{4}$. It means "one of the four pieces" needed to make one whole dollar. Sometimes, people say, "one fourth" instead of one quarter. It means the same thing, one of the four pieces. (Now you know why twenty-five cents is called a quarter, because it's a quarter of a dollar).

Now, let's divide that dollar into ten pieces. We all know what that would be, DIMES! If we broke up one dollar into dimes, we would have ten dimes. Ten dimes equal one dollar.

Each dime is $\frac{1}{10}$ (one tenth) of the dollar.

Look at that fraction.

$$\frac{1}{10}$$

The "10" on the bottom is how many dimes it takes to make one dollar. The "1" on top represents how many dimes we are talking about.

One dime is one tenth $\left(\frac{1}{10}\right)$ of the dollar. It is a fraction of a dollar. Think of the fraction $\frac{1}{10}$ (one tenth) as, "*one of the ten pieces.*"

Two dimes (two tenths) would be written like this…

$$\frac{2}{10}$$

because we have two of the ten pieces.

Sometimes fractions are written with a slanted line like $1/4$. Other times they are written with one number on top, one number on bottom and a straight line in between them; like the one below.

$$\frac{1}{4}$$

Either way it means the same thing, one of the four pieces. How would you write *one penny* as a fraction?

Think about how many pennies are in a dollar. There are one hundred, so that is the number on the bottom of the fraction. We are talking about only one penny, so that is the number on the top of the fraction.

$$\frac{1}{100}$$

To read this fraction, you would say "*One-one hundredth.*" A penny is one-one hundredth of a dollar.

How would you write two pennies as a fraction? There are 100 pennies in one dollar, so that is the number on the bottom. The two goes on top.

$$\frac{2}{100}$$

Can you guess how to write three pennies as a fraction? What would the number on the bottom be? It would be the number of pennies in one whole dollar, so 100. What is the number on top? That is the number of coins we are talking about, so 3. The fraction is written below, and it is read *three one-hundredths.*

$$\frac{3}{100}$$

Here's a tricky question. How many dollars would you have, if you had $\frac{100}{100}$ of a dollar? Well, let's think about that. If you had 100 of the 100 pennies, that would be one whole dollar.

$$\frac{100}{100} = 1$$

Now let's say you had 4/4 of a dollar. How many dollars would you have?

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

Well, if the bottom number is 4, and the top number is 4, then we have all four of the pieces that it takes to make one dollar. Any time the number on top is the same as the number on bottom, it equals 1.

Look at the four different fractions below. They all equal ONE because the numbers are the same on top and bottom.

$$\frac{25}{25} \qquad \frac{16}{16} \qquad \frac{44}{44} \qquad \frac{1003}{1003}$$

Does the fraction below equal one?

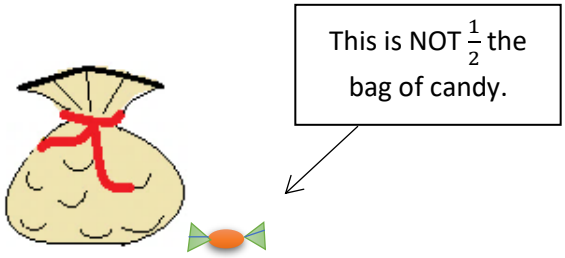
$$\frac{599}{600}$$

No, it doesn't. You only have 599 of the pieces. It takes all 600 pieces to have one whole whatever it is. You are just $\frac{1}{600}$ shy of the whole thing.

I apologize, but I'm going to have to get a little technical for a moment. That always takes all the fun out of math, but it must be said. When you break something up into fractions, each piece MUST be EXACTLY the same size. For example, let's say you cut up a piece of paper into four squares, creating four quarters. Each one of those squares MUST be EXACTLY the same size to truly be called one fourth of the piece of paper.

In the next example, I am going to slice up a candy bar. Each piece is supposed to be the EXACT same size, but they aren't really. To be totally "math legal" we would have to consider the crumbs as part of the whole candy bar. But we're going to just ignore the crumbs and pretend they are all exactly the same size.

When I used money to explain fractions, every penny was EXACTLY the same size and so was every dime and quarter. My point is, you can't take one bag of Halloween candy, give your brother one piece and call it "half." It may be in two pieces now, but not two EQUAL pieces.




You should just always assume that when I slice something up in this lesson, the pieces are all the EXACT same size even if, technically, they aren't.

OK, let's get back to the fun stuff. Look at the picture below. I have sliced up a candy bar into four "equal" pieces for you. I want to write a fraction to show how much of the candy bar you have eaten.

The number on the bottom of the fraction will show how many pieces there are in one candy bar.

$\frac{\quad}{4}$

The number on top will be how many of the four pieces you ate. If you eat three of the four pieces, then you will have eaten $\frac{3}{4}$ (three-fourths) of the candy bar. If you only eat one of the little pieces, then you will have eaten $\frac{1}{4}$ (one-fourth or one-quarter) of the candy bar. But you didn't just eat one or three pieces, you ate all four pieces. I'll put that number on top.

$$\frac{4}{4}$$

How many candy bars did you eat? You could say you ate four-fourths of the candy bar, but that sounds a little goofy. Let's just say that you ate one whole candy bar because the numbers on top and bottom are the same, so it equals 1.

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

Look at the picture of one whole candy bar below.

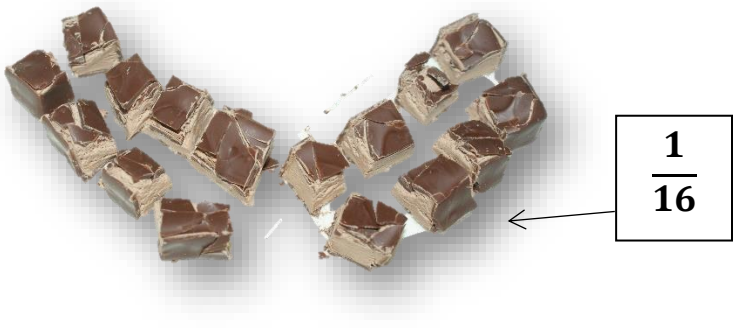
Let's say you have to share the candy bar with your sister. You slice the candy bar into two equal pieces, so you will each get $\frac{1}{2}$ (one half) of the candy bar.


Look at those fractions. The number "two" on the bottom shows how many pieces there are. The number one on top shows how many of the two pieces you will get and how many your sister will get.

Now let's say your two little brothers show up and they want to share the candy bar too. Now you have to cut the candy bar into four pieces (equal pieces).

The pieces are getting smaller. Each one is now $\frac{1}{4}$ of the candy bar; one of the four pieces.

The word is getting out. More and more people want to share the candy bar. Twelve more people show up. You are so kind, that you offer to share the candy bar with everyone. You now have to cut it up into SIXTEEN pieces. Your share is getting really small now. Each person will only get $\frac{1}{16}$ of the candy bar.




The fraction $\frac{1}{16}$ tells us that 16 people will share the candy bar and each one will get one of the sixteen pieces.

Look at the two fractions below. Which one is a BIGGER portion of the candy bar?

One half One sixteenth

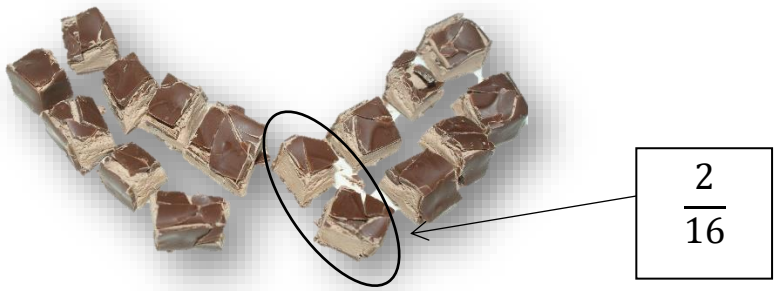
$$\frac{1}{2} \quad or \quad \frac{1}{16}$$

Well, think about that for a moment. The more people you shared the candy bar with, the smaller each portion got. When you only shared the candy bar with your sister, your portion was much bigger. The more pieces there are to make one, the smaller each piece will be. Do you know which fraction is bigger yet? The bigger fraction must be $\frac{1}{2}$.

I will add a $< or >$ sign to show which fraction is bigger. (Remember, look at the "Less than" and "Greater than" signs like an alligator's mouth. The alligator wants to eat the biggest fraction of the candy bar.)

$$\frac{1}{2} > \frac{1}{16}$$

Now let's say your sister was so impressed by how you shared your candy bar with everyone, that she gave you back her little $\frac{1}{16}$ piece. Now you have $\frac{2}{16}$ of the candy bar.




One of your little brothers saw what your sister did and decided to do the same thing. Now what fraction of the candy bar do you have? That's right, you have $\frac{3}{16}$.

Which is the bigger fraction?

One sixteenth Three sixteenths

$$\frac{1}{16} \quad or \quad \frac{3}{16}$$

Both fractions above are sliced into 16 pieces, but one of the fractions has three of the pieces, while the other one has only one of the 16 pieces. Now do you know which fraction is bigger?

Of course, $\frac{3}{16}$ is the bigger fraction.

Answer the questions on the next worksheet, to make sure you understand what fractions are.

Name: _____ Date:_____

# WORKSHEET 2-1

1. Which of the following are fractions? Circle them all.

$$36 \qquad 42.9 \qquad \frac{2}{5} \qquad 0 \qquad \frac{1}{100}$$

2. A dime is $\frac{1}{10}$ of a dollar and a quarter is $\frac{1}{4}$ of a dollar. Can you write a fraction for one penny? _____

3. What does the number on the bottom of a fraction mean?

_____

4. Give a number that is equal to $\frac{25}{25}$. _____

5. Write a fraction of a dollar that equals 2 dimes. _____

6. Write the fraction that represents the picture below. _____


7. Write a fraction that equals 1. _____

8. I bought a pack of gum. There were 10 pieces in the pack. I gave my sister 3 of the pieces. Write a fraction that shows how much gum I have left in the pack. _____

9. Which fraction is bigger? Use a $<$ *or* $>$ sign.

$$\frac{1}{4} \quad \_\_ \quad \frac{1}{100}$$

10. Write a fraction that stands for 3 cents. _____

# LESSON 2: ADDING FRACTIONS

So, now that you know what fractions are let's have some fun with them.
I have 5 pennies and you have 2 pennies. To add them together, use fractions like this:

$$\frac{5}{100} + \frac{2}{100} =$$

Now we don't want to add the 100's together because the number of pennies in a dollar can't change. Just add up the top numbers, 5 + 2 = 7 and the answer is…

$$\frac{7}{100}$$

You just added fractions! Remember, the number on top is how many pennies, and the number on bottom is how many pennies it takes to make one.

Next, we will add 1 quarter (think money) and 2 quarters. Look at the math and the pictures below.

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

To add fractions, just add the numbers on top. You can't change the number of quarters in one dollar, so the only math to solve is 1 + 2.

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

Let's try a few more together. Can you solve this one?

$$\frac{7}{25} + \frac{8}{25} =$$

All you have to do is add the numbers on top. The number on the bottom stays the same. The answer is $\frac{15}{25}$.

Earlier, we talked about slicing a candy bar into 16 pieces. In that example, you ended up with $\frac{3}{16}$ of the candy bar. Let's say you were given five more pieces. What fraction of the candy bar would you have now? Let's add them together.

$$\frac{3}{16} + \frac{5}{16} = \frac{8}{16}$$

Can you add these fractions together?

$$\frac{23}{256} + \frac{29}{256} =$$

Of course, you can. Just add the two numbers on top. Leave the numbers on the bottom the same.

$$\frac{23}{256} + \frac{29}{256} = \frac{52}{256}$$

Let's say you are playing a video game. In this particular game you need to collect stars. If you collect 100 stars, you will get a free life. So far, you have collected 83 stars. You could say that you have 83 of the 100 stars that you need to get a free life. I'll write a fraction to show how close you are to getting that free life.

$$\frac{83}{100}$$

You are eighty-three one-hundredths of the way there. Once you get to one hundred one-hundredths, you will have earned ONE free life. It looks like you need to collect 17 more stars.

Try adding fractions on your own. Complete the next worksheet. If you don't get 100% correct, fix your mistakes, or read this lesson again.

Name: _____ Date: _____

# WORKSHEET 2-2

Add the following fractions.

1. $\frac{3}{8} + \frac{3}{8} =$
2. $\frac{5}{21} + \frac{9}{21} =$
3. $\frac{1}{4} + \frac{2}{4} =$
4. $\frac{3}{10} + \frac{4}{10} =$
5. $\frac{5}{12} + \frac{4}{12} =$
6. $\frac{1}{5} + \frac{3}{5} =$
7. $\frac{8}{32} + \frac{18}{32} =$
8. $\frac{3}{6} + \frac{3}{6} =$
9. $\frac{4}{16} + \frac{7}{16} =$
10. $\frac{3}{14} + \frac{5}{14} =$
11. $\frac{11}{44} + \frac{11}{44} =$
12. $\frac{3}{27} + \frac{4}{27} =$
13. $\frac{2}{9} + \frac{4}{9} =$
14. $\frac{18}{48} + \frac{16}{48} =$
15. $\frac{4}{15} + \frac{3}{15} =$
16. $\frac{8}{24} + \frac{4}{24} =$

17. 1/4 + 2/4 =
18. 3/12 + 4/12 =
19. 4/10 + 2/10 =
20. 1/3 + 2/3 =
21. 5/16 + 3/16 =
22. 3/8 + 3/8 =
23. 3/7 + 2/7 =
24. 6/32 + 8/32 =
25. 7/14 + 2/14 =