

Fractions to Decimals

Fractions are also called ratios. In Algebra, you will typically use fractions to represent division more often than the \div symbol. To convert a fraction to a decimal, you divide the numerator by the denominator.

I know that to divide $\frac{2}{5}$ on a calculator I key in $2 \div 5$, but if I am dividing on paper, which number goes inside the division symbol?

Two brothers and their grandmother are here to help us answer this question.

Two brothers were wrestling in their backyard. Their grandmother called out the back door, “the cookies are ready.” The boy on top climbed off his brother and ran into the house. He locked the door and ate all the cookies.

Key fact: The boy on top ran into the house

Meaning: The number on top (numerator) goes in the house (division symbol)

$$\frac{2}{5} \longrightarrow 5 \overline{)2}$$

The same two brothers were running a race in their backyard. Their grandmother called out the back door, “the cookies are ready.” The boy in front beat his brother to the house. He locked the door and ... well, you know the rest.

Key fact: The boy in front ran into the house

Meaning: The first number goes in the house (division symbol)

$$3 \div 4 \longrightarrow 4 \overline{)3}$$

$$\begin{array}{r} 0.75 \\ 4 \overline{)3.00} \\ \underline{28} \\ 20 \\ \underline{20} \\ 0 \end{array}$$

After that, insert a decimal behind the 3, and another one directly above the first decimal. Add “zeroes and arrows” until you find the quotient or determine that it repeats.

To convert $\frac{3}{4}$ to a decimal using a calculator, key in: **3** **÷** **4** **ENTER**

The result will appear:

It helps to memorize the decimal form of the simplest fractions

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

$$\frac{1}{3} = \overline{.3}$$

$$\frac{2}{3} = \overline{.6}$$

$$\frac{1}{4} = .25$$

$$\frac{2}{4} = .50$$

$$\frac{3}{4} = .75$$

Remember, a bar over a number or set of numbers means those numbers repeat indefinitely.

Fourths are the only fractions that have their own nickname: quarters. One quarter equals 25 cents, two quarters equal .50, etc.

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

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

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

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

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

$$\frac{2}{10} = .2$$

Two, four, six, eight, who do we appreciate? Fifths, fifths, fifths!

Let's Practice

Grab your calculator and solve these division problems to the nearest hundredth:

$$\frac{4}{7} = \underline{\hspace{2cm}}$$

$$\frac{11}{5} = \underline{\hspace{2cm}}$$

$$\frac{6}{13} = \underline{\hspace{2cm}}$$

$$\frac{8}{3} = \underline{\hspace{2cm}}$$

$$\frac{9}{14} = \underline{\hspace{2cm}}$$

$$\frac{7}{6} = \underline{\hspace{2cm}}$$

$$\frac{2}{23} = \underline{\hspace{2cm}}$$

$$\frac{12}{4} = \underline{\hspace{2cm}}$$

The instructions for this portion say "answer to the nearest hundredth." Where are the hundredths located, and how do we round to them? Consider these two numbers.

458.2736



9,003.61682



The hundredths place is the second digit after the decimal point. To decide which number to write there, we look at the third place after the decimal (the thousandths place).

- If the third digit is 4 or less, we keep the digit in the hundredths place.

In 458.2736, the digit in the thousandths place -- 3 -- is 4 or less, so the answer is 458.27.

- If the third digit is 5 or more, we round up the digit in the hundredths place.

In 9,003.61682, the third digit -- 6 -- is 5 or more, so the answer becomes 9,003.62.

Now solve these on paper using the "house". Find the complete quotient or use the repeating bar.

$$\frac{3}{8} = \underline{\hspace{2cm}}$$

$$\frac{33}{5} = \underline{\hspace{2cm}}$$

$$\frac{4}{9} = \underline{\hspace{2cm}}$$

$$\frac{7}{12} = \underline{\hspace{2cm}}$$

Decimals to Fractions

The key to solving these problems is recognizing that every number has a name. While we might call .27 “point two seven,” its actual name is “twenty-seven hundredths.”

Write the twenty-seven over the hundredths: $\frac{27}{100}$

What about .3247? Its name is “Three thousand two hundred forty-seven ten thousandths.”

Write it: $\frac{3,247}{10,000}$

It is becoming evident that long decimals have complicated names, so try this: Count the number of digits to the right of the decimal. That is how many zeroes will be in the denominator. Look at the two examples above. The number .27 has **two** digits, so it is placed over 100, which has **two** zeroes. The number .3247 has **four** digits, and the 10,000 in the denominator has **four** zeroes.

What if there are numbers to the left of the decimal?

Just place the numbers in front of the fraction. For example, 12.1 becomes $12\frac{1}{10}$.

This seems too easy to be true? Does it get harder?

Actually, it does. All fractions must be simplified, unless you are told otherwise ... and you will never be told otherwise. The good news is that there are very few prime factors of 10, 100, etc...

Here are the main numbers that can be reduced out to the hundredths place:

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

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

$$\frac{2}{100} = \frac{1}{50}$$

$$\frac{4}{100} = \frac{1}{25}$$

$$\frac{5}{100} = \frac{1}{20}$$

$$\frac{10}{100} = \frac{1}{10}$$

$$\frac{20}{100} = \frac{1}{5}$$

$$\frac{25}{100} = \frac{1}{4}$$

$$\frac{50}{100} = \frac{1}{2}$$

and

$$\frac{24}{100} = \frac{6}{25}$$

$$\frac{80}{100} = \frac{4}{5}$$

$$\frac{58}{100} = \frac{29}{50}$$

Let's Practice

Convert these decimals to fractions in simplest form:

$$0.405 = \underline{\hspace{2cm}}$$

$$0.39 = \underline{\hspace{2cm}}$$

$$0.2468 = \underline{\hspace{2cm}}$$

$$12.4 = \underline{\hspace{2cm}}$$

$$0.002 = \underline{\hspace{2cm}}$$

$$3.334 = \underline{\hspace{2cm}}$$

$$416.35 = \underline{\hspace{2cm}}$$

$$0.64 = \underline{\hspace{2cm}}$$

Percent to Decimals

What exactly does percent mean?

When we see the word “per,” we divide. For example, 40 miles per hour is represented with the fraction:

$$\frac{40 \text{ miles}}{1 \text{ hour}}$$

Now let’s study the word “cent.”

In 1976, America celebrated its bicentennial anniversary.

My parents were born in the last century, but I was born in this one.

I wanted to buy a soda from the machine, but I only had 45 cents.

Tell me again, how many centimeters are in a meter?

More than 90 percent of my class is going on the field trip.

+ + + + + + + + + + + +

Each of the sentences above contains a word with “cent” in it. Underline the “cent” in each sentence ... just the “cent,” not the whole word.

Bicentennial means 200 years. The word is made up of “bi” meaning two – as in a bicycle has two wheels – “cent” meaning 100, and a variation of the word annual, which means a year.

Century means 100 years.

There are 100 cents in a dollar.

There are 100 centimeters in one meter.

Percent means “divide by 100.” The symbol for percent is: %

The great thing about the decimal system is that to divide by 100 we don’t need a calculator. We only need to move the decimal two places to the left.

$$\overset{\curvearrowright}{74} \div 100 = 0.74 \quad 29 \div 100 = 0.29 \quad 356 \div 100 = 3.56 \quad 0.04 \div 100 = 0.0004$$

Notice: with the first three examples, we must first draw a decimal after the last whole number before moving it two places to the left.

To convert a Percent to a Decimal, move the decimal point two places to the left and remove the % sign.

Decimals to Percent

After we master the previous skill, we can just do the whole process in reverse. To multiply by 100, move the decimal point two places to the right.

To convert a Decimal to a Percent, move the decimal point two places to the right and add a % sign.

Here is a **memory device** I would like you to use on every homework, quiz or test that involves converting between percent and decimals. Remember that 25% of a dollar is 25 cents, or .25. Before beginning your homework or test, write this on your paper:

$$25\% = .25$$

The first part of this equation is the percent. If there were a decimal point, it would be after the 5. The second number is the decimal. Notice, that to get from the first part to the second, you need to move the decimal two places to the left and drop the percent sign. To do the opposite, work in reverse.

$$43\% = .43$$

$$15\% = .15$$

$$99\% = .99$$

$$61\% = .61$$

$$58\% = .58$$

The two digit numbers are easy to convert, aren't they? If you will write down $25\% = .25$, and follow the rules that you can see in these numbers, all conversions will be easy.

For example, a company's stock has risen by 1,652% since it was released in 1993. Write 1,652% as a decimal. Rule: move the decimal two places to the left and drop the percent sign $\rightarrow 16.52$

A bank pays 0.038 interest on every dollar you maintain in a savings account. Write 0.038 as a percent. Rule: move the decimal two places to the right and add a percent sign $\rightarrow 3.8\%$

Let's Practice

Convert these decimals to percentages:

$13.62 = \underline{\hspace{2cm}}$

$0.0002 = \underline{\hspace{2cm}}$

$13,000 = \underline{\hspace{2cm}}$

$0.461 = \underline{\hspace{2cm}}$

Convert these percentages to decimals:

$614\% = \underline{\hspace{2cm}}$

$1.06\% = \underline{\hspace{2cm}}$

$1,473\% = \underline{\hspace{2cm}}$

$0.00056\% = \underline{\hspace{2cm}}$

Fractions to Percent

To make this conversion you need to take the long road. First you convert fractions to decimals, then you change the decimals to percentages. With pages of information on how to do each of these steps above, I will just remind you of the rules for each.

Fractions → Decimals

Divide the numerator by the denominator.

Decimals → Percent

Move the decimal point two places to the right and add the percent sign.



$$\frac{5}{8} = 0.625 = 62.5\%$$

Percent to Fractions

This is also a two-step process, so I will remind you of these rules.

Percent → Decimals

Move the decimal point two places to the left and remove the percent sign.

Decimals → Fractions

Remember that each number has a name, write this name as a fraction, and simplify.



$$44\% = 0.44 = \frac{44}{100} = \frac{11}{25}$$

Space for memory device →
(See page 5 above)

Fill in the missing conversions.

| | Decimal | Percent | Fraction | | Decimal | Percent | Fraction |
|---|-----------------|---------|--------------------|---|------------------|---------|--------------------|
| A | .4 | | $\frac{2}{5}$ | N | | 25,000% | |
| B | .63 | 63% | | O | $\overline{.18}$ | | $\frac{2}{11}$ |
| C | | .03% | $\frac{3}{10,000}$ | P | | 1.1% | |
| D | .75 | | | Q | 123.45 | | |
| E | $\overline{.3}$ | | $\frac{1}{3}$ | R | | | $\frac{61}{1,000}$ |
| F | | 24% | | S | | | $\frac{70}{9}$ |
| G | | | $\frac{7}{8}$ | T | .005 | | |
| H | 200.5 | | | U | | | $\frac{3}{10}$ |
| I | | 350.25% | | V | 3.14 | 314% | |
| J | | | $\frac{12}{25}$ | W | | .0008% | |
| K | .00007 | | | X | | 222.22% | |
| L | .035 | 3.5% | | Y | | | $\frac{17}{40}$ |
| M | | 99.9% | | Z | 25 | | |