

9. The standard algorithm for division

With all of our multiplying by fractions, we've actually had to split things up (divide) quite a bit.

Let's come up with an algorithm to divide something by looking at how we have done division thus far:

Mr. Potter had \$53.72

He used that money to buy 4 huge bags of disgusting Takis. How much did each bag cost?

What is going on:

We are dividing 53.72 into four equal groups. Our answer will be equal to one group, as we are figuring out how much ONE bag costs.

Set up: 53.72 is:

5 tens, 3 ones, 7 tenths, and 2 hundredths



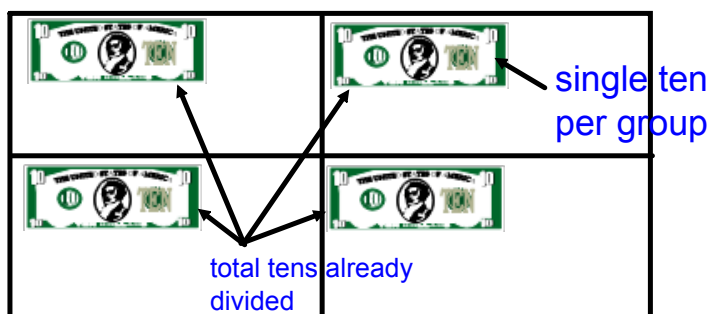
The Standard Algorithm

Set up: quotient will go here

$$\begin{array}{r} 4 \overline{) 53.72} \end{array}$$

divisor number being divided (dividend)

We will divide this into 4 equal groups:



We begin by dividing our largest place value. In this case, it is tens. We have 5 tens, so we can give each of our 4 groups a single ten.



$$\begin{array}{r}
 1 \leftarrow \text{single ten per group} \\
 4 \overline{) 53.72} \\
 \underline{4} \leftarrow \text{total tens already divided} \\
 1 \leftarrow \text{tens remaining to be divided}
 \end{array}$$

Over here we do the same thing. We assign a single ten to each group. We have handed out 4 tens, and so we have one remaining.

Next, we ungroup our remaining ten.



We will get ten ones, and we had 3 from the start, so we will now have 13 ones. This means we can put 3 in each group, and have 1 left over.



$$\begin{array}{r}
 13 \leftarrow \text{3 ones per group} \\
 4 \overline{) 53.72} \\
 \underline{4} \\
 13 \leftarrow \begin{array}{l} \text{1 ten becomes} \\ \text{ten ones} \end{array} \quad \leftarrow \text{3 ones from before} \\
 \underline{12} \leftarrow \text{12 ones divided already} \\
 1 \leftarrow \text{1 one remaining to divide}
 \end{array}$$

Next, we ungroup our remaining one.



We will get 10 tenths. We had 7 tenths from before, so now we will have 17 tenths. We divide this evenly into four groups, which means we can put 4 tenths in each group. $4 \times 4 = 16$. We will have one tenth remaining.



one tenth
remaining to divide.



$$\begin{array}{r}
 13.4 \\
 4 \overline{) 53.72} \\
 \underline{4} \\
 13 \\
 \underline{12} \\
 17 \\
 \underline{16} \\
 1
 \end{array}$$

We put 4 tenths in each group.

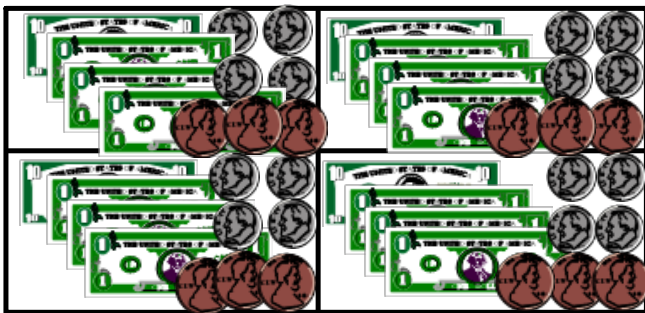
We ungrouped our remaining 1 into 10 tenths.

We had 7 tenths to start with, so now we have 17

4 tenths in each of 4 groups means we have divided 16 tenths total.

one tenth remaining to divide.

Next, we ungroup our remaining tenth.



When I ungroup a tenth, I get ten hundredths. There were 2 hundredths that we started with, so now there are 12 hundredths. We divide 12 hundredths into 4 groups, and so we can put 3 hundredths in each group.

$$\begin{array}{r}
 13.43 \\
 4 \overline{) 53.72} \\
 \underline{4} \\
 13 \\
 \underline{12} \\
 17 \\
 \underline{16} \\
 12 \\
 \underline{12} \\
 0
 \end{array}$$

3 hundredths in each group

add the 2 hundredths we had to start, for a total of 12 hundredths

we ungroup our tenth into ten hundredths.

And we have no hundredths remaining.

We divided up 12 of our hundredths