## Lesson 11: Dividing Numbers that Result in Decimals

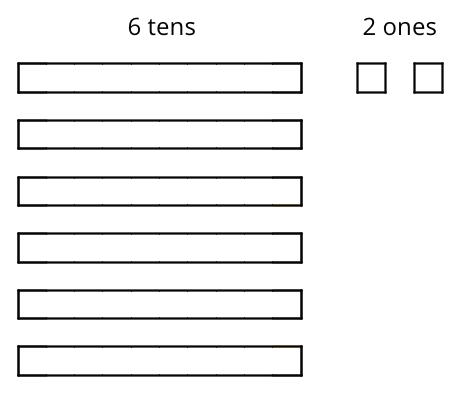
Let’s find quotients that are not whole numbers.

### 11.1: Number Talk: Evaluating Quotients

Find the quotients mentally.

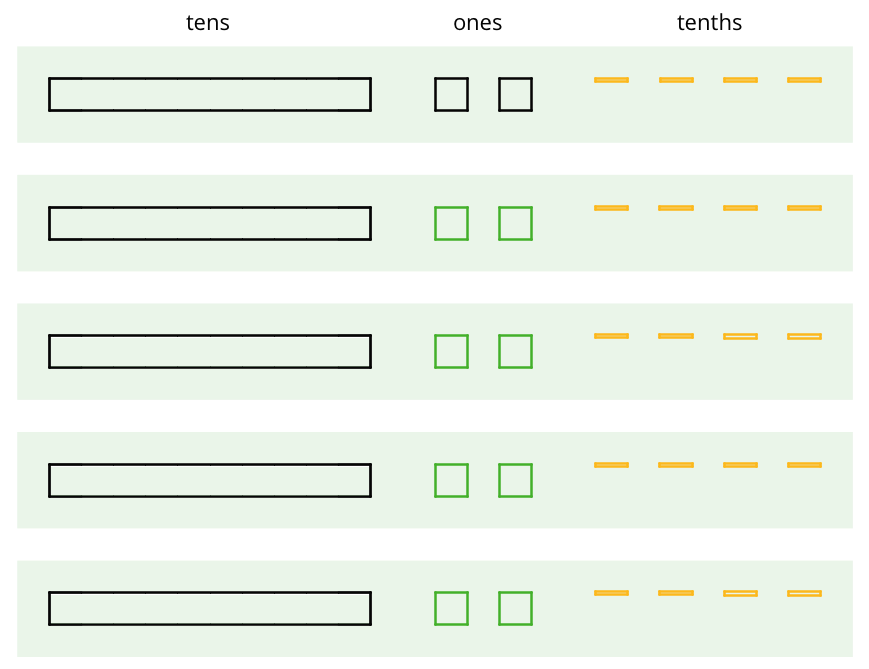
### 11.2: Keep Dividing

Mai used base-ten diagrams to calculate . She started by representing 62.



She then made 5 groups, each with 1 ten. There was 1 ten left. She unbundled it into 10 ones and distributed the ones across the 5 groups.

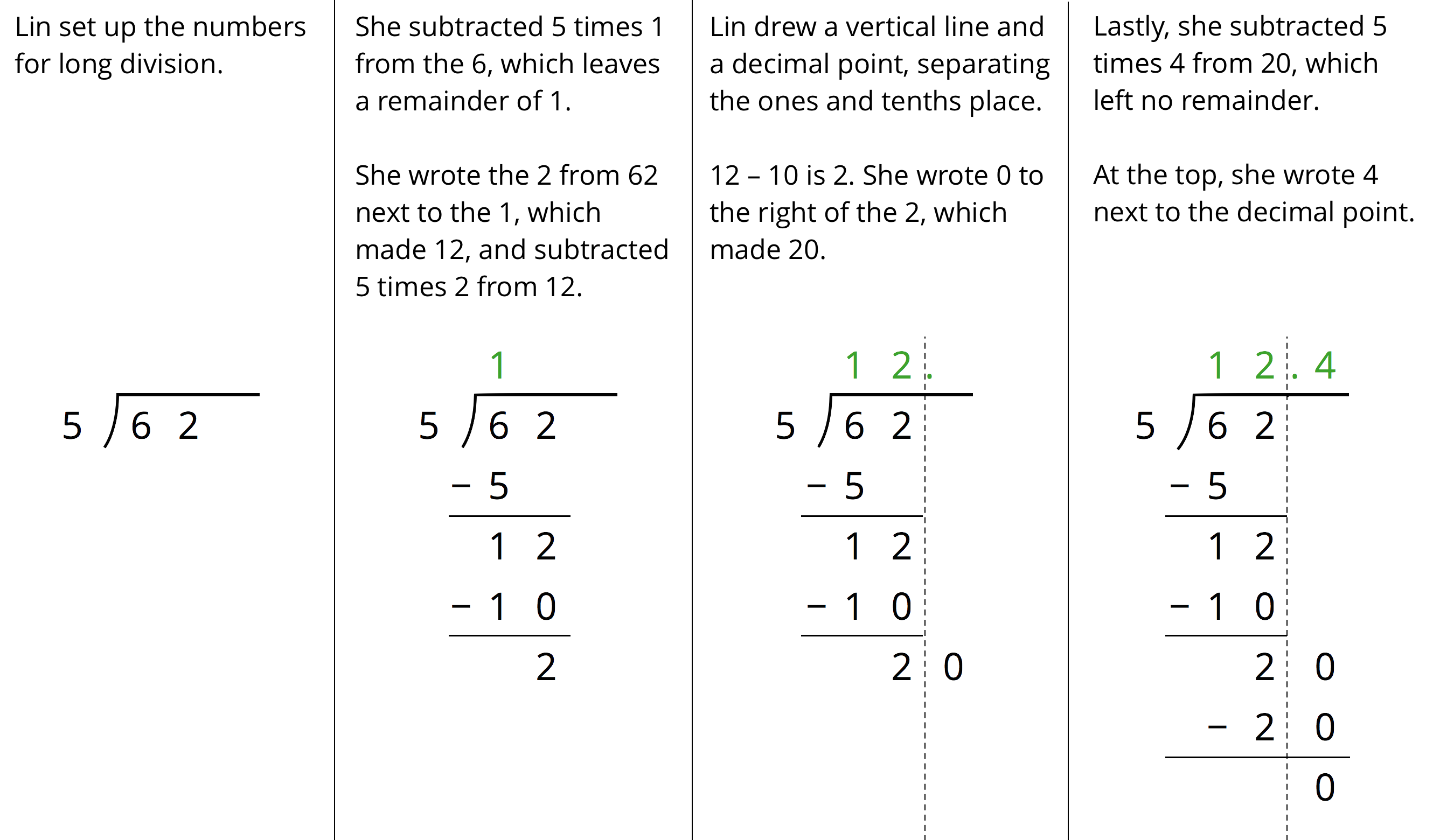
Here is Mai’s diagram for .



1. Discuss these questions with a partner and write down your answers:
   1. Mai should have a total of 12 ones, but her diagram shows only 10. Why?
   2. She did not originally have tenths, but in her diagram each group has 4 tenths. Why?
   3. What value has Mai found for ? Explain your reasoning.
2. Find the quotient of by drawing base-ten diagrams or by using the partial quotients method. Show your reasoning. If you get stuck, work with your partner to find a solution.
3. Four students share a $271 prize from a science competition. How much does each student get if the prize is shared equally? Show your reasoning.

### 11.3: Using Long Division to Calculate Quotients

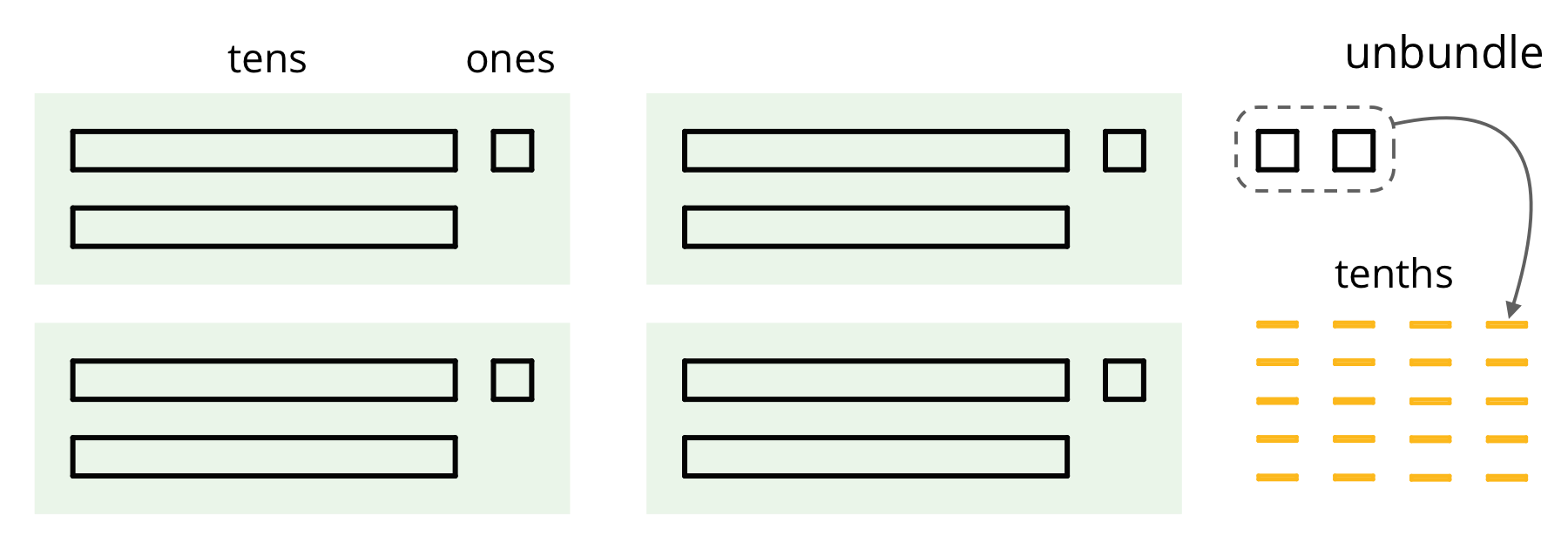
Here is how Lin calculated .



1. Discuss with your partner:
   * Lin put a 0 after the remainder of 2. Why? Why does this 0 not change the value of the quotient?
   * Lin subtracted 5 groups of 4 from 20. What value does the 4 in the quotient represent?
   * What value did Lin find for ?
2. Use long division to find the value of each expression. Then pause so your teacher can review your work.
3. Use long division to show that:
   1. , or , is 1.25.
   2. , or , is 0.8.
   3. , or , is 0.125.
   4. , or , is 0.04.
4. Noah said we cannot use long division to calculate because there will always be a remainder.
   1. What do you think Noah meant by “there will always be a remainder”?
   2. Do you agree with him? Explain your reasoning.

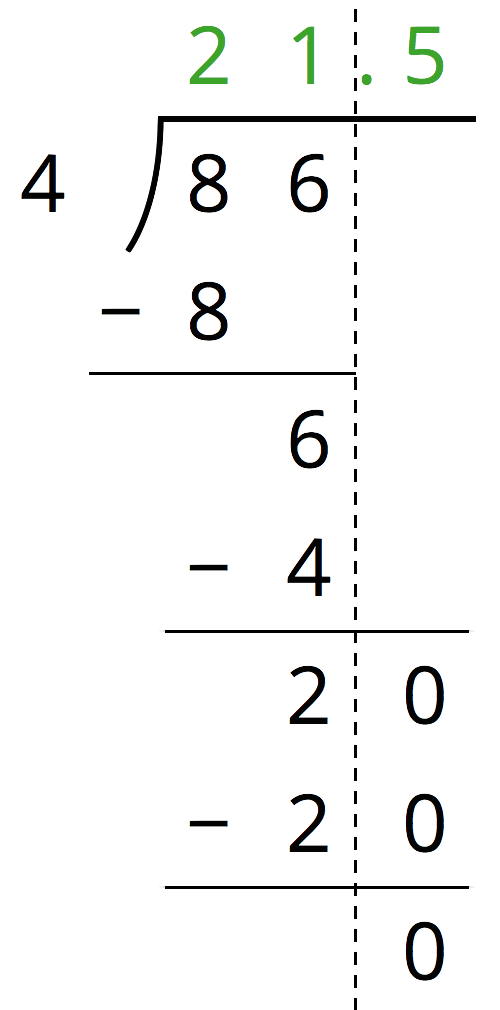
### Lesson 11 Summary

Dividing a whole number by another whole number does not always produce a whole-number quotient. Let’s look at , which we can think of as dividing 86 into 4 equal groups.



We can see in the base-ten diagram that there are 4 groups of 21 in 86 with 2 ones left over. To find the quotient, we need to distribute the 2 ones into the 4 groups. To do this, we can unbundle or decompose the 2 ones into 20 tenths, which enables us to put 5 tenths in each group.

Once the 20 tenths are distributed, each group will have 2 tens, 1 one, and 5 tenths, so .



We can also calculate using long division.

The calculation shows that, after removing 4 groups of 21, there are 2 ones remaining. We can continue dividing by writing a 0 to the right of the 2 and thinking of that remainder as 20 tenths, which can then be divided into 4 groups.

To show that the quotient we are working with now is in the tenth place, we put a decimal point to the right of the 1 (which is in the ones place) at the top. It may also be helpful to draw a vertical line to separate the ones and the tenths.

There are 4 groups of 5 tenths in 20 tenths, so we write 5 in the tenths place at the top. The calculation likewise shows .



© CC BY Open Up Resources. Adaptations CC BY IM.