Unit 5, Lesson 3

# Adding and Subtracting Decimals with Few Non-Zero Digits

Let's add and subtract decimals.

## 3.1 Do the Zeros Matter?

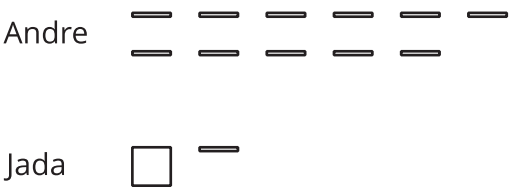
1. Find the value mentally: $1.009 + 0.391$
2. Decide if each statement is true or false. Be prepared to explain your reasoning.
   a. $34.56000 = 34.56$
   b. $25 = 25.0$
   c. $2.405 = 2.45$

## 3.2 Calculating Sums

1. Andre and Jada drew base-ten diagrams to represent $0.007 + 0.004$.

   Andre drew 11 small rectangles.

   Jada drew only two figures: a square and a small rectangle.

   a. If both students represented the sum correctly, what value does each small rectangle represent? What value does each square represent?

   b. Draw or describe a diagram that could represent the sum $0.008 + 0.07$.


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2. Here are two calculations of $0.2 + 0.05$. Which is correct? Explain why one is correct and the other is incorrect.

$$\begin{array}{r} 0.2 \\ +\ 0.05 \\ \hline 0.25 \end{array} \qquad \begin{array}{r} 0.2 \\ +\ 0.05 \\ \hline 0.07 \end{array}$$

3. Compute each sum. If you get stuck, consider drawing base-ten diagrams to help you.

   a.

$$\begin{array}{r} 0.11 \\ +\ 0.005 \\ \hline \end{array}$$

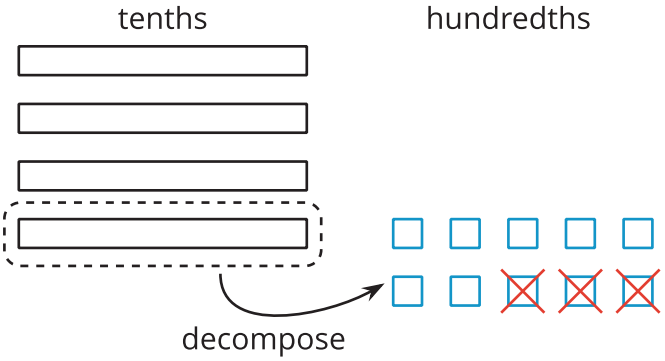
   b. $0.209 + 0.01$

   c. $10.2 + 1.1456$

# 3.3 Subtracting Decimals of Different Lengths

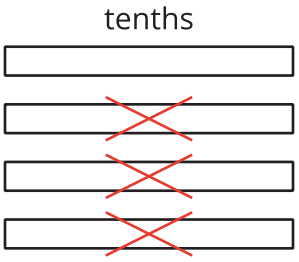
Diego and Noah drew different diagrams to represent $0.4 - 0.03$. Each rectangle represents 0.1. Each square represents 0.01.

- Diego started by drawing 4 rectangles to represent 0.4. He then replaced 1 rectangle with 10 squares and crossed out 3 squares to represent subtraction of 0.03, leaving 3 rectangles and 7 squares in his diagram.




Diego's Method

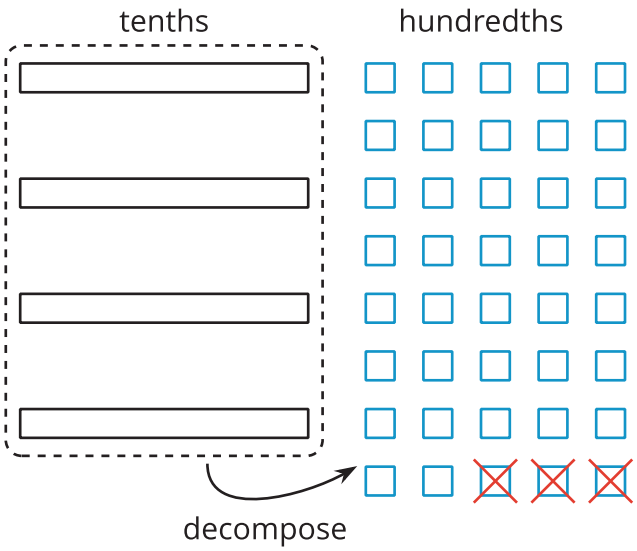
- Noah started by drawing 4 rectangles to represent 0.4. He then crossed out 3 rectangles to represent the subtraction, leaving 1 rectangle in his diagram.




Noah's Method

1. Do you agree that either diagram correctly represents $0.4 - 0.03$? Discuss your reasoning with a partner.

2. Elena also drew a diagram to represent $0.4 - 0.03$. She started by drawing 4 rectangles. She then replaced all 4 rectangles with 40 squares and crossed out 3 squares to represent subtraction of 0.03, leaving 37 squares in her diagram. Is her diagram correct? Discuss your reasoning with a partner.




Elena's Method

3. Find each difference. Be prepared to explain your reasoning. If you get stuck, you can use base-ten blocks or diagrams to represent each expression and find its value.

   a. $0.3 - 0.05$

   b. $2.1 - 0.4$

c. $1.03 - 0.06$

d. $0.02 - 0.007$

## Are you ready for more?

In a game, special stones are used for bartering. The values of the stones are based on their color and are ranked as shown, with red having the highest value.

| red |
|---|
| orange |
| yellow |
| green |
| blue |
| indigo |
| violet |

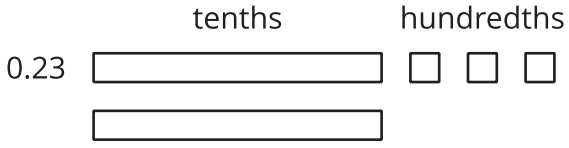
Each color is valued at 3 times the color below it in the ranking. So the value of a red stone is 3 times that of an orange stone, and the value of a green stone is 3 times that of a blue stone.

The stones can be used to buy items. Suppose you want to buy a tool that is worth 2 yellow stones, 2 green stones, 2 blue stones, and 1 indigo stone. You go into the store with 1 red stone, 1 yellow stone, 2 green stones, 1 blue stone, and 2 violet stones.

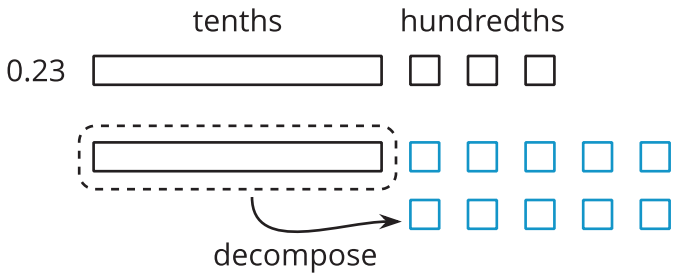
What stones would the shopkeeper give you for the change? Assume the shopkeeper would use as few stones as possible.

## Lesson 3 Summary

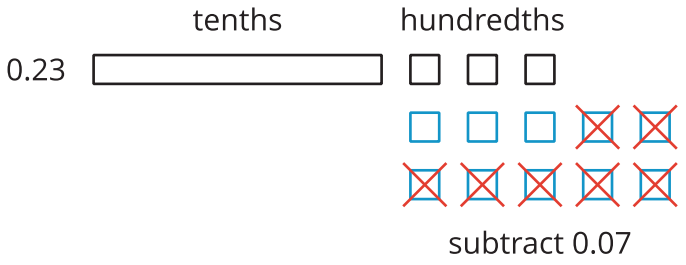
Base-ten diagrams can help us understand subtraction. Suppose we are finding $0.23 - 0.07$. Here is a diagram showing 0.23, or 2 tenths and 3 hundredths.




Subtracting 7 hundredths means removing 7 small squares, but we do ;not have enough to remove. Because 1 tenth is equal to 10 hundredths, we can decompose one of the tenths (1 rectangle) into 10 hundredths (10 small squares).




We now have 1 tenth and 13 hundredths, from which we can remove 7 hundredths.




We have 1 tenth and 6 hundredths remaining, so $0.23 - 0.07 = 0.16$.



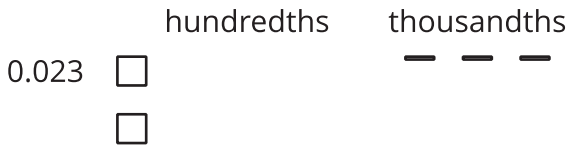

Here is a vertical calculation of $0.23 - 0.07$.

$$\begin{array}{r} {\scriptstyle 1\ 13} \\ 0.2\cancel{3} \\ -\ 0.0\ 7 \\ \hline 0.1\ 6 \end{array}$$

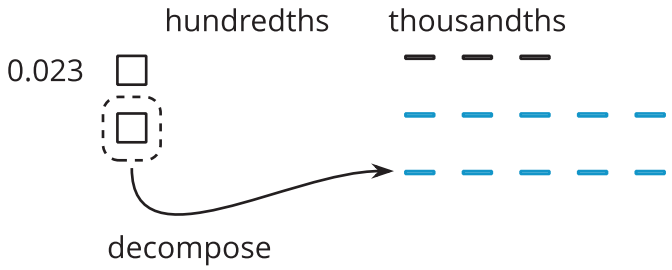
Notice how this representation also shows that a tenth is decomposed into 10 hundredths in order to subtract 7 hundredths.


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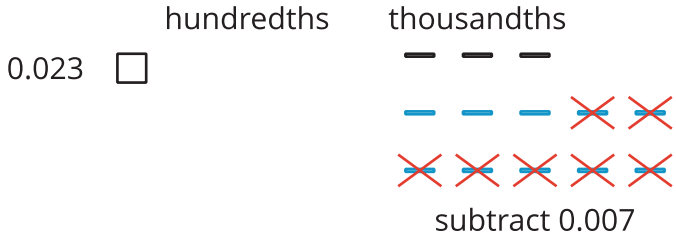
This works for any decimal place. Suppose we are finding $0.023 - 0.007$. Here is a diagram showing 0.023.



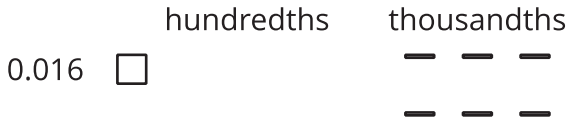

We want to remove 7 thousandths (7 small rectangles). We can decompose one of the hundredths into 10 thousandths.




Now we can remove 7 thousandths.




We have 1 hundredth and 6 thousandths remaining, so $0.023 - 0.007 = 0.016$.




Here is a vertical calculation of $0.023 - 0.007$.

$$\begin{array}{r} {\scriptstyle 1\ 13} \\ 0.0\not{2}\not{3} \\ -\ 0.007 \\ \hline 0.016 \end{array}$$