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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?

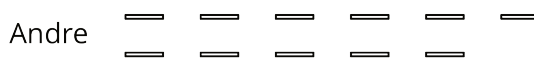
- Evaluate mentally: $1.009 + 0.391$
- Decide if each equation is true or false. Be prepared to explain your reasoning.
 - $34.56000 = 34.56$
 - $25 = 25.0$
 - $2.405 = 2.45$

3.2: Calculating Sums

m.openup.org/1/6-5-3-2



- 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.



- If both students represented the sum correctly, what value does each small rectangle represent? What value does each square represent?
- Draw or describe a diagram that could represent the sum $0.008 + 0.07$.

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

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

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

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

a.

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

b. $0.209 + 0.01$

c. $10.2 + 1.1456$

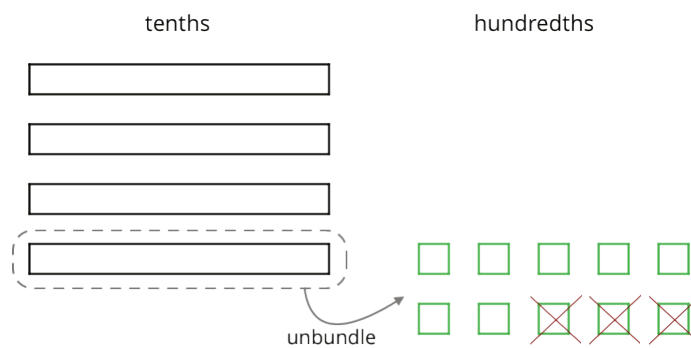
3.3: Subtracting Decimals of Different Lengths

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To represent $0.4 - 0.03$, Diego and Noah drew different diagrams. Each rectangle represented 0.1. Each square represented 0.01.

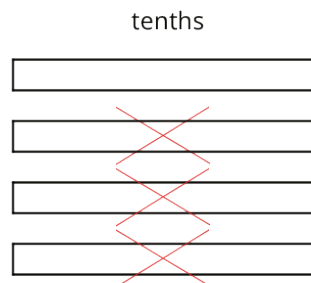


- Diego started by drawing 4 rectangles to represent 0.4. He then replaced 1 rectangle with 10 squares and crossed out 3 squares to represent subtraction of 0.03, leaving 3 rectangles and 7 squares in his diagram.



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

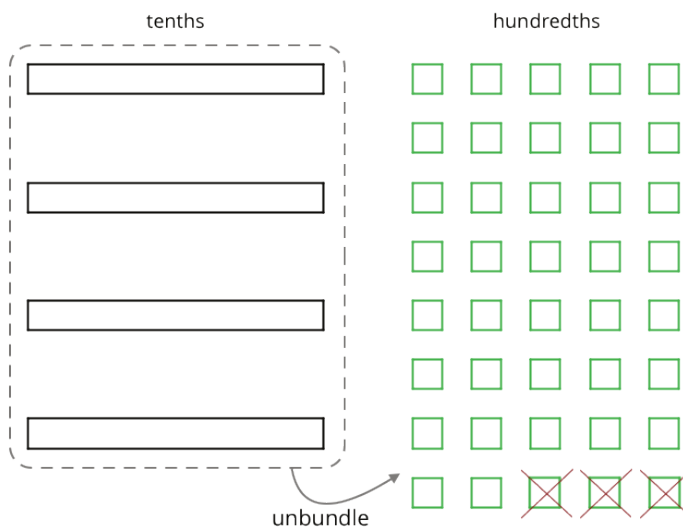
- Do you agree that either diagram correctly represents $0.4 - 0.03$? Discuss your reasoning with a partner.

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2. To represent $0.4 - 0.03$, Elena drew another diagram. She also 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. Explain or show your reasoning.

a. $0.3 - 0.05$

c. $1.03 - 0.06$

b. $2.1 - 0.4$

d. $0.02 - 0.007$

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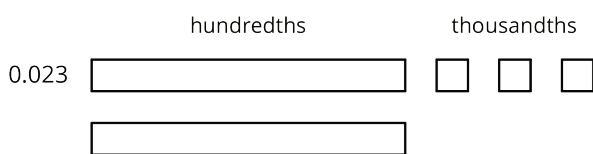
Are you ready for more?

A distant, magical land uses jewels for their bartering system. The jewels are valued and ranked in order of their rarity. Each jewel is worth 3 times the jewel immediately below it in the ranking. The ranking is red, orange, yellow, green, blue, indigo, and violet. So a red jewel is worth 3 orange jewels, a green jewel is worth 3 blue jewels, and so on.

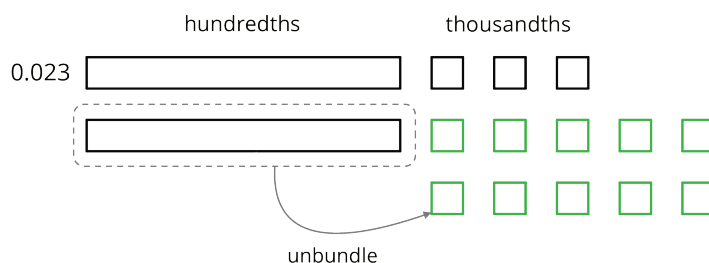
At the Auld Shoppe, a shopper buys items that are worth 2 yellow jewels, 2 green jewels, 2 blue jewels, and 1 indigo jewel. If they came into the store with 1 red jewel, 1 yellow jewel, 2 green jewels, 1 blue jewel, and 2 violet jewels, what jewels do they leave with? Assume the shopkeeper gives them their change using as few jewels as possible.

Lesson 3 Summary

Base-ten diagrams can help us understand subtraction as well as addition. Suppose we are finding $0.023 - 0.007$. Here is a diagram showing 0.023, or 2 hundredths and 3 thousandths.



Subtracting 7 thousandths means removing 7 small squares, but we do not have enough to remove. Because 1 hundredth is equal to 10 thousandths, we can “unbundle” (or decompose) one of the hundredths (1 rectangle) into 10 thousandths (10 small squares).

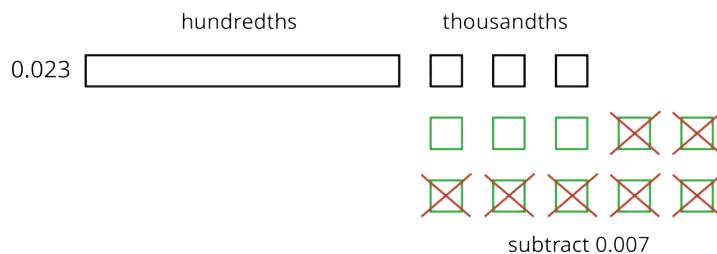


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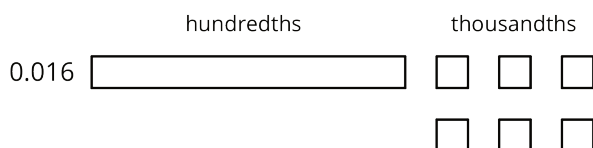
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We now have 1 hundredth and 13 thousandths, from which we can remove 7 thousandths.



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



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

$$\begin{array}{r}
 0 \overset{1}{\cancel{2}} \overset{10}{\cancel{3}} \\
 - 0 0 7 \\
 \hline
 0 1 6
 \end{array}$$

In both calculations, notice that a hundredth is unbundled (or decomposed) into 10 thousandths in order to subtract 7 thousandths.

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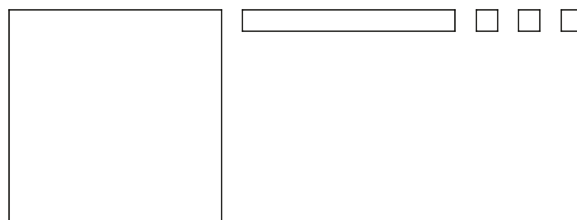
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Unit 5, Lesson 3: Adding and Subtracting Decimals with Few Non-Zero Digits

1. Here is a base-ten diagram that represents 1.13. Use the diagram to find $1.13 - 0.46$.

Explain how you found the difference, or label your diagram to show your steps.



2. Compute the following sums. If you get stuck, you can draw base-ten diagrams.

a. $0.027 + 0.004$

b. $0.203 + 0.1$

c. $1.2 + 0.145$

3. A student said we cannot subtract 1.97 from 20 because 1.97 has two decimal digits and 20 has none. Do you agree with his statement? Explain or show your reasoning.

4. Decide which calculation shows the correct way to find $0.3 - 0.006$ and explain your reasoning.

A	B	C	D
0.3	0.3	0.30	0.300
-0.006	-0.006	-0.006	-0.006
<hr style="width: 100%;"/>	<hr style="width: 100%;"/>	<hr style="width: 100%;"/>	<hr style="width: 100%;"/>
0.306	0.097	0.024	0.294

5. Complete the calculations so that each shows the correct difference.

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a.

$$\begin{array}{r} 142.6 \\ - 1.4 \\ \hline \square\square\square.2 \end{array}$$

b.

$$\begin{array}{r} 38.60 \\ - 6.75 \\ \hline \square\square.\square5 \end{array}$$

c.

$$\begin{array}{r} 241.76 \\ - 2.18 \\ \hline \square\square\square.\square8 \end{array}$$

6. The school store sells pencils for \$0.30 each, hats for \$14.50 each, and binders for \$3.20 each. Elena would like to buy 3 pencils, a hat, and 2 binders. She estimated that the cost will be less than \$20.

- Do you agree with her estimate? Explain your reasoning.
- Estimate the number of pencils could she buy with \$5. Explain or show your reasoning.

(from Unit 5, Lesson 1)

7. A rectangular prism measures $7\frac{1}{2}$ cm by 12 cm by $15\frac{1}{2}$ cm.

- Calculate the number of cubes with edge length $\frac{1}{2}$ cm that fit in this prism.

- What is the volume of the prism in cm^3 ? Show your reasoning. If you are stuck, think about how many cubes with $\frac{1}{2}$ -cm edge lengths fit into 1 cm^3 .

(from Unit 4, Lesson 15)

8. At a constant speed, a car travels 75 miles in 60 minutes. How far does the car travel in 18 minutes? If you get stuck, consider using the table.

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minutes	distance in miles
60	75
6	
18	

(from Unit 2, Lesson 12)