3.2 Adding and Subtracting Decimals

GOAL

Develop strategies to add and subtract decimals.

5.341 m

1.614 m   2.172 m

LEARN ABOUT the Math

Matthew and Fiona are cutting a water pipe that is 15.000 m long into sections. Matthew needs sections that are 1.614 m, 5.341 m, and 2.172 m long. Fiona needs a section that is 5.000 m long.

❓ Will there be enough pipe left for Fiona's section?

Example 1 | Estimating a sum and a difference

I estimated the length of pipe I will need using front-end estimation.

Matthew's Solution

$$
\begin{array}{r}
1.614 \\
5.341 \\
+\ 2.172 \\
\hline
8
\end{array}
$$

I added the ones.

$6 + 3 + 1 = 10$ tenths
        $= 1.0$

Then I added the tenths.

$8 + 1 = 9$

I added the two sums. I'll need about 9 m of pipe for my sections.

$15 - 9 = 6$

I subtracted my estimate from 15 m. I estimate that 6 m of pipe will be left. Since 6 m is greater than 5 m, there will be enough pipe left for Fiona's section.

Example 2 | Adding decimals

I calculated the length of pipe that Matthew will need.

Julie's Solution

Ones	•	Tenths	Hundredths	Thousandths

The three sections that Matthew will need are 1.614 m, 5.341 m, and 2.172 m. I modelled the lengths with base ten blocks on a place value mat.

I used the large block to represent 1 so that there would be a block to represent thousandths. The flat represents 0.1, the rod represents 0.01, and the small cube represents 0.001.

Ones	•	Tenths	Hundredths	Thousandths

I put blocks that were the same together, and I recorded my addition. There were 7 thousandths. I regrouped 10 of the 12 hundredths as 1 tenth.

$$
\begin{array}{r}
\overset{1}{} \\
1.614 \\
5.341 \\
+\ 2.172 \\
\hline
27
\end{array}
$$

Ones	•	Tenths	Hundredths	Thousandths

I regrouped 10 of the 11 tenths as a one.

$$
\begin{array}{r}
\overset{1\ \ 1}{} \\
1.614 \\
5.341 \\
+\ 2.172 \\
\hline
.127
\end{array}
$$

Ones	•	Tenths	Hundredths	Thousandths

Matthew will need 9.127 m of pipe for his sections.

$$
\begin{array}{r}
\overset{1\ \ 1}{} \\
1.614 \\
5.341 \\
+\ 2.172 \\
\hline
9.127
\end{array}
$$

There were 9 ones, 1 tenth, 2 hundredths, and 7 thousandths in total.

Example 3 | Subtracting decimals

To calculate the remaining length, I subtracted the amount that Matthew will need from the total length.

Fiona's Solution

15.000 − 9.127 is about 15 − 9 = 6.

$$15\ 000 = 14\ 999 + 1$$
$$\underline{-9\ 127} \quad \underline{-9\ 127}$$
$$\quad\quad\quad 5\ 872 + 1 = 5873$$

I'll have 5.873 m of pipe to work with.

I estimated first.

I thought of 15.000 as 15 000 thousandths and 9.127 as 9127 thousands and just calculated 15 000 − 9127.
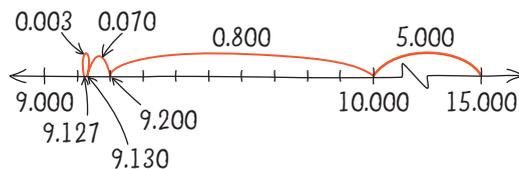I regrouped 15 000 to make the subtraction easier.

I knew the answer had to be about 6, so I could easily place the decimal point.

Example 4 | Subtracting decimals using mental math

I imagined a number line, and calculated the length of pipe that will be left using mental math.

Liam's Solution

There will be 5.873 m of pipe left.

15.000 − 9.127 means "How far is it from 9.127 to 15.000?"

I calculated the difference in steps that made mental calculation easier.

Reflecting

A. How else could Julie and Fiona have regrouped to calculate their answers?

B. Why do you think Liam added 5, then 0.8, then 0.07, and then 0.003?

C. Which method would you have used for the subtraction? Why?

WORK WITH *the Math*

Example 5 | Adding and subtracting thousandths

For a science experiment, Amar and William need to add 0.800 g of salt to a beaker of water. Amar has measured 0.345 g of salt, and William has measured 0.406 g. How many more grams of salt do they need?

Solution

$$\begin{array}{r} 0.345 \\ + 0.406 \\ \hline 0.751 \end{array}$$

Add the amounts that Amar and William measured. Line up the digits to make sure that you add tenths to tenths, hundredths to hundredths, and thousandths to thousandths.

$$\begin{array}{r} ^{7\ 9\ 10} \\ \cancel{0.800} \\ - 0.751 \\ \hline 0.049 \end{array}$$

Subtract the total amount that Amar and William have from the amount that they need. Line up the tenths digits, the hundredths digits, and the thousandths digits. Regroup so you can subtract.

The difference is 0.049, so Amar and William still need 0.049 g of salt.

A Checking

1. Estimate.
  a) $2.321 + 5.309 + 2.100$ **b)** $9.623 - 5.061$
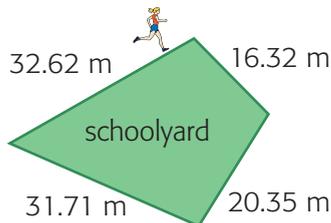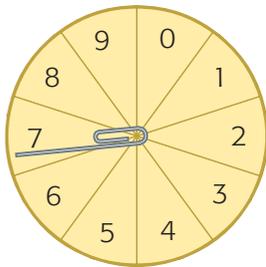
2. Calculate.
  a) $3.05 + 4.26 + 0.63$ **b)** $4.563 - 2.937$

B Practising

3. Estimate.
  a) $2.5 + 12.6 + 20.9$ **c)** $78.615 - 29.321$
  b) $1.32 + 10.55 + 62.41$ **d)** $426.3 + 252.8 - 139.2$

4. Calculate.
   a) $1.356 + 0.405 + 22.015$
   b) $335.216 + 40.52 + 5.145$
   c) $3.162 - 0.123$
   d) $261.72 - 30.568$
   e) $652.1 - 26.358$
   f) $4.123 - 3.200$

5. Zoë is putting a fence around her garden. She needs 14.6 m of wire fence. She has three pieces already cut. These pieces are 6.6 m, 2.1 m, and 7.2 m long. Does she have enough? If so, how much will she have left over? If not, how much more does she need? Explain your reasoning.

6. Jocelyne and Martine ran 400 m. Jocelyne took 74.53 s, and Martine took 89.34 s. How many seconds faster was Jocelyne than Martine?

7. a) Spin the spinner five times to fill in the digits.

   ■.■■
   0.■■

   b) Add the two numbers.
   c) Subtract the lesser number from the greater number.
   d) Repeat nine times. What is the greatest value you calculated? What is the least value?

8. Lucas made punch to sell at a powwow. He combined 1.22 L of ginger ale, 0.76 L of orange juice, 0.89 L of grapefruit juice, and 0.56 L of raspberry juice. Then Lucas spilled some of the punch. He had 2.95 L left. How much did he spill?

9. Gabrielle is training for a race by running around the schoolyard twice. What might be the distance of the race that she is training for?

10. Why might you be able to solve $3 - 2.04$ by solving $3.00 - 2.04$? Why might you not?

32.62 m   16.32 m

schoolyard

31.71 m   20.35 m