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## Decimals

## Learning Goals

- represent, read, and write decimals to hundredths
- explore equivalent decimals
- compare and order decimals
- round decimals to the nearest whole number
- estimate decimal sums and differences
- add, subtract, multiply, and divide decimals
- pose and solve problems involving decimals

The coins we use are made at the Royal Canadian Mint in Winnipeg, Manitoba. Coin blanks are punched from large sheets of thin metal. These blanks pass through machines that stamp designs on both sides. The coins are inspected, then loaded into machines that count and package them. The coins are now ready for your pocket or piggy bank.

# Key Words 

## placeholder

The Royal Canadian Mint can make 750 coins in a second, or 4 billion coins in a year! To pass inspection, all coins of the same value must have exactly the same mass, thickness, and width. The data below are from the Mint.


Data for Canadian Coins

| Coin | Mass <br> $\mathbf{( g )}$ | Thickness <br> $(\mathbf{m m})$ | Width <br> $(\mathbf{m m})$ |
| :--- | :---: | :---: | :---: |
| Penny | 2.35 | 1.45 | 19.05 |
| Nickel | 3.95 | 1.76 | 21.2 |
| Dime | 1.75 | 1.22 | 18.03 |
| Quarter | 4.4 | 1.58 | 23.88 |
| $50 ¢$ | 6.9 | 1.95 | 27.13 |
| Loonie | 7 | 1.75 | 26.5 |
| Toonie | 7.3 | 1.8 | 28 |



## Tenths and Hundredths

The Royal Canadian Mint has been producing pennies, nickels, dimes, quarters, and fifty-cent coins since 1908. Over the years, these coins have changed in mass, thickness, and width.

## Explore

You will need Base Ten Blocks.

This table shows how the mass of the penny has changed over the years.

Use Base Ten Blocks to model and compare each mass.
Record your work.

## Show and Share

Share your work with another pair of classmates.
Changes in Mass of the Penny

| Dates | Mass (g) |
| :---: | :---: |
| $1908-1920$ | 5.67 |
| $1920-1979$ | 3.24 |
| $1980-1981$ | 2.8 |
| $1982-1996$ | 2.5 |
| $1997-1999$ | 2.25 |
| $2000-2003$ | 2.35 |

How do the masses compare?

## Connect

- The toonie was first produced in 1996. It is 1.8 mm thick.

Here is one way to model 1.8.


1.8 is a decimal.

It can also be written as the mixed number $1 \frac{8}{10}$. Both are read as "one and eight-tenths."
> You can also say that the toonie has a thickness of 0.18 cm . Here is one way to model 0.18.

| Ones $\cdot$ Tenths | Hundredths |  |
| :---: | :---: | :--- |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

> The loonie was first produced in 1987. Loonies made since 1988 have a thickness of 1.75 mm . Here is one way to model 1.75 .

| Ones | Tenths | Hundredths |
| :---: | :---: | :---: |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

For a decimal less than 1 , you write a 0 in the ones place for 0 ones.
0.18 can be written as a fraction: $\frac{18}{100}$ Both are read as "eighteen-hundredths."

1.75 can be written as the mixed number $1 \frac{75}{100}$. Both are read as "one and seventy-five hundredths."

From 1968 to 1999 , the dime had a mass of 2.07 g . Here is one way to model 2.07 .


| Ones | $\cdot$ | Tenths |
| :--- | :--- | :--- |
|  |  | Hundredths |
|  |  |  |
|  |  |  |
|  |  |  |

2.07 can be written as the mixed number $2 \frac{7}{100}$. Both are read as "two and seven-hundredths."

You can use a place-value chart to show decimals.

| Ones | Tenths | Hundredths |
| :---: | :---: | :---: |
| 1 | 8 |  |
| 0 | 1 | 8 |
| 1 | 7 | 5 |
| 2 | 0 | 7 |

## Practice

Use Base Ten Blocks when they help.

1. Write a decimal and a fraction or mixed number for each picture.
a)

b)

c)

| Ones | \& Tenths | Hundredths |
| :--- | :--- | :--- |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

d)

2. Colour hundredths grids to show each decimal. Write it as a fraction or a mixed number.
a) 3.17
b) 2.06
c) 0.78
d) 1.4

3. Model each decimal with Base Ten Blocks.

Make a sketch to record your work.
a) 0.46
b) 3.04
c) 1.9
d) 1.09
e) 3.35
4. Sketch a place-value mat.

Show each number on it.
a) 12 hundredths
b) 1 and 27 hundredths
c) 6 tenths
d) 4 hundredths

| Ones | $\bullet$ Tenths | Hundredths |
| :--- | :--- | :--- |
|  |  |  |
|  |  |  |

e) 7 and 89 hundredths
f) 2 and 4 tenths
5. Use Base Ten Blocks to model each fraction or mixed number.

Then write it as a decimal.
a) $\frac{85}{100}$
b) $4 \frac{6}{10}$
c) $\frac{9}{10}$
d) $2 \frac{8}{100}$
e) $7 \frac{7}{100}$
6. Write each number as a decimal.
a) forty-six hundredths
b) five and six-hundredths
c) two and eight-tenths
d) nine and forty-nine hundredths
7. Use the data in the table.
a) Write the number that has a 5 in the hundredths place.
b) Write the number that has a 3 in the ones place.
c) Write a number that has a 3 in the hundredths place.

| Coin | Width (mm) |
| :---: | :---: |
| Penny | 19.05 |
| Dime | 18.03 |
| Quarter | 23.88 |
| $50 ¢$ | 27.13 |
| Loonie | 26.5 |

8. Draw boxes like these:
$\square$ . $\square \square$ and $\square$ $\square$. $\square$
Use the digits 4,5 , and 8 .
a) Write these digits in the boxes to make as many different decimals as you can.
b) Write a mixed number for each of your decimals.
c) Arrange your numbers to show you have found all possible decimals.
9. The dime is 1.22 mm thick.

Sketch Base Ten Blocks to show the decimal 1.22 in as many different ways as you can.

## Reflect

What is the purpose of the decimal point in a decimal?
Use words and numbers to explain.

## Number Strategies

Write each number in expanded form, and in words.

2005
20500
250000

## Equivalent Decimals

## Explore

You will need Base Ten Blocks and hundredths grids. Model each pair of decimals in as many ways as you can.
0.3 and 0.30
0.6 and 0.60
1.8 and 1.80
2.5 and 2.50

Record your work by colouring hundredths grids.

## Show and Share

Share your work with another pair of students.


Discuss what you discovered about the pairs of decimals.

## Connect

One row of this hundredths grid is one-tenth of the grid. Each small square is one-hundredth of the grid.


Both 0.4 and 0.40 name the shaded part of the grid.
So, $0.4=0.40$
Decimals that name the same amount are called
 equivalent decimals.

## Practice

1. Write two equivalent decimals that name the shaded part of each grid.
a)

b)

c)

d)

2. Colour hundredths grids to show each number. Write an equivalent decimal.
a) 0.20
b) 0.9
c) 0.70
d) 0.5
3. Write an equivalent decimal for each number.
a) 0.5
b) 0.80
c) 0.30
d) 0.6
e) 2.4
f) 1.70
g) 4.9
h) 7.20
i) 5.50
j) 0.10
4. Find the equivalent decimals in each group.
a) 0.5
0.05
0.50
b) 0.70
$0.7 \quad 0.07$
c) 4.84 .08
4.80
d) 6.04
6.40
6.4
5. Which bottle of olive oil is the better buy? Explain how you know.

6. Ruby said that 8.40 is greater than 8.4 because 40 is greater than 4. Was Ruby correct? Use words, pictures, or numbers to explain.

## Reflect

Use numbers, pictures, or words to explain why 7 tenths is the same as 70 hundredths.

## Number Strategies

Estimate each sum.
$4567+7654+6547$
$1234+4321+3214$
$8009+9008+8090$
Which strategies did you use?

## Comparing and Ordering Decimals

Olympic medal winners in racing events often beat their competitors by fractions of a second. Very small numbers can make a huge difference!

In the 2002 Winter Olympics, the gold medal-winning bobsled team from Germany beat one American team by 0.3 of a second and another by 0.35 of a second.


## Explore

th

Here are the top 5 results of the 2000 Summer Olympics women's $100-\mathrm{m}$ dash.

- Who finished first? Who finished last?
> Order the runners from first to last. Use any materials or strategies you wish.
> Suppose you do not have enough Base Ten Blocks. How can you order the decimals?

Women's 100-m Dash

| Athlete | Time (seconds) |
| :--- | :---: |
| M. Jones <br> (USA) | 10.75 |
| T. Lawrence <br> (Jamaica) | 11.18 |
| M. Ottey <br> (Jamaica) | 11.19 |
| Z. Pintusevych <br> (Ukraine) | 11.2 |
| E. Thanou <br> (Greece) | 11.12 |

## Show and Share

Share your results with another pair of students.
Discuss the strategies you used to order the times.

## Connect

Here are the top 3 results of the 2000 Olympics women's pole vault.

Here are 3 ways to find who won gold, silver, and bronze:
> Use Base Ten Blocks to model the height of each pole vault, then put the heights in order.

| Ones | Tenths | Hundredths |
| :---: | :---: | :---: |
|  |  |  |
|  | M | - - - |
|  |  |  |

Write each decimal in a place-value chart.


So, the heights from greatest to least are:
$4.6 \mathrm{~m}, 4.55 \mathrm{~m}, 4.5 \mathrm{~m}$

## - Use a number line.

Mark a dot for each number on the number line.


Since the best result is the greatest height, read the numbers from right to left: 4.6, 4.55, 4.5

So, Dragila won gold, Grigorieva won silver, and Flosadottir won bronze.

## Practice



Use Base Ten Blocks or a number line to model and compare decimals.

1. Choose the decimal that best describes the amount in each glass.
a) 0.35
0.60
0.85
b) 0.95
$0.38 \quad 0.50$
c) 0.35
$0.10 \quad 0.01$

2. Copy and complete. Use $>,<$, or $=$.
a) $0.60 \square 0.6$
b) $0.45 \square 0.62$
c) 4.07
4.12
d) 5.60
5.12
e) 3.08
3.8
f) 1.27 0.99
3. Write the decimals in order from least to greatest.
a) $1.47,1.82,1.31$
b) $2.07,2.01,1.85$
c) $0.83,0.73,1.04$
d) $7.30,7.62,6.80$
4. Write the decimals in order from greatest to least. Think about equivalent decimals when you need to.
a) $0.5,0.40,0.52$
b) $16.4,14.79,14.09$
c) $0.43,0.6,0.55$
d) $0.5,1.4,1.16$
5. Copy. Then write a decimal to make each statement true. How did you decide which decimal to write?
a) $0.45>\square$
b) $12.7<\square$
c) $7.01>$
d) $1.3<\square$
e) $3.24>\square$
f) $0.09<$
6. Use the data in the table.
a) Which sprinter was fastest?
b) Which sprinter was slowest?
c) Whose time was faster than Drummond's, but slower than Thompson's?
d) Look at the number line. Match each letter with the sprinter who made that time.

Men's 100-m Dash

| Athlete | Time (seconds) |
| :--- | :---: |
| A. Bolden <br> (Trinidad \& Tobago) | 9.99 |
| D. Chambers <br> (Great Britain) | 10.08 |
| J. Drummond <br> (USA) | 10.09 |
| M. Greene <br> (USA) | 9.87 |
| O. Thompson <br> (Barbados) | 10.04 |


e) Suppose they raced again.

Chambers and Greene took 1 second longer.
The others ran in the same time as in the first race.
How would this affect the race results?
Explain.
7. The average Canadian eats 23 kg of beef each year.

This is about 0.44 kg each week.
Look at the list.
a) Who eats less than the weekly average?
b) Who eats more?
8. a) Write 3 decimals less than 1.01 .
b) Write 3 decimals greater than 5.8.
c) Write 3 decimals greater than 4.81 and less than 5.73.
d) Write your answers to parts $a, b$, and $c$ in words.


## Reflect

How do you know 2.3 is greater than 2.27?
Use pictures, numbers, or words to explain.

## Calculator Skills

Find two 5-digit numbers:

- with a sum of 35428
- with a difference of 35428


## Rounding Decimals

Suppose there were 5362 spectators at an Olympic swimming event. Round this number to the nearest ten and nearest hundred.
What strategies did you use?
You can use the same strategies to round decimals.

## Explore

This table shows the winning times of seven gold medal winners at the 2000 Sydney Olympics.


## Connect

> In the women's 100-m dash, the gold medal time was 10.75 seconds.
The silver medal time was 11.12 seconds.
These times are measured to the nearest hundredth of a second.
To write an estimate of these times, you can round to the nearest second.
Here are 2 ways to round 10.75 and 11.12 to the nearest second.

- Use a number line.

10.75 is between 10 and 11, but closer to 11 .
So, 10.75 seconds rounds up to 11 seconds.
11.12 is between 11 and 12, but closer to 11 .
So, 11.12 seconds rounds down to 11 seconds.
- Use what you know about decimal hundredths.

Look at the hundredths in 10.75 .
You know that 75 hundredths is closer to 1 than to 0 .
So, 10.75 rounds up to 11 .


Look at the hundredths in 11.12.
You know that 12 hundredths is closer to 0 than to 1.

So, 11.12 rounds down to 11 .
> One swimmer had a time of 56.50 seconds in the men's $100-\mathrm{m}$ backstroke.

To round 56.50 seconds to the nearest second:
Since 50 hundredths is halfway between 0 and 1 , you round up. So, 56.50 seconds rounds to 57 seconds.

## Practice

1. Round to the nearest whole number.
a) 4.78
b) 6.31
c) 5.09
d) 1.98
e) 3.2
f) 12.50
g) 7.49
h) 11.71
i) 40.12
j) 4.47
k) 1.25
I) 3.62
2. Round to the nearest dollar.
a) $\$ 4.78$
b) $\$ 1.22$
c) $\$ 7.50$
d) $\$ 3.99$
e) $\$ 6.27$
f) $\$ 4.49$
g) $\$ 0.97$
h) $\$ 21.55$
3. Which decimals could be rounded to each circled number? Explain.
a) (7) $6.42,7.1,6.08$
b) (9) $8.50,9.43,9.01$
c) (2) $1.9,2.8,1.50$
d) (4) $0.09,3.89,4.44$
4. The toonie has a mass of 7.3 g and a thickness of 1.8 mm .

Round each measurement to the nearest whole number.
5. The 1908 penny has a mass of 5.67 g and a width of 25.4 mm . Round each measurement to the nearest whole number.
6. The biggest earthworm ever found was 6.7 m long and 2.03 cm wide. Round each measurement to the nearest whole number.
7. A runner's time in the $100-\mathrm{m}$ dash is about 11 seconds when rounded to the nearest second.
Suppose the time was recorded to the nearest hundredth of a second.
What are the fastest and slowest possible times?

8. Use the digits 4,5 , and 6 .
a) Write as many decimals as you can that round to 5 when rounded to the nearest whole number.
b) Order the decimals from least to greatest.
c) Suppose the digit 5 was replaced with 3.

How would this affect your results? Explain.

## Reflect

Choose a number with a digit in the hundredths place.
How would you round your number to the nearest whole number?

## Estimating Sums and Differences

The $50 ¢$ coin was the first coin produced in Canada. In recent decades, 50¢ coins have not been widely used. Nowadays, most of them are purchased by coin collectors.

## Explore

Use the data in the table.

- Estimate the combined mass of:
- a 50¢ coin and a quarter
- a $50 ¢$ coin and a nickel
- a $50 ¢$ coin and a dime
- Estimate the difference in widths of:
- a $50 \%$ coin and a penny
- a 50¢ coin and a quarter
- a $50 ¢$ coin and a nickel

| Coin | Mass <br> $\mathbf{( g )}$ | Width <br> $(\mathbf{m m})$ |
| :--- | :--- | :--- |
| Penny | 2.35 | 19.05 |
| Nickel | 3.95 | 21.2 |
| Dime | 1.75 | 18.03 |
| Quarter | 4.4 | 23.88 |
| $50 \varnothing$ | 6.9 | 27.13 |
| Loonie | 7 | 26.5 |
| Toonie | 7.3 | 28 |

## Show and Share

Compare your estimates with those of another pair of classmates.
Discuss the strategies you used to estimate the sums and differences.

## Connect

> The toonie has a mass of 7.3 g . The 50 C coin has a mass of 6.9 g .
To estimate the combined mass of these coins:
Estimate: $7.3+6.9$
Round each decimal to the nearest whole number.
7.3 rounds to 7 .
6.9 rounds to 7 .

You get another estimate if you round just 1 number.
$7+6.9=13.9$
So. $7.3+6.9$ is about 13.9 .

Add the rounded numbers: $7+7=14$
The combined mass of a toonie and a 50 c coin is about 14 g .

- The mass of a penny is 2.35 g . The mass of a dime is 1.75 g . To estimate the difference in these masses:
Estimate: 2.35 - 1.75
Round one or both decimals to a "nice number."
Round 2.35 down to 2.25 .
$2.25-1.75=0.50$
So, $2.35-1.75$ is about 0.50 .

The difference in masses of a penny and a dime is about 0.50 g .

You get another estimate if you round up to a "nice number."

Round 2.35 up to 2.50 .
$2.50-1.75=0.75$
So, $2.35-1.75$ is about 0.75 .

## Practice

1. Estimate each sum.
a) $4.6+9.8$
b) $\$ 2.31+\$ 8.79$
c) $5.99+1.40$
d) $11.20+6.31$
e) $\$ 12.36+\$ 4.08$
f) $7.1+4.2$

Number Strategies
Write each pattern rule.
$1,3,7,13,21,31,43, \ldots$
$100,90,81,73,66,60, \ldots$
Write the next 3 terms in each pattern.
2. Estimate each difference.
a) $4.7-3.8$
b) $8.07-7.91$
c) $10.82-6.99$
d) $\$ 12.99-\$ 8.50$
e) $4.04-2.96$
f) $12.1-8.8$
3. Estimate each sum or difference.
a) $9.75+5.5$
b) $5.25-1.4$
c) $9.9+6.42$
d) $7.1-2.96$
4. Use the data in the poster.
a) About how much would 2 adult tickets cost?
b) About how much would tickets for a 14 -year-old and a 9 -year-old cost?
c) About how much more is an adult ticket than a senior ticket?

5. Agnes has $\$ 50$ in her pocket.

Explain how Agnes might estimate to check if she has enough money to buy the sweater and the jeans.

6. Kenichi estimated that $23.58+11.14$ is about 35 .

Ariel's estimate was 34.58.
a) How did each student estimate the sum? Use numbers and words to explain.
b) Use a different strategy to estimate the sum. How is your estimate different?
7. Jamel is saving up for a helmet that costs $\$ 39.99$.

So far, he has saved \$14.10.
About how much more money does Jamel need to save?
8. An insect's body is 2.34 cm long. Its antennae are 4.58 cm long. Estimate the total length of the insect. Show your work.
9. Choose the better estimate. Explain your thinking.
a) $9.2-3.8$
4,5, or 6
b) $19.6+12.2$
31,32, or 33
c) 10.53-4.99
5,6 or 7

## Reflect

## At Home

Explain how estimating decimal sums and differences is the same as estimating whole-number sums and differences. How is it different?

Talk with family members. When do they estimate? How do they estimate?
Write about what you found out.

## Adding Decimals

## Explore

Lindy rides her scooter to school.
Lindy's mass, including her helmet, is 28.75 kg .
The mass of her backpack is 2.18 kg .

- About what mass is Lindy's scooter carrying?
> Find the total mass the scooter is carrying.
Use any materials you think will help.
Record your work.


## Show and Share

Share your results with another pair of classmates.


Discuss the strategies you used to estimate the mass, and to find the mass.
Were some of the strategies better than others? How?
Explain.

## Connect

Julio rides his skateboard to school.
Julio's mass is 26.79 kg .
The mass of his backpack is 2.60 kg .
What total mass is Julio's skateboard carrying?
Add: 26.79 + 2.60
Here are 2 ways to find $26.79+2.60$.
> Use Base Ten Blocks.
Model 26.79 and 2.60 on a place-value mat.

represents 10 .


Trade 10 tenths for 1 whole.
$26.79+2.60=29.39$
So, the total mass is 29.39 kg .
> Use place value.
Estimate.
26.79 rounds to 27 .
2.60 rounds to 3.

| Tens | Ones | Tenths | Hundredths |
| :---: | :---: | :---: | :---: |
| 2 | 6 | 7 | 9 |
|  | 2 | 6 | 0 |

$27+3=30$

Step 1: Record the numbers.
Align the numbers as
you aligned the blocks
on the place-value mat.

$$
\begin{array}{r}
26.79 \\
+\quad 2.60 \\
\hline
\end{array}
$$

Step 2: Add as you would with whole numbers.

$$
\begin{array}{r}
26.79 \\
+\quad 2.60 \\
\hline 29.39
\end{array}
$$

29.39 is close to 30 , so the answer is reasonable.

## Practice

1. Estimate first. Then add.
a) 4.6
b) 9.5
$\begin{array}{r}2.3 \\ \hline\end{array}$
$+5.4$
c) $\$ 6.25$
$+\$ 3.92$
d) 5.24
$\begin{array}{r}+6.99 \\ \hline\end{array}$
2. Write each sum vertically, then add.
a) $27.39+48.91$
b) $58.09+6.40$
c) $\$ 31.74+\$ 2.86$
3. Add. Think about equivalent decimals when you need to.
a) $7.56+4.8$
b) $7.6+3.85$
c) $0.3+4.71$
d) $0.62+0.9$
e) $20.48+9$
f) $10+3.7$
4. Tagak needed 2.43 m and 2.18 m of rope for his dog team.
When he added the two lengths, he got the sum 46.1 m .
Tagak realized he had made a mistake.
How did Tagak know? What is the correct sum?

5. Lesley bought a CD for $\$ 19.95$ and a DVD for $\$ 26.85$.

How much did she pay for the two items?
6. Paul bought a piece of ribbon 4.9 m long.

He cut it into 2 pieces. What lengths could the 2 pieces be?
How many different answers can you find?
7. Hannah bought 2 lobsters. One had a mass of 0.75 kg .

The other had a mass of 0.9 kg .
What was the total mass of the lobsters?
8. What is the perimeter of this tile?
9. The perimeter of a rectangle is 74.2 cm . What might the dimensions be? How do you know?
10. Write a story problem that uses the addition of two decimals with hundredths. Solve your problem. Show your work.

## Reflect

Can the sum of 2 decimals with hundredths be a decimal with only tenths? Use an example to explain.


You will need coloured markers.
Your teacher will give you a set of decimal cards and hundredths grids.

The object of the game is to shade hundredths grids to represent a decimal that is as close to 2 as possible.
> Shuffle the decimal cards.
Place the cards face down in a pile.
Turn over the top 4 cards.
> Players take turns choosing one of the 4 cards displayed. Each time, the card is replaced with the top card in the deck.
> On your turn, represent the decimal on one of the hundredths grids.
Use a different colour for each decimal.
You may not represent part of the decimal on one grid and the other part on the second grid.
You may not represent a decimal that would more than fill a grid. If each of the decimals on the 4 cards is greater than either decimal left on your grids, you lose your turn.

- Continue playing until neither player can choose a card. Find the sum of the decimals you coloured on your grids. The player whose sum is closer to 2 is the winner.



## Spinning Decimals

You will need Base Ten Blocks.
Your teacher will give you place-value mats and a spinner.
The object of the game is to make the greatest decimal using the fewest Base Ten Blocks.


Players take turns.


- On your turn, you must take rods and unit cubes. Spin the pointer 2 times.
After the first spin, you may choose to take that number of rods or that number of unit cubes.
After the second spin, take that number of unit cubes or rods, whichever you did not choose the first time.
- Make as many trades of Base Ten Blocks as you can. Record the decimal for that turn.
- After 3 rounds of play, find the sum of your decimals. The player with the highest score is the winner.


## Subtracting Decimals

## Explore



This chart shows the average annual snowfall in several Canadian cities.

Choose two cities from the chart. Estimate how much more snow one city gets than the other. Then find the difference. Use any materials you think will help. Record your work.

## Show and Share

Share your results with another pair of classmates.
Discuss the strategies you used to find the difference in snowfalls.

## Gonnect

St. John's, Newfoundland, gets an average of 3.22 m of snow a year.
Halifax, Nova Scotia, gets 2.61 m.
How much more snow does St. John's get than Halifax?
Subtract: 3.22-2.61
Here are 2 ways to find $3.22-2.61$.
> Use Base Ten Blocks.
Model 3.22 on a place-value mat.

You cannot take 6 tenths from 2 tenths.
Trade 1 whole for 10 tenths.



Take away 1 hundredth.
Take away 6 tenths.
Take away 2 ones.
$3.22-2.61=0.61$
> Use place value.
Estimate.
3.22 rounds to 3 .
2.61 rounds to 3.
$3-3=0$

Step 1: Record the numbers. Align the numbers to match the blocks and cards on the place-value mat on page 135.

| Ones | $\emptyset$ Tenths | Hundredths |
| :---: | :---: | :---: |
| 3 | 2 | 2 |
| 2 | $\ddots$ | 1 |

3.22
$-2.61$

Step 2: Subtract as you would with whole numbers.


The answer 0.61 is close to 0 , so the answer is reasonable.
So, St. John's gets 0.61 m more snow than Halifax.

## Practice

Use Base Ten Blocks to model the decimals.
Write the differences vertically if it helps.

1. Estimate first. Then subtract.
a) $7.8-2.3$
b) $6.7-3.8$
c) $9.35-4.26$
d) $\$ 10.62-\$ 4.07$
2. Subtract.
a) $6.04-3.78$
b) $2.76-0.98$
c) $\$ 9.03-\$ 7.28$
d) $11.09-9.29$
e) $12.26-3.91$
f) $73.40-54.23$
3. Subtract. Think about equivalent decimals when you need to.
a) $0.56-0.4$
b) $\$ 16-\$ 4.26$
c) $0.8-0.36$
4. Erin subtracted 12 from 37.8 and got a difference of 36.6.

How did Erin know she had made a mistake?
What is the correct answer?
5. Use the data in the table.

Average Annual Precipitation

| City | Precipitation (cm) |
| :---: | :---: |
| Calgary, AB | 39.88 |
| Victoria, BC | 85.80 |
| Montreal, QC | 93.97 |
| Whitehorse, YT | 26.90 |
| Winnipeg, MB | 50.44 |


a) What is the difference in precipitation between Calgary and Whitehorse?
b) How much more precipitation does Montreal get than Winnipeg?
c) How much less precipitation does Whitehorse get than Winnipeg?
d) What is the difference in precipitation between the cities with the greatest and the least precipitation?
6. Use the data in question 5 .

Find which two cities have a difference in precipitation of:
a) 45.92 cm
b) 8.17 cm
c) 54.09 cm

## Math link

Media
A headline in a newspaper writes a large number like this:

### 1.5 Million People Affected by Power Cut

We say 1.5 million as "one point five million" or "one and a half million." 1.5 million is one million five hundred thousand, or 1500000 .
7. In the men's long jump event, Marty jumped 8.26 m in the first trial and 8.55 m in the second trial. What is the difference between his jumps?
8. Candida got a $\$ 50$ bill for her birthday.

She bought a camera for $\$ 29.95$ and a wallet for $\$ 9.29$. How much of the $\$ 50$ is left?
9. Write a story problem that uses the subtraction of two decimals with hundredths.


Trade problems with a classmate.
Solve your classmate's problem.
10. Brad estimated the difference between 11.42 and 1.09 as less than 10. Is Brad correct?
Show 2 different ways to estimate that support your answer.

## Reflect

How is subtracting decimals like subtracting whole numbers?
How is it different?
Use words, pictures, or numbers to explain.

## Mental Math

Copy and complete each number pattern.

22, 33,55, $\square, \square$ 24, $\square, 48,60, \square, \square$

## Explore



You will need a calculator.
> Use a calculator to find each product.
$2.5 \times 10$
$43.7 \times 10$
$2.76 \times 10$
$14.81 \times 10$
$2.5 \times 100$
$43.7 \times 100$
$2.76 \times 100$
$14.81 \times 100$

Record the products in a place-value chart.

| Thousands | Hundreds | Tens | Ones $\oint$ Tenths |  |
| :--- | :--- | :--- | :--- | :--- |
|  |  |  |  |  |



How can you predict the product when you multiply by 10 ? By $100 ?$

- Find each product. Then check with a calculator.

| $4.8 \times 10$ | $26.8 \times 10$ | $3.8 \times 10$ | $24.68 \times 10$ |
| :--- | :--- | :--- | :--- |
| $4.8 \times 100$ | $26.8 \times 100$ | $3.8 \times 100$ | $24.68 \times 100$ |

## Show and Share

Share what you discovered with another pair of classmates.
What patterns do you see?
How can you mentally multiply a decimal by $10 ?$
How can you mentally multiply a decimal by $100 ?$

## Connect

> You can use Base Ten Blocks to multiply.
Multiply: $3.6 \times 10$
Use Base Ten Blocks.
Model 10 groups of 3.6.
Make equal 1, so
 is 10 , and $\square$ is 0.1 .


So, $3.6 \times 10=36$
You can use place value to understand what happens when you multiply a decimal by 10 and by 100 .

- Multiply by 10 .
- Multiply: $3.6 \times 10$
$3.6=3$ ones and 6 tenths

| Tens | Ones | $\emptyset$ |
| :---: | :---: | :---: |
|  | 3 | Tenths |
|  |  | 6 |

3 ones $\times 10=30$ ones $=3$ tens
6 tenths $\times 10=60$ tenths $=6$ ones
3 tens +6 ones $=36$
So, $3.6 \times 10=36$

| Tens | Ones | $\bullet$ |
| :---: | :---: | :---: |
|  | 3 | Tenths |
| 3 | 6 | 6 |

- You can use mental math to multiply a decimal by 10.

$2.47 \times 10=24.7$
$6.8 \times 10=68$

$14.81 \times 10=148.1$

| Hundreds | Tens | Ones | : Tenths |
| :---: | :---: | :---: | :---: |
|  |  | 3 | 0 |
| 3 | 6 | 0 |  |

6 tenths $\times 100=600$ tenths

$$
\begin{aligned}
& =60 \text { ones } \\
& =6 \text { tens }
\end{aligned}
$$

3 hundreds +6 tens $=360$
So, $3.6 \times 100=360$

- You can use mental math to multiply a decimal by 100.



## Practice

1. Use a place-value chart. Record each product in the chart.
a) $7.9 \times 10$
b) $2.67 \times 10$
c) $0.7 \times 100$
d) $42.3 \times 100$
2. Multiply. Use mental math.
a) $4.7 \times 10$
b) $62.8 \times 10$
$4.7 \times 100$
$62.8 \times 100$
c) $3.85 \times 10$
$3.85 \times 100$
d) $17.45 \times 10$
$17.45 \times 100$
3. Use mental math to multiply.
a) $1.6 \times 10$
b) $4.82 \times 10$
c) $53.7 \times 10$
d) $26.31 \times 10$
e) $3.05 \times 100$
f) $56.73 \times 100$
g) $0.5 \times 10$
h) $0.09 \times 100$

Use mental math to solve each problem.
4. a) Ana bought 10 cans of apple juice.

How many litres did she buy? How much did Ana pay?
b) Hans bought 100 cans of apple juice.

How many litres did he buy?
How much did Hans pay?

5. Fiona read about a man in India who grew a bush 18.59 m tall in his garden.
Fiona said the bush was 185.9 cm tall.
Was she correct? Explain.
6. A hot dog at the ballpark sells for $\$ 2.75$.

The vendor sold 100 hot dogs. How much money did she collect?
7. A nickel has a mass of 3.95 g .

A dime has a mass of 1.75 g .
Which has the greater mass:
10 nickels or 20 dimes?

## Reflect

Explain how to use mental math
to multiply 8.93 by 10 and by 100 .

Number Strategies
Estimate each product.

$$
\begin{aligned}
348 & \times 9 \\
7125 & \times 5 \\
25 & \times 35
\end{aligned}
$$

Which strategies did you use?

## Dividing Decimals by 10

## Explore

You will need a calculator.
Use a calculator to find each quotient.
Record the quotients in a place-value chart.

$$
\begin{array}{lll}
15.5 \div 10 & 4.6 \div 10 & 0.4 \div 10 \\
48.3 \div 10 & 9.7 \div 10 & 0.1 \div 10
\end{array}
$$

How can you predict the quotient when you divide by 10 ?
$>$ Find each quotient.

| Hundreds | Tens | Ones \& Tenths | Hundredths |  |
| :--- | :--- | :--- | :--- | :--- |
|  |  |  |  |  |
|  |  |  |  |  |

Then check with a calculator.
$10.2 \div 10$
$0.3 \div 10$
$6.1 \div 10$
$9.4 \div 10$

## Show and Share

Share your ideas with another pair of classmates.
How can you mentally divide a decimal by 10 ?

## Connect

- There are 4.6 m of ribbon to decorate 10 parcels. How much ribbon will each parcel get?

Divide: $4.6 \div 10$
Use Base Ten Blocks.
Model 4.6.


## Mental Math

Write an equivalent decimal for each decimal.

To divide these blocks into 10 equal groups, first trade each 1 whole for 10 tenths.


There are 46 tenths.
Divide these into 10 equal groups.
There are 4 tenths in each group, with 6 tenths left over.


Trade each 1 tenth for 10 hundredths.
There are 60 hundredths.


Divide these 60 hundredths among the 10 equal groups.


There are 4 tenths and 6 hundredths, or 46 hundredths in each group.
So, $4.6 \div 10=0.46$
Each parcel gets 0.46 m of ribbon.
> You can use place value to understand what happens when you divide a decimal by 10 .

Divide: $4.6 \div 10$
$4.6=4$ ones and 6 tenths
$=46$ tenths
$=460$ hundredths
460 hundredths $\div 10=46$ hundredths

| Ones | \& | Tenths |
| :---: | :---: | :---: |
| 4 | 0 | 6 |
|  | Hundredths |  |
| 0 | $\bullet$ | 4 |

So, $4.6 \div 10=0.46$

You can use mental math to divide a decimal by 10 .


$$
\begin{array}{ll}
26.5 \div 10=2.65 & \\
427.9 \div 10=42.79 & \begin{array}{l}
\text { When there are no } \\
\text { ones, you use zero } \\
\text { as a placeholder. }
\end{array} \\
8.4 \div 10=0.84 & \begin{array}{l}
\text { Sometimes you need } \\
\text { zero as a placeholder } \\
\text { in the tenths place. }
\end{array}
\end{array}
$$

## Practice

1. Use a place-value chart. Record each quotient in the chart.
a) $8.8 \div 10$
b) $4.2 \div 10$
c) $25.1 \div 10$
d) $16.7 \div 10$
2. Use Base Ten Blocks to divide.
a) $25.3 \div 10$
b) $185.3 \div 10$
c) $8.2 \div 10$
d) $0.9 \div 10$

Use mental math to solve each problem.
3. Luke jogged 10 laps around the track. He jogged a total of 7.5 km .

How far is it around the track?
4. Ten Grade 5 spelling books have a mass of 4.5 kg .

What is the mass of 1 spelling book?
5. Jen has 2.8 m of fabric. She will make 10 placemats, all the same size.
How long will each mat be?
6. Stanley divided a $2.5-\mathrm{kg}$ bag of dog food equally among his 10 dogs. How much food did each dog get? Show your work.

## Reflect

Use Base Ten Blocks to find $14.7 \div 10$.
Explain how this model shows how to divide by 10 mentally.

## Strategies Toolkit

## Explore

Pike Lake is twice as wide as Char Lake.
Char Lake is 2.5 km wider than Perch Lake.
Bass Lake is 10 times as wide as Perch Lake.
Bass Lake is 45.0 km wide.
How wide are Char Lake, Pike Lake, and Perch Lake?

## Show and Share

Describe the strategy you used to solve this problem.

## Connect

## Strategies

Four students have totem poles.
Scannah's pole is 1.3 m shorter than
Uta's pole.
Uta's pole is 2.5 m taller than Sta-th's pole.
Yeil's pole is 10 times as tall as Sta-th's pole.
Yeil's pole is 35.0 m tall.
How tall are Scannah's, Uta's, and Sta-th's poles?


What do you know?

- The height of Yeil's pole is 35.0 m.
- Make a table.
- Use a model.
- Draw a diagram.
- Solve a simpler problem.
- Work backward.
- Guess and check.
- Make an organized list.
- Use a pattern.
- Draw a graph.
- You can use that height to find the other heights.

Think of a strategy to help you solve the problem.

- You can start with the height of Yeil's pole and work backward.

Use the height of Yeil's pole to find the height of Sta-th's pole.
Use the height of Sta-th's pole to find the height of Uta's pole. Use the height of Uta's pole to find the height of Scannah's pole. How tall is each pole?

How can you check your answer?
How could you have solved this problem another way?

## Practice

1. Karl swam the length of the swimming pool 10 times.

## Choose one of the

 StrategiesHe swam a total distance of 166.5 m .
How long is the pool?
2. Lamar opened a 1-L can of tomato juice.

He poured an equal amount into each of 3 glasses. Lamar had 0.4 L left. How much did Lamar pour into each glass?
3. Last weekend, Inga earned money by mowing lawns. After her first job, Inga had twice the amount of money she had when she left home.
After her second job, Inga doubled her money again.
When Inga got home, she had \$18.60.
How much money did Inga have when she first left home?


## Reflect

Choose one of the problems in this lesson.
Use words, pictures, or numbers to explain how you solved it.

## Unit 4 Show What You Know

## LESSON

Use Base Ten Blocks when they help.
1 1. Write each fraction or mixed number as a decimal.
a) $\frac{9}{10}$
b) $3 \frac{14}{100}$
c) $20 \frac{1}{100}$
d) $\frac{67}{100}$
2. Use the digits $1,3,4,8$, and a decimal point.

Write the number that is closest to 40 .
2 3. Write an equivalent decimal for each decimal.
a) 0.8
b) 7.20
c) 1.1
d) 0.60
4. a) When would you write 7.50 instead of 7.5 ?
b) When would you write 7.5 instead of 7.50 ?

3 5. Use the digits $3,4,5$, and a decimal point.
Write all the possible decimals.
Order these decimals from least to greatest.
6. Use the digits $0,5,8$ in these boxes: $\qquad$ .$\square$
a) Write the greatest number.
b) Write the least number.

7. Copy and complete. Use $>,<$, or $=$.
a) $3.04 \square 3.19$
b) $0.40 \square 0.4$
c) 1.7 1.25

3 8. Write the decimals in order from greatest to least.
a) $5.62,5.9,5.30$
b) $0.95,0.6,1.3$
9. Copy each statement. Write a decimal to make the statement true.
a) $0.85>\square$
b) $7.62<$c) $0.04>$

4 10. Round each decimal to the nearest whole number.
a) 2.34
b) 0.6
c) 0.84
d) 5.5
11. An athlete's long jump, rounded to the nearest metre, was 8 m . What are the longest and shortest lengths the jump could have been, in decimals to the hundredths?

5 12. Estimate each sum or difference.
a) $1.7+4.9$
b) $7.3-2.45$
c) $28.1+3.14$
d) $12.98-4.01$
e) $6.78+3.12$
f) $7.8-0.9$
13. Add or subtract.
a) $3.48+7.62$
b) $14.7-8.35$
c) $1.98+6.3$

6 14. Tran wrote 4 numbers on 4 counters and placed them in a paper bag.
He drew 2 counters and added the numbers. He replaced the counters and repeated the steps 4 more times.


The sums were: $2.5,2.6,2.7,2.8,2.4$
Which 4 numbers did Tran write on the counters?
${ }_{7}^{6}$ 15. Lisa saved $\$ 9.26$. Her grandpa gave her $\$ 4.75$ more.
a) How much money does Lisa have?
b) How much more money does Lisa need to buy a remote control car that costs $\$ 19.95$ ?

8 16. A canoe is 5.67 m long. How many centimetres is that?
17. A nickel is 21.2 mm wide.

Suppose 100 nickels were laid side by side in a line.
How long would the line of nickels be?
9 18. Leonardo lives in a 10-storey apartment building. The building is 121 m tall. All the storeys have the same height. How high is each storey?
19. Use mental math to multiply or divide.
a) $2.7 \times 10$
b) $8.46 \times 100$
c) $15.8 \div 10$
d) $32.4 \div 10$
e) $52.73 \times 10$
f) $0.2 \div 10$

## Unit Problem coins Up Close



Use a calculator when it helps.

1. Gloria, Lino, and Lisette worked together doing odd jobs for their neighbours. At the end of the day, they had earned exactly 6 of each of the 7 kinds of coins.
a) How much money did they earn?
b) The children shared the money equally. How much money did each child get?
2. One toonie has a mass of 7.3 g .

Use these data to find the masses of all the numbers of toonies in the table. Copy and complete the table.
You may add, subtract, or multiply.
Award yourself points for each solution using this point system:

- 5 points for multiplying
- 3 points for subtracting
- 1 point for adding

What strategy can you use to get the most points? Explain your strategy.
3. Could you lift \$10 000 in toonies? Explain.

| Number of <br> Toonies | Total Mass <br> $\mathbf{( g )}$ |
| :---: | :---: |
| 1 | 7.3 |
| 2 |  |
| 3 |  |
| 4 |  |
| 5 |  |
| 6 |  |
| 7 |  |
| 8 |  |
| 9 |  |
| 10 |  |


4. On the Planet of the Giants, all objects are 10 times as long, wide, and tall as they are on Earth.
Use the table of coin data to answer these questions.
a) One giant's coin has a width of 265 mm . Which coin is it?
b) Another giant's coin is 15.8 mm thick. Which coin is it?
c) How high would a stack of 100 loonies be on the Planet of the Giants?

Write your answer in millimetres, centimetres, and decimetres.
5. Make up your own problem about the coins on the Planet of the Giants. Solve your problem.

## Reflect on the Unit

Explain why estimating is important when working with decimals.

## Units 1-4 Cumulative Review

1. 2. The first 2 terms of a pattern are 3 and 5 .

Write 5 different patterns that start with these 2 terms.
List the first 6 terms for each pattern.
Write each pattern rule.
2. Copy and complete the table for this Input/Output machine. Choose 5 input numbers. Find each output number.

3. Here is a pattern of figures made with congruent squares. The side length of each square is 1 unit.


Frame 1


Frame 2


Frame 3
a) Find the perimeters of the figures in the first 3 frames. Record the frame numbers and the perimeters in a table.
b) Write the pattern rule for the perimeters.
c) Use the pattern to predict the perimeter of the figure in Frame 12.

2 4. Write each number in standard form.
a) $600000+40000+3000+10$
b) five hundred three thousand nine hundred two
5. Find each sum or difference. Use mental math when you can.
a) $\quad 7081$
b) 4576
$+1199$
$-4149$
c) 8879
$-988$
d) 1213
$+2208$
6. Find each product or quotient.
a) $4 \times 6000$
b) $30 \times 20$
c) $11 \times 300$
d) $132 \div 12$
e) $27 \times 68$
f) $3576 \div 8$
g) $74 \times 55$
h) $9198 \div 7$

2 7. Caleb has 2691 marbles to share among 9 people. How many marbles will each person get?

3 8. Use a ruler and a protractor.
Measure the sides and the angles of each triangle.

a) Name each triangle by the number of equal sides. Use the words: scalene, equilateral, isosceles
b) Name each triangle by the angle measures. Use the words: acute, right, obtuse
9. You will need a pyramid.

Construct a net for the pyramid.
10. Order the numbers in each set from least to greatest.

a) 653 107, $651370,635710,670153,67531$
b) $3.7,3.68,3.86,3.2$
c) $0.75,0.8,0.57,0.6$

4
11. Write an equivalent decimal for each decimal.
a) 0.50
b) 3.2
c) 6.70
d) 0.3
12. Find each sum or difference.
a) $4.3+6.8$
b) $31.5-3.15$
c) $26.07+3.46$
d) $8.3-0.68$
13. Sophia had $\$ 10.47$. She spent $\$ 4.69$.

How much money does she have left?
14. Carter is 183 cm tall.

What is Carter's height in metres?

