UNIT 5

# Fractions and

## In the Garden

Brian and Samantha are planning a garden.

What fraction of the garden will they plant with flowers? Vegetables?

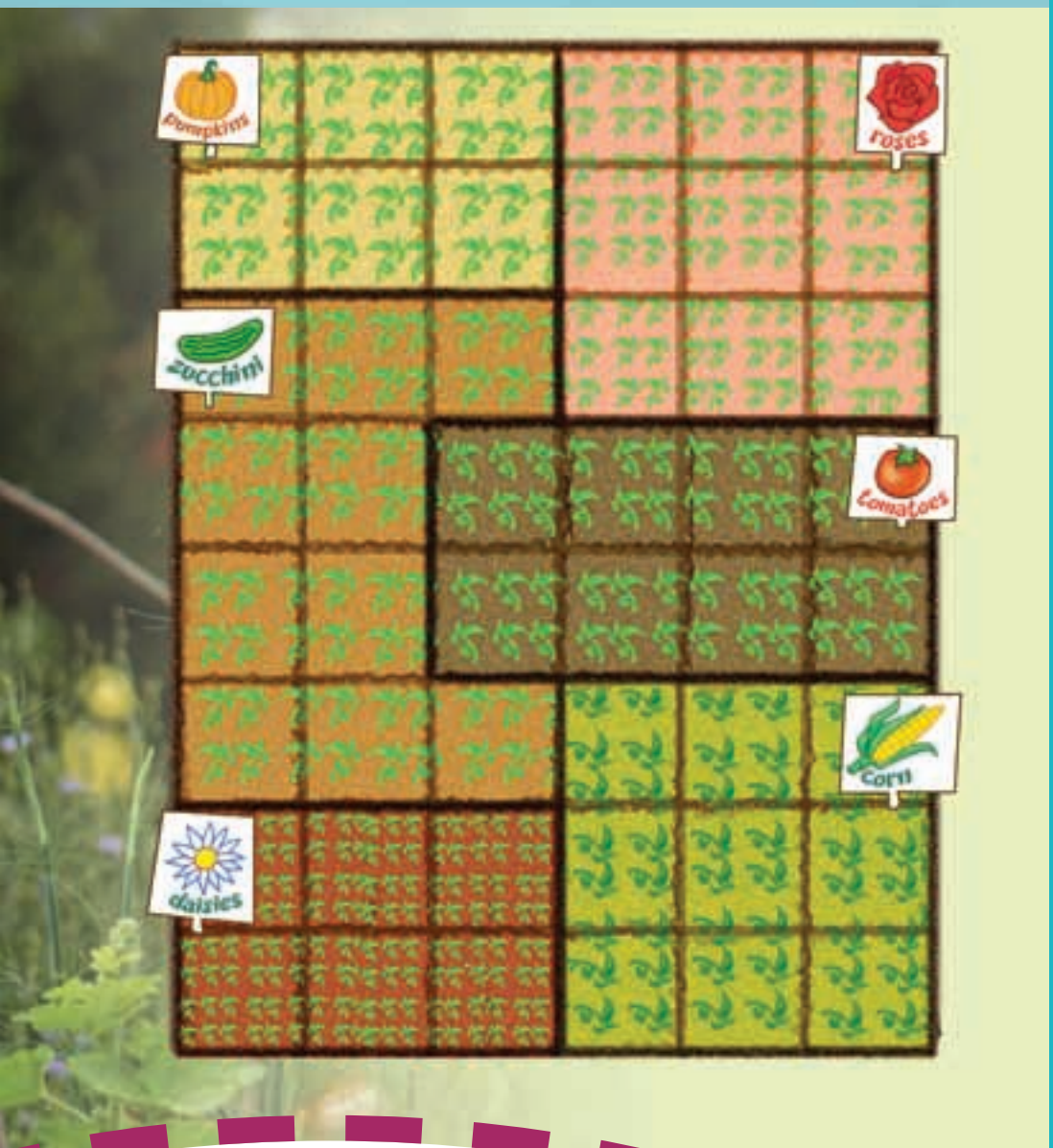

## Learning Goals

- create sets of equivalent fractions
- compare fractions with like and unlike denominators
- describe and represent decimals to thousandths
- relate decimals to fractions
- compare and order decimals to thousandths
- add and subtract decimals to thousandths

# Decimals

## Key Words

- equivalent fractions
- thousandths
- equivalent decimals




- What is the total cost of 1 pack of zucchini seeds and 1 pack of pumpkin seeds?
- Samantha paid for these seeds with a $5 bill. About how much change would she get?
- About how much will 10 packs of flower seeds and 1 pack of zucchini seeds cost? How could you find the exact amount?

LESSON 1

# Equivalent Fractions

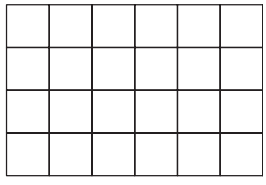

Who is correct?

## Explore

You will need red and yellow Colour Tiles or congruent squares, and 2-cm grid paper.

➤ Outline this rectangle on 2-cm grid paper.
Place the tiles on the rectangle so that:
- $\frac{1}{6}$ of the rectangle is red.
- The rest of the rectangle is yellow.

Record your work on the rectangle.



➤ How many ways can you describe the fraction of the rectangle that is red? Yellow?
Record each way.

➤ Find a way to write a fraction that names the same amount as each fraction below.
Write to explain what you did.

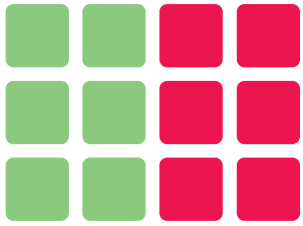
$\frac{1}{3}$ $\frac{8}{10}$ $\frac{5}{8}$ $\frac{6}{12}$

## Show *and* Share

Share your work with another pair of students.
Compare the fractions you wrote for each colour.
How did you know which fractions to write?
Describe any patterns you see in the fractions for each colour.

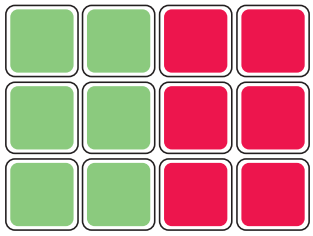
## Connect

This rectangle was made with Colour Tiles.

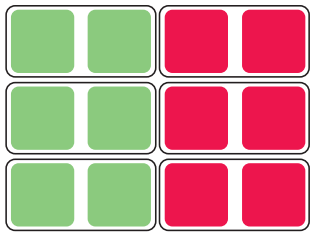


What fraction of the rectangle is green?
How many different fractions can you write to describe the green part?

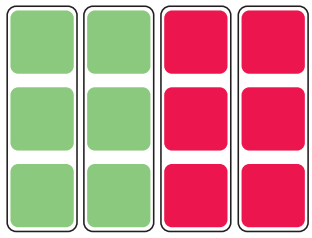
➤ There are 12 tiles.
6 tiles are green.
$\frac{6}{12}$ of the rectangle is green.



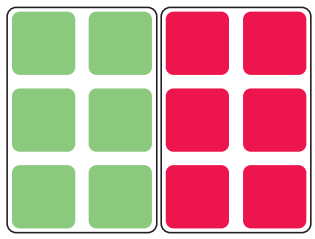
➤ There are 6 groups of 2 tiles.
3 groups are green.
$\frac{3}{6}$ of the rectangle is green.



➤ There are 4 groups of 3 tiles.
2 groups are green.
$\frac{2}{4}$ of the rectangle is green.



➤ There are 2 groups of 6 tiles.
1 group is green.
$\frac{1}{2}$ of the rectangle is green.



$\frac{1}{2}$, $\frac{2}{4}$, $\frac{3}{6}$, and $\frac{6}{12}$ name the same amount.
They are **equivalent fractions**.

➤ There are patterns in the equivalent fractions.

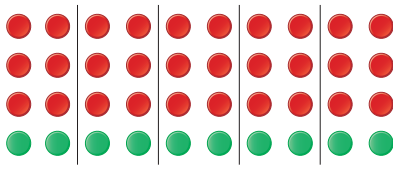
$\frac{1}{2}$, $\frac{2}{4}$, $\frac{3}{6}$, $\frac{6}{12}$

The numerators are multiples of the least numerator, 1.

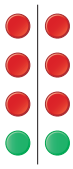
The denominators are multiples of the least denominator, 2.

➤ We can use a set model to find equivalent fractions.

Look at the fraction of each set that is red.



$\frac{6}{8} = \frac{30}{40}$ (× 5 above, × 5 below)



$\frac{6}{8} = \frac{3}{4}$ (÷ 2 above, ÷ 2 below)

When you multiply or divide the numerator and the denominator of a fraction by the same number, you do not change the value of the fraction.

So, $\frac{3}{4}$, $\frac{6}{8}$, and $\frac{30}{40}$ are equivalent fractions.

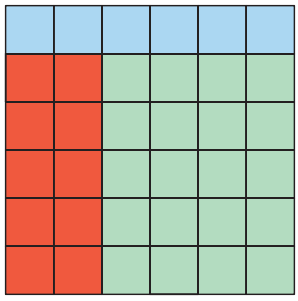
The number you multiply or divide by cannot be 0.

## Practice

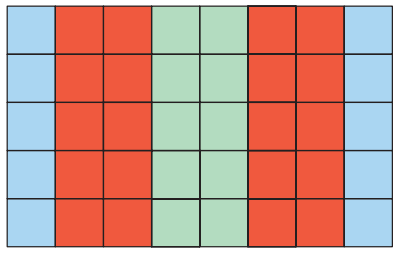
Use Colour Tiles or grid paper when they help.

**1.** What fraction of each rectangle is blue? Red? Green?
For each colour, write as many different fractions as you can.

**a)**

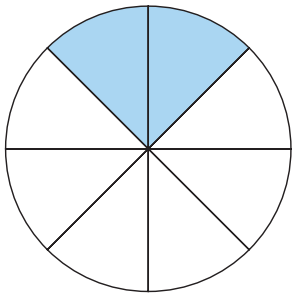


**b)**

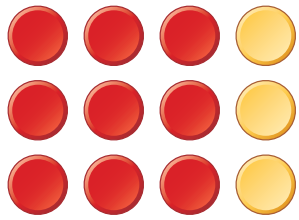


**2.** Find as many equivalent fractions as you can for each picture.
What patterns do you see?

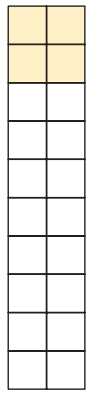
**a)**



**b)**

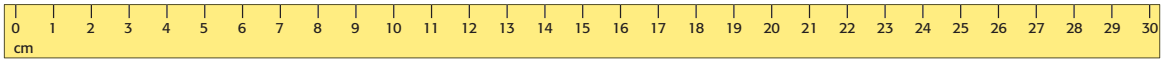


**c)**

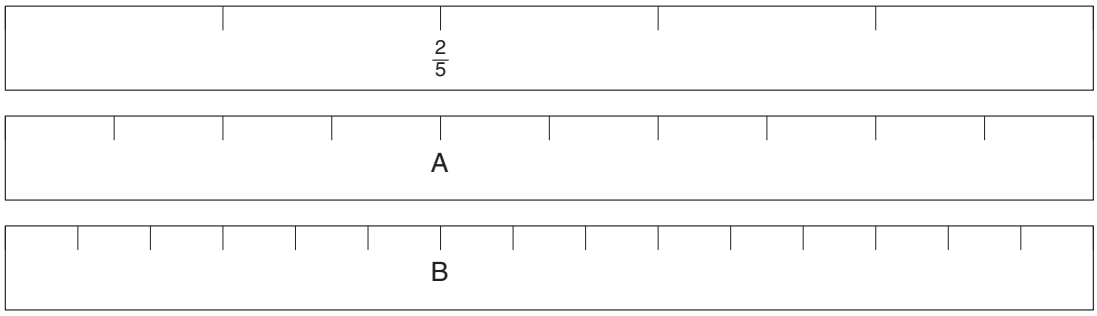


**3.** Use the patterns you found in question 2.
Write a rule you can use to find equivalent fractions.
How can you show your rule is correct?

**4.** Use a 30-cm ruler.
How many equivalent fractions can you find for $\frac{20}{30}$?
Explain how you found the fractions.




**5.** Use the strips below. Write 2 fractions that are equivalent to $\frac{2}{5}$.
Explain how you did it.




**6.** Draw a picture to show each pair of equivalent fractions.
**a)** $\frac{1}{4}, \frac{3}{12}$ **b)** $\frac{2}{3}, \frac{8}{12}$ **c)** $\frac{3}{5}, \frac{12}{20}$ **d)** $\frac{18}{24}, \frac{3}{4}$

**7.** Use tiles or counters to write 3 equivalent fractions for each fraction.
**a)** $\frac{1}{2}$ **b)** $\frac{5}{6}$ **c)** $\frac{20}{50}$ **d)** $\frac{4}{5}$ **e)** $\frac{20}{30}$ **f)** $\frac{25}{35}$

**8.** Use counters or draw a picture to find pairs of fractions that are equivalent.
**a)** $\frac{1}{6}$ and $\frac{6}{36}$ **b)** $\frac{12}{15}$ and $\frac{3}{5}$ **c)** $\frac{6}{16}$ and $\frac{3}{4}$ **d)** $\frac{8}{14}$ and $\frac{4}{7}$

**9.** Roxanne cut a pizza into 8 equal slices. She ate 2 slices.
**a)** Write 2 equivalent fractions to describe how much pizza Roxanne ate.
**b)** Write 2 equivalent fractions to describe how much pizza was left.
Show your work.

**10.** For each fraction, identify the equivalent fractions.
Explain how you know the fractions are equivalent.
**a)** $\frac{3}{4}$: $\frac{8}{12}, \frac{6}{8}, \frac{6}{9}, \frac{9}{12}$ **b)** $\frac{4}{10}$: $\frac{6}{15}, \frac{10}{25}, \frac{2}{5}, \frac{8}{15}$

## Reflect

Use numbers, pictures, or words to explain
what it means when fractions are equivalent.

LESSON 2

# Comparing and Ordering Fractions


Who has more money?
How do you know?

## Explore

Use any of these materials:
counters, tiles, fraction circles, ruler, number line, grid paper

Compare each pair of fractions.
Which fraction in each pair is greater?
How do you know?
Record your work.

$\frac{1}{2}$ and $\frac{1}{3}$

$\frac{5}{6}$ and $\frac{19}{24}$

$\frac{6}{8}$ and $\frac{3}{4}$

$\frac{6}{12}$ and $\frac{3}{4}$

$\frac{3}{8}$ and $\frac{2}{8}$

$\frac{2}{6}$ and $\frac{2}{3}$

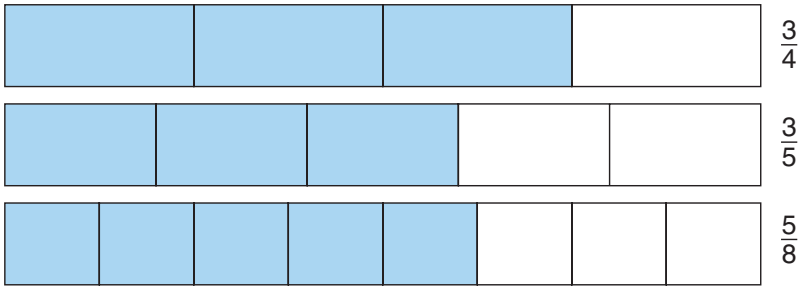
## Show *and* Share

Show your work to another pair of students.
Talk about why you chose a particular material to compare fractions.
Try to find a way to compare $\frac{5}{8}$ and $\frac{3}{4}$ without using any materials.

## Connect

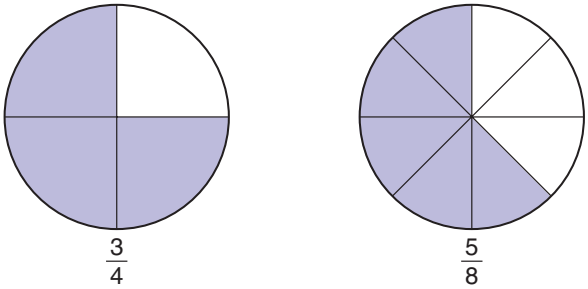
Here are four strategies to compare and order fractions.

➤ To order $\frac{3}{4}$, $\frac{3}{5}$, and $\frac{5}{8}$ from least to greatest:
Fold or measure, then colour, equal strips of paper; one strip for each fraction.



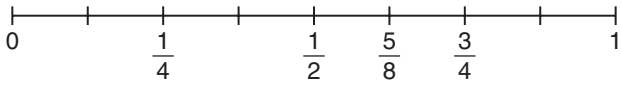

The least fraction is the shortest coloured strip.
The order from least to greatest is: $\frac{3}{5}$, $\frac{5}{8}$, $\frac{3}{4}$

➤ To compare $\frac{3}{4}$ and $\frac{5}{8}$:
Use fraction circles.




$\frac{3}{4}$ cover more of the circle than $\frac{5}{8}$ do.
So, $\frac{3}{4} > \frac{5}{8}$

➤ To order $\frac{1}{2}$, $\frac{3}{4}$, $\frac{1}{4}$, and $\frac{5}{8}$ from least to greatest:
Draw a number line from 0 to 1.
Divide the number line to show halves, fourths, and eighths.
Mark and label $\frac{1}{2}$, $\frac{3}{4}$, $\frac{1}{4}$, and $\frac{5}{8}$.




The order from least to greatest is: $\frac{1}{4}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$

➤ To compare $\frac{2}{3}$ and $\frac{3}{5}$:
List equivalent fractions until the numerators or the denominators are the same.

$\frac{2}{3} = \frac{4}{6} = \frac{6}{9} = \frac{8}{12} = \frac{10}{15} = \frac{12}{18} \cdots$

$\frac{3}{5} = \frac{6}{10} = \frac{9}{15} = \frac{12}{20} = \frac{15}{25} \cdots$

Since $\frac{6}{9} > \frac{6}{10}$, then $\frac{2}{3} > \frac{3}{5}$

When the numerators are the same, the greater fraction has the lesser denominator.

Or, since $\frac{10}{15} > \frac{9}{15}$, then $\frac{2}{3} > \frac{3}{5}$

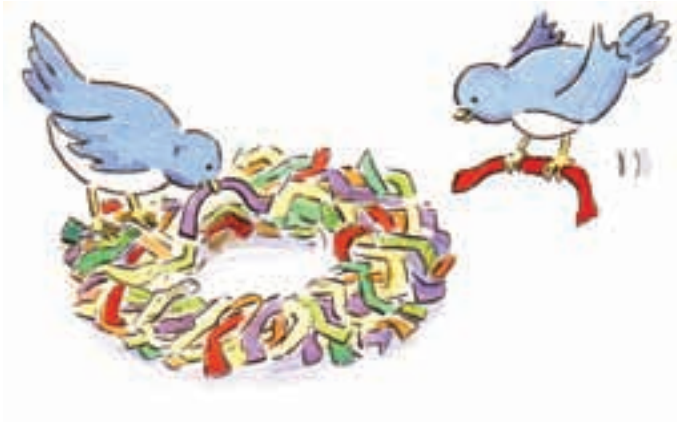
When the denominators are the same, the greater fraction has the greater numerator.

## Practice

**1.** Compare the fractions in each pair.
**a)** $\frac{3}{5}$ and $\frac{2}{5}$ **b)** $\frac{5}{8}$ and $\frac{7}{8}$ **c)** $\frac{4}{10}$ and $\frac{7}{10}$
Use counters to show how you know you are correct.

**2.** Compare the fractions in each pair. Which strategies did you use?
**a)** $\frac{4}{9}$ and $\frac{3}{6}$ **b)** $\frac{2}{3}$ and $\frac{4}{6}$ **c)** $\frac{8}{9}$ and $\frac{2}{3}$

**3.** Use three equal strips of paper.
Show halves on one strip.
Show tenths on another strip.
Show fifths on the third strip.
Use the strips to order these fractions from least to greatest:
$\frac{1}{2}, \frac{7}{10}, \frac{4}{5}$



**4.** Use three equal strips of paper.
Mark each strip with appropriate fractions.
Use the strips to order these fractions from least to greatest:
$\frac{5}{6}, \frac{2}{3}, \frac{7}{12}$

**5.** Draw a number line like the one below.


Divide the number line to show twelfths, sixths, and quarters.
Use the number line to order these fractions from least to greatest:
$\frac{11}{12}, \frac{4}{6}, \frac{3}{4}, \frac{7}{12}, \frac{5}{6}$

**6.** Use a number line to order these fractions from greatest to least:
$\frac{3}{5}$ $\frac{8}{10}$ $\frac{1}{2}$ $\frac{6}{10}$ $\frac{2}{5}$
Explain the strategy you used.

**7.** Use equivalent fractions to compare the fractions in each pair.
**a)** $\frac{4}{5}$ and $\frac{6}{10}$ **b)** $\frac{1}{4}$ and $\frac{2}{6}$ **c)** $\frac{3}{5}$ and $\frac{9}{15}$

**8.** Use grid paper.
Draw pictures to represent 3 fractions that are greater than $\frac{3}{5}$.
Each fraction should have a different denominator.
How do you know that each fraction is greater than $\frac{3}{5}$?

**9.** A quilt has 20 patches.
One-quarter of the patches are yellow,
$\frac{3}{5}$ are green, and the rest are red.
What colour are the greatest number of patches?
The least number of patches?
Show how you know.

**10.** Jessica and Ramon each has the same length of ribbon.
Jessica cut her ribbon into eighths.
Ramon cut his ribbon into twelfths.
Jessica sold 6 pieces and Ramon sold 8.
Who sold the greater length of ribbon?
How did you find out?

**11.** Which is greater, $\frac{2}{3}$ or $\frac{2}{5}$?
How do you know?

**12.** Compare the fractions in each pair.
Copy each statement. Write $>$, $<$, or $=$.
How did you decide which symbol to choose?
**a)** $\frac{4}{5} \square \frac{4}{10}$ **b)** $\frac{3}{8} \square \frac{2}{8}$ **c)** $\frac{2}{3} \square \frac{4}{6}$ **d)** $\frac{1}{4} \square \frac{1}{3}$

## Reflect

You have learned 4 strategies for comparing fractions.
Which strategy do you find easiest? Explain why.

LESSON 3

# Strategies Toolkit

## Explore

You will need Pattern Blocks.
Make a quadrilateral that is $\frac{3}{4}$ red and $\frac{1}{4}$ blue.
Can you do this in more than one way? Explain.

### Show *and* Share

Describe the strategy you used to solve this problem.

## Connect

Use Pattern Blocks.
Make the smallest triangle you can that is $\frac{3}{16}$ green, $\frac{3}{16}$ red, $\frac{1}{4}$ blue, and $\frac{3}{8}$ yellow.

How many blocks of each colour will you need?


What do you know?

- Use Pattern Blocks to build a triangle.
- $\frac{3}{16}$ of the triangle is green.
- $\frac{3}{16}$ of the triangle is red.
- $\frac{1}{4}$ of the triangle is blue.
- $\frac{3}{8}$ of the triangle is yellow.


Think of a strategy to help you solve the problem.

- You can **use a model**.

### Strategies

- **Make a table.**
- **Use a model.**
- **Draw a diagram.**
- **Solve a simpler problem.**
- **Work backward.**
- **Guess and test.**
- **Make an organized list.**
- **Use a pattern.**



Use Pattern Blocks to build the triangle.
$\frac{3}{16}$ of the triangle is to be green.
How many green blocks could you use?
How many blocks of each colour do you need to build the triangle?


Check your work.
Is $\frac{3}{16}$ of the triangle green?
Is $\frac{3}{16}$ of the triangle red?
Is $\frac{1}{4}$ of the triangle blue?
Is $\frac{3}{8}$ of the triangle yellow?

## Practice

Choose one of the **Strategies**

1. Brenna cuts wood for a fire. She can cut a log into thirds in 10 min.
How long would it take Brenna to cut a similar log into sixths?

2. One-fourth of a 10-m by 10-m rectangular garden is planted with corn.
Two-tenths of the garden is planted with squash.
Thirty-five hundredths of the garden is planted with beans.
The rest is planted with flowers.
What fraction of the garden is planted with flowers?

3. A snail is trying to reach a leaf 8 m away.
The snail crawls 4 m on the first day.
Each day after that, it crawls one-half as far as the previous day.
After 4 days, will the snail reach the leaf? How do you know?

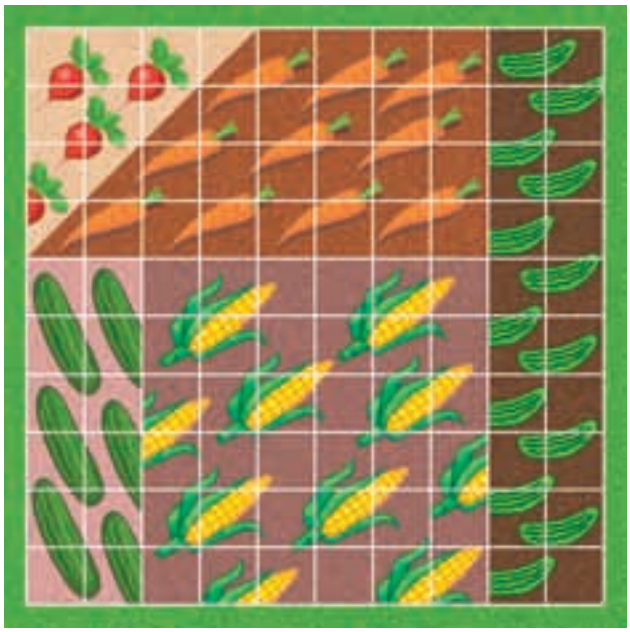
## Reflect

How can using a model help you to solve problems with fractions?
Use words, pictures, or numbers to explain.

LESSON 4

# Relating Fractions to Decimals

What fraction of the garden is planted with each vegetable? How many different ways can you write each fraction?



## Explore

You will need Base Ten Blocks and grid paper.

Use rods and unit cubes to design a vegetable garden.
Use a flat to represent the whole garden.
Each vegetable is in a separate region of the garden.
The garden must have:

- more carrots than corn
- more onions than potatoes
- all of the land planted with one of these vegetables

Record your vegetable garden design on grid paper.

➤ Write the fraction of your garden planted with each vegetable in as many ways as you can.

➤ How many ways can you use a decimal to describe the fraction of the garden that is planted with each kind of vegetable? Record each way.

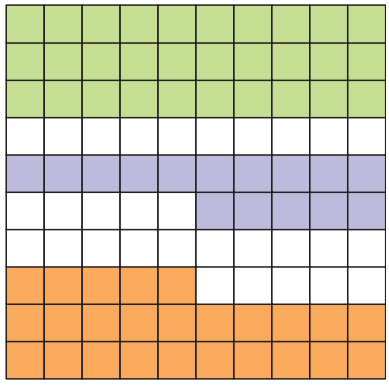
## Show *and* Share

Share your results with another pair of students.
How did you find the fractions and decimals?
Which fractions and decimals name the same amount?
How do you know?

## Connect

➤ This is Jake and Willa's design of a flower garden.
$\frac{25}{100}$, or $\frac{1}{4}$ of the garden is planted with roses.
$\frac{25}{100}$, or $\frac{1}{4}$ of the garden is planted with tulips.
$\frac{30}{100}$, or $\frac{3}{10}$ of the garden is planted with lilies.
$\frac{20}{100}$, or $\frac{2}{10}$ of the garden is planted with daisies.

➤ You can write fractions with denominators of 10 and 100 as decimals.
$\frac{3}{10}$ is 3 tenths, or 0.3.
$\frac{15}{100}$ is 15 hundredths, or 0.15.
$\frac{25}{100}$ is 25 hundredths, or 0.25.

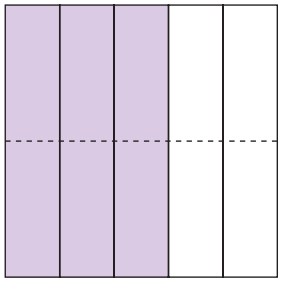


➤ You can use money to write some fractions as decimals.

$\frac{4}{10}$ of a dollar is \$0.40.

$\frac{3}{4}$ of a dollar is \$0.75.

➤ For some fractions, we can write an equivalent fraction with a denominator of 10 or 100. We can then write the fraction as a decimal.

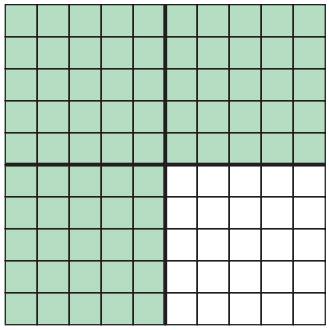


$\frac{3}{5} = \frac{6}{10}$ (× 2)

$\frac{3}{5}$ is equivalent to $\frac{6}{10}$.

$\frac{6}{10}$ is 6 tenths, or 0.6.

So, $\frac{3}{5}$ and 0.6 are equivalent.

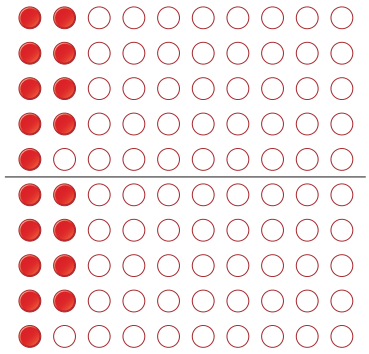


$\frac{3}{4} = \frac{75}{100}$ (× 25)

$\frac{3}{4}$ is equivalent to $\frac{75}{100}$.

$\frac{75}{100}$ is 75 hundredths, or 0.75.

So, $\frac{3}{4}$ and 0.75 are equivalent.



$\frac{9}{50} = \frac{18}{100}$ (× 2)

$\frac{9}{50}$ is equivalent to $\frac{18}{100}$.

$\frac{18}{100}$ is 18 hundredths, or 0.18.

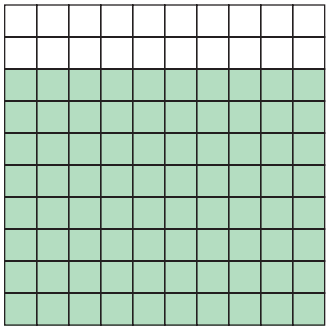
So, $\frac{9}{50}$ and 0.18 are equivalent.

## Practice

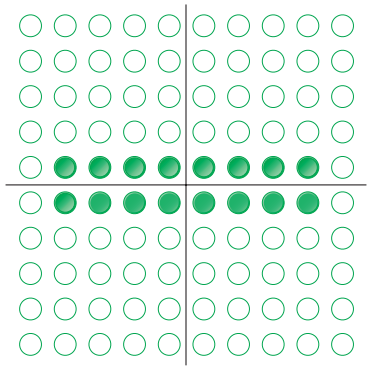
**1.** Write a fraction and a decimal to describe:

- the shaded part of each picture
- the white part of each picture

**a)**



**b)**



**2.** Use Base Ten Blocks to show each decimal.
Sketch the blocks you used.

**a)** 0.3 **b)** 0.07 **c)** 0.8 **d)** 0.34

**3.** Write each decimal in question 2 as a fraction.

**4.** Shade a hundredths grid to show each decimal.
Then write an equivalent decimal.

**a)** 0.8 **b)** 0.40 **c)** 0.90 **d)** 0.2

**5.** Write each fraction as a decimal.

**a)** $\frac{37}{100}$ **b)** $\frac{5}{10}$ **c)** $\frac{9}{100}$ **d)** $\frac{30}{100}$

**6.** Write each amount of money as a fraction of a dollar,
then as a decimal.

**a)** 20¢ **b)** 5¢ **c)** 25¢ **d)** 61¢ **e)** 95¢

**7.** Vijay has $\frac{1}{20}$ of a dollar in his pocket.
What coins might he have?

**8.** Use Base Ten Blocks and a grid to represent each fraction.
Then write each fraction as a decimal.

**a)** $\frac{1}{2}$ **b)** $\frac{7}{25}$ **c)** $\frac{9}{10}$ **d)** $\frac{3}{5}$

**9.** Represent each fraction on a hundredths grid.
Then write each fraction as a decimal.

**a)** $\frac{1}{4}$ **b)** $\frac{4}{5}$ **c)** $\frac{3}{50}$ **d)** $\frac{11}{20}$

**10.** Use counters to represent each fraction.
Then write each fraction as a decimal.

**a)** $\frac{4}{25}$ **b)** $\frac{3}{4}$ **c)** $\frac{2}{5}$ **d)** $\frac{7}{20}$

**11.** Do $\frac{3}{5}$ and 0.35 name the same amount?
Use pictures and words to explain how you know.

## Reflect

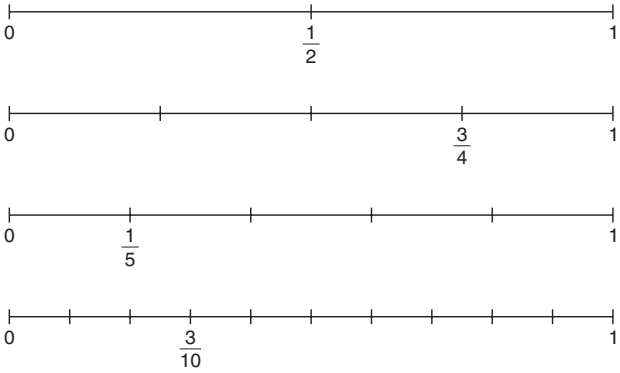
Which fractions can you write easily as decimals? Why?
Use examples in your explanation.

LESSON 5

# Fraction and Decimal Benchmarks

## Explore

Your teacher will give you a large copy of these number lines.




➤ The number lines are incomplete.
Label the lines with the missing fractions.

➤ Which fraction in each pair is greater?
How do you know?

$\frac{7}{10}$ or $\frac{3}{4}$ $\quad$ $\frac{5}{10}$ or $\frac{2}{5}$

$\frac{1}{2}$ or $\frac{6}{10}$ $\quad$ $\frac{2}{10}$ or $\frac{1}{4}$

➤ Suppose the number lines were labelled with decimals rather than fractions.
Which decimal would replace each of these numbers?

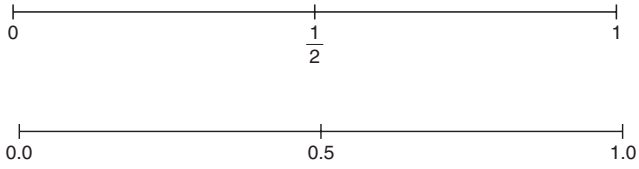
0 $\quad$ $\frac{9}{10}$ $\quad$ $\frac{3}{5}$ $\quad$ $\frac{1}{2}$ $\quad$ 1 $\quad$ $\frac{1}{4}$

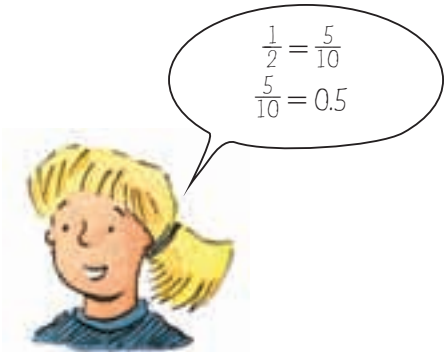
## Show *and* Share

Share your work with another pair of students.
How did you know on which number line to place each fraction?
How did you decide which fraction was greater?
How did you change each number to a decimal?

## Connect

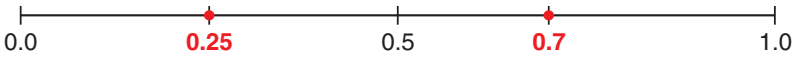
You can use benchmarks to compare and order decimals.
We can rename the benchmarks 0, $\frac{1}{2}$, and 1 as decimals.



➤ Which decimal is greater, 0.25 or 0.7?

0.25 is between 0.0 and 0.50.
0.7 is between 0.5 and 1.0.

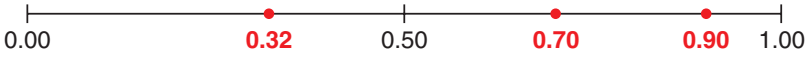



0.5 = 0.50

So, 0.7 > 0.25

➤ Order 0.7, 0.9, and 0.32 from least to greatest.

Use equivalent decimals.
0.0 = 0.00  0.5 = 0.50  0.7 = 0.70  0.9 = 0.90  1.0 = 1.00

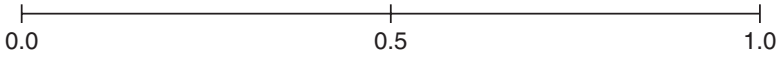



0.32 is greater than 0.00 and less than 0.50.
Both 0.70 and 0.90 are greater than 0.50 and less than 1.00,
but 0.70 < 0.90.

From least to greatest: 0.32, 0.7, 0.9

## Practice

Use copies of this number line to help you order decimals in questions 1 to 3.

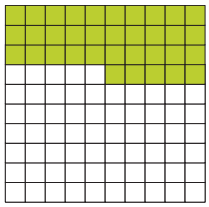


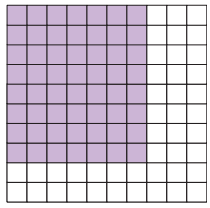

**1.** Order the decimals in each set from least to greatest.
**a)** 0.7, 0.3, 0.6  **b)** 0.1, 0.8, 0.4  **c)** 0.75, 0.30, 0.50  **d)** 0.80, 0.20, 0.10

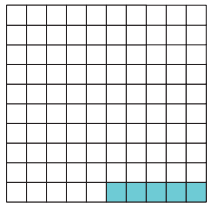
**2.** Use a number line and decimal benchmarks to compare the numbers in each pair.
**a)** $\frac{7}{10}$ and 0.9  **b)** $\frac{4}{5}$ and 0.6  **c)** $\frac{1}{4}$ and 0.2

**3.** Order 0.70, 0.80, and 0.25 from greatest to least.
Show your work.

**4.** Write a decimal for each picture.
Which decimal benchmark is each decimal closest to?
Order the three decimals from least to greatest.

**a)** 

**b)** 

**c)** 

**5.** Order the decimals in each set from least to greatest.
Think about equivalent decimals when you need to.

**a)** 0.5, 0.60, 0.75 **b)** 0.39, 0.7, 0.1 **c)** 0.02, 0.4, 0.20 **d)** 0.10, 0.6, 0.15

**6.** Copy and complete. Use $<$, $>$, or $=$.

**a)** 0.20 ☐ 0.2 **b)** 0.7 ☐ 0.74 **c)** 0.35 ☐ 0.1

**7.** Use the data in the table.

**a)** Which frog made the longest jump?

**b)** Which frog made the shortest jump?

**c)** Which frog's jump was longer than Skeeter's but shorter than Squiggy's?

**Frog Jumping Contest**

| Frog | Distance (m) |
|---|---|
| Charger | 0.76 |
| Skeeter | 0.89 |
| Speedy | 0.90 |
| Squiggy | 0.98 |
| Bubbles | 0.91 |

**8.** **a)** Copy and complete the table.

**b)** Order the decimals in the table from least to greatest.

| Decimal | Lower Benchmark | Upper Benchmark | Nearest Benchmark |
|---|---|---|---|
| 0.21 | | | |
| 0.09 | | | |
| 0.99 | | | |
| 0.80 | | | |

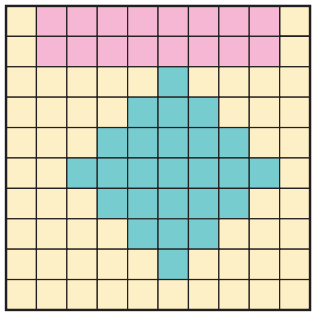
## Reflect

Describe how using benchmarks can help you to compare and order decimals.

LESSON 6

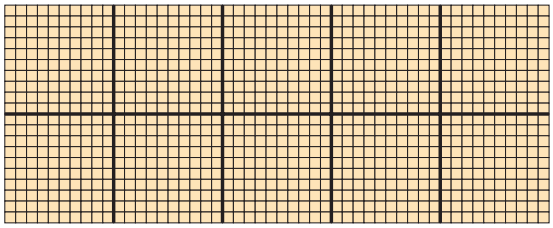
# Exploring Thousandths

This design contains 100 small square tiles.
What fraction of the design does each colour represent?



## Explore

You will need Base Ten Blocks and coloured pencils.
Your teacher will give you several copies of the grid below.



Each grid has 1000 congruent squares.

➤ Use Base Ten Blocks to model each number.
Each time, use the fewest blocks possible.

$\frac{700}{1000}$ $\frac{3}{10}$ $\frac{41}{1000}$ $\frac{70}{100}$

$\frac{732}{1000}$ $\frac{62}{1000}$ $\frac{300}{1000}$

➤ Colour grids to show each number.
Write each number in words.

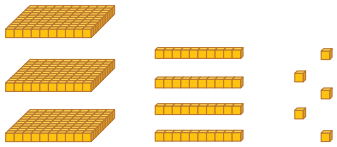
## Show *and* Share

Share your work with another pair of students.
How did you decide what each type of Base Ten Block represents? Explain.
For which pairs of numbers did you use the same blocks? Why?

## Connect

➤ We can show numbers with **thousandths** in different ways.

Base Ten Blocks



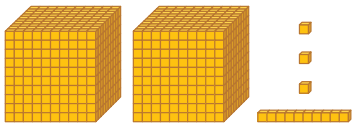
Place-value chart

| Ones | Tenths | Hundredths | Thousandths |
|---|---|---|---|
| 0 | 3 | 4 | 5 |

Notation

$\frac{345}{1000} = 0.345$

three hundred forty-five thousandths



| Ones | Tenths | Hundredths | Thousandths |
|---|---|---|---|
| 2 | 0 | 1 | 3 |

2.013

two and thirteen thousandths

| Ones | Tenths | Hundredths | Thousandths |
|---|---|---|---|
| 0 | 0 | 0 | 8 |

$\frac{8}{1000} = 0.008$

eight thousandths

➤ We can write some fractions with denominator 1000.

$\frac{1}{2} \overset{\times 5}{=} \frac{5}{10} \overset{\times 100}{=} \frac{500}{1000}$

$\frac{1}{2}$ is equivalent to $\frac{5}{10}$.
$\frac{5}{10}$ is equivalent to $\frac{500}{1000}$.
$\frac{500}{1000}$ is 0.500,
so $\frac{1}{2}$ is equivalent to 0.500.

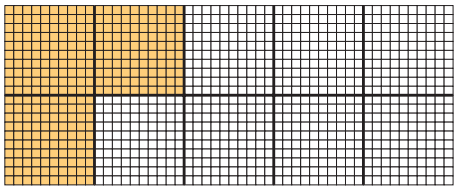
$\frac{2}{5} \overset{\times 2}{=} \frac{4}{10} \overset{\times 100}{=} \frac{400}{1000}$

$\frac{2}{5}$ is equivalent to $\frac{4}{10}$.
$\frac{4}{10}$ is equivalent to $\frac{400}{1000}$.
$\frac{400}{1000}$ is 0.400,
so, $\frac{2}{5}$ is equivalent to 0.400.

➤ We can write a decimal in expanded form to show the value of each digit.

3.248 = 3 ones + 2 tenths + 4 hundredths + 8 thousandths
= 3 + 0.2 + 0.04 + 0.008

➤ This thousandths grid represents 1 whole.
It contains 1000 congruent squares.



Each small square is one-thousandth of the grid.

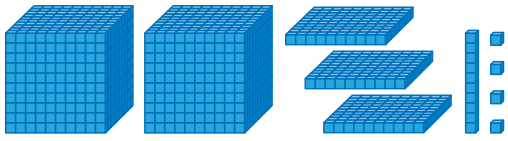
300 small squares are $\frac{300}{1000}$, or 0.300.
30 rows of 10 small squares are $\frac{30}{100}$, or 0.30.
3 large squares are $\frac{3}{10}$, or 0.3.
300 small squares = 30 rows of 10 small squares = 3 large squares
So, 0.300 = 0.30 = 0.3
0.300, 0.30, and 0.3 name the same amount.
They are **equivalent decimals**.

## Practice

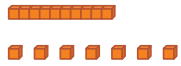
You may use Base Ten Blocks or thousandths grids to model numbers.

**1.** Write a decimal for each picture.

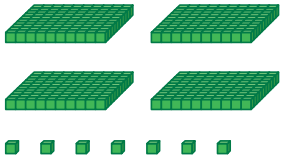
**a)**



**b)**



**c)**



**d)**

**2.** Colour a thousandths grid to show each decimal.
Then write the decimal as a fraction.

**a)** 0.358 **b)** 0.209 **c)** 0.001 **d)** 0.048

**3.** Use the data in the table.
Write the number that has:

**a)** a 5 in the tenths place
**b)** a 2 in the thousandths place
**c)** a 6 in the hundredths place
**d)** a 6 in the ones place
**e)** a 5 in the thousandths place
**f)** a 0 in the tenths place

| Creature | Length (cm) |
|---|---|
| Praying Mantis | 7.620 |
| Garden Spider | 2.412 |
| Dust Mite | 0.015 |
| Walking Stick Insect | 7.564 |
| Desert Tarantula | 6.943 |

**4.** Shade a thousandths grid to show each decimal.
Then write an equivalent decimal.

**a)** 0.070 **b)** 0.300 **c)** 0.010 **d)** 0.900

**5.** Write two equivalent decimals for each decimal.
Explain how you knew which decimals to write.

**a)** 0.9 **b)** 0.7 **c)** 0.1 **d)** 0.3

**6.** Write an equivalent decimal for each decimal.

**a)** 0.31 **b)** 0.29 **c)** 0.87 **d)** 0.55

What is the same about all the decimals you wrote?

**7.** Record each number in expanded form.

**a)** 573 thousandths **b)** 86.093 **c)** 6 and 240 thousandths
**d)** 292.73 **e)** 0.124 **f)** 0.107

**8.** Write each fraction as a decimal.

**a)** $\frac{341}{1000}$ **b)** $\frac{16}{1000}$ **c)** $\frac{3}{1000}$ **d)** $\frac{24}{1000}$

**9.** Write each fraction in question 8 in words.

**10.** Describe the value of each digit in each decimal.

**a)** 2.369 **b)** 0.042 **c)** 1.23

**11.** Use each of the digits 0, 2, 5, and 8 once.
Make a number that is less than 5 but greater than 1.
Find as many numbers as you can.
Explain the strategies you used.

**12.** The fastest-moving insect on land is a cockroach.
It has a record speed of 5.407 km/h.
Write this number as many ways as you can.

At this speed, the cockroach travels 5.407 km in one hour.

**13.** Earth revolves around the sun about every three hundred sixty-five and two hundred fifty-six thousandths days.
Write this number as a decimal.

**Reflect**

How are 0.5, 0.50, and 0.500 alike?
How are they different?

LESSON 7

# Comparing and Ordering Decimals

Mount Logan in the Yukon Territory is the highest mountain in Canada.
It is 5.959 km high!

## Explore

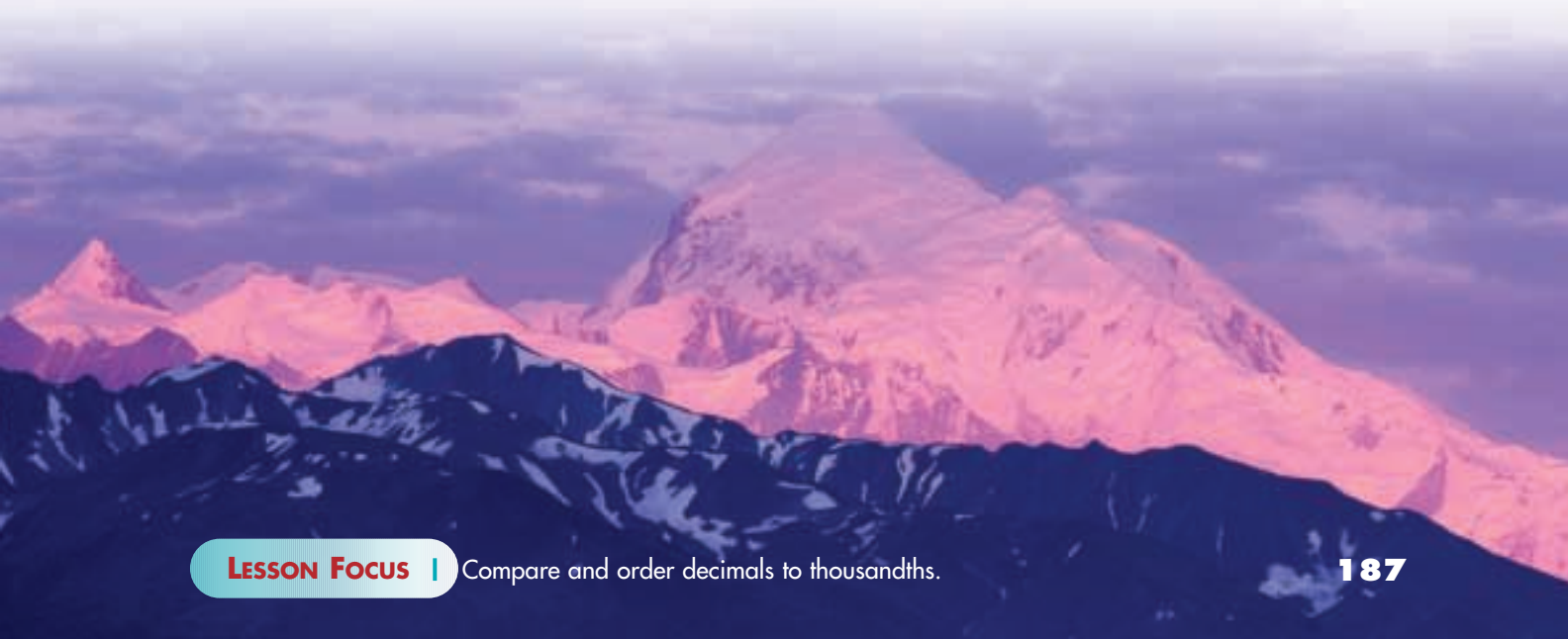
This table shows the heights of the highest mountains in some Canadian provinces and a territory.

Use any materials or strategies you wish.
Order the heights from least to greatest.

| Province/Territory | Mountain | Height (km) |
|---|---|---|
| Alberta | Columbia | 3.747 |
| British Columbia | Fairweather | 4.663 |
| Manitoba | Baldy | 0.832 |
| New Brunswick | Carleton | 0.817 |
| Newfoundland and Labrador | Caubvick | 1.652 |
| Nunavut | Barbeau Peak | 2.616 |

## Show *and* Share

Share your results with another pair of students.
Explain the strategies you used to order the heights.
An unnamed peak in the Northwest Territories is 2.773 km high.
Where does this height fit in your ordered list?
Explain why it fits there.



## Connect

Many organisms are too small to be seen with the naked eye. Scientists use a microscope to study them.
Here are the lengths of 4 micro-organisms.

| Micro-organism | Length (mm) |
|---|---|
| Tardigrade | 0.15 |
| Euglena | 0.139 |
| Vorticella | 0.11 |
| Paramecium | 0.125 |

Here are three ways to order the lengths from greatest to least.

➤ Use place value. Write each decimal in a place-value chart.

| | Ones | Tenths | Hundredths | Thousandths |
|---|---|---|---|---|
| Tardigrade | 0 | 1 | 5 | 0 |
| Euglena | 0 | 1 | 3 | 9 |
| Vorticella | 0 | 1 | 1 | 0 |
| Paramecium | 0 | 1 | 2 | 5 |

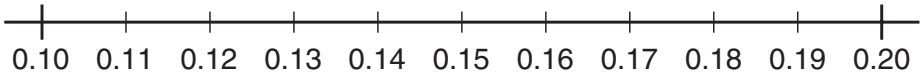
Compare the ones. All four numbers have 0 ones.
Compare the tenths. All four numbers have 1 tenth.
Compare the hundredths. 5 hundredths is the greatest number of hundredths, then 3 hundredths, 2 hundredths, and 1 hundredth.

The numbers in order from greatest to least are: 0.15, 0.139, 0.125, 0.11

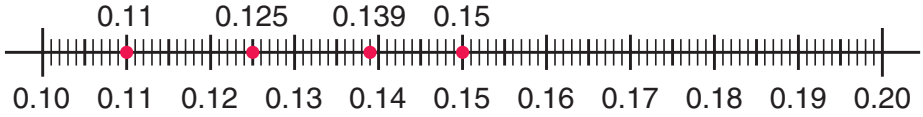
➤ Use equivalent decimals.
Write each decimal in thousandths.
0.15 is 0.150, or 150 thousandths.
0.139 is 139 thousandths.
0.11 is 0.110, or 110 thousandths.
0.125 is 125 thousandths.

Compare the numbers of thousandths.
From greatest to least: 0.150, 0.139, 0.125, 0.110

➤ Use a number line.
0.15, 0.139, 0.11, and 0.125 are between 0.1 and 0.2.
Use equivalent decimals.
So, label the endpoints of the number line 0.10 and 0.20.
Divide the interval between 0.10 and 0.20 to show hundredths.



Divide the hundredths to show thousandths.
Mark a dot for each number.




The farther to the right on the number line, the greater a number is.
So, reading the numbers from right to left gives the lengths from greatest to least.

The lengths from greatest to least are: 0.15 mm, 0.139 mm, 0.125 mm, 0.11 mm

## Practice

**1.** Use place value.
Order the decimals in each set from least to greatest.

**a)** 0.8, 0.3, 0.7 **b)** 0.5, 0.2, 0.1 **c)** 0.4, 0.7, 0.6
**d)** 0.12, 0.99, 0.81 **e)** 0.73, 0.19, 0.42 **f)** 0.88, 0.98, 0.89
**g)** 0.529, 0.592, 0.925 **h)** 0.125, 0.118, 0.181 **i)** 0.354, 0.500, 0.345

**2.** Copy and complete. Use $>$, $<$, or $=$.

**a)** 0.2 ☐ 0.4 **b)** 0.06 ☐ 0.01 **c)** 0.694 ☐ 0.690
**d)** 0.9 ☐ 0.90 **e)** 0.745 ☐ 0.75 **f)** 0.624 ☐ 0.8

**3.** Use equivalent decimals.
Order the decimals in each set from least to greatest.

**a)** 0.576, 0.02, 0.009, 0.1, 0.002 **b)** 0.06, 0.278, 0.003, 0.15, 0.7

**4.** Order the numbers from least to greatest.

**a)** 24.3, 24.7, 24.1 **b)** 0.59, 0.95, 0.57 **c)** 1.76, 1.63, 1.78

**5.** Order the numbers from greatest to least.

**a)** 0.571, 3.53, 0.538 **b)** 1.002, 1.35, 1.267 **c)** 15.2, 15.012, 16

**6.** Write a number between 6.73 and 6.741.
How did you choose the number?

**7.** Lian's paper airplane flew 4.247 m and Maude's flew 4.25 m.
Whose plane flew farther? Show how you know.

**8.** Write two numbers between 1.51 and 1.52.
How did you choose the numbers?

**9.** This table shows the results of a watermelon seed-spitting contest.

**a)** Whose seed went the greatest distance?

**b)** Whose seed went the least distance?

**c)** Whose seed went farther than Poppy's but not as far as Luis'?

**d)** Order the distances from greatest to least.

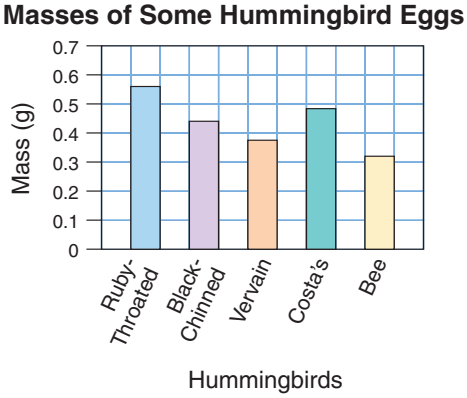
| Name | Distance (m) |
|---|---|
| Vladimir | 2.357 |
| Abu | 2.4 |
| Poppy | 2.35 |
| Suki | 1.943 |
| Cy | 1.7 |
| Luis | 2.438 |

**10.** Use the graph.
The masses in grams of the hummingbird eggs, in no specific order, are:
0.482, 0.44, 0.32, 0.56, 0.374
What is the mass of the egg of:

**a)** the Costa's hummingbird?

**b)** the bee hummingbird?

**c)** the black-chinned hummingbird?




**11.** Which number is closest to 6?
Explain how you know.
5.014, 6.4, 6.002, or 5.91

**12.** Copy each statement.
Write a decimal with thousandths to make each statement true.

**a)** $0.43 > \square$ **b)** $5.7 < \square$ **c)** $32.002 > \square$

**d)** $2.31 < \square$ **e)** $21.24 > \square$ **f)** $0.1 > \square$

**13.** Grady is 1.35 m tall. His sister is 1.7 m tall.
Grady's mother is 1.59 m tall.

**a)** Who is the tallest?

**b)** Who is the shortest?

**c)** Do you think Grady is older or younger than his sister? Explain.

**14.** Order these numbers on a number line: 1.27, 1.284, 1.236, 1.2, 1.279

**Reflect**

A student says that 7.52 is to the left of 7.516 on a number line because 52 is less than 516.
Is the student correct? Explain your answer.

LESSON 8

# Using Decimals to Relate Units of Measure

## Explore

Each of you will need string, scissors, a ruler, and a metre stick or measuring tape.

➤ Cut off a piece of string you think will fit each description:
- between 1 m and 2 m long
- between 50 cm and 100 cm long
- shorter than 10 cm

➤ Trade strings with your partner.
Measure your partner's strings to the nearest centimetre.
Then record each measurement in metres, centimetres, and millimetres.

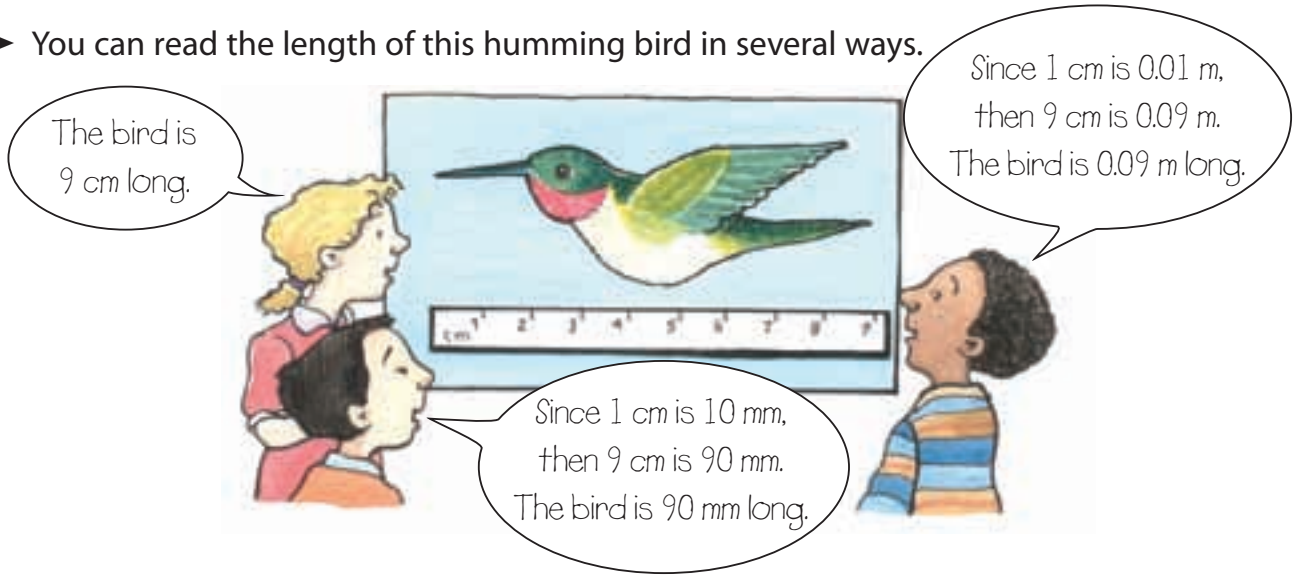
## Show *and* Share

Share your measurements with your partner.
Explain how you changed centimetres to the other units of length.
How did you use decimals to record some of your measures?

## Connect

Here are some relationships among the units you use to measure length.

➤ You can read the length of this humming bird in several ways.



| | | |
|---|---|---|
| 1 mm = 0.1 cm | 1 cm = 10 mm | 1 m = 1000 mm |
| 1 mm = 0.001 m | 1 cm = 0.01 m | 1 m = 100 cm |

➤ Change 2 m to millimetres.
1 m = 1000 mm
So, 2 m = 2 × 1000 mm
= 2000 mm

➤ Change 12 mm to centimetres.
10 mm = 1 cm
So, 1 mm = $\frac{1}{10}$ cm = 0.1 cm
Then, 12 mm = $\frac{12}{10}$ cm = 1.2 cm

➤ Change 23 mm to metres.
1000 mm = 1 m
So, 1 mm = $\frac{1}{1000}$ m = 0.001 m
Then, 23 mm = $\frac{23}{1000}$ m = 0.023 m

➤ Change 23 cm to metres.
100 cm = 1 m
So, 1 cm = $\frac{1}{100}$ m = 0.01 m
Then, 23 cm = $\frac{23}{100}$ m = 0.23 m

## Practice

Use metre sticks when they help.

**1.** Measure each line segment. Write its length 3 ways.

**a)**

**b)**

**2.** The northern pike can grow to a length of about 1 m. Write this length in millimetres and in centimetres.

**3.** Copy and complete.

**a)** 9 m = ☐ cm **b)** 15 mm = ☐ cm **c)** 5 m = ☐ mm
**d)** 17 cm = ☐ m **e)** 45 m = ☐ cm **f)** 45 cm = ☐ m

**4.** How many 1-cm cubes do you need to draw a line segment of each length?

**a)** 50 mm **b)** 1 m **c)** 21 m **d)** 70 mm

**5.** Record each measure in millimetres and metres.

**a)** 24 cm **b)** 17 cm **c)** 80 cm **d)** 145 cm

**6.** Record each measure in millimetres and centimetres.

**a)** 3 m **b)** 0.5 m **c)** 0.4 m **d)** 0.9 m

**7.** Draw a feather of each length.
Then write each length in 2 different units.

**a)** 50 mm **b)** 3 cm **c)** 11 cm **d)** 0.07 m

**8.** Copy and complete. Use $=$, $<$, or $>$. Explain how you know.

**a)** 5.56 m ☐ 70 cm **b)** 250 cm ☐ 1.46 m **c)** 16 mm ☐ 1.6 cm

**d)** 3000 mm ☐ 2.8 m **e)** 5.3 m ☐ 53 cm **f)** 2.90 m ☐ 227 cm

**9.** The right whale can grow to a length of 18 m.
The sperm whale can grow to a length of 1770 cm.
Which whale can grow to the greater length?
How do you know?

**10.** Jackie is 123 cm tall.
Suppose she wants to know her height in metres.
How will the number that represents her height in metres compare to the number that represents her height in centimetres? Explain how you know.

**11.** Jo-el is 1.21 m tall, Raynen is 1.03 m tall, and Keena is 131 cm tall.

**a)** Order the students from shortest to tallest.

**b)** Who is tallest? By how much?
Show your work.

**12.** Hannah-Li plans to measure the width of the classroom door in millimetres and centimetres. Which will be greater: the number that represents the width in millimetres or the number that represents the width in centimetres? How do you know?

## Reflect

Explain how to change a measurement from one unit to another.
Give examples to support your answer.

LESSON 9

# Relating Fractions and Decimals to Division

## Explore

Javier has 11 apples to share equally with a friend.
How many apples will each person get?

Try to do this 2 different ways.
How will you record your answer?

### Show *and* Share

Share your answer with another pair of classmates. Compare strategies for solving the problem and writing the answer.

## Connect

Helena has 8 doughnuts to share equally among 5 people.
How much will each person get?

Here are two ways to solve the problem.

➤ Use pictures.

Each person has 1 doughnut. There are 3 left over.
Divide each leftover doughnut in fifths.

There are 15 fifths.
Each person gets 3 fifths of a leftover doughnut.

So, each person gets 1 doughnut and $\frac{3}{5}$ more.

Since $\frac{3}{5} = \frac{6}{10}$ and $\frac{6}{10} = 0.6$, we can also say that each person gets 1 doughnut and 0.6 of a doughnut, or 1.6 doughnuts.


➤ Divide.
Eight doughnuts shared equally among 5 people is written as $8 \div 5$.

$$5\overline{)8}\quad 1\text{ R}3$$

There is a remainder of 3.

The 3 left over are shared equally among 5 people.

This can be written as $3 \div 5$, or $\frac{3}{5}$.

We write 1 R3 as 1 and $\frac{3}{5}$ more.

Any division statement can be written as a fraction.

$3 \div 5 = \frac{3}{5}$

## Practice

**1.** Write each division statement as a fraction.

**a)** $2 \div 4$ **b)** $3 \div 8$ **c)** $4 \div 10$ **d)** $5 \div 12$

**2.** Write each division statement as a fraction.

**a)** $15 \div 6$ **b)** $12 \div 5$ **c)** $16 \div 8$ **d)** $17 \div 10$

**3.** Write each fraction as a division statement.

**a)** $\frac{2}{3}$ **b)** $\frac{4}{9}$ **c)** $\frac{1}{8}$ **d)** $\frac{3}{4}$

**4.** Write each fraction as a division statement.

**a)** $\frac{10}{4}$ **b)** $\frac{14}{5}$ **c)** $\frac{20}{6}$ **d)** $\frac{12}{7}$

**5.** Divide.
Show each remainder as a fraction.

**a)** $7 \div 4$ **b)** $8 \div 3$ **c)** $24 \div 7$ **d)** $230 \div 8$

**6.** Divide.
Show each answer as a decimal.

**a)** $35 \div 2$ **b)** $193 \div 5$ **c)** $17 \div 5$ **d)** $299 \div 2$

**7.** Wenchun can make 4 origami swans from one sheet of paper.

**a)** How many sheets of paper will she need to make 45 swans?

**b)** Write the remainder in 2 different ways.

**8.** Jimmy has 79 m of string.
He plans to make 5 kites.
How much string is available for each kite?
Write the answer as a decimal.

**9.** Two people share a gift of $125 equally.
How much does each person get?

**10.** Mario cycled 17 km from his home to visit a friend.
He left home at 9 A.M.
Mario arrived at his friend's home at 11 A.M.
He cycled the same distance each hour.
How far did he cycle each hour?
Write the answer as a decimal.

**11.** Janine made 4 pizzas for her party.
She invited 8 friends.
How much pizza did Janine think each person would eat? Explain.

**12.** A 4-kg bag of peaches costs $10.
What does 1 kg of peaches cost?

**13.** Teagan bought 250 cm of leather cord to make necklaces.
He wants to make 8 necklaces, all the same length.
How much cord will Teagan use for each necklace?

## Reflect

One student wrote $\frac{9}{4}$ as 2 R1.
A second student wrote $\frac{9}{4}$ as 2.25.
A third student wrote $\frac{9}{4}$ as 2 and $\frac{1}{4}$ more.
Use pictures, numbers, or words to explain why each student is correct.

LESSON 10

# Estimating Sums and Differences

## Explore

Use the data in the table, taken from *Guinness World Records 2007*.

➤ Take turns to choose 2 fruits and estimate their combined mass. Tell your partner your estimate. Have your partner guess which 2 fruits you chose. If your partner guesses incorrectly, try to provide a closer estimate. Continue with different pairs of fruit.

➤ Repeat the activity.
This time, estimate the difference in masses of 2 fruits.

**Most Massive Fruits on Record**

| Fruit | Mass (kg) |
|---|---|
| Apple | 1.843 |
| Grapefruit | 3.065 |
| Lemon | 5.265 |
| Mango | 2.466 |
| Peach | 0.725 |
| Strawberry | 0.231 |

## Show *and* Share

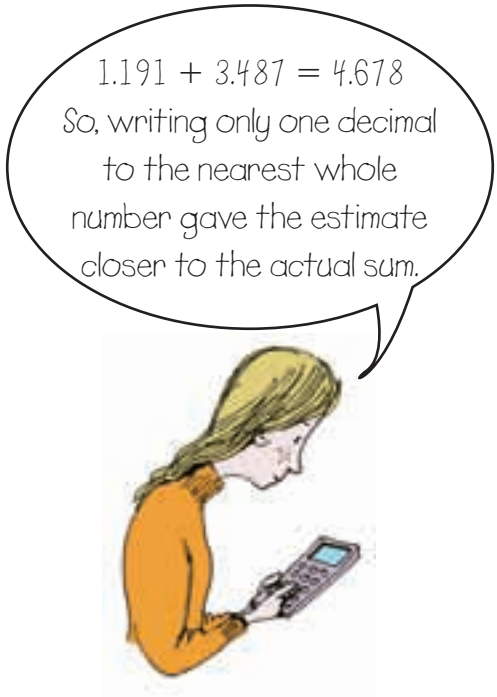
Discuss the strategies you used to estimate the sums and differences. Which strategies gave the closest estimate?

## Connect

According to *Guinness World Records 2007*, the most massive head of garlic had a mass of 1.191 kg.
The most massive potato had a mass of 3.487 kg.

➤ Here are two ways to estimate the combined mass of these vegetables:
Estimate: 1.191 + 3.487

- Write each decimal to the nearest whole number.
  1 + 3 = 4
  So, 1.191 kg + 3.487 kg is about 4 kg.
- Write only 1 decimal to the nearest whole number.
  1 + 3.487 = 4.487
  So, 1.191 kg + 3.487 kg is about 4.487 kg.



➤ Here are two ways to estimate the difference in the masses of the potato and the garlic.
Estimate: 3.487 − 1.191

- Write the decimal being subtracted to the nearest whole number.
  3.487 − 1 = 2.487
  So, 3.487 kg − 1.191 kg is about 2.487 kg.
- Write both decimals to the nearest whole number.
  3 − 1 = 2
  So, 3.487 kg − 1.191 kg is about 2 kg.

The exact difference is:

3.487 − 1.191 = 2.296

For these numbers, writing the decimal being subtracted to the nearest whole number gave the estimate closer to the actual difference.

## Practice

**1.** Estimate each sum. Explain your strategies.

**a)** 7.36 + 2.23
**b)** 1.689 + 3.128
**c)** 2.014 + 3.213
**d)** 4.405 + 2.167
**e)** 3.8 + 2.6
**f)** 5.278 + 0.732
**g)** 6.112 + 7.351
**h)** 6.204 + 3.009
**i)** 5.641 + 1.318
**j)** 4.219 + 8.604

**2.** Estimate each difference. Explain your strategies.

**a)** 4.255 − 1.386
**b)** 6.593 − 4.991
**c)** 8.737 − 5.837
**d)** 0.456 − 0.214
**e)** 4.32 − 1.245
**f)** 3.104 − 0.8

**3.** The tallest woman on record was 2.483 m tall.
The shortest woman on record was 0.61 m tall.
Estimate the difference in their heights.
Show your work.

**4.** Choose the closer estimate. Explain your choice.

**a)** 2.225 + 6.95 — 8 or 9
**b)** 83.1 − 34.016 — 50 or 60
**c)** 58.37 − 22.845 — 35 or 30
**d)** 19.531 + 16.8 — 35 or 36

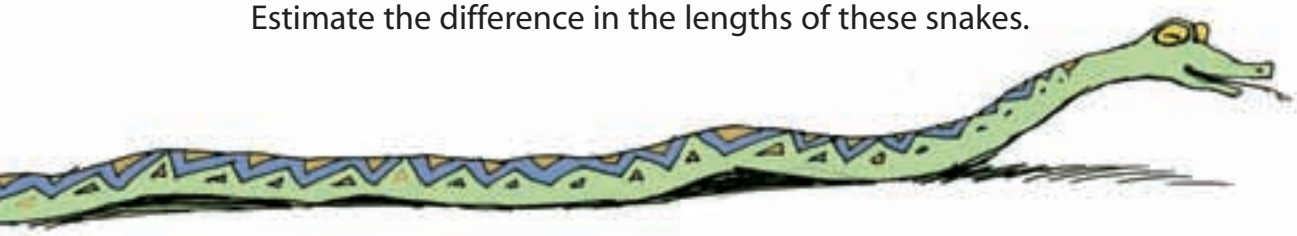
**5.** A grand piano has a mass of 396.696 kg.
An upright piano has a mass of 267.728 kg.

**a)** Could both pianos be put in a freight elevator with a mass limit of 650 kg? Explain how you know.

**b)** About how much over or under the 650-kg limit is the combined mass of the two pianos?

**6.** Mount Everest is 8.850 km high.
Mount Logan is 5.959 km high.
What is the approximate difference in their heights?

**7.** The reticulated python is the world's longest snake.
The thread snake is the world's shortest snake.
A reptile centre has a 6.248-m reticulated python and a 0.108-m thread snake.
Estimate the difference in the lengths of these snakes.



**8.** A toy store has a sale.
It will pay the tax if your purchase totals $25 or more.
Jessica buys a computer game for $14.95 and some batteries for $7.99.
About how much more would she need to spend and not pay the tax?

**9.** Tyrel and Jordana estimated the sum of 2.853 + 0.986.
Tyrel's estimate was 3.8 and Jordana's was 3.853.

**a)** Explain how Tyrel and Jordana may have estimated.

**b)** Whose estimate was closer to the actual sum? How do you know?

## At Home

Talk with family members to find out when they estimate sums or differences.
What strategies do they use?
Write about what you find out.

## Reflect

Which method for estimating do you find easiest?
Explain why it is easiest for you.

LESSON 11

# Adding Decimals


Suppose the students combine their money.
Do they have enough to buy a CD for $10.41? How could you find out?

## 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

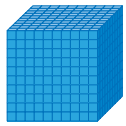
Share your results with another pair of classmates.
Discuss the strategies you used to estimate the mass, and to find the mass.
Were some of the strategies better than others? How? Explain.

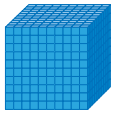
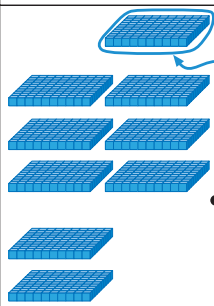
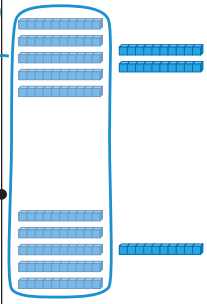
## Connect

Julio rides his bike to school.
Julio's mass is 26.79 kg.
The mass of his backpack is 2.60 kg.
What total mass is Julio's bike carrying?

Add: 26.79 + 2.60
Here are 3 different strategies students used to find 26.79 + 2.60.

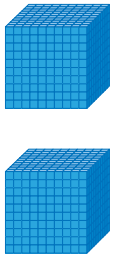
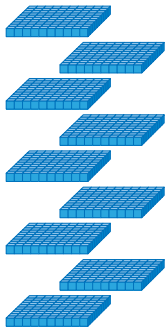
➤ Sidney used Base Ten Blocks on a place-value mat.
She modelled each number with blocks.
Sidney then traded 10 tenths for 1 one.


represents 10.

| Tens | Ones | Tenths | Hundredths |
|---|---|---|---|
|  |  |  |  |

$$\begin{array}{r} {\scriptstyle 1\phantom{00}} \\ 26.79 \\ +\ 2.60 \\ \hline .39 \end{array}$$

Sidney then counted the ones and counted the tens.

| Tens | Ones | Tenths | Hundredths |
|---|---|---|---|
|  |  |  |  |

$$\begin{array}{r} {\scriptstyle 1\phantom{00}} \\ 26.79 \\ +\ 2.60 \\ \hline 29.39 \end{array}$$

➤ Ben added from left to right.
He added whole numbers, then estimated to place the decimal point.

$$\begin{array}{r} 2679 \\ +\ 260 \\ \hline 2000 \\ 800 \\ 130 \\ +\ 9 \\ \hline 2939 \end{array}$$

Since 26.79 + 2.60 is about 20 + 2 = 22, Ben placed the decimal point in the sum so the whole number part is a number close to 22; that is, 29.

So, 26.79 + 2.60 = 29.39

➤ Katy also added from left to right, but she added decimals.
She aligned the decimals as Sidney aligned the blocks on the place-value mat.

$$\begin{array}{r} 26.79 \\ +\ 2.60 \\ \hline 20.00 \\ 8.00 \\ 1.30 \\ +\ 0.09 \\ \hline 29.39 \end{array}$$

So, 26.79 + 2.60 = 29.39

Julio's bike is carrying a total mass of 29.39 kg.

## Practice

**1.** Use Base Ten Blocks to add.

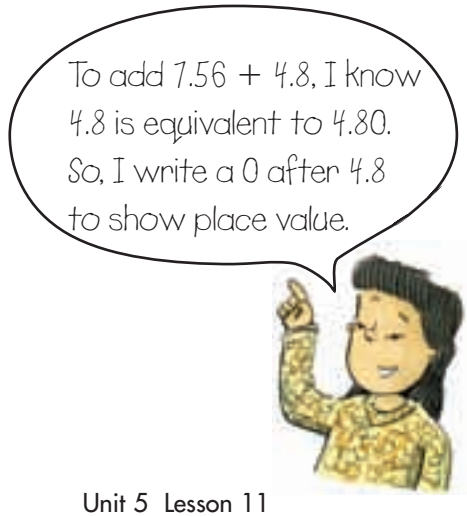
**a)** $\begin{array}{r} 4.6 \\ +\ 2.3 \end{array}$ **b)** $\begin{array}{r} 9.5 \\ +\ 5.4 \end{array}$ **c)** $\begin{array}{r} 6.25 \\ +\ 3.92 \end{array}$ **d)** $\begin{array}{r} 5.24 \\ +\ 6.99 \end{array}$

**2.** Add. Estimate to check.

**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.** 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?

**5.** Lesley bought a CD for $19.95 and
a DVD for $26.85.
How much did she pay for the two items?

**6.** 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?

**7.** The decimal point is missing in each sum.
Use estimation to place each decimal point.
**a)** $3.56 + 2.79 = 635$
**b)** $27.36 + 43.02 = 7038$
**c)** $7.5 + 3.26 + 28.11 = 3887$
**d)** $135.2 + 4.7 + 0.37 = 14027$

**8.** The decimal point in each sum is in the wrong place.
Write the sum with the decimal point in the correct place.
**a)** $5.36 + 4.78 = 101.4$
**b)** $38.92 + 27.35 = 6.627$
**c)** $0.43 + 114.8 = 1152.3$
**d)** $0.98 + 0.35 = 0.133$

**9.** Write a story problem that uses the
addition of two decimals with hundredths.
Solve your problem.
Show your work.

## Reflect

Explain why keeping track of place-value positions
is important when adding decimals.
Use an example to explain.

# Make 2!


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.

LESSON 12

# Subtracting Decimals

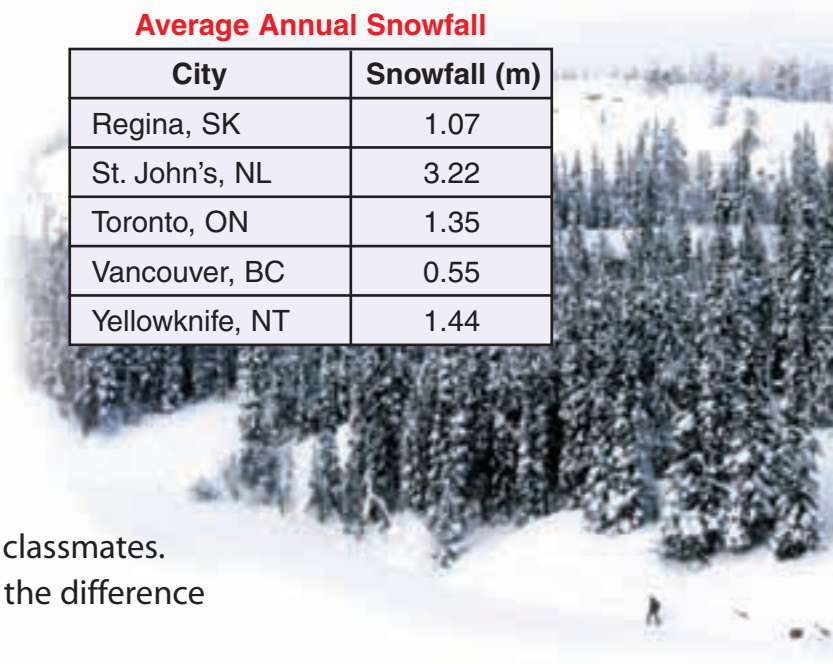
## Explore

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.

**Average Annual Snowfall**

| City | Snowfall (m) |
|---|---|
| Regina, SK | 1.07 |
| St. John's, NL | 3.22 |
| Toronto, ON | 1.35 |
| Vancouver, BC | 0.55 |
| Yellowknife, NT | 1.44 |



## Show *and* Share

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

## Connect

St. John's, Newfoundland, gets an average of 3.22 m of snow a year.

Halifax, Nova Scotia, gets 2.61 m.

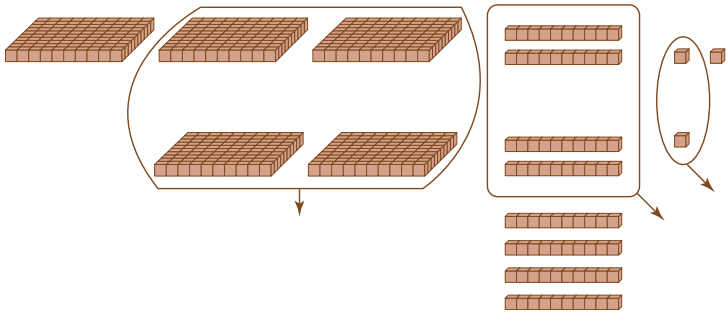
How much more snow does St. John's get than Halifax?
Subtract: 3.22 − 2.61

Here are 3 different strategies students used to find 3.22 – 2.61.

➤ Alex used Base Ten Blocks to compare the two numbers.

St. John's:

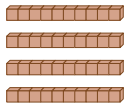
Halifax:



Alex removed the blocks that were the same in each number.
He had these blocks left.

St. John's:

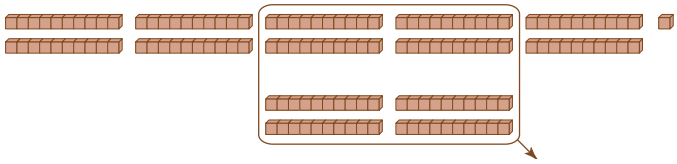
Halifax:



Alex traded the ones flat for 10 tenths, then removed more blocks that were the same in each number.

St. John's:

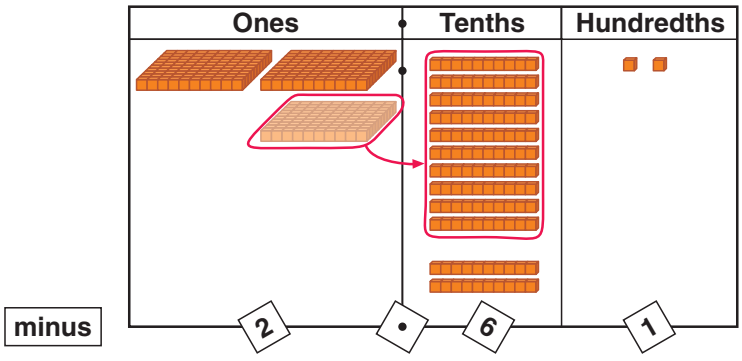
Halifax:



The blocks for 6 tenths 1 hundredth remain.
So, St. John's has 0.61 m more snow than Halifax.

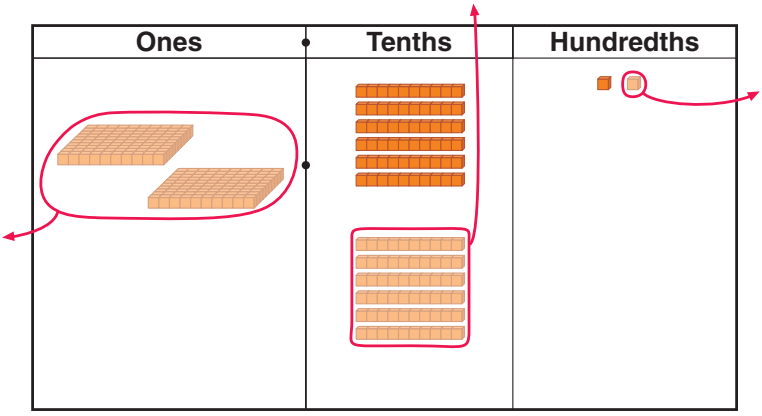
➤ Lindsay used Base Ten Blocks on a place-value mat.
She modelled 3.22 on the mat.
Lindsay cannot take 6 tenths from 2 tenths,
so she traded 1 one for 10 tenths.

Lindsay used a "take-away" model to compare

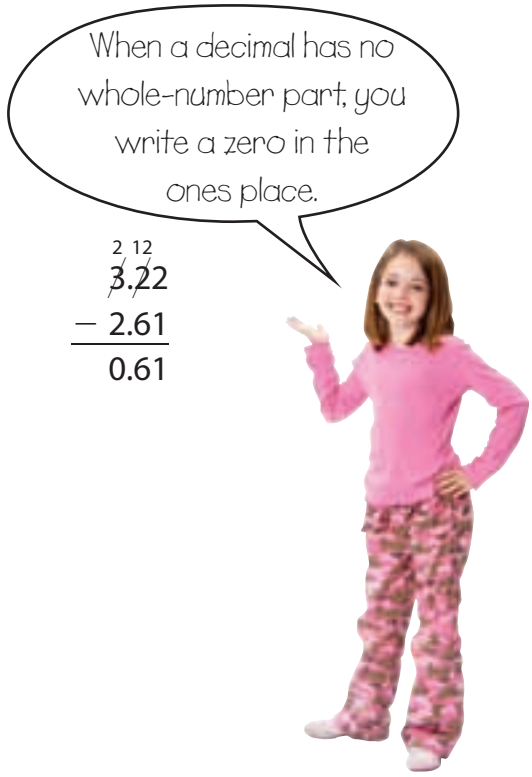



$$\begin{array}{r} {}^{2}\not{3}.{}^{12}\not{2}2 \\ -\ 2.61 \\ \hline \end{array}$$

Lindsay then took away 2 ones 6 tenths 1 hundredth.




0 ones 6 tenths 1 hundredth

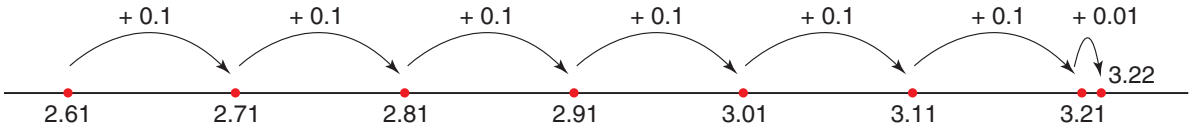



$$\begin{array}{r} {}^{2}\cancel{3}\,{}^{12}\cancel{.2}2 \\ -\ 2.61 \\ \hline 0.61 \end{array}$$

Lindsay added to check her answer.

$$\begin{array}{r} {}^{1} \\ 2.61 \\ +\ 0.61 \\ \hline 3.22 \end{array}$$

➤ Graeme used a number line to add on.




Graeme added on: $0.1 + 0.1 + 0.1 + 0.1 + 0.1 + 0.1 + 0.01 = 0.61$

So, $3.22 - 2.61 = 0.61$

Graeme used front-end rounding to check his answer is reasonable.
He wrote 3.22 as 3.
He wrote 2.61 as 2.
$3 - 2 = 1$
The answer 0.61 is close to the estimate 1, so the answer is reasonable.

So, St. John's gets 0.61 m more snow than Halifax.

## Practice

**1.** Use Base Ten Blocks to subtract. Estimate to check.

**a)** 7.8 − 2.3 **b)** 6.7 − 3.8 **c)** 9.35 − 4.26 **d)** 10.62 − 4.07

**2.** Subtract. Add to check.

**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.

**a)** How did Erin know she had made a mistake?

**b)** 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

**7.** The decimal point is missing in each difference.
Use estimation to place each decimal point.

**a)** 17.25 − 2.18 = 1507
**b)** 33.08 − 21.4 = 1168
**c)** 203.08 − 137.32 = 6576
**d)** 93.5 − 0.93 = 9257

**8.** The decimal point in each difference is in the wrong place.
Write the difference with the decimal point in the correct place.

**a)** 25.49 − 3.28 = 2.221
**b)** 1.35 − 0.78 = 57.0
**c)** 328.76 − 1.94 = 32.682
**d)** 257.9 − 98.83 = 1590.7

**9.** Why is it important to keep track of the place-value position of each digit when subtracting decimals?

**10.** 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 of his jumps?

**11.** Candida got a $50 bill for her birthday.
She bought a camera for $29.95 and a wallet for $9.29.
How much money is left?

**12.** Write a story problem that uses the subtraction of two decimals with hundredths.
Trade problems with a classmate.
Solve your classmate's problem.

**13.** 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.

**Math Link**

**Media**

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

1.5 Million People Affected by Power Cut

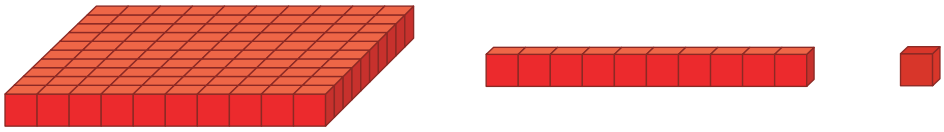
We say 1.5 million as "one point five million."
1.5 million is one million five hundred thousand, or 1 500 000.

**Reflect**

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

# 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 tens 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 cubes.
  After the second spin, take that number of 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 wins.

LESSON 13

# Adding and Subtracting Decimals

Some population numbers are written as decimals, in millions.
For example, in 2006, the population of Saskatchewan was about 0.968 million, or 968 000.
In the same year, the population of Alberta was about 3.290 million, or 3 290 000.

## Explore

This table shows the approximate populations of the western provinces and territories in 2006.

| Province or Territory | Population (millions) |
|---|---|
| Alberta | 3.290 |
| British Columbia | 4.113 |
| Manitoba | 1.148 |
| Nunavut | 0.029 |
| Saskatchewan | 0.968 |
| Northwest Territories | 0.041 |
| Yukon Territory | 0.030 |

➤ Estimate first.
Then find the total population of:
- Alberta and the Yukon Territory
- British Columbia and the Northwest Territories
- Manitoba and Nunavut

➤ Estimate first.
Then find the difference in populations of:
- Saskatchewan and the Yukon Territory
- British Columbia and Saskatchewan
- the greatest and least populations

## Show *and* Share

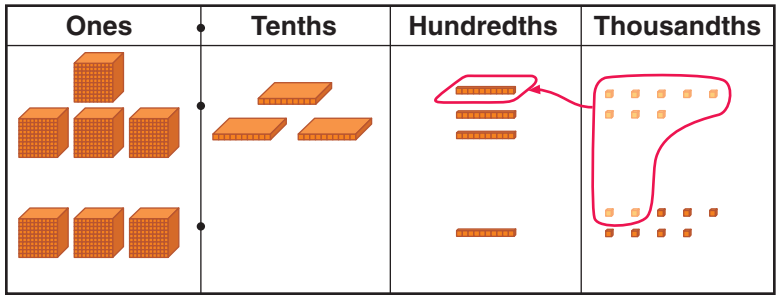
Share your results with another pair of classmates.
Discuss the strategies you used to estimate and to find the sums and differences.

## Connect

Another number that is written as a decimal, in millions, is the money that a movie earns in Canada and the United States. The earnings are recorded in millions of US dollars.
A popular movie opened in theatres on Friday, August 13, 2004.
That Friday, it earned US$4.328 million in Canadian and American theatres.
It earned US$3.019 million the next day.

➤ To find the total earnings on Friday and Saturday, add: 4.328 + 3.019
Here are two ways to find the sum.

- Use Base Ten Blocks.
  Model 4.328 and 3.019 on a place-value mat.
  Add the thousandths.
  Trade 10 thousandths for 1 hundredth.
  Add the hundredths. Add the tenths. Add the ones.




$$\begin{array}{r} {\scriptstyle 1\phantom{.000}} \\ 4.328 \\ +\ 3.019 \\ \hline 7.347 \end{array}$$

- Add from left to right.

$$\begin{array}{r} 4.328 \\ +\ 3.019 \\ \hline 7.000 \\ 0.300 \\ 0.030 \\ +\ 0.017 \\ \hline 7.347 \end{array}$$

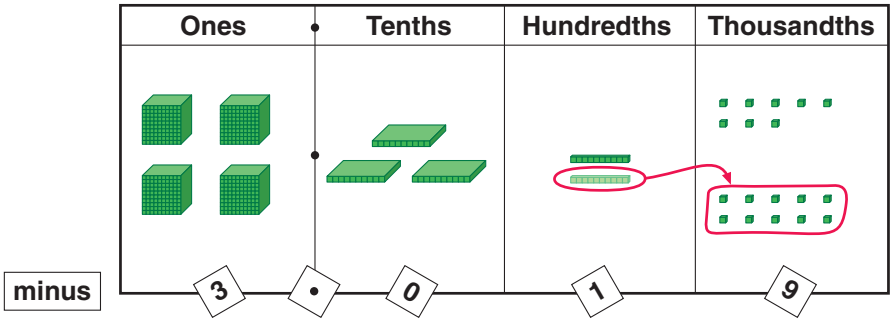
Estimate to check the answer is reasonable.
Write 3.019 as 3.
Add: 4.328 + 3 = 7.328

7.347 is close to the estimate 7.328, so the answer is reasonable.

The combined earnings were US$7.347 million.

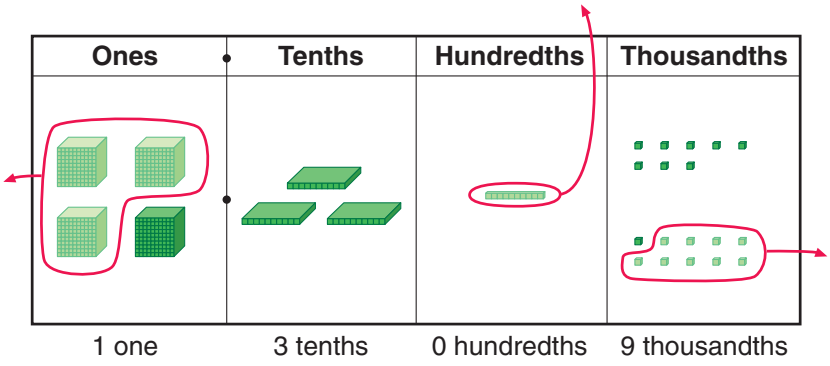
➤ To find the difference in the earnings on Friday and Saturday, subtract: 4.328 − 3.019
Here are two ways to find the difference.

- Use Base Ten Blocks.
  Model 4.328 on a place-value mat.
  You cannot take 9 thousandths from 8 thousandths.
  Trade 1 hundredth for 10 thousandths.



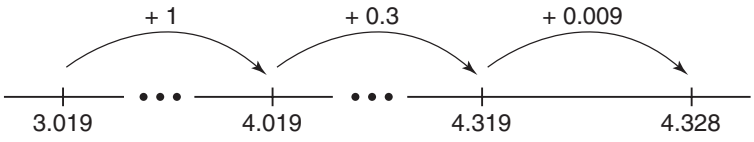

$$\begin{array}{r} {\scriptstyle 1\,1\,8} \\ 4.3\not{2}\not{8} \\ -\ 3.019 \\ \hline \end{array}$$

Take away 9 thousandths.
Take away 1 hundredth.
Take away 3 ones.




$$\begin{array}{r} {\scriptstyle 1\,1\,8} \\ 4.3\not{2}\not{8} \\ -\ 3.019 \\ \hline 1.309 \end{array}$$

- Use a number line and think addition.
  We added on: 1 + 0.3 + 0.009 = 1.309




So, 4.328 − 3.019 = 1.309

Estimate to check the answer is reasonable.
Write 3.019 as 3.
Subtract: 4.328 − 3 = 1.328

1.309 is close to the estimate 1.328, so the answer is reasonable.

The movie earned US$1.309 million more on Friday than on Saturday.

Add to check that the answer is correct.
Add: 3.019 + 1.309
The sum should be 4.328.

$$\begin{array}{r} {\scriptstyle 1}\\ 3.019\\ +\,1.309\\ \hline 4.328 \end{array}$$

So, the answer is correct.

## Practice

**1.** Add or subtract. Check your answers.

**a)** $\begin{array}{r} 3.251\\ +\,8.960 \end{array}$ **b)** $\begin{array}{r} 17.324\\ -\,9.166 \end{array}$ **c)** $\begin{array}{r} 84.032\\ -\,8.263 \end{array}$ **d)** $\begin{array}{r} 4.629\\ +\,0.576 \end{array}$

**2.** Estimate first. Then find each sum or difference.

**a)** 2.876 − 0.975 **b)** 71.382 + 9 **c)** 0.58 + 0.736
**d)** 0.14 + 4.038 **e)** 7 − 0.187 **f)** 0.999 − 0.99

**3.** Use each of the digits 0 to 7 once.
Make 2 decimals with thousandths whose sum is close to 2 and whose difference is close to 1.
Explain your choices.
Show your work.

**4.** The decimal point is missing in each sum and difference.
Use estimation to place each decimal point.

**a)** 2.567 + 5.431 = 7998 **b)** 5.101 + 3.267 = 8368
**c)** 7.636 − 0.963 = 6673 **d)** 5.042 − 3.15 = 1892

**5.** The decimal point in each sum and difference is in the wrong place.
Move each decimal point to the correct place.

**a)** 9.123 + 2.45 = 115.73 **b)** 6.7 + 2.451 = 91.51
**c)** 84.623 − 25.418 = 5.9205 **d)** 0.758 − 0.256 = 5.02

**6.** Mirko is making fruit punch.
Will the contents of these 3 containers fit in a 3-L punch bowl?
Explain.

**7.** Winsome is being trained as a guide dog for a blind person.
At birth, she had a mass of 0.475 kg.
At 6 weeks, her mass was 4.06 kg.
At 12 weeks, her mass was 9.25 kg.

**a)** By how much did her mass change from birth to 6 weeks?

**b)** By how much did her mass change from 6 weeks to 12 weeks?

**8.** Write a story problem that can be solved by subtracting two decimals with thousandths.
Solve your problem. Show your work.

**9.** Use each of the digits from 0 to 7 once to make this addition true.
Find as many different answers as you can.

$$\begin{array}{r} \square.\square\square\square \\ +\ \square.\square\square\square \\ \hline 5.788 \end{array}$$

**10.** A student added 0.523 and 2.36 and got the sum 0.759.

**a)** What mistake did the student make?

**b)** What is the correct answer?

**11.** Four students have favourite totem poles.
Scannah's pole is 1.36 m shorter than Uta's pole.
Uta's pole is 2.57 m taller than Sta-th's pole.
Yeil's pole is 31.53 m taller than Sta-th's pole.
Yeil's pole is 35.25 m tall.
How tall are Scannah's, Uta's, and Sta-th's poles?

**12.** The difference in the capacities of 2 containers is 0.653 L.
What might the capacity of each container be?

**13.** Two numbers have thousandths other than zero.
Could the difference of these numbers be 5.3? Explain.

## Reflect

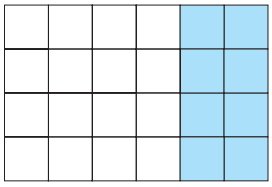
When Mahala subtracted 2.768 from 5.9, she wrote 5.9 as 5.900.
Why might she have done this?

# Unit 5 Show What You Know

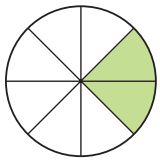
LESSON

1

**1.** Write as many different fractions as you can to describe the shaded part of each picture.

**a)** 

**b)** 

**c)** 

**2.** Find an equivalent fraction for each fraction.

**a)** $\frac{2}{5}$ **b)** $\frac{5}{8}$ **c)** $\frac{30}{40}$ **d)** $\frac{25}{50}$

2

**3.** Compare the fractions in each pair. Which strategies did you use?

**a)** $\frac{3}{8}$ and $\frac{1}{2}$ **b)** $\frac{1}{8}$ and $\frac{2}{16}$ **c)** $\frac{3}{4}$ and $\frac{5}{16}$ **d)** $\frac{6}{8}$ and $\frac{6}{16}$

**4.** Draw a number line like the one below.


Divide the number line to show halves, quarters, and sixths.
Use the number line to order $\frac{3}{4}$, $\frac{1}{6}$, $\frac{1}{2}$, and $\frac{5}{6}$ from least to greatest.

4

**5.** Represent each fraction on a hundredths grid.
Then write each number as a decimal.

**a)** $\frac{7}{25}$ **b)** $\frac{3}{5}$ **c)** $\frac{1}{4}$ **d)** $\frac{9}{20}$

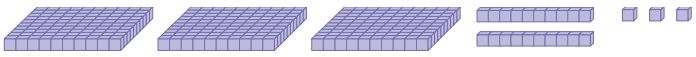
5

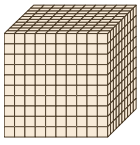
**6.** Use benchmarks on a number line.
Order the decimals in each set from least to greatest.

**a)** 0.90, 0.09, 0.81 **b)** 0.3, 0.33, 0.14 **c)** 0.56, 0.6, 0.5

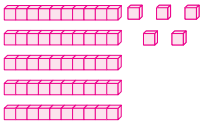
6

**7.** Write a fraction and a decimal for each picture.

**a)** 



represents 1 whole.

**b)** 

**8.** Write each fraction as a decimal.

**a)** $\frac{55}{100}$ **b)** $\frac{208}{1000}$ **c)** $\frac{1}{4}$ **d)** $\frac{9}{1000}$

LESSON

**9.** Write each decimal as a fraction.

**a)** 0.257 **b)** 0.001 **c)** 0.9 **d)** 0.34

**10.** Write an equivalent decimal for each number.

**a)** 0.7 **b)** 0.50 **c)** 1.84 **d)** 2.100

**11.** Describe the value of each digit in 3.675.

7 **12.** Use a number line to order the decimals from least to greatest.

**a)** 0.24, 1.93, 1.9 **b)** 2.051, 2.3, 2.75

8 **13.** A canoe is 5.67 m long.
How many centimetres is that?

**14.** A nickel is about 21 mm wide.
How many centimetres is that?

9 **15.** Five identical books cost $33.
How much does 1 book cost?

10 **16.** Estimate each sum or difference.

**a)** 2.48 + 2.99 **b)** 6.543 − 4.897

**c)** 4.23 + 7.862 **d)** 23.78 − 0.36

11 12 13 **17.** Use the data in the table. For each type of pet, find the difference in the masses of the largest and smallest animals.

| Animal | Mass (kg) | |
|---|---|---|
| | Smallest | Largest |
| Rabbit | 0.397 | 11.991 |
| Dog | 0.113 | 155.582 |
| Cat | 1.361 | 44.452 |

**18.** Add or subtract.

**a)** 3.84 + 7.63 **b)** 15.942 − 8.6

**c)** 1.97 + 6.323 **d)** 18.25 + 9.375

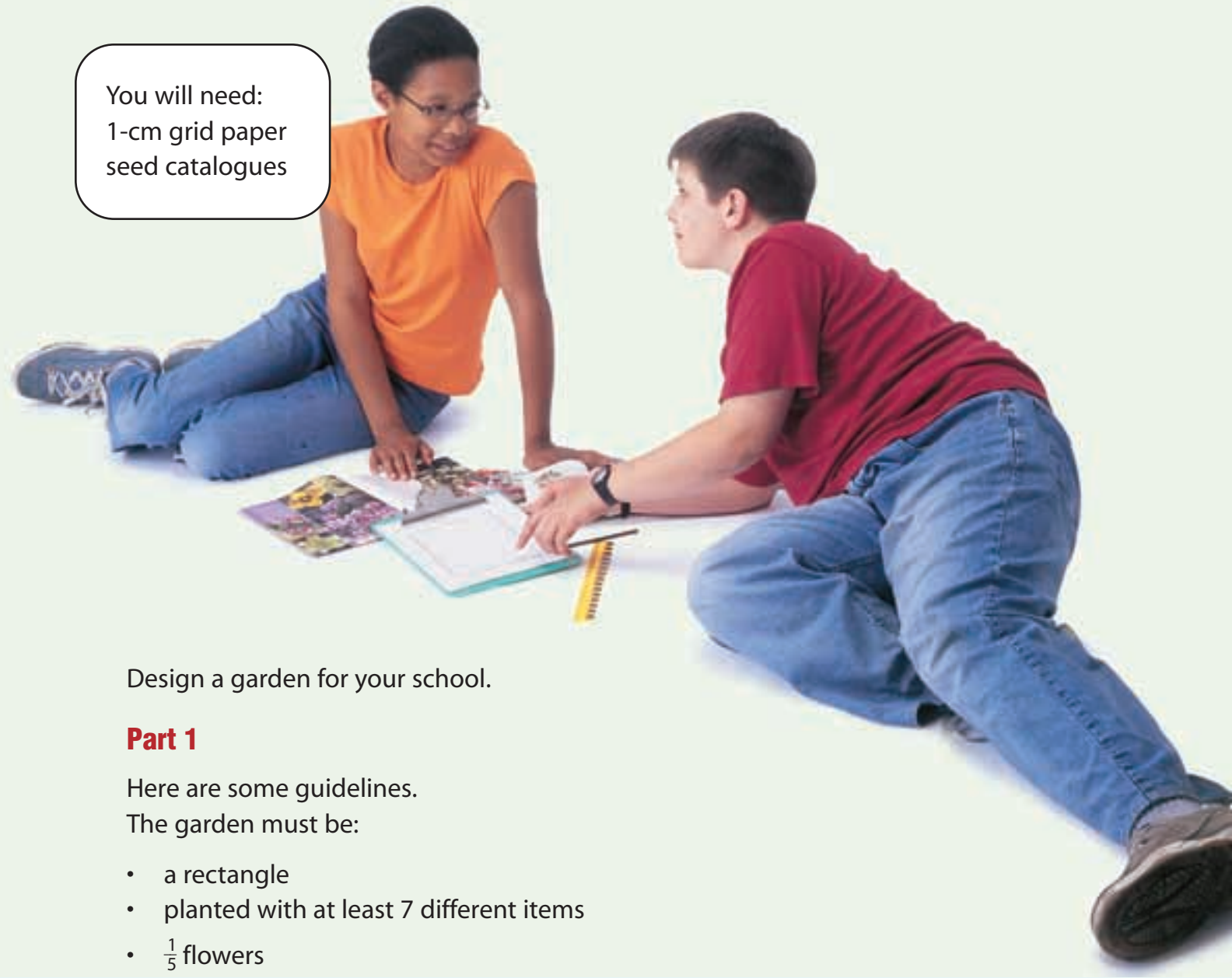
UNIT 5 **Learning Goals**

- ☑ create sets of equivalent fractions
- ☑ compare fractions with like and unlike denominators
- ☑ describe and represent decimals to thousandths
- ☑ relate decimals to fractions
- ☑ compare and order decimals to thousandths
- ☑ add and subtract decimals to thousandths

# Unit Problem

# In the Garden

You will need:
1-cm grid paper
seed catalogues



Design a garden for your school.

## Part 1

Here are some guidelines.
The garden must be:

- a rectangle
- planted with at least 7 different items
- $\frac{1}{5}$ flowers
- $\frac{3}{10}$ carrots and/or radishes
- $\frac{30}{100}$ corn and tomatoes

The tomatoes section is twice the size of the corn section.
Draw your garden on grid paper.
Label each section clearly.

What fraction of the garden does each section represent?
What decimal does each section represent?

## Part 2

Make up your own guidelines for designing a garden.
Exchange guidelines with another pair of classmates.
Follow the guidelines to design your classmates' garden.

## Part 3

Write 2 story problems about your garden:

- One problem involves adding decimals.
- The other problem involves subtracting decimals.

Exchange problems with another pair of classmates.
Solve your classmates' problems.
Check each other's work.

### Check List

Your work should show

- ☑ a plan of the garden on grid paper, with each section clearly labelled
- ☑ the fraction or decimal each section represents
- ☑ how you calculated how to represent each section on the grid
- ☑ how you added and subtracted decimals


### Reflect on Your Learning

How are fractions and decimals the same?
How are they different?