

# **Lesson 6: Finite and Infinite Decimals**

Classwork

Exercises 1–5

1. Use long division to determine the decimal expansion of  $\frac{54}{20}$ .

2. Use long division to determine the decimal expansion of  $\frac{7}{8}$ .

3. Use long division to determine the decimal expansion of  $\frac{8}{9}$ .

4. Use long division to determine the decimal expansion of  $\frac{22}{7}$ .



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5. What do you notice about the decimal expansions of Exercises 1 and 2 compared to the decimal expansions of Exercises 3 and 4?

Example 1

Consider the fraction  $\frac{5}{8}$ . Is it equal to a finite decimal? How do you know?

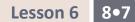
#### Example 2

Consider the fraction  $\frac{17}{125}$ . Is it equal to a finite or infinite decimal? How do you know?









#### Exercises 6–10

Show your steps, but use a calculator for the multiplications.

- 6. Convert the fraction  $\frac{7}{8}$  to a decimal.
  - a. Write the denominator as a product of 2's or 5's. Explain why this way of rewriting the denominator helps to find the decimal representation of  $\frac{7}{8}$ .

b. Find the decimal representation of  $\frac{7}{8}$ . Explain why your answer is reasonable.

7. Convert the fraction  $\frac{43}{64}$  to a decimal.

8. Convert the fraction  $\frac{29}{125}$  to a decimal.



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9. Convert the fraction  $\frac{19}{34}$  to a decimal.

10. Identify the type of decimal expansion for each of the numbers in Exercises 6–9 as finite or infinite. Explain why their decimal expansion is such.

## Example 3

Write  $\frac{7}{80}$  as a decimal. Will it be finite or infinite? Explain.

## Example 4

Write  $\frac{3}{160}$  as a decimal. Will it be finite or infinite? Explain.



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#### Exercises 11–13

Show your steps, but use a calculator for the multiplications.

- 11. Convert the fraction  $\frac{37}{40}$  to a decimal.
  - a. Write the denominator as a product of 2's and/or 5's. Explain why this way of rewriting the denominator helps to find the decimal representation of  $\frac{37}{40}$ .

b. Find the decimal representation of  $\frac{37}{40}$ . Explain why your answer is reasonable.

12. Convert the fraction  $\frac{3}{250}$  to a decimal.

13. Convert the fraction  $\frac{7}{1,250}$  to a decimal.



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#### **Lesson Summary**

Fractions with denominators that can be expressed as products of 2's and/or 5's have decimal expansions that are finite.

Example:

Does the fraction  $\frac{1}{2}$  have a finite or infinite decimal expansion?

Since  $8 = 2^3$ , then the fraction has a finite decimal expansion. The decimal expansion is found by:

$$\frac{1}{8} = \frac{1}{2^3} = \frac{1 \times 5^3}{2^3 \times 5^3} = \frac{125}{10^3} = 0.125$$

When the denominator of a fraction cannot be expressed as a product of 2's and/or 5's then the decimal expansion of the number will be infinite.

When infinite decimals repeat, such as 0.88888888 ... or 0.45454545454545 ..., they are typically abbreviated using the notation  $0.\overline{8}$  and  $0.\overline{45}$ , respectively. The notation indicates that the digit 8 repeats indefinitely and that the two-digit block 45 repeats indefinitely.

# **Problem Set**

Convert each fraction to a finite decimal. If the fraction cannot be written as a finite decimal, then state how you know. Show your steps, but use a calculator for the multiplications.

2 32 1.

- 99 125 2.
  - Write the denominator as a product of 2's and/or 5's. Explain why this way of rewriting the denominator a. helps to find the decimal representation of  $\frac{99}{125}$ .
  - Find the decimal representation of  $\frac{99}{125}$ . Explain why your answer is reasonable. b.
- 15 128 3.
- 4.
- 3 28 5.



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- 6.  $\frac{13}{400}$
- 7.  $\frac{5}{64}$
- 8.  $\frac{15}{35}$
- 9.  $\frac{199}{250}$
- 10.  $\frac{219}{625}$



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