Terminating and Repeating Decimals

Getting the Idea

Terminating and repeating decimals are also rational numbers. A **terminating decimal** ends. A **repeating decimal** does not end. Instead, it repeats a digit or pattern of digits over and over.

To determine whether a fraction can be expressed as a terminating or repeating decimal, convert the fraction to a decimal using long division.

Example 1

Can the fraction $\frac{1}{3}$ be expressed as a terminating or repeating decimal?

Strategy **Divide the numerator by the denominator. Analyze the quotient.**

Step 1 Divide the numerator by the denominator.

$$
\begin{array}{r}
0.333\ldots \\
3\overline{)1.000} \\
\underline{-9} \\
10 \\
\underline{-9} \\
10 \\
\underline{-9} \\
1
\end{array}
$$

Step 2 Does the decimal end?

No, the decimal does not end, so it is not terminating.

Step 3 Does one digit or a pattern of digits in the decimal repeat?

Yes, the digit 3 repeats.

So, the decimal is repeating.

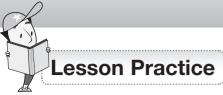**Solution** **The fraction $\frac{1}{3}$ can be expressed as a repeating decimal.**

To indicate the numbers that repeat in a repeating decimal, draw a bar over the repeating digit or digits. The repeating decimal 0.333 … can be written as $0.\overline{3}$.

Example 2

Can the fraction $\frac{7}{8}$ be expressed as a terminating or repeating decimal?

Strategy   **Divide the numerator by the denominator. Analyze the quotient.**

Step 1   Divide the numerator by the denominator.

$$
\begin{array}{r}
0.875 \\
8{\overline{)7.000}} \\
-6\ 4 \\
\hline
60 \\
-56 \\
\hline
40 \\
-40 \\
\hline
0
\end{array}
$$

Step 2   Does the decimal end?

Yes, the decimal ends.

So, the decimal is terminating.

Solution   **The fraction $\frac{7}{8}$ can be expressed as a terminating decimal.**

Coached Example

Can the fraction $\frac{3}{8}$ be expressed as a terminating or repeating decimal?

Divide the _____ by the _____.

$$8{\overline{)3}}$$

Does the decimal end? _____

The fraction $\frac{7}{8}$ can be expressed as a _____ decimal.

Lesson Practice

Choose the correct answer.

1. Which fraction can be expressed as a terminating decimal?

   A. $\frac{1}{9}$

   B. $\frac{3}{11}$

   C. $\frac{5}{8}$

   D. $\frac{2}{3}$

2. Which fraction can be expressed as a repeating decimal?

   A. $\frac{1}{10}$

   B. $\frac{1}{4}$

   C. $\frac{3}{5}$

   D. $\frac{7}{9}$

3. Which fraction **cannot** be expressed as a terminating decimal?

   A. $\frac{1}{15}$

   B. $\frac{3}{10}$

   C. $\frac{2}{5}$

   D. $\frac{7}{8}$
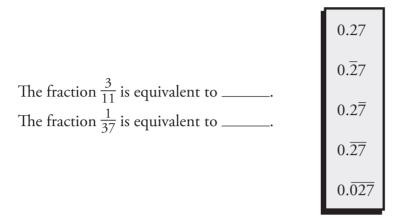
4. Which fraction **cannot** be expressed as a repeating decimal?

   A. $\frac{8}{9}$

   B. $\frac{3}{4}$

   C. $\frac{13}{18}$

   D. $\frac{1}{7}$

5. Which numbers repeat in the decimal form of $\frac{5}{11}$?

   A. 4

   B. 45

   C. 444

   D. 454

6. Which shows the fraction $\frac{2}{9}$ as a decimal?

   A. $0.\overline{2}$

   B. $0.\overline{22}$

   C. $0.2\overline{9}$

   D. $0.\overline{29}$

7. Which shows the fraction $\frac{7}{12}$ as a decimal?

   A. 7.12

   B. $0.71\overline{2}$

   C. $0.58\overline{3}$

   D. $0.\overline{58}$

8. Which shows the fraction $\frac{1}{8}$ as a decimal?

   A. $0.12\overline{5}$

   B. 0.125

   C. 0.18

   D. $0.\overline{18}$

9. George wrote the division expression $2 \div 5$.

   A. Can George's expression be expressed as a rational number? Explain your answer.

   _____

   _____

   B. Can George's expression be expressed as a terminating or repeating decimal? Explain.

   _____

   _____

10. Select True or False for each statement.

   A. $\frac{3}{5}$ can be expressed as a terminating decimal.   ○ True   ○ False

   B. $\frac{5}{6}$ can be expressed as a terminating decimal.   ○ True   ○ False

   C. $\frac{4}{11}$ can be expressed as a repeating decimal.   ○ True   ○ False

   D. $\frac{9}{10}$ can be expressed as a repeating decimal.   ○ True   ○ False

11. Use numbers from the box to complete each sentence.
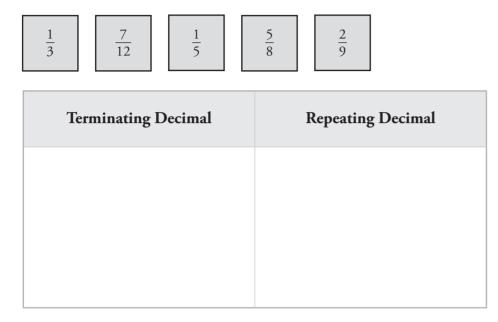
| 0.27 |
| 0.$\overline{27}$ |
| 0.2$\overline{7}$ |
| 0.$\overline{27}$ |
| 0.0$\overline{27}$ |

The fraction $\frac{3}{11}$ is equivalent to _____.

The fraction $\frac{1}{37}$ is equivalent to _____.

12. Look at each fraction. Can it be expressed as a repeating decimal? Select Yes or No.

A. $\frac{5}{6}$ ○ Yes ○ No

B. $\frac{3}{8}$ ○ Yes ○ No

C. $\frac{3}{13}$ ○ Yes ○ No

D. $\frac{3}{5}$ ○ Yes ○ No

13. Draw a line from each fraction to its equivalent decimal.

A. $\frac{1}{12}$ •   • 0.75

B. $\frac{3}{4}$ •   • 0.$\overline{45}$

C. $\frac{1}{25}$ •   • 0.04

D. $\frac{5}{11}$ •   • 0.08$\overline{3}$

14. Determine if each fraction can be expressed as a terminating decimal or a repeating decimal. Write each fraction in the correct box.

$$\frac{1}{3} \qquad \frac{7}{12} \qquad \frac{1}{5} \qquad \frac{5}{8} \qquad \frac{2}{9}$$

Terminating Decimal	Repeating Decimal

15. Which fraction **cannot** be represented by a terminating decimal? Circle all that apply.

A. $\frac{3}{4}$

B. $\frac{6}{11}$

C. $\frac{2}{3}$

D. $\frac{1}{5}$

E. $\frac{7}{9}$

16. Circle the equivalent decimal for each fraction.

$\frac{1}{9} =$
- 0.1
- $0.\overline{1}$
- 0.9
- $0.\overline{9}$

$\frac{5}{6} =$
- 0.83
- $0.8\overline{3}$
- $0.\overline{83}$
- $0.\overline{83}$