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Learning Objective: We will convert repeating decimals to fractions.

(G8M7L7)

Activating Prior Knowledge:

We can solve systems of equations using substitution

$\begin{cases} x + y = 15 \\ y = 3x - 3 \end{cases}$ $x+3x-3=15$ $4x-3=15$ $4x=18$ $x=4.5$ $y=10.5$	$\begin{cases} 2x + y = 21 \\ y = 3x + 1 \end{cases}$ $2x+3x+1=21$ $5x=20$ $\boxed{x=4 \quad y=13}$

Concept Development:

Repeating Decimals: Numbers with infinite decimal expansions that repeat are rational numbers.

Example: $\frac{4}{11}$, $0.\overline{253}$

$0.\overline{36}$

We would know what to do to convert 0.35 to a fraction, but what about $0.\overline{35}$?

$0.35 = \frac{35}{100} = \frac{7}{20}$

$\frac{35.\overline{35}}{100}$??

We can use linear equations to convert repeating decimals into fractions.

Even though repeating decimals are infinite, when we work with them, we treat them as finite. Why?

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Guided Practice:

<u>Steps to Converting from a Repeating Decimal to a Fraction</u>

1. Let *x* equal the repeating decimal.
2. Multiply both sides of the equation by a power of ten depending on how many digits are repeating.
3. Rewrite the right side as a whole number plus *x*.
4. Use properties of equality to isolate your variable.

$0.\overline{81}$

Let $x = 0.\overline{81}$

$100x = 100(0.\overline{81})$

$100x = 81.\overline{81}$

$100x = 81 + x$

$-x \quad -x$

$\frac{\cancel{99}x}{\cancel{99}} = \frac{81}{99}$

$x = \frac{81}{99} = \frac{9}{11}$

$0.\overline{81} = \frac{9}{11}$

$0.\overline{39}$

$x = 0.\overline{39}$

$100x = 39.\overline{39}$

$100x = 39 + x$

$-x \quad -x$

$\frac{\cancel{99}x}{\cancel{99}} = \frac{39}{99}$

$\boxed{x = \frac{13}{33}}$

$0.\overline{123}$

$x = 0.\overline{123}$

$1000x = 123.\overline{123}$

$1000x = 123 + x$

$-x \quad -x$

$\frac{\cancel{999}x}{\cancel{999}} = \frac{123}{999}$

$\boxed{x = \frac{41}{333}}$

$0.\overline{567}$

$x = 0.\overline{567}$

$1000x = 567.\overline{567}$

$1000x = 567 + x$

$-x \quad -x$

$\frac{\cancel{999}x}{\cancel{999}} = \frac{567}{999}$

$\frac{189}{333} \quad \frac{63}{111} \quad \boxed{\frac{21}{37}}$

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$x = 2.13\overline{8}$

$100x = 213.\overline{8}$

$y = .\overline{8}$

$10y = 8.\overline{8}$

$10y = 8 + y$

$-y \quad -y$

$9y = 8$

$\boxed{y = \frac{8}{9}}$

$100x = 213\frac{8}{9}$

$\frac{100x}{100} = \frac{\frac{1925}{9}}{100}$

$x = \frac{1925}{900} = \frac{77}{36}$

$x = 1.6\overline{23}$

$10x = 16.\overline{23}$

$y = .\overline{23}$

$100y = 23.\overline{23}$

$-y \quad -y$

$\frac{99y}{99} = \frac{23}{99}$

$y = \frac{23}{99}$

$10x = 16\frac{23}{99}$

$\frac{\cancel{10}x}{\cancel{10}} = \frac{\frac{1607}{99}}{10}$

$\boxed{x = \frac{1607}{990}}$

Independent Practice:

$1.\overline{12}$	$0.03\overline{2}$

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$0.\overline{312}$	$1.90\overline{32}$
$0.\overline{50}$	$3.0\overline{15}$

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Closure:

What is the difference in how you'd convert the two repeating decimals to fractions:

$$2.\overline{34}\ \ v. 2.3\overline{4}$$

Notes:

This maps to Lesson 10 from Module 7