

Unit 4B Day 15: Fractions to Decimals and Back again

Focus Question: What are decimals?

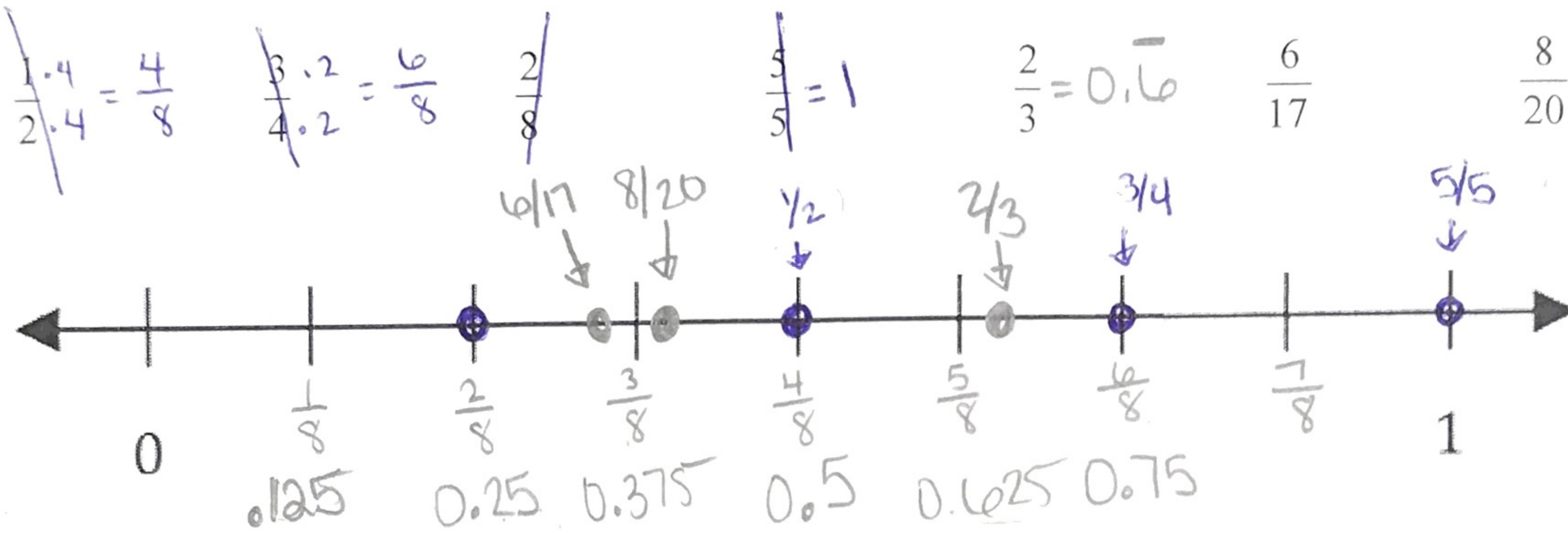
$$\begin{array}{r} 0.4 \\ 20 \overline{) 8.0} \\ \underline{-80} \\ 0 \end{array}$$

A. Turning Fractions to Decimals (REVIEW!)

To turn a fraction into a decimal, you use long division (or its easy one you have memorized!)

1. Place each rational number in its correct place on the number line below.

$$\begin{array}{r} 0.35 \\ 17 \overline{) 6.00} \\ \underline{-51} \\ 90 \\ \underline{-85} \\ 5 \end{array}$$



2. For each pair of numbers, tell which is greater and why.

a. $\frac{25}{3}$ or $\frac{58}{7}$. $\frac{25}{3}$ is greater because $\frac{25}{3} = 8.\bar{3}$ and $\frac{58}{7} \approx 8.2$.
 AND $8.\bar{3} > 8.2$

b. $\frac{33}{5}$ or $\frac{13}{2}$. $\frac{33}{5}$ is greater because $\frac{33}{5} = 6.6$ and $\frac{13}{2} = 6.5$.
 AND $6.6 > 6.5$

$$\begin{array}{r} 6.6 \\ 5 \overline{) 33.0} \\ \underline{30} \\ 30 \\ \underline{-30} \\ 0 \end{array} \quad \begin{array}{r} 6.5 \\ 2 \overline{) 13.0} \\ \underline{12} \\ 10 \\ \underline{-10} \\ 0 \end{array}$$

B. Terminating Decimals into Fractions (REVIEW!)

1. What does terminate mean? (end)
2. Give two examples of terminating decimals.
3. Are terminating decimals rational numbers? Explain.

Yes b/c of the alternate def. of rational

To turn a terminating decimal back into a fraction, you use place value.

4. Fill in the blank for the place value

Decimal Place values **0.1234567**
 Ones tenths hundredths thousandths ten thousandths hundred thousandths millionths ten millionths

$$\begin{array}{r} 8.33 \\ 3 \overline{) 25.00} \\ \underline{24} \\ 10 \\ \underline{9} \\ 10 \\ \underline{-10} \\ 0 \end{array}$$

$$\begin{array}{r} 8.2 \\ 7 \overline{) 58.0} \\ \underline{56} \\ 20 \end{array}$$

5. To use place value to turn a decimal into a fraction:

Put the decimal as the numerator and the place value as the denominator.
 You SHOULD reduce the fraction and turn mixed numbers into improper fractions.

6. Turn each terminating decimal into a rational number.

a. 0.127 $\frac{127}{1000}$

b. -0.3 $-\frac{3}{10}$

c. 8.7 $8\frac{7}{10}$
 $\frac{80}{10} + \frac{7}{10} = \frac{87}{10}$ A

d. -2.13 $-2\frac{13}{100}$
 $\frac{200}{100} + \frac{13}{100} = -\frac{213}{100}$ A

e. 4.85

f. -5.2

$4\frac{85}{100} \div 5 = 4\frac{17}{20}$ C

$4\frac{17}{20}$ B

$\frac{80}{20} + \frac{17}{20} = \frac{97}{20}$ A

$-5\frac{2}{10}$ C

$-5\frac{1}{5}$ B

$\frac{25}{5} + \frac{1}{5} = \frac{26}{5}$ A

$-\frac{26}{5}$ A

C. Repeating Decimals to Fractions (NEW!)

1. What does repeating mean?

The same # goes on forever b/c of a pattern

2. Which of the following numbers is a repeating decimal? Explain.

a. $5.\overline{67}$

the 67 goes on forever

b. 2.3131131113...

3. Are repeating decimals rational numbers? Explain.

Yes b/c they meet the definition b/c it CAN BE written as a ratio.

There is a mathematically correct way to turn any repeating decimal into its fractional equivalent.

4. The repeating decimal is $0.\overline{12}$

Let $x = 0.121212\dots$ What is $100x = 12.1212\dots$

5. Complete the subtraction.

$$\begin{array}{r} 100x = 12.\overline{1212} \\ - x = 0.\overline{1212} \\ \hline 99x = 12 \\ \hline 99 \quad 99 \\ \hline x = \frac{12}{99} \end{array}$$

6. Find a fraction form for $0.\overline{12}$ by solving for x.

$0.\overline{12} = \frac{12}{99} \div 3$
 $\frac{4}{33}$

$\frac{4}{33}$

7. Why do you think this method starts out by multiplying by 100?

The 100^{ths} place repeats

If you want an A or B

8. There is short cut that works for MOST repeating decimals. Find it by looking for a pattern to the table below.

Decimal	Fraction	Decimal	Fraction	Decimal	Fraction
$0.\overline{1}$	$\frac{1}{9}$	$0.\overline{04}$	$\frac{4}{99}$	$0.\overline{122}$	$\frac{122}{999}$
$0.\overline{5}$	$\frac{5}{9}$	$0.\overline{16}$	$\frac{16}{99}$	$0.\overline{537}$	$\frac{537}{999}$
$0.\overline{8}$	$\frac{8}{9}$	$0.\overline{71}$	$\frac{71}{99}$	$0.\overline{821}$	$\frac{821}{999}$

$\overline{1234}$
=?

Describe any patterns you see in the table.

- the decimal (with no bar) is still the numerator
- for the denominator you subtract 1 from the place value

9. Interesting Mathematical concept...What does $0.\overline{9}$ equal? Explain.

$$\frac{9}{9} = 1 \quad 0.\overline{9} = 1$$

10. Turn the following repeating decimals into fractions. (Remember they should be reduced or improper fractions)

Handwritten work for problem 10:

- $0.\overline{3}$ (10ths) $\rightarrow \frac{3}{9} = \frac{1}{3}$ (A)
- ~~$6.\overline{123}$~~
- $3.\overline{09}$ (100ths) $\rightarrow \frac{309}{99} = 3\frac{1}{11} = \frac{33}{11} + \frac{1}{11}$ (B)
- $6.\overline{7}$ (10ths) $\rightarrow \frac{67}{9} = \frac{54}{9} + \frac{7}{9} = \frac{61}{9}$ (A)
- $-1.\overline{42}$ (100ths) $\rightarrow \frac{-142}{99} = \frac{-42}{99} - \frac{100}{99} = \frac{-42}{99} - \frac{10}{11} = \frac{-42}{99} - \frac{90}{99} = \frac{-132}{99} = \frac{-4}{3}$ (C)
- $-2.\overline{63}$ (100ths) $\rightarrow \frac{-263}{99} = \frac{-22}{99} - \frac{241}{99} = \frac{-2}{9} - \frac{241}{99} = \frac{-22}{99} - \frac{241}{99} = \frac{-263}{99}$ (B)
- $-2.\overline{7}$ (10ths) $\rightarrow \frac{-27}{9} = \frac{-22}{9} - \frac{5}{9} = \frac{-22}{9} - \frac{5}{9} = \frac{-27}{9} = -3$ (A)

11. The shortcut does NOT work for all repeating decimals. For instance $0.\overline{12} \neq \frac{12}{99}$. Explain what makes this repeating decimal different (and therefore why the shortcut doesn't work).