Unit 1 LESSON 16:

Using Number Properties to Multiply and Divide Rational Numbers

- *Associative Property*
- *Commutative Property*
- *Identity Property of Multiplication (One)*
- *Multiplicative Inverse*

- Carnegie Learning Lesson 5.3
- Properties of Operations Foldable

Essential Question

How do multiplication and division of rational numbers relate to one another?

Identity = Self (the original)

For all real numbers *n*,

WORDS	**Multiplicative Identity Property** The product of a number and 1, the multiplicative identity, is the original number.
NUMBERS	$\frac{2}{3} \cdot 1 = \frac{2}{3}$
ALGEBRA	$n \cdot 1 = 1 \cdot n = n$

Inverse = Reciprocal

For all real numbers n,

WORDS	**Multiplicative Inverse Property** The product of a nonzero number and its reciprocal, or multiplicative inverse, is 1.
NUMBERS	$8 \cdot \frac{1}{8} = 1$
ALGEBRA	$n \cdot \frac{1}{n} = 1 \quad (n \neq 0)$

Practice

Using Number Properties to Multiply and Divide

Rewrite the expression as only multiplication and evaluate.

$1 \div \frac{2}{3} \times (-8) \times 3 \div \left(-\frac{1}{2}\right)$

$4.\ 2 \times \left(-\frac{1}{3}\right) \div \frac{1}{6} \times (-10)$

Multiply the expression using the distributive property.

$9 \times \left(-3\frac{1}{2}\right)$

I can . . .

Apply properties to multiply and divide rational numbers.

Practice

Using Number Properties to Multiply and Divide

Rewrite the expression as only multiplication and evaluate.

$1 \div \frac{2}{3} \times (-8) \times 3 \div \left(-\frac{1}{2}\right)$

$1 \times \frac{3}{2} \times (-8) \times 3 \times (-2)$ — *Multiplicative inverse*

$1 \times \left[(-2) \times \left(\frac{3}{2}\right)\right] \times (-8) \times 3$ — *Commutative multiplication*

$1 \times [\ -3\ ] \times (-8) \times 3$ — *Associative property*

$-3 \times (-8) \times 3$

$-3 \times 3 \times (-8)$ — *Commutative multiplication*

$-9 \times (-8)$

72

I can . . .

Apply properties to multiply and divide rational numbers.

Practice

Using Number Properties to Multiply and Divide

Rewrite the expression as only multiplication and evaluate.

$$4.2 \times \left(-\frac{1}{3}\right) \div \frac{1}{6} \times (-10)$$

$$4.2 \times \left(-\frac{1}{3}\right) \times \frac{6}{1} \times (-10)$$ *Multiplicative inverse*

$$\underbrace{4.2 \times (-10)} \times \left(-\frac{1}{3}\right) \times 6$$ *Commutative multiplication*

$$\underbrace{-42 \times \left(-\frac{1}{3}\right)} \times 6$$

$$14 \times 6$$

$$84$$

I can . . .

Apply properties to multiply and divide rational numbers.

Practice

Using Number Properties to Multiply and Divide

Multiply the expression using the distributive property.

$$9 \times \left(-3\frac{1}{2}\right)$$

$$9 \times \left(-3 \quad + \quad \left(-\frac{1}{2}\right)\right)$$

$$\underbrace{(9 \times (-3))}_{-27} + \underbrace{\left(9 \times \left(-\frac{1}{2}\right)\right)}_{\left(-4\frac{1}{2}\right)}$$

$$-31\frac{1}{2}$$

I can . . .

Apply properties to multiply and divide rational numbers.

Bonus Lesson:

Mental Math Using Number Properties

Mental math means "doing math in your head."

Many mental math strategies use number properties that you already know to make equivalent expressions that may be easier to simplify.

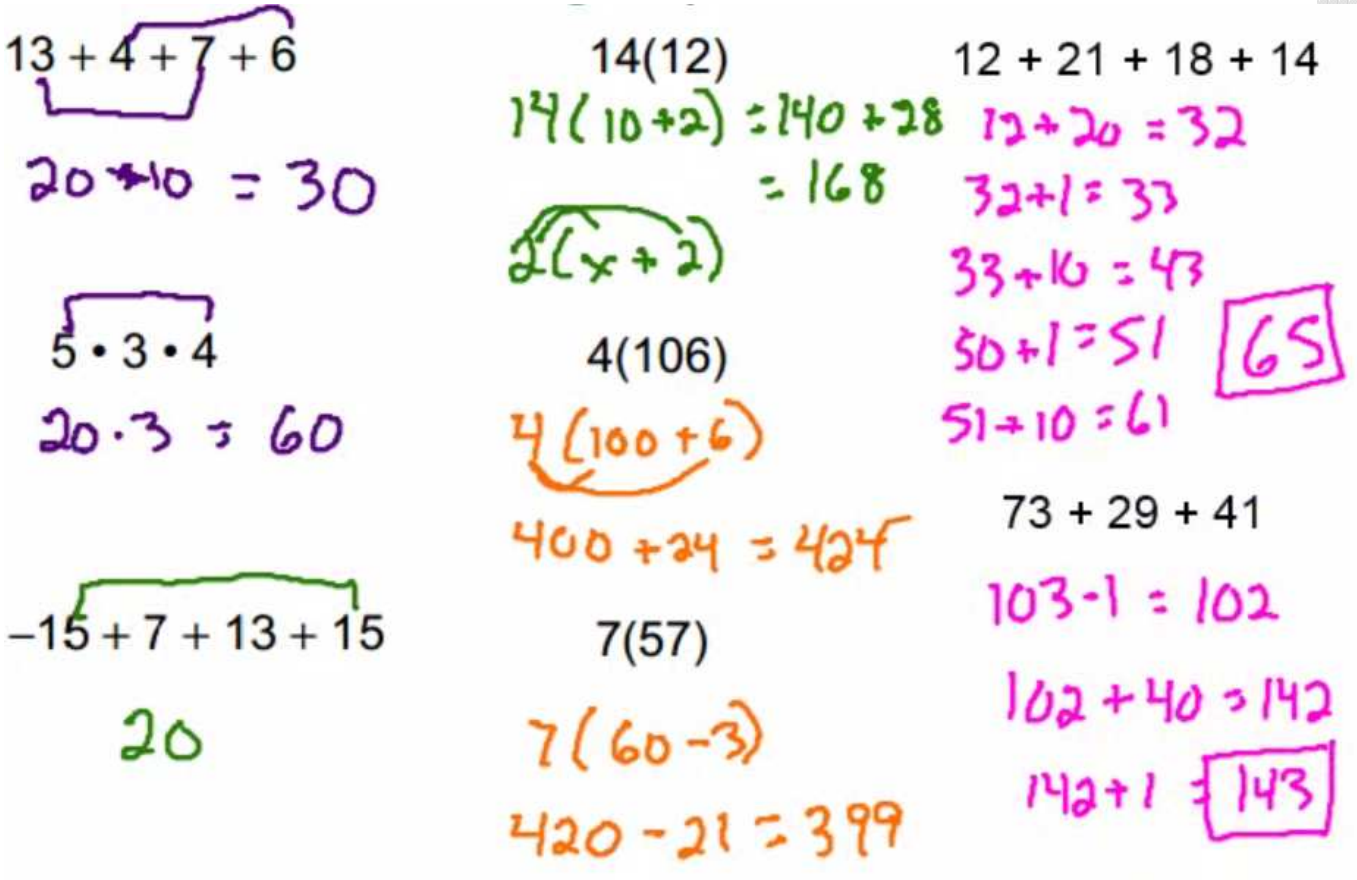
Essential Question

How do I use number properties to compute mentally?

Bonus Lesson:

Mental Math Using Number Properties

Commutative Distributive Inverse Associative



Practice

Computing Mentally

Find each sum or product mentally.

1. $17 + 15 = 22 + 10 = 32$
2. $29 + 39 = 40 + 28 = 68$
3. $8(24) = 8(20) + 8(4) = 192$
4. $7(12) = 70 + 14 = 84$
5. $3(91) = 3(90) + 3(1) = 273$
6. $6(15) = 6(10 + 5) = 90$

I can . . .

use number properties to compute mentally.

Let's Try Some Mental Math

Evaluate

$$17 + 5 + 3 + 15$$

$17 + 5 + 3 + 15$	*Look for sums that are multiples of 10*
$17 + 3 + 5 + 15$	*Use the Commutative Property.*
$(17 + 3) + (5 + 15)$	*Use the Associative Property to make groups of compatible numbers.*
$20 + 20$	
40	*Use mental math to add.*

Evaluate

$4 \times 13 \times 5$

$4 \times 13 \times 5$ — *Look for products that are multiples of 10*

$13 \times 4 \times 5$ — *Use the Commutative Property.*

$13 \times (4 \times 5)$ — *Use the Associative Property to group compatible numbers.*

13×20 — *Use mental math to multiply.*

260

Evaluate

$12 + 5 + 8 + 5$

$12 + 5 + 8 + 5$

Look for sums that are multiples of 10

$12 + 8 + 5 + 5$

Use the Commutative Property.

$(12 + 8) + (5 + 5)$

Use the Associative Property to make groups of compatible numbers.

$20 + 10$

30

Use mental math to add.

Evaluate

6×35

$6 \times 35 = 6 \times (30 + 5)$ *"Break apart" 35 into 30 + 5.*

$(6 \times 30) + (6 \times 5)$ *Use the Distributive Property.*

$180 + 30$ *Use mental math to multiply.*

210 *Use mental math to add.*

Evaluate

9×87

$9 \times 87 = 9 \times (80 + 7)$ *"Break apart" 87 into 80 + 7.*

$(9 \times 80) + (9 \times 7)$ *Use the Distributive Property.*

$720 + 63$ *Use mental math to multiply.*

783 *Use mental math to add.*

Evaluate

4×27

$4 \times 27 = 4 \times (20 + 7)$ *"Break apart" 27 into 20 + 7.*

$(4 \times 20) + (4 \times 7)$ *Use the Distributive Property.*

$80 + 28$ *Use mental math to multiply.*

108 *Use mental math to add.*

Evaluate

6×43

$6 \times 43 = 6 \times (40 + 3)$ *"Break apart" 43 into 40 + 3.*

$(6 \times 40) + (6 \times 3)$ *Use the Distributive Property.*

$240 + 18$ *Use mental math to multiply.*

258 *Use mental math to add.*

Practice:
Mental Math

Evaluate.

1. $18 + 24 + 2 + 6$
(Comm. and Assoc.) 50

2. $10 \times 5 \times 3$
(Assoc.) 150

3. $13 + 42 + 7 + 8$
(Comm. and Assoc.) 70

Use the Distributive Property to find each product.

4. 8×12
96

5. 6×15
90

6. Angie wants to buy 3 new video games. How much will she need to save if each game costs $27?

$3 (27) = 3 (20 + 7) = \$81$

I can . . .

use number properties to compute mentally.

Conclusion

At the bottom of today's notes, complete this sentence:

- *One thing I need to remember from today's lesson is . . .*

18

Converting Fractions to Decimals (Repeating and Terminating Decimals)

7.NS.2d

Unit 1

Unit 1 LESSON 18:

Repeating Decimals

7.7777……

0.246246…..

0.7222……

Repeating Decimal: includes a pattern of digits that REPEAT FOREVER.

0.8121212……

4.12123123……

22.520101010……

Essential Question

What symbol indicates that a number repeats?

How is this symbol used correctly?

Repeating Decimals: Bar Notation

Fraction

$$\frac{5}{11}$$

$$11\overline{)5.00000}\ 0.45454\ldots$$

Decimal

~~$0.454\overline{\ }$~~

~~$0.45\overline{4}$~~

$0.\overline{45}$

means $5 \div 11$

Repeating Decimals: Bar Notation

Fraction

$$\frac{1}{3}$$

Decimal

$$3\overline{)1.000}\quad 0.333\ldots$$

$0.\overline{3}$

~~$0.\overline{33}$~~

means $1 \div 3$

Repeating Decimals: Bar Notation

Fraction

$$\frac{5}{6}$$

$$6\overline{)5.000}\quad 0.833\ldots$$

Decimal

~~$0.8\overline{3}$~~

~~$0.83\overline{3}$~~

$0.8\overline{3}$

means $5 \div 6$

Repeating Decimals: Bar Notation

Fraction

$$\frac{5}{12}$$

$$12\overline{)5.0000}\ 0.4166\ldots$$

Decimal

$$0.41\overline{6}$$

means $5 \div 12$

Write each repeating decimal with bar notation.

a) $7.7777\ldots = 7.\overline{7}$

b) $0.246246\ldots = 0.\overline{246}$

c) $0.7222\ldots = 0.7\overline{2}$

d) $0.8121212\ldots = 0.8\overline{12}$

e) $4.12123123\ldots = 4.12\overline{123}$

f) $22.52010101\ldots = 22.52\overline{01}$

Essential Question

What symbol indicates that a number repeats?

How is this symbol used correctly?

Unit 1 LESSON 18:

Terminating Decimals

2.5

3.25

4.3

Terminating Decimal: decimal that ends with a specific digit

2.6

5.3566

0.003

Essential Question

How do I know if the decimal form of a number terminates or repeats?

Terminating Decimals: Look at the Denominator

Fraction

$\frac{3}{8}$

Decimal

$$8\overline{)3.000}\quad 0.375$$

0.375

means $3 \div 8$

$$\frac{375}{1000} \div \frac{125}{125} = \frac{3}{8}$$

0.375

Say it correctly!

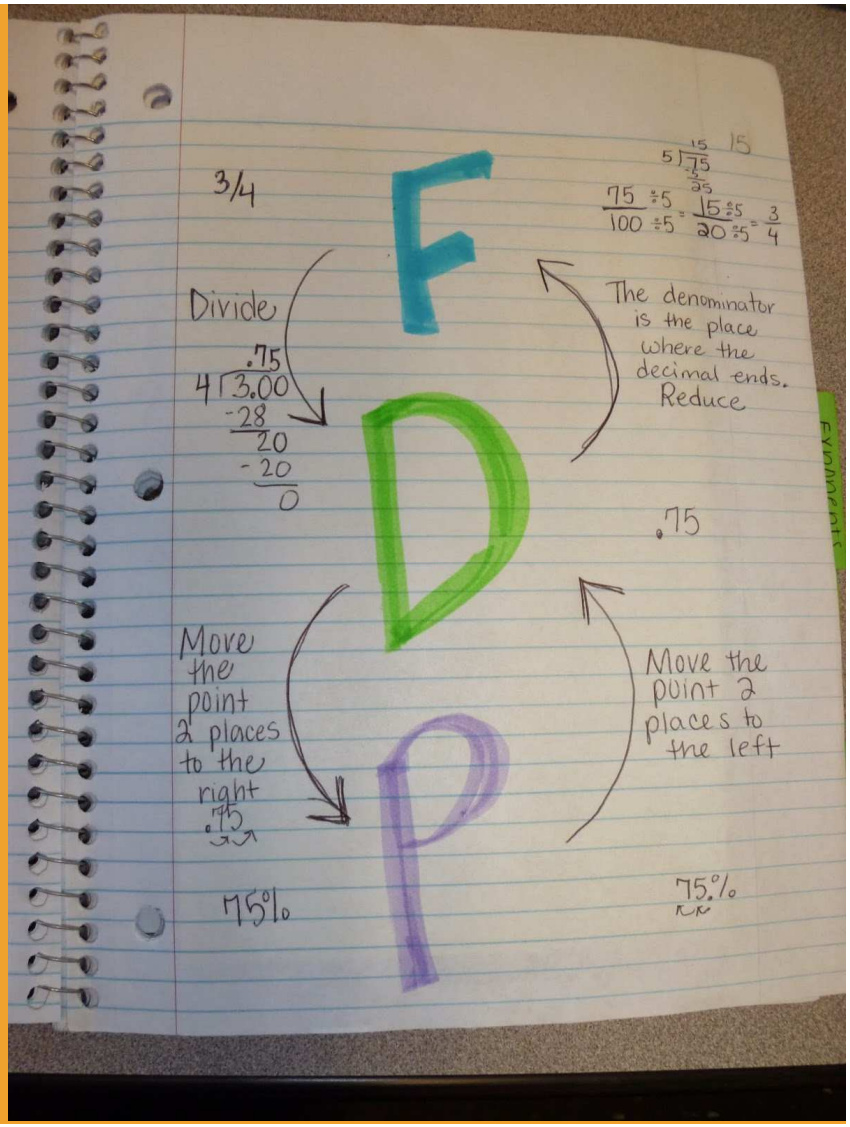
Terminating Decimals: Look at the Denominator

Fraction	Decimal
$\frac{4}{5} = \frac{8}{10}$	0.8
$\frac{3}{100}$	0.03
$\frac{7}{20} \frac{\bullet 5}{\bullet 5} = \frac{35}{100}$	0.35

Unit 1 LESSON 18:

Converting Fractions to Decimals

(Repeating and Terminating Decimals)



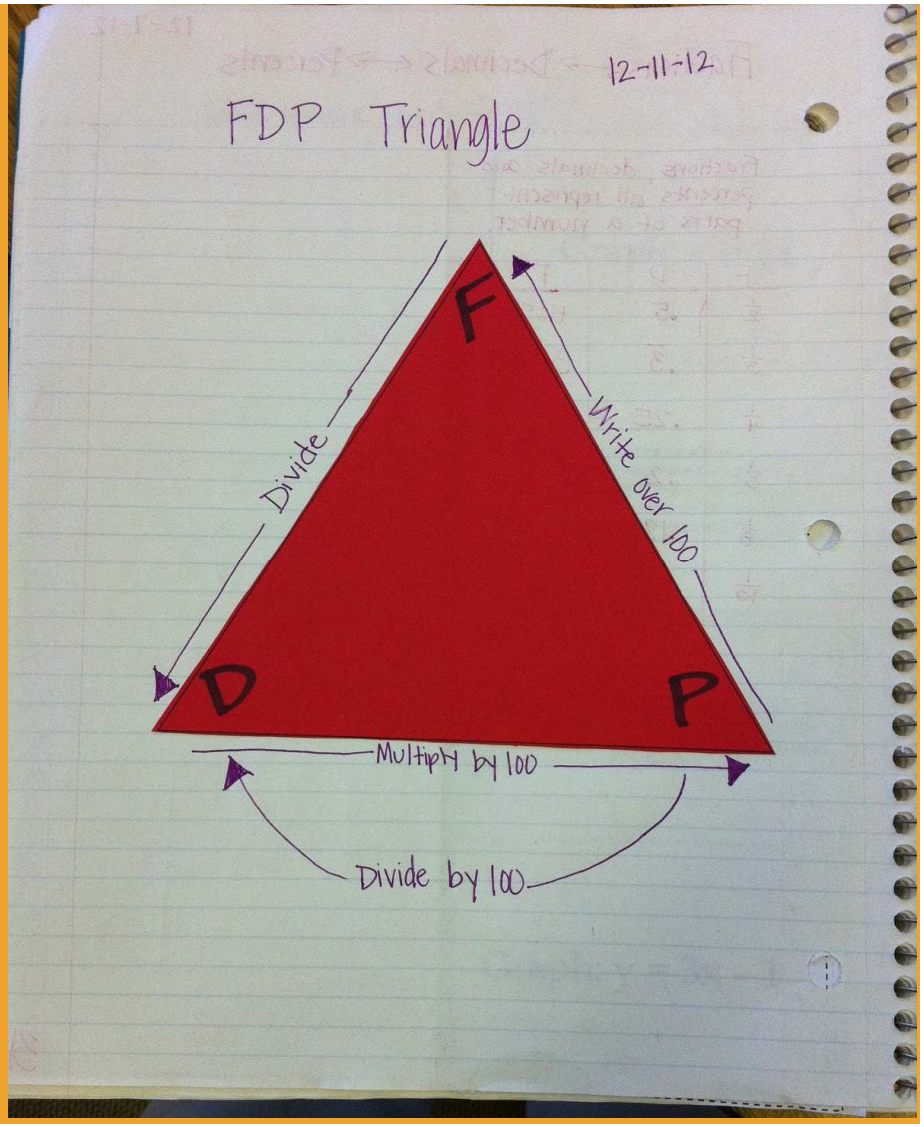
Essential Question

What are the steps to converting a rational number (fraction) to a decimal using long division?

Unit 1 LESSON 18:

Converting Fractions to Decimals

(Repeating and Terminating Decimals)



Essential Question

What are the steps to converting a fraction to a decimal using long division?

Repeating Decimals as Fractions

What do you notice about the repeating decimals compared to the terminating decimals?

Terminating

$$0.1 = \frac{1}{10}$$

Repeating

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

Terminating

$$0.2 = \frac{2}{10}$$

Repeating

$$0.\overline{2} = \frac{2}{9}$$

Terminating

$$0.3 = \frac{3}{10}$$

Repeating

$$0.\overline{3} = \frac{3}{9} = \frac{1}{3}$$

Repeating Decimals as Fractions

Terminating

$$0.1 = \frac{1}{10}$$

Repeating

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

$$0.\overline{4} = \frac{4}{9}$$

Terminating

$$0.2 = \frac{2}{10}$$

Repeating

$$0.\overline{2} = \frac{2}{9}$$

$$0.\overline{5} = \frac{5}{9}$$

Terminating

$$0.3 = \frac{3}{10}$$

Repeating

$$0.\overline{3} = \frac{3}{9} = \frac{1}{3}$$

$$0.\overline{6} = \frac{6}{9} = \frac{2}{3}$$

Writing Repeating Decimals as fractions can be a challenge. But following a pattern really helps!

Repeating Decimals as Fractions

Terminating

$$0.13 = \frac{13}{100}$$

Repeating

$$0.\overline{13} = \frac{13}{99}$$

Terminating

$$0.24 = \frac{24}{100}$$

Repeating

$$0.\overline{24} = \frac{24}{99}$$

Terminating

$$0.36 = \frac{36}{100}$$

Repeating

$$0.\overline{36} = \frac{36}{99}$$

What do you notice about the repeating decimals compared to the terminating decimals?

Repeating Decimals as Fractions

Terminating

$$0.123 = \frac{123}{1000}$$

Repeating

$$0.\overline{123} = \frac{123}{999}$$

Try these challenging ones!

Terminating

$$0.2154 = \frac{2154}{10000}$$

Repeating

$$0.\overline{2154} = \frac{2154}{9999}$$

Terminating

$$0.83 = \frac{83}{100}$$

Repeating

$$0.8\overline{3} = \frac{5}{6}$$

When one digit is terminating this can be a challenge!

Unit 1 LESSON 18:

Converting Fractions to Decimals (Repeating and Terminating Decimals)

Divide the numerator by the denominator.

Converting Fractions to Decimals

To Change a Fractions To a Decimal:

Divide the numerator by the denominator.

$$\frac{4}{5}$$

$$\begin{array}{r} .8 \\ 5\overline{)\,4.0} \\ -\,4\,0 \\ \hline 0 \end{array}$$

$$\frac{4}{5} = 0.8$$

Zero Remainder? YES

Terminating Decimal

Converting Fractions to Decimals

To Change a Fractions To a Decimal:

Divide the numerator by the denominator.

$\frac{3}{4}$

$$
\begin{array}{r}
0.75 \\
4\overline{)\,3.00} \\
-\,28\downarrow \\
\hline
20 \\
-\,20 \\
\hline
0
\end{array}
$$

$\frac{3}{4} = 0.75$

Zero Remainder? YES

Terminating Decimal

Converting Fractions to Decimals

To Change a Fractions To a Decimal:

Divide the numerator by the denominator.

$\frac{1}{3}$

$$
\begin{array}{r}
.3\overline{3} \\
3\overline{)\,1\,0\,0} \\
-\;\;9\downarrow \\
\hline
\;10 \\
-\;\;9 \\
\hline
\;\;1
\end{array}
$$

$$\frac{1}{3} = 0.\overline{3}$$

Zero Remainder? NO

Repeating Decimal

Converting Mixed Numbers: Leave the Whole Number Alone

Fraction	Decimal
$6\frac{7}{10}$	6.7
$9\frac{45}{100}$	9.45

Practice:

Converting Fractions to Decimals

$\frac{1}{4}$ $\quad -\frac{8}{33}$ $\quad 4\frac{7}{200}$

0.25 $\quad -0.\overline{24}$ $\quad 4.035$

I can . . .

convert rational numbers to decimals.

Practice:

Converting Fractions to Decimals

$\frac{2}{5}$ $\frac{6}{11}$ $4\frac{27}{125}$

0.4 $0.\overline{54}$ 4.216

I can . . .

convert rational numbers to decimals.

Conclusion

At the bottom of today's notes, complete this sentence:

- *One thing I need to remember from today's lesson is . . .*