DECIMAL REPRESENTATION AND OPERATIONS 6

Name: Key Date: Period:

SECTION 6.4 DIVISION OF DECIMALS

VOCABULARY

DEFINITION	EXAMPLE
Terminating decimal: The quotient terminates (stops) or decimal	$1 \div 8 = 0.125$
Repeating decimal: The division never has a remainder of 0, and the decimal repeats a pattern.	$1 \div 3 = 0.33333\ldots = 0.\overline{3}$

Big Idea: How do we divide with decimals?

In previous sections, we have used visual models of division to reexamine the process of long division. All of the division problems we have examined have had divisors that were integers.

EXPLORATION

A. What is the effect of increasing the dividend by a factor of 10?

Complete the table below by performing the division indicated.

$1 \div 4 =$	0.25
$10 \div 4 =$	2.5
$100 \div 4 =$	25
$1000 \div 4 =$	250

What pattern do you notice?

Increasing the dividend by a factor of 10 increases the quotient by a factor of 10.

B. What is the effect of increasing the divisor by a factor of 10 in the following sequence of division problems?

Complete the table below by performing the division indicated.

$2 \div 1 =$	2
$2 \div 10 =$	0.2
$2 \div 100 =$	0.02
$2 \div 1000 =$	0.002

What pattern do you notice?

Increasing the divisor by a factor of 10 decreases the quotient by a factor of 10.

C. What is the effect of decreasing the dividend by a factor of 10?

Complete the table below by performing the division indicated using a calculator.

$112 \div 7 = 16$	$3276 \div 14 = 234$
$11.2 \div 7 =$ 1.6	$327.6 \div 14 =$ 23.4
$1.12 \div 7 =$ 0.16	$32.76 \div 14 =$ 2.34
$0.112 \div 7 =$ 0.016	$3.276 \div 14 =$ 0.234

What pattern do you notice? How does this pattern compare to the patterns you observed in parts A and B?

Decreasing the dividend by a factor of 10 decreases the quotient by a factor of 10 (opposite of A)

D. What is the effect of decreasing the divisor by a factor of 10?

$117 \div 9 = 13$	$450 \div 18 = 25$
$117 \div 0.9 =$ 130	$450 \div 1.8 =$ 250
$117 \div 0.09 =$ 1,300	$450 \div 0.18 =$ 2,500
$117 \div 0.009 =$ 13,000	$450 \div 0.018 =$ 25,000
$117 \div 0.0009 =$ 130,000	$450 \div 0.0018 =$ 250,000

What pattern do you notice? How does this pattern compare to the patterns you observed in parts A and B?

Decreasing the divisor by a factor of 10 increases the quotient by a factor of 10

(opposite of B)

The trickiest long division problems are those from part D in which the divisor is a decimal number. It might not be clear where to place the decimal point in the quotient. There is a connection between division by a decimal number and the patterns you observed in parts A, B, C, and D.

From the patterns you have observed, the quotient $0.36 \div 0.2$ is related to the quotient $3.6 \div 2 = 1.8$. In part B, increasing the divisor by a factor of 10 decreases the quotient by a factor of 10. In part A, increasing the dividend by a factor of 10 increases the quotient by a factor of 10. When both the dividend and the divisor increase by a factor of 10, the quotient remains the same as the original division problem.

$0.36 \div 0.2$ = $3.6 \div 2$

You have previously learned that a fraction is equivalent to division. In the following tables, we will use the fractional notation to represent division to help us see the pattern of where the decimal point is located in the quotient.

$\frac{3.42}{0.09} = 38$	$\frac{0.36}{0.08} = 4.5$	$\frac{5.508}{0.034} = 162$
$\frac{34.2}{0.9} = 38$	$\frac{3.6}{0.8} = 4.5$	$\frac{55.08}{0.34} = 162$
$\frac{342}{9} = 38$	$\frac{36}{8} = 4.5$	$\frac{550.8}{3.4} = 162$
$\frac{3420}{90} = 38$	$\frac{360}{80} = 4.5$	$\frac{5508}{34} = 162$

For the following division problems, find an equivalent transformed division problem with whole number divisor, by multiplying both the original dividend and divisor by the same power of 10. Then compute the answer to the equivalent problem using division and check your answer for both with a calculator, if necessary.

Original division problem with decimal divisor	Equivalent division problem with whole number divisor
$48 \div 0.4 = 120$	$480 \div 4 = 120$
$192 \div 1.2 = 160$	$1920 \div 12 = 160$
$0.324 \div 3.6 = 0.09$	$3.24 \div 36 = 0.09$
$14 \div 0.25 = 56$	$1400 \div 25 = 56$
$4.452 \div 0.84 = 5.3$	$445.2 \div 84 = 5.3$

You might have noticed that all of the long division problems that we have considered have had a very nice property in common: at the end, every remainder is 0. The quotients terminate or stop. This type of decimal number is known as a **terminating decimal**. Of course, in real computations this is seldom the case. Look at the following division problems:

a. $1 \div 3$ $= 0.333\ldots = 0.\overline{3}$

b. $2 \div 3$ $= 0.666\ldots = 0.\overline{6}$

c. $5 \div 6 = 0.8333\ldots = 0.8\overline{3}$

These quotients are examples of **repeating decimals.**

Write some rules to remember for dividing decimals:

A) When dividing a whole number by a decimal

Multiply both the dividend and divisor by a factor of 10 (the same factor), so the divisor is a whole number.

B) When dividing a decimal by a whole number

Divide as usual. Add 0s as needed.

C) When dividing a decimal by a decimal

Multiply both the dividend and divisor by the same factor of 10, so the divisor is a whole number.

D) When dividing a whole number by a larger whole number

Write ".0" to the right of the dividend and divide as usual. Add 0s as needed.

SUMMARY (What I learned today)