

DECIMAL REPRESENTATION AND OPERATIONS 6

Name: Key Date: _____ Period: _____

SECTION 6.3 LONG DIVISION

VOCABULARY

DEFINITION	EXAMPLE
Dividend: <i>The number being divided</i>	9
Quotient: <i>Solution to a division problem</i>	2
Divisor: <i>What the dividend is divided by.</i>	4
Remainder: <i>what is left over after the rest of the division is evenly divided</i>	1

Big Idea: What is the long division algorithm?

We have seen how closely related multiplication and division are. For example, we know $8 \div 4 = 2$ because $4 \times 2 = 8$. Also recall that in the long division form, the multiplication fact is rewritten as

$$4 \overline{)8} \quad \text{The area model looks like this:} \quad \begin{array}{|c|} \hline 2 \\ \hline 4 \cdot 8 \\ \hline \end{array}$$

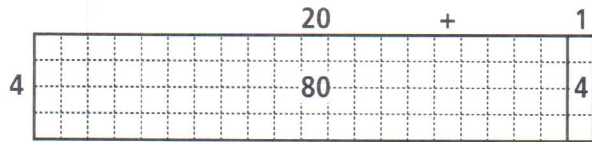
We have the **dividend** 8 "under" the **quotient** 2, and the **divisor** 4 is to the left of the dividend.

By changing the dividend to 9, our problem becomes $9 \div 4$. Because $8 \div 4 = 2$, $9 \div 4$ must be more than 2. In the long division form we have,

$$4 \overline{)9} \quad \text{The area model looks like this:} \quad \begin{array}{|c|} \hline 2 \\ \hline 4 \cdot 8 \\ \hline \end{array} \quad \boxed{1} \quad \text{The quotient is 2, and the remainder is 1}$$

Now consider the problem, $84 \div 4$. We know that $80 \div 4$ is 20 and $4 \div 4$ is 1. Putting these together shows $84 \div 4 = 21$.

Here is the area model for this problem:



or

$$\begin{array}{r} 1 \\ 20 \\ 4 \overline{) 84} \\ \underline{-40} \\ 4 \\ \underline{-4} \\ 0 \end{array}$$

This is called the **scaffolding** method because the different partial quotients are first computed and stacked, then combined, much like a scaffold is used in constructing a building. There is more than one way to implement the scaffolding method in division. For example $84 \div 4$ can also be calculated as

$$\begin{array}{r} 1 \\ 10 \\ 10 \\ 4 \overline{) 84} \\ \underline{-40} \\ 44 \\ \underline{-40} \\ 4 \\ \underline{-4} \\ 0 \end{array} \quad \text{or} \quad \begin{array}{r} 5 \\ 6 \\ 10 \\ 4 \overline{) 84} \\ \underline{-40} \\ 44 \\ \underline{-24} \\ 20 \\ \underline{-20} \\ 0 \end{array}$$

PROBLEM 1

Use the scaffolding method to compute the following quotients. You may sketch a picture of the corresponding area model if it helps. *Answers will be the same, work may vary.*

a. $380 \div 14 = 27 \text{ r}2$

$$\begin{array}{r} 2 \\ 5 \\ 10 \\ 10 \\ 14 \overline{) 380} \\ \underline{-140} \\ 240 \\ \underline{-140} \\ 100 \\ \underline{-70} \\ 30 \\ \underline{-28} \\ 2 \end{array} \quad \begin{array}{r} 10 \\ +10 \\ +5 \\ +2 \\ \hline 27 \end{array}$$

b. $960 \div 6 = 160$

$$\begin{array}{r} 60 \\ 100 \\ 6 \overline{) 960} \\ \underline{-600} \\ 360 \\ \underline{-360} \\ 0 \end{array}$$

c. $2,175 \div 25 = 87$

$$\begin{array}{r} 7 \\ 40 \\ 40 \\ 25 \overline{) 2175} \\ \underline{-1000} \\ 1175 \\ \underline{-1000} \\ 175 \\ \underline{-175} \\ 0 \end{array}$$

PROBLEM 2

In the traditional long division method, we start with the largest place value to determine the quotient and then gradually include the smaller place values. Use both the scaffolding method and the traditional method to compute the division problem $552 \div 15$.

$ \begin{array}{r} 2 \\ 4 \\ 10 \\ 20 \text{ r } 12 \\ \hline 15 \overline{) 552} \\ - 300 \\ \hline 252 \\ - 150 \\ \hline 102 \\ - 60 \\ \hline 42 \\ - 30 \\ \hline 12 \end{array} $	$ \begin{array}{r} 36 \text{ r } 12 \\ 15 \overline{) 552} \\ - 45 \\ \hline 102 \\ - 90 \\ \hline 12 \end{array} $
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EXAMPLE

How does division differ with decimals?

The decimal can be shifted,
 as long as it moves the same amount in
 both the dividend & the divisor.
 (This is like multiplying both by a power
 of 10.)

Sarah spent \$3 on 6 candy bars. How much did each candy bar cost?

$ \begin{array}{r} 0.5 \\ 6 \overline{) 3.0} \\ - 3.0 \\ \hline 0 \end{array} $	$ \begin{array}{l} \$.50 \\ \text{or } 50 \text{ cents} \end{array} $
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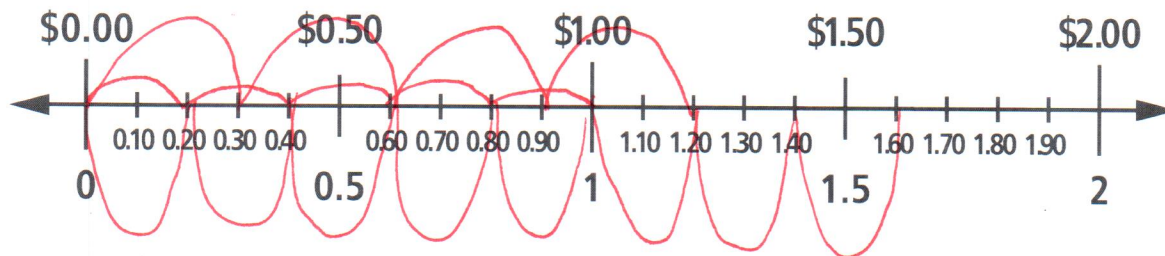
PROBLEM 3

Compute the following division problems by using an abbreviated number line from 0 to 2, like the one below. Find the quotient using the skip-counting method. Then use the scaffolding method to verify your answer. Make sure the decimal point in the quotient makes sense in the context of the problem. Use the calculator to confirm your work, if necessary.

a. $\$1 \div 5 = \0.20

b. $\$1.60 \div 8 = \0.20

c. $\$1.20 \div 4 = \0.30



PROBLEM 4

Mr. Garza has some money in his pocket that he intends to divide equally among his four nephews. How much will each nephew receive if he has

a. \$26 in his pocket,

$$\begin{array}{r} 6.5 \\ 4 \overline{)26.0} \\ \underline{-24} \\ 20 \\ \underline{-20} \\ 0 \end{array}$$

\$6.50

b. \$27.40 in his pocket

$$\begin{array}{r} 6.85 \\ 4 \overline{)27.40} \\ \underline{-24} \\ 34 \\ \underline{-32} \\ 20 \\ \underline{-20} \\ 0 \end{array}$$

\$6.85

PRACTICE EXERCISES

1. Compute the following quotients and remainders. Check your answer with a visual method. Identify the dividend, quotient, divisor, and remainder.

a. $265 \div 2$

$$\begin{array}{r} 132 \\ 2 \overline{)265} \\ \underline{-2} \\ 06 \\ \underline{-6} \\ 05 \\ \underline{-4} \\ 1 \end{array}$$

Dividend is 265.

Divisor is 2.

Quotient is 132.

Remainder is 1.

b. $99 \div 15$

$$\begin{array}{r} 6 \\ 15 \overline{)99} \\ \underline{-90} \\ 9 \end{array}$$

Dividend is 99.

Divisor is 15.

Quotient is 6.

Remainder is 9.

2. Juliet is comparing prices of goat cheese. The first package is \$30 for 12 ounces and the second package is \$33.60 for 14 ounces. Which is the better value and why??

$$\begin{array}{r} 2.5 \\ 12 \overline{)30.0} \\ \underline{-24} \\ 60 \\ \underline{-60} \\ 0 \end{array}$$

\$2.50 per ounce

$$\begin{array}{r} 2.4 \\ 14 \overline{)33.60} \\ \underline{-28} \\ 56 \\ \underline{-56} \\ 0 \end{array}$$

\$2.40 per ounce

14-ounce package is a better value since the price per ounce is less.

SUMMARY (What I learned today)
