Division

Objective 1

Understand the Meaning and Notation of Division

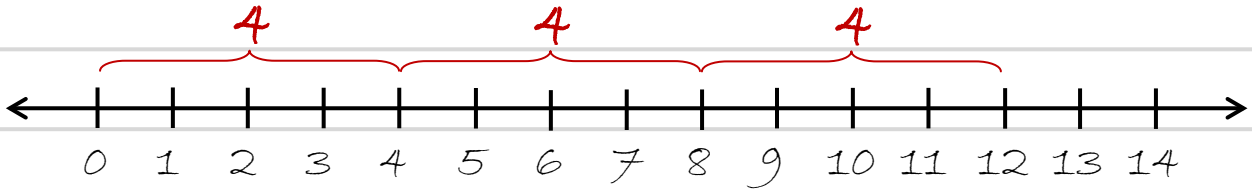
There are different ways to indicate division. Here are a few.

$12 \div 4 \qquad 12/4 \qquad 4\overline{)12} \qquad \frac{12}{4}$

But what does $12 \div 4$ or "12 divided by 4" actually mean? Why does $12 \div 4 = 3$?

Recall: $4 \cdot 3 = 4 + 4 + 4 = 12$

So how many 4's does it take to make up a 12?



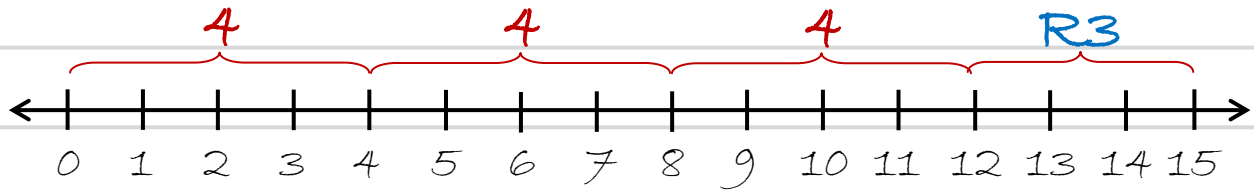
It takes three 4's to make up a **12**. Or we can say 4 goes into **12** three times!

Therefore $12 \div 4 = 3$.

This is what the problem would like using long division to represent $12 \div 4$.

$$\begin{array}{r} 3 \\ 4\overline{)12} \\ -12 \\ \hline 0 \end{array}$$

So how many 4's does it take to make up a 15?



It takes three 4's to make up a 15 but there are 3 units still remaining. In this case we say 4 goes into 15 three times with 3 remaining units left over!

Therefore $15 \div 4 = 3R3$.

This is what the problem would like using long division to represent $12 \div 4$.

$$\begin{array}{r} 3R3 \\ 4\overline{)15} \\ -12 \\ \hline 3 \end{array}$$

Knowing your multiplication tables can help you with division! See if you can find a pattern in the problems below!

If $3 \cdot 4 = 12$ then $\frac{12}{3} = 4$.

If $8 \cdot 9 = 72$ then $\frac{72}{8} = 9$.

If $6 \cdot 7 = 42$ then $\frac{43}{6} = 7R1$.

Answer the following homework questions.

In Exercises 1 – 9, perform each division problem. Try to do each problem mentally using your multiplication tables. Remember that if $9 \cdot 8 = 72$ then $\frac{72}{9} = 8$.

1) $20 \div 4$

2) $64 \div 8$

3) $55 \div 11$

4) $108 \div 12$

5) $132 \div 11$

6) $65 \div 5$

7) $15 \div 4$

8) $23 \div 6$

9) $17 \div 3$

In Exercises 10 – 15, rewrite each division problem as an equivalent multiplication problem.

Sample: $24 \div 8 = 3$ is equivalent to $8 \cdot 3 = 24$

10) $36 \div 12 = 3$

11) $42 \div 7 = 6$

12) $54 \div 9 = 6$

13) $63 \div 7 = 9$

14) $100 \div 25 = 4$

15) $150 \div 10 = 15$

Objective 2

Understand how to Perform Long Division

Consider $131 \div 4$

$$4\overline{)131}$$

How many times does 4 go into 1? Zero

$$\begin{array}{r} 0 \\ 4\overline{)131} \end{array}$$

How many times does 4 go into 13? Three

$$\begin{array}{r} 03 \\ 4\overline{)131} \\ -12 \\ \hline 11 \end{array}$$

Subtract. → ← 3×4 goes here.

← Bring down the 1.

How many times does 4 go into 11? Two

$$\begin{array}{r} 032 \\ 4\overline{)131} \\ -12 \\ \hline 11 \\ -\ 8 \\ \hline 3 \end{array}$$

Subtract. → ← 2×4 goes here.

← There are 3 units left over.

Therefore, $131 \div 4 = 32R3$.

Objective 3

Understand Division with Zero

Recall that if $\frac{12}{3} = 4$, then $3 \cdot 4 = 12$.

If $\frac{72}{9} = 8$, then $9 \cdot 8 = 72$.

If $\frac{20}{5} = 4$, then $5 \cdot 4 = 20$.

Do you notice the pattern between division and multiplication?

With this in mind, consider $\frac{0}{5}$.

If $\frac{0}{5} = 0$, then $5 \cdot 0 = 0$. This is true!

Similarly, if $\frac{0}{8} = 0$, then $8 \cdot 0 = 0$. Again true!

Conclusion: Zero divided by any number (except zero), is always zero!

But what about $\frac{5}{0}$ or $\frac{0}{0}$?

To evaluate $\frac{5}{0}$, we ask ourselves "0 times what number equals 5?" $\frac{5}{0} = ?$ $0 \cdot ? = 5$

Since 0 times any number is always 0, there is no answer. In math, we say that $\frac{5}{0}$ is undefined.

To evaluate $\frac{0}{0}$, we ask ourselves "0 times what number equals 0?"

$\frac{0}{0} = ?$ $\quad 0 \cdot ? = 0$

Since 0 times any number is always 0, any number will work! There is no defined answer! In math, we say that $\frac{0}{0}$ is undefined. In other words, we cannot divide by zero!

Conclusion: Any number divided by zero is always undefined!

Answer the following homework questions.

In Exercises 16 – 21, perform each division problem using the long division.

16) $84 \div 4$

17) $96 \div 3$

18) $41 \div 4$

19) $23 \div 6$

20) $155 \div 6$

21) $191 \div 8$

In Exercises 22 – 27, write in the correct number to make the equation true.

22) $54 \div \_\_ = 9$ 24) $24 \div \_\_ = 3$ 26) $88 \div \_\_ = 11$

23) $\_\_ \div 9 = 8$ 25) $\_\_ \div 8 = 4$ 27) $\_\_ \div 12 = 7$

In Exercises 28 – 31, write in the correct number to make the equation true.

28) $54 \div \_\_ =$ undefined 30) $0 \div \_\_ = 0$

29) $\_\_ \div 9 = 0$ 31) $\_\_ \div 0 =$ undefined

Objective 4 Write a mathematical expression using words.

Definition

The **quotient** of two numbers **a** and **b** is written **a ÷ b**. The word **quotient** indicates division.

Example 1: Using the word **quotient**, write "56 ÷ 8" as a word statement and find the value of the quotient.

We first begin our sentence by defining the mathematical operation first and then define the numbers. Notice how the word "and" is used.

The word statement is written as:

"The quotient of fifty-six and eight."

The value of the quotient is 7.

Example 2: Using the word **quotient**, write "231 ÷ 7" as a word statement, and find the value of the quotient.

Answer the following homework questions.

32) The word "quotient" is used to represent _____.

33) Write "the quotient of 54 and 6" using math symbols.

34) Write "the quotient of x and y" using math symbols.

35) Using the word quotient, write "732 ÷ 6" as a word statement and find the value of the quotient.