NORQUEST COLLEGE

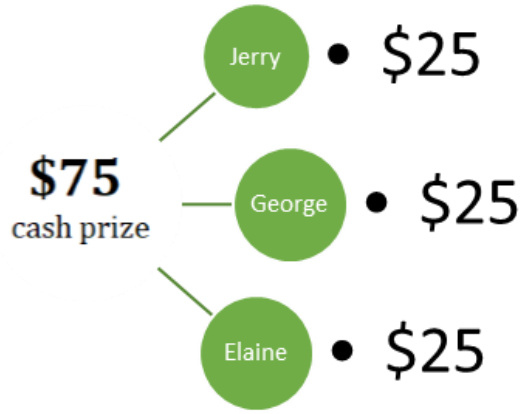
Foundational Numeracy

MATH 1525

Introduction to Division

Division

Suppose Jerry, George, and Elaine pooled their money and bought raffle tickets for a fundraiser. One of their tickets won, and they received a $75 cash prize. They then divided the prize money into three equal parts so that each person received $25



The process of separating a quantity into equal parts is called **division**

Several notations can be used to represent the division from above:

$$75 \div 3 = 25$$

$$\frac{75}{3} = 25$$

$$\begin{array}{r} 25 \\ 3\overline{)\,75} \\ -\,6 \\ \hline 15 \\ -\,15 \\ \hline 0 \end{array}$$

In all cases above: **75** is the **dividend**, **3** is the **divisor**, and **25** is the **quotient**

Long Division

$$75 \div 3 = ?$$

Dividend: 75

Divisor: 3

$$3\overline{)75}$$

Step 1:

Identify your Dividend & Divisor

Step 2:

Write the question in long division form

*****THE DIVISOR IS ALWAYS ON THE <u>OUTSIDE</u> OF THE LONG DIVISION BOX**

Long Division

$$75 \div 3 = ?$$

$$3\overline{)\,75}$$
$$\quad\;\; 2$$

Step 3:

See how many times your Divisor goes into the first digit of the Dividend without going over

"How many times will 3 go into 7 without going over?"

$3 \times \mathbf{1} = 3$ (probably not enough)
$3 \times \mathbf{2} = 6$ (maybe?)
$3 \times \mathbf{3} = 9$ (too much)

3 will go into 7, (**2**) times.
So, write a (2) above the 7

Long Division

$$75 \div 3 = ?$$

$$\begin{array}{r} 2 \\ 3\overline{)\,75} \\ 6 \end{array}$$

Step 4:

*****ANY TIME YOU PLACE A NUMBER IN THE QUOTIENT, WE MUST MULTIPLY THAT NUMBER WITH OUR ORIGINAL DIVISOR**

$$2 \times 3 = 6$$

Place this 6 under the 7 (because that's the number you're multiplying into)

Long Division

$$75 \div 3 = ?$$

$$\begin{array}{r} 2 \\ 3\overline{)\,75} \\ -\,6\downarrow \\ \hline 15 \end{array}$$

Step 5:

Subtract

$$7 - 6 = 1$$

Write this (1) under the subtraction line

Step 6:

Bring down the next digit of the dividend

In this case, bring down the (5)

Long Division

$$75 \div 3 = ?$$

$$\begin{array}{r} 25 \\ 3\overline{)\,75} \\ -\,6 \\ \hline 15 \end{array}$$

Step 7:

At this point, 15 is our new dividend

"How many times will 3 go into 15?"

$3 \times \mathbf{3} = 9$ (not enough)
$3 \times \mathbf{4} = 12$ (not enough)
$3 \times \mathbf{5} = 15$ (perfect)
$3 \times \mathbf{6} = 18$ (too much)

3 will go into 15, exactly (**5**) times
So, write a 5 in the **ones** place of the quotient

Long Division

$$75 \div 3 = ?$$

$$\begin{array}{r} 25 \\ 3\overline{)\,75} \\ -\,6 \\ \hline 15 \\ 15 \end{array}$$

Step 8:

*****ANY TIME YOU PLACE A NUMBER IN THE QUOTIENT, WE MUST MULTIPLY THAT NUMBER WITH OUR ORIGINAL DIVISOR**

Since we placed a 5 in the quotient, we will multiply it by our divisor

$$5 \times 3 = 15$$

Write 15 underneath the current dividend (which also happens to be 15)

Long Division

$$75 \div 3 = ?$$

$$\begin{array}{r} 25 \\ 3\overline{)\,75} \\ -\,6 \\ \hline 15 \\ -\,15 \\ \hline 0 \end{array}$$

Step 9:

Subtract to see if there is a remainder

Step 10:

There are no more numbers in the dividend to drop; the division is complete

The number at the top of the division box is our quotient

$\therefore 75 \div 3 = 25$

Long Division

$$364 \div 7 = ?$$

$$7\overline{)364}$$
$$5$$

Step 1:

7 cannot go into 3

However,
It CAN go into 36

"How many times will 7 go into 36?"

$7 \times \mathbf{3} = 21$ (not enough)
$7 \times \mathbf{4} = 28$ (not enough)
$7 \times \mathbf{5} = 35$ (pretty darn close)
$7 \times \mathbf{6} = 42$ (too much)

7 will go into 36, (**5**) times

Write a 5 above the 6, and
NOT above the 3

Long Division

$$364 \div 7 = ?$$

$$\begin{array}{r} 5 \\ 7\overline{)364} \\ 35 \end{array}$$

Step 2:

*****ANY TIME YOU PLACE A NUMBER IN THE QUOTIENT, WE MUST MULTIPLY THAT NUMBER WITH OUR ORIGINAL DIVISOR**

$5 \times 7 = 35$

Write 35 under the 36 of 364

Long Division

$$364 \div 7 = ?$$

$$\begin{array}{r} 5 \\ 7\overline{)364} \\ -\,35 \\ \hline 1 \end{array}$$

Step 3:

Subtract

$$36 - 35 = 1$$

Write a 1 under the subtraction line

Long Division

$$364 \div 7 = ?$$

$$\begin{array}{r} 5 \\ 7\overline{)364} \\ -35\downarrow \\ \hline 14 \end{array}$$

Step 4:

Bring down the next number of The dividend

In this case, bring down the 4

Long Division

$$364 \div 7 = ?$$

$$\begin{array}{r} 52 \\ 7\overline{)364} \\ -\,35 \\ \hline 14 \end{array}$$

Step 5:

14 is our new dividend

"How many times will 7 go into 14?"

$7 \times \mathbf{2} = 14$ (perfect)
$7 \times \mathbf{3} = 21$ (too much)

7 will go into 14, (**2**) times
So, write a 2 in the ones place of the quotient

Long Division

$$364 \div 7 = ?$$

$$\begin{array}{r} 52 \\ 7\overline{)364} \\ -35 \\ \hline 14 \\ 14 \end{array}$$

Step 5:

*****ANY TIME YOU PLACE A NUMBER IN THE QUOTIENT, WE MUST MULTIPLY THAT NUMBER WITH OUR ORIGINAL DIVISOR**

$2 \times 7 = 14$

Write 14 under the current dividend (which also happens to be 14)

Long Division

$$364 \div 7 = ?$$

$$\begin{array}{r} 52 \\ 7\overline{)364} \\ -\underline{35} \\ 14 \\ -\underline{14} \\ 0 \end{array}$$

Step 6:

Subtract to see if there is a remainder

$$14 - 14 = 0$$

Step 7:

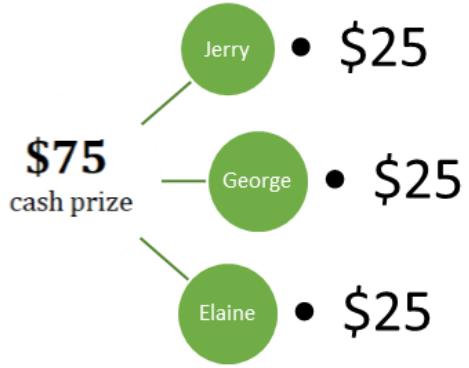
There are no more numbers in the dividend to drop; the division is complete

The number at the top of the division box is our quotient

$$\therefore\ 364 \div 7 = 52$$

Long Division

Think back to our opening example of Jerry, George, and Elaine winning a group raffle prize of $75. They split it 3 ways, and each person walked away with $25



In math terms, we can represent this with the following:

$$\frac{\text{Cash Prize}}{\text{\# of Winners in Group}} = \frac{75}{3} = 25$$

What if the cash prize was $80?
Long Division Process

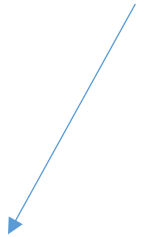
Long Division

Suppose Jerry, George, and Elaine pooled their money and bought raffle tickets for a fundraiser. One of their tickets won, and they received an $80 prize. How many whole dollars will each person receive?

$$\frac{\text{Cash Prize}}{\text{\# of Winners in Group}} = \frac{80}{3} = ?$$

Long Division

$$\frac{80}{3}$$



$$3\overline{)80}$$

Whenever division is written in fractional form like this, always use the '*bottom*' number on the OUTSIDE of the long division box; in other words, treat it as the divisor!)

Long Division

$$
\begin{array}{r}
26\ \text{R2} \\
3\overline{)\,80} \\
-\,6 \\
\hline
20 \\
-\,18 \\
\hline
2
\end{array}
$$

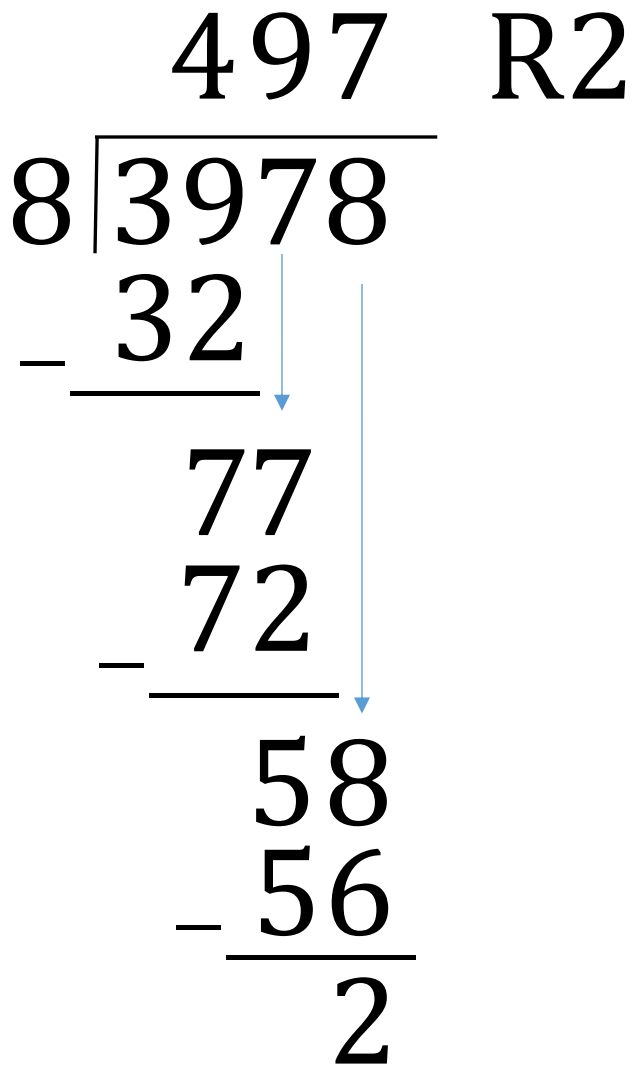
At this point, there are no other numbers in the dividend to work with

The division is complete

$80 \div 3 = 26 \text{ with Remainder: } 2$

On an $80 prize win, Jerry, George, and Elaine will each take home $26. There are $2 unaccounted for, which they will gift to their friend Kramer.

Long Division



Verifying Quotients

Just as subtraction is the reverse of addition, division is the reverse of multiplication. This means that we can **verify** our answers using multiplication

As stated in a previous slide….

$$75 \div 3 = 25$$

Dividend

Divisor

Quotient

To verify the quotient, we will multiply the **Quotient** & **Divisor**

If this product matches the original dividend, then we have verified our quotient. If it doesn't match, look back at your work

$$\begin{array}{r} {\scriptstyle 1} \\ 25 \\ \times \quad 3 \\ \hline 75 \end{array}$$

Long Division

1) Complete the following question in long division form: $\frac{10}{4}$

2) Verify your quotient

$$\begin{array}{r} 2\ \text{R2} \\ 4\overline{)10} \\ -\ 8 \\ \hline 2 \end{array}$$

Verify:

$$\text{Quotient} \times \text{Divisor}$$

$$2 \times 4 = 8$$

We must add the Remainder (2) to our product
- If it matches, we have verified our quotient

$$8 + 2 = 10$$

Long Division

1) Complete the following question in long division form: $\frac{6478}{31}$

2) Verify your quotient

$$
\begin{array}{r}
208\ \text{R}30 \\
31\overline{)6478} \\
-\ 62 \\
\hline
27 \\
-\ 0 \\
\hline
278 \\
-\ 248 \\
\hline
30
\end{array}
$$

Verify:

Quotient $\times$ Divisor

208×31

$$
\begin{array}{r}
{\scriptstyle 2} \\
208 \\
\times\ 31 \\
\hline
208 \\
+\ 624 \\
\hline
6448
\end{array}
$$

?????

$$
\begin{array}{r}
6448 \\
+\ \ 30 \\
\hline
6478
\end{array}
$$

It's important to realize WHY our product does not match the original dividend

We still need to account for the remainder so we will **add** this to our product