Prime Decomposition

Sunday, 25 March 2018 9:53 pm

By the end of teaching all students will be asked to complete the following work:

Year 7 Textbook
Chapter 3
Exercise 3F
Questions: 5-6(s), 8. 9, 10, 13
Extension: None

RECAP:

In a previous lesson we looked at the following two topics:

- Prime Numbers (and composite Numbers)
- Powers

We have also looked at how to find the:

- Lowest Common Multiple, and
- Highest Common Factor

We did this using Factor Trees and some interesting Mathematics!

We are now going ...

BACK IN TIME

Prime Decomposition

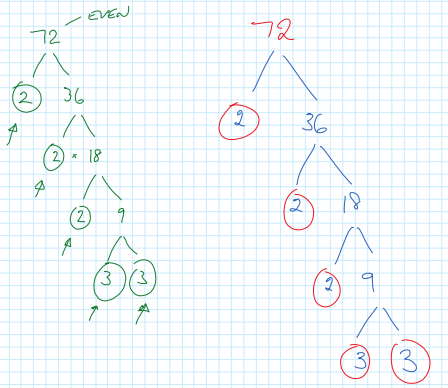
When I see the word Decomposition ... I think of the Walking Dead ... and Zombies which are decomposing.
Thankfully ... Mathematics has nothing to do with decomposing bodies!

However, the word decompose means:
"To break down into small parts."

Let's look at the title now .... And see how the English is giving us a hint in how to do this!

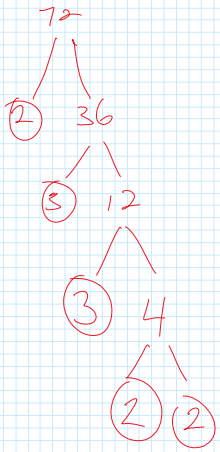
Prime Decomposition means "**Breaking a number down into its smallest parts using Prime Numbers**"

Here is an example:



You have already been doing this for HCF and LCM.

All we are doing is breaking down the number 72 into a lot of prime numbers which, when they are multiplied together, give us the original number.



$\therefore 72 = 2 \times 2 \times 2 \times 3 \times 3$

$2 \times 2 \times 2 \times 3 \times 3$
$4 \times 2 \times 3 \times 3$
$8 \times 3 \times 3$
24×3
72 ✓

This seems a long way to write a number!

So let's use powers!

$72 = 2^3 \times 3^2$

$2 \times 2 = 2^2$
$2 \times 2 \times 2 = 2^3$
$3 \times 3 = 3^2$

~~$2^3 3^2$~~

RECAP:

Powers are a quick and easy way for us to write lots of multiplications in a simpler way.
There are rules to powers and some of them are really funky!
But ... for now ... we know that:

A number (the base) written to a power (floaty number) means you need to **Multiply the base by itself the number of times the floaty number says!**

$3^2 = 3 \times 3$ (2 ← POWER / INDEX / FLOATY NUMBER; 3 ← BASE)

Agreed! Let's look at some examples ...

$6^3 = 6 \times 6 \times 6$

$a^2 \times a^2 = a^4 = a \times a \times a \times a$

$a^3 \times a^6 = a^9 = a \times a \times a \times a \times a \times a \times a \times a \times a$

$a^4 \times a^3 = a^7$

$2^3 \times 3^2 =$

Power Examples:

Here are some examples which probably show much better than a definition:

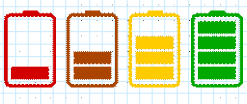
$x^2 = x \times x$

$x^3 = x \times x \times x$

$b^2 = b \times b \times b \times b \times b$

$x^2 = x \times x$

$x^3 = x \times x \times x$



The "base number" is the big number.

We can string lots of powers together like:

This is called Index Notation

Floaty numbers are also called indices

Index Notation

$a^3 \otimes b^2 \otimes c$

Is the same as:

$a \times a \times a \times b \times b \times c$

$a \times a \times a \times b \times b \times c$

This is called "Expanded Form"

Powers become really powerful later in the book!
Just wait until we get to **Real Numbers**!!

Don't you just hate the English Language?

The same thing can be called SO many things.
Just think of the word HELLO ...

What would you think you were being asked to do if you were given the following question?

Question:
Find the product of the primes of 80.

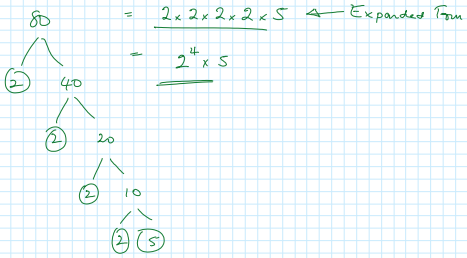
Well ... we know the work **PRIME** probably stands for **PRIME NUMERS**.
But what about the word **PRODUCT**?

In Mathematics we use the word **PRODUCT** to mean **MULTIPLY/TIMES.**

Product of Primes
= Prime Decomposition

So, the question is asking us to write the number 80 as a list of prime numbers which are multiplied together.

Which is the same as PRIME DECOMPOSITION.



$= 2 \times 2 \times 2 \times 2 \times 5$ ← Expanded Form

$= 2^4 \times 5$