Review of Index Laws

Wednesday, 25 July 2018 5:58 pm

By the end of the lesson I am hoping you will be able to understand and apply the knowledge to:

- You will understand that when you multiply numbers with indices you add the indices
- You will understand that when you divide numbers with indices you subtract the indices
- Anything to the power of zero is One (1)
- When you have a power of a power you multiply the powers.

RECAP:

You have covered this work in past years. Before we move on to the harder concepts in the rest of this course we need to make sure that we know how to use indices.

Multiplying terms with indices

Multiply terms together is really easy!
For examples $x \times x = x^2$

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We have known this for a long time … but we need to know that $x = x^1$

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

In certain circumstances, we can "ignore the 1". Hence, we think of $1 \times x^1$ as just x

$x \times x \times x \times x \times x \times x = x^6$

Question:

What is $x^2 \times x^3 =$

$x^2 \times x^3 = x \times x \times x \times x \times x = x^5$

Lots of people think it's x^6 but it's not.

If we write it in expanded form then $x^2 \times x^3 = x \times x \times x \times x \times x$

When we count the number of x's we see we have 5. Hence, we must have x^5.

Ahhhh … so …. Rather than multiplying the indices together, we know that we add them :)

Example:
Simplify, $x^4 \times x^3$

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

Adding the powers we get the answer as: x^7

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

Example:
Simplify, $3x^5 \times 2x^4$

$3x^5 \times 2x^4$

Everything above is multiplied together. Hence, we can move things around.

$3x \times x^5 \times 2 \times x^4$

I can rewrite the question as: $3 \times 2 \times x^5 \times x^4 = 6 \times x^9 = 6x^9$.

$3 \times 2 \times x^5 \times x^4 = 6 \times x^9 = 6x^9$

Dividing terms with indices

In maths what we do one way …. We can do the other way … so long as we reverse the thinking.

Hence, if we **add powers** when we multiply terms with indices, what do we do when we divide terms with indices.

THE OPPOSITE! Yup. We **subtract the powers.**

$x^6 \times x^4 = x^{10}$

Example:
Simplify, $x^4 \div x^3$

$x^6 \div x^4 = x^2$

This is a **division** question so …. We subtract the powers.
Hence the answer is x.

But why?!?!?!

$x^4 = \frac{x \times x \times x \times x}{x \times x \times x} = \frac{x}{1} = x$

But why?!?!?!

$$\frac{x^4}{x^3} = \frac{x \times x \times x \times x}{x \times x \times x} = \frac{x}{1} = x$$

$$x^6 \div x^4 = \frac{x^6}{x^4} = \frac{x \times x \times x \times x \times x \times x}{x \times x \times x \times x} = \frac{x^2}{1} = x^2$$

The Zero Power

This is one of the biggest, fattest tricks in Maths ever conceived!
It's such a basic rule … but it's awesome.
YOU HAVE TO REMEMBER THIS!

Oh … and how to use it properly.

The rule: **Anything to the power of zero is one!**

Why???

$$x^6 \div x^4 = x^2$$

$$x^1 \div x^1 = \frac{x}{x} = 1$$

$$z^1 \div z^1 = \frac{z}{z} = 1$$

$$2^1 \div 2^1 = \frac{2^1}{2^1} = 1$$

$$x^1 \div x^1 = x^0 = 1$$

$$z^1 \div z^1 = z^0 = 1$$

$$2^1 \div 2^1 = 2^0 = 1$$

Example:
Evaluate 5^0 $= 1$

Example:
Evaluate x^0 1

Example:
Evaluate $(3x)^0$ $= 1$

Example:
Evaluate $(3x)^0$ = 1

Example:
Evaluate $3x^0$ = 3 × 1 = 3

Example:
Evaluate $3x^0 + (5x^2)^0$

3 × 1 + 1

= 3 + 1

= 4

The work I ask that you complete before the end of the lesson is:

Lesson 6	**3F Review of index laws** Let's start: *Recall the laws* Key ideas Example 13, 14, 15, 16	Exercise 3F Page 194	— 4-7(½) 8-10(½) 12, 13 14-16