Index Laws 4 and 5

Year 9 Mathematics

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Learning Objectives

By the end of the lesson I hope that you understand and can apply the following to a range of questions from the Year 9 Mathematics course.

- Understand how to use Index Law 4
- Understand how to use Index Law 5

RECAP

These are the last two "laws" of indices. We have already met the following laws:

$$a^m \times a^n = a^{m+n}$$

 $a^m \div a^n = a^{m-n}$
 $(a^m)^n = a^{mn}$

Anything to the power of zero is one (1).

We now move onto some more rules ... which are pretty much the same as the above ... so ...

Index Law 4

The formal definition first ...

 $(ab)^m = a^m \times b^m$

Let's look at how this comes about.

Example:

Expand $(xy)^4$

 $(ab)^{m} = a^{m} b^{m}$ $(xy)^{4} = xy \times xy \times xy \times xy$ = ZXYXXXY XZXY XZXY = XXXXXXXXXXXXXXX $x^4x.4$ 7.4 x U 11

Another example

What about the following:

Expand $(2x)^3$

 $= 2^3 \times x^3$ $= 8 x^3$ $(2x)^{3} = 2x^{3}$ = $8x^{3}$

More examples

Expand each of the following using the fourth index law

 $(5b)^{3}$ $= 5^{3} \times b^{3}$ $= 125 \times b^{3}$

More examples

Expand each of the following using the fourth index law

 $(-2)^{4} \times (31^{3})^{4} \times (y)^{4}$

A $= (-2)^{4} \times (x^{3})^{4} \times y^{4}$ = $16 \times x^{12} \times y^4$ $= \int bx^{12}$

 $(-2x^{3}y)^{4}$

More examples

Expand each of the following using the fourth index law

 $4(c^2d^3)^5$ $= 4x (c^{2})^{5} x (d^{3})^{5}$ $= 4 \times c^{10} \times d^{15}$ $= 4 c^{10} d^{15}$

Index Law 5

Fractions again! But the same idea is true. And, we have looked at this in a different lesson.

Here is the formal definition:

$$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$$

 $\left(\frac{x}{3}\right)^3$



Let's see what happens with fractions:

Expand and simplify the following:

Write it long hand first and then see how we can write is simpler.

$$\left(\frac{x}{3}\right)^{3} = \frac{x}{3} \times \frac{x}{3} \times \frac{x}{3} = \frac{x^{3}}{3^{3}}$$
$$\frac{x^{3}}{3^{3}} = \frac{x^{3}}{27}$$

Other examples

Apply the fifth index law to the following example:

$$\left(\frac{6}{b}\right)^{3} = \frac{6^{3}}{b^{3}} = \frac{216}{b^{3}} \qquad \frac{36}{b^{3}} \qquad \frac{36}{b^{3}}$$

Other examples

Apply the fifth index law to the following example:

 $\left(\frac{-2a^2}{3bc^3}\right)$ $= (-2)^{4} \times (a^{2})^{4}$ $3^{4} \times (b)^{4} \times (c^{j})^{4}$ 16 x a 160° 8164 C¹² -81×64×C12

Other examples

Apply the fifth index law to the following example:

 $\left(\frac{x^2y^3}{c}\right)^3 \times \left(\frac{xc}{v}\right)^4$ $= (x^{2})^{3} \times (y^{3})^{3} \times (x^{3})^{4} \times (x^{3})^{4}$ $= \frac{x^{6} x y^{9} x \frac{x^{4} x c^{4}}{y^{4}}}{c^{3}}$ $= \frac{x^{6}xy^{9}xx^{4}ac^{4}}{c^{3}xy^{4}}$



Work to complete for this topic

The questions I am asking you to complete from this section of the course is shown asked to answer all parts of each question.

They are quick to complete, but it's important you master the Indices component of

Exercise 6D 2abcdhk, 3adfhj, 4acegij, 5acegjkl, 7

