

Indices

The PowerPoint contains the slides shown below, and these give an animated explanation of how to use the rules of indices for multiplication and division with terms that have the same bases. There are questions with worked answers.

Indices

Objectives

Use the rules of indices for multiplication and division with terms that have the same bases

☆ 1

In maths, often we want to multiply the same number by itself two or more times. We show this by writing a smaller number like this...

4^3 means three fours multiplied together

$4^3 = 4 \times 4 \times 4$

The BASE

The INDEX tells us how many times the base is to be multiplied together

The INDEX

☆ 2

Complete this table:

		Means	Value
1.	2^3	$2 \times 2 \times 2 =$	8
2.	3^4		
3.	2^5		
4.	10^4		
5.	5^3		
6.	4^5		
7.	5^4		
8.	1^6		

☆ 3

Complete this table:

		Means	Value
1.	2^3	$2 \times 2 \times 2 =$	8
2.	3^4	$3 \times 3 \times 3 \times 3 =$	81
3.	2^5	$2 \times 2 \times 2 \times 2 \times 2 =$	32
4.	10^4	$10 \times 10 \times 10 \times 10 =$	10000
5.	5^3	$5 \times 5 \times 5 =$	125
6.	4^5	$4 \times 4 \times 4 \times 4 \times 4 =$	1024
7.	5^4	$5 \times 5 \times 5 \times 5 =$	625
8.	1^6	$1 \times 1 \times 1 \times 1 \times 1 \times 1 =$	1

☆ 4

If the bases are the same $\times \rightarrow +$

If the bases are the same, we can add the indices in multiplication problems

$2^3 \times 2^4 = 2^{3+4} = 2^7$

Why?

$2^3 \times 2^4 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 2^7$

☆ 5

If it is possible, multiply by adding the indices

- $2^3 \times 2^5$
- $3^3 \times 2^3$
- $4^3 \times 4^2$
- $6^2 \times 6^2$
- $2^7 \times 4^3$
- $9^4 \times 9^3$
- $t^3 \times t^5$
- $r^3 \times t^5$
- $n^7 \times n^5$
- $v^3 \times b^2$
- 2×2^5
- $v^2 \times v$

☆ 6

If it is possible, multiply by adding the indices

- $2^3 \times 2^5 = 2^8$
- $3^3 \times 2^3$ (Different bases)
- $4^3 \times 4^2 = 4^5$
- $6^2 \times 6^2 = 6^4$
- $2^7 \times 4^3$ (Different bases)
- $9^4 \times 9^3 = 9^7$
- $t^3 \times t^5 = t^8$
- $r^3 \times t^5$ (Different bases)
- $n^7 \times n^5 = n^{12}$
- $v^3 \times b^2$ (Different bases)
- $2^2 \times 2^5 = 2^7$
- $v^2 \times v^1 = v^3$

The indices with 2 and vis 1

☆ 7

If the bases are the same $\div \rightarrow -$

If the bases are the same, we can subtract indices in division problems

$2^5 \div 2^3 = 2^{5-3} = 2^2$

Why?

$2^5 \div 2^3 = \frac{2 \times 2 \times 2 \times 2 \times 2}{2 \times 2 \times 2} = 2^2$

Cancel out the terms

☆ 8

If it is possible, divide by subtracting the indices

- $2^8 \div 2^5$
- $3^3 \div 2^3$
- $4^3 \div 4^2$
- $6^4 \div 6^2$
- $8^7 \div 4^3$
- $2^3 \div 2^3$
- $t^5 \div t^2$
- $r^7 \div t^5$
- $n^3 \div n^2$
- $v^3 \div b^2$
- $d^7 \div d^3$
- $v^7 \div v^7$

☆ 9

If it is possible, divide by subtracting the indices

- $2^8 \div 2^5 = 2^3$
- $3^3 \div 2^3$ (Different bases)
- $4^3 \div 4^2 = 4^1$
- $6^4 \div 6^2 = 6^2$
- $2^3 \div 2^3 = 1$
- $2^3 \div 2^3 = 1$
- $t^5 \div t^2 = t^3$
- $r^7 \div t^5$ (Different bases)
- $n^3 \div n^2 = n^1$
- $v^3 \div b^2$ (Different bases)
- $d^7 \div d^3 = d^4$
- $v^7 \div v^7 = 1$

We don't need to write in the 1

Anything to the power of 0 is 1

We don't need to write in the 1

☆ 10

Any value raised to the index (power) of 0 (zero) is equal to 1

$3^2 \div 3^2 = 3^{(2-2)} = 3^0 = 1$

Why?

$3^2 \div 3^2 = \frac{3 \times 3}{3 \times 3} = 1$

$9 \div 9 = 1$

☆ 11

SAME BASE

$\times \rightarrow$ ADD POWERS

$\div \rightarrow$ SUBTRACT POWERS

BUT THE BASES MUST BE THE SAME

☆ 12