The National Orthodox School Shmaisani

Indices

Think Tac Toe

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Indices Rules

An **index** tells us how many times a term has been multiplied by itself. The plural of **index** is **indices.** Indices can be positive or negative numbers.

Below is an example of a term written in index form:

4^3 ⟶ **4** is the base and **3** is the index.

Laws of indices provide us with rules for simplifying calculations or expressions involving powers of the **same base**.

The first rule: $a^n \times a^m = a^{m+n}$

The second rule: $(a^n)^m = a^{mn}$

The third rule: $a^m \div a^n = a^{m-n}$

The fourth rule: $a^0 = 1$

The fifth rule: $a^{-1} = \frac{1}{a}$ $a^{-m} = \frac{1}{a^m}$

The sixth rule: $a^{\frac{1}{2}} = \sqrt{a}$ $a^{\frac{1}{m}} = \sqrt[m]{a}$

$a^{\frac{n}{m}} = (a^{\frac{1}{m}})^n = (\sqrt[m]{a})^n$

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Let's start! Choose three rectangles to simplify. They must go in a straight line.

Can you solve more?

$\frac{(3^7 \times 3^4)^2}{3^{10}} = \frac{3^{22}}{3^{10}} = 3^{12}$	$14^8 \times 14^5 = 14^{13}$	$7^8 \div 7^5 = 7^3$
$\frac{(5^6 \times 5^3)^3}{5^{11}} = \frac{5^{27}}{5^{11}} = 5^{16}$	$6^9 \times 6^{-6} = 6^3$	$2^5 \div 2^5 = 1$
	$4^{-4} \times 4^4 = 4^0 = 1$	$3^7 \div 3^9 = 3^{-2} = \frac{1}{3^2}$
$8^2 \times 8^5 = 8^7$	$\frac{(2^7 \times 2^1)^3}{2^{10}} = \frac{2^{24}}{2^{10}} = 2^{14}$	$31^7 \times 31^6 = 31^{13}$
$11^9 \times 11^{-8} = 11^1$		$13^{12} \times 13^{-11} = 13$
$7^{-5} \times 7^5 = 7^0 = 1$	$\frac{(13^8 \times 13^3)^2}{13^{14}} = \frac{13^{22}}{13^{14}} = 13^8$	$1^{-7} \times 1^7 = 1^0 = 1$
$26^8 \div 26^5 = 26^3$	$8^8 \times 8^5 = 8^{13}$	$\frac{(5^6 \times 5^3)^3}{5^{11}} = \frac{5^{27}}{5^{11}} = 5^{16}$
$2^5 \div 2^5 = 1$	$7^9 \times 7^{-6} = 7^3$	$\frac{(11^7 \times 11^4)^2}{11^{10}} = \frac{11^{22}}{11^{10}} = 11^{12}$
$3^7 \div 3^9 = 3^{-2} = \frac{1}{3^2}$	$20^{-7} \times 20^7 = 20^0 = 1$	

You can solve more!

How many straight lines did you get? _____