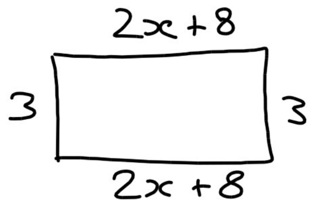
A rectangle has side lengths, ***2x + 8*** and ***3cm***. Determine a ***simplified expression*** for the **area** of the rectangle. If the **area** of the rectangle is ***72cm²***, ***solve*** for ***x***. Use this value and *determine the actual dimensions* of the rectangle. What is the perimeter of the rectangle?



Area = length × width

$= (2x+8) \times 3$

$= 6x + 24$

$6x + 24 = 72$

$6x + 24 - 24 = 72 - 24$

$\frac{6x}{6} = \frac{48}{6}$

$x = 8$

length $= 2x + 8$

$= 2(8) + 8$

$= 24$ cm

width $= 3$ cm

Perimeter $= 2l + 2w$

$= 2(24) + 2(3)$

$= 48 + 6$

$= 54$ cm

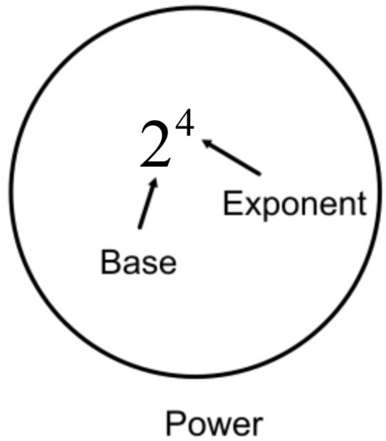
MTH1W Grade 9 Mathematics

5.2 Powers of Powers, Products and Quotients

Goal(s)
- *To identify the resulting exponent when a power is raised to a power*
- *To identify equivalent expressions involving powers*
- *Simplify expressions involving powers*

Jun 19-8:29 AM

Recall that a **power** is a product of identical factors and consists of two parts: a ***base*** and an ***exponent***.



The base is the ***identical factor***, and the exponent tells how many ***factors*** there are.

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

exponential form **expanded form**

Investigating the Power Rules

Complete each table below. Is there a relationship between the exponents in the first column and the exponent in the last column?

Power of a Power	Expanded Form	Single Power
$(2^2)^3$	$(2^2)\times(2^2)\times(2^2)$ $=(2\times2)\times(2\times2)\times(2\times2)$	2^6
$(10^4)^2$	$(10\times10\times10\times10)\times(10\times10\times10\times10)$	10^8
$(n^3)^2$	$(n\times n\times n)\times(n\times n\times n)$	n^6

Relationship?

When raising a power to a power we MULTIPLY the exponents. The base stays the same.

$$\Rightarrow (x^m)^n = x^{m\times n}$$

Power of a Power Rule

A power of a power can be written as a **single power** by **multiplying** the exponents.

$$\left(x^a\right)^b = x^{a\times b}$$

Careful when the base has a coefficient. The coefficient needs to be raised to the exponent as well.

Eg. $(2x^2)^3$

$= 2^{1\times3}x^{2\times3}$

$= 2^3x^6 \Rightarrow 8x^6$

Write each product as a single power. Then evaluate the power.

$(4^2)^3 =$ $4^{2\times3} = 4^6$

$[(-5)^7]^2 =$ $(-5)^{7\times2} = (-5)^{14}$

$(12^2)^4 \div 12^5 =$ $12^{2\times4} \div 12^5$

$= 12^8 \div 12^5$

$= 12^{8-5} \Rightarrow 12^3$

$\frac{[(-9)^7]^{-3}}{(-9)^{-22}} =$ $(-9)^{7\times-3} \div (-9)^{-22}$

$= (-9)^{-21} \div (-9)^{-22}$

$= (-9)^{-21-(-22)} \Rightarrow (-9)^1 = -9$

Rewrite with a single power.

$(-6m^3n^4)^2 =$ $(-6)^{1\times2} m^{3\times2} n^{4\times2}$

$= (-6)^2 m^6 n^8$

$= 36m^6n^8$