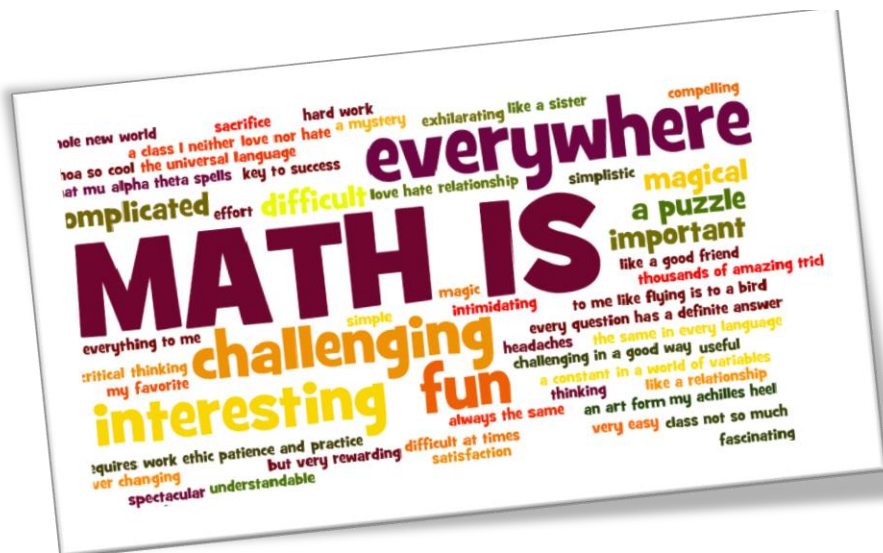


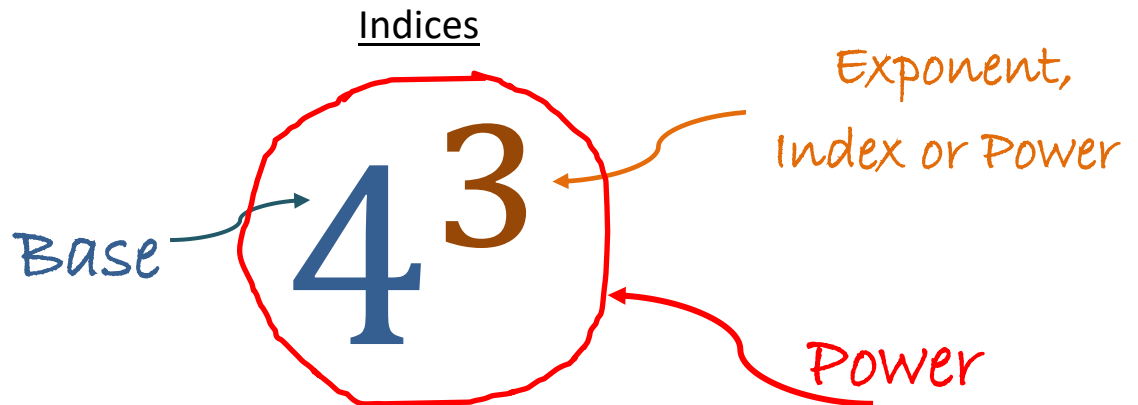
Grade 9

Making sense of Algebra

# Indices - EXtra



2018-2019



$$4^3 = \underbrace{4 \cdot 4 \cdot 4}$$

Base multiplied exponent  
number of times.

### Index Laws

<u>Law</u>	<u>Example</u>
$a^m \times a^n = a^{m+n}$	$5^3 \times 5^8 = 5^{3+8} = 5^{11}$
$\frac{a^m}{a^n} = a^{m-n}$	$\frac{6^8}{6^3} = 6^{8-3} = 6^5$
$(a^m)^n = a^{m \cdot n}$	$(4^3)^5 = 4^{3 \cdot 5} = 4^{15}$
$(ab)^n = a^n b^n$	$(5 \cdot 4)^3 = 5^3 \cdot 4^3 = 125 \cdot 64$
$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$	$\left(\frac{2}{3}\right)^4 = \frac{2^4}{3^4}$
$a^0 = 1, a \neq 0$	$6^0 = 1$
$a^{-m} = \frac{1}{a^m}$ and $\frac{1}{a^{-m}} = a^m$	$5^{-3} = \frac{1}{5^3}$ and $\frac{1}{4^{-2}} = 4^2$

## Exercises

1. Simplify. Write the answer using only positive exponents and prime numbers.

a.  $-(2a^2)^3 =$

b.  $m^9 \frac{1}{m^{-2}m^8} =$

c.  $\frac{(x^2)^3 \cdot x^{-2}}{(5x^4)^2} =$

d.  $\frac{(x^2)^3}{(-x^4)^2} \cdot \frac{-x^{-2}}{5} =$

e.  $-27m^3 \frac{-9}{(-3m)^{-2} \cdot [-(m)^8]} =$

f.  $-27(-a^3) \frac{-9b}{(-a)^{-2} \cdot [-(b)^8]^{-3}} =$

g.  $12 \cdot 2^3 \cdot (-2)^{-3} \cdot \frac{1}{6^{-1}}$

h.  $(-4)^2 \cdot 3 \cdot 3^3 \cdot (-2)^5 \cdot 2^{-4} \cdot [10^0 - (-1)^3 \cdot 5]$

i.  $(-4)^2 \cdot 3 - 3^3 + (-2)^5 \cdot 2^{-4} + [10^0 - (-1)^3 \cdot 5]$

j.  $-b[-(-3a^{-2})]^3 =$

k.  $\left(\frac{-4}{-5a^3b^{-3}}\right)^3 =$

l.  $\left(\frac{-a^{-2}(-b)(-c)^3}{-5(-a)^3(-b^{-3})}\right)^{-4} =$

2. Simplify:

$$a. 4(x^{-3}y^{-2})^2\left(\frac{-x^2}{2y^3}\right)^{-2}$$

$$b. \left(-\frac{7x^2}{3y^4}\right)^{-3}\left(\frac{9y^2}{49x^4}\right)^{-2}$$

$$c. \left(\frac{x^3y^{-2}}{9y^2}\right)^{-2}\left(\frac{x^2y^{-3}}{6y^3}\right)^2$$

$$d. \left(\frac{1}{6}x^{-1}y^3\right)^{-2}\left(\frac{x^2}{y^2}\right)^{-2}\left(-\frac{2x^2}{y^3}\right)^{-4}$$

$$e. \frac{x^0(x^{-3}y)^2(x^2)^3}{y^{-2}(y^2x)^3} : \frac{x^4y : x^3}{y^5x^4}$$

$$f. \frac{(x^{-3})^2x^2}{(x^{-2})^5}$$

$$g. \frac{-6x^7y^4}{3x^4y^3}$$

$$h. \frac{(x^{-1}y^{-1}z)^{-2}}{x^4z^{-4}}$$

$$i. \frac{(-2)^7x^3y^2}{2^6(x^{-3}y^{-2})^{-1}}$$

$$j. (a^{-1}a^{-2})^{-3}$$

$$k. a^{-2}a^3 : a^4$$

$$l. \left(\frac{x^3x^2}{x^4}\right)^2 \frac{x^3x^{-2}}{x}$$