

## Curriculum Outcome

(N1) Demonstrate an understanding of powers with integral bases (excluding base 0) and whole number exponents by: representing repeated multiplication using powers; using patterns to show that a power with an exponent of zero is equal to one; solving problems involving powers.

(N2) Demonstrate an understanding of operations on powers with integral bases (excluding base 0) and whole number exponents.

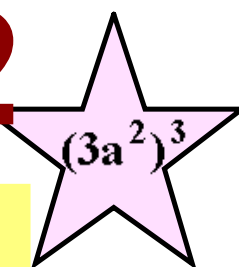
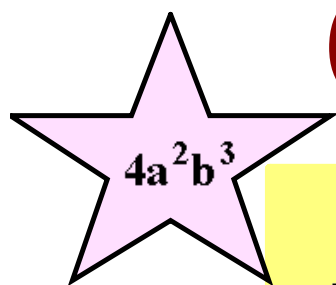
**Student Friendly:**

**"What does an exponent do to a number"**

**&**

**"Powers of tens and the ZERO exponent"**

# Chapter 2



power  
8<sup>3</sup> exponent  
base

Write each as a product, then evaluate.

#1 a)  $3^4$

$$3 \times 3 \times 3 \times 3$$

$$= 81$$

b)  $5^3$

$$5 \times 5 \times 5$$

$$= 125$$

c)  $\left(\frac{2}{3}\right)^3$

$$\left(\frac{2}{3}\right)\left(\frac{2}{3}\right)\left(\frac{2}{3}\right)$$

$$= \frac{8}{27}$$

Write each as a power, then evaluate.

#2

a)  $(4)(4)(4)$

$$4^3$$
$$= 64$$

b)  $(-6)(-6)(-6)(-6)(-6)$

$$(-6)^5$$
$$= -7776$$





Can you see the difference?

$$(-4)^2$$

Expanded:  $(-4)(-4)$

Evaluated: 16

Base:  $(-4)$

Exponent: 2

$$-4^2$$

Expanded:  $-(4)(4)$

Evaluated: 16

Base: 4

Exponent: 2

**You Try!!!**

$$-(-2)^3$$

Base:  $(-2)$

Exponent:  $3$

$$-2^5$$

Base:  $2$

Exponent:  $5$



$$(-1)^{10247} = -1$$

$$(-1)^{29584} = 1$$

**THINK**

Evaluating powers when the base is negative...

If the exponent is **even** the answer will be **positive**.

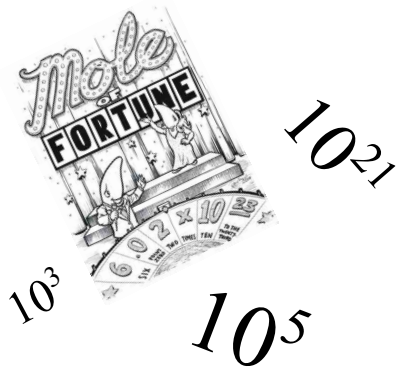
If the exponent is **odd** the answer will be **negative**.

Figure out if the answer is positive or negative: (Explain)

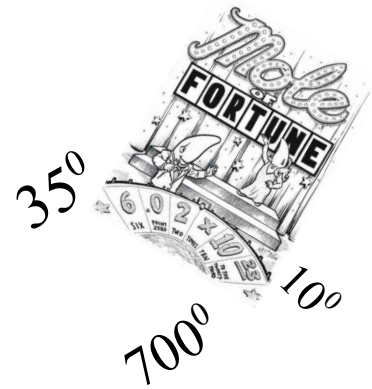
$$\frac{(-2)^{52} \times (-6)^{31}}{-(-4)^6} = \frac{(+)(-)}{(-)(+)} = \frac{(-)}{(-)} = (+)$$

Figure out if the answer is positive or negative: (Explain)

$$\frac{-(-x)^4 x (-y)^{12}}{-z^2(-xy)^5} = \frac{(-)(+)(+)}{(-)(+)(-)} = \frac{(-)}{(+)} = (-)$$



## Section 2.2



# Powers of Ten and the Zero Exponent



Avogadro's number =  $6.0221415 \times 10^{23}$

The speed of light =  $2.99\ 792\ 458 \times 10^8$  m / s

Temperature of the Sun's Core =  $1.5 \times 10^7$  °C  
since 15000000 kelvin = 14999726.85 degree Celsius

Light years =  $4.96 \times 10^{12}$  km

Distance related to Powers of 10  
<http://vimeo.com/819138>

Please use your calculator to evaluate the following:

$$2^0 = 1$$

$$13^0 = 1$$

$$199^0 = 1$$

$$(-6)^0 = 1$$



What do you notice?



## Zero Exponent LAW

Any number raised to the power of  
**ZERO** is equal to 1



$$x^0 = 1$$

Examples:

$$(-6)^0 = \mathbf{1}$$

$$-6^0 = \mathbf{-1}$$

$$-(-6)^0 = \mathbf{-1}$$

Read this number to me

426

Four hundred  
Twenty  
Six

In elementary school you may have expressed it in this form

$$400 + 20 + 6$$

$$(4 \times 100) + (2 \times 10) + (6 \times 1)$$

# Powers of 10

page 59

Number in Words	Standard Form	Power
One billion	1 000 000 000	$10^9$
One hundred million	100 000 000	$10^8$
Ten million	10 000 000	$10^7$
One million	1 000 000	$10^6$
One hundred thousand	100 000	$10^5$
Ten thousand	10 000	$10^4$
One thousand	1 000	$10^3$
One hundred	100	$10^2$
Ten	10	$10^1$
One	1	$10^0$

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# Writing Numbers Using Powers of Ten

Standard form



Write 96 713 as a power of 10

$10^4$

$10^3$

$10^2$

$10^1$

$10^0$

Expanded form:

$$90\ 000 + 6\ 000 + 700 + 10 + 3$$

Powers of ten form:

$$(9 \times 10^4) + (6 \times 10^3) + (7 \times 10^2) + (1 \times 10^1) + (3 \times 10^0)$$

7 605 404

Standard form

**Write in powers of ten form:**

$$(7 \times 10^6) + (6 \times 10^5) + (5 \times 10^3) + (4 \times 10^2) + (4 \times 10^0)$$

$$(5 \times 10^4) + (3 \times 10^3) + (6 \times 10^2) + (4 \times 10^0)$$

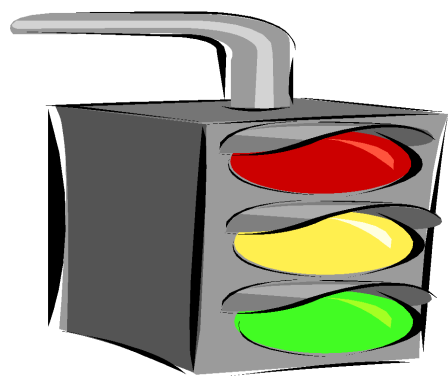
Write in standard form:

$10^4$	$10^3$	$10^2$	$10^1$	$10^0$
5	3	6	0	4

$$(6 \times 10^0) + (2 \times 10^5) + (7 \times 10^6) + (5 \times 10^2) + (9 \times 10^4)$$

Write in standard form:

$10^6$	$10^5$	$10^4$	$10^3$	$10^2$	$10^1$	$10^0$
7	2	9	0	5	0	6



**Page 55-57**

**Questions**

7ace, 8ace, 9, 13, 14, 16

**Page 61-63**

**Questions**

4ab, 5abcd, 8acef, 9, 10, 13