



Concept: The Meaning of Exponents

Name:

- You should have completed Exponents Outline A for Topic 1: The Meaning of Exponents before beginning this handout.

Warm Up

Complete the following. Show all your steps.

(a) $2 \times 2 =$

(b) $3 \times 3 \times 3 =$

(c) $4 \times 4 \times 4 \times 4 =$

(d) $5 \times 5 \times 5 \times 5 \times 5 \times 5 =$

(e) $6 \times 6 \times 6 \times 6 \times 6 \times 6 =$

(f) $7 \times 7 \times 7 \times 7 \times 7 \times 7 \times 7 =$

COMPUTER COMPONENT

Instructions: Select the computer program *Understanding Exponents* (Neufeld)
Follow the instructions to the Main Menu.
Select *The Meaning of Exponents* from the Main Menu.

Notice: You will need to use the **Jump To** feature of the program (found on the top left of your screen) in order to get to the section where you left off.



Work through all sections of this topic **in order**:

- *Exponents, Powers, Bases*
- *Powerful Explosions*
- *Introductory Examples*
- *Examples – Substitution*
- *Examples – Order of operations*
- *Practice Questions*



As you work through the computer exercises, make your notes in the **NOTES** section of this page.

When you reach the end of the section *Practice Questions* on the computer, move on to the **OFF COMPUTER EXERCISES** below.

NOTES:

Fill in the following blanks:

- Exponents are used to write _____ expressions that have repeated _____.

$$2^4$$

- The base is ____ Use the base as the _____.
- The exponent is _____. The exponent indicates how many _____ to use the base as a _____.
- The entire _____ is called a _____.

2^{10}

➤ is read as “_____ to the _____ of _____.”

➤ is read as “_____ to the _____.”

It means that you use _____ as a factor _____ times.

Fill in the chart.

Power	Base	Exponent	Factor	Standard Form
	2	1	2	2
	2	2	2×2	4
	2	3	$2 \times 2 \times 2$	
	2	4	$2 \times 2 \times 2 \times 2$	
	2	5		
	2	6		
	2	7		
	2			
	2			
	2			
	2			

Power	Base	Exponent	Factor	Standard Form
	3			
	3			
	3			
	3			
	3			
Power	Base	Exponent	Factor	Standard Form
	4			
	4			
	4			
	4			
Power	Base	Exponent	Factor	Standard Form
	5			
	5			
	5			
	5			
Power	Base	Exponent	Factor	Standard Form
	6			
	6			
	6			

Power	Base	Exponent	Factor	Standard Form
	10			
	10			
	10			
	10			
	10			
	10			
	10			

Interesting Fact: Descartes invented the exponent notation.

http://books.google.ca/books?id=7juWmvQSTvwC&pg=PA346&lpg=PA346&dq=exponents+Descartes&source=web&ots=KWfICmK8Ss&sig=eTUkAqRdrQIDf8PUXpqlZCiRCOU&hl=en&sa=X&oi=book_result&resnum=8&ct=result

S^6

➤ “ S^6 ” is _____ by itself _____ times.

Remember:

- A power with a negative base is **positive** when _____ is _____.
- A power with a negative base is **negative** when _____ is _____.

Practice:**Fill in the chart.**

Power	Expanded Form	Standard Form
10^2		
3^3		
$\left(\frac{2}{3}\right)^2$		
$(-7)^3$		
$(-7)^4$		
$(-1)^{23}$		
$(-1)^{44}$		
4^3		
3^4		
$(-2)^4$		
$-(2)^4$		

Interesting fact:

Computer Memory

A byte is a unit of storage capable of storing one letter of the alphabet. For example, the word "math" requires four bytes to store in a computer.

Bytes of computer memory are often manufactured in amounts equal to powers of 2.

1 kilobyte (1K) = 2^{10} = _____ bytes

1 megabyte (1 MB) = 2^{20} = _____ bytes

1 gigabyte (1 GB) = 2^{30} = _____ bytes

<http://www.webopedia.com/TERM/b/byte.html>

OFF COMPUTER EXERCISES

1. Complete the chart.

Power	Expand the Power	Answer
2^4	(2) (2) (2) (2)	16
$(-2)^{16}$		
-4^4		
$(-4)^4$		
$(-1)^{33}$		
$(0.75)^3$		

Power	Expand the Power	Answer
$(-3)^5$		
$(-1)^{22}$		
$(-2)^3$		

2. Find the number that makes each expression true.

(a) $2^{(\quad)} = 32$

(b) $(-4)^{(\quad)} = -64$

(c) $(\quad)^3 = -27$

$$(d) \quad (0.5)^{(\quad)} = 0.25$$

$$(e) \quad (\quad)^{(\quad)} = 10\,000$$

$$(f) \quad 1^3 + 2^3 + 3^3 + 4^3 = (\quad)^{(\quad)}$$

3. For each of the following substitute, the given value and then evaluate the expression. (*Use good form.*)

Example: $x^2 + 2y^3$ when $x = 2$ and $y = -1$

$$\begin{aligned}x^2 + 2y^3 &= (\underline{2})^2 + 2(\underline{-1})^3 \\ &= 4 + 2(-1) \\ &= 4 + (-2) \\ &= 2\end{aligned}$$

(a) $2x^3$ when $x = -2$

(b) $-3x^3 - y^3$ when $x = -1$ and $y = 2$

(c) $2x^3 - 3y$ when $x = -3$ and $y = -4$

(d) $-4x^2y^3$ when $x = -3$ and $y = -2$

4. Evaluate. Remember to use **Order of Operations** rules.

(a) $33 - 3^3 =$

(b) $21 + 2^3 =$

(c) $3^4 + 2(-17) =$

(d) $2^5 - (5)(5) =$

$$(e) \quad (2 + 3)^2 =$$

$$(f) \quad (2)^3 + (3)^2 =$$

$$(g) \quad (-4)^2 + (-1)^3 =$$

$$(h) \quad (3)^4 + (4)^3 =$$

5. Fill in the blanks.

In an expression $(-5)^3$, 3 is the _____, -5 is the _____ and

$(-5)^3$ is the _____.



6. Is it possible for a person's age to be expressed as an exponent? *Explain your answer.*

7. On my first birthday, my parents gave me a dollar. On each birthday after that, they tripled my previous amount.

(a) *How much money did I receive on my 13th birthday?*

(b) *If I saved my birthday money, how much money in total will I have on my 13th birthday?*

