

## Exponents

Exponents are shortcuts to express a multiplication of a number by itself. Exponents tell you how many times you should multiply the number by. This process of using exponents is called 'raising to a power,' where the exponent is the 'power.'

For example: instead of writing  $2 \times 2 \times 2$ , you could write  $2^3$ .  
2 is known as the base. 3 is the exponent or power.

Examples:

$$\begin{aligned} 2^2 &= 2 \times 2 = 4 \\ 5^2 &= 5 \times 5 = 25 \\ 3^3 &= 3 \times 3 \times 3 = 27 \end{aligned}$$

When the exponent or power is 2, the process is called squaring. It would be read 2 squared or 5 squared

When the exponent or power is 3, the process is called cubing. It would be read 2 cubed.

There are rules for exponents:

- Any number (except 0) raised to the zero power is equal to 1.  
 $258^0 = 1$
- Any number raised to the first power is always equal to itself.  
 $8^1 = 8$

Some rules to simplify how we express exponents:

- Whenever you multiply two terms with the same base, you can add the exponents:
 

$(a^m)(a^n) = a^{m+n}$	
$(2^3)(2^6)$	$= 2^9$
$(125^4)(125^{16})$	$= 125^{20}$
$(637^{13})(637^{20})$	$= 637^{33}$
- When you have an exponent expression that is raised to a power, you can multiply the exponent and power:  $(a^m)^n = a^{mn}$ 

$(2^3)^4$	$= 2^{12}$
$(76^6)^{10}$	$= 76^{60}$
$(203^3)^5$	$= 203^{15}$
- If you have a product inside parentheses and a power on the parentheses, then the power goes on each element inside.  $(a^m \times b)^n = a^{mn} \times b^n$ .
 

$(2^3 \times 4)^2$	$= 2^6 \times 4^2$
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## Exponents (Cont'd)

This rule also applies to the following:

$$[a/b]^m = (a^m) / (b^m)$$

$$[3/8]^4 = (3^4) / (8^4)$$

This rule does not apply to additions or subtractions that are in parenthesis. For example, if you have  $(3+4)^2$ , then you cannot apply the abovementioned rule and distribute the power to both numbers. It would be wrong if you simplified:  $(3+4)^2$  and wrote:  $(3^2 + 4^2)$ . In order to simplify or solve  $(3+4)^2$ , you would first solve what is inside the parenthesis, which is the addition operation, then you would raise it to the second power. This means:

$$\begin{aligned}(3+4)^2 &= (7)^2 \\ &= 49\end{aligned}$$

## Exponents Questions

### Multiple Choice:

1. Exponents are shortcuts to refer to:
  - a. Adding a number to itself
  - b. Subtracting a number from itself
  - c. Multiplying a number by itself
  - d. Dividing a number by itself
  
2. Whenever you multiply two terms with same base, you can:
  - a. Add the exponents
  - b. Subtract the exponents
  - c. Multiply the exponents
  - d. Divide the exponents
  
3.  $(5^2)(5^6)$  can be simplified into the following:
  - a.  $5^{12}$
  - b.  $5^8$
  - c. 5
  - d.  $5^{26}$
  
4.  $(2,879^{34})^0$ :
  - a. 0
  - b. 1
  - c. 2,879
  - d. None of the above

### Matching:

- |                      |              |
|----------------------|--------------|
| _____ 5. $(678)^0$   | a. $(678)^6$ |
| _____ 6. $(678)^1$   | b. 1         |
| _____ 7. $(678^2)^3$ | c. 678       |

### True or False:

- \_\_\_\_\_ 9.  $(8/7)^3$  can be simplified into  $(8)^3 / (7)^3$ .
- \_\_\_\_\_ 10.  $(6 + 2)^2$  can be simplified into  $(6^2 + 2^2)$

## Exponents Answers

### Multiple Choice:

- Exponents are shortcuts to refer to:
  - Adding a number to itself
  - Subtracting a number from itself
  - Multiplying a number by itself**
  - Dividing a number by itself
- Whenever you multiply two terms with same base, you can:
  - Add the exponents**
  - Subtract the exponents
  - Multiply the exponents
  - Divide the exponents
- $(5^2)(5^6)$  can be simplified into the following:
  - $5^{12}$
  - $5^8$**
  - 5
  - $5^{26}$
- $(2,879^{34})^0$ :
  - 0
  - 1**
  - 2,879
  - None of the above

### Matching:

- |                                |              |
|--------------------------------|--------------|
| <u><b>b</b></u> 5. $(678)^0$   | a. $(678)^6$ |
| <u><b>c</b></u> 6. $(678)^1$   | b. 1         |
| <u><b>a</b></u> 7. $(678^2)^3$ | c. 678       |

### True or False:

- T** 8.  $(8/7)^3$  can be simplified into  $(8)^3 / (7)^3$ .
- F** 9.  $(6 + 2)^2$  can be simplified into  $(6^2 + 2^2)$