

# Unit 2 : Powers and Exponent Laws

## Section 2.1: What is a Power?

A power is an expression in the form  $a^n$ , where  $a$  is the base and  $n$  is the exponent. A power represents a product of equal factors.

1. The base is the number repeatedly multiplied.
2. The exponent is the number of times the base is multiplied.

Consider the following:

$$\underbrace{2^5}_{2^5 \text{ is the power}}$$

2 is the base  
5 is the exponent

Write as a power:

A.  $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = \underline{2^7}$

B.  $5 \times 5 \times 5 \times 5 = \underline{5^4}$

C.  $(-10)(-10)(-10) = \underline{(-10)^3}$

D.  $4 \times 4 = \underline{4^2}$

E.  $(-7)(-7)(-7)(-7)(-7)(-7)(-7)(-7) = \underline{(-7)^8}$

## Evaluating Expressions Involving Negative Signs

To evaluate a power that contains negative integers, identify the base of the power and apply the rules for multiplying integers.

Power	Repeated Multiplication	Standard	Is the Answer Positive or Negative?
$(-5)^2$	$(-5) \times (-5)$	25	Positive
$(-5)^3$	$(-5) \times (-5) \times (-5)$	-125	Negative
$(-4)^4$	$(-4) \times (-4) \times (-4) \times (-4)$	256	Positive
$(-4)^5$	$(-4) \times (-4) \times (-4) \times (-4) \times (-4)$	-1024	Negative
$(-2)^6$	$(-2) \times (-2) \times (-2) \times (-2) \times (-2) \times (-2)$	64	Positive
$(-2)^7$	$(-2) \times (-2) \times (-2) \times (-2) \times (-2) \times (-2) \times (-2)$	-128	Negative

From the above table, we can see for a negative base:

1. An even exponent will result in a positive product.

2. An odd exponent will result in a negative product.

If there are no brackets, the negative applies to the whole expression:

Power	Repeated Multiplication	Standard Form
$-3^2$	$-(3 \times 3)$	$-(9) = -9$
$-(-3)^3$	$-[(-3) \times (-3) \times (-3)]$	$-(-27) = 27$
$-(-3)^4$	$-(3 \times 3 \times 3 \times 3)$	$-(81) = -81$

Identify the base and evaluate each power.

Power	Base	Repeated Multiplication	Standard Form
$(-5)^4$	-5	$(-5) \times (-5) \times (-5) \times (-5)$	625
$-5^4$	5	$-(5 \times 5 \times 5 \times 5)$	$-(625) = -625$
$-(-5)^4$	-5	$-[(-5) \times (-5) \times (-5) \times (-5)]$	$-(625) = -625$
$(-5)^3$	-5	$(-5) \times (-5) \times (-5)$	-125
$-5^3$	5	$-(5 \times 5 \times 5)$	$-(125) = -125$
$-(-5)^3$	-5	$-[(-5) \times (-5) \times (-5)]$	$-(-125) = 125$

Practice Exercises:

Pg. 55 #4,5,7,8,9

Pg.56 #12,13,16

Pg. 57 #20