

Important Concepts . . .

Preview Review



Mathematics Grade 9 TEACHER KEY
W1 - Lesson 1: Powers

Important Concepts of Grade 9 Mathematics

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Materials Required

Paper
Pencil
Calculator

**No Textbook
Required**

**This is a stand-
alone course.**

Mathematics Grade 9

Version 6

Preview/Review W1 - Lesson 1

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Preview/Review Concepts for Grade Nine Mathematics

Teacher Key



W1 - Lesson 1:

Powers

OBJECTIVES

By the end of this lesson, you will be able to:

- Explain, using repeated multiplication, the difference between two given powers in which the exponent and base are interchanged; e.g., 10^3 and 3^{10} .
- Express a given power as a repeated multiplication.
- Express a given repeated multiplication as a power.

GLOSSARY

Power: Has two parts:

$$\text{Base}^{\text{exponent}} = 3^4$$

Exponent: The number of times a number is being multiplied by itself in a power.

Base: The number being multiplied in a power.

Repeated Multiplication: A longer way to express a power.

$$\text{ex. } 6^4 = 6 \times 6 \times 6 \times 6$$

W1 – Lesson 1: Perfect Squares and Square Roots

Materials required:

- Paper, Pencil, and Calculator

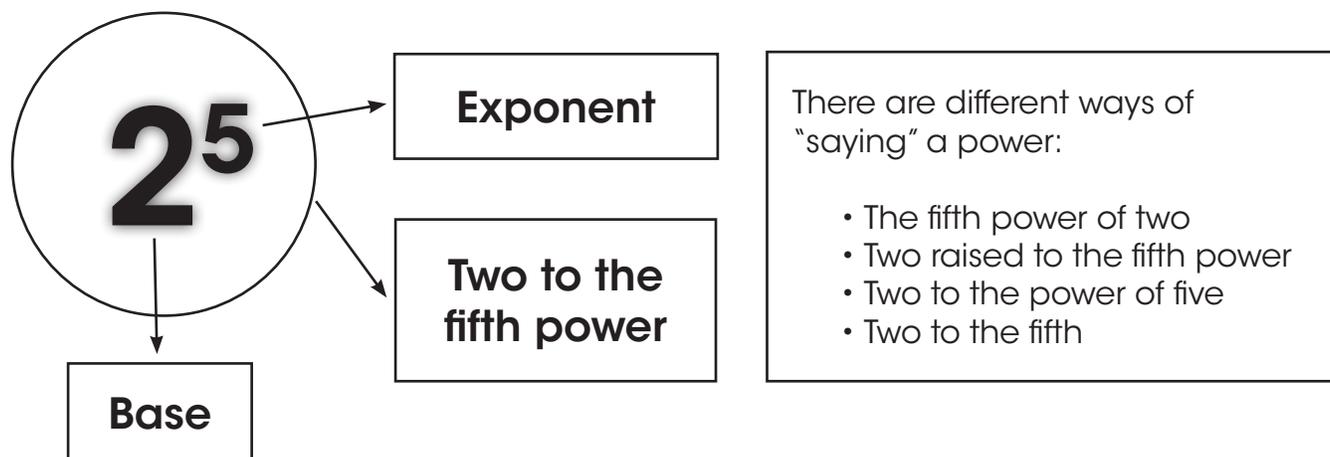
Part 1: Bases and Exponents

Powers have two parts: a base and an exponent.

Example: 2^5

The number 2 is the base. The number 5 is the exponent.

The exponent tells you how many times to multiply the base by itself.



This means $2 \times 2 \times 2 \times 2 \times 2 = 32$

Note: 2^5 does NOT mean '2 times 5'. It means 'multiply 2 by itself 5 times'.

Example 1

The base is 4 and the exponent is 3. The power would be represented like this:

$$4^3$$

This one means 'multiply 4 by *itself* 3 times. So it's $4 \times 4 \times 4 = 64$

Practice Questions

1. Identify the base in each of the following powers.

a. 5^4

5

b. 3^7

3

c. -4^3

4

d. $(-6)^5$

-6 or (-6)

2. Identify the exponent in each of the following powers.

a. b^7

7

b. 9^1

1

c. 5^4

4

d. -6^2

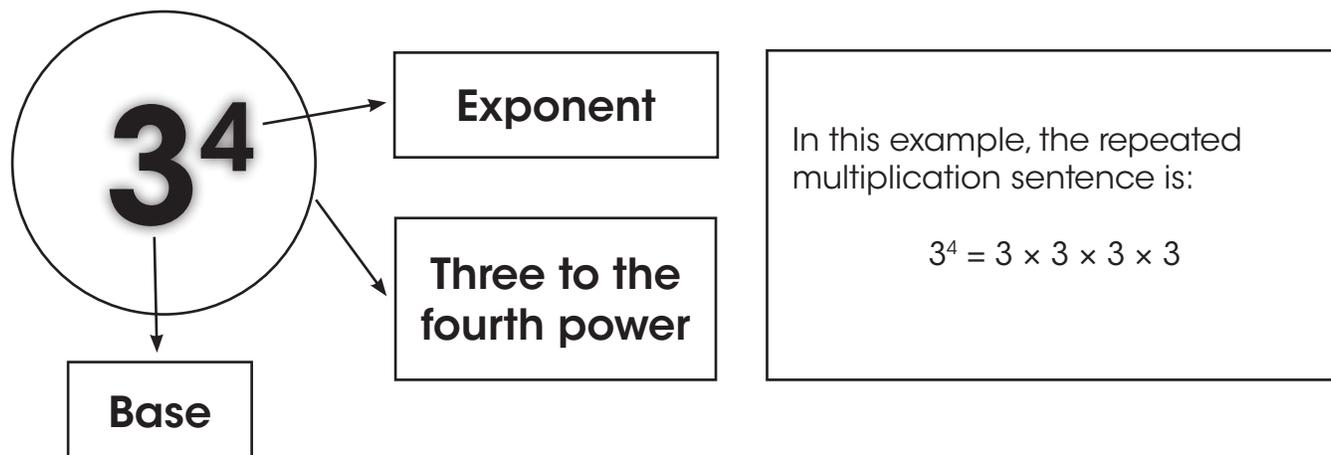
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3. Write the power for each of the following.

a. Two to the third 2^3

b. Seven to the power of four 7^4

Part 2: Repeated Multiplication



The base represents the number that is in the repeated multiplication sentence. The exponent represents how many times the base is being multiplied. In the example, 3^4 , think as 3 multiplied by itself 4 times.

Example 1

Power: 3^5

Repeated Multiplication: $3 \times 3 \times 3 \times 3 \times 3$

Example 2

Power: b^4

Repeated Multiplication: $b \times b \times b \times b$

Example 3

Power: $(-3)^4$

The base is (-3) and the exponent is 4.

Repeated Multiplication: $(-3) \times (-3) \times (-3) \times (-3)$

Example 4

Power: -3^4

The base is 3 and the exponent is 4.

Repeated Multiplication: $-(3 \times 3 \times 3 \times 3)$

Note: Notice that $-$ is not a part of the base in the last example.

Practice Questions

1. Express each power as repeated multiplication.

a. 6^3

$6 \times 6 \times 6$

b. 3^5

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

c. -8^4

$-(8 \times 8 \times 8 \times 8)$

d. $(-9)^6$

$(-9) \times (-9) \times (-9) \times (-9) \times (-9) \times (-9)$

2. Express each repeated multiplication sentence as a power.

a. $d \times d \times d \times d$

d^4

b. $(-8) \times (-8) \times (-8)$

$(-8)^3$

c. $-(5 \times 5 \times 5 \times 5)$

-5^4 or $-(5)^4$

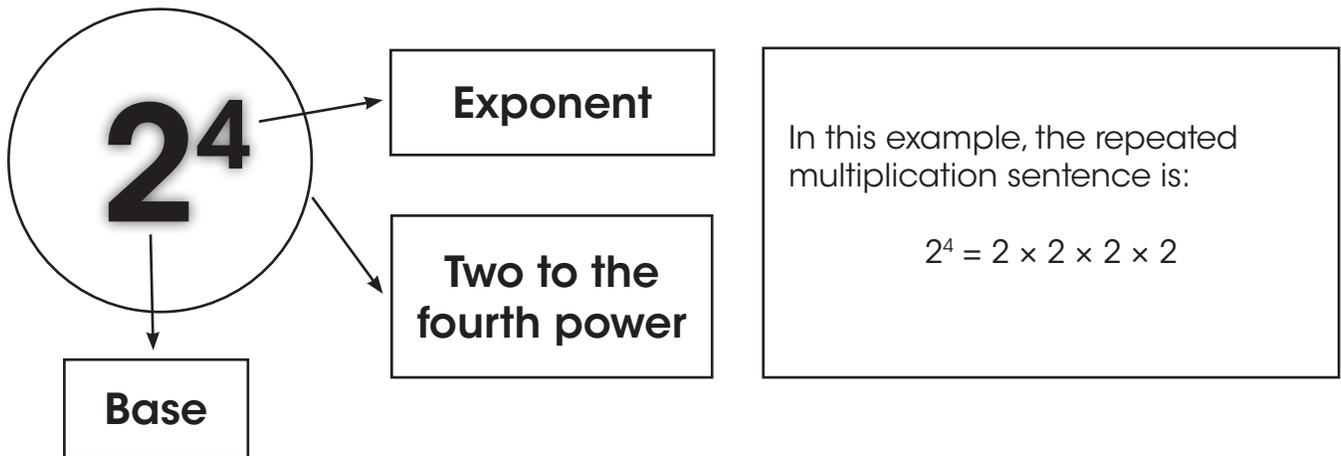
d. $(-y) \times (-y) \times (-y) \times (-y) \times (-y)$

$(-y)^5$

3. Complete the chart

Power	Base	Exponent	Repeated Multiplication
7^5	7	5	$7 \times 7 \times 7 \times 7 \times 7$
9^3	9	3	$9 \times 9 \times 9$
$(-8)^4$	-8	4	$(-8) \times (-8) \times (-8) \times (-8)$

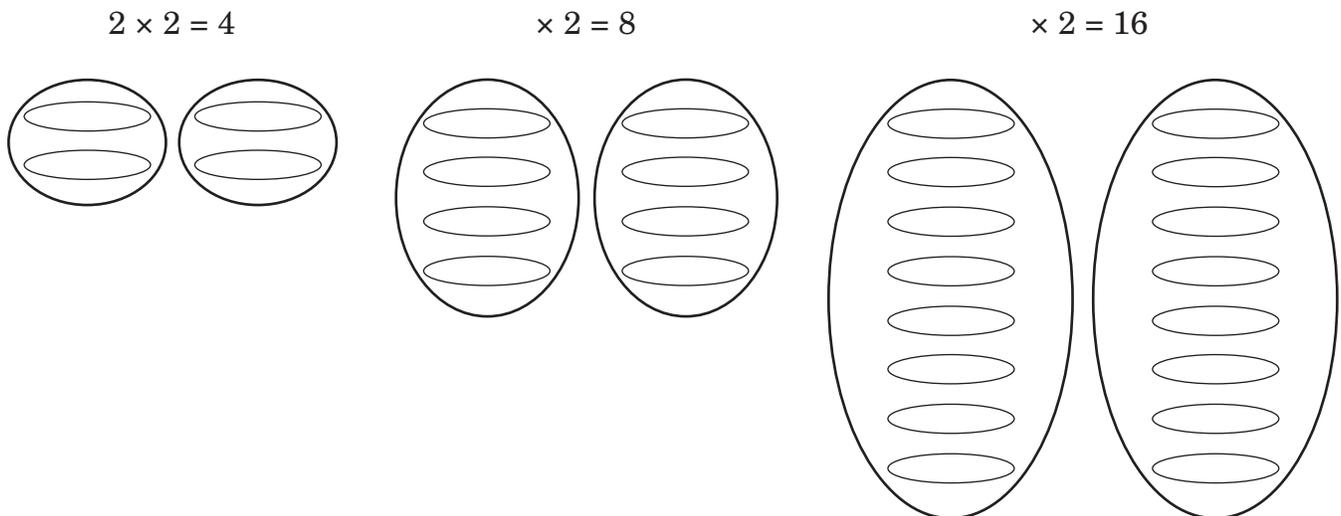
Part 3: Evaluating Powers



The base represents the number that is in the repeated multiplication sentence. The exponent represents how many times the base is being multiplied.

In our example:

2^4 , think as



Example 1

Evaluate 4^3 .

Think: repeated multiplication = $4 \times 4 \times 4$

$$4 \times 4 = 16 \times 4 = 64$$

Example 2

Evaluate $(-5)^4$.

Think: repeated multiplication = $(-5) \times (-5) \times (-5) \times (-5)$

$$(-5) \times (-5) = (25) \times (-5) = (-125) \times (-5) = (600)$$

It can also be thought of like this:

$$\begin{array}{c} (-5) \times (-5) \times (-5) \times (-5) \\ \swarrow \quad \searrow \quad \downarrow \quad \swarrow \quad \searrow \\ (25) \times (-5) \\ \swarrow \quad \searrow \quad \swarrow \quad \searrow \\ (-125) \times (-5) \\ \swarrow \quad \searrow \\ 600 \end{array}$$

Example 3

Using your calculator, evaluate 7^4 .

Solution 1:

Type in 

The screen will show an answer of 2401.

Solution 2 (using a scientific calculator):

Type in 

The screen will show an answer of 2401.

Note: On some scientific calculators, the  could also appear as  or as . Play with your calculator to see which function is present.

Example 4

Using your calculator, evaluate 7^0 , $(-5)^0$, and 101^0 . What do you notice?

Solution:

Any base with exponent zero gives an answer of 1.

Practice Questions

1. Write each power as a repeated multiplication sentence and then evaluate.

a. 5^6

$$= 5 \times 5 \times 5 \times 5 \times 5 \times 5$$

$$= 15\,625$$

b. -3^4

$$= -(3) \times (3) \times (3) \times (3)$$

$$= -81$$

c. $(-8)^5$

$$= (-8) \times (-8) \times (-8) \times (-8) \times (-8)$$

$$= -32\,768$$

d. 2^0

$$= 1$$

2. Complete the chart

Power	Base	Exponent	Repeated Multiplication	Value
3^6	3	6	$3 \times 3 \times 3 \times 3 \times 3 \times 3$	729
5^3	5	3	$5 \times 5 \times 5$	125
$(-4)^3$	(-4)	3	$(-4) \times (-4) \times (-4)$	-64
$-b^4$	b	4	$-(b \times b \times b \times b)$	$-b^4$
3^3	3	3	$3 \times 3 \times 3$	27

3. Which is greater? Circle the greater power and explain your answer.

a. 5^3 or (4^4)

$$5 \times 5 \times 5 = 125$$

$$4 \times 4 \times 4 \times 4 = 256$$

b. -3^4 or $(-3)^4$

$$-(3 \times 3 \times 3 \times 3) = -81$$

$$(-3) \times (-3) \times (-3) \times (-3) = 81$$

Lesson 1 Assignment

1. Identify the base in each of the following powers.

a. 6^9

6

b. -7^4

7

2. Identify the exponent in each of the following powers.

a. 5^3

3

b. $(-8)^5$

5

3. Express each power as repeated multiplication.

a. r^4

$= r \times r \times r \times r$

b. $-(6)^8$

$= -(6 \times 6 \times 6 \times 6 \times 6 \times 6 \times 6 \times 6)$

c. $(-d)^5$

$= (-d) \times (-d) \times (-d) \times (-d) \times (-d)$

d. 6^3

$= 6 \times 6 \times 6$

4. Evaluate each power.

a. 3^6

$= 729$

b. -4^0

$= -1$

c. $(-8)^3$

$= -512$

d. -5^4

$= -625$

5. Complete each number sentence by using either $<$, $>$ or $=$.

a. $5^6 > 6^5$

b. $-2^4 < (-2)^4$

c. $(-8)^5 < (-5)^8$

d. $2^0 = (-5)^0$

6. Look at the power and answer the following questions.

$$(-5)^3$$

a. What is the base? **-5**

b. What is the exponent? **3**

c. Write the repeated multiplication sentence. **$= (-5) \times (-5) \times (-5)$**

d. Evaluate the power. **-125**

7. Explain the following:

a. $(-3) \times (-3) \times (-3) \times (-3) \neq -3^4$

$(-3)^4 = 81$ and $-3^4 = -(3 \times 3 \times 3 \times 3) = -81$, so they are not equal.

b. $-4^4 \neq 64$

$-4^4 = -(4 \times 4 \times 4 \times 4) = -64$, so they are not equal.

