

Important Concepts . . .

Preview Review



Mathematics Grade 9 TEACHER KEY
W1 - Lesson 1: Powers

Important Concepts of Grade 9 Mathematics

W1 - Lesson 1	Powers
W1 - Lesson 2	Exponents
W1 - Lesson 3	Rational Numbers
W1 - Lesson 4	Order of Operations
W1 - Lesson 5	Square Roots of Rational Numbers
W1 - Review	
W1 - Quiz	
W2 - Lesson 6	Graphing Linear Relations
W2 - Lesson 7	Solving Linear Relations
W2 - Lesson 8	Linear Inequalities
W2 - Lesson 9	Polynomials
W2 - Lesson 10	Surface Area of 3D Objects
W2 - Review	
W2 - Quiz	
W3 - Lesson 11	Properties of Circles
W3 - Lesson 12	Polygons and Scale Diagrams
W3 - Lesson 13	Rotational Symmetry
W3 - Lesson 14	Representing Data
W3 - Lesson 15	Probability
W3 - Review	
W3 - Quiz	

Materials Required

Paper
Pencil
Calculator

No Textbook Required

This is a stand-alone course.

Mathematics Grade 9

Version 6

Preview/Review W1 - Lesson 1

ISBN: 978-1-927090-00-8

Publisher: Alberta Distance Learning Centre

Written by: Lenee Fyfe

Reviewed by: Danielle Winter

Project Coordinator: Danielle Winter

Preview/Review Publishing Coordinating Team: Julie Reschke



Alberta Distance Learning Centre has an Internet site that you may find useful. The address is as follows: <http://www.adlc.ca>

The use of the Internet is optional. Exploring the electronic information superhighway can be educational and entertaining. However, be aware that these computer networks are not censored. Students may unintentionally or purposely find articles on the Internet that may be offensive or inappropriate. As well, the sources of information are not always cited and the content may not be accurate. Therefore, students may wish to confirm facts with a second source.

ALL RIGHTS RESERVED

Copyright © 2011, by Alberta Distance Learning Centre, 4601-63 Avenue, Barrhead, Alberta, Canada, T7N 1P4. Additional copies may be obtained from Alberta Distance Learning Centre.

No part of this courseware may be reproduced or transmitted in any form, electronic or mechanical, including photocopying (unless otherwise indicated), recording, or any information storage and retrieval system, without the written permission of Alberta Distance Learning Centre.

Every effort has been made both to provide proper acknowledgement of the original source and to comply with copyright law. If cases are identified where this effort has been unsuccessful, please notify Alberta Distance Learning Centre so that appropriate corrective action can be taken.

IT IS STRICTLY PROHIBITED TO COPY ANY PART OF THESE MATERIALS UNDER THE TERMS OF A LICENCE FROM A COLLECTIVE OR A LICENSING BODY.

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

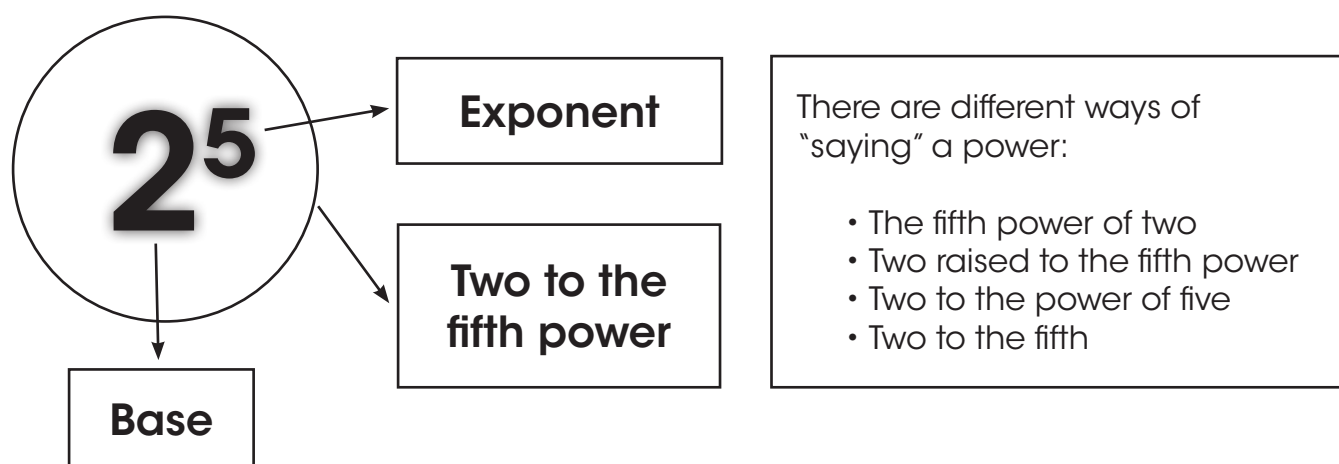
Part 1: Bases and Exponents

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

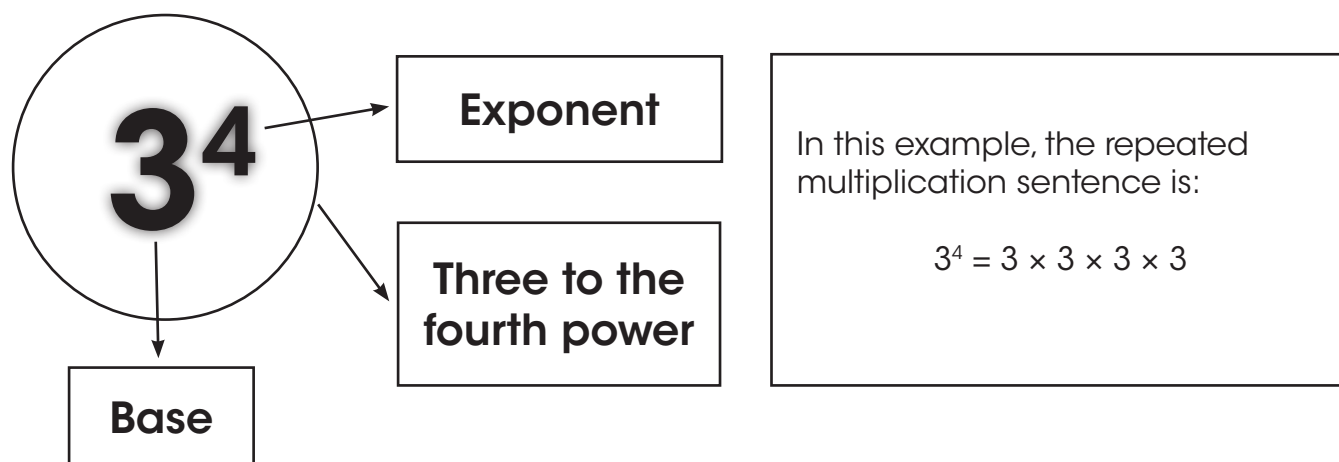
2

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 $-(5)^4$

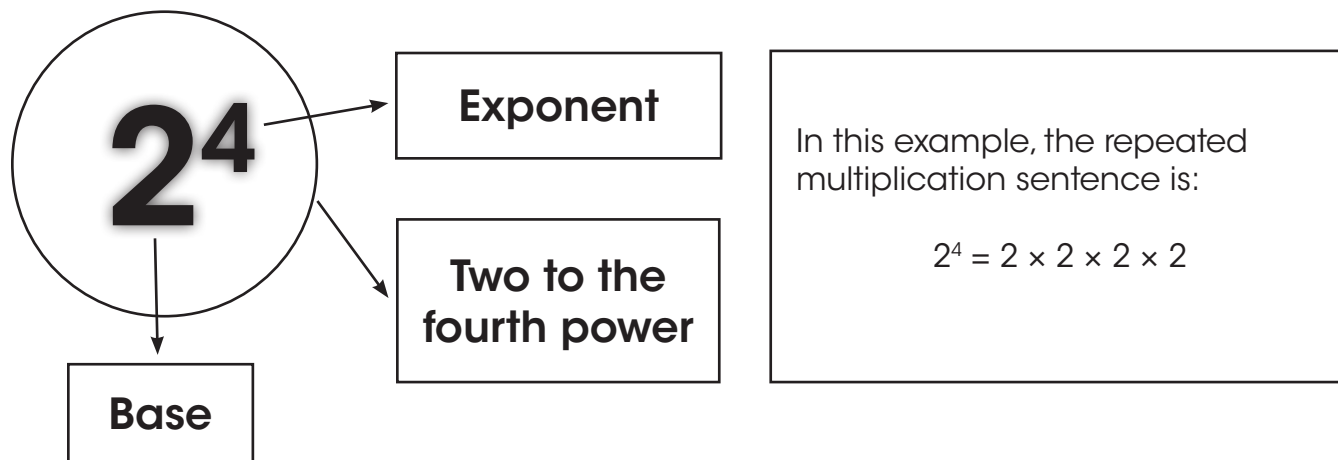
d. $(-y) \times (-y) \times (-y) \times (-y) \times (-y)$

$(-y)^5$

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

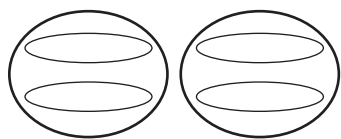


The base represents the number that is in the repeated multiplication sentence. The exponent represents how many times the base is being multiplied.

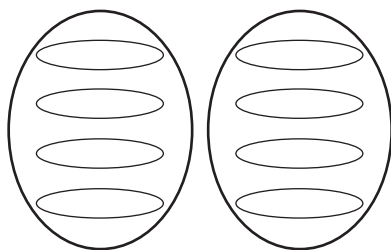
In our example:

2^4 , think as

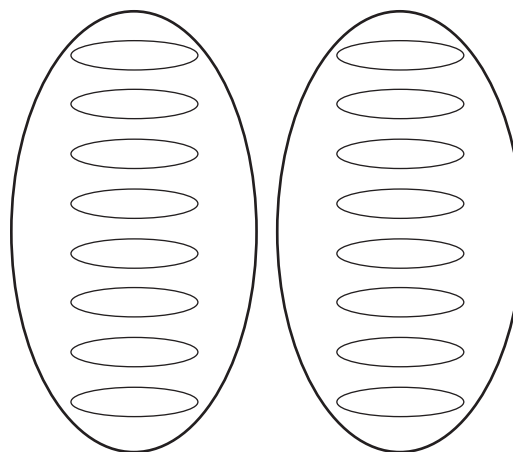
$$2 \times 2 = 4$$



$$\times 2 = 8$$



$$\times 2 = 16$$



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:

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

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.

