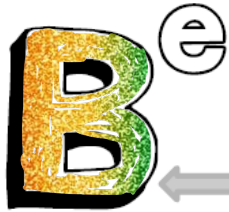




Essential Question:
How do you use exponents to represent numbers?

EXPONENTS



The **exponent** tells how many times the multiplication is repeated.

The **base** is the number being multiplied.

LOOK OUT

$$5^2 \neq 10$$

DO NOT multiply the base and exponent to find the value.

Let's Try it Together.

EXPONENTIAl Form	EXPANDEd Form	Standard Form
2^4	$[2 \cdot 2] \cdot [2 \cdot 2]$	16
5^3	$5 \times 5 \times 5$	125
6^2	$(6)(6)$	36
1^5	$1 \times 1 \times 1 \times 1$	1
3^3	$[3 \times 3] \times 3$	27

$$\begin{array}{r} 2 \\ 25 \\ \times 5 \\ \hline 125 \end{array}$$

Your Turn.

EXPONENTIAl Form	EXPANDEd Form	Standard Form
9^2	$9 \cdot 9$	81
2^5	$(2 \times 2) \times (2 \times 2) \times 2$	32
10^5	$10 \times 10 \times 10 \times 10 \times 10$	$100,000$
7^3	$[7 \times 7] \times 7$	343
8^2	$8 \cdot 8$	64

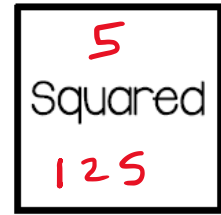
$$\begin{array}{r} 6 \\ 49 \\ \times 7 \\ \hline 343 \end{array}$$

$$2^6 = [2 \cdot 2 \cdot 2] [2 \cdot 2 \cdot 2] = 64 \quad 4^3 = [4 \cdot 4] \cdot 4 = 64$$

Here are different ways we can read exponents out loud.



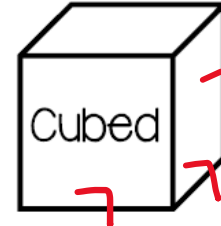
9^2 Say "9 squared" or "9 to the 2nd power"



2

5

7^3 Say "7 cubed" or "7 to the 3rd power"



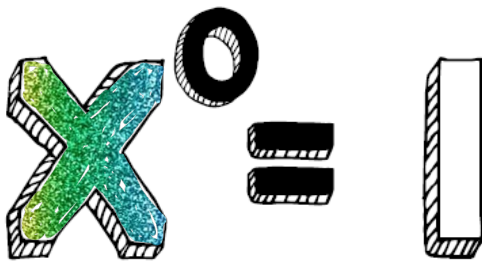
3

8^4 Say "8 to the 4th power"

4^7 Say "4 to the 7th power"

Power of Zero

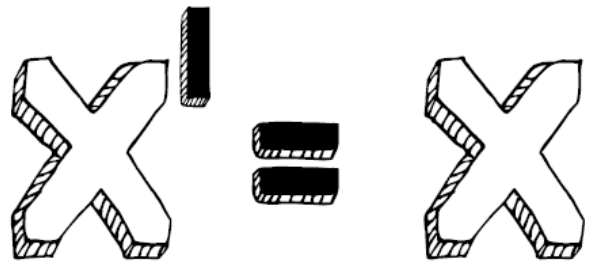
$2^4 = 16$
 $2^3 = 8$
 $2^2 = 4$
 $2^1 = 2$
 $2^0 = 1$



The value of any nonzero number raised to the power of 0 is equal to 1.

$6^0 = 1$ $8^0 = 1$ $97^0 = 1$

Power of One



The value of any number raised to the power of 1 is equal to itself.

$6^1 = 6$ $8^1 = 8$ $97^1 = 97$

Select all the expressions that are equal to 64.

- (A) 2^4
- 8^2 $8 \times 8 = 64$
- (C) 6^3
- 2^6 $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 64$
- 4^3 $4 \cdot 4 \cdot 4 = 64$
 $[4 \times 4] \times 4 = 16 \times 4 = 64$

Select all the expressions that are equivalent to $\frac{16}{81}$.

- (A) $(\frac{2}{3})^2 \times (\frac{2}{3})^2 = \frac{4^2}{9^2} = \frac{2^4}{3^4}$
- (B) $(\frac{8}{9})^2$
- (C) $(\frac{2}{3})^4 = \frac{2^4}{3^4}$
- (D) $(\frac{4}{9})^2 = \frac{4^2}{9^2}$
- (E) $(\frac{4}{3})^4$

Name: _____

Date: _____



ORDER OF OPERATIONS

GUIDED NOTES

IMPORTANT VOCABULARY:

- **Numerical expression:** contains only numbers and operations.
- **Evaluate:** to find the value of a numerical expression.
 (also known as simplifying)

ORDER OF OPERATIONS

1. When evaluating a numerical expression, be sure to follow the Order of Operations.
2. The order of operations makes sure that answers are Consistent.
3. The order of operations tells the order to complete each operation.

ORDER OF OPERATIONS: PEMDAS

1. Perform operations in Parenthesis or Grouping Symbol
2. Evaluate numbers with Exponents
3. Multiply or Divide from left to right
4. Add or Subtract from left to right.

GUIDED PRACTICE

Evaluate the expression below:

$$\begin{array}{l}
 3 \times (2 + 4)^2 - 2 \\
 3 \times (6)^2 - 2 \\
 3 \times 36 - 2 \\
 108 - 2 \\
 \boxed{106}
 \end{array}$$

PV
EV ✓
MD ✓
AS ✓

Evaluate the expression below:

$$\begin{array}{l}
 5^2 - 4 \times 2 + 3 \\
 25 - 4 \times 2 + 3 \\
 25 - 8 + 3 \\
 17 + 3 \\
 \boxed{20}
 \end{array}$$

P x
EV ✓
MD ✓
AS ✓

Name: _____

Date: _____



ORDER OF OPERATIONS

Evaluate each expression.

PRACTICE PROBLEMS

#1

$$\begin{aligned} & (15 - 12)^2 - 2 + 5 \\ & (3)^2 - 2 + 5 \\ & 9 - 2 + 5 \\ & 7 + 5 = \boxed{12} \end{aligned}$$

#2

$$\begin{array}{r} 108 \\ 3 \overline{)324} \\ \underline{-31} \\ 14 \\ \underline{-12} \\ 20 \\ \underline{-18} \\ 20 \\ \underline{-18} \\ 2 \end{array}$$

$$\begin{aligned} & (25 - 9 + 2)^2 \div 3 \times 6 \\ & 16 + 2 \\ & (18)^2 \div 3 \times 6 \\ & 324 \div 3 \times 6 \\ & 108 \times 6 = \boxed{648} \end{aligned}$$

$$\begin{array}{r} 618 \\ \times 18 \\ \hline 144 \\ + 180 \\ \hline 324 \end{array}$$

#3

$$\begin{aligned} & 25 \div 5 \times 10 - 2 \\ & 5 \times 10 - 2 \\ & 50 - 2 = \boxed{48} \end{aligned}$$

#4

$$\begin{aligned} & 16 \times 3 - 5 + 16 \\ & 48 - 5 + 16 \\ & 43 + 16 = \boxed{59} \end{aligned}$$

$$\begin{array}{r} 16 \\ \times 3 \\ \hline 48 \end{array}$$

#5

$$\begin{aligned} & 2 \cdot 2 \cdot 2 \\ & 20 + 2^3 \times 3 - 1 \\ & 20 + 8 \times 3 - 1 \\ & 20 + 24 - 1 \\ & 44 - 1 = \boxed{43} \end{aligned}$$

#6

$$\begin{aligned} & [4(3 + 2) - 4] + 4^2 \\ & [4(5) - 4] + 4^2 \\ & [20 - 4] + 16 \\ & 16 + 16 = \boxed{32} \end{aligned}$$

#7 Tickets to the County Fair cost \$12 for each adult and \$7 for each child. Write and evaluate an expression to find the cost for 3 adults and 6 children.

$$\begin{aligned} & \rightarrow (3 \times 12) + (6 \times 7) \\ & 36 + 42 = \boxed{78} \end{aligned}$$

Homework: KHAN with Scratch, WORK!

Name: _____

Date: _____

ORDER OF OPERATIONS ASSESSMENT

Select the correct answer for each question.

1. Which operation would you complete first when evaluating the numerical expression?

$$14 \div 2 \times 5 + 6 - 1$$

- a) Division
- b) Multiplication
- c) Addition
- d) Subtraction

3. Evaluate the expression:

$$15 + 15 \div 3 \times 2$$

- a) 20
 - b) 22
 - c) 25
 - d) 40
- Handwritten work: $15 + 5 \times 2 = 15 + 10 = 25$

2. Which operation would you complete first when evaluating the numerical expression?

$$(7 - 3)^3 \times 3 + 2$$

- a) Exponents
- b) Multiplication
- c) Addition
- d) Subtraction

4. Evaluate the expression:

$$22 - 18 + 2 \times 3$$

- a) 6
 - b) 10
 - c) 20
 - d) 30
- Handwritten work: $22 - 18 + 6 = 4 + 6 = 10$

5. Evaluate the expression:

$$15 + (25 - 6 \times 2) + 32$$

- a) 45
 - b) 60
 - c) 80
 - d) 85
- Handwritten work: $25 - 12 = 13$, $15 + 13 + 32 = 28 + 32 = 60$

6. Select each expression where you would multiply first.

- a) $12 + 3 \times 4 - 5$
- b) $45 \div 3 \times 2 - 2$
- c) $(15 \times 3) - 6 \times 5$
- d) $35 + (6 + 2 \times 3) - 3$
- e) $45 - (15 \div 3 \times 3) + 2$

Answer the question below. Be sure to show all of your work.

7. Everly is going back to school shopping. She purchases 4 notebooks, 3 packs of pencils and 6 folders. Write and evaluate a numerical expression to find out how much money she spent on school supplies.

SUPPLY	COST
Packs of pencils	\$4 per pack
Folders	\$2 each
Notebooks	\$5 each

Handwritten work:

NB: 4 notebooks, pencils: 3 packs, folders: 6

$$(4 \times 5) + (3 \times 4) + (6 \times 2)$$

$$20 + 12 + 12$$

$$32 + 12$$

$$44$$