

Name: KEY

Date: _____

Math 9**Lesson 2.3 ~ Order of Operations with Powers**When evaluating an expression with powers (**BEDMAS**):

- Do the operations in **brackets** first.
- Evaluate the **exponents**.
- **Divide** and **multiply**, in order, from left to right.
- **Add** and **subtract**, in order, from left to right.

Example # 1: Evaluate each expression.

a) $3^2 + 2^3$

$= \underbrace{3 \times 3} + \underbrace{2 \times 2 \times 2}$

$= 9 + 8$

$= \boxed{17}$

b) $3 - 2^3$

$= 3 - \underbrace{2 \times 2 \times 2}$

$= 3 - 8$

$= \boxed{-5}$

c) $(3+2)^3$

$= (5)^3$

$= 5 \times 5 \times 5$

$= \boxed{125}$

Example # 2: Evaluate each expression.

a) $[2 \times (-3)^3 - 6]^2$

Curved brackets

Square brackets

When we need curved brackets for integers, we use square brackets to show the order of operations.

$= [2 \times \underbrace{(-3)(-3)(-3)} - 6]^2$

$= [\underbrace{2 \times (-27)} - 6]^2$

$= [-54 - 6]^2$

$= [-60]^2$

$= (-60)(-60)$

$= \boxed{3600}$

b) $(18^2 + 5^0)^2 \div (-5)^3$

$= (\underbrace{18 \times 18} + 1)^2 \div [(-5)(-5)(-5)]$

$= (\underbrace{324} + 1)^2 \div (-125)$

$= \underbrace{(325)(325)} \div (-125)$

$= 105\,625 \div (-125)$

$= \boxed{-845}$

Practice

1. Evaluate.

$$\begin{aligned} \text{a) } 2^2 + 1 &= 4 + 1 \\ &= \boxed{5} \end{aligned}$$

$$\begin{aligned} \text{c) } (2 + 1)^2 &= (3)^2 \\ &= \boxed{9} \end{aligned}$$

$$\begin{aligned} \text{b) } 2^2 - 1 &= 4 - 1 \\ &= \boxed{3} \end{aligned}$$

$$\begin{aligned} \text{d) } (2 - 1)^2 &= (1)^2 \\ &= \boxed{1} \end{aligned}$$

2. Evaluate.

$$\begin{aligned} \text{a) } 4 \times 2^2 &= 4 \times 4 \\ &= \boxed{16} \end{aligned}$$

$$\begin{aligned} \text{c) } (4 \times 2)^2 &= 8^2 \\ &= \boxed{64} \end{aligned}$$

$$\begin{aligned} \text{b) } 4^2 \times 2 &= 16 \times 2 \\ &= \boxed{32} \end{aligned}$$

$$\begin{aligned} \text{d) } (-4)^2 \div 2 &= 16 \div 2 \\ &= \boxed{8} \end{aligned}$$

3. Evaluate.

$$\begin{aligned} \text{a) } 2^3 + (-1)^3 &= 8 + (-1) \\ &= \boxed{7} \end{aligned}$$

$$\begin{aligned} \text{c) } 2^3 - (-1)^3 &= 8 - (-1) \\ &= \boxed{9} \end{aligned}$$

$$\begin{aligned} \text{b) } (2 - 1)^3 &= 1^3 \\ &= \boxed{1} \end{aligned}$$

$$\begin{aligned} \text{d) } (2 + 1)^3 &= 3^3 \\ &= \boxed{27} \end{aligned}$$

4. Evaluate.

$$\begin{aligned} \text{a) } 3^2 \div (-1)^2 &= 9 \div 1 \\ &= \boxed{9} \end{aligned}$$

$$\begin{aligned} \text{c) } 3^2 \times (-2)^2 &= 9 \times 4 \\ &= \boxed{36} \end{aligned}$$

$$\begin{aligned} \text{b) } (3 \div 1)^2 &= 3^2 \\ &= \boxed{9} \end{aligned}$$

$$\begin{aligned} \text{d) } 5^2 \div (-5)^1 &= 25 \div (-5) \\ &= \boxed{-5} \end{aligned}$$

5. Evaluate.

$$\begin{aligned} \text{a) } (-2)^0 \times (-2) &= 1 \times (-2) \\ &= \boxed{-2} \end{aligned}$$

$$\begin{aligned} \text{b) } 2^3 \div (-2)^2 &= 8 \div 4 \\ &= \boxed{2} \end{aligned}$$

$$\begin{aligned} \text{c) } (3 + 2)^0 + (3 \times 2)^0 &= 1 + 1 \\ &= \boxed{2} \end{aligned}$$

$$\text{d) } (3 \times 5^2)^0 = 1$$

$$\begin{aligned} \text{e) } (2)(3) - (4)^2 &= 6 - 16 \\ &= \boxed{-10} \end{aligned}$$

$$\begin{aligned} \text{f) } 3(2 - 1)^2 &= 3(1)^2 \\ &= 3(1) \\ &= \boxed{3} \end{aligned}$$

A power with exponent 0 is equal to 1.

$$\begin{aligned} \text{g) } (-2)^2 + (3)(4) &= 4 + 12 \\ &= \boxed{16} \end{aligned}$$

$$\begin{aligned} \text{h) } (-2) + 3^0 \times (-2) &= (-2) + \underbrace{1 \times (-2)} \\ &= (-2) + (-2) \\ &= \boxed{(-4)} \end{aligned}$$

6. Amaya wants to replace the hardwood floor in her house.

Here is how she calculates the cost, in dollars:

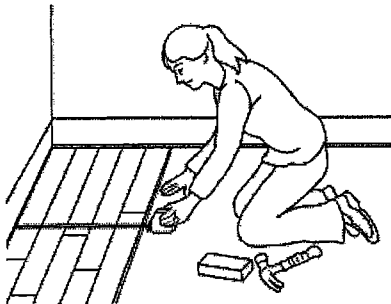
$$70 \times 6^2 + 60 \times 6^2$$

How much will it cost Amaya to replace the hardwood floor?

$$\begin{aligned} &= \underbrace{70 \times 36} + \underbrace{60 \times 36} \\ &= 2520 + 2160 \\ &= 4680 \end{aligned}$$

Remember the order of operations: BEDMAS

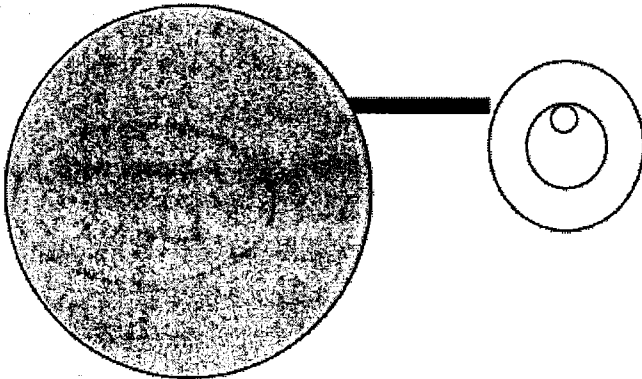
It will cost Amaya \$4680 to replace the hardwood floor.



Unit 2 Puzzle

Bird's Eye View

This is a view through the eyes of a bird. What does the bird see?



To find out, simplify or evaluate each expression on the left, then find the answer on the right.

Write the corresponding letter beside the question number.

The numbers at the bottom of the page are question numbers.

Write the corresponding letter over each number.

1. $5 \times 5 \times 5 \times 5$	<u>$5^4 = 625$</u>	R	X	100 000
2. 2^3	<u>8</u>	I	X	5^6
3. $\frac{3^6}{3^2}$	<u>$3^4 = 81$</u>	F	X	0
4. $4 \times 4 \times 4 \times 4 \times 4$	<u>$4^5 = 1024$</u>	N	X	1
5. $(-2)^3$	<u>-8</u>	Y	X	3^4
6. $(-2) + 4 \div 2$	<u>$(-2) + 2 = 0$</u>	S	X	6
7. $(5^2)^3$	<u>$5^6 = 15625$</u>	P	X	8
8. $3^2 - 2^3$	<u>$9 - 8 = 1$</u>	E	X	4^6
9. $10^2 \times 10^3$	<u>$10^5 = 100\ 000$</u>	A	X	4^5
10. $5 + 3^0$	<u>$5 + 1 = 6$</u>	G	X	5^4
11. $4^7 \div 4$	<u>$4^6 = 4096$</u>	O	X	-8

A P E R S O N F R Y I N G A N E G G
 9 7 8 1 6 11 4 3 1 5 2 4 10 9 4 8 10 10