

Name: _____

Date: _____

ORDER OF OPERATIONS

N-GEN MATH[®] 6



You have studied many operations, including **addition**, **subtraction**, **multiplication**, and **division**. In the last lesson you learned the operation **exponentiation** (raising a number to a power through repeated multiplication). When more than one operation is involved in a calculation, it is important to know which comes first. This is known as the **order of operations**.

Exercise #1: Evaluate the following expression in two ways: $10 + 6 \div 2$.

- (a) By adding first and then dividing (b) By dividing first and then adding
- (c) Which is the correct result of this **expression** and why?

Before we discuss other aspects of **order of operations**, we want to introduce two new ways to show multiplication besides the traditional \times symbol.

ALTERNATE METHODS OF SHOWING MULTIPLICATION

The product $a \times b$ can also be shown as: $a \cdot b$ and $a(b)$ or $(a)(b)$.

Exercise #2: Find each of the following calculations.

(a) $7 \cdot 2 =$ (b) $5(8) =$ (c) $\left(\frac{5}{2}\right)\left(\frac{4}{7}\right) =$

Recall that in the **order of operations** you learned last year, expressions in parentheses are evaluated first, then multiplication and division, and then addition and subtraction.

Exercise #3: Using order of operations, find the value of each of the following expressions. Show intermediate steps in your calculations.

(a) $(9)(5) - (2)(7)$ (b) $12(8 - 3) + 13$ (c) $11 \cdot 4 - 21 \div (12 - 9) + 3 \cdot 3$



Now that we've added a fifth operation, that of **exponentiation**, we must see how it fits into the mix. First, let's understand why it is an important issue.

Exercise #4: Consider the following expression: 5×2^3 . Find its value in two ways:

- (a) First by multiplying and then by exponentiating. (b) First by exponentiating and then by multiplying.

(c) Did it make a difference? Which one do you think is correct?

The order of operation is shown in the table to the right. Use it to help answer the following questions.

Exercise #5: Evaluate each of the following expressions using the **order of operations**. Show intermediate steps.

(a) $25 - 4^2$

(b) $5 \cdot 3^2$

(c) $5^3 - 2^3$

(d) $(5 - 2)^3$

(e) $(11 + 3^2) \div (4 \cdot 10 - 6^2)$

ORDER OF OPERATIONS

1. Expressions in Parentheses
2. Exponentiation
3. Multiplication/Division (from left to right)
4. Addition/Subtraction (from left to right)

P.E.M.D.A.S.

Exercise #6: Kirk believes the value of the expression $18 \div 3^2$ is 36 because he knows that 18 divided by 3 is 6 and 6 squared is 36. Why is Kirk mistaken?



Name: _____

Date: _____

THE ORDER OF OPERATIONS
N-GEN MATH[®] 6 HOMEWORK

FLUENCY

1. Evaluate each of the following expressions by using the order of operations. Show the intermediate steps in your calculation.

(a) $2 \cdot 5 + 7$

(b) $20 - 10 \div 2$

(c) $30 \div 5 + 5$

(d) $7^2 + 2(10)$

(e) $8(7 - 2) - 3(2 + 4)$

(f) $5^2 - 3^2$

(g) $\frac{3}{4}(16) + \frac{5}{2}(8)$

(h) $2 + 2^2 + 2^3 + 2^4$

(i) $(4 \cdot 5 + 6^2) \div (2 \cdot 8 - 3^2)$

(j) $2(4)^3$

(k) $60 - \frac{1}{2}(8)^2$

(l) $63 \div 3^2 + 5^3 - 6(10)$



2. Which of the following is the correct value of the expression: $24 \div 2^2 + 8\left(\frac{3}{2}\right)$?

- (1) 8 (3) 144
 (2) 18 (4) 156

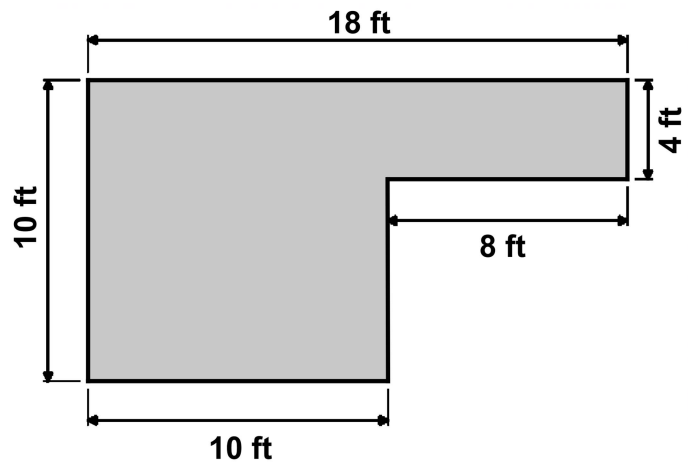
USING YOUR MATH

3. Shana is designing a garden bed with the shape and dimensions shown below.

(a) When calculating the amount of straw she will need to cover the garden, Shana writes down the following expression:

$$(8)(4) + 10^2$$

Evaluate this expression. Show your steps.



(b) Using proper units, explain what the value of this expression represents about the garden.

REVIEWING YOUR MATH

4. Plot and label each of the following points on the coordinate plane shown.

A(6, 8) B(3, -5) C(-9, 3)

D(-2, -10) E(0, 7) F(-4, 0)

