

1.2

Words & Expressions

NUMERICAL EXPRESSIONS contain a combination of numbers & operations such as addition, substitution, multiplication, and division.

Example: Write a numerical expression for each verbal phrase.

1. the total amount of money if you have nine dollars & twelve dollars

$$9 + 12$$

2. the age difference between fifteen years old & ten years old

$$15 - 10$$



Example: Write a numerical expression for each verbal phrase.

3. the cost of ten yo-yos if each costs three dollars

$$3 \times 10$$

4. the number of students in each group if fifteen students are divided into five equal groups

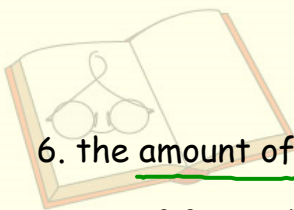
$$15 \div 5$$

5. the number of students on three buses if each bus hold twenty-two students

$$3 \times 22$$

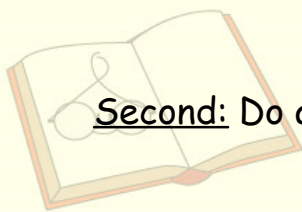
6. the amount of money Nina earned if she mowed the lawn for fifteen dollars & walked the dog for four dollars

$$15 + 4$$



To evaluate an expression, you find its numerical value. If an expression has more than one operation, use the order of operations. The **ORDER OF OPERATIONS** are the rules to follow when evaluating an expression with more than one operation. These rules ensure that numerical expressions have only one value.

First: Do all multiplication & divisions from left to right.



Second: Do all additions and subtractions from left to right.

Example: Find the value of each expression.

a.) $7 \times 3 + 5$

$$\begin{array}{l} \downarrow \\ 21 + 5 \\ \downarrow \\ \textcircled{26} \end{array}$$

b.) $18 - 6 + 4 \times 3$

$$\begin{array}{l} \downarrow \\ 18 - 6 + 12 \\ \downarrow \\ 12 + 12 \\ \downarrow \\ \textcircled{24} \end{array}$$

c.) $12 \div 4 + 5 \times 2 - 24 \div 6$



$$\begin{array}{l} \downarrow \\ 3 + 5 \times 2 - 24 \div 6 \end{array}$$

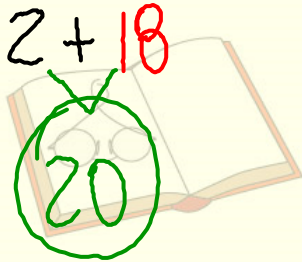
$$\begin{array}{l} \downarrow \\ 3 + 10 - 24 \div 6 \end{array}$$

$$\begin{array}{l} \downarrow \\ 3 + 10 - 4 \\ \downarrow \\ 13 - 4 = \textcircled{9} \end{array}$$

The order of operations can be changed by using grouping symbols such as parentheses () and brackets [].

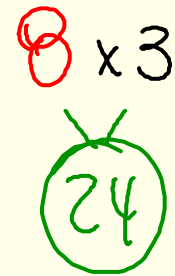
For example, the value of the expression $(2 + 6) \times 3$ changes with and without the parentheses:

$$2 + 6 \times 3$$



$2 + 18$
 20

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



8×3
 24

The order for performing the operations in an expression is summarized as follows:

1. Do all operations within grouping symbols first. Start with the innermost grouping symbols.
2. Next, do all multiplications and divisions from left to right.
3. Then, do all additions and subtractions from left to right.



In algebra, there are many ways to indicate multiplication & division.

A raised dot or parentheses can be used to indicate multiplication:

$$8 \cdot 7 \implies 8 \times 7$$

$$3(4), (3)4, \text{ or } (3)(4) \implies 3 \times 4$$

A fraction bar can be used to indicate division:




$$\frac{26 - 2}{4 + 8} \implies (26 - 2) \div (4 + 8)$$

Example: Find the value of each expression.

$$\begin{aligned}
 &4(2 + 6) - 2 \cdot 3 \\
 &\quad \downarrow \\
 &4(8) - 2 \cdot 3 \\
 &\quad \downarrow \\
 &32 - 2 \cdot 3 \\
 &\quad \quad \downarrow \\
 &32 - 6 \\
 &\quad \quad \downarrow \\
 &\quad \quad (26)
 \end{aligned}$$



Example: Find the value of each expression.

$$\begin{aligned}
 & 3[(7 + 5) \div 4(2)] \\
 & 3[12 \div 4(2)] \\
 & 3[3(2)] \\
 & 3[6] \\
 & 18
 \end{aligned}$$


Example: Find the value of each expression.

$$\begin{aligned}
 & \frac{19 + 2}{11 - 8} = \frac{21}{3} = 7 \\
 & (19 + 2) \div (11 - 8) \\
 & 21 \div 3 \\
 & 7
 \end{aligned}$$
