**A numerical expression** is a mathematical phrase that contains only constants and/or operations.

To evaluate a numerical expression, you find its numerical value.

**Sample Problem 1**: **Find the value of each numerical expression.** **Follow the order of operations when finding each value.**

|  |  |  |
| --- | --- | --- |
| **a.** | $$12+10÷2-4=$$ | $$ 12+10÷2-4=$$$$=12+5-4=$$$$=17-4=$$$$=13$$ |
| **b.** | $$20÷10+6=$$ | $$ 20÷10+6=$$$$=2+6=$$$$=8$$ |
| **c.** | $$12\*2-6÷3=$$ | $$ 12\*2-6÷3=$$$$=24-2=$$$$=22$$ |

**A variable expression** is a mathematical phrase that may contain variables, constants, and/or operations**.**

**A variable** is a letter that is used to represent one or more numbers. The letters $x and y$ are used very often as variables in algebra, but variables can be any letter$ (z, k, l, m, k )$.

Any number not joined to a variable is called **a constant.** It’s called that because its value doesn’t change, even if the value of the variable changes.

Each algebraic expression is made up of **terms**.

A term can be a signed number, a variable, or a constant multiplied by a variable or variables.

Each term in an algebraic expression is separated by a + sign or a – sign.

When a term is made up of a constant multiplied by a variable or variables, that constant is called **a coefficient.**

**Example: Coefficient** $ 5x+7$ **Constant**

 **Variable**

The terms having the same algebraic factors are called **like terms.**

The terms having different algebraic factors are called **unlike terms.**

Expression with one term is called **a monomial,** with two unlike terms is called **a binomial,** in general, an expression with one or more than one term (with nonnegative integral exponents of the variables) is called **a polynomial.**

**Sample Problem 2: Find the terms, constant/s and coefficient/s for each expression.**

|  |  |  |
| --- | --- | --- |
| **a.** | $$2x-10$$ | $$Terms: 2x and 10$$$$Variable: x $$$$Constant: 10$$$$Coefficient: 2$$ |
| **b.** | $$x+4y+32$$ | $$Terms: x , 4y ,and 32$$$$Variable: x ,y $$$$Constant: 32$$$Coefficients: 1 and 4$ |

Expressions are like instructions that tell you what you have to do to a number or variable.

Expressions are used to write word problems in math terms.

**Sample Problem 3**: **Write an algebraic expression for each verbal phrase.**

|  |  |  |
| --- | --- | --- |
| **a.** | A number minus 10 | $$x-10$$ |
| **b.** | The product of a number and 6 | $$x\*6$$ |
| **c.** | 12 less than a number | $$x-12$$ |
| **d.** | 16 plus a number | $$16+x$$ |
| **e.** | The sum of $ n$ and 8, divided by 4 | $$(n+8)÷4$$ |
| **f.** | 4 more than 2 times a number | $$4+2x$$ |

***Substituting Values into Algebraic Expressions***

To evaluate an algebraic expression, you substitute values for the variables and then simplify the resulting numerical expression.

**Sample Problem 4**: **Evaluate each expression using the values given.**

|  |  |  |
| --- | --- | --- |
| **a.** | $x+y $$when x=2 and y=6$ | $ x+y= $$when x=2 and y=6$$$=2+6=$$$$=8$$ |
| **b.** | $$3x-4y when x=7 and y=1$$ | $ 3x-4y= $$when x=7 and y=1$$$=3\*7-4\*1=$$$$=21-4=$$$$=17$$ |
| **c.** | $$10a-4(2+b) $$$$when a=7 and b=2$$ | $ 10a-4\left(2+b\right)= $$when a=7 and b=2$$$=10\*7-4\left(2+2\right)=$$$$=70-4\*4=$$$$=70-16=$$$=54 $ |

**Sample Problem 5: If** $a=8$**,** $b=3$**, and** $c=6$**, evaluate the following by substituting these values into the following expressions.**

|  |  |  |
| --- | --- | --- |
| **a.** | $$a+4b÷c= $$ | $$ a+4b÷c=$$$$=8+4\*3÷6=$$$$=8+12÷6=$$$$=8+2=$$$$=10$$ |
| **b.** | $$4a+2bc-3= $$ | $$ 4a+2bc-3=$$$$=4\*8+2\*3\*6-3=$$$$=32+36-3=$$$$=32+33=$$$$=65$$ |
| **c.** | $$\frac{3a+2b}{c}=$$ | $$ \frac{3a+2b}{c}=$$$$=\frac{3\*8+2\*3}{6}=$$$$=\frac{24+6}{6}=$$$$=\frac{30}{6}=$$$$=5$$ |