07

Algebraic Expression

Topic: Algebra
Theme: Algebraic Expressions in one variable
Abilities: Acquisition of an understanding on how Algebraic Expressions in one variable (x) are being formed / Be able to "construct" and "deconstruct" an algebraic expression, by following an out-of-the box, non-formal methodological path.
Material: Matches; Tables provided within this document
Level: Age 13-14

Math Reality

Algebraic expression

In mathematics, we use letters or symbols to represent quantities that constantly change. Those letters or symbols are called **VARIABLES.**

For instance, the distance covered by a car moving at a speed of 130 kilometres per hour is given by the algebraic expression $S=130t$ This implies that for different inputs in the place of time (variable t) we estimate different values for distance.

We call **ALGEBRAIC EXPRESSIONS** any mathematical expression that includes operations with numbers and variables.

e.g. $y = 3x + 5$, [Note: $3x$ implies that 3 is multiplied by x]

On the other hand, we call **NUMERICAL EXPRESSION** any series of numbers linked with the symbols of operations (+, -, x, ÷, etc.).

$8x + 12$ (algebraic expression with variable x)

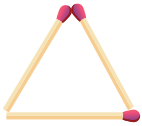
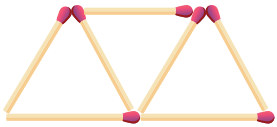
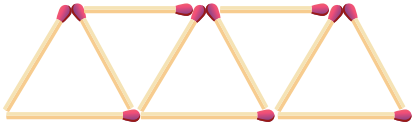
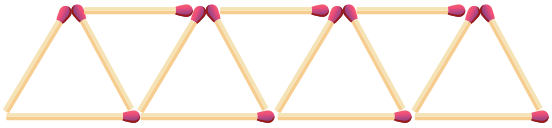
$2x + 3y + 5$ (algebraic expression with variables x,y)

$\frac{5^3}{5}$ (numerical expression)

1 | Fill in the Table below to visualize the task.

The table below is being composed of three columns: the first column depicts a triangular pattern made of matches; the second column should give the length of the pattern depicted in the first column whilst the third column should give the corresponding number of matches needed for the creation of the pattern depicted in the first column.

As you might have observed when filling in the table, based on the length of each pattern we count different number of matches. In other words, the number of matches depends on the length of the pattern.

PATTERN	LENGTH OF THE PATTERN (L)	NUMBER OF MATCHES
	1	3
		
		
		
	VARIABLE « L »	

2 Comprehend the general task.

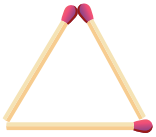
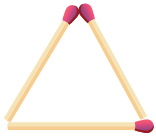
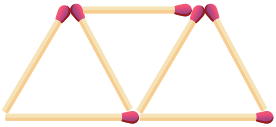
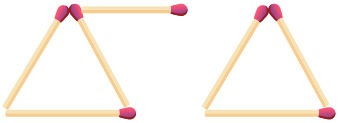
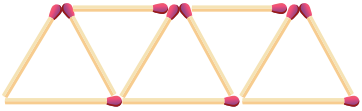
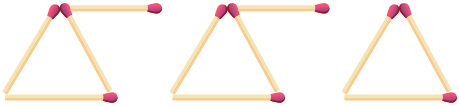
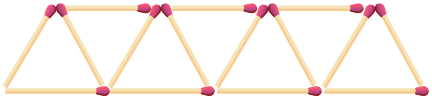
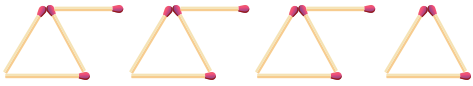
Your target now is to create an algebraic expression which will give the number of matches (output) for ANY value of length (input) we might enter/introduce at each time.

Let's suppose that the English letter "L" symbolizes the variable "Length of the pattern" since the length of the pattern constitutes a quantity that constantly changes.

You can go through the following methodological process which will assist you to come up with a general formula

3 Methodological process

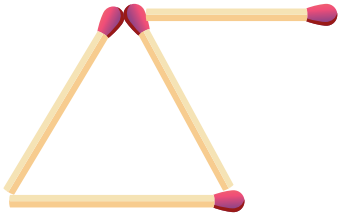
What if we try to visualise the patterns depicted within the previous table in an alternative way. This 'altearnative' way of depiction, presented within the following table, will help you to systematize the solution of the task:

COLUMN A : PATTERN	COLUMN B : ALTERNATIVE WAY OF DEPICTING THE PATTERNS OF COLUMN A
	
	
	
	

Subsequently, let's have a look at column B. A careful observer will soon realise that in column B we have worked in a specific, systematised way: we have basically divided the patterns of column A into smaller parts, of which the basic component is being depicted below

QUESTION 1:

How many matches are you counting in the basic component?



BASIC COMPONENT OF A PATTERN

QUESTION 2:

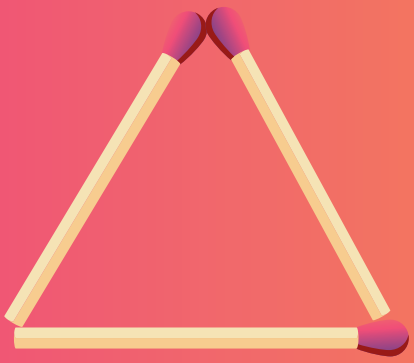
How many times is the basic component repeated in each of the cases?
Use the Table that comes after the TIP to record your answers.
Don't forget to consider the TIP below while recording your answers.

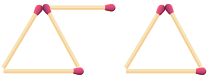
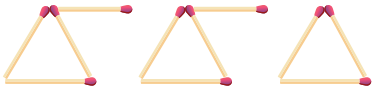
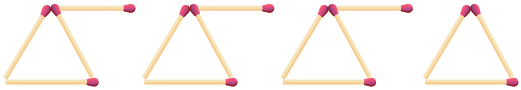
TIPS

As you can see in Column B of the previous table, all the patterns end up with a triangle.

This triangle is obviously missing one match if we compare it with what had been defined as "basic component of the pattern".

NB : we may also consider it as a basic component by necessarily subtracting one unit (-1) in our final algebraic expression.



PATTERN	NUMBER OF REPETITIONS OF THE BASIC COMPONENT OF THE PATTERN	VALUE OF VARIABLE L
	DON'T forget to consider the final triangle as one of the répétitions in each case	Write the value of L for each case
		
		
		
		

QUESTION 3:

Can you identify a systematic correlation between the number of repetitions of the basic component of a pattern and the variable "L"?

QUESTION 4:

Consider your answers in the previous questions (1-4). You are now ready to form the requested algebraic expression which gives the final number of matches for ANY value of length (input) we might introduce at each time.

QUESTION 5:

In this case, the algebraic expression which gives a correlation between the number of matches and the length of the pattern (L) is the following:

number of matches = 3 + 4L

Find a pattern, using the matches, in order to express the following algebraic expressions:

- Number of matches = 2 + 3L
- Number of matches= 2 + 2L