

# UNIT 3. POLYNOMIALS

(3º ESO)

## HISTORY

### **The first steps: rhetorical algebra**

Algebraic problems of a particular nature were present in all ancient civilisations. They were concerned with activities such as distribution, inheritances and calculating areas.

The ancient Mesopotamians and the Egyptians practised a 'rhetorical' algebra, using everyday language. We can see evidence of this in ancient texts. Egyptians called the unknown quantity in algebra 'Aha'.

### **The first symbols: syncopated algebra**

In the 3<sup>rd</sup> century, Diophantus of Alexandria, sometimes called 'the father of mathematics', was one of the first mathematicians to use symbols for common operations and to represent unknown values. This system was called 'syncopated algebra'. Although the symbols were rudimentary, improving them and systemizing algebraic techniques significantly advanced the language of algebra.

### **The arrival of 'symbolic algebra'**

Algebra developed at different rates throughout Europe. There were some notable algebraists in Italy during the 16<sup>th</sup> century. Towards the end of the 16<sup>th</sup> century, François Viète, a French mathematician, developed the use of letters in equations. This formed the base of the modern algebra that we use today.

The French philosopher Descartes expanded on this work in the 17<sup>th</sup> century.

## HOW APPEARED THE X IN MATHS?

### **Al – Khwarizmi, the Persian mathematician**

In the 9<sup>th</sup> century, Al-Khwarizmi wrote a manual that had great influence on the entire civilised world.

He called the unknown quantity in algebra *shay*, which was the Arabic word for *thing*. When his work was translated to Spanish it was translated to *xay*. This word eventually became abbreviated as *x*, which is now the universal symbol for the unknown quantity.

## VOCABULARY & EXPRESSIONS

**Monomial:** monomio

**Coefficiente:** coeficiente

**Literal part:** parte literal

**Degree:** grado

**Variables:** variables

**Similar:** semejantes

**Opposite:** opuesto

**Polynomial:** polinomio

**Fully simplified:** Reducido

**Term:** término

**Independent term:** término independiente

**Principal term:** término principal

**Opposite of a polynomial:** polinomio opuesto

**Numerical value:** valor numérico

**Root of a polynomial:** raíz del polinomio

**Taking out a common factor:** extraer factor común

**Notable identities:** identidades notables

**Square of a sum:** el cuadrado de una suma

**Square of a difference:** el cuadrado de una diferencia

**Sum times a difference:** suma por diferencia

**Divisor:** divisor

**Factorising a polynomial:** factorizar un polinomio

## PARTS OF MONOMIALS

Identify the parts of  $24x^3y^5t^8$

**Coefficient:** 24

**Literal Part:**  $x^3y^5t^8$

**Degree:**  $3 + 5 + 8 = 16$

Practise with the students and they have to explain you the different parts:

$8x^4y^6$ ;  $-25xyt^3$ ;  $x^4y^7z^2$

## OPERATIONS WITH MONOMIALS

**Addition and subtraction:**  $2x^2y + 3xy^2 - 5x^2y + xy^2 = -3x^2y + 4xy^2$

**Product:**  $-3x^3y^2t \cdot (-7x^4yt^3) = 21x^7y^3t^4$

**Quotient:**  $12x^7y^5z^3 : 2x^2y^4z = 6x^5yz^2$

The students can practice the vocabulary explaining you these operations:

a)  $-7x^3 + 6x^3$       b)  $3xy^3 + 9y^2 - 7xy^3 + 10y^2$       c)  $14x^3y^7 \cdot (-2xyt)$

d)  $35x^4y^7 : 7xy^2$       e)  $40x^2y - 5x^3y^4 \cdot x^3y^2 : 5x^4y^5$

## POLYNOMIALS

Identify, with the pupils, the different parts of a polynomial:

Polynomial	Principal Term	Independent Term	Degree
$-6x^2 + 3x - 11$	$-6x^2$	$-11$	2
$3x + 5x^3 - 4 + x^4$	$5x^3$	$-4$	4
$15x^7 + 3x^2$	$15x^7$	0	7
$-x^3 + 5x - 1$	$-x^3$	$-1$	3

## OPERATIONS WITH POLYNOMIALS

**Addition:**  $(6x^4 + 3x^2 + 1) + (x^5 - x^3 + 2x^2 - 3) = 6x^4 + 3x^2 + 1 + x^5 - x^3 + 2x^2 - 3 = x^5 + 6x^4 - x^3 + 5x^2 - 2$

**Subtraction:**  $(6x^4 + 3x^2 + 1) - (x^5 - x^3 + 2x^2 - 3) = 6x^4 + 3x^2 + 1 - x^5 + x^3 - 2x^2 + 3 = -x^5 + 6x^4 + x^3 + x^2 + 4$

**Product:**  $(x^2 - 3) \cdot (4x^5 - 3x^2) = 4x^7 - 3x^4 - 12x^5 + 9x^2 = 4x^7 - 3x^4 - 12x^5 + 9x^2$

The students can practice the vocabulary explaining you these operations:

a)  $(3x^2 - 4x + 1) + (2x + 5)$       b)  $(3x^2 - 4x + 1) + (2x + 5)$       c)  $(2x^2 - x + 5) \cdot (x^2 - 1)$

d)  $(3x - 4) \cdot (4x^2 + 2x - 1)$       e)  $3x \cdot (x^3 + 2x - 1) + 4x^4 - 3x$

## RIDDLE

**Think a number:** x

**Multiply it by 5:**  $5x$

**Add 1:**  $5x + 1$

**Multiply it by 2:**  $2(5x+1) = 10x + 2$       **The result is:** -1

**Subtract 12:**  $10x + 2 - 12 = 10x - 10$

**Divide it by 10:**  $(10x-10):10 = x - 1$

**Subtract the initial number:**  $x - 1 - x = -1$

