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UNIT 8: ALGEBRA

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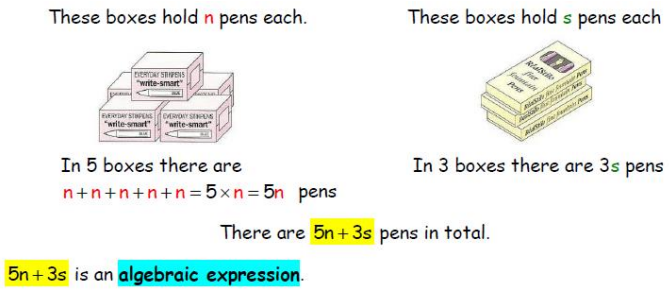
1. Letters instead of numbers

You can describe everyday situations using algebra. In **algebra**, you use letters to represent unknown numbers.
An algebraic expression has numbers and letters linked by operations. The letters are called **variables**. Every addend is called **term**.
The expression **5n+3s** has two terms: 5n and 3s.



a. Algebraically express sentences

We can use a letter to represent a number whose value we do not know, operate with it and associate it with other numbers. Algebraic expressions are useful to solve problems.
Example: How? Just translating the sentences to algebraic expressions:

- Francisco is twice as much old as his son Pedro: **2x**
- Marta is 5 years older than her husband: **x + 5**
- Luisa's mother is three times older than Luisa: **3x**
- Juan´ sister is one year younger than Juan: **x – 1**
- Two fifths of my income: $\frac{2}{5}x$
- The cube of a number times the number plus eight: $x^3 \cdot (x+8)$
- The sum of two squared numbers: $a^2 + b^2$
- The squared of two numbers sum: $(x+y)^2$

Exercise 1. Let **x** represent a number. Write the following sentences using algebraic expressions:

a) The number plus seven:
b) One more than the number:
c) Two less than the number:
d) The number times four:
e) The number times three plus five:
f) The number times two minus eight:
g) Half of the number:
h) A third of the number plus nine:

Exercise 2. Write in algebraic language:

a) The product of two consecutive numbers:
b) An even number:
c) An odd number:
d) The square root of two numbers difference:
e) The perimeter of an equilateral triangle:
f) The volume of a cube:
g) The area of a rectangle whose length is twice its width:
h) The area of a rectangular plot of land whose length is 5 meters less than triple its width:
i) The side of a square whose perimeter is 10 meters long:

Exercise 3. Lee, reflexiona y contesta:

a) Llamando x a la edad de Enrique, escribe una expresión para cada apartado.

b) Sabiendo que Enrique tiene 12 años, ¿cuántos tienen Jacinto, Laura y Rosa?

La edad de Enrique	x
La edad que tenía Enrique el año pasado.	
La edad que tendrá Enrique dentro de dos años.	
La edad de Jacinto, que tiene 3 años más que Enrique.	
La edad de Laura, que tiene el doble de años que Jacinto.	
La edad de Rosa, que es la tercera parte de la edad de Laura.	

b. Numerical value of an algebraic expression

The numerical **value** of an algebraic expression is its value when you replace the letters with numbers. You can find the value of an algebraic expression when you know the value of the letters used.

Example: Find the value of $20x+15y$ when $x=5$ and $y=8$.

We substitute the values of x and y in the expression:

$$20\cdot 5+15\cdot 8=100+120=220$$

Exercise 4. Find the value of these algebraic expressions when p=3, q=5 and r=6:

a) $\frac{4p+r}{2}$ e) $6-2r$ i) $r+pq$ n) pqr

o) $2(3q+1)$ q) $pq-3r$ t) $4+3p$ u) $pr-2q$

Exercise 5. Find the value of these expressions when p= - 2

a) p^3 b) $3p^2$ c) $(3+p)^2$ d) $3+p^2$ e) $\frac{2p^2}{10}$

Exercise 6. Calculate the value of each expression if x = $\frac{1}{2}$ and y = -2.

a. $5x + 4 = 5\cdot\frac{1}{2}+4=\frac{5}{2}+4=\frac{5}{2}+\frac{8}{2}=\frac{13}{2}$

b. 8 - 5y =

c. $\frac{1}{3}x-y^2=$

d. $xy-5y+7=$

2. Algebraic expressions

Algebraic expressions take place when translating situations, which include unknown variables or data represented by letters, into mathematical language.

a. Monomials

i. Definition

A **monomial** is an algebraic expression containing one term which may be a number, a variable or a product of numbers and variables, with no negative or fractional exponents.

For example: $\frac{2}{3}a^2b$, x^2 , $-2xy$, 13 , $520x^2y^4$ are monomials

x^{-1} , $x^{\frac{1}{2}}$ are NOT monomials

Exercise 7. Indicate if the several couples or monomials are like or not.

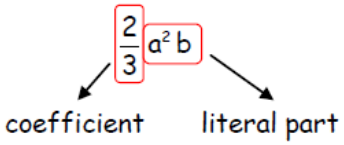
a. $45a^2$ y $3ab^2$ → Non like

b. $-34x^4$ y $3x^4$

c. $5x^3y$ y $6yx^3$

ii. Parts of a monomial (coefficient, literal part, degree)

The number is called **coefficient** and the variables are called **literal part**.
The **degree** is the sum of the exponents of every variable



the degree of $\frac{2}{3}a^2b$ is $2+1=3$

Exercise 8. For every monomial write the coefficient, the literal part and the degree:

Monomial	$5x$	$0.3x^4$	$-\frac{1}{9}x^2y$	$\frac{1}{8}xy$	$-\frac{3}{7}x^2y^3$	$-x^2y^4$
Coefficient						
Literal part						
Degree						

iii. Similar monomials

Two monomials are **similar** when having the same literal part.

Exercise 9. Complete the table:

Monomial	-3x	5	$3ab^2$	$\frac{1}{2}x^2y^3$	$-x^4$
Coefficient					
Literal part					
Degree					
Similar monomial					

b. Polynomials

i. Definition

A **polynomial** is the sum (or subtraction) of several monomials. The **degree of a polynomial** is the summand of the highest degree.

polynomial : $5y^2 + 8y - 6$
term 1 : $5y^2$ **degree :** 2
term 2 : $8y$ **degree :** 1
term 3 : -6 **degree :** 0
degree of the polynomial is 2

c. Operations

i. Adding and subtracting monomials and polynomials.

You can add or subtract monomials only if they have the same literal part, that is, if they are **similar terms**. In this case, you sum or subtract the coefficients and leave the same literal part.

Examples: $4xy^2 + 3xy^2 = 7xy^2$ $\qquad 5x^2 + 3 - 2x^2 - 1 = 3x^2 + 2$

Exercise 10. Simplify these algebraic expressions.

a) $a+a+a+a$ b) $m+m-m$ c) $x+x+y+y+y$ d) $4a+3a$

e) $9x-5x$ f) $6a+2a-5a$ g) $10x-3x-x$ h) $8a^2-3a^2-a^2$

Exercise 11. Remove brackets and simplify.

a) $5x^2-(2x+x^2)$ b) $3x-(x-x^2)$ c) $x^2-(3x-x^2)$

d) $(x^2+x)+(3x+1)$ e) $(5x^2-4x)-(2x^2+2x)$ f) $(4x^2-5x)-(2x^2+2)$

Exercise 12. At a pick-your-own fruit farm, Lucy picks n apples. Mary picks 5 more apples than Lucy. Nat picks 3 times as many apples as Mary.

a. Write in terms of n, the number of apples Mary picks.
b. Write in terms of n, the number of apples Nat picks.

Exercise 13. Jake is n years old.
Jake's sister is 4 years older than Jake.
Jake's mother is 3 times older than his sister.
Jake's father is 4 times older than Jake.
Jake's uncle is 2 years younger than Jake's father.
Jake's grandmother is twice as old as Jake's uncle.

Jake	Sister	Mother	Father	Uncle	Grandmother
					
n					

a) Copy the table and write each person's age in terms of n.
b) Find, in terms of n, how much older Jake's grandmother is than his mother. Give your answer in its simplest form.

ii. Multiplying monomials

The product of two monomials is always another monomial.

- $(2x)\cdot(4y) = 2\cdot x\cdot 4\cdot y = 2\cdot 4\cdot x\cdot y = 8xy$
- $(-2a)\cdot(5a) = (-2)\cdot a\cdot 5\cdot a = (-2)\cdot 5\cdot a\cdot a = -10a^2$
- $\left(\frac{1}{3}x\right)\cdot(6xy) = \frac{1}{3}\cdot x\cdot 6\cdot x\cdot y = \frac{1}{3}\cdot 6\cdot x\cdot x\cdot y = \frac{6}{3}x^2y = 2x^2y$

iii. Multiplying a monomial by a polynomial

If one of the factors is a sum of monomials, distribute the monomial through the brackets. Multiply all the terms inside the bracket by the term outside is called **expanding the bracket**.

- $3x(4x^2+10) = 3x\cdot 4x^2 + 3x\cdot 10 = 12x^3 + 30x$
- $-2x(3x^4 - 5y) = -6x^5 + 10xy$

iv. Dividing monomials

When you divide two monomials you can get a number, a monomial or an algebraic fraction.

- $(2a):(8a) = \frac{2a}{8a} = \frac{2}{8}\cdot\frac{a}{a} = \frac{1}{4}\cdot 1 = \frac{1}{4}$
- $(12x^2y):(-4xy) = \frac{12x^2y}{-4xy} = \frac{12}{-4}\cdot\frac{x^2}{x}\cdot\frac{y}{y} = -3x$
- $(-10xy):(-2y^2) = \frac{-10xy}{-2y^2} = \frac{-10\cdot x\cdot \cancel{y}}{-2\cdot y\cdot \cancel{y}} = \frac{5x}{y}$

Exercise 14. Multiply the following monomials

a) $x\cdot 2x$ b) $a^3\cdot a^2$ c) $3a\cdot 4a^2$ d) $(2a)\cdot(-4ab)$

e) $(-xy^2)\cdot(3x^2y)$ f) $(5a^2)\cdot(2ab)$ g) $(3a^2b^3)\cdot(a^2b)$ h) $\left(\frac{3}{5}x^2\right)\cdot\left(\frac{2}{9}x^4\right)$

Exercise 15. Divide the following monomials.

a) $x^2 : x$ b) $a^5 : a^2$ c) $b^4 : b^4$ d) $x^2 : x^3$

e) $m^2 : m^5$ f) $10x^4 : (-5x)$ g) $6a^2 : 9a^5$ h) $12x^2 : (-4x^2)$

Exercise 16. Simplify these algebraic fractions.

a) $\frac{10x}{5x^3}$ b) $\frac{3ab}{9a^2}$ c) $\frac{4a^2b}{8ab^2}$ d) $\frac{2ab}{10a^2b^2}$

Exercise 17. Reduce the following expressions:

a. 6x - 5x + x =
b. $2x + x + y - \frac{1}{3}y =$
c. $3\cdot(x - 4y) - 2x =$
d. $(3a + b) - (a + 2b) =$
e. $(-2)\cdot(-5b) =$
f. $-\frac{1}{2}\cdot 8x^3 =$
g. $5\cdot(2x - y) - 3x =$
h. $\frac{1}{3}\cdot(9x + 12) + 4\cdot(4x - 1) =$

3. Equations

a. Equations and identities

- An **identity** is true for all values of x. For example:

$x(x+1) \equiv x^2 + x$ Whatever value of x you try, this statement is always true.

$\equiv$ means 'is identical to'

- An **equation** is an expression showing the equality of two algebraic expressions. This equality **is true only when certain values are assigned to the letters.**
  For example, the equation: $x + 6 = 2x + 1$ is true only when $x = 5$, since $5 + 6 = 2\cdot 5 + 1$.

- A **formula** describes the relationship between two or more variables.

For example: the formula for the area of a triangle is $A = \frac{1}{2}bh$

Exercise 18. Decide if each of these statements is an identity, an equation or a formula.

a) $x^3 - 2x = x(x^2 - 2)$ b) $3x - 1 = 17$ c) $A = \pi r^2$

b. Elements of an equation

- On each side of the equal sign in an equation there is an **expression.**
- The summands that form the expressions located at both sides are called **terms**.
- The letters are called **unknowns**.
- The values for which the equation is true are called **solutions**.

c. First techniques for solving equations

The **solution** of an equation is the set of values which, when substituted for unknowns, make the equation a true statement:

$x+5=8 \Rightarrow \underline{\underline{x=3}}$ $\quad 3x=15 \Rightarrow \underline{\underline{x=5}}$ $\quad 2x+1=9 \Rightarrow \underline{\underline{x=4}}$

In an equation the equals sign shows that the sides balance. To solve an equation you must always keep the balance.

$$\begin{aligned} x+3&=-2 \\ x+3-3&=-2-3 \\ x&=-2-3 \\ x&=-5 \end{aligned}$$

Tip: we "leave out" the first step and we say: terms can "move" from the left-hand side to the right-hand side (and vice versa) by changing their sign.

$$\begin{aligned} x+3&=-2 \\ x&=-2-3 \\ x&=-5 \end{aligned}$$

$$\begin{aligned} 3x&=15 \\ \frac{3x}{3}&=\frac{15}{3} \\ x&=5 \end{aligned}$$

Tip: we "leave out" the first step and we say: the number that is multiplying on one side "is moved" to the other side and its terms are divided by it (and vice versa).

$$\begin{aligned} 3x&=15 \\ x&=\frac{15}{3} \\ x&=5 \end{aligned}$$

$$\begin{aligned} 6x-7&=3x+5 \\ 6x-3x&=5+7 \\ 3x&=12 \\ x&=\frac{12}{3} \\ x&=4 \end{aligned}$$

You want all the x terms on one side of the equation and all the number terms on the other side.

$$\begin{aligned} 7-(1-3x)&=12 \\ 7-1+3x&=12 \\ 3x&=12-7+1 \\ 3x&=6 \\ x&=\frac{6}{3} \\ x&=2 \end{aligned}$$

Exercise 19. Solve each of these equations:

a) $5x-4x=9$

b) $3x+6=2x+13$

c) $(2x-1)-1=5(3x-2)+3$

d) $5(x-1)-3(3x-2)=2$

e) $\frac{5x}{2}=10$

f) $\frac{x}{2}+\frac{5x}{2}=9$

g) $\frac{9}{2x}=3$

h) $\frac{x+4}{x}=3$

d. Equations with parentheses and denominators

1º Remove the **parenthesis**: we multiply the coefficient previous to the parenthesis by all the elements it contains. This coefficient can be a negative sign (like –1, the content changes sign), a positive sign (like +1, the content does not change) or a positive or negative number or fractions (this number multiplies everything in the parentheses, changing the signs whenever it is negative).

2º When there are **denominators**, we have to remove them (common multiple of the denominators).

3º Transpose the terms from one side to the other side.

4º Find the solution.

$$-4(3-x)-(-3-5x)=2(x-3x-1)$$

Solución:

$$-12+4x+3+5x=2x-6x-2\Rightarrow$$
$$\Rightarrow 4x+5x-2x+6x=-2+12-3\Rightarrow$$
$$\Rightarrow 13x=7\Rightarrow x=\frac{7}{13}$$

$$-\frac{11x}{2}+\frac{14}{6}-1=\frac{1}{4}+\frac{1}{8}$$

Solución:

m.c.m(2,4,6,8) = 24. Entonces:

$$-\frac{11x\cdot 12}{24}+\frac{14\cdot 4}{24}-\frac{1\cdot 24}{24}=\frac{1\cdot 6}{24}+\frac{1\cdot 3}{24}\Rightarrow -\frac{132x}{24}+\frac{56}{24}-\frac{26}{24}=\frac{6}{24}-\frac{3}{24}\Rightarrow$$
$$\Rightarrow -132x+56-26=6-3\Rightarrow 132x=-27\Rightarrow x=-\frac{27}{132}=-\frac{9}{44}$$

$$\frac{3(x-4)}{2}+\frac{5(2x+1)}{3}=\frac{2x}{4}$$

Solución:

m.c.m(2,3,4) = 12. Entonces:

$$\frac{3(x-4)\cdot 6}{12}+\frac{5(2x+1)\cdot 4}{12}=\frac{2x\cdot 3}{12}\Rightarrow 18(x-4)+20(2x+1)=6x\Rightarrow$$
$$\Rightarrow 18x-72+40x+20=6x\Rightarrow 18x+40x-6x=72-20\Rightarrow$$
$$\Rightarrow 52x=52\Rightarrow x=\frac{52}{52}=1$$

e. Solving problems through equations

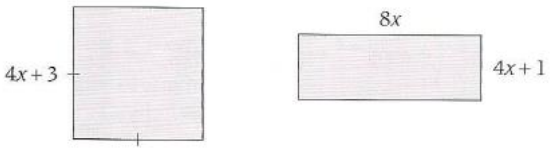
Equations are useful tools that can help you to solve problems.

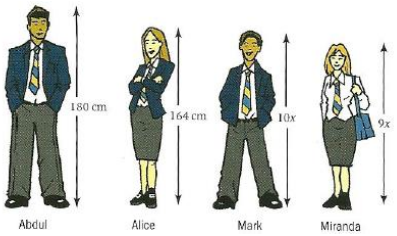
Example: Watch the steps taken.

In a pride of 13 lions, there are 3 more females than there are males. How many lions and how many lionesses are there?

Step 1:Identify the known and unknown numbers: *Lions→x* *Lionesses→x+3* *Total →13*	*Step 2: Use an equal sign to state the relationship between the components of the problem.* *Lions + lionesses = 13* *x + (x + 3) = 13*
Step 3: Solve the equation: *x + x + 3 = 13* *2x = 13 - 3* *2x = 10 → x = 10/2 → x = 5*	*Step 4: Give a solution:* *Lions →x=5* *Lionesses→ x + 3 = 5 + 3 = 8* *Solution: There are 5 lions and 8 lionesses.*

Exercise 20. The perimeters of these two shapes are equal. What are the dimensions of each shape?





Exercise 21. Abdul is 180 cm tall and Mark is 10x cm tall. Alice is 164 cm tall and Miranda is 9x cm tall. The difference in height between the two boys is equal to the difference in height between the two girls. How tall are Mark and Miranda?

Exercise 22. You have $60 and your sister has $120. You are saving $7 per week and your sister is saving $5 per week. How long will it be before you and your sister have the same amount of money?

Exercise 23. Karen is twice as old as Lori. In three years' time, the sum of their ages will be 42. How old is Karen?

Exercise 24. What are two consecutive integers, such that seven times the larger minus three times the smaller is 95?

Exercise 25. Christina and Julia were running for mayor in a small town. Christina received thirty percent of the votes. Julia received four thousand, sixty votes. How many votes were cast in the town, assuming that everybody in the town voted for either Christina or Julia?

Exercise 26. In each case, write an equation and solve it to find the starting number.

a) I think of a number, multiply it by 8 and subtract 2. I get the same answer as when I multiply this number by 2 and add 10.

b) I think of a number, multiply it by 5 and add 3. I get the same answer as when I multiply it by 2 and subtract it from 24.

c) Taking double a number from 11 is equal to taking treble that number from 14.

Exercise 27. If the larger of two numbers were decreased by three hundred forty-nine, then the two numbers would be the same. The sum of the two numbers is 735. What are the numbers? *Hint: the larger number is "x" and the other one is " 735-x"*

Exercise 28. Kyle lives twenty-nine miles from work. During the summer, she rides her bike at six mph to the metro station. She then takes the metro to work, which travels at thirty-three mph. If she spends six minutes less on the metro than on her bike, how long does she take to go to work?
Hint: Let "x" be the time she rides her bike.

Exercise 29. There are 31 people in a cafe. How many men and how many women are in the café if there are 5 more men than women?

Exercise 30. If you add thirteen to two times a number, you obtain a result of 99. What is the number?

Exercise 31. A bowl of cream costs eighty cents more than a pasty. Maria and Felisa bought one bowl of ice cream and two pasties for a total of €4.40. How much does a pasty cost? How much does a bowl of ice cream cost?

Exercise 32. A box of figs weighs one kilo more than a box of strawberries. Together three boxes of strawberries and two boxes of figs weigh 12 kg. How much does each box weigh?

Exercise 33. Calculate the dimensions of a rectangular plot of land, given that the plot's length is 20 meters more than its width and the fence that surrounds the plot is 240 meters long.

Exercise 34. Express algebraically:

a. Double a number plus four
b. Double the sum of a number plus four
c. The third part of the square of a number
d. The sum of two consecutive numbers
e. The cube of the sum of two numbers
f. The difference of the squares of two numbers

Exercise 36. Complete the table:

Monomial	Coefficient	Literal Part	Degree
$-3x^2y$			
xy			
$2x^3$			
$-y$			

Exercise 37. Simplify the following operations with monomials:

a. $-2xy^2 - 3xy^2 =$

b. $-2x \cdot 3xy^2 =$

c. $3xy - 2xy^2 - 2xy =$

d. $-6x^3 : (-3x) =$

e. $-2x \cdot 3yx^2 =$

f. $-2x^3y^2 : xy^2 =$

g. $2x \cdot (3x^2 - x + 2) =$

h. $2 \cdot (2x - 3y) =$

Exercise 38. Solve the following simple equations:

a. $2x - 34 = -20$ **b.** $9x + 8 = 7x + 6$ **c.** $4x + 3 = 3x + 5$

d. $x - 8 = 2x - 11$ **e.** $6x + 6 = 4 + 8x$ **f.** $2x + 3 = 3x$

g. $4x + 1 = 3x + 3$ **h.** $1 + 8x = -16x + 31$ **i.** $12x - 48 = -15x - 30$

j. $10 - 5x = x - 2$ **k.** $48 - 3x = 5x$ **l.** $10x - 15 = 4x + 27$

m. $60x - 1 = 3(1 + 12x)$ **n.** $2x + 3(2x - 1) = x + 67$ **o.** $3(x + 4) = 4x + 1$

p. $2(3 - 4x) = 2x - 9$ **q.** $10 - 9x = 4(x - 4)$ **r.** $x + 3 = 3(2x - 4)$

Exercise 39. Solve the following equations with denominators:

a. $\frac{3x}{2} + 2 = x + 4$ **b.** $x - 8 = \frac{x}{2} - \frac{x-6}{3}$

c. $\frac{9x}{4} - 6 = \frac{2x}{3} + \frac{1}{3}$ **d.** $\frac{5x}{6} - \frac{3x}{4} = x - 11$

e. $\frac{3x}{5} - 7 = \frac{2x}{6} + 1$ **f.** $x - 10 = \frac{5}{9}(x - 6)$

g. $\frac{x}{3} + x = 10 + \frac{2x}{9}$ **h.** $\frac{3x}{2} + 1 = 12 - \frac{x}{3}$

i. $\frac{x}{5} + \frac{x}{2} = x - 3$ **j.** $4x - 7 = \frac{5x - 6}{4}$

k. $\frac{x+2}{3} = 5x - 4$ **l.** $\frac{x}{3} + 10 = \frac{x}{5} + 16$

m. $\frac{x}{4} + \frac{3x}{6} + x = 21$ **n.** $\frac{x}{4} - \frac{13}{6} = \frac{5x}{2} - \frac{5}{6}$

Exercise 40. Find two numbers knowing that one exceeds the other by 6 units and their sum is 40.

Exercise 41. If two numbers are such that one is four times the other and their sum is 125. What are those numbers?

Exercise 42. Chocolates are distributed among three children. To the 2nd they give double that to the first and to the third triple that to the second. If the total is 18 chocolates. How many chocolates do you give each child?

Exercise 43. In a classroom there are twice as many girls as boys and half as many adults as boys. If there are 35 people in total, how many children and adults are there?

Exercise 44. En una reunión hay 4 veces más niños que mujeres y de hombres 3 veces más que la mitad de mujeres. Si en total hay 91 personas ¿Cuántos niños, mujeres y hombres hay?

Exercise 45. En un avión viajan el cuádruple de hombres que de mujeres y la mitad de niños que de mujeres, en total viajan 165 personas. ¿Qué número corresponde a cada tipo de persona?

Exercise 46. Un hombre legó su fortuna de la siguiente manera: la mitad para su esposa, la tercera parte para su hijo, la octava parte para su sobrina y 180 € a una institución benéfica ¿Cuánto dinero poseía?

Exercise 47. En una clase hay niños de 13, 14 y 15 años. De 14 años hay el doble que de 15 años y de 13 años el triple que de 14. ¿Cuántos niños hay de cada edad si en total hay 27 alumnos?

Exercise 48. En un autobús viajan triple número de mujeres que de niños y doble número de hombres que de mujeres y niños juntos. En total viajan 60 personas. Calcula cuántos niños mujeres y hombres viajan en dicho autobús.

Exercise 49. Luis is 16 years older than Manuel and in 4 years he will be double. How old is each one?

Exercise 50. Juan's sister is 13 years older than him and in 6 years he will be twice. How old is each one?

Exercise 51. Un padre tiene 25 años más que su hijo y dentro de 5 años tendrá el doble ¿Qué edad tiene cada uno?

Exercise 52. Ana tiene 7 años más que Pedro y hace 1 año tenía el doble ¿Qué edad tiene cada uno?

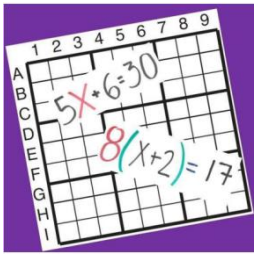
WORD SCRAMBLE

M	I	G	N	I	D	N	A	P	X	E	N
T	O	W	E	F	N	T	Y	S	E	V	L
E	S	N	N	O	Y	E	A	R	S	I	S
T	E	I	O	R	E	M	R	E	T	M	O
E	L	M	Y	M	B	E	R	E	O	T	L
H	B	E	R	U	I	W	R	I	L	R	U
L	A	B	E	L	F	A	O	G	A	U	T
R	I	T	I	A	L	M	L	E	E	E	I
S	R	A	S	P	O	L	N	D	A	D	O
S	A	H	A	E	I	I	S	N	O	W	N
H	V	R	O	W	L	O	L	D	I	S	H
E	T	N	E	I	C	I	F	F	E	O	C

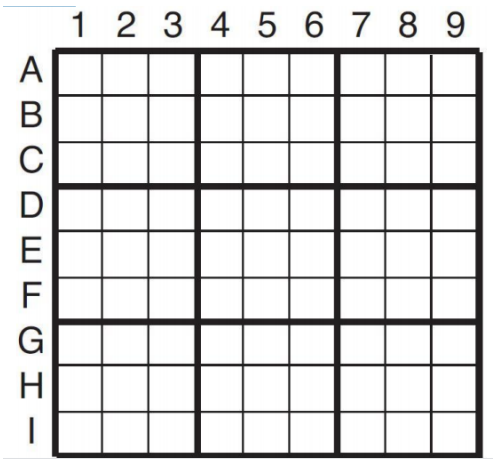
a) Every addend in an algebraic expression.
b) The letters in an algebraic expression.
c) An algebraic expression that has just one term.
d) In a monomial, the number is called _____.
e) The sum of the exponents of every variable in a monomial.
f) You can add or subtract monomial only if they have the same _____ _____. (2 words)
g) If you multiply all the terms inside the brackets by the term outside, then you are _____ brackets.
h) The set of values which, when substituted for unknowns, make the equation a true statement.
i) A first-degree equation is also called a _____ equation.
j) A _____ describes the relationship between two or more variables.

The letters not used in the word scramble make a word problem. Could you work it out?

SUDOMATES DE ECUACIONES



PRIMERA FASE:
Los alumnos deben rellenar algunas de las casillas de este tablero de SUDOKU completamente vacío, resolviendo las ecuaciones que aparecen en una tabla. La solución de estas ecuaciones se debe colocar en las casillas que se indican.



	ECUACIÓN		ECUACIÓN
A1	3a+4=a+18	A2	6 - 3(2p-4)= -18
A3	2c-3(c-4)=c+2	A6	0,5t - 3t+5=0
A9	4(1/4 +x)=5	B6	1- 6(y+3) = -23
B7	-2s -5 = -11	C1	4u -7 = 5 -2u
D3	-2x-13= -3x-5	D5	5z +2= 2z +5
D8	4y+9=-6y -5	E1	4s -2s =18
E6	2/3 + 3t/4 = 31/6	E8	7x-10=x+2
E9	-9 = p -14	F4	2(a+2)=3(a-1)
F7	4/6 = m/9	F8	2b +4=6a -32
G1	-4(x+6)= -40	G3	2x -7=20-x
G4	8y-(2y-3)=9	H4	2(8+p)=22
I2	3d - (d+4)= -2	I6	5c -3=2c +12
I8	3x -2 =16		

SEGUNDA FASE:
En la segunda fase, los alumnos deben acabar de rellenar las casillas, siguiendo las reglas clásicas de los SUDOKUS.

ECUSUDOKU

En esta ficha te proponemos resolver un sudoku de una manera distinta y aplicando lo aprendido sobre la resolución de ecuaciones de primer grado.
Vamos a llamar **ecusudoku** a un sudoku en el que cada una de las celdas que debemos rellenar se corresponde con la solución de una ecuación de primer grado.
Completa el siguiente ecusudoku donde tendrás que cambiar cada letra por el resultado de las ecuaciones de primer grado correspondientes.

5	3	H	E	7	F	I	B	A
6	D	A	1	9	5	C	H	F
B	9	8	C	H	A	G	6	D
8	G	I	D	6	B	H	A	3
4	A	E	8	G	3	D	I	1
7	B	C	I	2	H	F	G	6
I	6	B	G	C	D	2	8	H
A	F	D	4	1	9	E	C	5
C	H	G	A	8	E	B	7	9

A → $3 - 4x = 2x - 9$

B → $2(3x + 1) - 2x + 7 = x + 12$

C → $12 - (-2x + 5) = 4x + 1$

D → $\frac{x+3}{2} + \frac{2x-4}{5} = x$

E → $5(2x - 7) - (x - 2) = 3 + 3x$

F → $3(x - 7) = 5(x - 1) - 4x$

G → $3(2 - x) + 4 = 5 - (3x - 10) - x$

H → $\frac{12x}{3} + 2 = \frac{3x}{2} + 12$

I → $\frac{x-5}{4} - \frac{x-5}{36} = \frac{x-1}{9}$

Observa que sabrás si has resuelto de manera correcta las ecuaciones si el ecusudoku queda bien rellenado, es decir, en cada fila, columna o caja aparecen todos los números del 1 al 9.