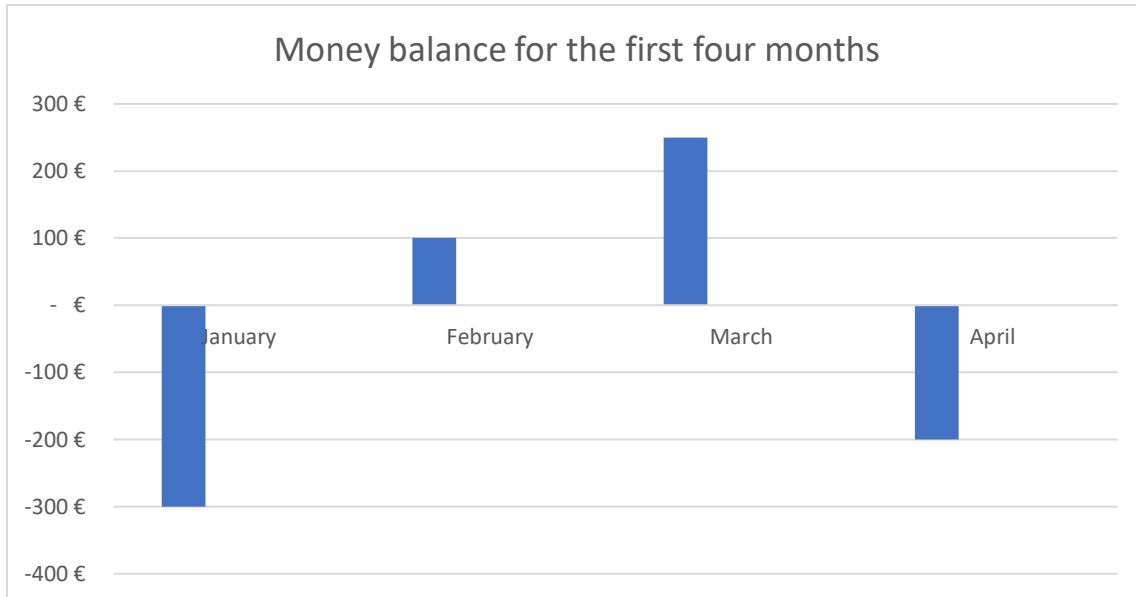# STAGE 0: CAN I? ACCEPTING THE LEARNING PROBLEM

Task 0.1

You are doing some practices in a company and you are asked to calculate the money balance for the first four months in the year by watching this graphic. You will have more opportunities to be hired in this company if your work is well done.

Balance: -300 + 100 + 250 – 200 = -150€

Task 0.2

The company wants to have a positive balance of 600€ by the end of May. You are asked to calculate how much money the company must earn in May to get this desired balance.

600 – (-150) = 750€

Task 0.3

Studying the report of the last year, you see that the balance in the first three months was -1500€, what was the average balance in each month?

-1500: 3 = -500€

Tarea 0.4

Have you found problems solving these previous tasks? Write them down and compare with your classmates.

STAGE 1: WHAT AM I DEALING WITH? CREATING A MODEL OF AN ELEMENT

<u>Task 1.1</u>

Watch the pictures from A to M from the bank. Classify the operations into as many groups as you can and explain what the criterion you have chosen is.

- Group 1: Name of feature for the classification: Kind of operation

Value of feature: Addition	Value of feature: Subtraction	Value of feature: Multiplication	Value of feature: Division	Value of feature:
C, E, F	A, B, D	G, H, I, J	K, L, M, N	

- Group 2: Name of feature for the classification: Sign of the result

Value of feature: Positive	Value of feature: Negative	Value of feature:	Value of feature:	Value of feature:
B, C, E, G, H, K, L	A, D, F, I, J, M, N			

- Group 3: Name of feature for the classification: Sign of the numbers

Value of feature: Both negative	Value of feature: Both positive	Value of feature: One positive and the other negative	Value of feature:	Value of feature:
D, G, K	C, H, L	A, B, E, F, I, J, M, N		

- Group 4: Name of feature for the classification: Absolute value of the result

Value of feature: Calculate by adding the absolute value of the numbers	Value of feature: Calculate by subtracting the absolute value of the numbers	Value of feature: Calculate by multiplying the absolute value of the numbers	Value of feature: Calculate by dividing the absolute value of the numbers	Value of feature:
C, D,	A, B, E, F	G, H, I, J	K, L, M, N	

Task 1.2

You are going to make a passport for the operations with integer numbers. In a Passport you can find every piece of information needed to identify someone or something, so you are going to think what features and values have been to consider making the passport. To do that, look at the features and values you have chosen in the previous task.

PASSPORT FOR THE OPERATIONS WITH INTEGER NUMBERS

FEATURE	NAME OF FEATURE
Kind of operation	Addition, subtraction, multiplication, division
Sign of the result	Positive, negative
Sign of the numbers	Both positive, both negative, one positive and the other negative
Absolute value of the results	Calculate by adding, subtracting, multiplying and dividing the absolute value of numbers

Task 1.3

To verify how the features of your passport are related to each other, write some of the different types of operations that can exist by giving different values to the type of operation and the sign of the numbers. Compare your results with your classmates.

NUMBER	KIND OF OPERATION	SIGN OF THE RESULT	OPERATION
5 y 20	Addition	Both negative	-5 + (-20) =
	Multiplication	One positive and the other negative	(-5) • 20 =
	Substraction	Both positive	5 – 20 =
	Addition	One positive and the other negative	(-5) + 20 =
8 y 3	Substraction	Both negative	(-8) – (-3) =
	Substraction	One positive and the other negative	(-8) – 3 =
	Multiplication	Both positive	8 • 3 =
	Suma	Both positive	8 + 3 =

STAGE 2: HOW DO WE MAKE A CHOICE? BULDING A HYPOTHESIS

Task 2.1

a) Read the story number 1 and 2 from the bank and fill in the table with the suitable sentence and translate it into mathematic language.

Give 2 positive points.   Remove 2 positive points.

Give 2 negative points.   Remove 2 negative points.

	POSITIVE POINTS (+)	NEGATIVE POINTS (-)
ADDITION (+)	Give 2 positive points + (+2)	Give 2 negative points + (-2)
SUBTRACTION (-)	Remove 2 positive points - (+2)	Remove 2 negative points - (-2)

b) After having translated the sentences into mathematic language, join the sentences with the same mathematical meaning.

Give 2 positive points.   Remove 2 positive points.

Give 2 negative points.   Remove 2 negative poins.

Task 2.2

Read the story number 1 and 2 from the bank and fill in the table relating each sentence with a moment in the stories.

SENTENCES	STORY 1	STORY 2
It doesn't matter if you subtract positive points or you add negative points, in both ways you lose points.	When the teacher gives Clara negative points because of the table incident.	When the teacher removes the positive points that she gave to Clara when she realizes Clara wasn't the person who did the exercise.
If you subtract negative points is the same if you earn positive points.	When the teacher removes the negative points to Clara when she realizes Clara wasn't the person who got dirty the table.	

Task 2.3

Watch the operations in A, B, C, D cards from the bank. Pay attention to the sign and the absolute value in the results and the numbers. Now, look at the new operations (1, 2, 3 and 4) and join the operations with the same features. After that, draw in the building drawing the graphic representation of this new operations (1, 2, 3 and 4).

Operation 1: $6 - 4 = 2$ Operation A

Operation 2: $2 + 4 = 6$ Operation B

Operation 3: $5 - 12 = -7$ Operation C

Operation 4: $-1 - 5 = -6$ Operation D
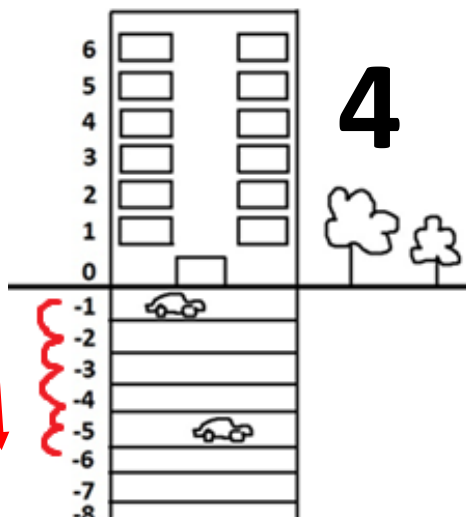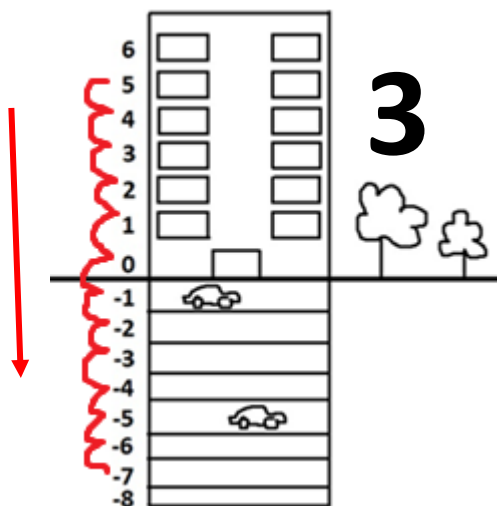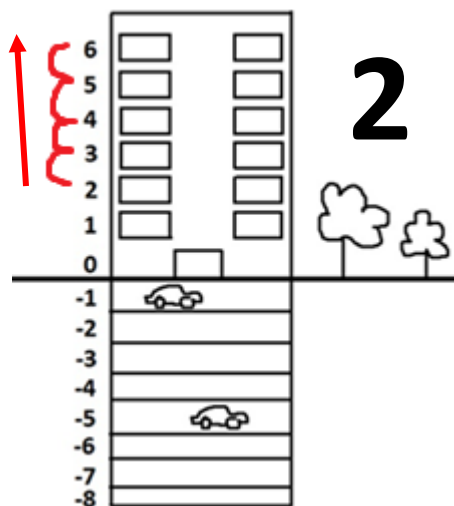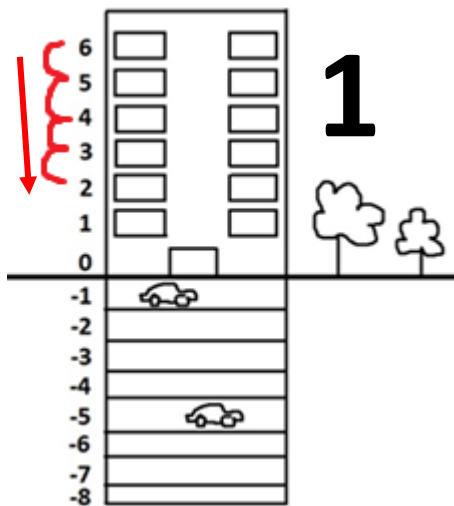
NEGATIVE NUMBERS

Task 2.4

You are going to make predictions about the result in operations of ADDITION/SUBTRACTION. To do that, look at the operations from the bank and answer the next questions.

a) Operations A, B, E, F
   - In all these operations we find a number with a positive sign and the other one with negative sign, but in some of them the sign result is negative and in others are positive. What does it depend on?

It depends on the absolute value. The sign of the number with higher absolute value will be the sign of the result.

   - All the operations have one number with positive sign and another with negative sign. How you calculate the absolute value of the result?

By subtracting them.

b) Operations C, D
   - In these operations we find two numbers with the same sign (+ o -), but in some of them the result is negative and in others is positive. What does it depend on?

It depends on sign of the numbers. The result will have the same sign than the numbers.

   - All the operations have numbers with the same sign. How you calculate the absolute value of the result?

By adding them.

Task 2.5

Fill in the empty columns to complete the hypothesis about the result of the ADDITION/SUBTRACTION operations.

PASSPORT ADDITION/SUBTRACTION

FEATURE	RESULT'S SIGN	HOW TO CALCULATE THE ABSOLUTE VALUE OF THE RESULT
Both numbers have positive sign	Positive	By adding the absolute value
Both numbers have negative sign	Negative	By adding the absolute value
The absolute value of the positive number is higher than the negative one	Positive	By subtracting the absolute value
The absolute value of the negative number is higher than the positive one	Negative	By subtracting the absolute value

Task 2.6

You are going to make predictions about the result in operations of MULTIPLICATION/DIVISION. To do that, look at the operations from the bank and answer the next questions.

   a) Operations I, J, M, N.
      - In these operations, some of them multiplications and other divisions, all the results have negative sign, what do they have in common?

One number has negative sign and the other has a positive one.

   b) Operations G, H, K, L
      - In these operations, some of them multiplications and other divisions, all the results have positive sign, what do they have in common? Is there anything different?

In common: Both numbers have the same sign.

Different: In some operations the same sign is the positive one and in other the negative one.

Task 2.7

Fill in the empty columns to complete the hypothesis about the result of the MULTIPLICATION/DIVISION operations.

FEATURE	RESULT'S SIGN
Both numbers have positive sign	Positive
Both numbers have negative sign	Positive
One number has a negative sign and the other has a positive one	Negative

STAGE 3: DOES THE HYPOTHESIS WORK?

Task 3.1

Verify with these examples if the hypothesis you made are correct. Write the hypothesis which fix with each operation.

8 + 9 = 17 → In an addition/subtraction, if both numbers are positive, the result will be positive, and its absolute value will be calculated by adding the absolute value of numbers.

7 – 18 = -11 → In an addition/subtraction, if the absolute value of a negative number is higher than the absolute value of a positive one, the result will be negative, and its absolute value will be calculated by subtracting the absolute value of numbers.

-13 -6 = -19 → In an addition/subtraction, if both numbers are negative, the result will be negative, and its absolute value will be calculated by adding the absolute value of numbers.

– 3 + 8 = 5 → In an addition/subtraction, if the absolute value of a positive number is higher than the absolute value of a negative one, the result will be positive, and its absolute value will be calculated by subtracting the absolute value of numbers.

-9 • 5 = -45 → In multiplication/división, if a number is positive and the other is negative, the result will be negative.

10 : 2 = 5 → In multiplication/división, if both numbers are positive, the result will be positive.

-8 • -3 = 24 → In multiplication/división, if both numbers are negative, the result will be negative.