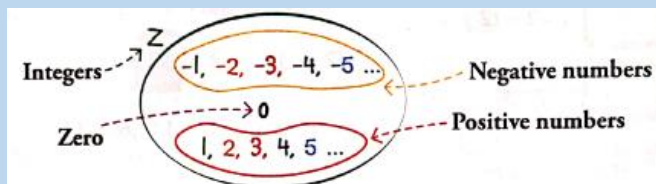# UNIT 3. INTEGERS

INTEGERS

The set of the integers is represented by $\mathbb{Z}$ and it is formed by:
- The **positive numbers**: 1, 2, 3, 4, 5...
- The **zero**: 0
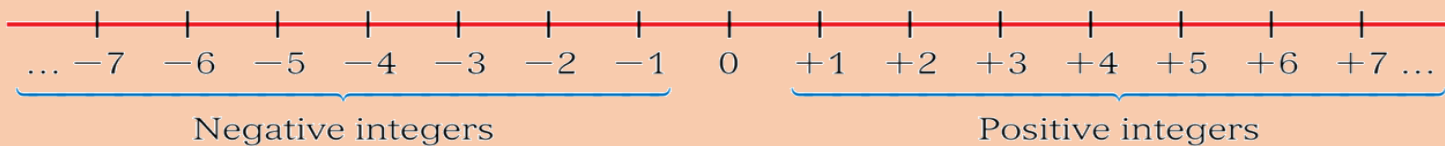- The **negative numbers**: - 1, - 2, - 3, - 4, - 5...

We want to **represent some situations**, we use positive or negative numbers. So, now, you can practice with the students different situations and they can explain you why is a negative or positive number

- The height of Mount Everest is 8700 metres: **+ 8700 m**
- A submarine is sailing 700 metres below sea level: **- 700 m**
- The second floor of a subterranean garage: **- 2**
- He has saved 5000 € in his bank account: **+ 5000 €**
- The airplane flies at 800 metres above sea level: **+ 800 m**
- He is 400 € overdrawn: **- 400 €**
- The average summer temperature here is 35º C: **+ 35 ºC**

- I have spent 150 € at the supermarket: **- 150 €**
- The temperature in Siberia has risen 8 ºC below zero: **-8ºC**
- She has been diving at 50 metros below sea level: **- 50 m**
- The clotingh store is three floors underground: **-3**
- The thermometer reads five degrees below zero: **-5ºC**
- Mercedes has 250 euros in the bank: **+250 €**
- Miguel owes 150 euros: **-150 €**

NUMBER LINE

We can represent these numbers in a number line:

$$\ldots\; -7\quad -6\quad -5\quad -4\quad -3\quad -2\quad -1\quad 0\quad +1\quad +2\quad +3\quad +4\quad +5\quad +6\quad +7\;\ldots$$

Negative integers   Positive integers

You can practice with them this represntation with two diferent activities:
- They have to tell you where you have to put the number you say awhat
- They have to guess what is the number that you representate in the number line

ADDING AND SUBTRACTING TWO INTEGERS

Both numbers have the same sign

$5 \oplus 3 = \oplus 8$
$\ominus 4 \ominus 8 = \ominus 12$

- We add their absolute values.
- The answer has the same sign as the numbers.

same sign

The numbers have different signs

$-3 + 10 = \oplus 8$
$+5 \ominus 8 = \ominus 3$

- We subtract their absolute values.
- The answer has the same sign as the number with the greatest absolute value.

same sign

The same sign as the number with the greatest absolute value

ACTIVITIY

$6 + 5 = +11$	$-8 + 4 = -4$
$-3 - 1 = -4$	$-5 + 9 = +4$
$-8 + 7 = -1$	$-15 - 3 = -18$
$-3 + 5 = +2$	$-20 + 12 = -8$
$-9 - 11 = -20$	$-5 - 1 = -6$
$2 - 9 = -7$	$-16 + 20 = +4$
$-6 + 3 = -3$	$-18 + 11 = -7$
$+1 + 8 = +9$	$10 - 12 = -2$
$-2 + 8 = +6$	$-4 + 11 = +7$

ADDING AND SUBTRACTING TWO INTEGERS

Adding and subtracting more than two numbers

There are two different ways to solve them.

We can calculate step by step, following the order in which the numbers appear in the expression.

Or, we can first add up the positive numbers and then add up the negative numbers. After that, we subtract the two previous sums from one another.

$(2 - 7) + 6 - 3$
$(-5 + 6) - 3$
$(+1 - 3)$
-2

$2 - 7 + 6 - 3$
$(2 + 6)(-7 - 3)$
$8 - 10$
-2

Activities: Calculate step by step

a) $9 - 2 - 3$ b) $12 - 4 - 6$ c) $5 - 9 + 8$
d) $-13 + 6 + 4$ e) $-11 - 4 + 8$ f) $-5 - 3 - 4$

a) $6 - 9 - 7 - 5 + 2 + 11$
b) $15 + 18 - 11 - 7 - 21 + 27$
c) $-9 + 12 - 16 + 25 - 18 - 4$
d) $-44 - 16 + 8 + 33 + 23 - 5$
e) $-3 - 17 - 21 - 9 - 17 + 57$

• $7 - 5 - 8 - 4 = 2 - 8 - 4 = -6 - 4 = -10$
a) $2 - 4 - 5 + 8$ b) $6 - 7 + 4 - 3$
c) $5 + 8 - 9 - 6$ d) $-4 - 9 + 6 + 2$
e) $-3 - 5 + 7 + 7$ f) $-4 - 8 - 2 - 5$

a) $5 + 7 - 2 - 4$ b) $2 - 6 + 4 - 9$
c) $9 - 6 - 7 + 2$ d) $-4 - 5 + 3 + 8$
e) $-8 + 2 - 7 + 6$ f) $-1 + 5 + 6 - 7$

a) $13 - 9 + 5 - 7$
b) $6 - 8 - 6 + 5 + 4 - 6$
c) $-3 - 5 + 2 - 1 - 7 + 4$
d) $-8 - 7 + 2 + 9 - 10 + 18$

MULTIPLICACTION AND DIVISION INTEGERS

Multiplication and division with integers

$(+3) \cdot (+7) = +21$
$(-4) \cdot (-5) = +20$
$(+4) \cdot (-5) = -20$
$(-3) \cdot (+7) = -21$

$+ \cdot + = +$
$- \cdot - = +$
$+ \cdot - = -$
$- \cdot + = -$

$+ : + = +$
$- : - = +$
$+ : - = -$
$- : + = -$

$(+20) : (+4) = +5$
$(-20) : (-5) = +4$
$(+20) : (-4) = -5$
$(-20) : (+4) = -5$

Activities:

a) $3 \cdot (-2)$ b) $-5 \cdot (+3)$ c) $-4 \cdot (-6)$
d) $(-4) \cdot (+7)$ e) $(+2) \cdot (+6)$ f) $(-5) \cdot (-7)$
g) $(+3) \cdot (-8)$ h) $(-9) \cdot (-3)$ i) $(-6) \cdot (+4)$

a) $(-8) : (+2)$ b) $(+20) : (-10)$ c) $(-12) : (-4)$
d) $(-4) : (+3)$ e) $(-15) : (-3)$ f) $(-1) : (+6)$
g) $(+42) : (-7)$ h) $(+38) : (+8)$ i) $(-36) : (+9)$

a) $(+12) : (+3)$ d) $(+6) \cdot (-8)$
b) $(+15) : (-3)$ e) $(-12) \cdot (-3)$
c) $(-28) : (-7)$ f) $(-7) \cdot (+10)$

COMBINED OPERATIONS

Combined operations

$20 - (9 - 12) \cdot (+4)$ → We calculate inside brackets
$20 - (-3) \cdot (+4)$ → We multiply
$20 - (-12)$ → We remove the brackets
$20 + 12$ → We add up
32

1st Brackets [( )]
2nd Multiplication and division ✕ ÷
3rd Addition and subtraction +

a) $3 \cdot (3 - 5)$ b) $(-4) \cdot (6 - 10)$
c) $(-5) \cdot (2 - 9)$ d) $16 : (1 - 5)$
e) $(-35) : (9 - 2)$ f) $(5 + 7) : (-4)$

a) $35 + 7 \cdot (6 - 11)$
b) $60 : (8 - 14) + 12$
c) $(9 - 13 - 6 + 9) \cdot (5 - 11 + 7 - 4)$
d) $(6 + 2 - 9 - 15) : (7 - 12 + 3 - 6)$
e) $-(8 + 3 - 10) \cdot [(5 - 7) : (13 - 15)]$

VOCABULARY & EXPRESSIONS

Integers → números enteros

Positive numbers → números positivos

Negative numbers → números negativos

Zero → cero

Number line →recta numérica

Absolute value → valor absoluto

Opposite → opuesto

Compare → comparar

Order → ordenar

Biggest, greatest, largest → más grande

Smallest, lowest → más pequeño

Addition → suma

Add → sumar

Subtraction → resta

Subtract → restar

Plus → signo más (+)

Minus → signo menos (-)

Bracket → paréntesis

Equal to → igual a

Sign → signo

Remove brackets → quitar paréntesis

Compute → calcular, resolver

Solve → resolver

Perform → resolver

Multiplication → multiplicación

Multiplicate → multiplicar

Division → división

Divide → dividir

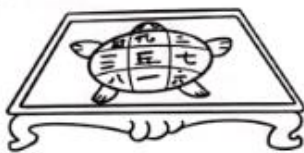**8 times to 2** → 8 por 2

8 divided by 2 → 8 entre 2

Combined operations → operaciones combinadas

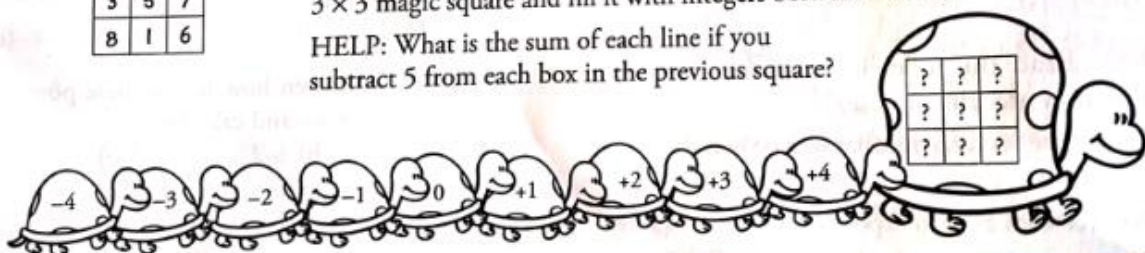**Sign rule** → regla de los signos

---

THE FINAL CHALLENGE

READ AND LEARN

Magic squares

Humans use numbers as a tool for scientific and technological development. However, we have also found many different ways to play with numbers. Magic squares are a good example of a number game. The squares are filled with numbers that follow an order. The sum of the numbers in each row, column and diagonal line is always the same. Magic squares can be found in many different cultures since ancient times. For example, look at the Chinese magic square. This 3×3 example is the oldest kind we know of. Draw a 3×3 magic square and fill it with integers between −4 and +4.

HELP: What is the sum of each line if you subtract 5 from each box in the previous square?

4	9	2
3	5	7
8	1	6

-1	+4	-3
-2	0	+2
+3	-4	+1