

UNIT 3: WHOLE NUMBERS OR INTEGERS**1.- WHOLE NUMBERS OR INTEGERS**

Natural numbers are considered **positive integers** and we write them with a (+) +1, +2, +3,...

For each positive integer there is a **negative integer** and we write it with a (-) -1, -2, -3...

Whole numbers or integers are positive integers, negative integers and zero.

2.- ABSOLUTE VALUE**Representation on the numerical line**

Whole numbers can be represented on a numerical line:

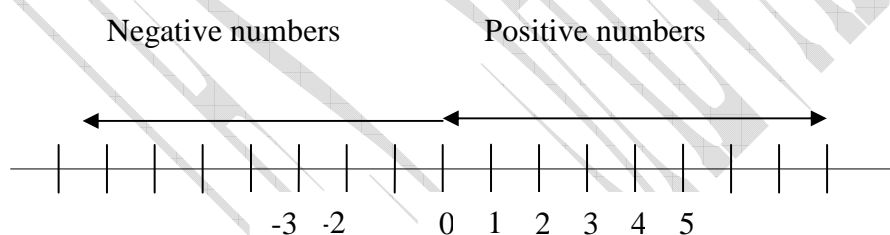
First: We draw a straight line.

Second: We mark a dot on the line and then we write the number **0**

Third: To the right of zero we write +1

Fourth: To its right we write the positive integers: +2, +3, +4...

Fifth: We write negative integers to the left of zero, and with the same distances as the corresponding positive numbers.

**Absolute value of an integer number**

The absolute value of a whole number is the natural number without the negative sign and it is indicated by putting it inside two lines.

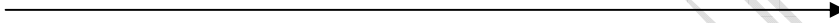
$$|+4| = 4$$

$$|-4| = 4$$

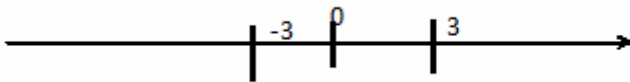
Exercise

Represent these numbers on a numerical line

a) -5 b) +3 c) 0 d) -7 f) 7 g) -1

**3.- ORDER OF WHOLE NUMBERS**

We can see that 0, various positive whole numbers, and various negative whole numbers are all placed on a number line.



We can see that:

- every positive number is larger than any negative number
- 0 is less than any positive number, and larger than any negative number

Comparison of positive whole number

Given two positive whole numbers the larger number is that which has the higher absolute value.

$$|+6| = 6 \qquad | +4| = 4 \qquad 6 > 4$$

Comparison of negative whole number

Given two negative whole numbers the larger number is that which has the smaller absolute value.

$$|-7| = 7 \qquad |-3| = 3 \qquad -3 > -7$$

Exercise

Put the following numbers in order, from largest to smallest, and then draw them on the number line: +3, -5, 0, -1, +6

4.- ADDITION OF WHOLE NUMBERS**Addition of two whole numbers of the same sign**

$$(+2) + (+3) = (+5)$$

$$(-2) + (-3) = (-5)$$

To add two whole numbers of the same sign:

- ☺ Add their absolute value
- ☺ Add the sign which belongs to them

Addition of two whole numbers of the different sign

$$(+3) + (-7) = (-4)$$

To add two whole numbers of different signs:

- ☺ Subtract their absolute value
- ☺ Add the sign which has the higher absolute value

Addition of various whole numbers

We want to add the following numbers: $(+4) + (-2) + (+3) + (+5) + (-6)$

We can do it using two methods:

Method 1

$$\underbrace{(+4) + (-2)}_{(+2)} + \underbrace{(+3) + (+5)}_{(+8)} + (+6) =$$

$$\underbrace{(+2) + (+8)}_{(+10)} + (+6) =$$

$$\underbrace{(+10) + (-6)}_{(+4)} = (+4)$$

Add the pairs of numbers in the order in which they appear

Method 2

$$(+4) + (-2) + (+3) + (+5) + (-6) =$$

$$\underbrace{(+4) + (+3) + (+5)}_{(+12)} + \underbrace{(-2) + (-6)}_{(-8)} =$$

$$\underbrace{(+12) + (-8)}_{(+4)} = (+4)$$

Separate positive and negative numbers and then add them.

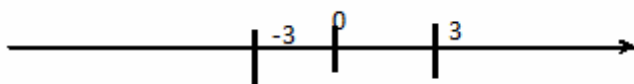
Exercise

Complete the following calculation

$(+10)+(-4)+(-2)$	$(-5)+(-3)+(10)$	$(-3)+(+15)+(-2)+(+25)$	$(-6)+(+8)+(-5)+(-3)$

5.- CONVERSE OF A WHOLE NUMBER

Converses numbers



As you can see 3 and -3 are at the same distance from 0. They are symmetrical to 0. They have the same absolute value. They are called **converse numbers**.

The converse of a whole numbers is a whole numbers

- With the same absolute value
- With a different sign(+/-)

converse $(+3) = -3$

converse $(-5) = +5$

CAREFUL: you can say a converse, but never converses. Converses has another meaning in English. To make converse plural, you must say converse numbers.

6.- SUBTRACTION OF WHOLE NUMBERS

$$10 - 4 = 6$$

When subtracting a negative number like

$$12 - (-3) = 12 + (+3) = 15$$

or parenthesis, the two negative signs cancel each other out. $(-)(-)= (+)$

7.- CALCULATION WITH PARENTHESIS

We want to do the following calculations $8 - (4 - 14) + (12 + 7)$

We can solve calculations with brackets using two methods:

First method

Calculate within the brackets first and then add the sums.

$$8 - \underbrace{(4 - 14)}_{(-10)} + \underbrace{(-12 + 7)}_{(-5)} = 8 - (-10) + (-5) = 8 + 10 - 5 = 13$$

Second method

Remove the brackets if the brackets are preceded by the sign (+), write them as they are. If they are preceded by the sign (-), the numbers change their sign.

$$\begin{aligned} 8 - (4 - 14) + (-12 + 7) &= 8 - (+4) - (-14) + (-12) + 7 = \\ &= 8 - 4 + 14 - 12 + 7 = 13 \end{aligned}$$

Exercise:

Complete the following calculations

- a) $16 - (17 + 2)$
- b) $-13 + (14 + 21)$
- c) $32 + (-6 + 4 - 8)$
- d) $16 - (-25 + 12)$
- e) $-24 - (6 + 2) + (3 - 8) + 1$