

# INTEGERS

## A DEFINITION

### Definition Positive and Negative Numbers

- **Positive numbers** are  $+1, +2, \dots$ . We write them with a **positive sign** (+) before the number:

$$+2 = \text{⊕} \text{⊕}$$

- **Negative numbers** are  $-1, -2, \dots$ . We write them with a **negative sign** (−) before the number:

$$-3 = \text{⊖} \text{⊖} \text{⊖}$$

- **Positive numbers** are the opposite of **negative numbers**:

$$\text{⊕} \text{⊕} + \text{⊖} \text{⊖} = \text{⊖} \text{⊖}$$

$$(+2) + (-2) = 0$$

$-2$  is the opposite of  $+2$ .

- Integer numbers are **positive numbers**, **negative numbers**, and zero :

$$\dots, -3, -2, -1, 0, +1, +2, +3, \dots$$

- Positive numbers can be written **with** or **without** a positive sign (+) in front of the number:

$$1 = +1 = \text{⊕}$$

- To avoid confusion between the sign of the number and the sign of the operation, we can use parentheses. For example,  $+1 + -2$  becomes  $(+1) + (-2)$ .
- 0 is neither positive nor negative.

**Ex:** Calculate  $(+1) + (-2)$ .

*Answer:*

$$\text{⊕} + \text{⊖} \text{⊖} = \text{⊖} \text{⊖}$$

$$= \text{⊖}$$

- So,  $(+1) + (-2) = -1$ .

### Definition Absolute Value

The **absolute value** of a number is the number without its sign.

- The absolute value of  $+2 = \text{⊕} \text{⊕}$  is 2.
- The absolute value of  $-3 = \text{⊖} \text{⊖} \text{⊖}$  is 3.

## B RULES OF ADDITION

### Method Rules of Addition

- When you add **two positive numbers**, add their absolute values. The sum is also a positive number.

$$(+2) + (+7) = +9 \quad \text{as } 2 + 7 = 9$$

- When you add **two negative numbers**, add their absolute values. The sum is also a negative number.

$$(-5) + (-10) = -15 \quad \text{as } 5 + 10 = 15$$

- When you add a **positive number** and a **negative number**, subtract the smaller absolute value from the larger one and use the sign of the number with the larger absolute value.

$$\begin{aligned}
 &(-2) + (+5) = +3 \quad \text{as } 5 - 2 = 3 \\
 &\ominus \ominus + \oplus \oplus \oplus \oplus \oplus = \oplus \oplus \oplus \oplus \oplus \oplus \\
 &= \oplus \oplus \oplus \\
 \\
 &(+2) + (-6) = -4 \quad \text{as } 6 - 2 = 4 \\
 &\oplus \oplus + \ominus \ominus \ominus \ominus \ominus \ominus \ominus = \ominus \ominus \ominus \ominus \ominus \ominus \ominus \ominus \\
 &= \ominus \ominus \ominus \ominus
 \end{aligned}$$

**Ex:** Calculate  $(-10) + (+3)$

*Answer:*

- $(-10) + (+3) = -7 \quad \text{as } 10 - 3 = 7$

$$\begin{aligned}
 &\ominus \ominus \ominus \ominus \ominus \ominus \ominus \ominus \ominus \ominus + \oplus \oplus \oplus = \ominus \ominus \ominus \ominus \ominus \ominus \ominus \ominus \ominus \ominus \ominus \ominus \ominus \ominus \ominus \ominus \ominus \ominus \\
 &= \ominus \ominus \ominus \ominus \ominus \ominus \ominus \ominus
 \end{aligned}$$

## C SUBTRACTION

### Definition Subtraction

**Subtracting** a number is adding its opposite.

**Ex:** Convert the subtraction into addition:  $(+4) - (+2)$

*Answer:*

- $(+4) - (+2) = (+4) + (-2)$

$$\oplus \oplus \oplus \oplus - \oplus \oplus = \oplus \oplus \oplus \oplus + \ominus \ominus$$

**Ex:** Calculate  $(+4) - (-2)$

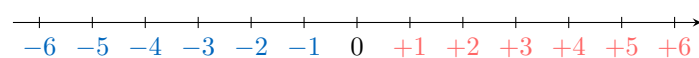
*Answer:*

$$\begin{aligned}
 (+4) - (-2) &= (+4) + (+2) \quad (\text{add the opposite}) \\
 &= +6 \quad (\text{same sign: add the absolute values})
 \end{aligned}$$

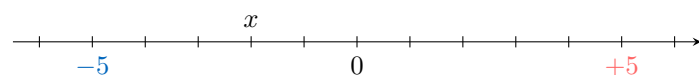
## D ON THE NUMBER LINE

### Definition Number line

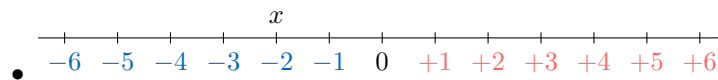
A **number line** is a straight line with markings at equal intervals to denote the numbers.



**Ex:** Find the value of  $x$ .



*Answer:*

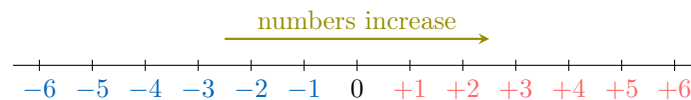


- So,  $x = -2$ .

## E ORDERING

### Method Compare two numbers

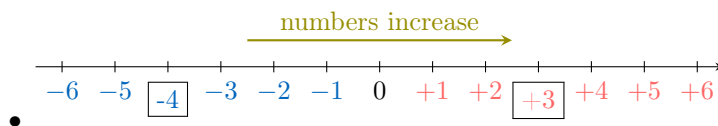
- When one number is **positive** and the other is **negative**, the positive number is **greater**.
- When both numbers are **negative**, the number closer to zero is **greater** (the number with the smaller absolute value is greater).
- When both numbers are **positive**, the number further from zero is **greater** (the number with the greater absolute value is greater).



**Ex:** Compare  $-4$  and  $+3$

*Answer:*

- As  $+3$  is positive and  $-4$  is negative, the positive number is greater than the negative number:  $-4 < +3$



## F MULTIPLICATION

### Definition Multiplication

- $(+) \times (+) = (+)$ : a **positive** times a **positive** gives a **positive**.
- $(+) \times (-) = (-)$ : a **positive** times a **negative** gives a **negative**.
- $(-) \times (+) = (-)$ : a **negative** times a **positive** gives a **negative**.
- $(-) \times (-) = (+)$ : a **negative** times a **negative** gives a **positive**.

**Ex:** Calculate  $(+2) \times (-5)$

*Answer:*  $(+2) \times (-5) = -10$  as  $(+) \times (-) = (-)$

## G DIVISION

### Definition Division

- $(+) \div (+) = (+)$ : a **positive** divided by a **positive** gives a **positive**.
- $(+) \div (-) = (-)$ : a **positive** divided by a **negative** gives a **negative**.
- $(-) \div (+) = (-)$ : a **negative** divided by a **positive** gives a **negative**.
- $(-) \div (-) = (+)$ : a **negative** divided by a **negative** gives a **positive**.

**Ex:** Calculate  $(+10) \div (-5)$

*Answer:*  $(+10) \div (-5) = -2$  as  $(+) \div (-) = (-)$