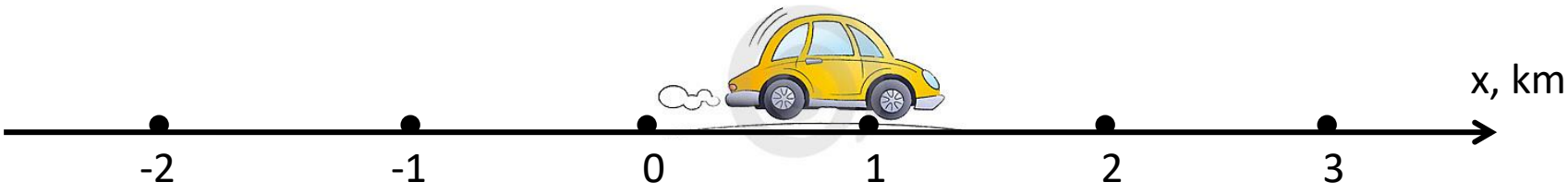
Distance and displacement in 1D



Distance:

$$d$$

The distance is just a measure of length of the path followed by the object. It can only be positive or zero.

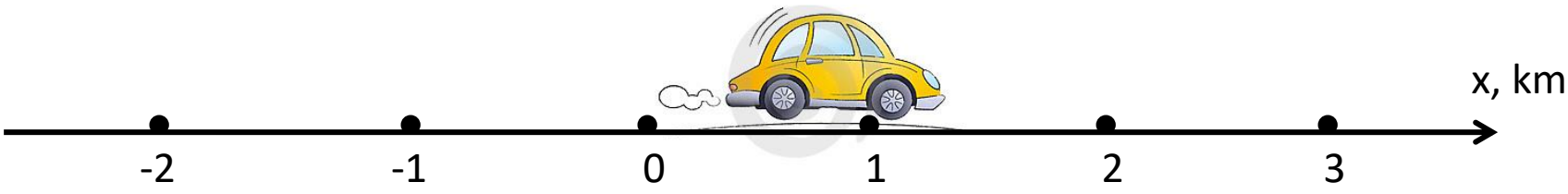
Displacement:

$$\Delta x = x_f - x_i$$

$x_f \rightarrow$ final position in x axis.
$x_i \rightarrow$ initial position in x axis.
The displacement tells us the length **and** direction of a movement. Its sign matters!

In science, the Greek letter Δ usually represents the change or difference of a quantity. For example, Δt would represent the change in time between two events.

Instantaneous Velocity and Speed



Earlier, we defined ***Average velocity:*** between times t_i and t_f:

$$\vec{v} = \frac{\Delta x}{\Delta t}$$

x_i → Initial position x_f → Final position

$\Delta x = x_f - x_i$ → Displacement

$\Delta t = t_f - t_i$ → Travel time

Instantaneous velocity tells you how fast an object moves *right now*, at specific time t. The formula is the same as above, but **Δt must be as small as possible.** Similarly, we can define ***instantaneous speed***.

Homework 4

Problem 1.

A straight walkway connects a house with a beach. A dog named Einstein runs along that walkway towards the beach with speed 4 m/s, for 5 minutes. After that, the dog turns back and runs for another 10 minutes with speed 3m/s. Find:

a) The total distance travelled, d.
b) The total displacement of the dog, Δx. Let the positive direction be towards the beach.
c) Average *speed* of the dog.
d) Average *velocity* of the dog.

Problem 2

A Lion rest under a palm tree somewhere near the Earth's equator.

a) Find the speed of the Lion due to the Earth's spin about its axis. Express the result in m/s, using scientific notation. Assume that the circumference of the Earth is C=40,000km.