Galilean Relativity

It is fair to say that although Spacetime Physics is attempting to be elementary and self-contained, it is presuming you have had some physics. I will therefore fill in some gaps.

Speed

the triple equals means this is a definition

$$s \equiv \frac{d}{t}$$

In this equation, s is "speed," d is "distance," and t is "time."

This equation assumes constant speed. If you want the corresponding definition for a non-constant speed, you need a derivative.

Speed is what is displayed on a car's speedometer. Speed does not make reference to direction.

Velocity

Velocity adds direction to speed. We can say, "the car was going 40 mph to the northwest." The opposite velocity would be 40 mph to the southeast. There is no such thing as going "the opposite speed."

Cartesian Coordinates

It is super-convenient to grid out space in three Cartesian coordinates, usually labeled x, y and z.

Cartesian coordinates are at right angles to each other. Very often we choose z to be in the vertical direction.

If a particle goes Δx in the x direction in a time Δt, we write

$$V_x \equiv \frac{\Delta x}{\Delta t}$$

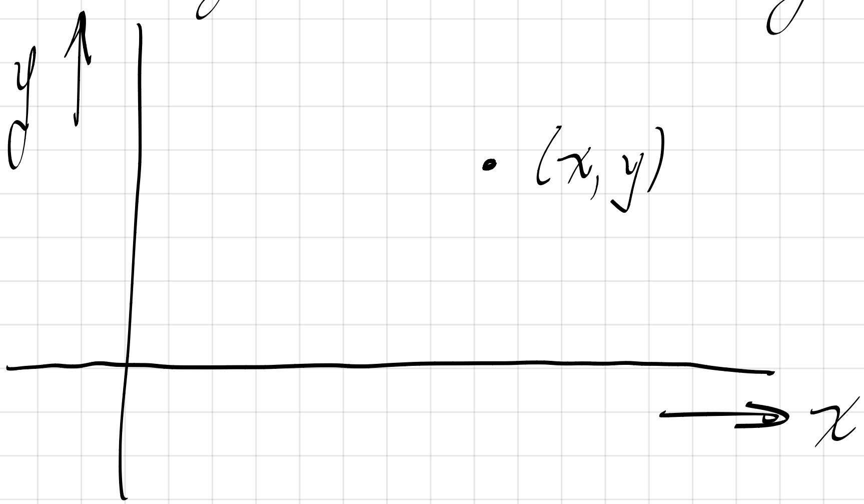
Similarly $V_y \equiv \frac{\Delta y}{\Delta t}$ and $V_z \equiv \frac{\Delta z}{\Delta t}$

Galilean Relativity

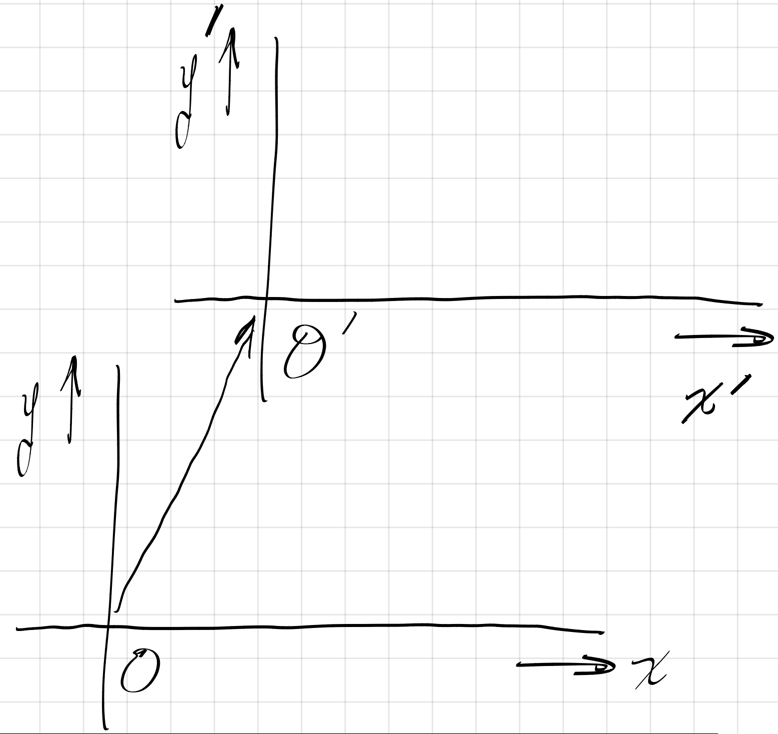
Finally we have enough notation to describe Galilean relativity in Cartesian coordinates.

Let's restrict ourselves to two dimensions (just forget about z).

The position of a particle is specified by an x value and a y value.



We could certainly have another Cartesian coordinate system moving steadily relative to the first one:



Salvatius (actually Galileo) is telling us that as long has O' has a steady velocity in the frame of O, then an observer moving along with O' cannot tell that they are moving no matter what experiments they perform. Of course if they look out the window and see O drifting away then they know that at least one of them is moving (perhaps both!).