2.2 Velocity

Velocity is the rate of change of displacement-velocity tells us how an object's position is changing in time.

$$\text{velocity} = \frac{\text{change in position}}{\text{change in time}}$$

Or, in symbols (for motion along only the x axis):

$$v = \frac{\Delta x}{\Delta t} \qquad (2.1)$$

Because position is a vector, velocity is also a vector. The direction of the velocity vector is the direction of motion. When working with one-dimensional motion, a positive or negative sign indicates direction; for two-dimensional motion we'll use vector notation $\vec{v}$. For two-dimensional motion, we use

the rate of change of each component $\frac{\Delta x}{\Delta t}, \frac{\Delta y}{\Delta t}$ of the position:

$$\vec{v} = \left(\frac{\Delta x}{\Delta t}\right)\hat{x} + \left(\frac{\Delta y}{\Delta t}\right)\hat{y} \qquad (2.2)$$

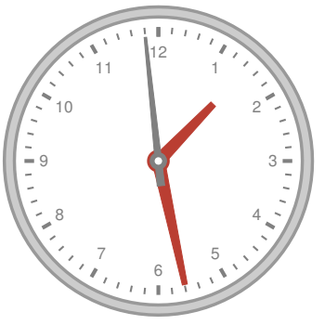
The magnitude of an object's velocity is its speed:

$$|\vec{v}| = \text{speed}$$

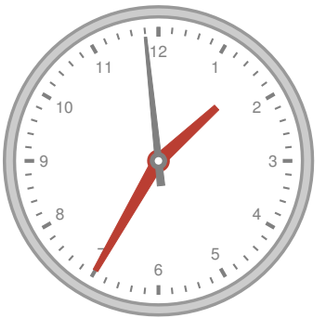
The SI unit for velocity (and speed) is meters per second (m=s).

Example 2.3

Start Time:



End Time:



$\Delta t = 7$, $\Delta x = 4$, $\Delta y = -13$

$$\vec{v} = \left(\frac{\Delta x}{\Delta t}\right)\hat{x} + \left(\frac{\Delta y}{\Delta t}\right)\hat{y} = \left(\frac{4}{7}\right)\hat{x} + \left(\frac{-13}{7}\right)\hat{y}$$

$$|\vec{v}| = \sqrt{\left(\frac{4}{7}\right)^2 + \left(\frac{-13}{7}\right)^2}$$