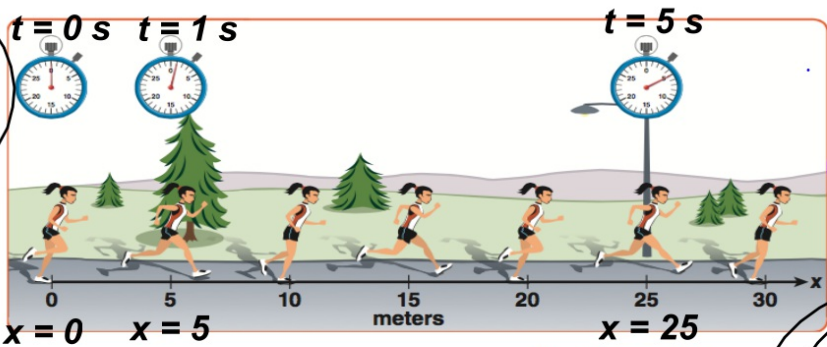


Phy40-lesson 3
Position -time graph

1. Plot data as a position-time graph for single and multiple objects and analyze the position-time graphs.
2. Solve problems involving single and multi-particles as well as problems involving instantaneous position

When analyzing complex motion, it often is useful to represent the motion in a variety of ways. A motion diagram contains information about an object's position at various times. Tables and graphs can also show this same information.

Motion diagram



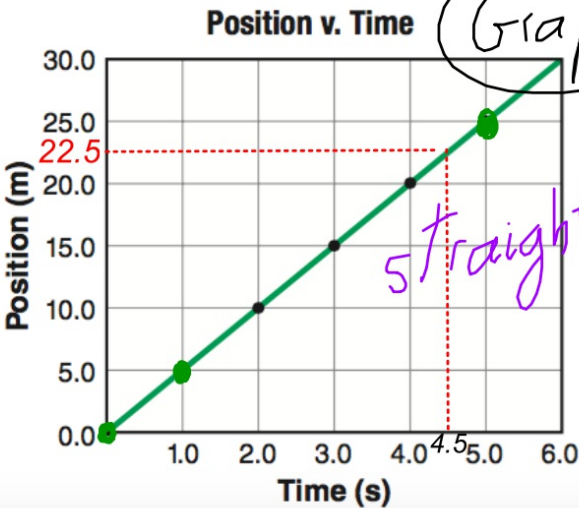
constant speed

Table

Time (s)	Position (m)
0.0	0.0
1.0	5.0
2.0	10.0
3.0	15.0
4.0	20.0
5.0	25.0

Given →
Given →
→
→
→
Given →

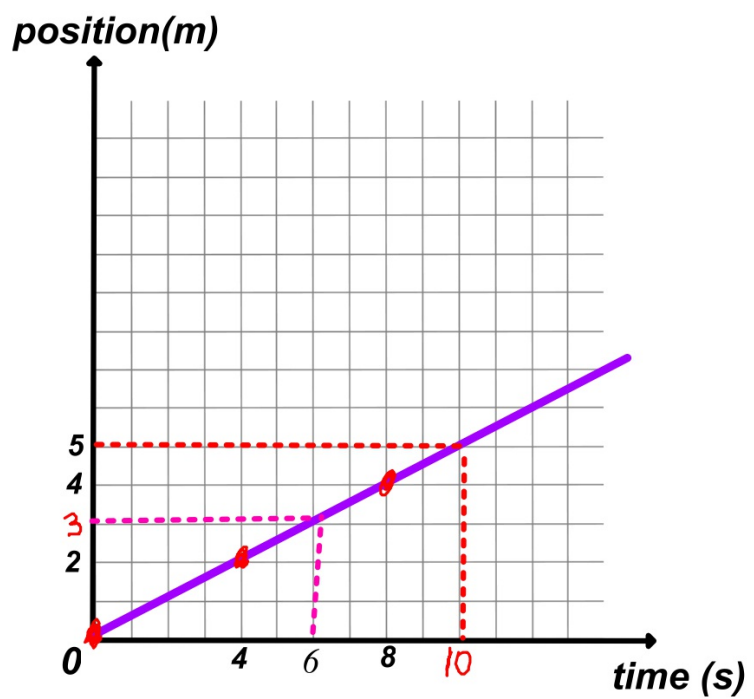
Graph



Even though there is no data point exactly when the runner was 12.0 m beyond her starting point or where she was at $t = 4.5$ s, you can use the graph to estimate the time or her position.

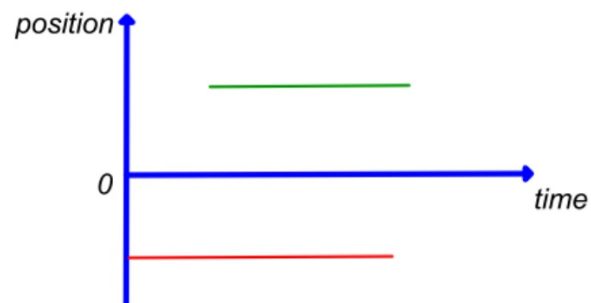
A straight line means constant speed.

Position (m)	Time (s)
0	0
2	4
4	8
5	10
3	6

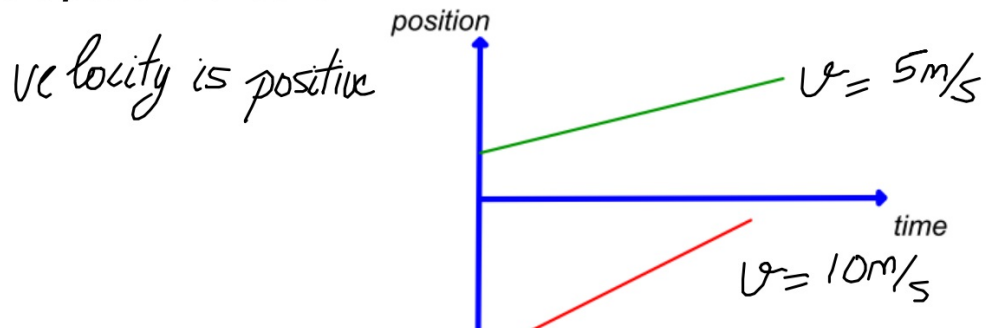


A **constant speed** is represented by a **line** in the **position-time graph**.

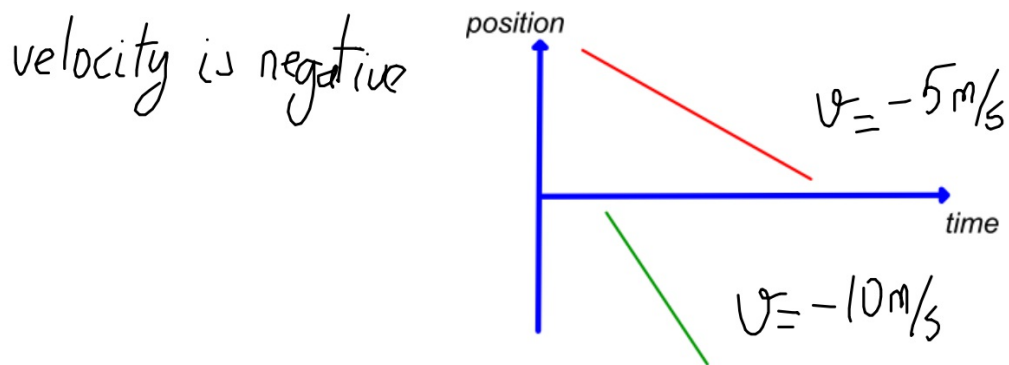
1. If the line is **horizontal**, the object is at **rest**.



2. If the line is going upwards, the object is moving at constant speed in the positive direction



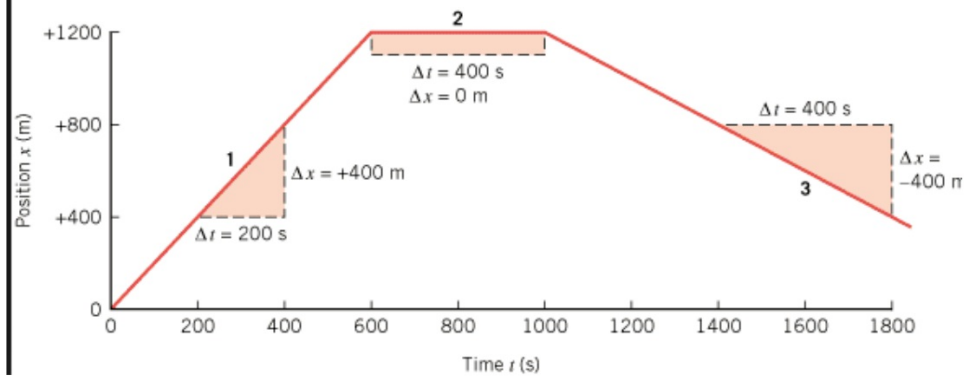
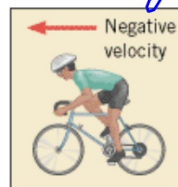
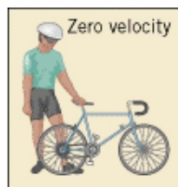
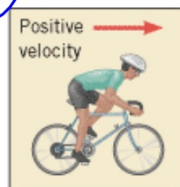
3. If the line is going downwards, the object is moving at a constant speed in the negative direction



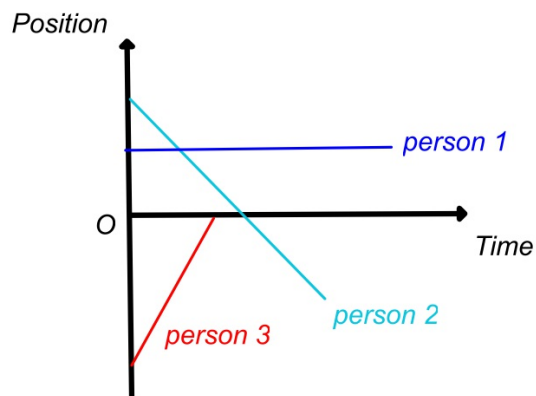
moving to the right

At rest

moving to the left



Problem



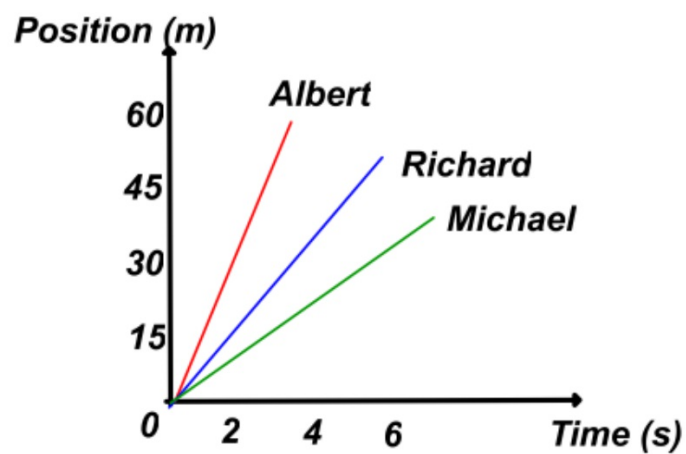
Describe the motions of person 1, person 2, and person 3 above.

person 1 is at rest

person 2 constant velocity negative direction

person 3 constant velocity positive direction

The **steeper** the line the **faster** is the object



Who is the fastest? Why

Albert, because the line is the steepest

Who is the Slowest? Why

Michael, because the line is least steep.

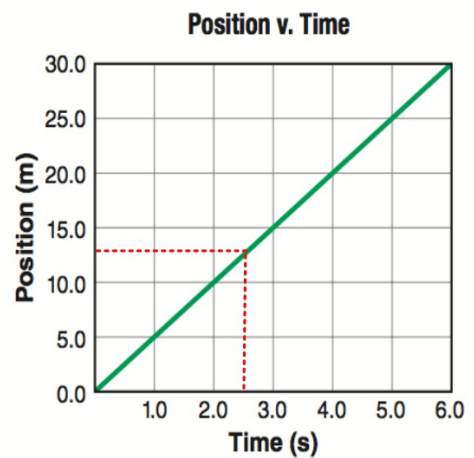
Instantaneous position

The position at a particular instant. Instantaneous position is usually simply called position.

Example: What is the instantaneous position of the object at 1s, 2.5s?

$$\text{at } t=1\text{s} \quad x=5.0\text{m}$$

$$\text{at } t=2.5\text{s} \quad x=12.5\text{m}$$



Multiple Objects on a Position-Time Graph

The graph to the right describes the motion of two runners moving along a straight path. The lines representing their motion are labeled A and B.

Answer the following questions

Who is faster Runner A or B? Explain why.

B is faster because the line is steeper

When and where does runner B pass runner A? at $t=45s$ and $x=190m$

How far apart were runners A and B at $t = 20.0 s$?

$x_B = 60m$ $x_A = 80m$ A was 20m in front of B

