

## Graphing Motion (Part 2)

A second type of graph used to describe the motion of an object will be covered in this lesson.

### Velocity-Time Graphs

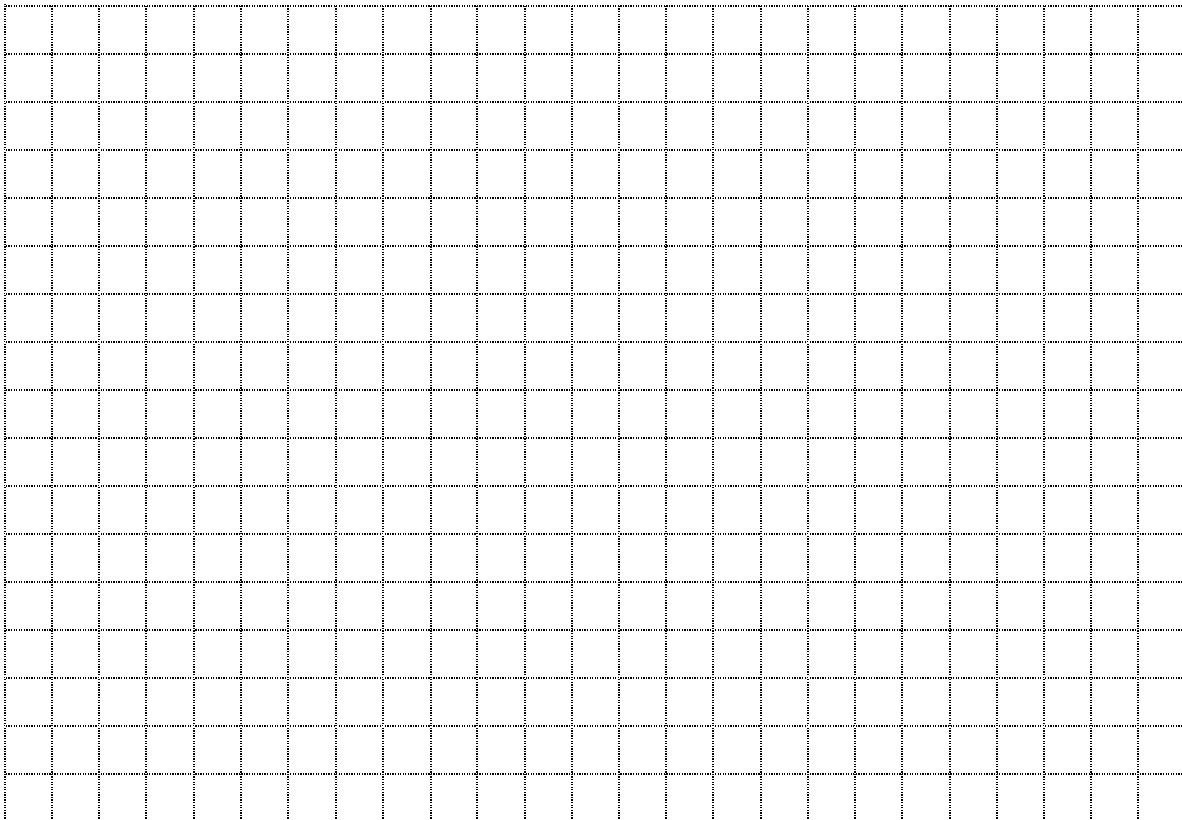
A Velocity-time graph describes the velocity of an object as a function of time. When plotting a velocity-time graph:

- Place velocity on the y-axis.
- Place time on the x-axis.
- Plot the data points.
- Connect the data points using either straight line segments or smooth curves.

#### Example 1

The following data describes the velocity of a bicycle at various times. Plot the velocity-time graph of the bike's motion.

<b>Velocity (m/s)</b>	0.0	2.0	4.0	6.0	8.0	10.0
<b>Time (s)</b>	0	10.0	20.0	30.0	40.0	50.0



A velocity-time graph can be used to determine:

1. The velocity of the object at a given time.

**Example 2**

What is the velocity of the bike in Example 1 at  $t = 25 \text{ s}$ ?

2. The displacement of the object over a given time interval.

**Example 3**

What is the displacement of the bike in Example 1 from  $t = 10.0 \text{ s}$  to  $t = 30.0 \text{ s}$ ?

3. The acceleration of the object over a given time interval.

**Example 4**

What is the acceleration of the bike in Example 1?

**Summary**

On a velocity-time graph:

1. The object's velocity at a given time is found by reading the graph.
2. The object's displacement over a given time interval is found by determining the area under the graph during the time interval.

**Note:** Areas above the time axis are positive displacements. Areas below the time axis are negative displacements.

3. The object's acceleration over a given time interval is given by the slope of the graph in that interval.

## **Common Velocity-Time Graphs**

A velocity-time graph can also be used to provide a description of the motion of an object.

**Homework**  
Motion Worksheet #5

## Motion Worksheet #5

1. Given the velocity-time graph below:
  - a. Describe the motion of the object in each segment of the graph (A to I).
  - b. Calculate the acceleration of the object in each segment of the graph (A to I).
2. This graph describes the motion of an object moving in a straight line. At the beginning it is going east.

From the graph determine each of the following:

- a. The object's displacement in the first 3.0 s.
- b. The object's displacement between  $t = 3.0$  s and  $t = 5.0$  s.
- c. The total displacement of the object in 14 s.
- d. The acceleration of the object at  $t = 7.0$  s.

3. Use this graph of the motion of a car to find the total displacement (north is positive).

4. From the graph below, determine the acceleration for each interval (A to E).