

### Describing Motion Numerically

Read from **Lesson 1** of the **1-D Kinematics** chapter at **The Physics Classroom**:

<http://www.physicsclassroom.com/Class/1DKin/U1L1d.html>  
<http://www.physicsclassroom.com/Class/1DKin/U1L1e.html>

**MOP Connection:** Kinematic Concepts: sublevel 8

Motion can be described using words, diagrams, numerical information, equations, and graphs. Describing motion with numbers can involve a variety of skills. On this page, we will focus on the use of tabular data to describe the motion of objects.

- Position-time information for a giant sea turtle, a cheetah, and the continent of North America are shown in the data tables below. Assume that the motion is uniform for these three objects and fill in the blanks of the table. Then record the speed of these three objects (include units).

**Giant Sea Turtle**

Time (hr)	Position (mi)
0	0
1	0.23
2	0.46
3	_____
4	0.92
5	_____
6	_____

Speed = \_\_\_\_\_

**Cheetah**

Time (s)	Position (m)
0	0
0.5	12.5
1	_____
1.5	_____
2	_____
2.5	_____
3	75.0

Speed = \_\_\_\_\_

**North America**

Time (yr)	Position (cm)
0	0
0.25	_____
0.50	0.50
0.75	0.75
1.0	_____
1.25	_____
1.5	1.5

Speed = \_\_\_\_\_

- Motion information for a snail, a Honda Accord, and a peregrine falcon are shown in the tables below. Fill in the blanks of the table. Then record the acceleration of the three objects (include the appropriate units). Pay careful attention to column headings.

**Snail**

Time (day)	Position (ft)
0	0
1	11
2	_____
3	_____
4	44
5	_____
6	66

Acceleration = \_\_\_\_\_

**Honda Accord**

Time (s)	Velocity (mi/hr)
0	60, E
0.5	54, E
1	_____
1.5	42, E
2	_____
2.5	_____
3	24, E

Acceleration = \_\_\_\_\_

**Peregrine Falcon**

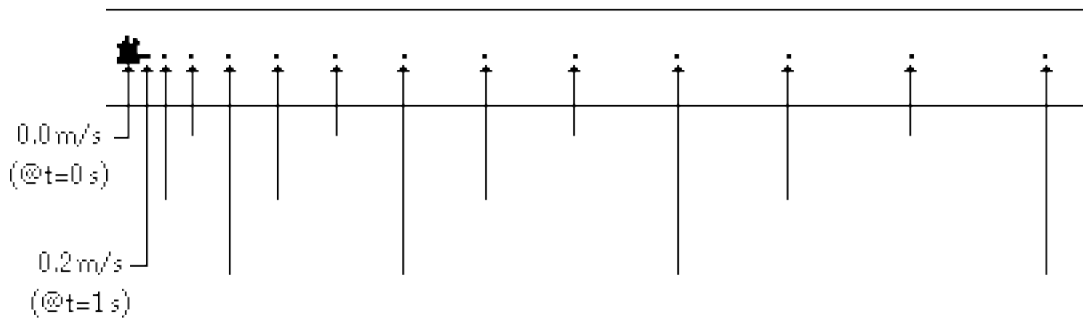
Time (s)	Velocity (m/s)
0	0
0.25	_____
0.50	18, down
0.75	27, down
1.0	_____
1.25	_____
1.5	54, down

Acceleration = \_\_\_\_\_

3. Use the following equality to form a conversion factor in order to convert the speed of the cheetah (from question #1) into units of miles/hour. ( $1 \text{ m/s} = 2.24 \text{ mi/hr}$ ) **PSYW**
4. Use the following equalities to convert the speed of the snail (from question #2) to units of miles per hour. Show your conversion factors.

**GIVEN:**  $2.83 \times 10^5 \text{ ft/day} = 1 \text{ m/s}$   $1 \text{ m/s} = 2.24 \text{ mi/hr}$

5. Lisa Carr is stopped at the corner of Willow and Phingsten Roads. Lisa's borrowed car has an oil leak; it leaves a trace of oil drops on the roadway at regular time intervals. As the light turns green, Lisa accelerates from rest at a rate of  $0.20 \text{ m/s}^2$ . The diagram shows the trace left by Lisa's car as she accelerates. Assume that Lisa's car drips one drop every second. Indicate on the diagram the instantaneous velocities of Lisa's car at the end of each 1-s time interval.



6. Determine the acceleration of the objects whose motion is depicted by the following data.

**Data Set A**

t(s)	v(m/s)
0	32
1	28
2	24
3	20
4	16
5	12
6	8

a = \_\_\_\_\_ m/s/s

**Data Set B**

t(s)	v(m/s)
0	12
0.5	10
1.0	8
1.5	6
2.0	4
2.5	2
3.0	0

a = \_\_\_\_\_ m/s/s

**Data Set C**

t(s)	v(m/s)
0	24
1	21
2	18
3	15
4	12
5	9
6	6

a = \_\_\_\_\_ m/s/s

**Data Set D**

t(s)	v(m/s)
0	32
0.5	28
1.0	24
1.5	20
2.0	16
2.5	12
3.0	8

a = \_\_\_\_\_ m/s/s

