Acceleration
Lesson Notes

Velocity Speed + Direction (at any given instant in time)

Accelerating Objects are changing their velocity … either their speed or their direction.

Three ways to accelerate:
1. Speed up
2. Slow down
3. Change directions

Acceleration The rate at which the velocity changes.

Acceleration Equation:

$$\text{Acceleration} = \frac{\Delta \text{velocity}}{\Delta \text{time}} \qquad a_{ave} = \frac{\Delta v}{\Delta t}$$

Acceleration Units:
1. (mi/hr)/s
2. (km/hr)/s
3. (m/s)/s
4. m/s^2

An acceleration of 5.0 m/s/s means …
… the velocity of the object changes by 5.0 m/s every 1.0 second of travel.

Determining acceleration values from velocity-time data (answers at end of page):

Table 1

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

Table 2

Time (s)	Velocity (m/s)
0.0	12.0
1.0	15.0
2.0	18.0
3.0	21.0
4.0	24.0
5.0	27.0

Table 3

Time (s)	Velocity (m/s)
0.0	0.0
1.0	4.0
2.0	8.0
3.0	12.0
4.0	16.0
5.0	20.0

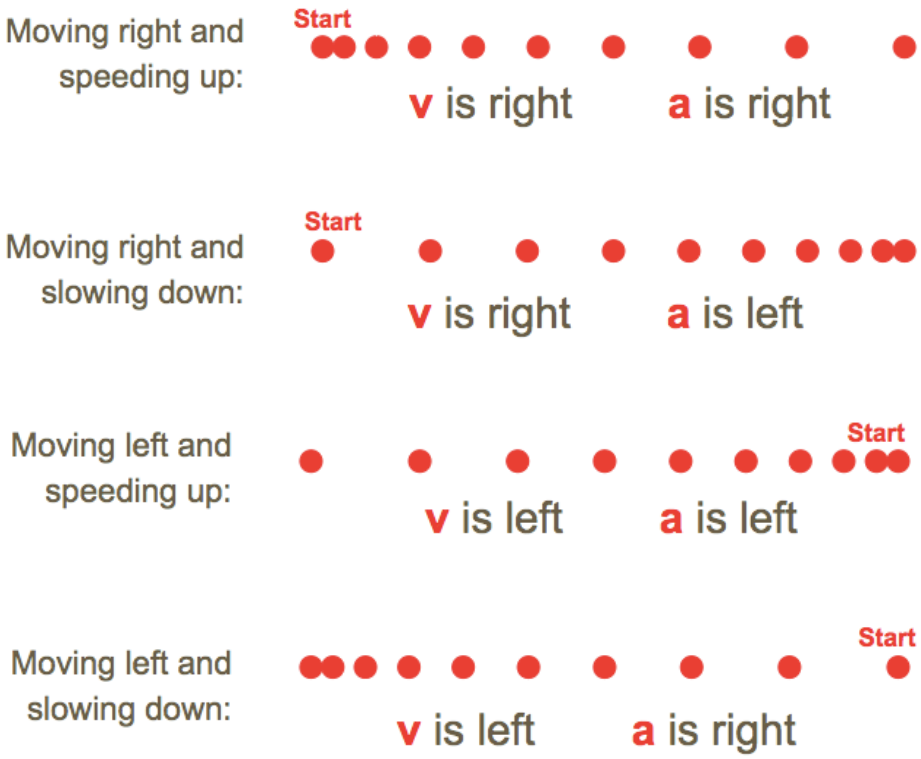
Table 4

Time (s)	Velocity (m/s)
0.0	0.0
1.0	2.0
2.0	4.0
3.0	6.0
4.0	8.0
5.0	10.0

Rules for Acceleration Direction

1. For a **speeding up** object, acceleration is in the **same direction** that object moves.
2. For a **slowing down** object, acceleration is in the **opposite direction** that object moves.

(**Review**: for **Velocity**, direction of velocity vector is the same direction that object moves.)



Your Turn: A sled accelerates from 1.4 m/s to 7.9 m/s in 5.1 s. Determine the acceleration of the sled.

An acceleration of -6.2 m/s/s means accelerating left (or west or down …) at 6.2 m/s/s.

A **uniform acceleration** means the velocity is changing by the same amount each second.

Answers

Table 1: 5.0 m/s/s **Table 2: 3.0 m/s/s** **Table 3: 4.0 m/s/s** **Table 4: 2.0 m/s/s**