Chapter 2-2

Acceleration

Acceleration is the measure of how fast something speeds up or slows down.

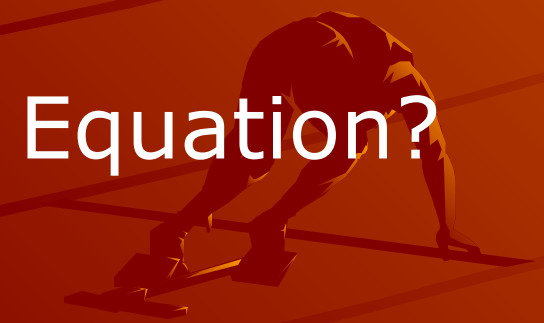
$a = (v_f - v_i)/t$

Si Units for acceleration is m/s^2

#1. As the shuttle comes to a sudden stop, it accelerates at $-4.1 m/s^2$ as it slows from 9 m/s to 0 m/s in what time?

Knowns?

Unknown?



Equation?

Answer?

Vector versus Scalar

A vector has a size and a direction

Example – 20 m/s due North

A scalar has only a size - no direction

Example – 20 m/s

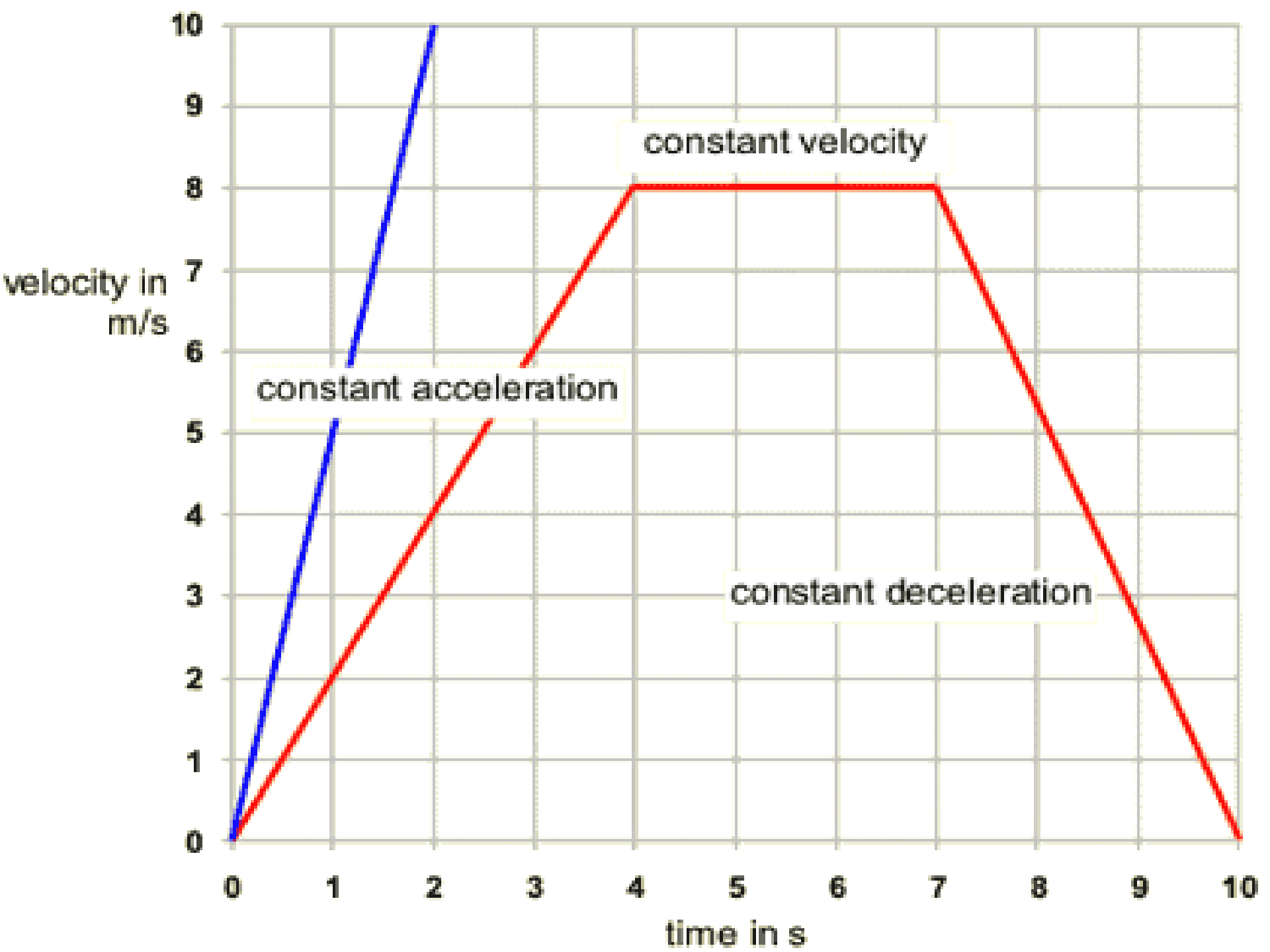
Acceleration is a vector because it has size and direction.

If the final velocity is greater than the initial velocity the Δv will be positive

If the final velocity is less than the initial velocity the Δv will be negative .

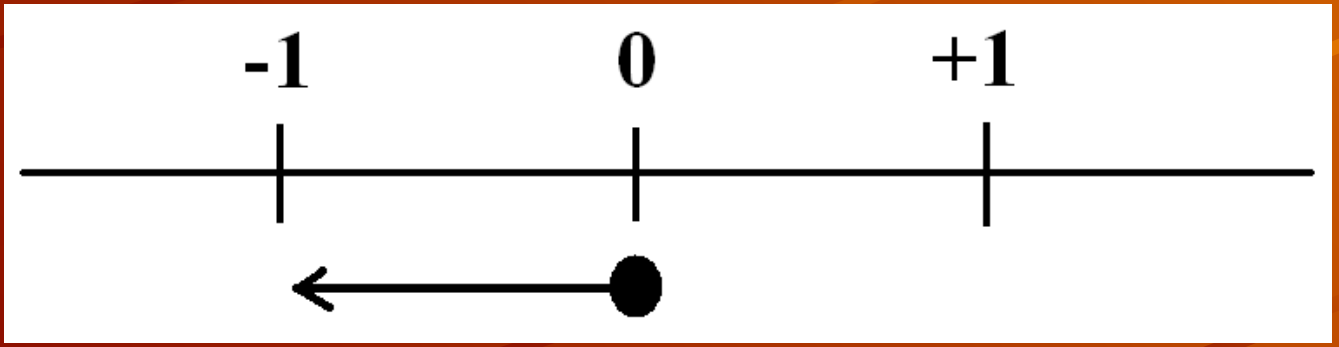
Graphs

The slope and shape of a graph describes the object's motion.


velocity in m/s
10
9
8
7
6
5
4
3
2
1
0
constant velocity
constant acceleration
constant deceleration
0
1
2
3
4
5
6
7
8
9
10
time in s

Accelerating Versus Decelerating

A negative acceleration doesn't always mean the object is slowing down. It could be moving in the negative direction.

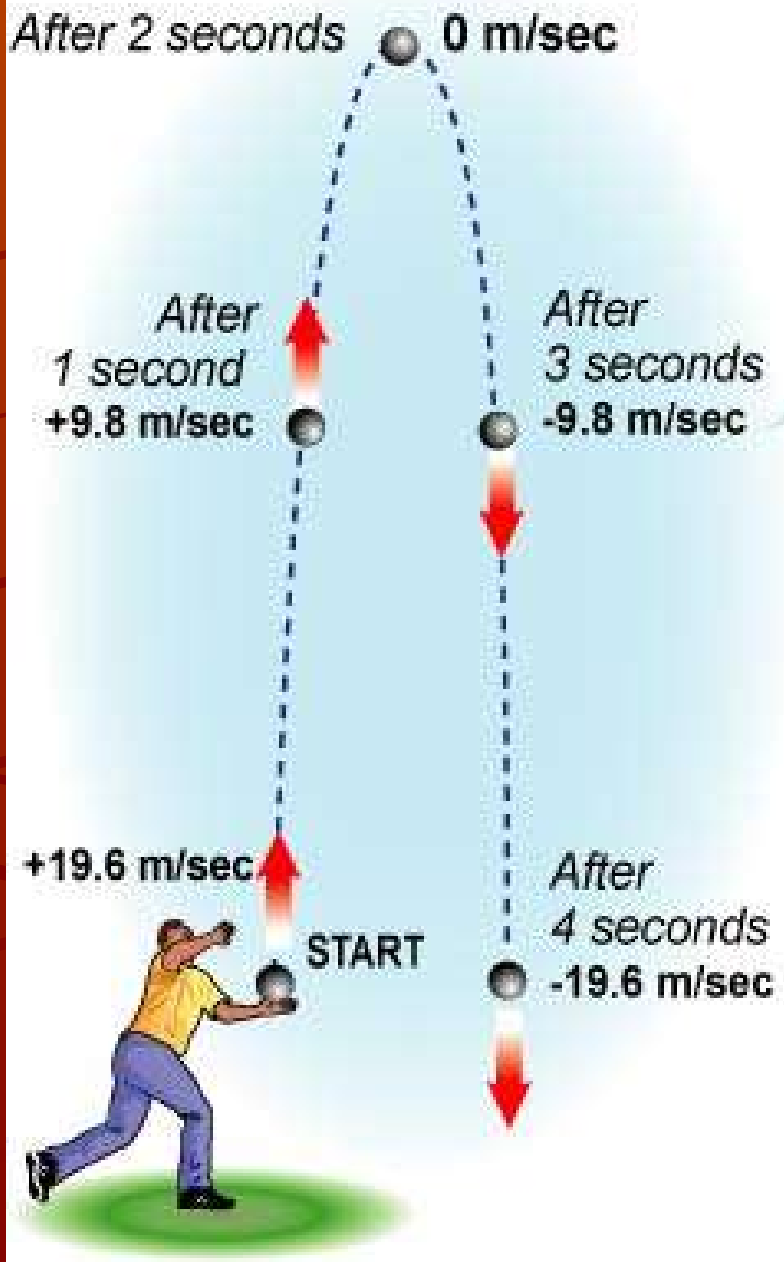


Constant Acceleration

Velocity increases by the exactly the same amount during each time interval.

The displacement for each time interval increases by the same amount.

Free Fall with Upward Motion



The speed changes by -9.8 m/sec every second

Time (sec)	Velocity (m/sec)	Height (m)
0.0	19.60	0.00
1.0	9.80	14.70
2.0	0.00	19.60
3.0	-9.80	14.70
4.0	-19.60	0.00

4 Kinematic Equations

All the kinematic equations are related.

There is always more than one way to solve each problem.

In general though, one equation is generally easier to use then others.

Equations - Kinematic

$V_f = v_i + at$

$x = v_i(t) + \frac{1}{2} a(t)^2$

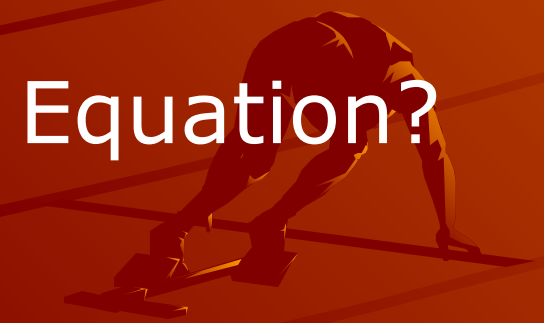
$x = \frac{1}{2} (V_i + V_f)t$

$V_f^2 = V_i^2 + 2ax$

#1. A car accelerates from rest to a speed of 23.7 km/h in 6.5 s. Find the distance the car travels.

Knowns?

Unknowns?



Equation?

Answer = ?

Homework Assignment

Worksheet 2.2