# Describing Acceleration

Thinking question: What is the difference between uniform and non-uniform motion?

Uniform motion occurs at a constant displacement over a constant time interval; non-uniform motion occurs with changing speeds (different displacements in different time intervals) – it is not consistent

When an object in motion has a change in velocity, this is called **acceleration**. Change in **velocity**, or non-uniform motion, occurs when direction changes, speed increases, or speed decreases.

An object travelling with non-uniform motion will:

- Have **different** displacements during equal time intervals
- If displacement is increasing, velocity is **increasing**
- If displacement is decreasing, velocity is **decreasing**
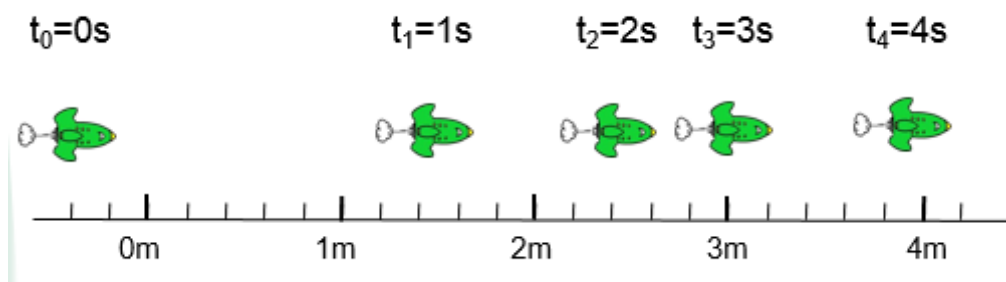
The diagram above shows a change in velocity. Where on the diagram is the plane moving fastest? Slowest? How can you tell?

The plane moves fastest from 0 s – 1 s because it is travelling the farthest distance in 1 s.

The plane moves slowest from 2 s – 3 s because it is travelling the shortest distance in 1 s.

You must compare at least two different time intervals or displacements to see a change in velocity

Change in velocity occurs when the speed of an object **changes** or the direction of motion **changes**.

How do we calculate this?

$\Delta \vec{v} = \vec{v}_f - \vec{v}_i$

Use the equation to fill out the following table:

Time Interval	Displacement	Velocity	Δv
1 s	+1.45 m	+1.45 m/s	█████████████████████████
1 s	+0.9 m	+0.9 m/s	$\Delta \vec{v} = 0.9\frac{m}{s} - 1.45\frac{m}{s} = -0.55 \, m/s$
1 s	+0.6 m	+0.6 m/s	$\Delta \vec{v} = 0.6\frac{m}{s} - 0.9\frac{m}{s} = -0.3 \, m/s$
1 s	+0.9 m	+0.9 m/s	$\Delta \vec{v} = 0.9\frac{m}{s} - 0.6\frac{m}{s} = +0.3 \, m/s$

Thinking question: What do the positive and negative changes in velocity mean?

A positive change in velocity shows an increase in velocity (speeding up)

A negative change in velocity shows a decrease in velocity (slowing down)

Recall: Acceleration – what is this?

Acceleration is the rate of change in **velocity**. This can be a change in speed and/or a change in direction

Thinking question: Imagine two cars are racing and they start at rest. They increase their velocity to be the same. The two cars have different accelerations. How can this be is they have the same change in velocity?

If one objects change in velocity occurs in a shorts time, its acceleration will be higher.

The direction of the **acceleration** is the same as the direction of the change in velocity. When the acceleration is opposite the direction of motion, we call this **deceleration**.