I can use vectors to show displacement, velocity, and acceleration. ***325-5***

Uniform Acceleration

Terminology

Accelerated motion: nonuniform motion that involves change in an object's speed or direction or both.

Uniformly accelerated motion:
motion that occurs when an object travelling in a straight line changes its speed uniformly with time.

Use the tables below to make two velcoity-time graphs.

Graph 1

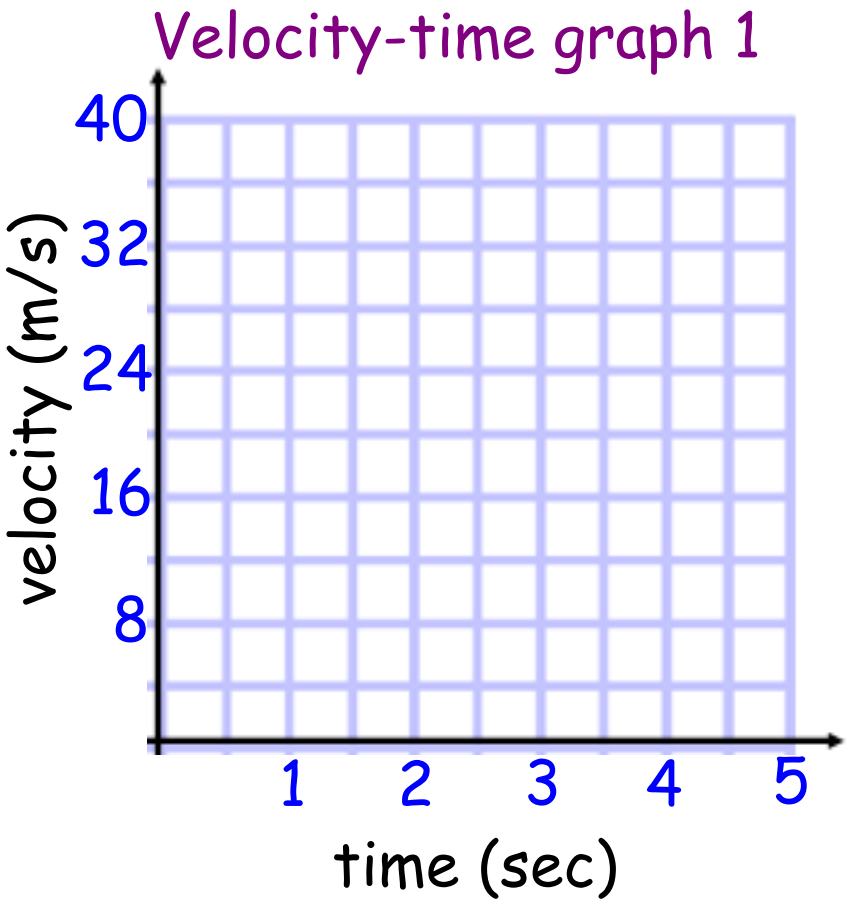
time (s)	$\vec{V}$ (m/s [W])
0.0	0.0
1.0	6.0
2.0	12.0
3.0	18.0
4.0	24.0

Graph 2

time (s)	$\vec{V}$ (m/s [W])
0.0	24.0
1.0	18.0
2.0	12.0
3.0	6.0
4.0	0.0

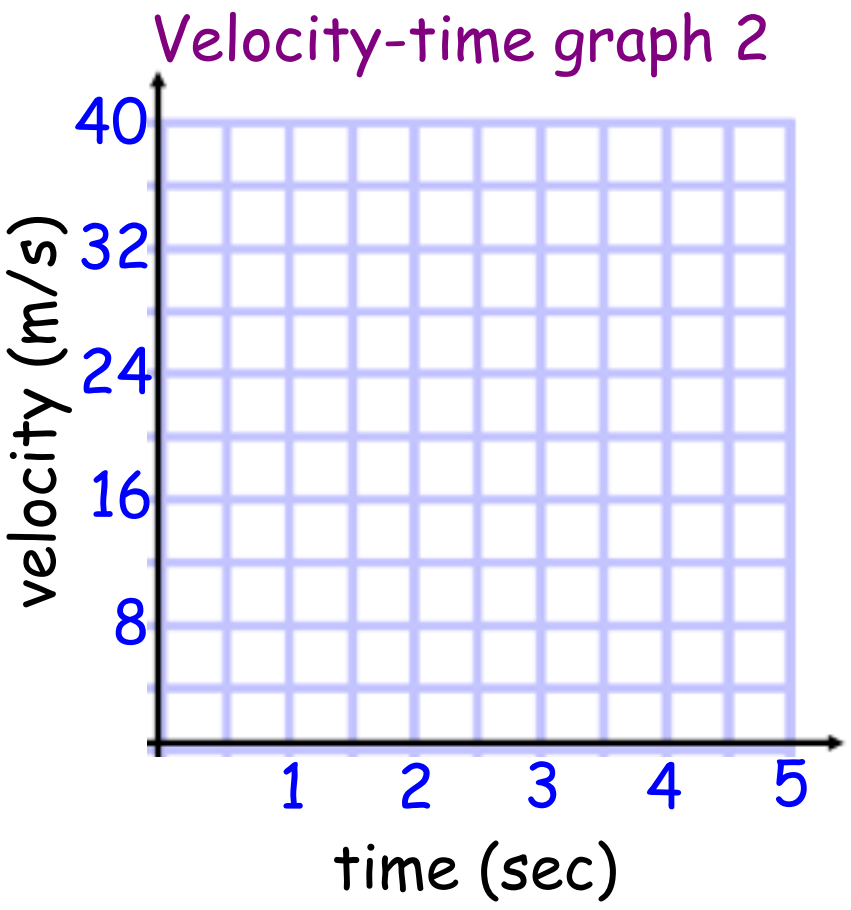
a) What is the slope in this case?

b) How are the graphs the same? How are they different?



Graph 1

time (s)	V (m/s [W])
0.0	0.0
1.0	6.0
2.0	12.0
3.0	18.0
4.0	24.0



Graph 2

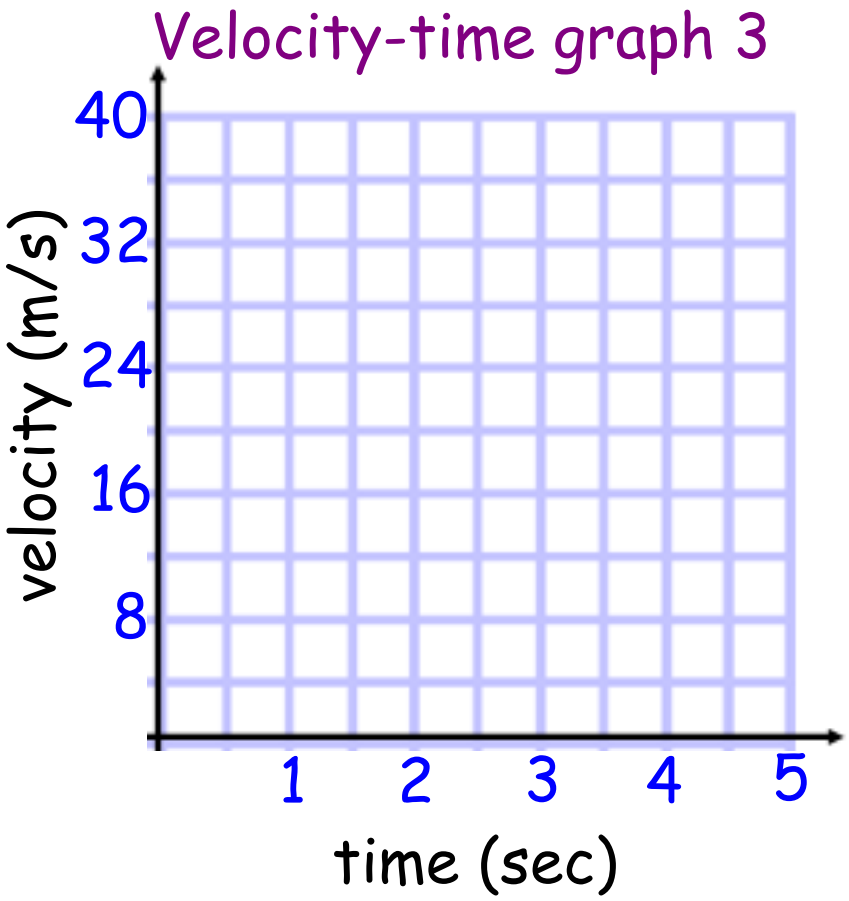
time (s)	V (m/s [W])
0.0	24.0
1.0	18.0
2.0	12.0
3.0	6.0
4.0	0.0

One more....

Graph 3

time (s)	$\vec{V}$ (m/s [S])
0.0	0.0
1.0	10.0
2.0	16.0
3.0	20.0
4.0	22.0

What is the difference compared to graphs 1 and 2?



Graph 3

time (s)	V (m/s [S])
0.0	0.0
1.0	10.0
2.0	16.0
3.0	20.0
4.0	22.0

Finding Acceleration

Terminology

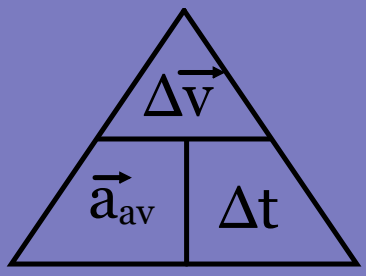
acceleration: rate of change of velocity

instantaneous acceleration: acceleration at a particular instant

average acceleration: change of velocity by the time interval for that change.

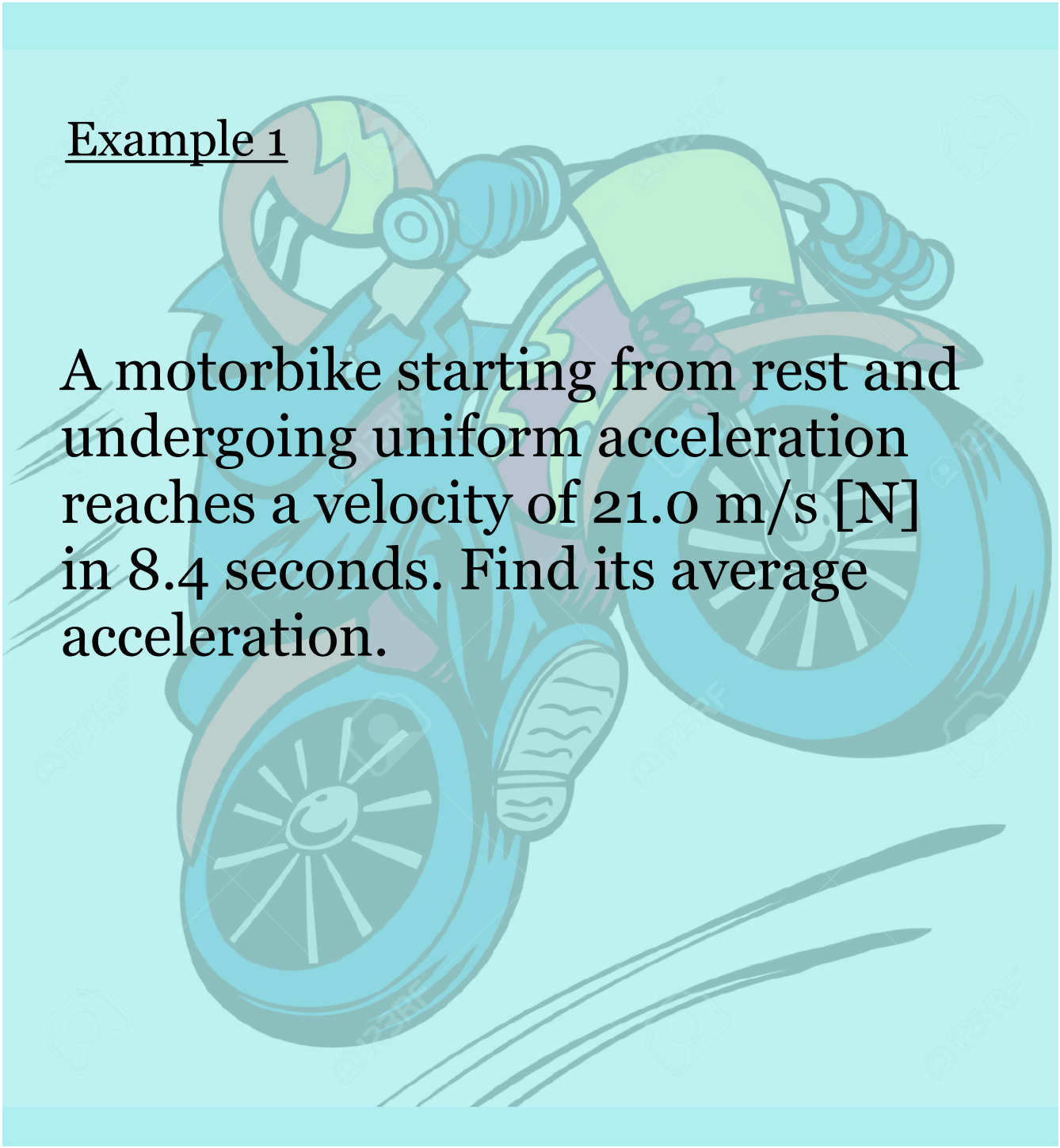
$$\text{average acceleration} = \frac{\text{change of velocity}}{\text{time interval}}$$

$$\vec{a}_{av} = \frac{\Delta\vec{v}}{\Delta t}$$



Since the change in velocity is the final velocity (v_f) minus the initial velocity (v_i) ...

$$\vec{a}_{av} = \frac{\vec{v}_f - \vec{v}_i}{\Delta t}$$



Example 1

A motorbike starting from rest and undergoing uniform acceleration reaches a velocity of 21.0 m/s [N] in 8.4 seconds. Find its average acceleration.

Example 2

A cyclist, travelling initially at 14 m/s [S], brakes smoothly and stops in 4.0 seconds. What is the cyclist's average acceleration?

Example 3

Megan is skiing down a hill. After 10.0 seconds her final velocity is 20.0m/s [S]. If accelerated down the hill with a speed of 1.5 m/s^2, what was her initial velocity?