



Vectors and Scalars

	Magnitude (size)	Direction
Scalars		
Vectors		✓

Scalars	Vectors
<i>Speed</i>	

North ↑

10 ms⁻¹

3 ms⁻¹

Calculate resultant velocity

1. Draw vectors tip-to-tail:

2. Draw on Resultant vector

3. Use Pythagoras to find magnitude:
 $a^2 = b^2 + c^2$

4. Use Trigonometry to find direction (as a bearing from North):

5. Final answer with magnitude and direction:

Jack walks 5m forward, turns around and walks 5m back to his starting point. His journey took 20s.

- A) What is the total distance travelled?
- B) What is Jack's displacement?
- C) What is Jack's average speed?
- D) What is Jack's average velocity?

Dynamics

distance = x time

displacement = x time

Acceleration

acceleration = /

time

Velocity-time Graphs

How do we use a v-t graph to determine displacement?

Equipment	Needed to measure acceleration?
Trolley & track	
Metre stick	
Light gate(s)	
Mask/card	
Computer	
Stop watch	
Protractor	

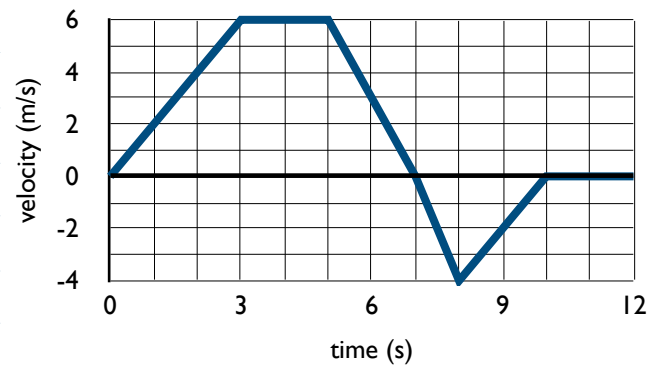
An aircraft decelerates at 0.5 ms⁻² after landing. How long does it take to come to rest if the initial velocity was 70 ms⁻¹?

What is happening at each point of the Remote Control Car's velocity-time graph?

Time	Speed	Direction	Acceleration (ms ⁻²)
0 to 3 s	<i>Increasing</i>		
3 to 5 s		<i>Forward</i>	
5 to 7 s			
7 to 8 s			<i>-4</i>
8 to 10 s			
10 to 12 s			



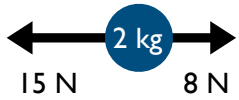
Remote Control Car



Newton's Laws

Motion of Object	Balanced forces	Unbalanced forces
Stationary	✓	
Constant velocity		
Accelerating		

Unbalanced force = x acceleration



Unbalanced force:

Acceleration:



Calculate acceleration

1. Draw vectors tip-to-tail:

2. Draw on Resultant vector

3. Use Pythagoras and Trigonometry to find unbalanced force:

4. Use unbalanced force to calculate acceleration:

Earth	
mass (kg)	weight (N)
1	9.8
	118
60	
	8000

Mars	
mass (kg)	weight (N)
1	
	118
60	

Jupiter	
mass (kg)	weight (N)
1	
	118

Skydiver Motion (total mass 100 kg)	Upward force (N)	Downward force (N)
Freefall	< 980	980
Terminal Velocity (no parachute)		
Parachute opened		
Terminal Velocity (with parachute)		

Weight = mass x

Work Done = Force x

Dynamics 2



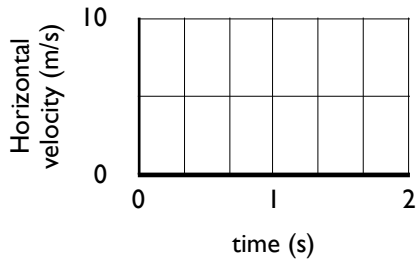
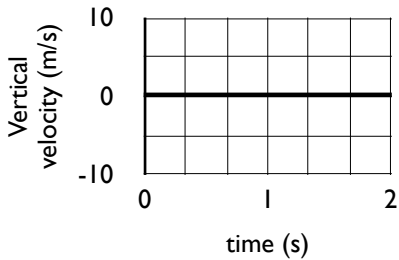
Every force has an equal and opposite 'reaction'

Force of engine on exhaust gases

Force of exhaust gases on

Projectile Motion

A golf ball is hit over level ground with an initial vertical velocity of 10 ms⁻¹ and horizontal velocity 7.5 ms⁻¹. It lands 2 s later. Complete the graphs.



What is the maximum vertical height?

What is the horizontal range?

An object is pulled along a bench with a constant 12 N force. How far has the object been moved if the Work Done is 42 J?

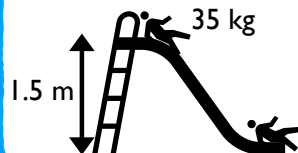


Gravitational Potential Energy →

→ Heat + Light Energy

Kinetic Energy = x mass x

Gravitational Potential Energy = x gravitational field strength x



A child starts from rest at the top of the frictionless slide. What is their velocity at the bottom?

Energy