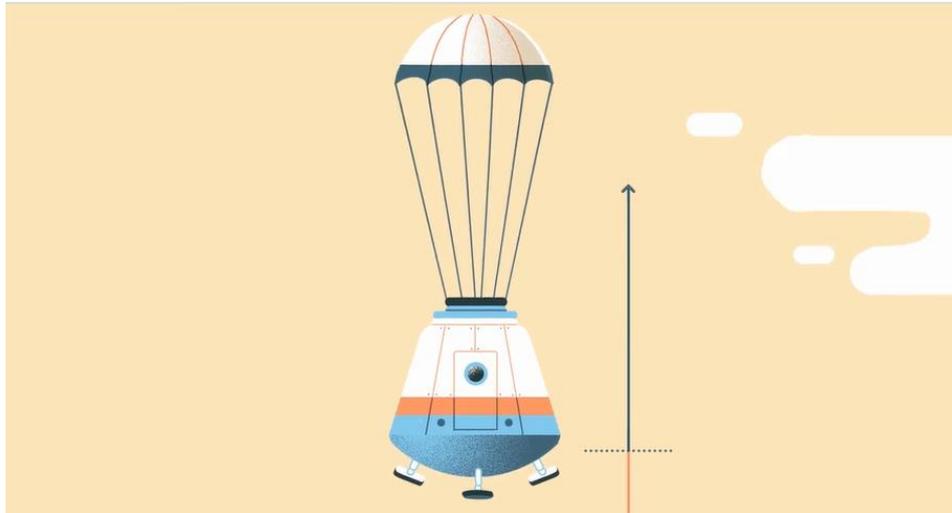


## Forces on a Space Probe

### Key Stage 3

**Topics covered:** weight and air resistance, balanced and unbalanced forces, forces and change in velocity

Watch the video "Newton's Laws of Motion", <https://vimeo.com/159043081>

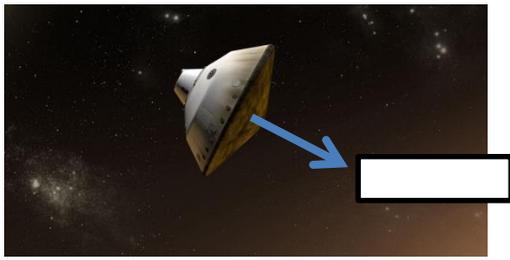


After travelling 8 months through the Solar System to get to Mars, NASA's Curiosity rover experienced changing forces as it descended through the Martian atmosphere to land on its surface in August 2012.

Its descent consisted of a period of free fall followed by a parachuted descent and finally it used small thrusters to slow it down enough for it to land safely.

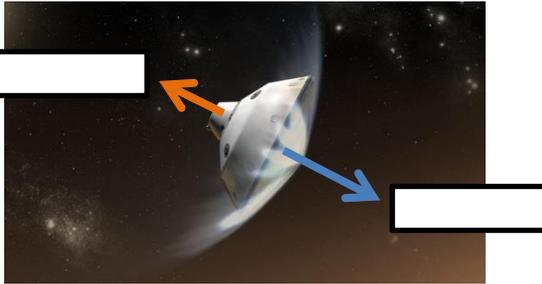
1. What two forces would be acting on a space probe as it descends down to Mars' surface?
2. For each of the following diagrams on the next page:
  - a) Label the forces
  - b) Describe the forces (balanced or unbalanced)
  - c) Describe the speed (speeding up, slowing down or at a constant speed)
  - d) Describe the acceleration (accelerating, decelerating or no acceleration / deceleration)
3. Conclusions:
  - a) If the \_\_\_\_\_ are balanced, the object's speed will \_\_\_\_\_ and if the forces are unbalanced, the object's speed will \_\_\_\_\_ .
  - b) An object will \_\_\_\_\_ if the forces on it are \_\_\_\_\_ .

Pulled in by Mars' gravity from space



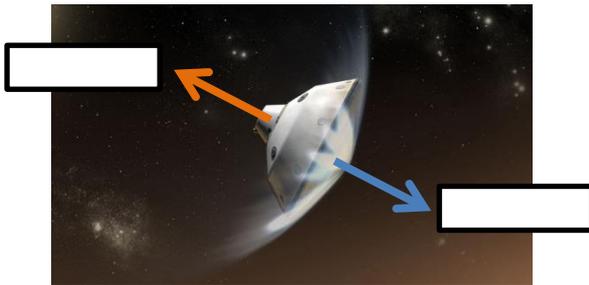
Description

Falling through Mars' atmosphere



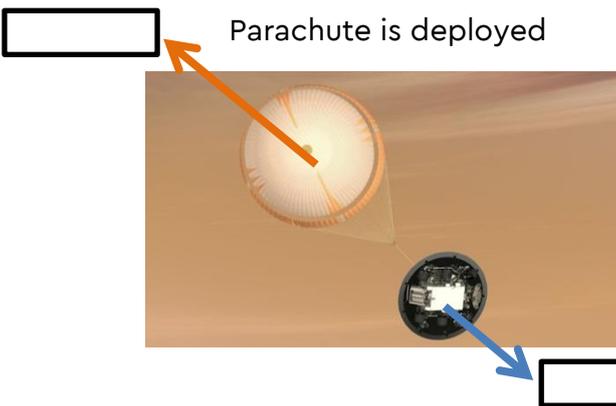
Description

Continues falling through Mars' atmosphere



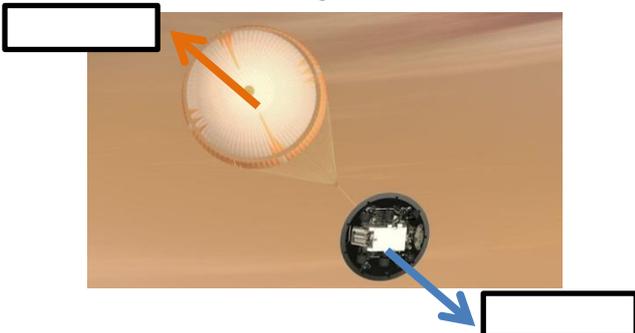
Description

Parachute is deployed



Description

Continues falling to Mars' surface



Description

## Forces on a Space Probe: **ANSWERS**

### Key Stage 3

1. Weight or gravity (acting downwards towards the planet's surface)  
Air resistance or drag (acting upwards away from the planet's surface)
  
2. Blue arrow denotes the force of weight or gravity  
Orange arrow denotes the force of air resistance or drag  
Image 1 – unbalanced forces, speeding up, accelerating  
Image 2 – unbalanced forces, speeding up, accelerating  
Image 3 – balanced forces, constant speed (terminal velocity),  
not accelerating or decelerating  
Image 4 – unbalanced forces, slowing down, decelerating  
Image 5 – balanced forces, constant speed (new terminal  
velocity), not accelerating or decelerating
  
3. a) Forces, remain constant, change (speed up / slow down)  
b) Accelerate or decelerate, unbalanced  
Or the opposite - not accelerate or decelerate, balanced