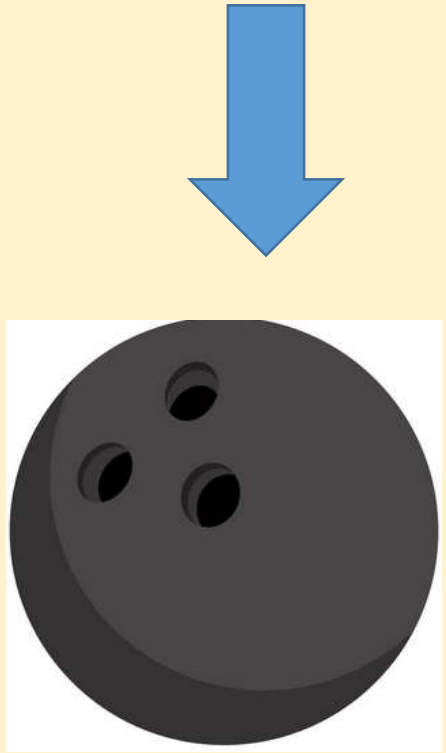
Air Resistance

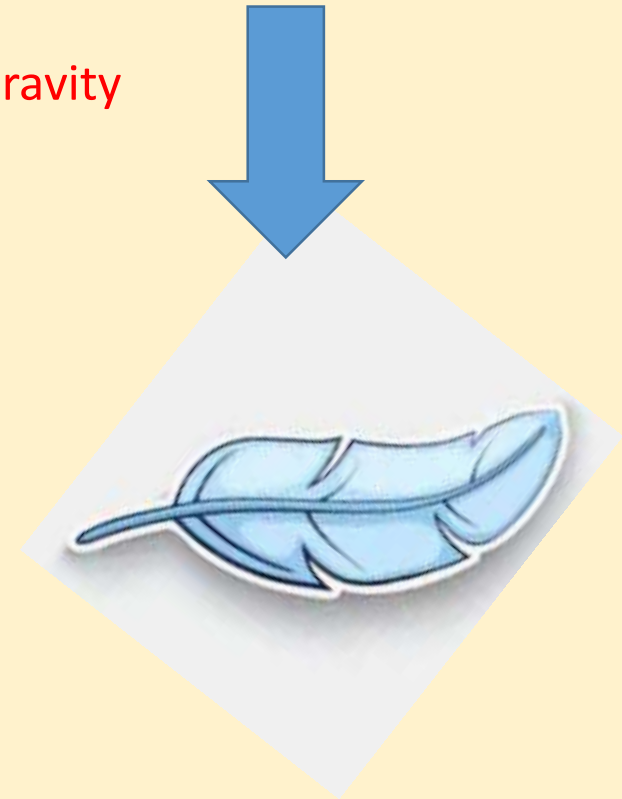
L.O:
To investigate and understand the effects of air resistance

In the first lesson of this unit, we learnt that gravity is a force which pulls objects down to earth.

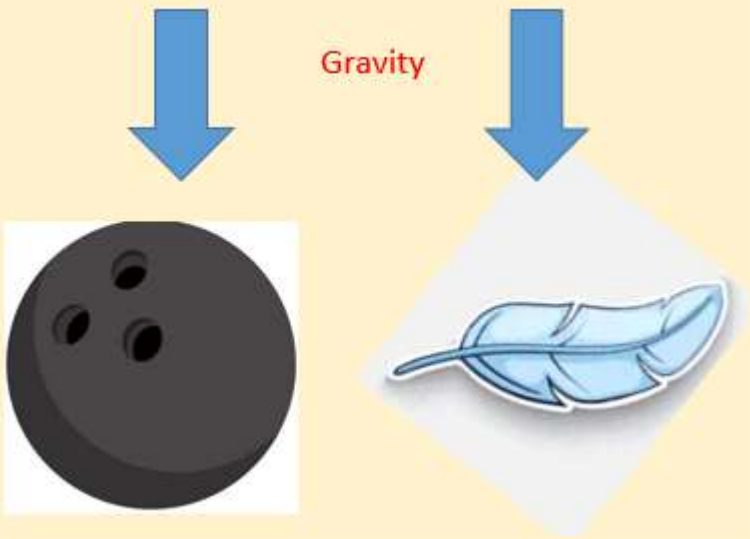
The force of gravity acts the same on all objects.
For instance, if we look at a bowling ball and a feather.
It is the same size of pull force acting on both objects. We can draw force arrows for gravity the same size above each object to represent the same strength force acting on them.



Gravity



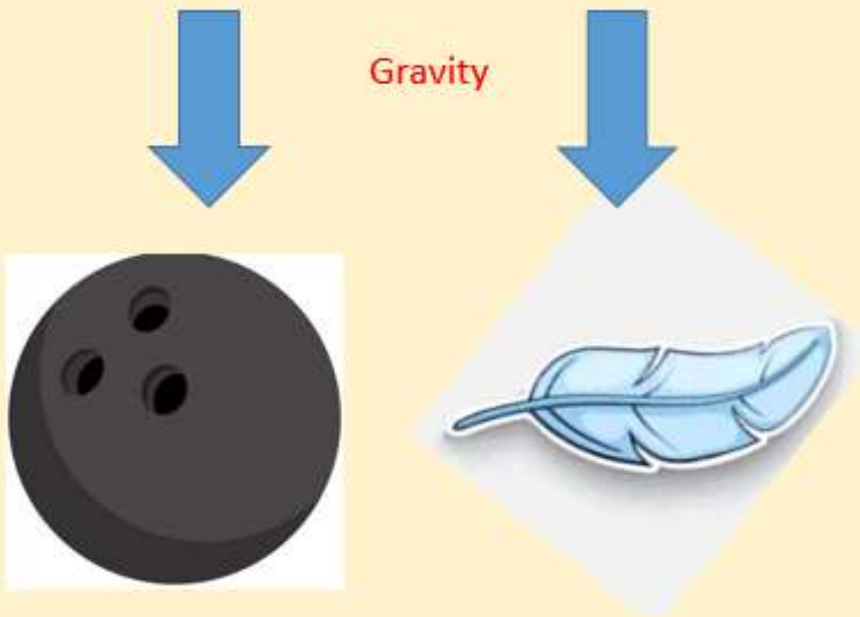
But, if we drop a bowling ball and a feather at the same time, which will fall to the earth first?



https://www.youtube.com/watch?v=E43-CfukEgs

If gravity is pulling both the bowling ball an feather down to earth with the same amount of force, why does the bowling ball fall faster?

Watch the YouTube video by Brian Cox. He recreates a famous experiment which Gallileo performed in 1590 to show that it isn't gravity that makes the bowling ball fall faster!



If the bowling ball and feather are dropped through the air, then the bowling ball will fall the fastest.

But if we take the air away by creating a vacuum, like in the video, they fall at the same speed!

This means it's the air that it's not gravity pulling the bowling ball down stronger, it's the air which is slowing the feather down more than the bowling ball!

When men landed on the moon (where there is no air), they tried the experiment by dropping a heavy hammer and a feather. Watch the video below.

https://www.youtube.com/watch?v=KDp1tiUsZw8

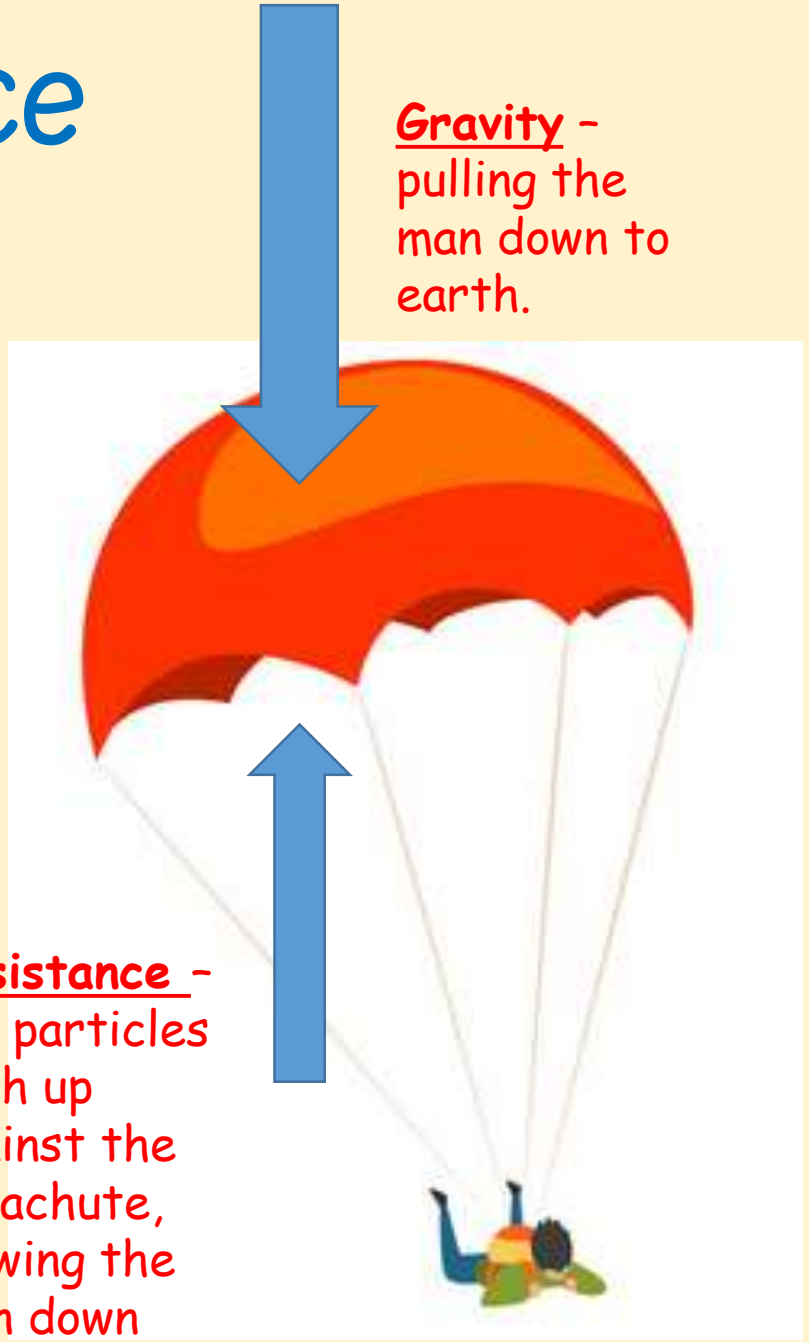
Air Resistance

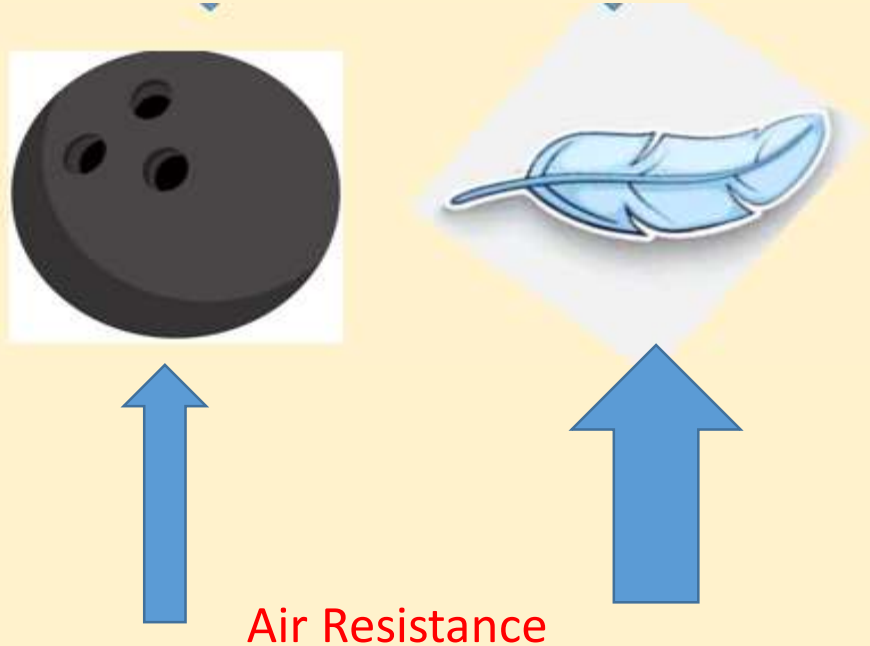
- On Earth some objects fall faster than others, not because of gravity but because of air.

- As an object falls, air particles push against the object. This slows it down. We call this pushing force by the air '**air resistance**'.

- Air resistance is a type of friction. Like friction it slows thing down!

https://www.youtube.com/watch?v=vZYwsAvHgVw





- When we drop the feather and the bowling ball in air, the air pushes against both objects.

- But because the feather is very light, the air is able to push the feather up more.
- The ball is very heavy so the air resistance isn't strong enough to slow it down as much as the feather.

Which factors can effect air resistance?

- Which man will fall to the Earth first?
- Which man will land last?
- Why do you think this?

Man B fell the fastest.
This is because he had the smallest parachute.
Because it is small, only a small amount of air pushes against the parachute, there is less air resistance, so it only slows him down a small amount.

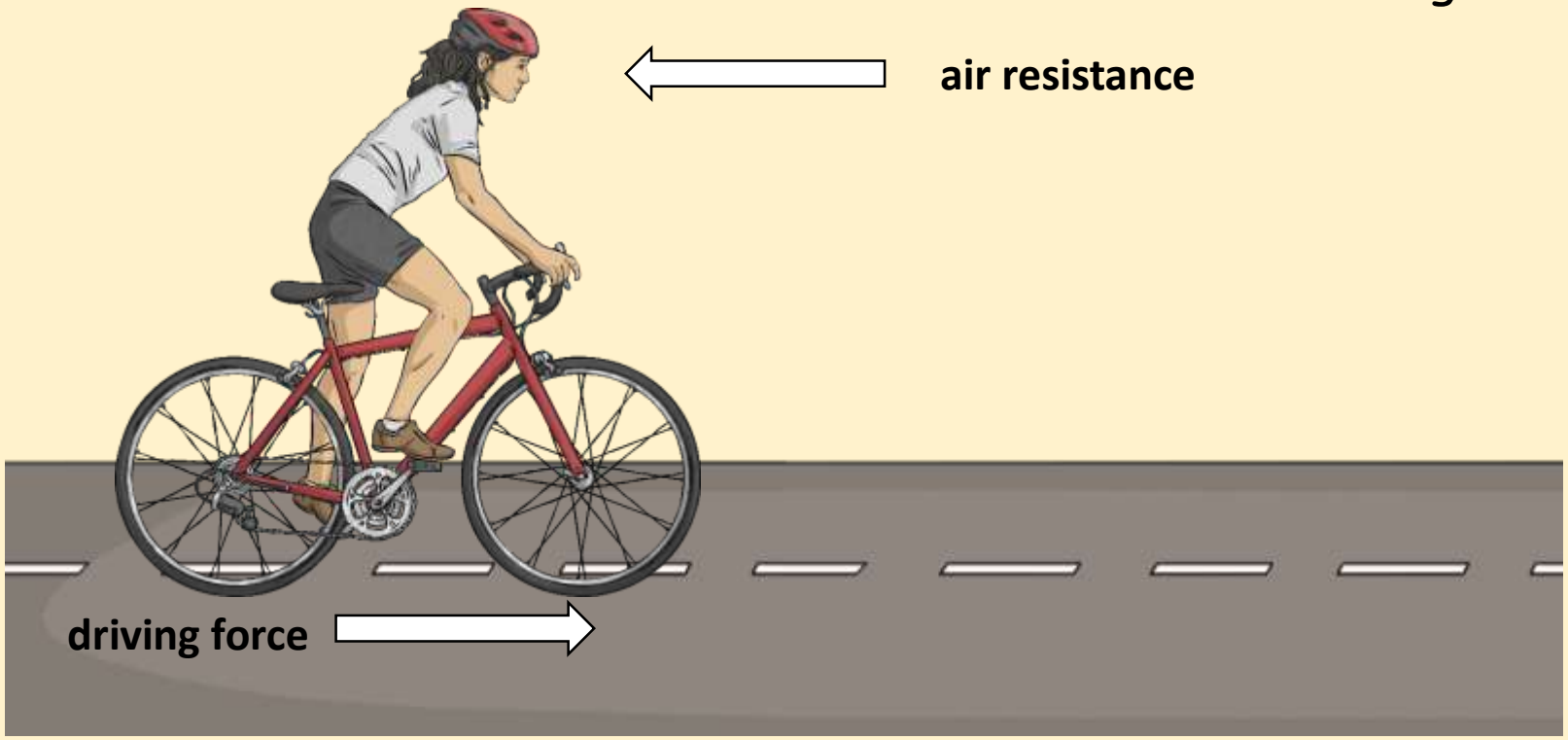
Man C fell the slowest.
This is because he had the biggest parachute.
Because it is big, more air pushes against the parachute, there is more air resistance, so it only slows him down a larger amount.

In science we say larger objects have a bigger **surface area**, compared to smaller objects (they take up more space). Object with larger surface areas are slowed down more by air resistance.

Air resistance doesn't just effect objects that are falling.

Anything moving through the air is effected.

When you run, ride a bike or drive a car, air resistance is pushing against you, trying to slow you down.



Streamlining

We know that objects with large surface areas create more air resistance.

This means that by reducing the surface area, we can reduce air resistance and therefore go faster.

When cyclist crouch down over their handle bars, they reduce their surface area.

They 'make themselves smaller'. This reduces air resistance and helps them to go faster.

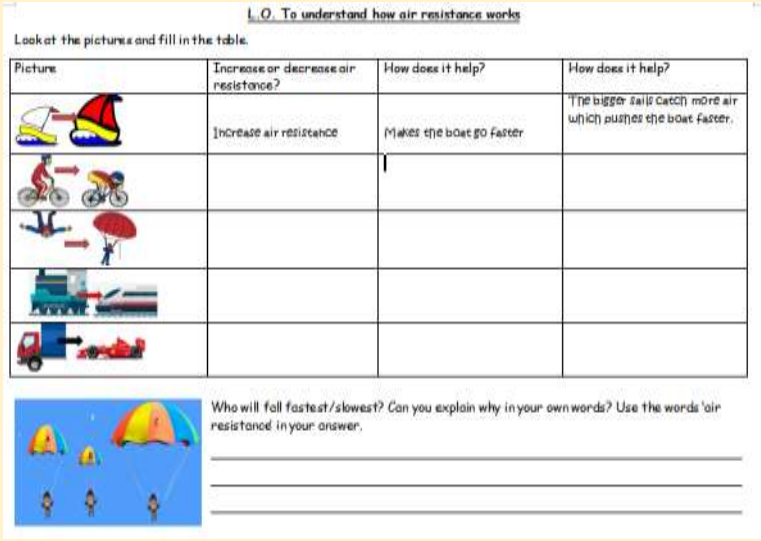
The front of a lorry has a large surface area. It creates a lot of air resistance.

But a race car is low to the ground and 'pointy'. This reduces the surface area, meaning less air resistance, helping it to go faster

Reducing the shape of an objects surface area in order to reduce air resistance is called **STREAMLINING**. We can say an F1 car has a streamline shape.

Your mission....

Choose one of the activities (or both if you like).



L.O. To understand how air resistance works

Look at the pictures and fill in the table.

Picture	Increase or decrease air resistance?	How does it help?	How does it help?
	Increase air resistance	Makes the boat go faster	The bigger sails catch more air which pushes the boat faster.

Who will fall fastest/slowest? Can you explain why in your own words? Use the words 'air resistance' in your answer.

1. Air resistance worksheet
- Complete the table and explain which parachute will fall fastest in your own words.

2. Air resistance experiment – paper helicopters
- Download the PowerPoint and read through the instructions.
- Fill in the experiment sheet as you go.
- Think about the variables you could change on your helicopters.

(if you don't have paper clips, you could weigh the bottom of the helicopter down with plasticine or blu-tak).