In this unit we will

- Investigate the force of Gravity – take force measurements
- Investigate force of buoyancy, or up-thrust
- Investigate how forces can create movement - plan and carry out a fair test
- Investigate the force of friction – plan & carry out a fair test
- Explore the effect of air resistance – taking repeat readings

Forces

Science Skills that we will develop:

Explaining Science

- I use complex science words correctly
- I use a science model to describe and explain
- I draw & annotate diagrams to help describe/explain

Designing Experiments

- I plan a fair test & ensure controlled variables stay the same

Data, Tables & Graphs

- I measure/calculate in standard units
- I construct a complex table to show repeated data
- I plot mean values and draw a trend line for line graphs

L.O. Understand how gravity and air resistance act on falling objects

What happens to a paper ball in your hand if you let it go? Does it always travel the same way?

What force is involved?

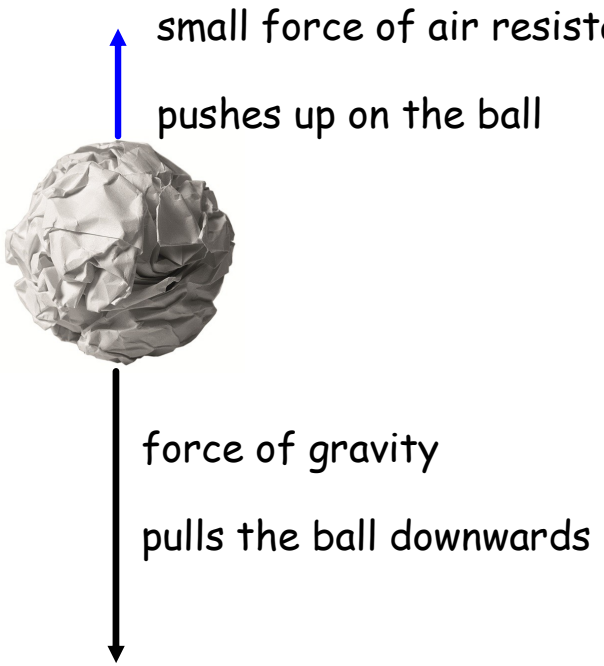
If you unroll the ball and drop it, what happens?

Why?

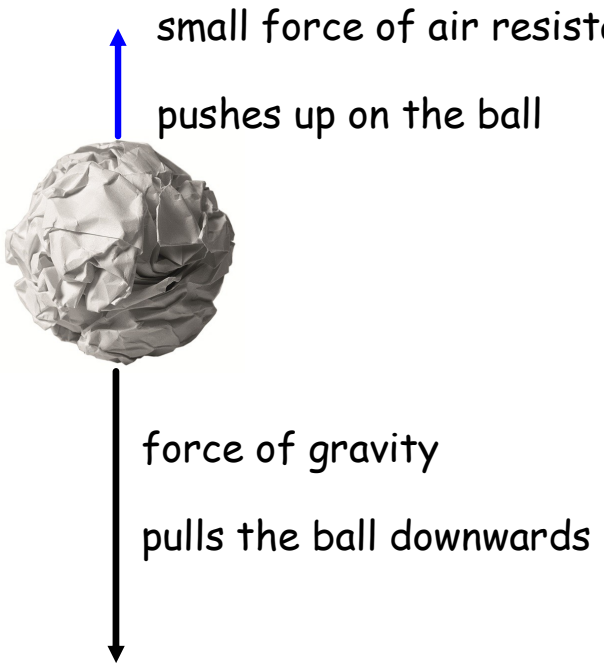
What **forces** are involved?

What caused it to fall more slowly this time?

Can you make sense of what happened using the **particle model**?

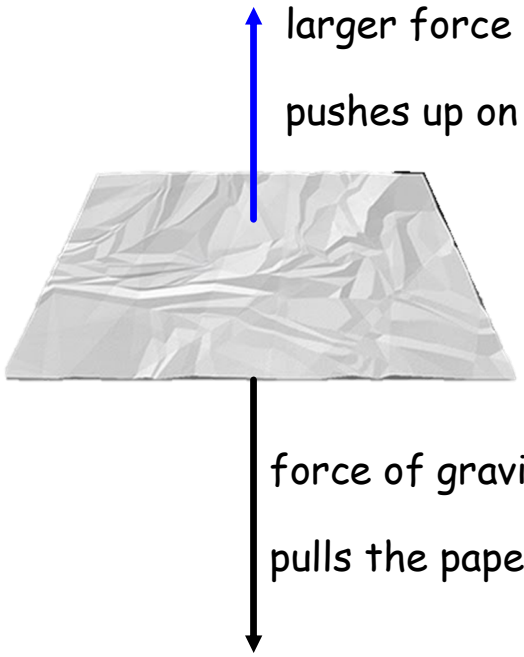


Why is the force of air resistance small?

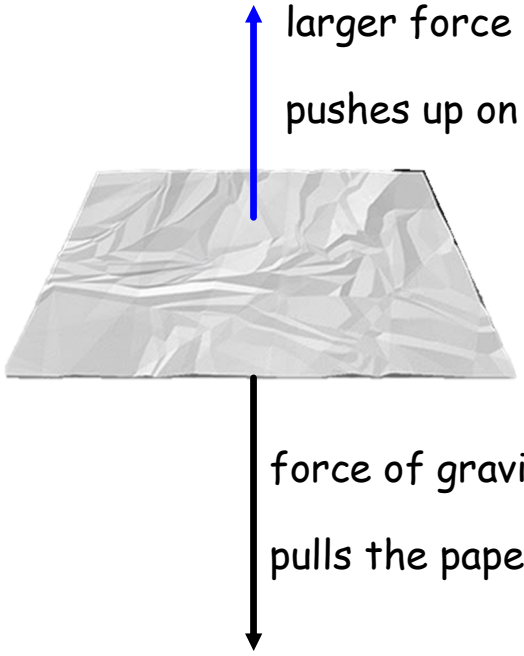


Why is the force of air resistance small?

The ball of paper takes up less volume, and falls through the air particles more easily, because the area of paper pushing downwards at the bottom of the ball is small.



Why is the force of air resistance much bigger when the paper is not crumpled into a ball?



Why is the force of air resistance much bigger when the paper is not crumpled into a ball?

The sheet of paper has a much bigger surface area, which pushes down on more air particles. The effect of so many more particles pushing up against the paper slows it down.

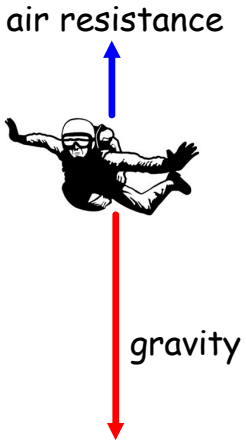
What forces are acting on these people?

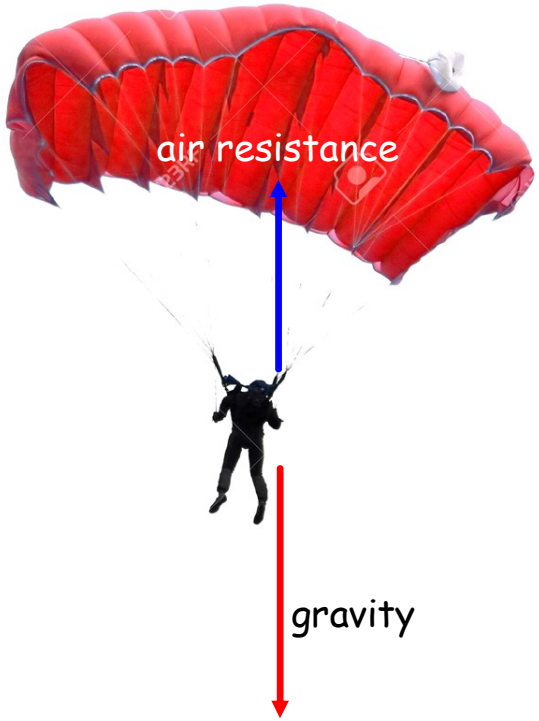
Who falls more slowly? Why?

Answer the questions on the sheet with your partner.

How should we draw the force arrows for the sky-diver and the parachutist?

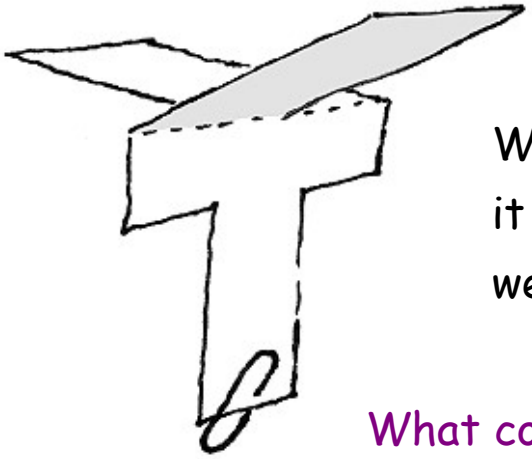
Why is the gravity arrow the same for both? Why is the air resistance much bigger for the parachutist? Is it possible for the air resistance to be *greater* than gravity?





What do all these seeds have in common?

What helps them to fall more slowly?



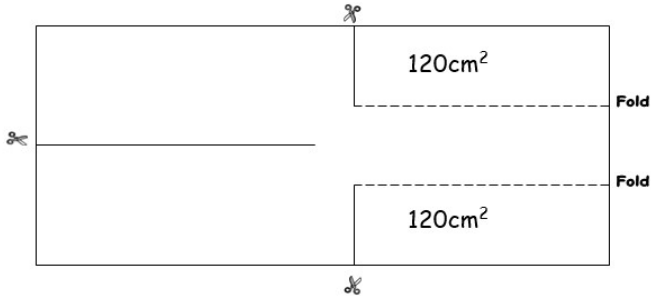
Watch how the spinner falls to the floor; what makes it fall more slowly than the paper ball? What forces were acting on it?

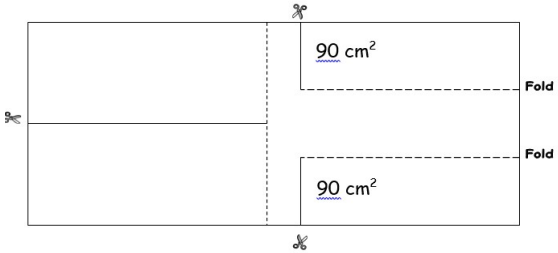
What could you change about this spinner that would affect the time it takes to fall to the floor?

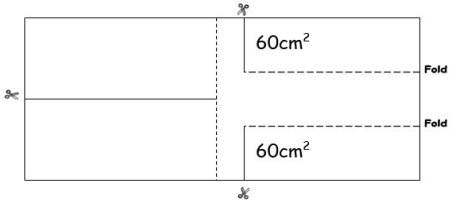
With a partner, think of as many as you can, then gather your ideas as a class.

We should have realised that the main dependent variables are the area of the spinner's wings and the weight of the spinner itself. Changing the material of the spinner would involve two variables, as the weight would also change, so we can't do that. Changing the height of the drop is a bit too obvious and doesn't really need investigating.

So these are the dependent variables you can choose...



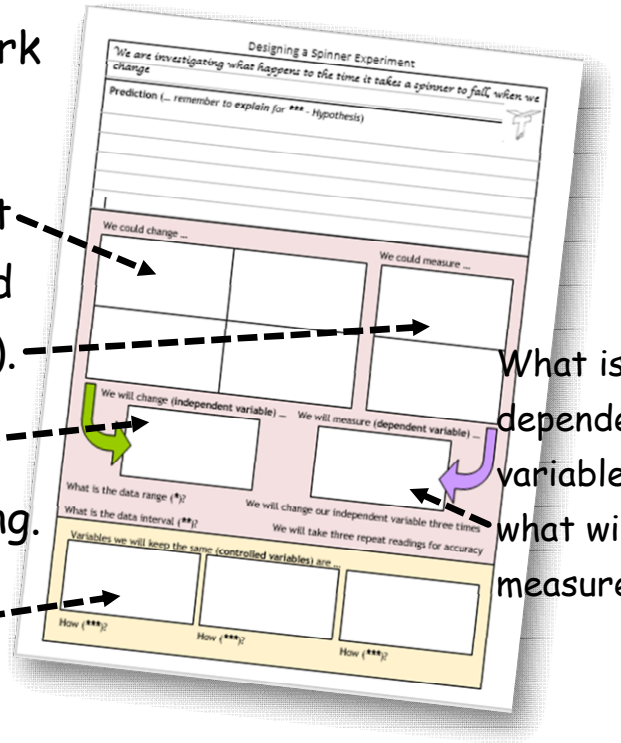




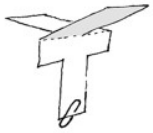
In groups of four, use this sheet together to work out a simple investigation involving spinners.

You will need to think about possible independent variables (the factors that you could change) and what you could measure (the dependent variable).

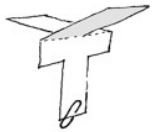
Then, your group needs to choose the one independent variable that you will be investigating. Also think about how you will control the rest of the variables to keep them the same each time.



What is your dependent variable - what will you measure?



Air resistance Investigation



- L.O. Understand how gravity and air resistance act on falling objects

Science skills success criteria	Me	Teacher
*I can use Force Arrows to help me describe what happens to different falling spinners		
** I use Force Arrows to describe and begin to explain what happens to different falling spinners		
*** I use Force Arrows to describe and explain confidently what happens to different falling spinners		

My investigation question: _____

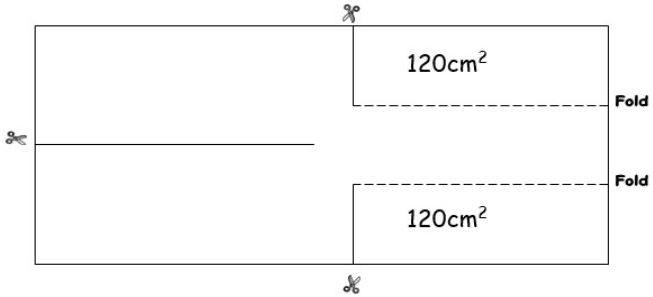
_____

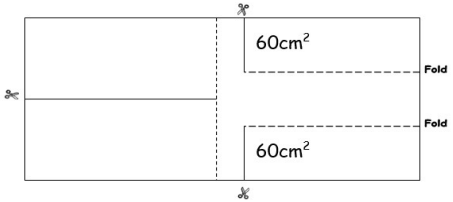
My method and prediction:

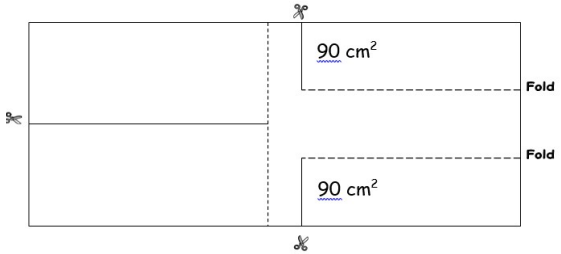
Use your group planning notes to write an investigation question on the sheet, then a simple method and the prediction underneath.

You will also need to design your own recording table before you start investigating. Look at the skills success criteria: this one focuses on your conclusion and the use of the Force Arrow model to explain what you found out.

Time to gather your equipment, and, like last time, decide on your individual roles and how you will carry out your investigation.







Results: Do your results show any patterns or trends?

Do they support your predictions?

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You will need to draw a/some simple diagram(s) to help you explain what you observed. The diagrams will need to use force arrows to show how different forces were acting on the paper spinners.