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

In your groups, follow these instructions and watch carefully:

Place half a denture tablet into the petri dish and add a pipette-full of water.

What happens?

Denture cleaning tablets contain detergent powder, but they also contain dried citric acid (lemon juice) and sodium bicarbonate powder.

As long as the tablets remain dry, nothing happens.

However, when water is added, the **particles** of detergent, dried lemon juice and sodium bicarbonate all start to **dissolve**. Because the lemon juice is a (mild) **acid**, it reacts with the sodium bicarbonate in a **chemical reaction**. This produces a lot of **carbon dioxide gas** (the bubbles).

This is exactly the same chemical reaction as when vinegar (another acid) is added to sodium bicarbonate for those home-made volcano experiments.

Sodium bicarbonate is also used to create the air bubbles in soda bread, instead of yeast

Now watch this...

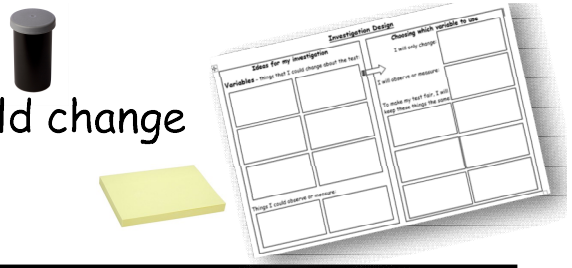
What forces were involved?

What caused the film tub to explode?

When the fizzing tablet was trapped inside the tub, the carbon dioxide gas had nowhere to escape. This meant that the CO_2 particles filled the space more and more tightly, bouncing around the container and into each other with ever more force. This created **pressure** inside the tub, causing the lid and base to bulge out.

The weakest part of the closed tub was the lid seal. Eventually, the gas pressure became too great to resist, and the seal failed, releasing all of the gas in one explosive moment. Because the tub was upside-down, the exploding gas pushed back against the lid and forced the tub upwards.

1. What factors, or **variables,** can be changed with this?



Work with your group to think of as many things you could change about the exploding tub experiment as you can.

2.

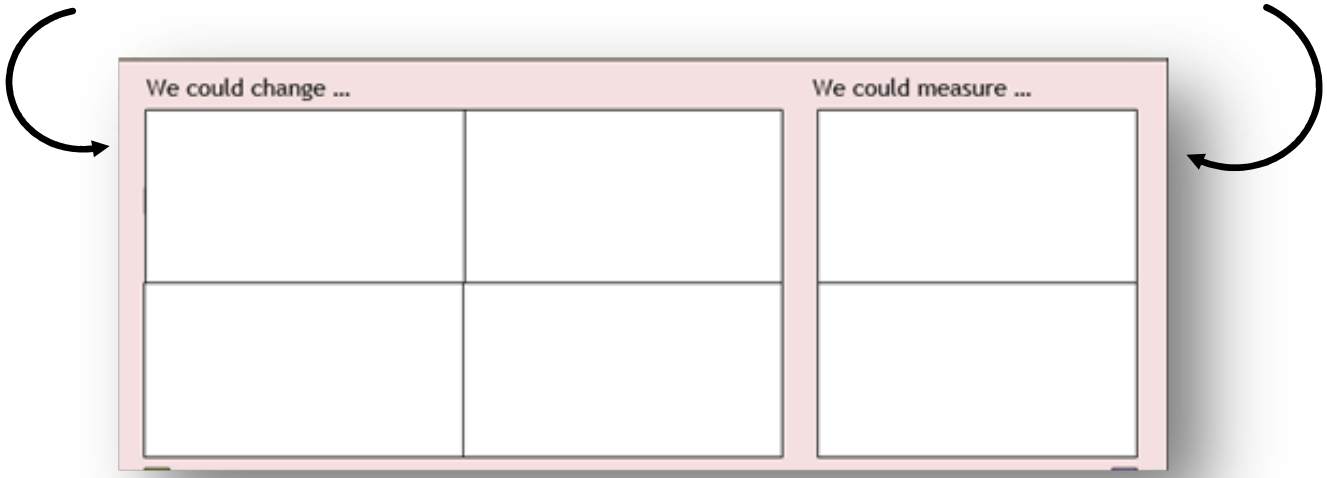
3.

Today, we are going to be **planning** (yes, planning) our own exploding tub experiments. The advantage of doing this, is that next week, we will have enough time to take repeated readings, to make sure we get as accurate results as possible.

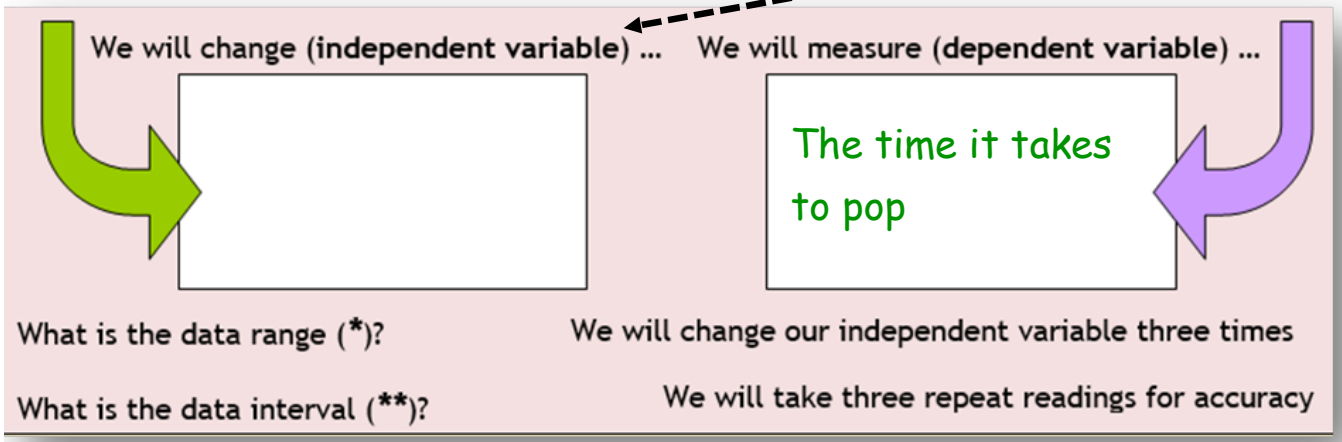
In other words, if we do it this week, we'll only have time to do it once; next week, we'll be able to get in **three** rounds of explosions...

So, now record four of your ideas on the left side of this part of the planning sheet.

Next, think of two things that you could **measure** about what happens to the film tub.



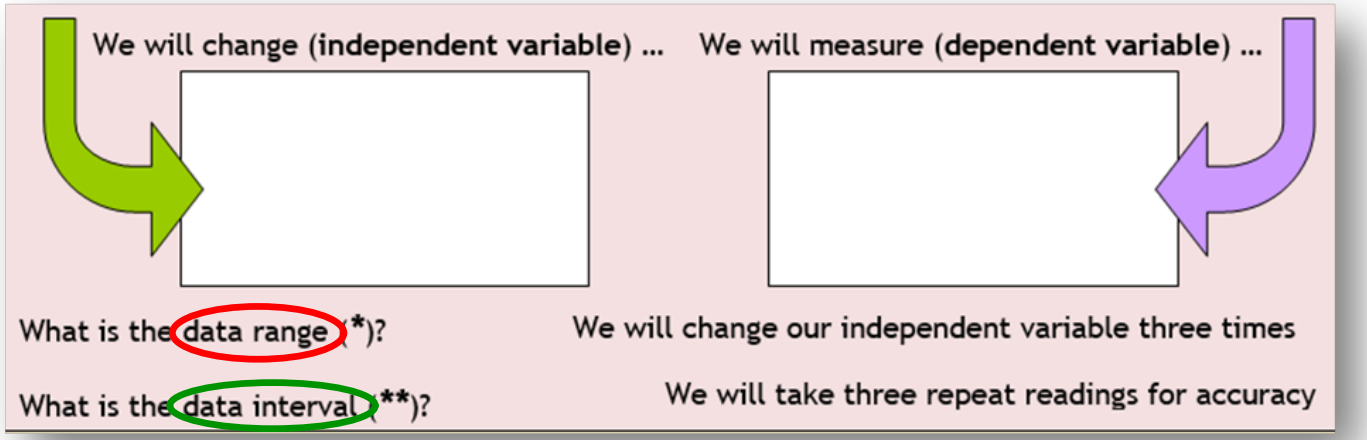
Each group will now need to choose the independent variable - the variable that you will **change** in your experiment. We call it the 'independent' variable because it does not depend on anything else.



The 'dependent' variable is what we measure, and of course, depends on what we change. In a classroom, it's not really practical to measure the height that the film tub reaches, so we will all be measuring **the time it takes to pop**.

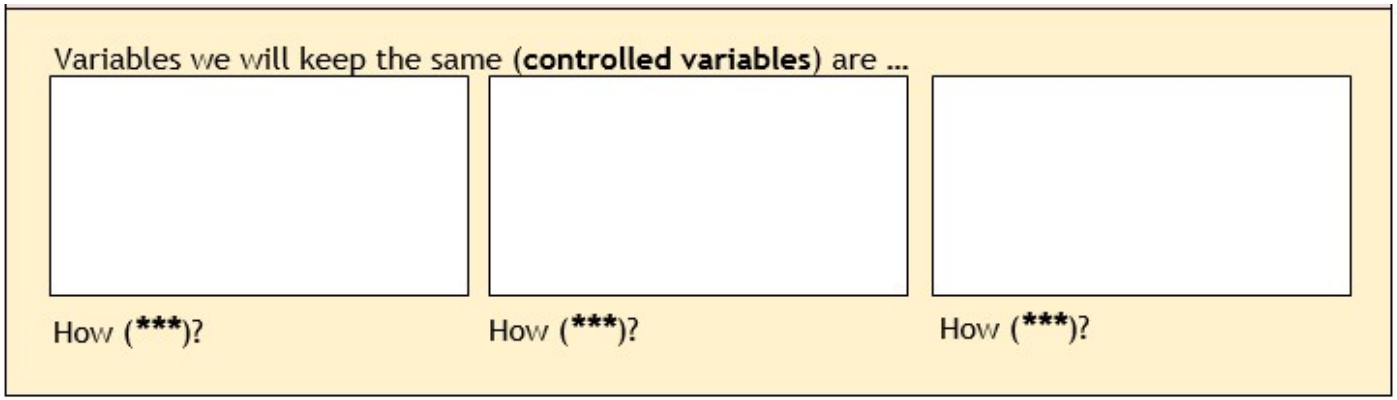
Each group will need to change their independent variable three times, so the **data range** is the smallest to the largest values that you use. The **data interval** is just the size of the steps between each value. E.g. if you're changing the size of tablet, what sizes will you use?

We need to make the test accurate, so we'll all repeat each of our readings three times (that's nine explosions...).



In a **fair** test, how many variables should we change?

So, *all* your other variables must be kept the same for each test - these are called the **controlled variables**.

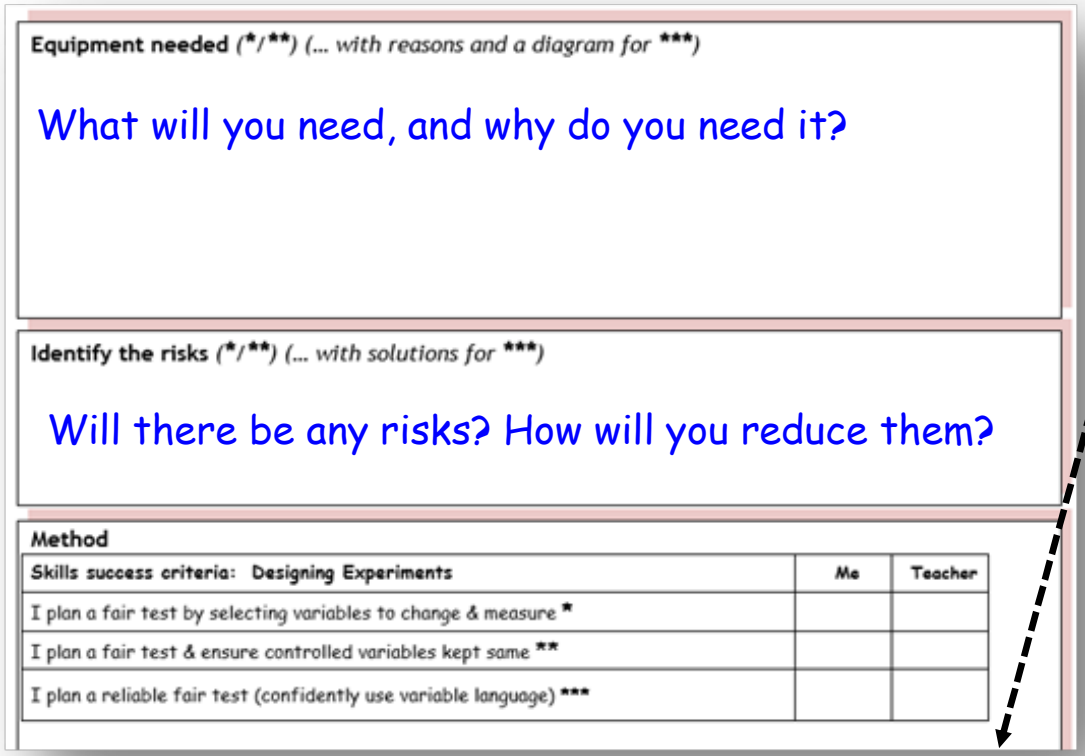


You also have to decide how you will keep all your controlled variables the same. For example, if you are changing the volume of water, what temperature will you keep it at and how much fizzy tablet will you use each time?

Now you need to make your own **prediction** about what will happen when you change the independent variable. If you use scientific ideas to explain your prediction, you have made a ***hypothesis***.

The **Particle model** and how it relates to dissolving will help you to make a hypothesis. Think carefully about what might make the tablet fizz more, or less, and what might make the tub pop more or less quickly.

Prediction (... *remember to* ***explain*** *for* *** - *Hypothesis*)



The final 'method' section is the where you will write about how you plan to carry out your fair test. **You need to show if you understand how to keep it fair.** Look back at your planning notes to help you.

Science Bob and Jimmy Kimmel Launch Over 1000 Film Canisters.wmv