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:

<u>**Explaining Science**</u>

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

<u>**Designing Experiments**</u>

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

<u>**Data, Tables & Graphs**</u>

- 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

This term's Science topic is about **forces** - tell someone what you know about them.

<u>Force</u> <u>Type</u>: is it a push, or a pull?

Now that we have agreed that all forces are either pushes or pulls, try these...

Rubber is a material; 'elastic' describes a material that will return to its original shape after a force has been exerted on it

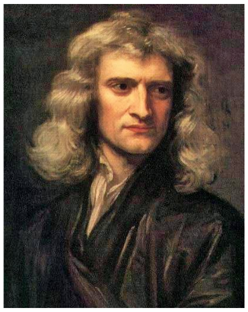



Can you exert both a push and a pull with each of these?

Can you come up with a general scientific statement about elastic bands or springs, in terms of forces? (an '_er', '_er' statement)

How much do you think this sellotape dispenser weighs?

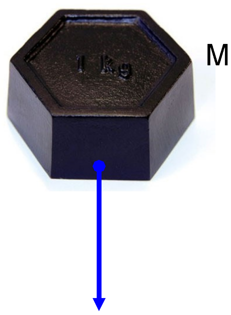
Anyone who mentioned grams or kilograms was wrong! When we use grams and kilograms, we are actually measuring **mass**, not weight. Mass is the amount of material in an object.



Sir Isaac Newton - studied forces and named gravity as the force that causes everything to fall towards Earth. He realised that it is gravity that causes us to feel **weight**. When we weigh something, we are actually measuring the force of **gravity** on it. We measure this force in **Newtons,** after the great man himself. Grams and kilograms are actually a measure of **mass,** which is the amount of material (or 'stuff') in an object.

Unfortunately, anyone who is not a scientist gets it wrong when they use kilograms to give the weight of something - we should be talking about mass when we use kitchen scales!

For every 100g of mass, there is 1 Newton of force acting on it by gravity. So, for each Kg of mass, there are 10N of force (weight).



Mass of 1kg

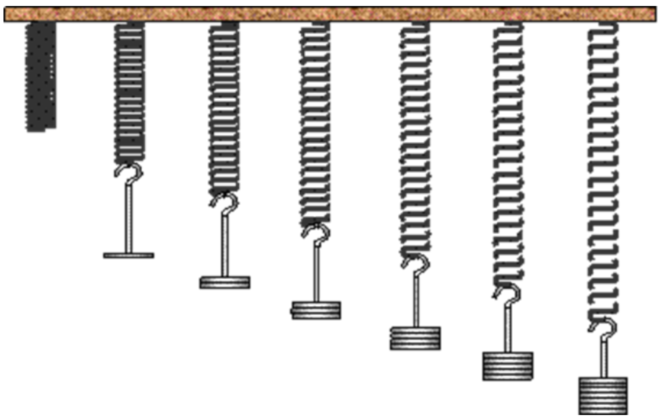
Mass of 100g

Weight of 1N - the force of **gravity** on the mass

Weight of 10N

Try holding one of these masses (not weights) in your hand; you are feeling the **force** of gravity acting on it, pulling your hand to the ground.

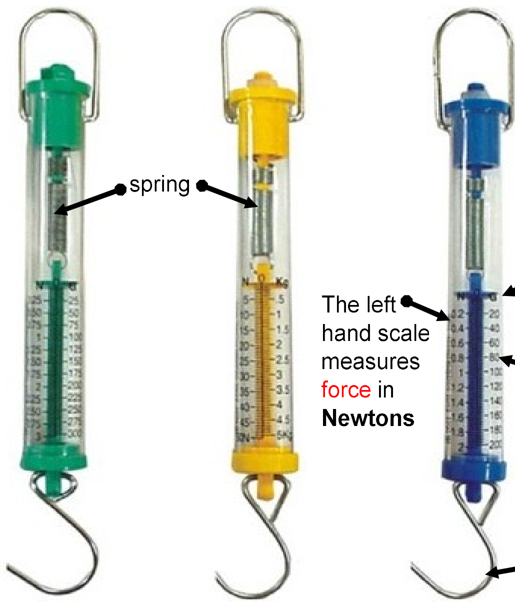
The bigger the mass, the greater the force, and so the weight increases.



Because a pull force will stretch a spring, we can use it to measure the force of gravity on an object.

What happens to the spring, as more masses are added to the hook?

These are called Newton meters, or force meters.



Different Newton meters have different ranges of measurements. Match up the maximum **mass** readings (g/kg) with the equivalent **force** readings (Newtons). Remember: gravity pulls on a mass of 100g with a force of 1N.

5N

20N

2.5N

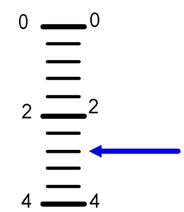
10N

30N

50N

Unfortunately, because the maximum values are different for each Newton meter, each one has a different set of numbers so we need to work out how to read the scale before we use them.

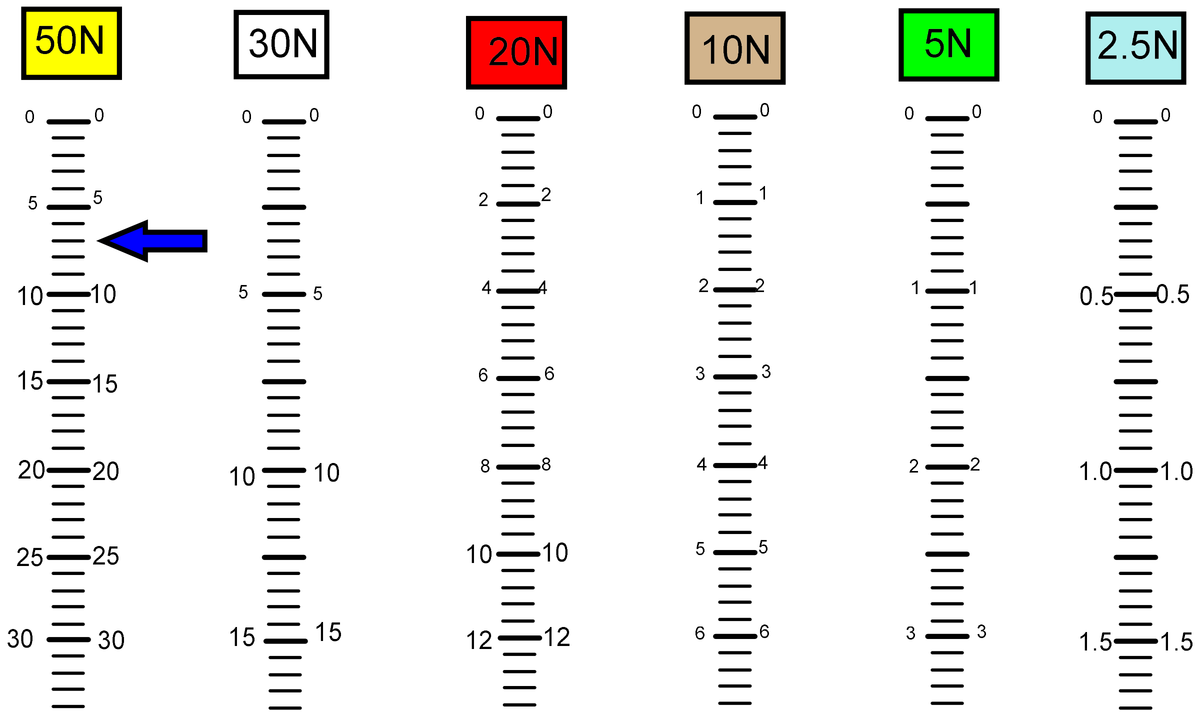
The good news is that the markings on the cylinders are all the same, and are arranged in sets of 5 markings, which means all we have to do to work out the value of each interval, is divide the number next to the tenth mark by 10. On this example, there is a number 4 next to the tenth mark, so we know that each interval is worth 0.4 (4 ÷ 10 = 0.4).



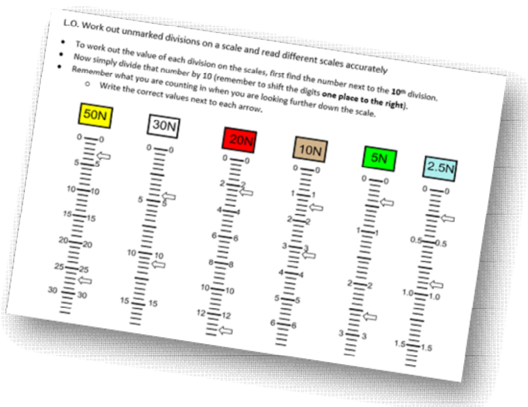
The arrow is pointing to a value of 2.8

On the next screen, you will see a range of scales taken from the different Newton meters that we have in school. Before we use them, we need to make sure that we can read them.

Look at the blue arrow on the first scale and work with your partner to determine what value it is pointing to. We'll try moving the arrow to different scales to make sure everyone understands how to read them.


50N
0 0
5 5
10 10
15 15
20 20
25 25
30 30
30N
0 0
5 5
10 10
15 15
20N
0 0
2 2
4 4
6 6
8 8
10 10
12 12
10N
0 0
1 1
2 2
3 3
4 4
5 5
6 6
5N
0 0
1 1
2 2
3 3
2.5N
0 0
0.5 0.5
1.0 1.0
1.5 1.5

Now try working out what the arrows are pointing to on this worksheet. Work with your partner - **discuss** with each other how to read each of the scales.


L.O. Work out unmarked divisions on a scale and read different scales accurately

- To work out the value of each division on the scales, first find the number next to the 10th division.
- Now simply divide that number by 10 (remember to shift the digits **one place to the right**).
- Remember what you are counting in when you are looking further down the scale.
  - Write the correct values next to each arrow.