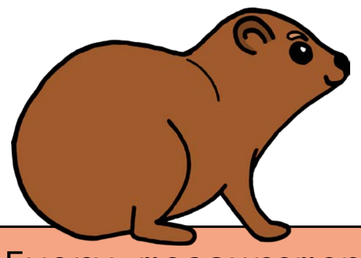
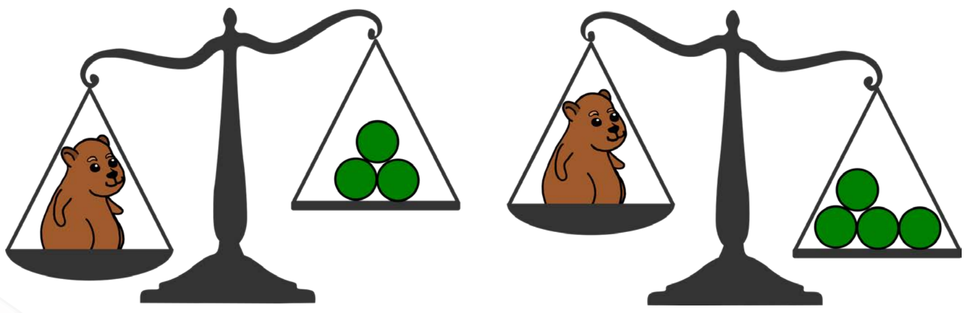
Measurement and the SI

A measurement is an action that you take in order to know the value of a physical quantity for the first time, or to improve what you may already know about the quantity. This can be within the context of science, engineering, law, medicine or trade.



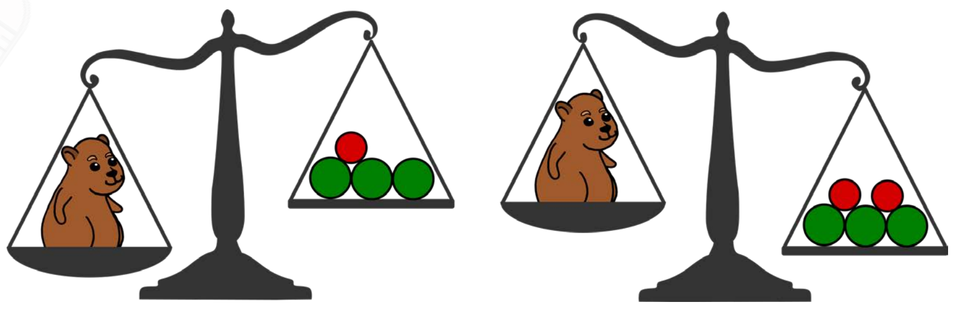
How can you measure my mass?

Every measurement requires you to make a comparison with the apparatus you are using for the measurement. For example you may use a balance to determine the mass of the dassie, and a set of "large standard balls" 🟢.



What could I do if I wanted to know my mass better than saying that "it's between 3 and 4 large standard balls"?

You could use a set of small standard balls as well 🔴.
We say that the **precision** of the measurement has improved.

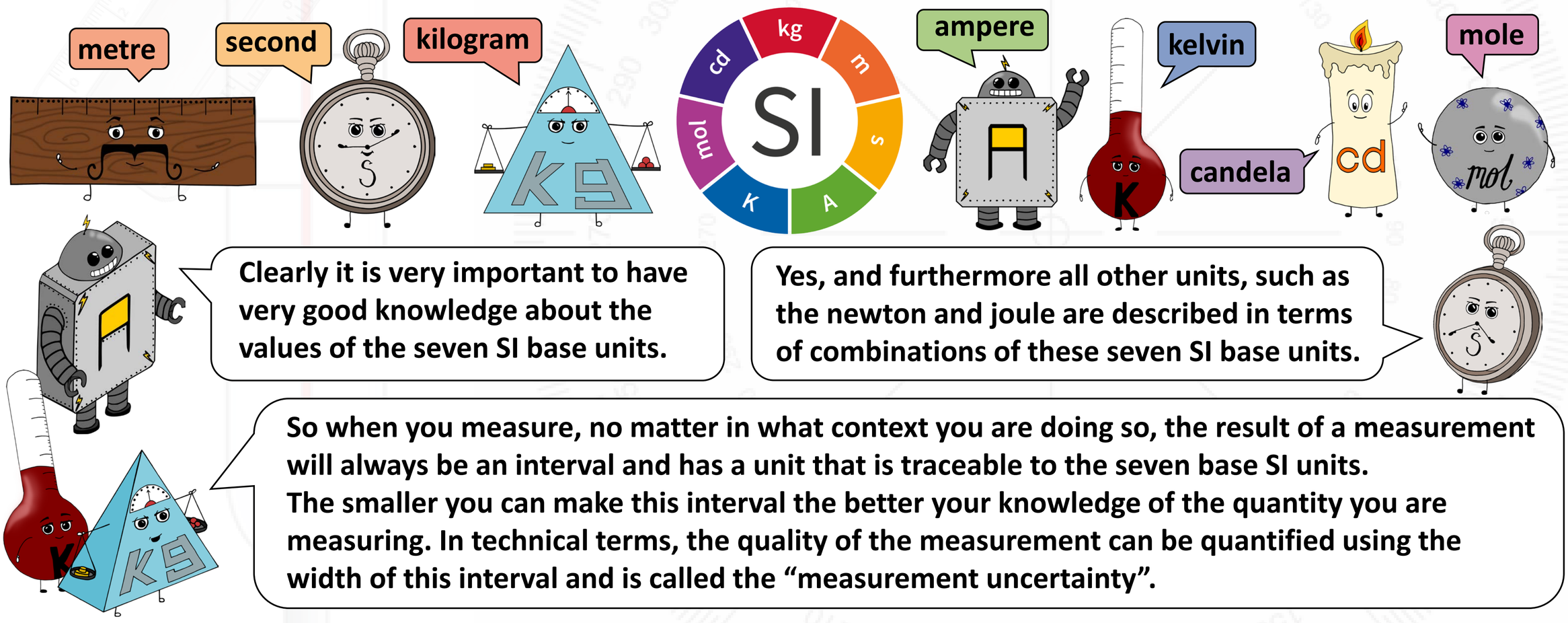


Clearly no matter how small we are able to practically make our standard balls, the knowledge we have about the mass of the dassie (or any other physical measurement) will always be limited to an interval (between two values) and will never be exact (a single value). This is a very important feature of **all** measurement: our knowledge can never be perfect (is always between two values).

The other important issue is how the **unit** of the measurement is defined and by whom. In the example above the unit was "the standard ball." Throughout history a huge number of standard units (for many different quantities) were created, often based on physical artefacts such as someone's foot or nose!

For example, shown alongside are a few drawers from a "cabinet of weights" used in the 19th century. Since each city had its own measurement system, you needed to choose the appropriate weights from the collection when trading with a particular city. This made trade very complicated.

As a consequence of there being many different units in use around the world, in 1875 a number of countries agreed to the "Convention of the Metre" which declared a standard set of units for length, time, and mass, the so called Metric System. Units for electric current, temperature, luminosity, and amount of substance were introduced in later years to form the International System of Units (SI). Nearly all the countries in the world have signed the Convention of the Metre, agreeing to use the SI with its seven base units and derived units, for science, engineering, and trade.



The seven SI base units are all precisely defined by a group of international experts. Each country is responsible for the implementation of the SI through their own national metrology institute. In South Africa this is the National Metrology Institute of South Africa (NMISA).

nmisa
National Metrology Institute of South Africa

MeASURe
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