

Engineers use their **knowledge** and **experience of mathematics** to find solutions to problems.

How could you measure the **stretchiness** of a jelly sweet?



- Will all jelly sweets have the same stretchiness?
- How could you set up your experiment?
- What data could you collect?
- How could you analyse the data?

What factors could affect the **stretchiness**?

Time stretched for?



Different colour?



Hot or cold?



Wet or dry?



Long or short?



Type of sweet?



making things work

Making things work : Stretchiness

Description

This topic models one way in which engineers use their knowledge of mathematics to investigate the properties of materials. Here the property under investigation is the stretchiness of jelly sweets.

Resources

A variety of materials with varying degrees of stretchiness (for example, a long rubber band, a length of wide elastic and a piece of string), a variety of jelly sweets (snakes or crocodiles), rulers.

Activity 1: Measuring stretchiness

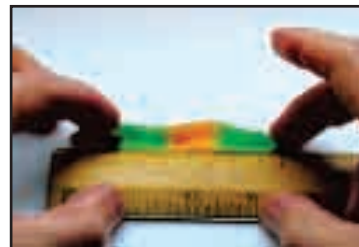
Begin **Measuring stretchiness** by demonstrating that some materials are stretchier than others. Compare, for example, a long rubber band, a length of wide elastic and a piece of string and use this to motivate a class discussion to agree on a measure of stretchiness – percentage increase in length when the item will no longer return to its original length, when it begins to tear, when it breaks. Establish a procedure for measuring stretchiness which will be used by all working in small groups of 3 or 4.

For example:

Equipment needed: Ruler, timer

Procedure:

Straighten the jelly sweet, without stretching, to get an accurate original reading.



Stretch the snake by a set amount of time, release and leave for a minute to contract, and then re-measure. Repeat increasing the stretch amount by 10% of the original length each time until the snake breaks.

Agree a recording table for the experiment. For example:

Stretched by %	Target length mm = original amount mm + stretch amount mm	Return length	Comment
10	$84 + 10\% \times 84 = 92.4$	84	
20	100.8	84	
etc.			

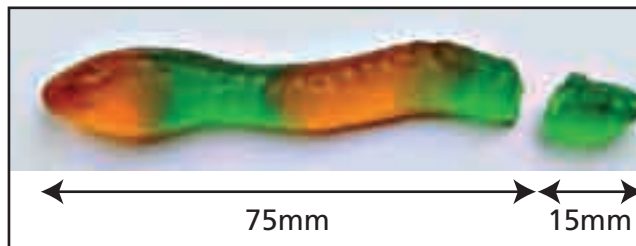
Making things work : Stretchiness

Each group investigates the stretchiness of a particular type of sweet and results are shared in a plenary.

For example:

Results: The snake stretched 150% more than its original length before it broke into two pieces. Damage started occurring when stretched 100%.

The combined length of the two parts is 7% more than the original length.



Further investigations can address the question: *what factors could affect the stretchiness?* Begin by asking groups of pupils to generate as many factors as they can. Allow plenty of time for this thinking process and offer this guidance:

- 1 Focus on generating lots of ideas.
- 2 Add to each other's ideas but do not criticise.
- 3 Combine and improve ideas.

When all their ideas have been collected, encourage group discussion to evaluate them before agreeing which factor to pursue. The **Measuring stretchiness prompt card** can be then handed out or displayed to help your pupils decide how to control their chosen factor. When the experiments are completed your pupils can write up their results on a poster or a PowerPoint presentation and feedback to the class.

The mathematics

Measuring stretchiness involves the collection of real data, percentages, experimental design