Anti-Leak Bag

There's nothing quite so satisfying as poking pencils into a watery bag. Trust us on this, we're scientists! But your wits will need to be as sharp as your pencils if you're going to earn a record out of it – spill just one drop and it's game over.

THE RECORD: Most pencils pierced through a water-filled bag in one minute

THE CHALLENGE: Fill a resealable plastic bag – a sandwich or freezer bag is perfect – with water and ram as many pencils through it as you can in 60 sec without springing a leak. Impossible, you say? Think again! Thanks to the wonders of science, you should be able to pierce both sides of the bag without soaking your legs, your lab assistant or your bedroom carpet. (But just to be sure, you should probably attempt this record outside!)

TIL
TODAY I LEARNED
Plastic is a type of man-made polymer, generally made from hydrocarbons – a by-product from processing crude oil. However, not all polymers are artificial. Examples of natural polymers include leaves (cellulose), leather (collagen) and even our very own DNA!

GUIDELINES

- Any wooden graphite pencils can be used; plastic pencils are not permitted.
- The plastic bag must be no larger than 25 cm (9.8 in) wide and 30 cm (11.8 in) high. When filled, the water level in the bag can be no lower than 3 cm (1.18 in) below the resealable strip.
- On the start signal, the participant must pick up one pencil at a time and pierce the bag; each pencil must go through both sides of the bag.
- The bag must be held over coloured paper (or similar), which clearly shows up if water drops on to it. If the bag starts to leak at any time during the minute, the attempt is disqualified.

YOU MUST USE:
- PENCILS
- COLOURED PAPER
- RESEALABLE PLASTIC BAG
- WATER

TOP TIP!
FROM PROFESSOR ORBAX

You can only use wooden graphite pencils for this record – it's one of the rules. But the shape and length of the pencils are totally up to you, so feel free to experiment with a few different types. Make sure you read up on all the guidelines before you give this record a go at **www.guinnessworldrecords.com**.

Something else that you're recommended to do before the attempt is to sharpen your pencils – a *lot*. It's worth investing in a new pencil sharpener for this, because the finer you can get the tip, the cleaner the point of penetration will be. The smaller the holes made, the lower the likelihood of a leak!

1

Hold the bag in one hand over the piece of coloured paper. (The paper will help show any water droplets that might trickle out during the attempt.) When you're ready, your lab assistant should start the stopwatch.

2

Pierce the plastic with a single swift movement. If you do this too slowly or too gently, the hole is more likely to leak. It will help if the plastic bag is held taut.

3

Continue pushing the pencil all the way through the bag until the nib emerges on the other side. Then repeat! Try to keep the pencils as far apart from each other as possible to avoid forming weak points. If any water leaks, the attempt is over.

HOW DOES IT WORK?

The secret to this trick lies in the make-up of plastic. Plastics are made of large molecules, called "polymers", consisting of many repeating units that are forced together with heat. Not only are these molecule chains strong, they are also flexible.

When the fine tip of the pencil presses against the surface of the bag, the polymers don't break; instead, they bunch up and nudge to the side. As the pencil passes through, the molecules mould themselves around it, forming an almost perfect seal.

Plastic is only so strong, though. Poke too many pencils through the same area of the bag and you increase the chances of a leak, as the polymers are put under too much stress.