Propping up Pisa

A do-at-home civil engineering activity for ages 4-18.

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The Leaning Tower of Pisa is famous around the world for its signature 'wonky' construction. It was built between the 12th and the 14th Centuries in Italy and started to lean about half way through the construction due to the soft ground underneath. The tower is 55m tall and weighs an impressive 14,500 tonnes.

By 1990 the tower was in danger of falling down, leaning a further 2mm every year to the South. Civil engineers designed and carried out works to partly correct it's lean – saving it for future generations. Read about this fascinating project at ice.org.uk/what-is-civil-engineering/what-do-civil-engineers-do/stabilising-the-leaning-tower-of-pisa

Your challenge today is to build your very own 'Not-so-leaning Tower of Pisa' using household items!

What you'll need

- A sponge
- 3-5 small (200g) tins of food, or two 400 tins will do if necessary
- Cocktail sticks
- Plasticine or Playdoh
- A flat tray

Activity instructions

Important safety note: This activity involves falling tins that could hurt participants or cause damage to the surrounding area, please take the following precautions.

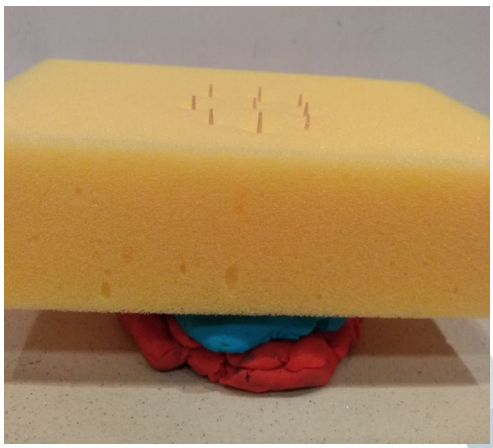
- Make sure participants are wearing shoes
- Do not set the activity on top of a table
- Take care to stand back, and keep any young children or pets safe when the tower wobbles or falls

1. Place a dry sponge in the area you are doing the activity. this sponge represents the soft and spongy ground that the tower was built on. Now build your tower with cans on the sponge. You will see that just like in real life, the tower will lean and eventually wobble and fall down.

Now we are going to make some changes to see if we can make our tower straight and stable. If we were civil engineers building the same tower in modern times, we might use piles to stabilise the building on the soft ground – going through it and anchoring into the bedrock deep below.

For our challenge we will be using cocktail sticks to represent the piles and plasticine as the hard bedrock below our spongy ground.

2. Lay the plasticine slab (flattened to about 2-3cm thickness) on your tray and place the sponge on top. Then use the cocktail sticks to pierce the top of the sponge and push all the way through so they are embedded in the plasticine at regular intervals in a circle shape the same diameter as your cans. Now test your foundation with a can – you should find that it is more stable. Adjust your foundation as needed to make sure the piles are in straight. Now see if you can build the tower higher than before, remembering to follow the safety instructions.



For 11-16 year olds

At 12.00 the sun would be directly above the Leaning Tower of Pisa. Can you use Pythagoras' Theorem to figure out how long the shadow would be?

Stats: The height of the tower is 55.86m from the ground on the low side and 56.67 metres on the high side, the width of the walls at the base is 2.44 m.

For 16-18 year olds

By 1990 the tilt on the tower had reached 5.5 degrees. The structure was stabilised by remedial work between 1993 and 2001, which managed reduce the tilt to 3.97 degrees.

Can you figure out how much taller the tower became after the angle was reduced?

Tell us what you thought!

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