Mathematics

Height vs. circumference of a cylinder

(Ireland)

Background

Humans are not very accurate at estimating the length of a curve. With using a measuring device they often find the process difficult, leading to inaccurate results. This may be due to the phenomenon of light travelling in straight lines.

The following can be used as an introduction to π and the mathematical formula for the circumference of a circle $L = 2\pi r$

You will need:

- ✓ A cylinder, such as a drinking glass or ideally a transparent 3 tennis ball.
- ✓ A piece of string, rope or even a shoe-lace
- ✓ An adult hand that can stretch to indicate the height of the cylinder

Follow these steps:

1. With the tennis ball tube, ask your students which is the greater length the height of tube or the rim (circumference) of the tube?
2. The majority of students will probably choose the height of the tube.
3. Wrap the string around the rim of the tube; hold this length.
4. Carefully place this length of string beside the tube to compare it with its height.
5. It will be considerably longer.
6. It can also be demonstrated by comparing the circumference and height of the cylinder with outstretched fingers.

So what happened?

Now for the maths!

Explain that the widest part of the top surface is the diameter which equals twice the radius (r) of the cylinder.

The circumference

$L = 2\pi r$

$= 2(3.14)\, r$

$= 6.28\, r$

Each tennis ball also has radius (r)

Height of tube = $6\, r$

So the circumference is greater than the height

What next?

- Set an extension activity for your students to carry out the experiment with different heights and circumferences of cylinders.
- Set a challenge to find a cylinder where the circumference length is as close as possible to the height.
- Verify this with by measuring the height, the diameter and using $L = 2\pi r$