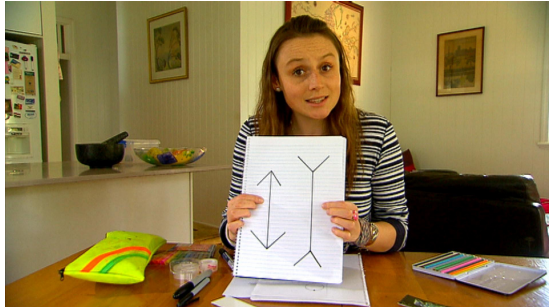


## Optical Illusions

On SCOPE's Things that See episode, Julia proved that seeing isn't always believing with some optical illusions! Here's how you can do it at home:



### What you need:

- Paper
- Pens
- Ruler
- Scissors
- Sticky tape
- Something round to trace around (e.g. a plastic cup)
- Ames room template (see last page)
- Small objects of similar sizes
- A friend to trick with your illusions!

### What to do: Illusion #1

1. Draw two parallel lines of equal length about 10cm apart on a piece of paper.
2. At the ends of one line, draw diagonal lines to make arrowheads pointing outwards.
3. At the ends of the other line, draw arrowheads pointing inwards (see diagram for help).
4. Ask your friend which of the two lines appears longer!

### What to do: Illusion #2

1. Repeat step 1 from illusion #1 (above).
2. At the ends of one line, draw squares with a side length of 1cm.
3. At the ends of the other line, draw squares with a side length of 4cm (see diagram for help).
4. Ask your friend which of the two lines appears longer!

### What to do: Illusion #3

1. Draw around the cup twice to make two circles a few centimetres apart.
2. Draw dots on the edges of the circles furthest from each other (see diagram for help).
3. Measure the distance between the two dots and draw a third dot at the same distance in line with the others.
4. Place the cup so it covers the third dot, and draw a circle that contains the dot.
5. Ask your friend which two dots appear closest together!

### What to do: Illusion #4 (Ames room)

1. Print the template onto large paper and cut it out. Make sure you also cut out the sections marked 'x'.
2. Fold along the joins, and along the lines, to form a box-like shape. Tape the edges together to form your Ames room (the black and white checks are the 'floor', and the large cut-out section marked 'x' is the roof).
3. Place some of your small objects in the corners of the room so you can see them by looking through the smaller cut-out hole in the 'door'.
4. Ask your friend which of the objects looks the biggest!

## **What's happening?**

An optical illusion is something that is perceived by your eyes and interpreted by your brain, in a way that is different from reality.

Our eyes and brain work together to make sense of the sights around us. But because of the HUGE range of things there are to see, our brains often look for patterns to help make sense of what we are seeing. There are many theories as to how these particular illusions trick our eyes, but below are just a few.

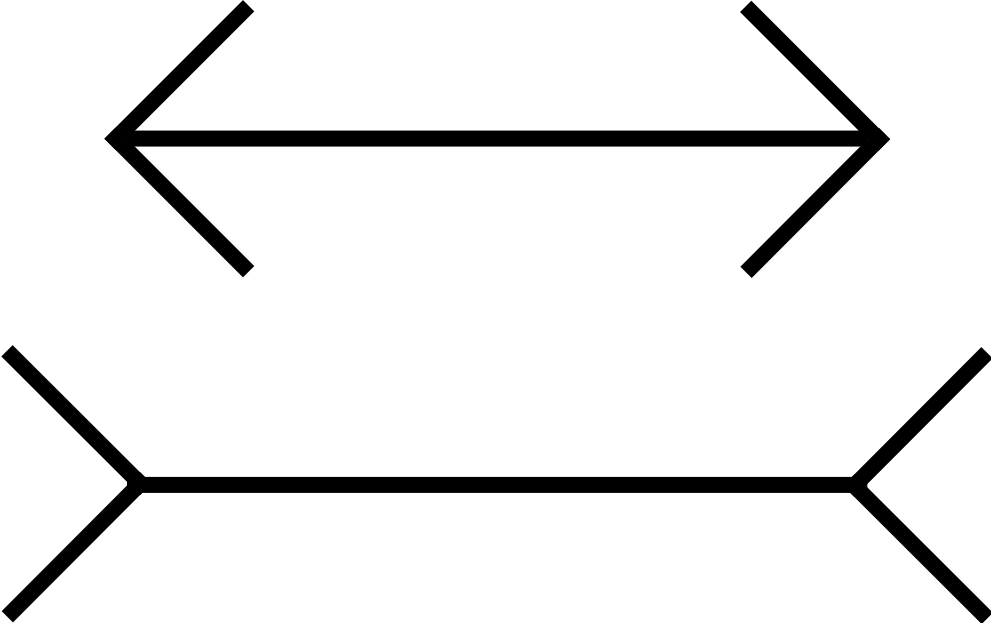
**Illusion 1:** This is a variation of a famous illusion known as the Müller-Lyer illusion. The world around us is 3-dimensional, so your brain may be trying to interpret this 2-dimensional drawing in 3D. If you rotate the lines so they are vertical, do they remind you of 3D objects? The top line could look like the corner of a building nearest us, whereas the bottom line could look like the corner of a room furthest from us. So your brain may be interpreting them as 'near' and 'far' and therefore assuming that the 'far' one is longer.

**Illusion 2:** When judging an object on characteristics like size and distance, your brain compares the object in question with other objects around it. If you surround it with larger objects, it will appear smaller by comparison; whereas if you surround it with smaller objects, it will appear larger. The small squares therefore make the top line appear longer, and the large squares make the bottom line appear shorter, when in fact we know they are both the same length!

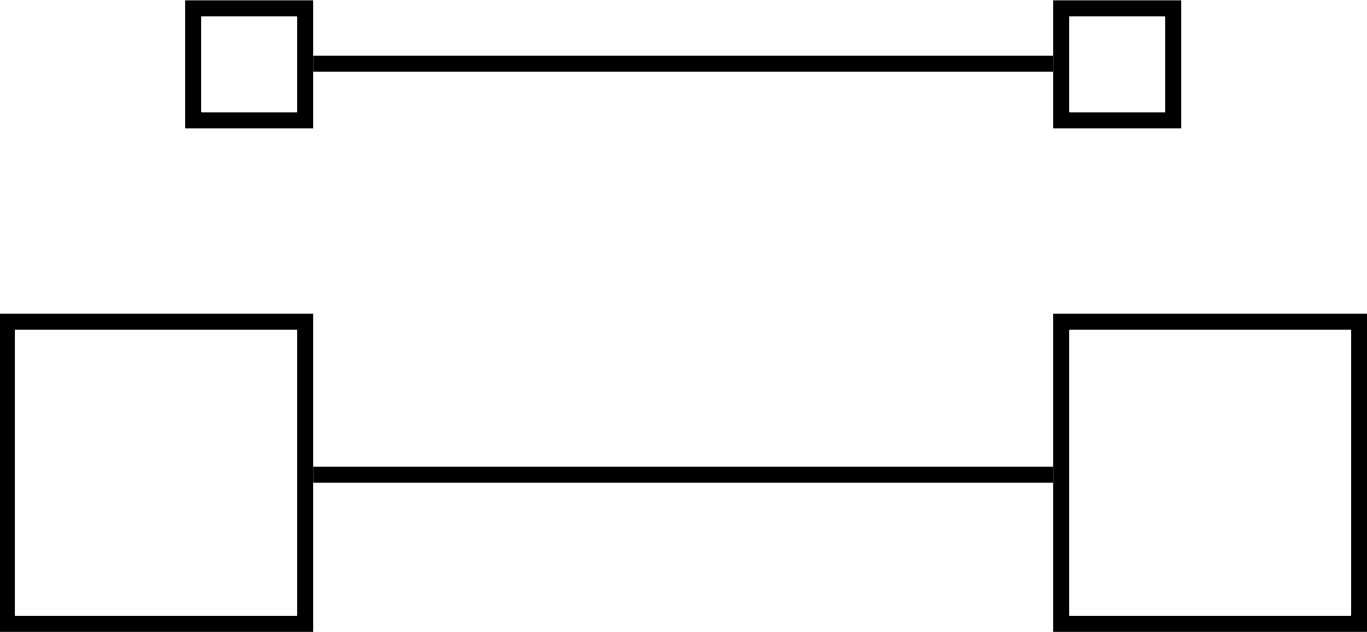
**Illusion 3:** This is another variation on the Müller-Lyer illusion (see Illusion #1). The two circles on the left are obviously much closer together than the third is to either of them, so your brain assumes that the two dots on the left circles will be closer together as well.

**Illusion 4:** When you look through the hole into the 'room', your brain is tricked into believing that the wall furthest away is rectangular, although it is in fact trapezoidal and angled away at one end. So an object placed in the left corner is closer to your eye and therefore appears larger than an object placed in the right corner. Usually your brain knows that objects further away are actually much bigger than they look, and so you interpret size in conjunction with distance. But because your brain can't detect the strange shape of the Ames room, it can't correct for this difference in distance so the objects appear to be different sizes!

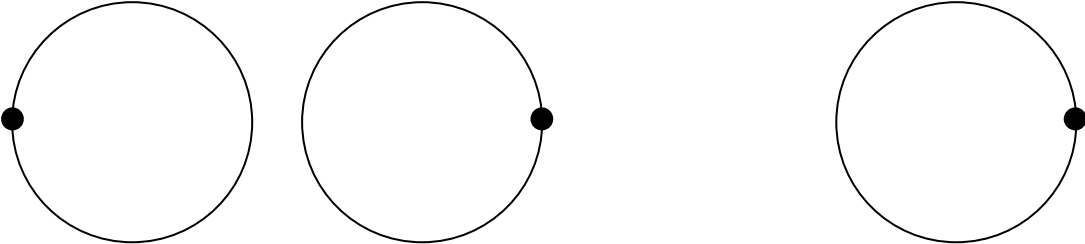
**Illusion #1**



**Illusion #2**



**Illusion #3**



Ames room template (If you want a BIG Ames room like Julia's, cut the template into 3 sections and copy each section onto A3 paper)

