Infinity Mirror

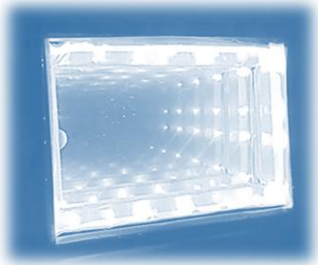
WHAT HAPPENS WHEN A WAVE MEETS A SURFACE?

When a light or sound wave meets a surface there several things that can happen. The wave may be:

- **Transmitted** through the material. If the wave changes speed as it enters the material, it will be **refracted**, or bent.
- **Absorbed** by the material: Energy will be transferred to the material, usually in the form of heat.
- **Reflected** from the surface.

Usually, a combination of these will happen.
Waves may also be bent around an object, or through an opening. This is called **Diffraction**.

HOW IT WORKS



The LEDs are sandwiched between two mirrors, so light is reflected back and forth between them.
But the one-way mirror film on the top is only partially reflective: some light is transmitted through the film each time. We see the light that is transmitted, and since less light is reflected each time, the reflections get dimmer, creating the illusion of depth.

Work Safely and Responsibly!

- **An adult must give permission and carry out a risk assessment.**
- Take extra care and get help from an adult if using glass. Clear Perspex and acrylic mirrors are safer alternatives (available from craft stores).
- If using cutting tools to cut the box, get help from an adult, use protective gloves and always **follow HSE guidelines**: https://www.hse.gov.uk/textiles/hand-knives.htm
- Use battery, (**not** mains operated) fairy lights. Always inspect before use and do not use if damaged. Do not dispose of batteries with household, waste. Many supermarkets collect batteries for recycling.

Materials

- A shallow box with a lid
- A mirror to fit the base
- One way mirror window film (also called two-way mirror film!)
- Glass or Perspex to fit the lid
- Battery operated LED fairy lights
- Duct tape
- Glue or double sided tape

WHAT TO DO

- Read the safety guidance!
- Make holes all around the sides of the box large enough to poke the LEDs through. How many depends on how many LEDs you have.
- Glue the mirror into the base of the box.
- From the outside, thread an LED through each hole to the inside of the box. Secure in place with duct tape on the outside of the box.
- Apply the one-way mirror film to the glass or Perspex, following the manufacturer's instructions.
- Make a hole in the lid of the box large enough to frame the glass or Perspex.
- Secure the one-way mirror to the inside of the lid with the film pointing inwards. Put the lid on the box and turn on the LEDs.

WHAT WE DO

We are a research group at the University of Manchester. We use applied mathematics to model and test the properties of materials and waves including acoustic, elastic and water waves. Examples of our research include understanding and reducing engine noise; modelling the behaviour of soft tissues such as ligaments and tendons; and the design of metamaterials: special materials with properties not found in nature.

Mathematics of Waves and Materials