



Make your own telescope

Looking at the universe

time

45 minutes

learning outcomes

To:

- know that a convex lens enlarges the image you see
- know that a concave lens makes the image you see smaller
- know that a telescope enables you to see objects in more detail
- know how to use a telescope to observe an object

end product

- a telescope for each child

materials needed

- photograph of telescope (Appendix)
- 48 toilet paper rolls
- 24 sheets of coloured A4 paper
- 24 lenses, OM.7
- 24 lenses, OM.8a
- 12 concave lenses
- sticky tape
- paint
- brushes
- water

Preparation

For the activity **Which lens makes things bigger?** you will need the photograph of the telescope from the Appendix.

Make sure you have the right lenses. You can order them online from Astro-media (www.astromediashop.co.uk). Lens OM.7 has a diameter of 34.5mm and a strength of +9.4. Lens OM.8a has a diameter of 40mm and a strength of +5.6.



Which lens makes things bigger? 15 min.

Take one of the convex lenses (OM 7 or 8a) to show the children what a convex lens looks like. Pass the lens around the class so that all the children can feel that the lens curves outwards. Then show a concave lens. Pass this lens around the class so that the children can feel that this lens curves inwards. Draw a cross section of a convex and a concave lens on the board. Can the children see the difference? Encourage the children to look at their thumb through the different lenses. What can they see through the concave lens? And what can they see through the convex lens? So what are the lenses useful for? You can use them to look at objects in the distance, using binoculars or a telescope for instance. Ask the children if they know what a telescope is. Show the photograph of the telescope. Explain that a telescope has very powerful lenses, so you can use it to look at objects a very long way away. Telescopes are mainly used to examine celestial bodies such as stars, planets and moons.

Tip.

Encourage the children to experiment by changing the distance between their eye and the telescope or the object and the telescope.

Good to know.

A lens changes the direction of a beam of light. If the lens is concave, the beams of light spread out but converge again within the eye to produce an image reduced in size. If the lens is convex, the beams bend towards each other and the image is enlarged. A telescope uses the enlarging function of a convex lens.



The children make a telescope.



Making a telescope 30 min.

Go through the instructions in [Task 1](#) on the worksheet. Help the children to make their telescopes. Wait for the paint to dry before attaching the lenses to the toilet paper rolls. Encourage the children to roll up the coloured paper to form a tube. Explain that they must not tape the tube shut until the toilet paper rolls have been inserted. It is important that each of the lenses on the toilet paper rolls is on an outside end of the telescope. Encourage the children to work together if necessary.



Ask the children to look through their telescope and to focus on something. Warn them that they must not look through their telescope directly at the Sun or a light as this could damage their eyes.

Ask the children to draw what they can see on the worksheet. Encourage them to experiment with their telescope. What can they see when they look through the other end of the telescope? If the image they see is fuzzy, can they focus it by sliding one of the toilet rolls in or out a little? If the children look through lens 8a, the image will appear bigger. If they use the other lens, the image will appear smaller. If they want to look at the stars through a telescope, they will need one with far more powerful lenses.

Good to know.

Many telescopes have two lenses and therefore two focal points. By choosing where these focal points overlap you can decide at what distance the image will be in focus.



Make your own telescope

1 *Make a telescope*



What do you need?

- 2 toilet paper rolls
- 2 convex lenses
- sticky tape
- coloured paper



What are you going to do?

Take a good look at the drawing.

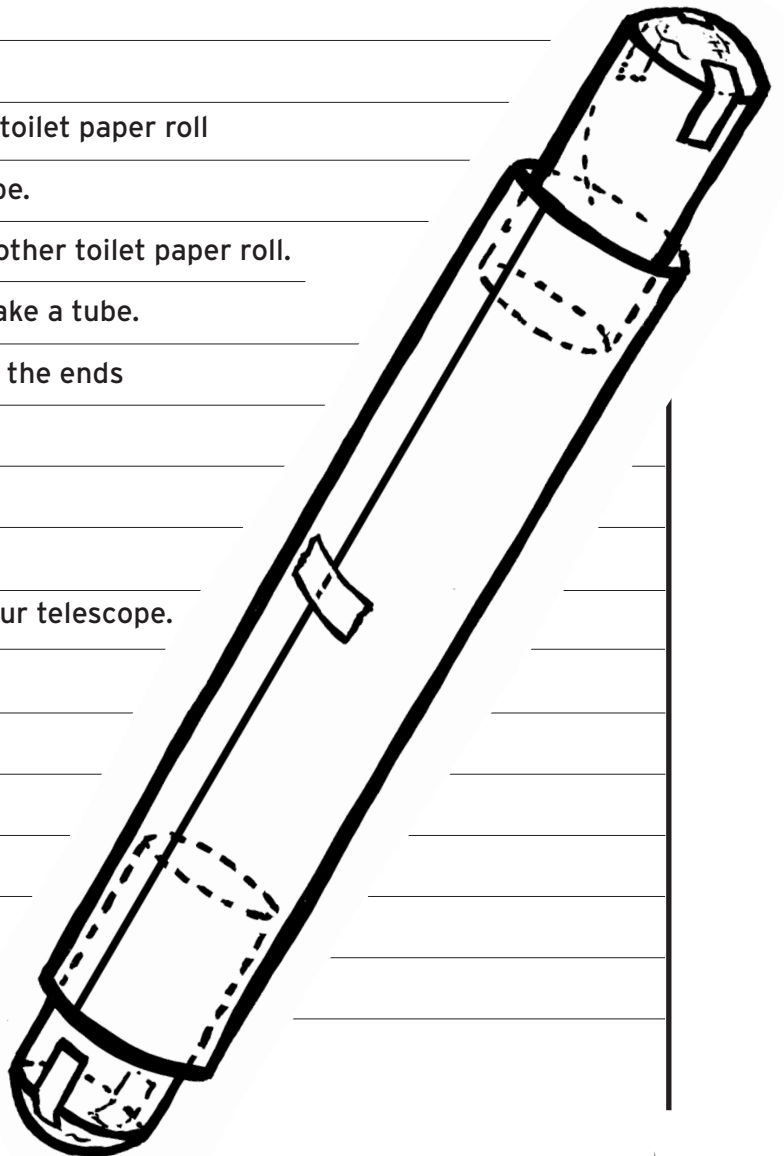
- 1 Paint the toilet paper rolls.
- 2 Attach a lens to the end of a toilet paper roll using two pieces of sticky tape.
- 3 Attach the other lens to the other toilet paper roll.
- 4 Use the coloured paper to make a tube.
- 5 Place the toilet paper rolls in the ends of the tube.
- 6 Paste the tube shut.



7 Now you can look through your telescope.

Important!

Never use your telescope to look directly at the Sun. You will damage your eyes.



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Draw what you can see through your telescope.

