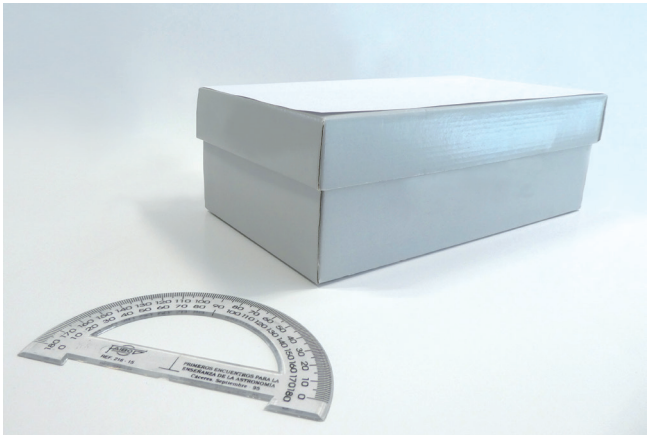
→ Build an exoplanet in a box

Equipment

- Cardboard shoebox, or similar with lid
- Torch
- Light meter (e.g. smart phone with app or datalogger)
- Craft knife / scissors
- Semi-circular protractor
- Clothes peg
- Cocktail sticks or wooden BBQ skewer
- Plane white paper
- Sticky tape
- Modelling clay or similar

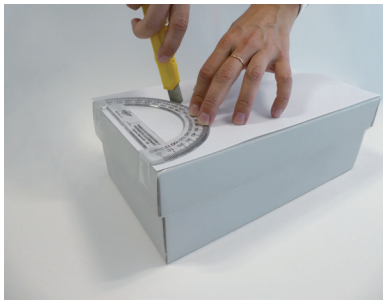
Instructions to construct an exoplanet in a box model

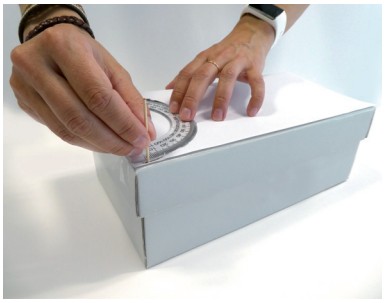
1. If the outside of your box lid has a dark surface then you may want to attach a blank sheet of paper on to it this will make it easier to read measurements once you start to do the experiment.

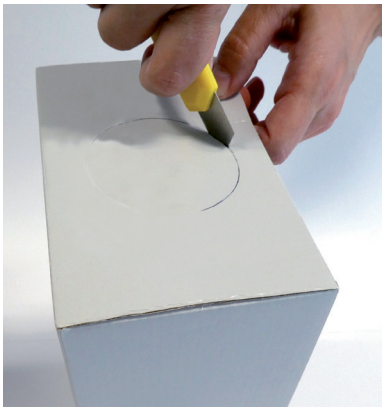


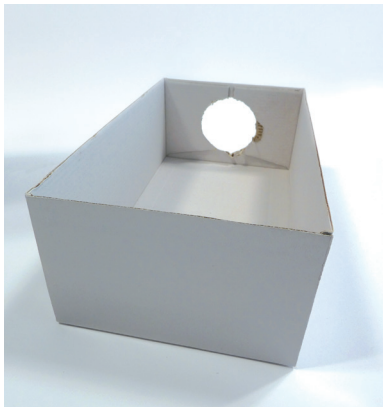
2. Use sticky tape to attach your protractor on to the lid of the box, across the straight side only.

3. Use a knife to carefully cut around the edge of the protractor. You can adjust the orbit of the exoplanet by cutting a semi-circle further away from the light source. An orbital path further from the light source may produce a more focused shadow. Move a cocktail stick around in the gap to make it easier to move whilst taking readings.





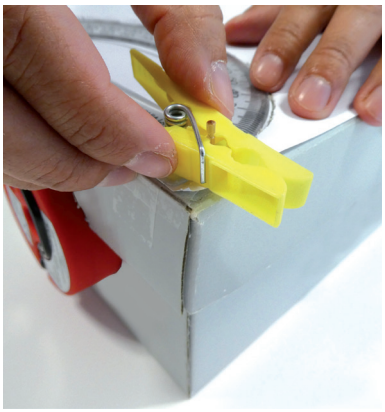




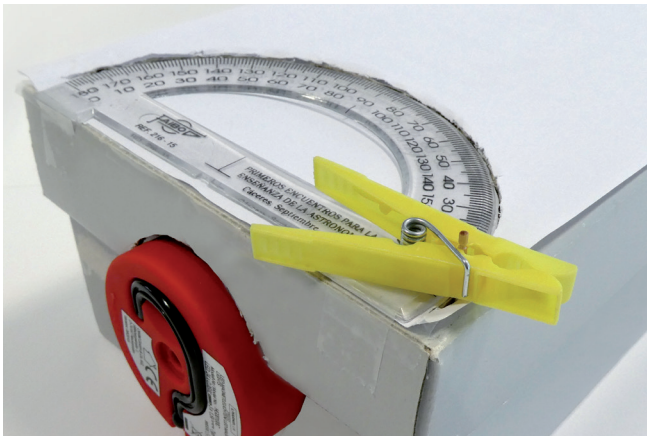
4. Cut a hole in the end of the box (the side end as the protractor) that is large enough for your torch to poke through. Tape your torch firmly into the hole.

5. Using a cocktail stick measure the depth to centre of the torch lamp and mark the stick and attach the peg on that mark. Tape the end of the peg to secure it in place.

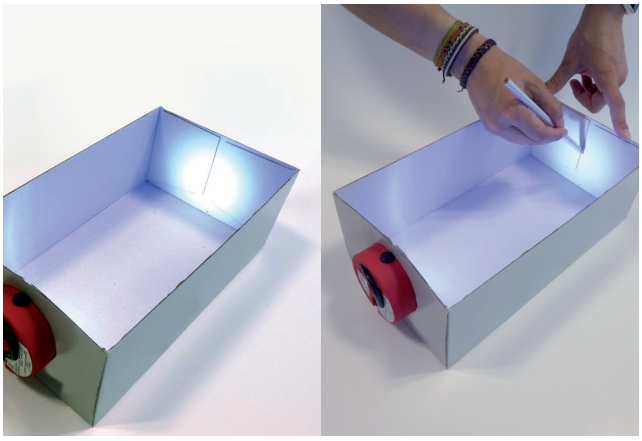




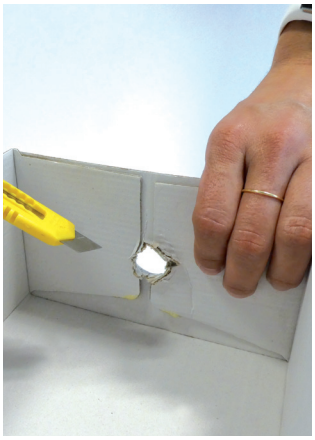
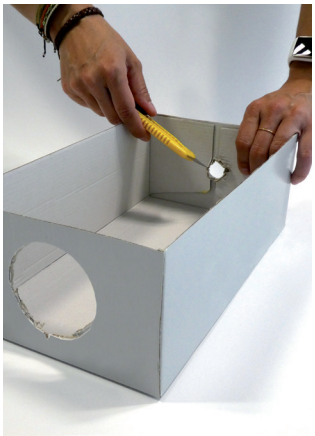
6. Insert the cocktail stick into the gap around the protractor. Check that you can move the peg around the full 180° of the semi-circle. You may need to use the knife again to free up movement.



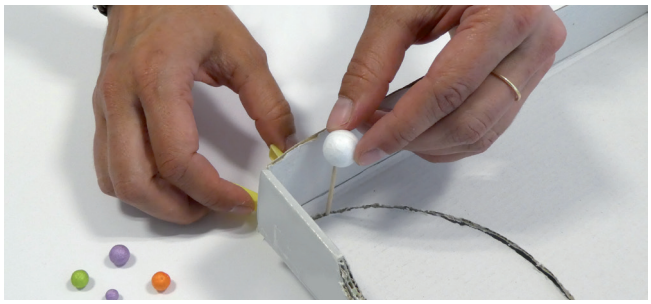
7. Turn on your torch and make a mark on the other end of the box at the centre of the beam.



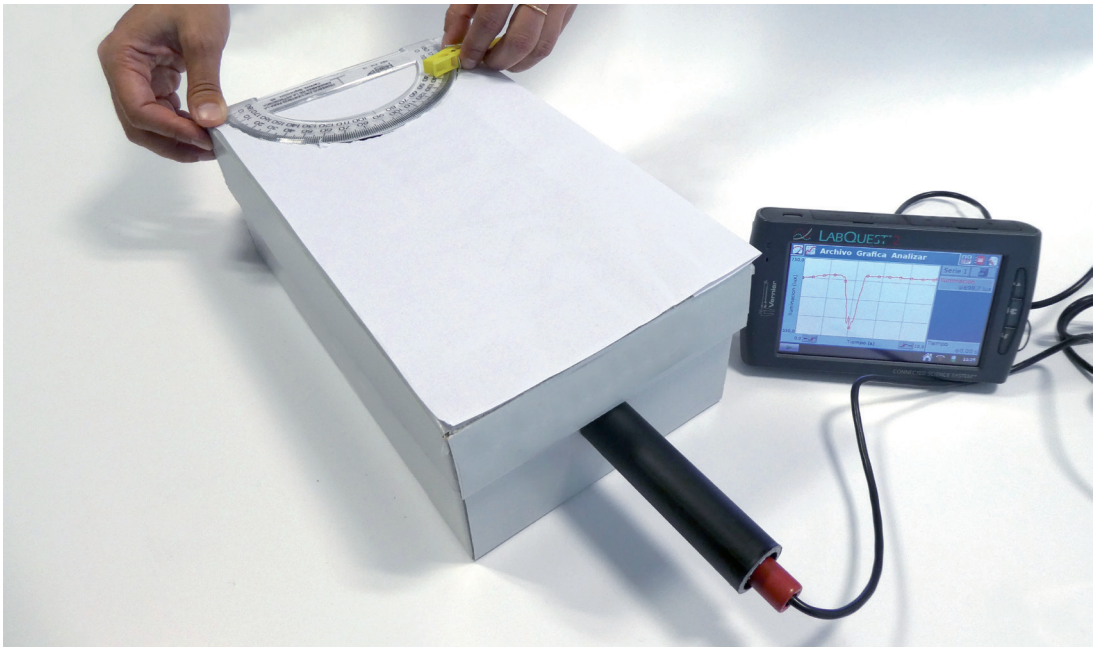
8. On the mark you made in the previous step, cut a hole large enough for your smartphone camera or datalogger to see through.

9. Make your exoplanet and push on to the end of the cocktail stick. Be careful of the sharp end. Close the box lid.

10. Start your light meter and point through the viewing hole to take readings.Alternatively, the datalogger can be placed inside the box and propped up with a flap of cardboard taped to the side.



11. Move the peg past the light source to check that the light meter is showing a dip in light level. You may need to adjust the position of your exoplanet and/or your light meter.