

## Home experiment: Shadow sticks and sundials.

The Earth rotates once on its axis every 24 hours so the direction of the Sun in the sky continually changes. Sundials use the motion of the Sun across the sky to measure time.

**These experiments investigate how the shadow cast by the Sun can be used to measure time.**

### 1. Shadow stick and sundial experiments, materials needed:

A sunny open space in your garden.

A small pot or jar with earth or sand in.

A straight stick or rod about 30-50 cm long.

A flat board\*

A marker pen

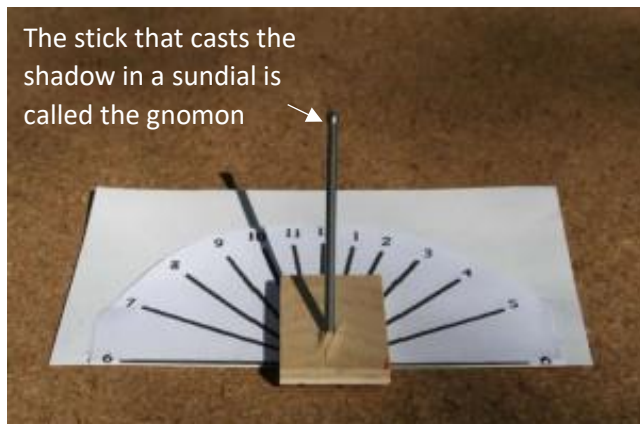
A ruler

A clock or watch

A pencil

### Instructions:

- Place the rod vertically in the pot and place the pot on the board before 10:00 am.
- Make sure the shadow falls across the board
- Starting at 10:00 am or earlier mark the position of the shadow as it leaves the edge of the board.
- Record the time (from your watch or clock) there (e.g. 10:00 am).
- Join this position to the position of the rod with a straight line.
- Repeat this every half an hour (or hour) after that, throughout the day.
- You now have a very simple sundial that can be used to tell the time.



### Find out:

Why does the length of the shadow change during the day?

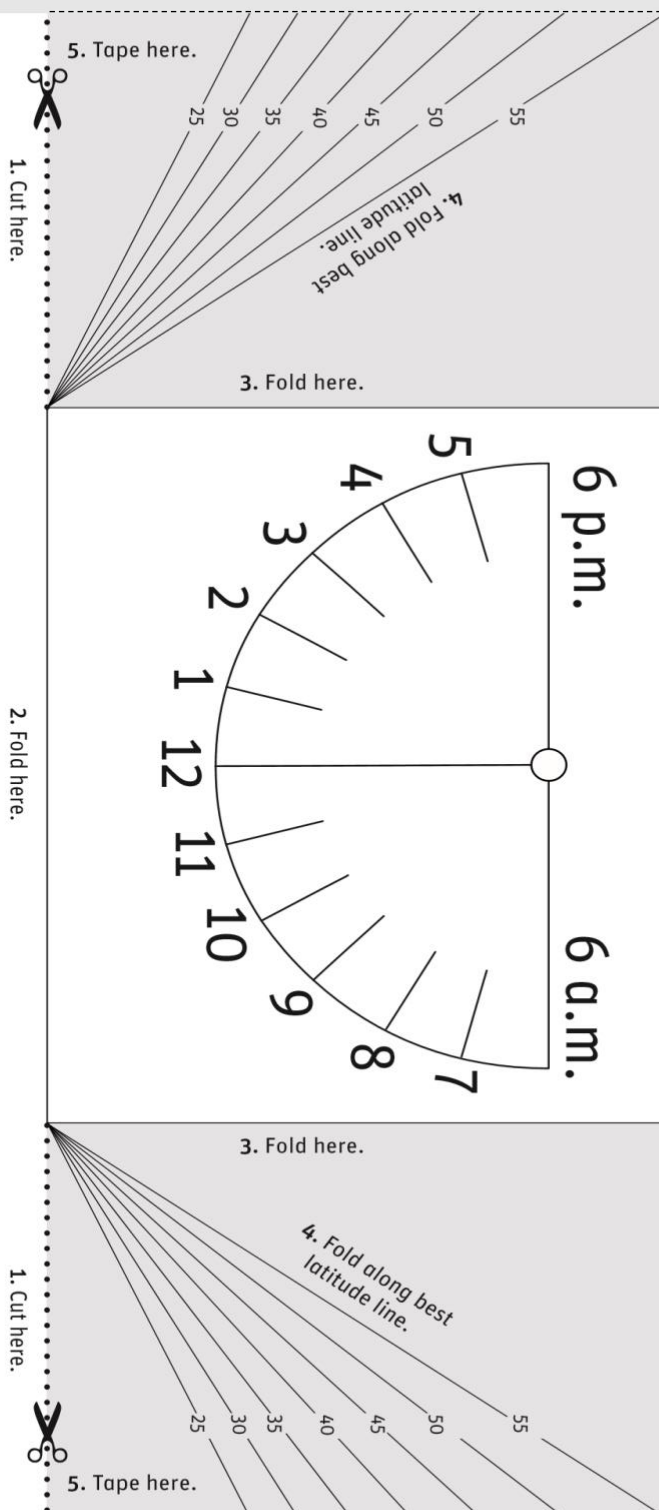
Why does the length of the shadow change at different times of the year?

How could you use your shadow stick to find due south?

*Now turn over to learn how to make a simple portable sundial*

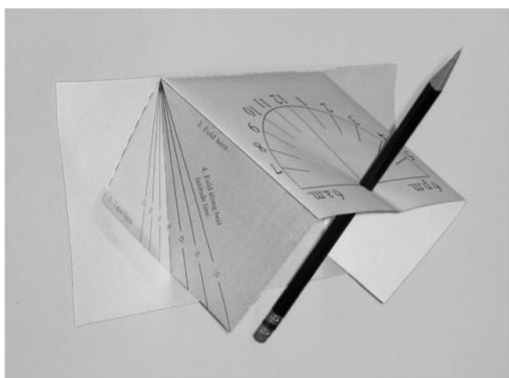
## 2. Build a simple portable sundial

You can use this template (taken from: <https://skyandtelescope.org/astronomy-resources/how-to-make-a-sundial/>) or download another one and use that. When using the sundial the gnomon (pencil) MUST point due north (Why?).



### Northern Hemisphere Sundial

1. Cut in from edge of paper along dotted lines. Stop at solid lines.
2. Fold along solid horizontal line with line on outside. Crease, then open flat again.
3. Fold along solid vertical lines with lines on outside. Crease, then open flat again.
4. Select the latitude line closest to your latitude. Fold with line outside, crease, and fold again with line on *inside*.
5. Tape the paper together as shown at right.
6. Insert a sharp pencil point-first through the small circle at top center. Remove pencil and reinsert it with the eraser first.
7. If needed for stability or durability, tape the whole thing to a sheet of cardboard.
8. Turn the sundial so the pencil points due north, as determined by a map or a compass.
9. If you can't find north, orient the sundial so that it agrees with your clock. (Subtract one hour from the clock time if you're on daylight-saving time.)



On this dial the times are equally spaced but on the shadow stick they weren't why is there a difference?

Look out for sundials on old buildings how do they differ from the ones you have made?