

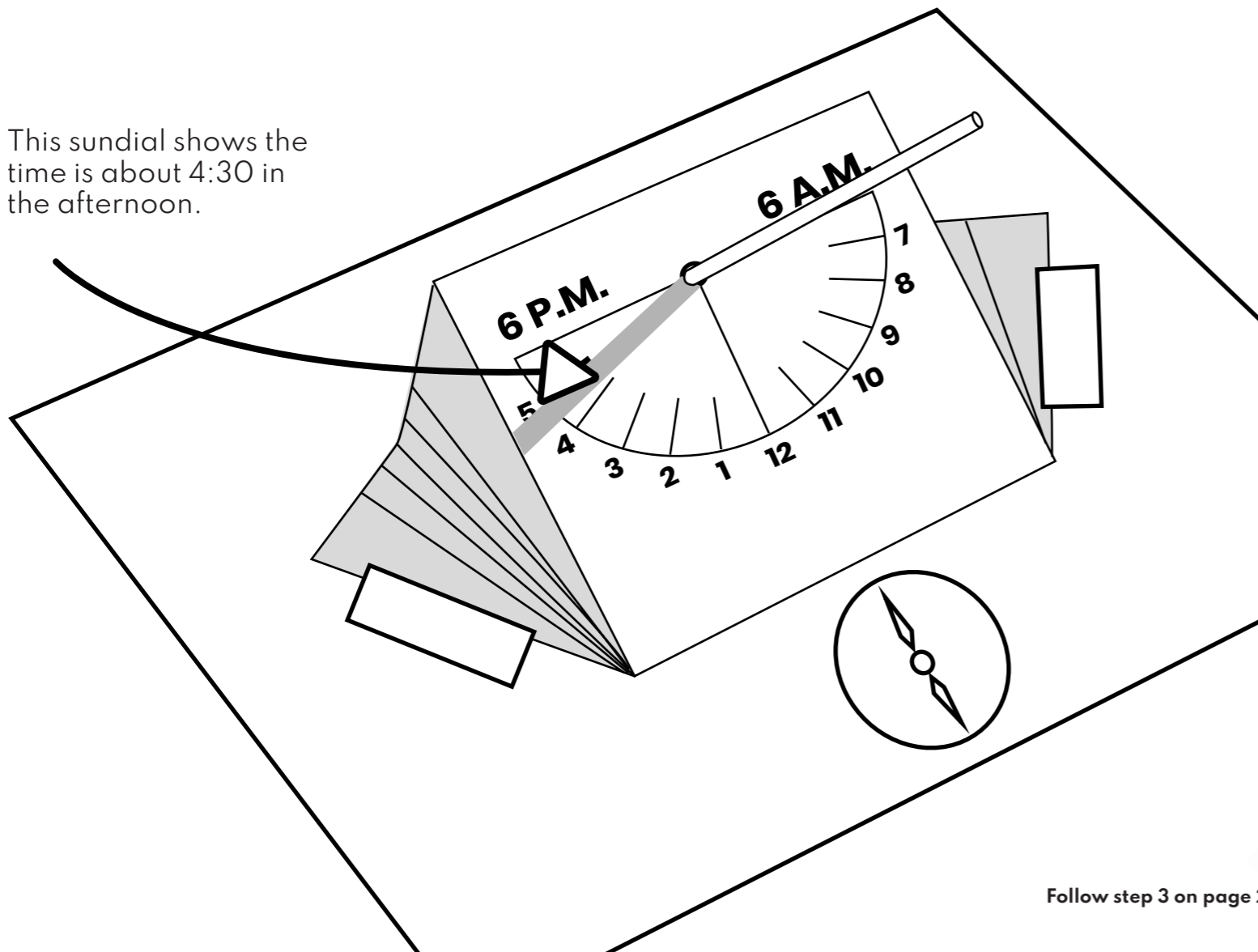
# Make a sundial

During the day, as the sun moves across the sky, the shadows cast by objects move too. You can use the shadows on a sundial to tell the time. You can easily make your own sundial using a drinking straw and a piece of paper, but you'll only be able to use it between spring and autumn. During the winter the sun will be too low in the sky for the straw to cast a shadow on the paper. But you can use a torch to be the sun and use your sundial inside in the winter!

## Reading the sundial

In some regions of the world you may have to adjust the time the sundial shows for daylight saving time. This is when clocks are changed to give more daylight in the evening. Ask your teacher if that applies to your location, and when it occurs. When it does, you'll usually have to add an hour to the time shown on the sundial.

This sundial shows the time is about 4:30 in the afternoon.



## How to make a paper sundial

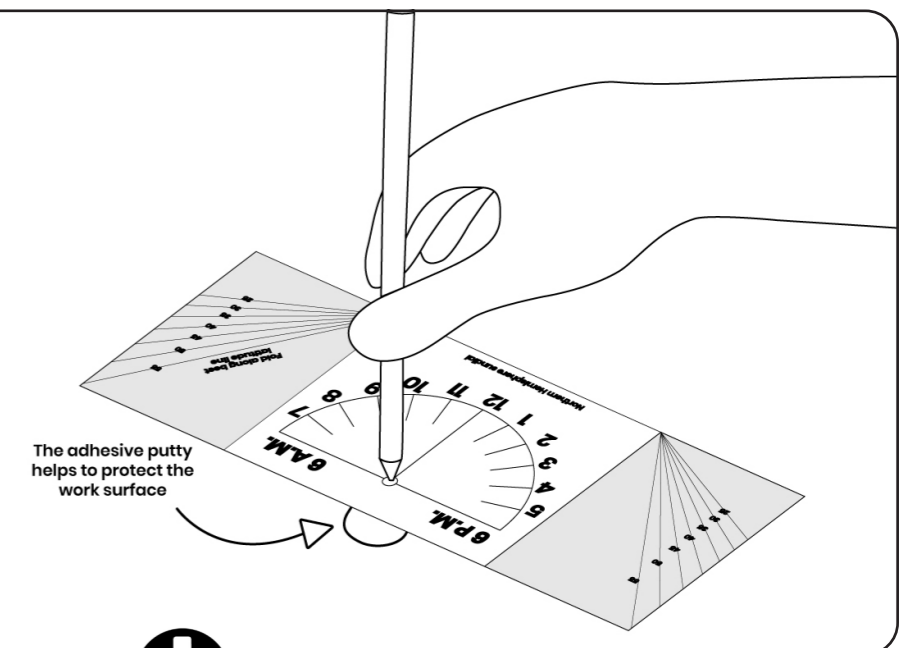
Firstly, you'll need to trace or photocopy one of the templates provided by your teacher. There is one template for countries in the northern hemisphere, and a different one for countries in the southern hemisphere. You'll have to use the correct version for your location. You'll also need to find out your latitude number.

## What you'll need:

- Plastic straw
- Pencil
- Adhesive putty
- Scissors
- Coloured tape
- Cardboard
- A4 sheet of paper
- Ruler
- Compass
- A torch, if you live in the northern hemisphere

### Step 1:

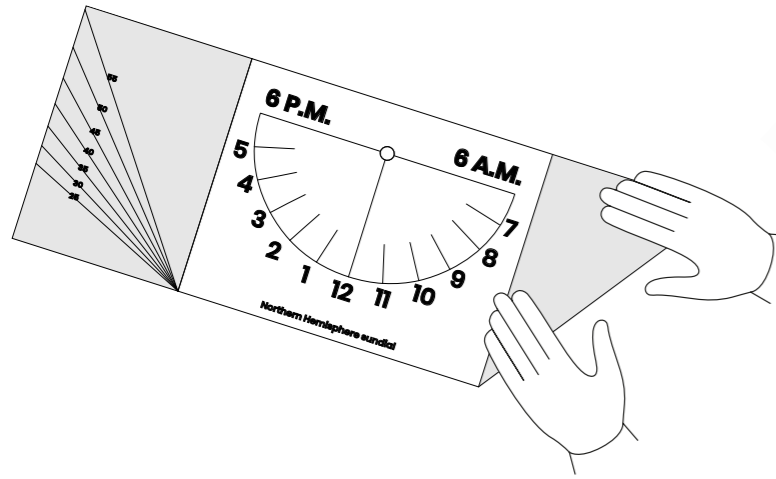
Make sure you have a copy of the right template and cut it out. Place some adhesive putty under where the dot is at the top of the hour scale. Make a hole through the dot with the pencil.



### Step 2:

Find your latitude angle along the scale at the side of the paper. Fold and crease the paper along that angle.

Follow step 3 on page 2



### Step 3:

Turn the template over and fold it again along the crease you created. Repeat steps 2 and 3 for the scale at the other side of the template.



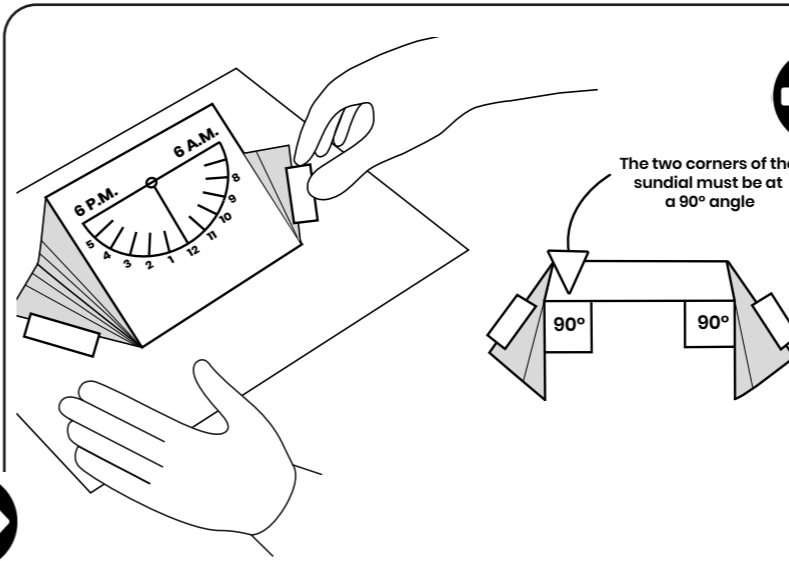
### Step 4:

Now unfold the angled sides. Then fold and crease along the dotted straight lines on either side of the main panel of the sundial.



### Step 5:

Using the tape, attach the creased sundial template to the cardboard. Make sure the sides are vertical. The corners of the sundial must be at a 90 degree angle.



### Step 6:

Cut a piece of the straw about 6 inches (15cm) long. This is going to be your 'gnomon' - the part of the sundial that casts a shadow to tell the time.



### Step 7:

Push the straw through the hole in the sundial's face carefully, from the top down until it's touching the cardboard. Make sure it's at right angles to the face of the sundial.



## How it works

As a result of planet earth spinning, the sun moves across the sky. It rises in the east, reaches its highest point at midday, and sets in the west. Earth takes 24 hours to make one complete rotation (360 degrees). This means it turns 15 degrees per hour. The shadows created by the sun shift by 15 degrees per hour. The lines on the sundial are 15 degrees apart. The space between each line represents one hour.

### Northern hemisphere

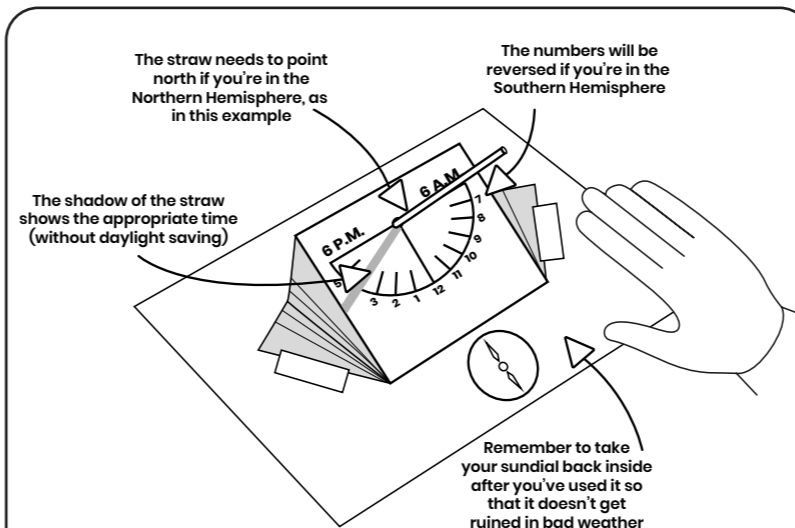
The sun moves 15 degrees across the sky each hour. In the northern hemisphere the sun is in the south.

### Southern hemisphere

In the southern hemisphere the sun is in the north.

### Real world science: shadows

Your own shadow is very long just after sunrise and just before sunset. This is when the sun is low in the sky. Your shadow is shortest at noon when the sun is high in the sky. If you stood on the equator at noon on a midsummer day you would have no shadow at all as the sun would be directly overhead.



### Step 9:

Place your sundial somewhere flat outside in the sun. Use the compass to align the straw to point north if you're in the northern hemisphere or south if you're in the southern hemisphere. The shadow of the straw shows the approximate time (without daylight saving).



### Step 8:

Secure the straw to the cardboard base, making sure that the sundial's face is flat and the straw is at right angles.

