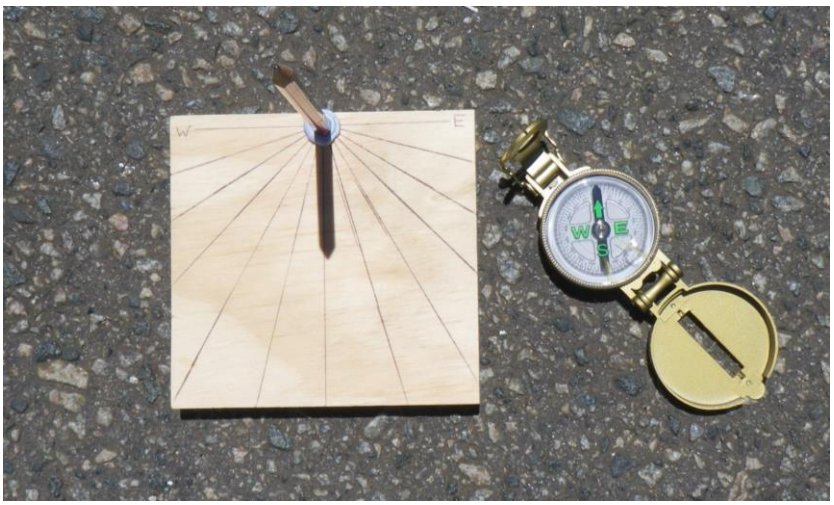
Nodal Sundial - Teacher's Notes

Nodal Sundial

Ancient people noticed that shadows thrown by the Sun moved in regular and predictable ways. They used this to make sundials.



Almost noon at midsummer

The nodal sundial measures 12 solar hours of different lengths. It was used for general timekeeping and for religious ceremonies. We shall be experimenting to find out how accurate it is.

Common Misconceptions

A. Sundials show the movement of shadows cast by the sun clockwise. This only happens in the northern hemisphere. Shadow movement south of the equator is anticlockwise. The word clockwise was coined in the northern hemisphere because movement of the clock's hands are the same as the movement of shadows on a sundial
B. There is a common misconception that stele (needles of rock) such as Cleopatra's needle originally from the banks of the Nile River in Egypt were used to estimate time. They were usually only memorial

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rocks. Although the Solarium Augusti in Rome may have functioned to tell the time as well as celebrating the birthday of Caesar Augustus.

Materials

- This worksheet
- A blob of Blu-Tack, plasticine or play dough
- A pencil (nodus) and ruler
- A magnetic compass, phone compass app or school map
- Classroom clock, watch or mobile phone clock

Method

1. Select a dry sunny day if possible. (If unfortunately this activity has to be done when it is raining or overcast then you will need a strong torch. Once the dial has been drawn and nodus attached, switch off classroom lights and arc the torch over the dial in an east to west direction).
2. With pencil and ruler draw a straight line between 0 and 180 on the paper protractor on your worksheet. This line must always lie east to west.

The ancient people used 12 hours in one day so we need to divide the paper into 12 parts of equal size. Night and day were considered antagonistic.

3. Start at zero and measure in units of 15 degrees. Look clockwise round the circle until you see 15 and then join that point to the cross in the middle of the base. You will have made the first section.
4. For every section you will need to add another 15 until you reach 180. Draw lines from these numbers to the cross.

Q What numbers will we need to use? 0, 15, 30, 45, 60, 75, 90, 105, 120, 135, 150, 165 then 180.

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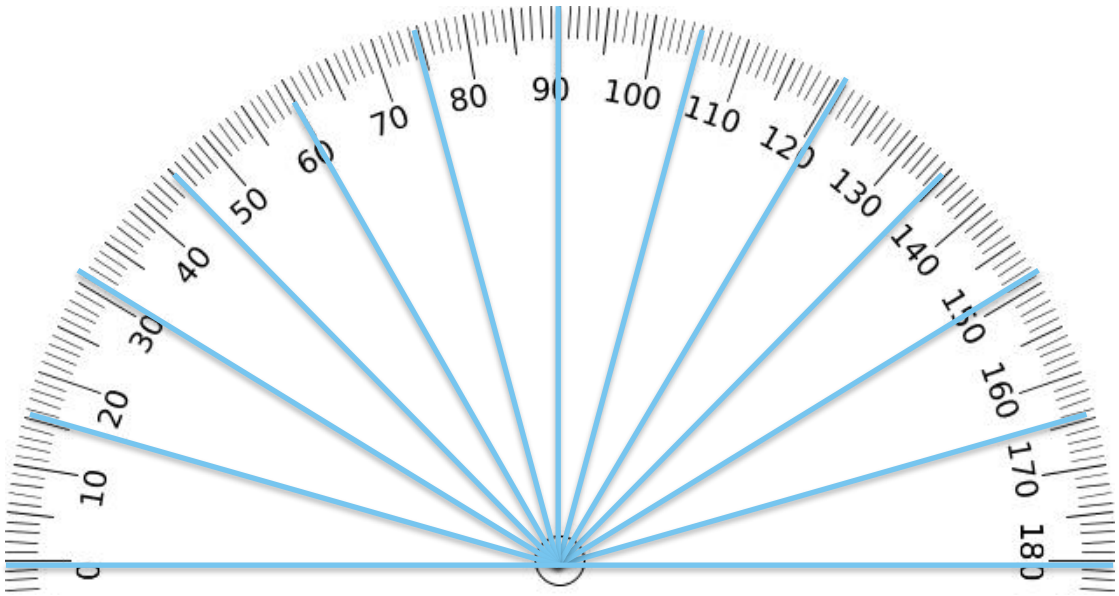

5. Mark these on the worksheet and draw in the sections from the number to the central cross using a pencil and ruler. This is easiest if a "step by step" instruction process is used. These mark where solar hours should fall on the sundial if they were of equal length. (They are not).

6. Using Blu-Tack or plasticine set your pencil upright on the cross.

7. Take your sundial outside, align the horizontal line east to west. If you are using a magnetic compass it needs to be kept away from metal and power lines. Phone apps use satellite information not magnetism. Most school maps have "North" at the top. Mark where the shadow falls on each standard (UTC) hour.

Horus was God of the Sky in Ancient Egypt. The pharaoh represented him in life.

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Q How accurate is your sundial? It is not very accurate because solar hours vary in length.

This Assyrian king needs a nodal sundial. What things would he use it for?
Setting times for:
Organising religious and social control.
Meetings, meals, working hours, prayers, religious activities,
ceremonies, changing of guard

Brain Strain

In Western Australia in February, daylight lasts $13^1/_2$ standard hours.

In summer will Ancient Egyptian solar hours be longer or shorter than our standard hours?

Egyptian solar hours will be longer because they only had twelve. At that time of year there was a longer period of daylight to be divided into 12. In winter when there is less than 12 standard hours of daylight then the reverse would apply

Why do you think that modern people need a more accurate measure of time than the solar hour? Any reasonable answer that involves organising many more people to work. How could you organise education for 300 students and 25 teachers together if they all arrived and left at different times? Advanced technologies require more accuracy to get a good result.

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Name four things in your home that tell the time. Clocks, watches, mobile phones, laptops, televisions, fridges, microwaves and cookers.

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