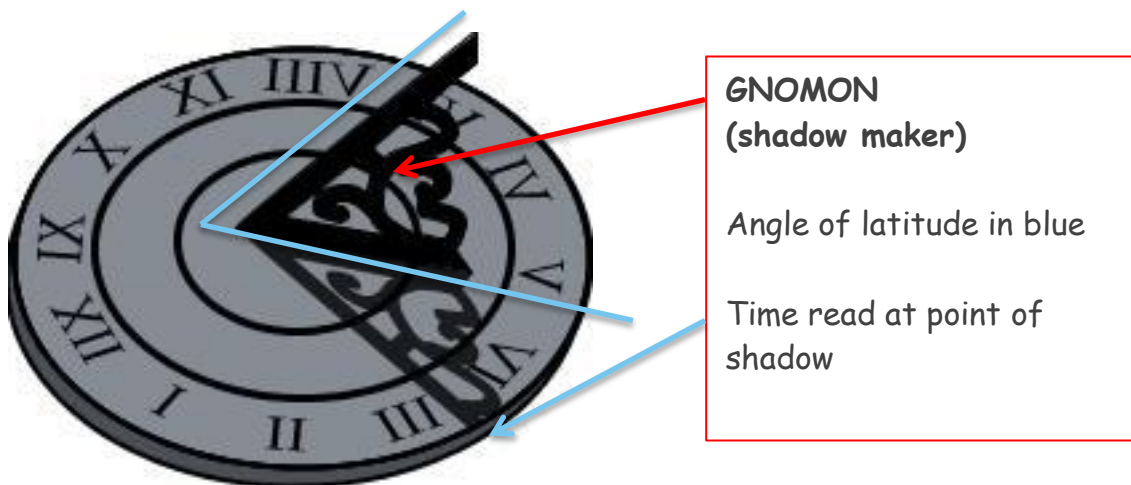




Gnomon Sundial - Teacher's Notes

Gnomon Sundial



Arab philosophers of the 9th and 10th centuries were amongst the first advanced scientists and mathematicians in Europe. They discovered that using a gnomon, a triangular shadow maker, would indicate hours of exactly the same length of standard time, no matter what time of year it was. The angle between its base and top has to be the same as the latitude of the location in which it is used. This is because when it points south it lies parallel to the Earth's axis of rotation.

These became very popular in Renaissance times in Europe and the concept of a single standard hour made scientific measurements more reliable. Some sundials were placed on walls.

Sundials were often ornate and had mottos such as:

- Tempus fugit (Time flies - Latin)
- Tak tint o time ere time be tent (Pay attention to time or time will be lost - Scots)
- Let others tell of storms and showers. I only tell of sunny hours (Anon)



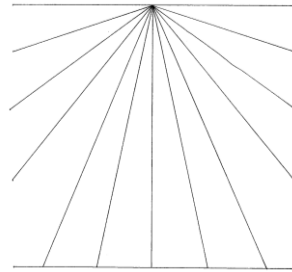
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Gnomon Sundial - Teacher's Notes

Materials

- Worksheet for sundial base
- Spare paper for gnomon
- Pencil
- Ruler
- Protractor
- Glue or sticky tape
- Scissors
- Atlas or Internet access to find your latitude



E.g.	Broome	20.3°S
	Perth	32°S
	Kalgoorlie	30.7°S
	Albany	35°S

- Prepared gnomon (Shadow triangle for your school's latitude)

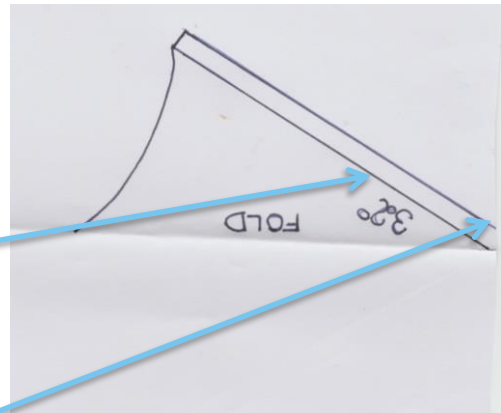
To prepare your gnomon

Fold a sheet of paper in half. The fold will be the top of the gnomon and will be used to reinforce it.

With the protractor, measure your school's latitude (in this case 32°S) away from the fold then draw that line about 9cm long.

Draw another line about 1cm below this to make the flaps that will stick onto the base in the worksheet.

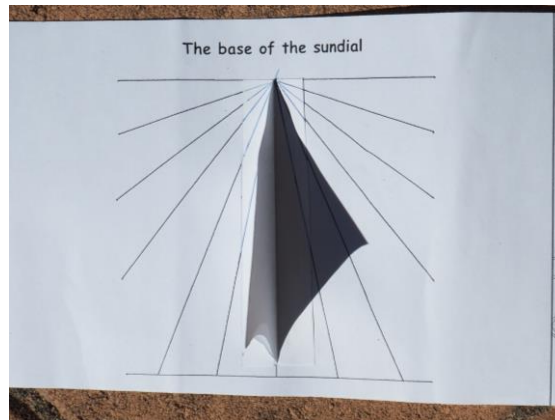
Leaving the paper folded cut round the outside of the gnomon. Fold out the flaps to attach to the prepared base in the student worksheet.





Gnomon Sundial - Teacher's Notes

The gnomon should be attached with the fold running down to origin of the rays on the base as shown below. This point will be north when you align your sundial.



North

South

Method

1. Before class prepare photocopies of the correct gnomon for your school.
2. Ask students to cut out the gnomon, fold back the flaps and stick it onto the base with the fold pointing downwards towards the origin of the rays in the base.
3. Take the sundial outside and align it so that the pointed part of the gnomon points towards the north, as indicated next to the picture above. (Note that this the opposite if the sundial was made for the northern hemisphere)
4. Read the time.

Observations

What time did your sundial read? [Dependent on time](#)

What time is it according to your watch, clock or mobile? [There will usually be a difference.](#)



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Gnomon Sundial - Teacher's Notes

Why is there a difference? The dial tells solar time. Our watches etc. give standard time according to standard agreed time zones.

Both Perth and Kalgoorlie are in the same time zone but their sundials read noon at different times. Why would a Kalgoorlie sundial read noon much earlier than the Perth one? Kalgoorlie lies east of Perth. It faces the Sun much earlier than Perth. The overhead Sun at noon will happen earlier there.

Does the moving Sun rise and set? No, The Earth rotates so that particular places approach the Sun and then roll away from the Sun .

What fractions of a sundial hour can you accurately read? Quarters of a sundial hour.

One thousand years ago, what would our ancestors have used a sundial for? To organise people to come together for church services, meals, meetings, trading times.

To estimate distances when travelling on land or sea.

To organise people to come together at the same time for working parties



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Gnomon Sundial - Teacher's Notes

Extension

Write a short letter to a friend organising a meeting using information from a sundial

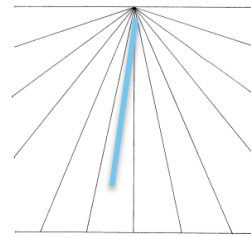
Dear _____

We must meet at _____ o'clock to _____
because _____

Look on the sundial. Set out when the shadow fall looks like this below.

Student draws a coloured line at the time agreed.
This would be for 5.15pm.
(The shadow moves anticlockwise).

Your good friend _____



Cottesloe Sundial - An advanced gnomon sundial



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Gnomon Sundial - Teacher's Notes



The Cottlesloe sundial was built in 1993. It is based on 18th century sundials popular in Jaipur in India. The parallel triangular gnomons throw shadows onto engraved plates which curve on either side of them permitting accurate time to be read throughout the year. Curved lines engraved on the plates permit adjustment to WA standard time.

An Earth Science excursion here permits students to not only visit the sundial but also to look at ancient and recent fossils on the beach and in the dunes.



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