YEARS 5-8

# Sundial time

# Te wā karaka ātārangi

## OVERVIEW

Learn about the Sun's position in the sky throughout the day, how Earth rotates and how a sundial works to show the time.

## NZ CURRICULUM LINKS

| LEARNING AREAS: | ACHIEVEMENT OBJECTIVES: | LEVELS: | YEARS: |
|---|---|---|---|
| Science:<br>Planet Earth and Beyond:<br>Astronomical systems | Investigate the components of the solar system, developing an appreciation of the distance between them. | 3-4 | 5-8 |
| Physical World:<br>physical inquiry and physics concepts | Explore, describe and represent patterns and trends for everyday examples of physical phenomena, such as movement, forces, electricity, light, sound, waves and heat. | 3-4 | 5-8 |
| Mathematics:<br>Geometry and Measurement:<br>Measurement | Use linear scales and whole numbers of metric units for length, area, temperature and time. | 3-4 | 5-8 |

# TEACHER INFORMATION:

## Learning sequence

INTRODUCING KNOWLEDGE

EXPLORE AND INVESTIGATE

CREATE AND SHARE

REFLECT AND EXTEND

MAKE A DIFFERENCE

## Learning intentions

Students are learning to:

- explore how the Earth rotates and how its daily rotation changes the angle of the Sun
- measure the passing of time and movement of the Earth in relation to the Sun using a sundial

## Success criteria

Students can:

- describe how a sundial works
- record changes in the Sun's shadow position using a sundial

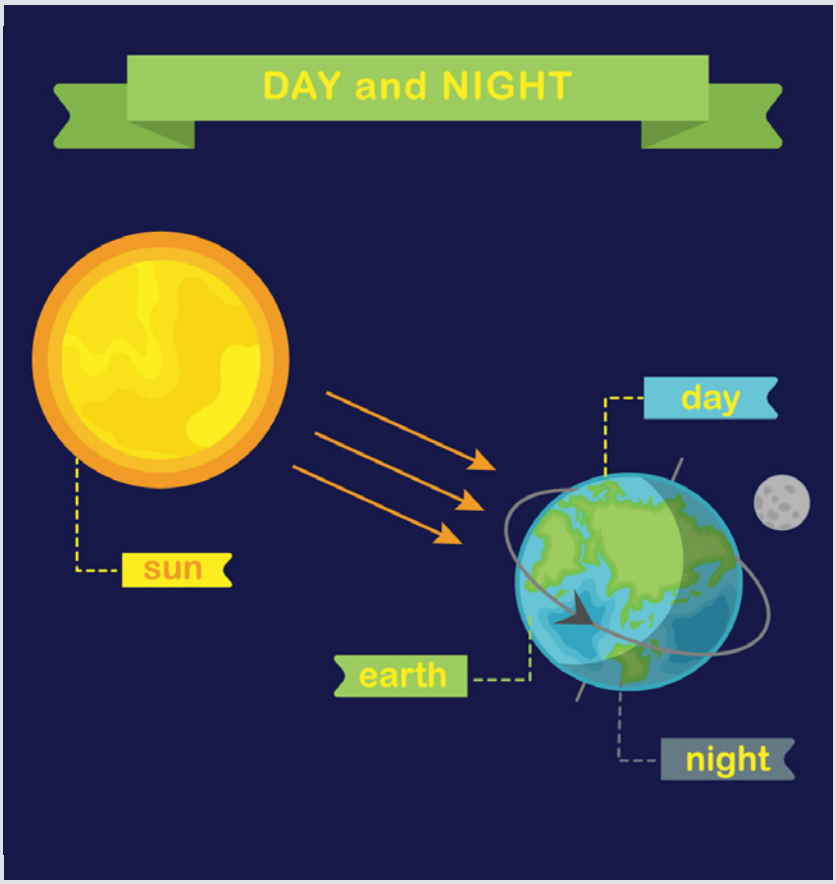
## Resources needed

Slideshow: Our Amazing Sun

Any text highlighted in orange represents a link to further material. If you have printed this resource, please return to schoolgen.co.nz/for-teachers/resources to access the linked material.

## Additional Support

The Earth rotates around its own axis constantly, making one rotation every 24 hours. This rotation causes sunlight to shine on different parts of the planet at certain times of the day. The side of the Earth that faces the Sun is lit up and experiences daytime and the half that is not facing the Sun experiences night-time. The Earth rotates on an angle of about 23°. From Earth, the Sun appears to move across the sky, but it is actually the Earth that is moving (rotating), changing position in relation to the Sun all the time!




The Sun is almost still in comparison to the Earth. At the same time as it is rotating, the Earth also orbits around the Sun. The time it takes to orbit the Sun is one year and is the reason we experience the four seasons.

The angle of the Sun in one location on the Earth changes throughout the day. A sundial records these changes in the angle of the sunlight. Before clocks, phones or watches people used sundials to tell the time!

## Vocabulary

Sundial, rotation, Sun, angle, shadow, gnomon, Earth, axis.

# LEARNING EXPERIENCE

*Note: These are suggestions only and teachers are encouraged to adjust the activity to suit the needs and interests of their students.*

*Wait until a few cloudless, sunny days to do this activity, when you'll get the best shadows on your sundials. Don't look directly at the Sun as it can damage your eyes. This activity works best if you can go back to it through the school day or over a few days.*

## INTRODUCING KNOWLEDGE

Allow approximately 20 minutes

### Introducing the Sun and Earth's movements

- Introduce the Sun with the slideshow Our Amazing Sun
- Show students the video Day and Night - The Rotation of the Earth by NG Science, which explains how the Earth's rotation causes day and night.

## EXPLORE AND INVESTIGATE

Allow approximately 20 minutes

Stand a tall steady object in a sunny, flat area on a still day. Where is the shadow cast?

Would this shadow move at different times of the day? Why is this?

Stand in the sunlight at two different times of day and draw around your shadow or an object's shadow.
In this example you are the gnomon (the part of the sundial that sticks up from the sundial and makes the shadow).
The Earth is rotating slowly on its axis so the Sun will shine at a different angles during the day.

THINKING LIKE A SCIENTIST:
Observing sunlight and shadows

Observe the Sun when you get to school in the morning and then again at the end of the school day.

Discuss the differences in the Sun's position throughout the day.

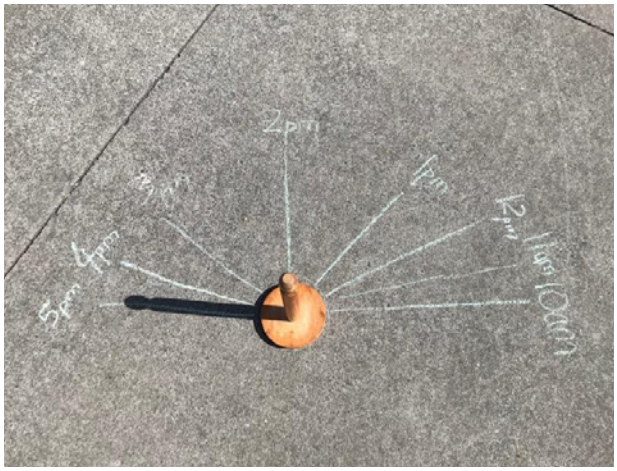
How can this be explained by what you have learnt about Earth's rotation?

# CREATE AND SHARE

Allow approximately one school day (intermittently a few minutes at a time)

## Recording the time with shadows

Create a basic sundial using a tall object secured to the ground. This object could be a paper towel holder, pencil or even yourself! Use chalk to mark where your shadow is at each hour of the school day. Make your sundial in a flat open area which receives sun all through the school day. Sundial measurements and hour positions will change with the seasons and daylight saving. They are not as accurate as using a clock or watch but give a general idea of the time.



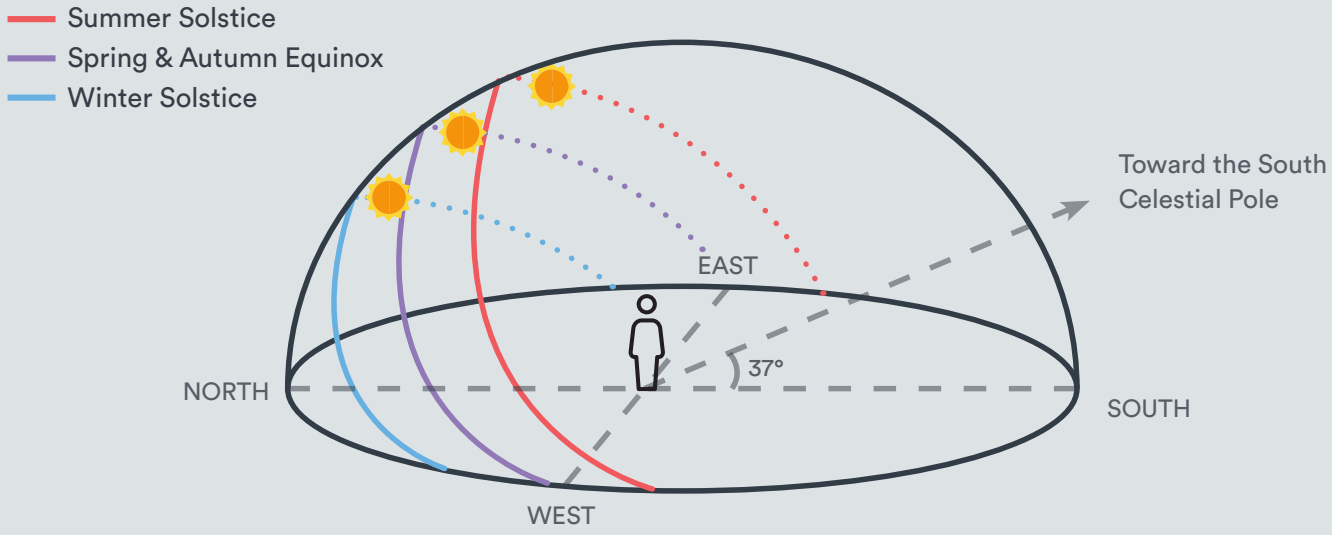

# REFLECT AND EXTEND

Allow approximately 10 minutes
Explain to a partner and/or write an explanation of how a sundial works.

## Extending thinking about sundials

- Would your sundial be accurate at all times of the year?
- Why would this change?

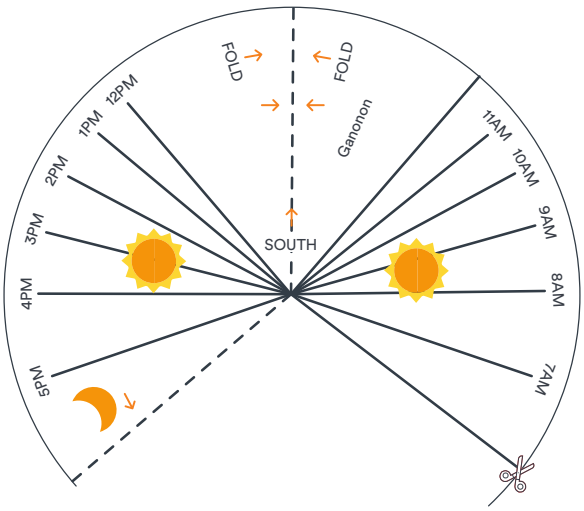
The Sun changes position in the sky during each season because of the orbit of the Earth around the Sun during the year (see diagram below). This will change the angle the gnomon (the part of the sundial that sticks up from the sundial) and its shadow, so one sundial will not be accurate at all times of the year.



## Extending learning: Paper sundial

For a more complex but accurate sundial template, see page 6. Print the template onto thick paper or card.

Cut the template out and fold up the triangle shape to make the gnomon (the part of the sundial that sticks up from the sundial and makes the shadow). Face your sundial south and see what time of day it is.




# MAKE A DIFFERENCE

Allow approximately 10 minutes

## Sunlight and energy use

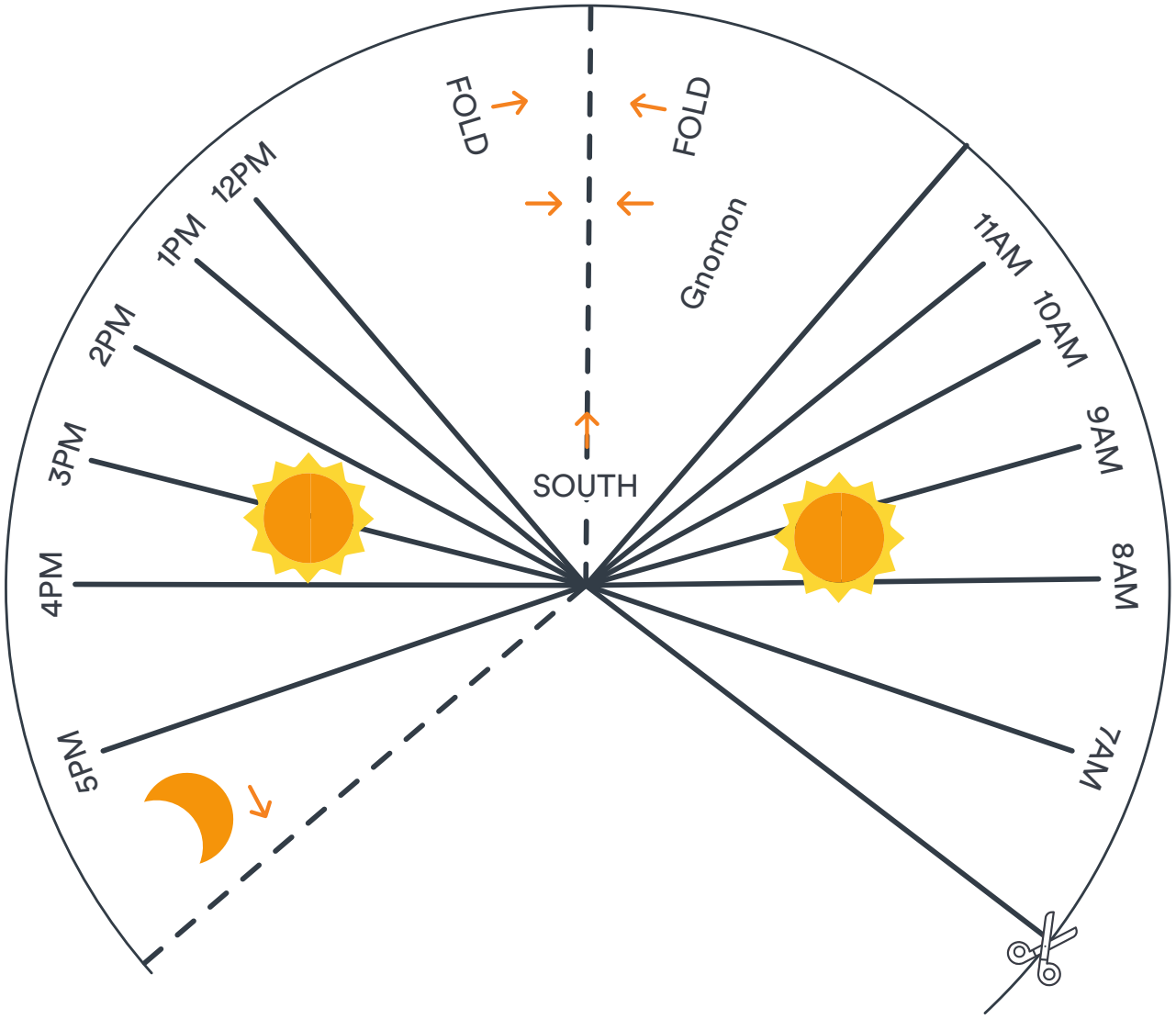
- How could the time of day and path of the Sun through the sky change your use of electricity?

*The angle of the sun can alter which rooms get light and heat energy at certain times during the day. We can use heat and light energy from the Sun to heat our homes and classrooms and block it out to keep cool.*

- How could you let sunlight into your rooms in winter to heat your classroom? How can you keep out too much heat and light energy from the sun in summer?
- Well-designed buildings let light and heat from the Sun inside in winter and keep out the heat in the summer. Find out more in the energy efficiency design unit.

# PAPER SUNDIAL TEMPLATE

This sundial works best in northern NZ at latitude 36-37°.

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EMPOWERING KIWI KIDS