



# Astrolabes

## Learning Objectives:

- To know that constellations are recognisable patterns made by stars;
- To know that Earth rotates on an imaginary axis between the poles;
- To know that the Pole Star remains in a constant position in the night sky because it is directly above the North Pole;
- To be able to recognise some of the constellations visible in the northern hemisphere;
- To know that constellations can be used to navigate;
- Build and apply a repertoire of knowledge, understanding and skills in order to

## Science and D/T Skills:

- Making a model of a simple machine;
- Solving practical problems encountered;
- Following instructions to build a model of an Inclinator, which within it also presents the opportunity to teach science knowledge (Gravity, plumb line etc.), construction skills and look at decorative pattern and mark making, to apply artistic design to the product.

## Resources:

- Whiteboards and dry wipe pens
- Hypatia PowerPoint
- Skills development worksheet template for mark and pattern making
- Instructions for making the Inclinator/Astrolabe
- A protractor, Card, string, tape, Artstraw or similar, washer or other small weight

## WHAT YOU SHOULD KNOW BEFORE YOU START

Hypatia was born in Alexandria which was a famous centre of learning in the ancient world. The exact date of her birth is unknown but, from the writings from that time it can be estimated that she was born between 350 and 370 AD. Her father was a famous mathematician and he taught her everything he knew. Hypatia went on to learn even more than her father and became a well-respected teacher which was unusual for a woman at that time.

She wrote books on maths and made refinements to various scientific instruments, such as the astrolabe, which used the position of the stars to tell the time and to navigate.

This is an astrolabe: <https://www.youtube.com/watch?v=yioZhHeIi5M>

As a Neoplatonist, she believed that maths, music, and astronomy were all interlinked, and scholars would travel from far and wide to study with her.

Hypatia was also unusual for teaching men from many different faiths. She, herself, followed no particular religion and her ideas were acceptable for scholars from all faiths - Jewish or Christian or Pagan. This proved to be her downfall. Christianity had become the state religion in Alexandria and Jewish or Pagan people came under attack. The roman governor Orestes sought Hypatia's advice on how to handle the situation. She advised moderation but, when Orestes himself was injured in a riot incited by zealous Christian monks, he killed the leader. The Christians blamed Hypatia, saying she was a witch and had led Orestes away from Christianity. So, they had her brutally murdered.

## WARM UP – constellations

Watch:

<https://www.bbc.co.uk/news/av/uk-england-norfolk-25675942/stargazing-live-human-constellation-of-city-s-nightsky>

Ask:

- What is a constellation?
- Do you know the names of any of them?

You might also like to watch: (darken the room first)

<https://www.youtube.com/watch?v=fUHMpOpQYq4>

Ask:

- Can you remember the shape of the plough? Draw it on a white board.
- Can you remember the shape of Cassiopeia? Draw it on a white board.

Watch

<https://www.youtube.com/watch?v=MZffhapfOgg>

<https://www.youtube.com/watch?v=BbzCA0Lgf3Y>

### INTRODUCTION – recognising constellations

If you'd like to hear one of the stories which inspired the naming of a constellation, watch:

<https://www.youtube.com/watch?v=sAmJjvq27T4>

Show *Slides 1- 4* and ask the children to identify the constellations of the plough and Cassiopeia (shown in the warm up videos) then identify the position of 3 more constellations.

Tell the children:

The constellations were used in Ancient civilisations to navigate. The study of the stars – astronomy - was considered as an important part of education but only boys went to school in ancient times. There was, however, one woman, in Alexandria, who was educated by her father and ended up being a teacher herself. Her name was Hypatia.

Watch:

<https://www.youtube.com/watch?v=nImwZrVJ-TI>

Tell the children:

Hypatia refined the design of various scientific instruments. One of them was the astrolabe which was used to do all kinds of calculations including working out the time, using the position of the stars. They were complex scientific instruments but were often beautifully designed.

Watch:

<https://www.youtube.com/watch?v=yioZhHel i5M>

## MAIN ACTIVITY – Build an Inclinometer

**Introduction** – Talk about the purpose of an astrolabe, in particular its central function as an inclinometer in order to measure slope or height.

Consider how this is important in navigation – (knowing the angles of celestial bodies above the horizon helps to calculate location).

### Activity

Introduce the worksheet which gives step by step instructions on how to build an inclinometer.

Depending on the needs of your class you may wish to ask your children to follow the instructions themselves or you can work through it step by step with them following your demonstration.

You use this as your differentiation: Some children working through on their own; perhaps another group working on it themselves but with a partner to support; a lower ability group working with an adult etc.

### Follow up

Children could decorate their model in the manner of the examples they have seen during your project.

This can be supported by use of the mark making template to explore mark and pattern-making.

### REVIEW Science

**ALL:** Children know that constellations are groups of stars.

**MOST:** Children can recognise the plough and Cassiopeia.

**SOME:** Children know that the constellations appear to rotate around the pole star which is directly over the north pole – the point about which the Earth rotates.

### REVIEW Design and Technology

**ALL:** Children will construct an astrolabe with appropriate levels of support.

**MOST:** Children will construct their astrolabe following step by step instructions by adult.

**SOME:** Children will be able to construct the astrolabe by following the instructions independently.

