

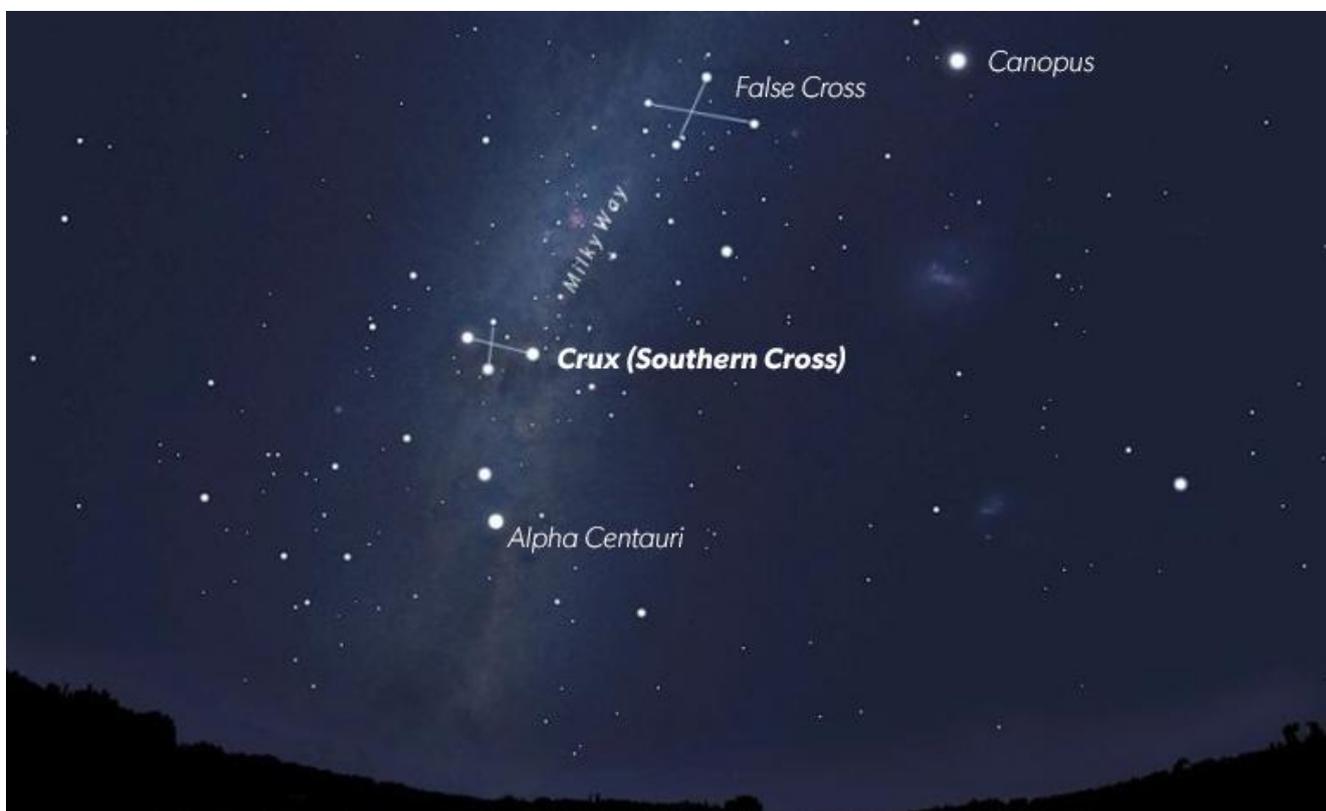
Navigation – Stars – Celestial Navigation

Aspects of this worksheet may work better presented on a screen at the front. For example, the images of the night sky and the maps may need talking through as a whole class.

Polynesian navigators used stars to locate land. Navigators could place their Waka (canoe) immediately beneath a star at its highest point in the sky in the knowledge that this would point them to an island.

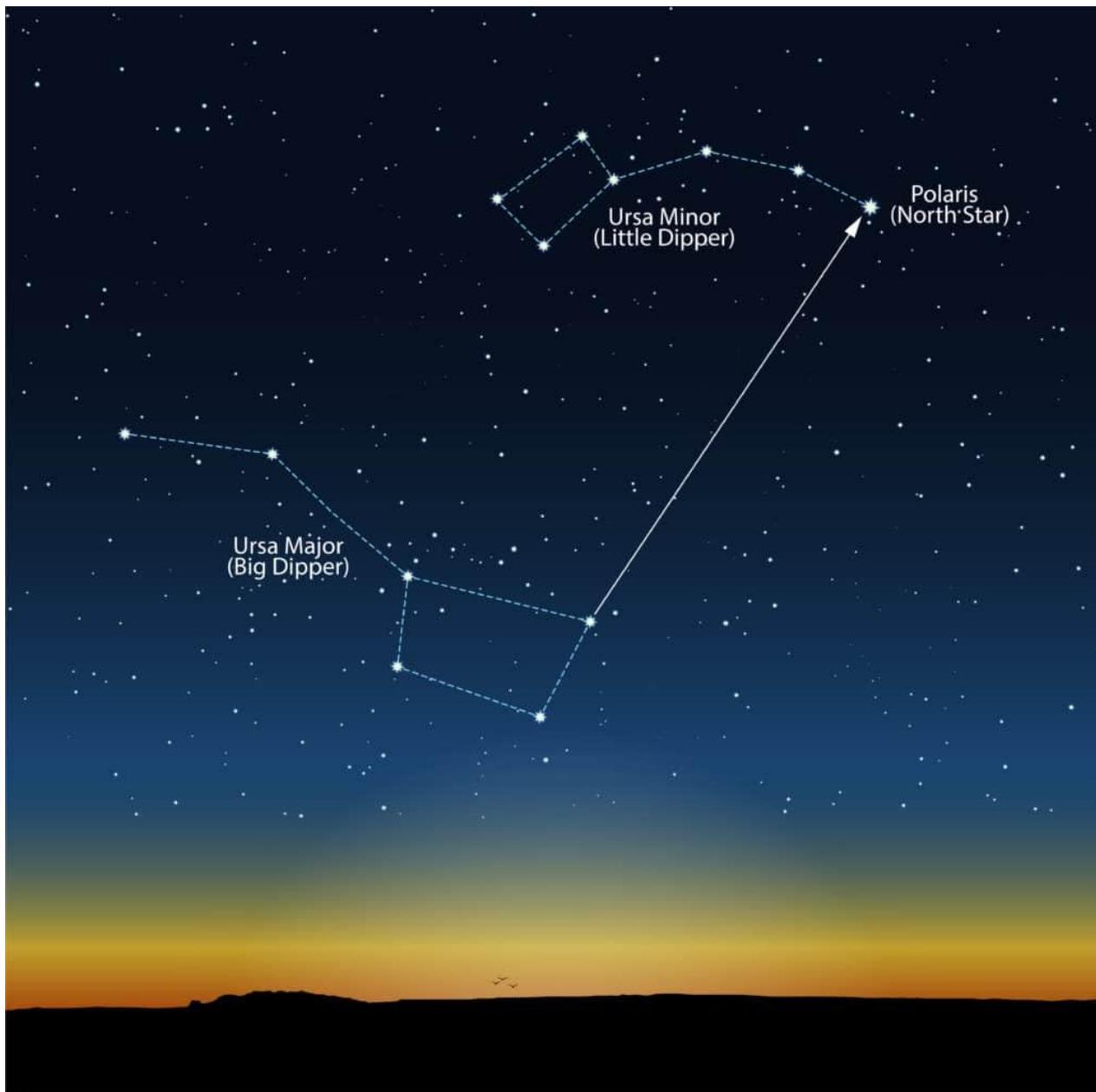
The navigators knew the position of the stars in relation to the time of the year. They knew how to use the stars to find south, north east and west.

The Southern Cross in the Southern Hemisphere shows due South



NAVIGATION – Pupil Worksheet – Stars

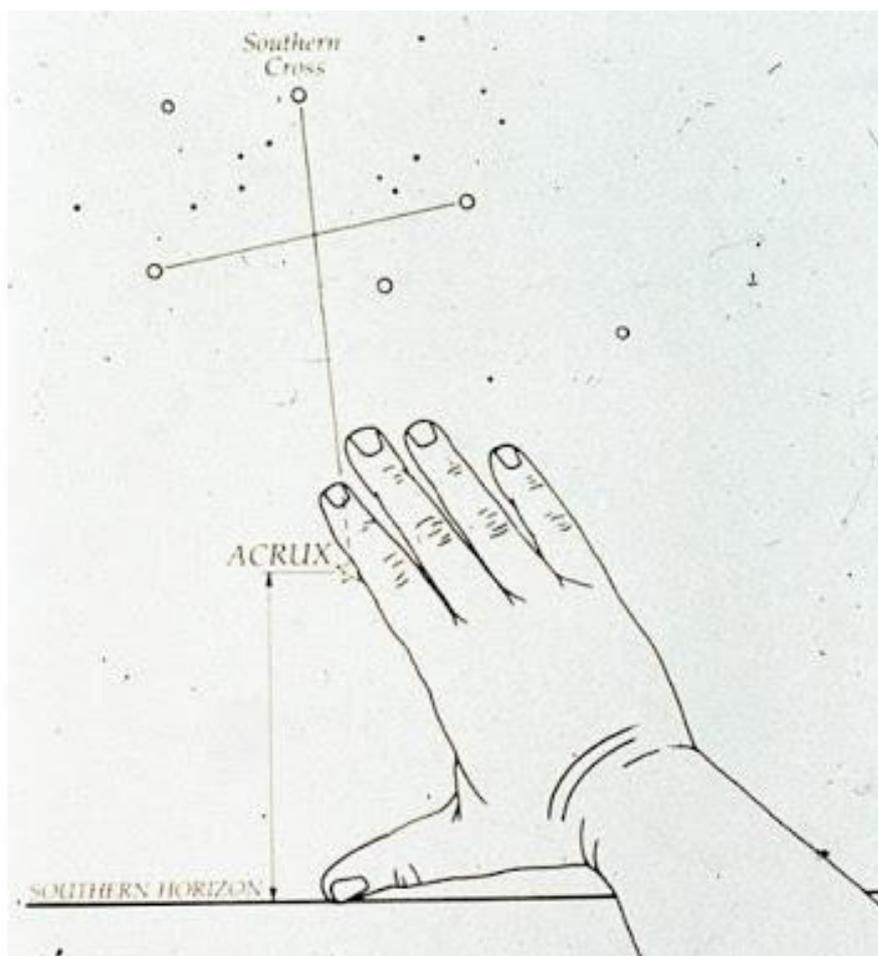
The North Star in the Northern Hemisphere shows due North – on a dark clear night see if you can find it. The Big and Little Dipper point to it.



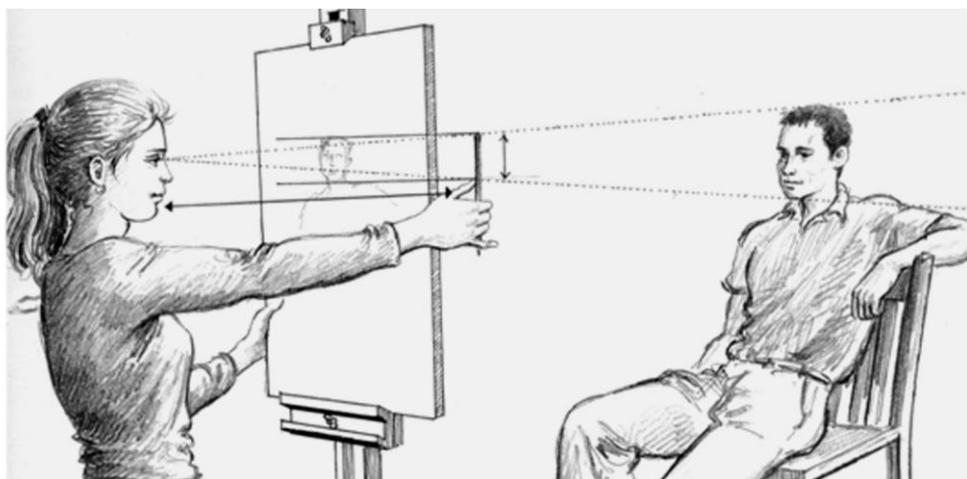
Sailing Waka had points marked around their hull to line up with the stars so that a certain star can be followed by lining it up with the mark.

Polynesian navigators measured the height of stars, moon and sun above the horizon to find their position. Fingers and hands held at arm's length can be used for measuring height above the horizon.

Pupils can experiment with this holding their hands out to measure things in the distance.



Try measuring something in the distance using your fingers at arm's length.



The drawing task is best demonstrated first

If you can set up a few easels then the children can take turns in measuring and drawing. The task is harder if they have to look down onto the page and up at the object.

NAVIGATION – Pupil Worksheet – Stars

A pencil and a straight arm is all you need to take measurements for a drawing. Your head must remain in the same place and if you bend your arm the measurements will not be consistent.

See how accurately you can draw by only drawing what you can measure. Keep it simple.

Doing your drawing this way you are plotting points from the world on your paper.

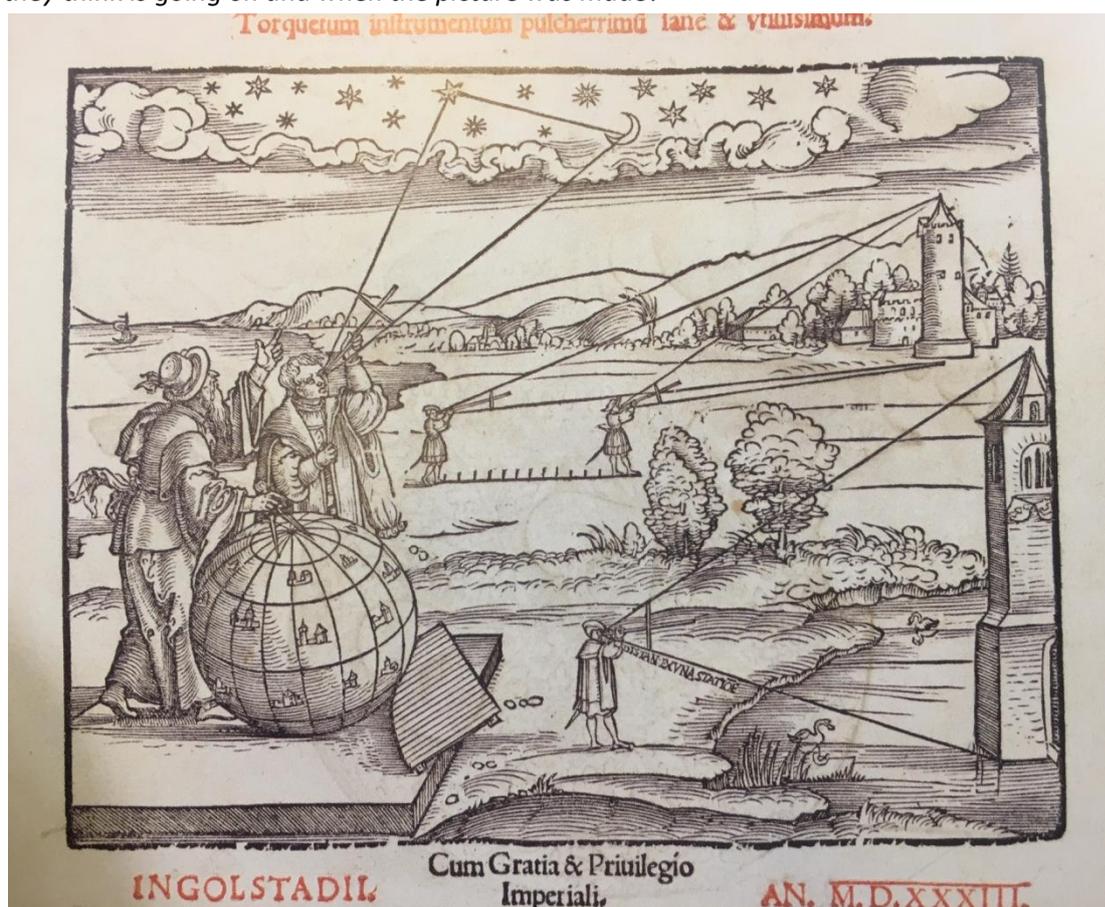
Look at the angle the top and bottom of the head make going into the girl's eye.
Would this angle get bigger or smaller if the girl moved further away?

Answer. *The angle would get smaller.*

This answer seems simple but it is the principle behind a world changing method of navigation

The points you plot for the drawing are measurements of angles from your eye. If you reverse the process the angles can be used to plot your position in the world.

Interesting to see how pupils respond to this as there is often an intuitive understanding for some and a complete lack of understanding for others. Show the pupils this picture and ask them what they think is going on and when the picture was made?



It is from 1533 (see date in roman numerals) it shows people making links between the angles they can measure on land and the angles they can measure in the sky. Plotting their position.

NAVIGATION – Pupil Worksheet – Stars

From your ship what would you measure the angle of in the day time?

Answer. The Sun

From your ship what would you measure the angle of at night time?

Answer. Moon

What would always be at the same angle from your ship?

Answer. The horizon

You may get them to think about the how the sun and moon rise and set – when they are at their highest it is midday or midnight

The answers are revealed on the next page of the worksheet -

NAVIGATION – Pupil Worksheet – Stars

The Polynesians measured the angle between the horizon and the stars and planets.

This page of the worksheet may need explanation from the front with images projected on a screen

When you are in a ship in an ocean the horizon is always visible so the angles of stars or planets above the horizon can be measured.

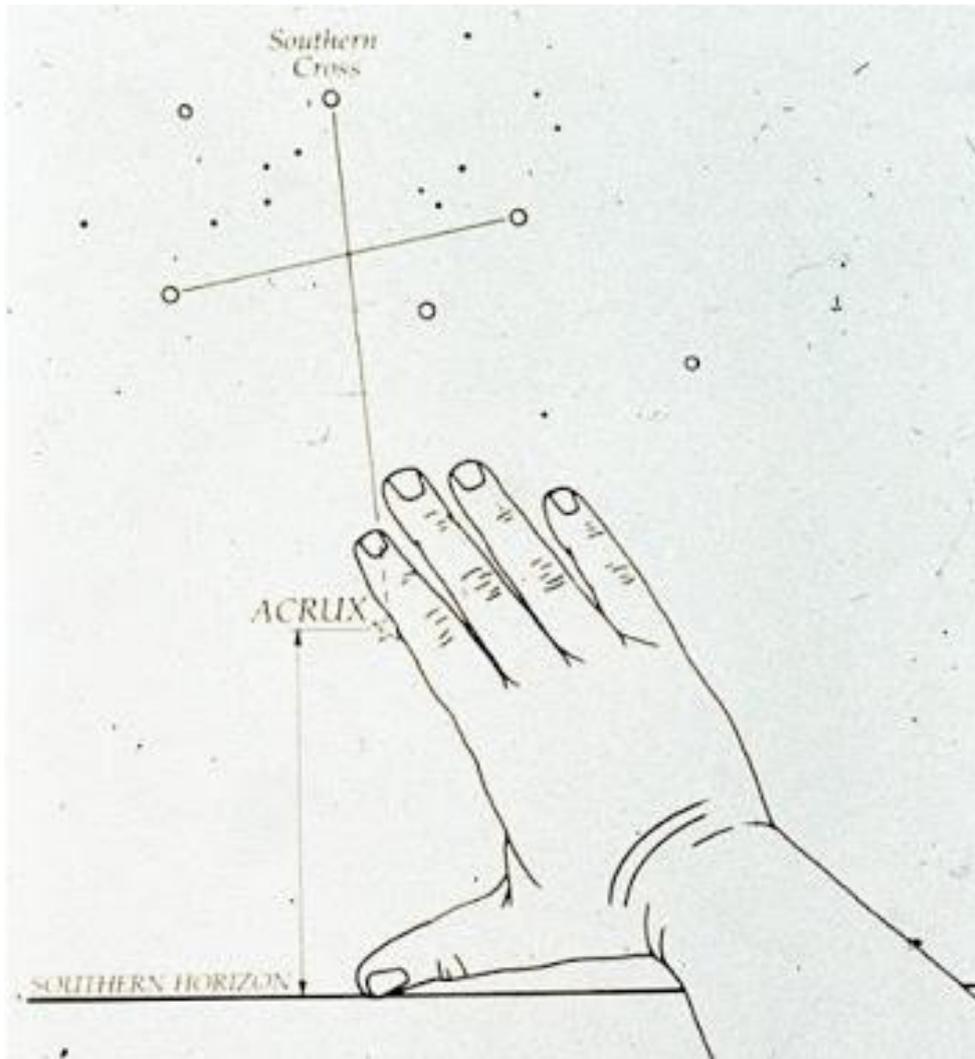


- Standing in Hawaii the bottom of the Southern Cross is four fingers widths above the horizon
- Standing at the Equator the bottom of the Southern Cross is one full hand span above the horizon
- Standing further south in Tahiti the bottom of the Southern Cross is two hand spans above the horizon



Where do you think this hand measuring the height from the Southern Horizon to the star at the base of the Southern Cross is in the Pacific Ocean?

NAVIGATION – Pupil Worksheet – Stars



Put your answer on the map and explain how you worked it out.

Answer. *Just north (above) the Equator*

REASONING - *At the equator is one full hand span*

The picture shows it as less than one hand span.

They know that its two hand spans further south of the equator and four finger widths further north so it is somewhere just north of the equator.

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An extension activity - *Pupils may ask – but where on the equator? The answer is, we don't know from that picture of a hand and the stars how far east or west it is on the equator. Finding positions east to west is called finding longitude and it was a much harder problem which many people tried to solve.*

- *Ask pupils to find out where Zero Degrees Longitude is and what city it passes through.*
- *Why would it pass through Greenwich in London.*
- *What would it mean to be the nation that invented ways of mapping longitude?*

Being the nation that invented a way of finding longitude was critical in making Britain a powerful sea faring, trading and ultimately a nation that colonised the world.