

# Hoea te Waka, piki te mātau

## NAVIGATION

In this module we compare modern and traditional navigational methods. How do you find out where you are, and how to get to where you want to go? Maps are about perspective and students will learn how to navigate in order to find their kai, and discuss how that might help them navigate their lives.

This module includes:

- Night Sky activity
- GPS Activity
- Compass Activity

# Navigation - background reading

These days when sailing, we have GPS (Global Positioning Systems) to tell us where we are and to point us in the right direction. There are maps of all the lands and oceans of our world. When the Maori came to Aotearoa they came in sailing waka with no modern navigation aids. Out of sight of land, the Pacific people used their knowledge of the sea and the sky to guide them on long voyages across oceans. Before there were paper charts the early Pacific navigators used maps made of woven flax or sticks and shells that showed islands, currents and routes.

The example on the right is a stick chart from the Marshall Islands (Photo credit: Walter Meayers Edwards/National Geographic).

Stick charts are very individual and possibly only able to be deciphered by the person who created them. In this chart it is thought that the long sticks show directions to islands, the short sticks show currents, the curved sticks show where swells are deflected by islands, and the cowry shells represent the islands themselves.

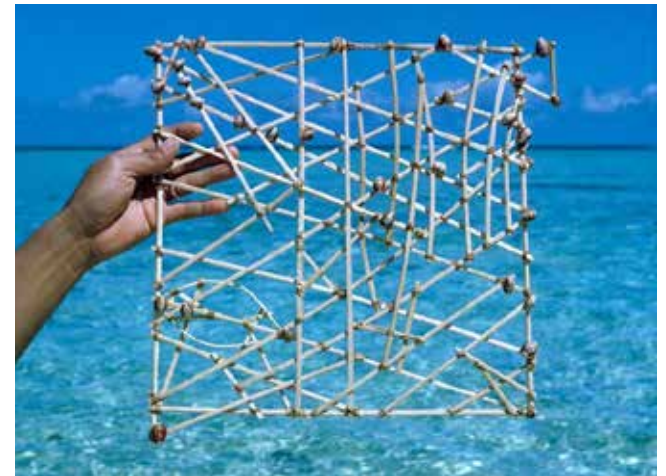
Some stick charts also show constellations.

Navigators don't take chances, they prepare well before they even start out: a sturdy ship, a good team, food and drink, charts, emergency equipment to fix the ship, and things they will need when they reach their destination. They take into account the seasons and the weather before deciding if it is a good time to set out.

When on a voyage, navigators take in every clue in the environment to help them work out which direction to go. It is not always about heading in a straight line towards your destination.

Stars can guide you, but they are not always visible – for example in the day or on a cloudy night. Other signs might be the sun, the swell and look of the sea, the wind, the clouds, sealife.

Ocean swells are waves that persist when other waves caused by winds or local storms die away. They are a constant in a particular



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area, Once you have worked out what that direction is, you can use the swell to map a direction when you cannot see the stars any longer. Navigators can tell they are on course by the movement of the waka which changes according to whether it is going with the swell or at a particular angle to the swell. As long as that movement stays the same, the waka is on course.

A south-west swell means a storm is coming – the swell is being pushed ahead of the storm (so you might run with it).

Other indications of location may be cumulus clouds which gather over islands, (orographic rainfall). Seabirds are most frequently seen close to land. Albatross can indicate storms as they often fly away from them or towards their fringes. Some fish, for example flying fish and mau mau can indicate your are approaching a reef area.

A navigator uses all these clues and his experience to work out where he is and which is the best direction to reach the end goal.

The skills and knowledge are learned through listening to and taking advice from those who have gone before.

Patai to discuss with your group:

- Do you have any clues to share about how to tell what the weather will be like?
- What things might navigators and explorers have taken with them when setting out on long journeys?
- How can this preparation be applied to modern day life?
- Can it help you to reach your own goals?

Do check out the resources and videos about Polynesian navigation - see the links at the end of this book.



# Night sky activity

Do some research on the night sky before you take your group out and look at what is available on the internet. There are Night Sky apps to be used on a tablet or phone which can tell you which stars you are looking at. You could download a star chart to help you identify stars. A good activity for the night sky can be found on this website: <http://eotc.tki.org.nz/EOTC-home/For-teachers/Teaching-resources/>.

Take your group out on a clear night and somewhere there is a good view of the sky with as little light pollution as possible - and of course all warmly dressed ready for some time out of doors at night!

Get the students to find some of the main stars and constellations using a star chart or app.

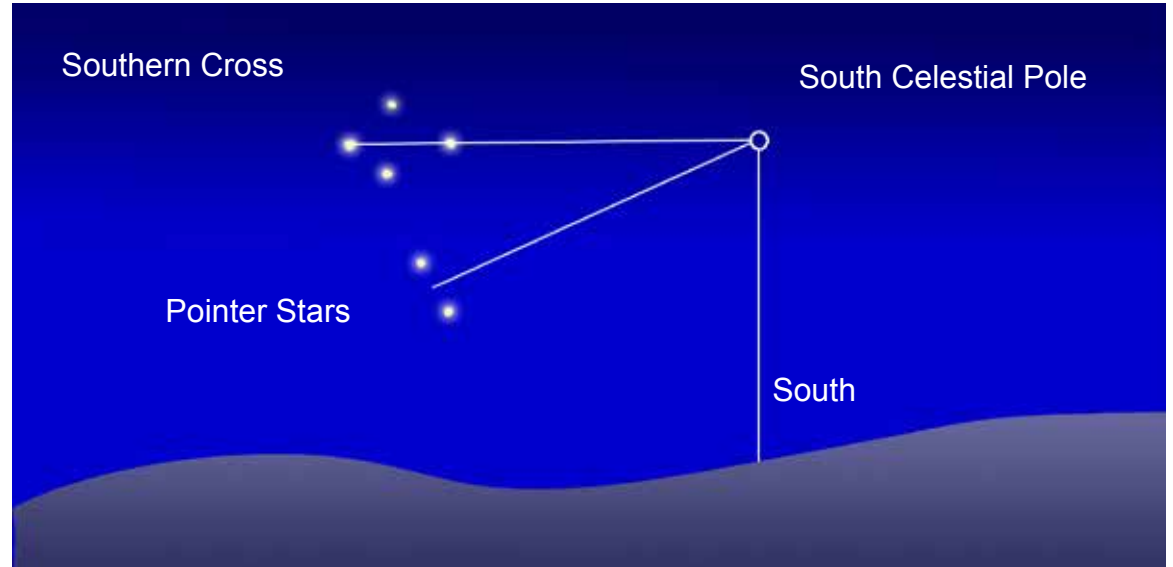
Which are planets and which are stars? What is the difference?

The Southern Cross is easy to spot because it has two pointer stars. Other star groups that look similar are the False Cross and the Diamond Cross.

Using the diagram as a guide, use the Southern Cross to plot true south. Draw an imaginary line following the direction of the cross. Next draw an imaginary line at 90 degrees out from the centre of the two pointer stars.

Where they meet each other, this is the "South Celestial Pole". If you drop a line directly to the horizon, this is due South.

So where are North, West and East?



## GPS Activity

GPS stands for Global Positioning System, and uses a series of satellites that can be used to pinpoint your position, providing you have a GPS unit.

To see how they work, try out this activity.

Make three coloured “satellites” using the template on the next page.

For best results print three copies of the page onto sheets of thin card of three colours, eg blue, red and yellow. Cut out along the solid lines and fold the satellite sections along the dotted lines as shown in the diagrams. Staple or glue the “wings” together so the numbers are in the right order to make up three coloured satellites, each an 8-sided shape.

Position the three satellites in different places near the edges of the room. Use these to plot your position around the room.

If you can see two numbers on one satellite eg 5 and 6 on the blue satellite, you can call it Blue 5 1/2 or B5.5.

Example codes might look like: B3.5, R6, Y2.5 or B4R7.5Y8.5

For an additional exercise, copy, cut out and distribute the GPS Satellite cards to individuals or groups to plot the positions.

Ask if they need all three satellites, or could they get away with only two? Why might they want three?

Try inventing some codes and try them out!

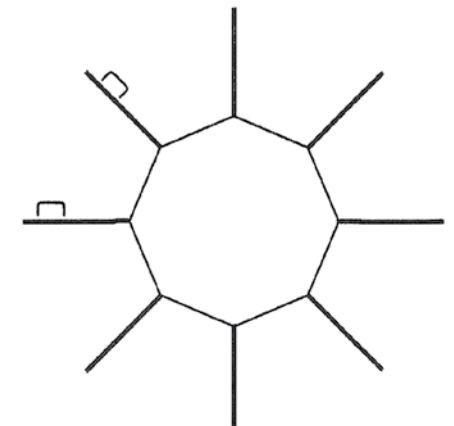
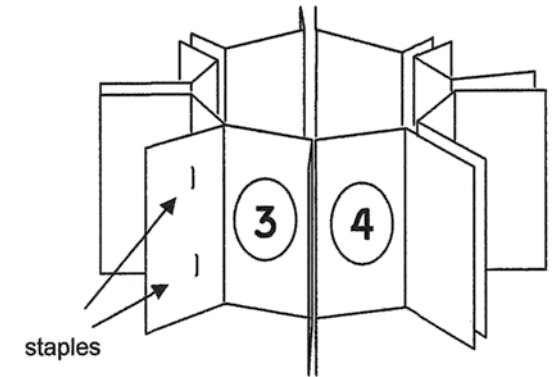
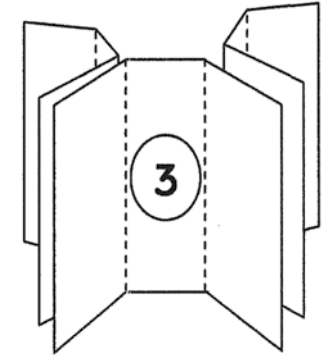


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1	2
3	4
5	6
7	8

## GPS "satellites"

- Make 3 copies on different coloured card.
- Cut out along solid lines.
- Fold along dotted lines.
- Staple as shown.



## GPS Satellite Card

The Yellow, Red and Blue model satellites, have numbers around their edges. The fins mean that you can only see one or sometimes two numbers. Try moving around the room and watch as the numbers you can see change.

Try moving around the room to stand at these coordinates.

Y=yellow, R=Red, B=Blue

<b>Y6R5B6.5</b>	<b>Y8R4B7</b>	<b>Y8.5R3B8</b>
<b>Y4R4B2</b>	<b>Y8R2B8</b>	<b>Y6R5.5B6.5</b>

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# Compass Activity

When Abel Tasman and James Cook sailed to New Zealand they used compasses to tell which way the ship was going. If you have no GPS, another method of finding your way is to use a compass. This is a useful skill on land as well as sea.

Does a compass point North? If it doesn't, where does it point?

A Compass in fact points to Magnetic North which is close to, but not quite, true North. Magnetic North in NZ is around 22 degrees East of true North.

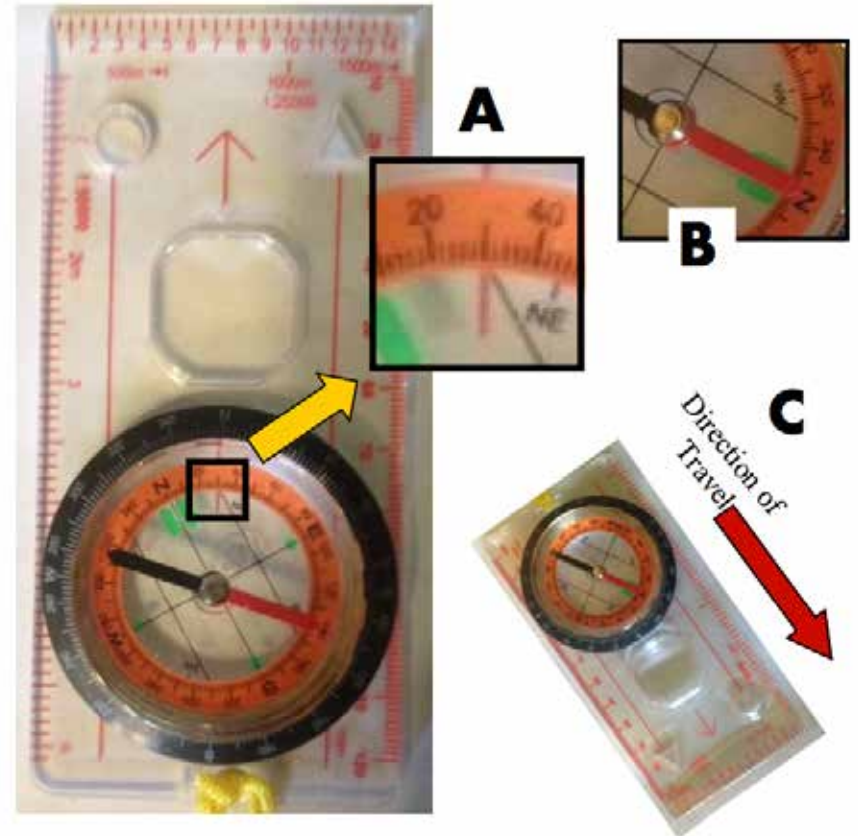
For this compass activity, you need some space, use an open area without obstructions.

You will need a compass and a copy of the instructions and the directions for each group. You will also need something small - a sticky dot or stick pushed into the ground - to act as a starting point marker for each group. If their paces are even and compass directions perfect, each group should end up back on their marker! Some of the directions are easier than others, try several, but don't get lost!

A. Set the required compass direction at the red line shown in the picture. This example it has been set at 30 degrees.

B. Then, holding the compass flat to allow the needle to float freely, rotate the compass until the red portion of the needle is directly over the two green marks as shown in B.

C. Holding to compass in this orientation walk in the direction of the main arrow on the plastic base.





## COMPASS CHALLENGE

- Mark your starting point.
- Using the instructions on this card set your first compass direction, and pace out the distance.
- At the end of each set of directions, reset your compass and pace the new distances until you arrive back at the base dot!
- The more accurately you do this the more likely you'll get home!

Compass direction	Paces
45° (North East)	8
315° (North West)	8
225° (South West)	8
135° (South East)	8

**EASY**

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Compass direction	Paces
16°	12
234°	4
200°	7
136°	4

**QUITE HARD**

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Compass direction	Paces
305°	8
79°	5
185°	10
35°	5

**HARD**

