ASTRONOMY

NAVIGATIONAL ASTRONOMY

Provide participants with a broad understanding of celestial navigation and how to determine positions and directions by observing the stars, planets, the moon and the sun.

CAREER PATH

Astronomers use the stars and galaxies to ask and answer questions about our place in the universe. These questions give us skills in many disciplines from data analysis and coding to international project management, to contribute to our understanding of the universe we live in. You will find astronomers working in strange and wonderful places like the finance industry, education, universities, defence, international science projects and government.

SCIENCE KNOWLEDGE

Measuring time using the sun is a predictable way of making rough but simple measurements.

F1 LINK

Skills associated with drivers determining distance, speed and timing angles ar related to the the skills of navigation using astronomy

DEADLY CONNECTION

This form of navigational astronomy has been used by Indigenous people for thousands of years, and is one of the first tools used to navigate Country. Just like a Formula 1® driver needs to navigate around a track making calculations in their head, Indigenous people navigate land and sea using calculations from the stars.

ACTIVITY ONE

Participants will estimate the distance to an object at the other end of the activation tent using techniques from Indigenous navigation with skills in distance estimations that are practised and perfected by Formula 1® drivers.

STEP 1
At the other end of the activation, you will see a map of the Formula 1® track.

STEP 2
Predict: Make some predictions on the distance to the image. Estimate the distance and describe your methods for these estimates. Turn your estimate into the form of a hypothesis: If I change X, then Y will change. Here is a suggestion. If I measure the distance to the image using the following technique, I will get the correct answer to within 10% of the true value. This statement is called a hypothesis and can be tested!

STEP 3
Close one eye and cover the image of the track with your pinky finger.

STEP 4
Now open the closed eye and close the open eye. You will see your finger no longer covering the Formula 1® track.

STEP 5
How far did it move? (in comparison to the size of the image of the track). Think of a meter ruler, to help you with that distance estimate

STEP 6
Multiply that estimate by 10. That is your estimated distance to the image of the Formula 1® track.

STEP 7
Observe: Measure the actual distance using a ruler. Discuss the results vs answer. Try again with updated estimates from Step 5. (Start from a different location). Make some observations about the results. If you try again, can you get better at it?

STEP 8
Explain: The ratio between the distance to the object, and the distance that your finger apparently moved, is approximately 10 times the ratio between your arm length and the distance between your eyes.

WWW.DEADLYSCIENCE.ORG.AU/FORMULA-1/
For lesson plans, resources for the classroom and teacher guides to recreate this experiment for your deadly learners.

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ACTIVITY TWO

In part two of this activity, you will estimate the position of a shadow on the ground after 1 hour, or how far a shadow will move in one hour. This activity relates timing techniques from Indigenous Astronomy to timing estimations that are used by Formula 1® drivers.

STEP 1

Use your pinky finger and place it in front of you with outstretched arms. Position your finger so that the edge of a shadow is on one side of and touching your finger.

Predict: Make some predictions on the time it will take for a shadow to move from one side of your pinky finger to the other (either left side to right side, or right side to left side). Ask learners to make an estimate of the time and describe their methods for their estimates. Ask learners to turn their estimate into the form of a hypothesis: If I change X, then Y will change. Here is a suggestion. If I hold my finger in one place covering a shadow on the ground, the shadow will move past my finger in 4 minutes. This statement is called a hypothesis and can be tested!

STEP 2

Keep your finger steady and see how far the shadow edge has moved across your finger in one minute. Estimate how long it will take until the shadow edge moves to the other side of your finger.

STEP 3

From this data, can you work out where the shadow will be in 1 hour?

STEP 4

Observe: Measuring time using the sun is a predictable way of making rough but simple measurements. Encourage students to make their predictions about where the shadow will be, then come back to the same spot and confirm or update their results.

STEP 5

Explain: Your finger represents one degree across the sky. You will use a shadow as a placeholder for the sky. This is because it is dangerous to observe the sun with your naked eye. If it takes 4 minutes for the shadow to move one degree, then it will move 15 degrees in one hour.

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