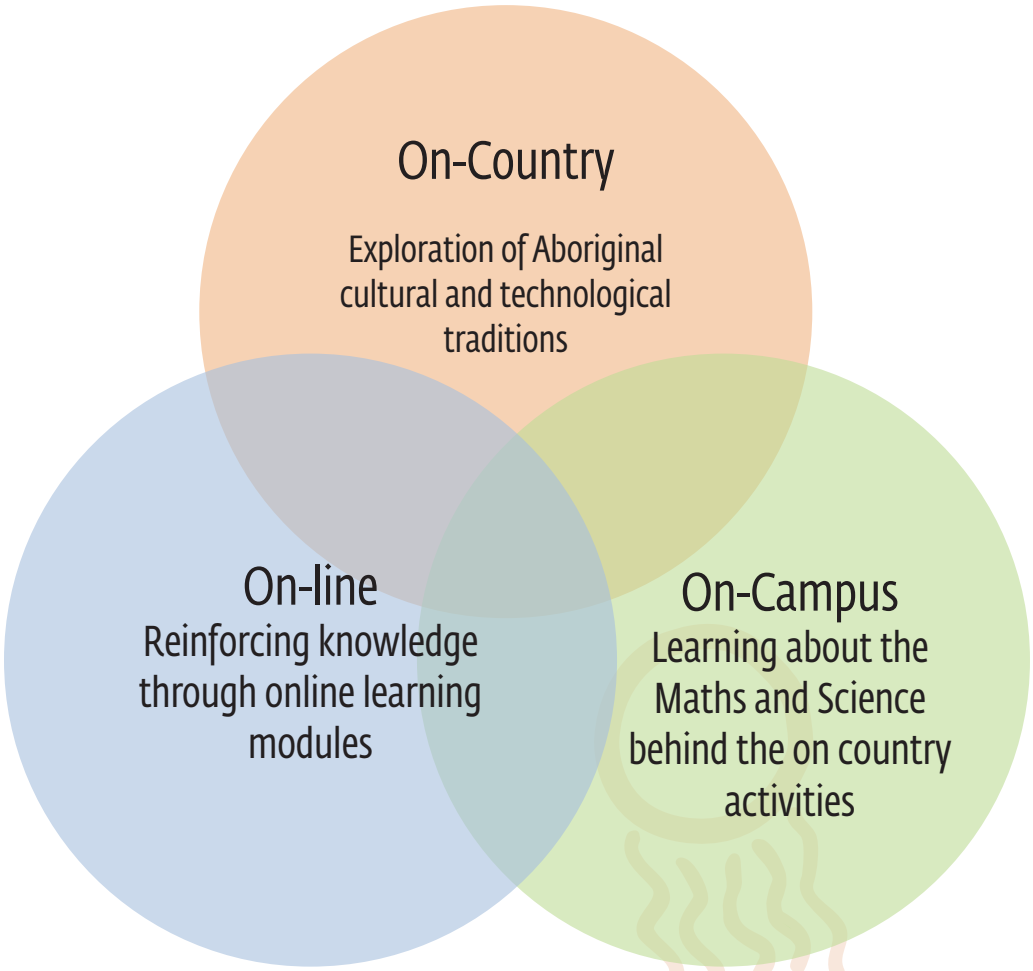
University of New England Switched On On-Country Experience Worksheets



University of New England

Oorala Aboriginal Centre
Celebrating 30 Years
1986 - 2016

University of New England

Agriculture

Introduction to Workbook

Description of location

The activities can be conducted in any area of bushland typical of your local area; our On Country activities took place in an area of regenerated eucalypt open woodland, with the dominant species being New England Stringybark *(Eucalyptus caliginosa,* with an understorey of Blackthorn (*Bursaria spinosa).* The students need to be divided into 4 groups, along with teachers, Aboriginal Education Officers and Aboriginal Elders. The 4 groups will then rotate around 4 different stations. We spent 20 minutes on each station, but could easily have spent longer! Half an hour is probably a more realistic time frame to achieve the goals of each activity.

Summary of the four stations

Station 1: Blue quadrant: Echidna and ant group.

The aim of this activity is to identify and measure food resources for the Echidna. In our activity, this involved listening to the story of the echidna from an Aboriginal Elder, Auntie Lesley Patterson, for whom this species is a totem and learning to identify the food sources (ant nests, fallen logs, termite mounds etc). The mathematics involves measuring the length and width of the potential food sources, and using these measurements to calculate area and density of food resource. If no Echidna live in your local area, a different species of animal could be identified, incorporating the knowledge of local Elders.

Station 2: White quadrant: Habitat and fuel load.

The aim of this activity is to look for habitat for animals and insects on the ground (for example, echidnas, ants and termites) and in any available tree hollows (for example, for bats, kookaburras and galahs), and also the habitat that smaller shrubs may provide (for example, for small birds and butterflies). This activity also considers the concept of fuel load (for fire) and the measurements needed to make the calculation of load from fallen timber. The mathematics involves the measurement of circumference, and using Pi to work out radius; then measuring length and using the calculations to estimate volume. In our area of bushland, there were so many fallen trees, it was not possible to make the full calculation, so we made just a few calculations as examples.

Station 3: Pink Quadrant: Forest structure.

The aim of this activity is to determine tree height and location of trees. The mathematics practiced involves a clinometer, a tape measure, and also the use of trigonometry for older students. The measurements taken are useful in determining the age of the forest.

Station 4: Red Quadrant: Animal Identification.

The aim of this activity is to identify the animals using the area from their scats. Most animals, except sheep, are either nocturnal or crepuscular, or just like to avoid humans! Therefore, one of the most effective ways to measure biodiversity is by counting and identifying the poo left in an area. Scat samples can be plotted on a map. The mathematics involves measuring right angles and using a compass or tape measure to determine map coordinates.

Blue group – Echidna and ant group

(Michelle McKemey (@mmckemey), Melaleuca Enterprises http://melaleucaenterprises.com.au/)

Photo: Michelle McKemey

Aim

To identify and measure food resources for the echidna, and to consider its ecological requirements in a landscape context.

Background

The echidna is called *iwata* in the Nganyaywana language of the Anaiwan people who are traditional owners of Mt Duval/Armidale region and *kukra* in Banbai language of the neighbouring Banbai people from the Guyra region. It is the totem of the Anaiwan and Banbai people. It features in rock art around Guyra and is commonly seen in the New England Tablelands. Some Aboriginal groups have eaten and continue to eat the echidna, it is a valued food source across Aboriginal communities throughout Australia.

The echidna (Tachyglossus aculeatus) is a slow moving, long lived monotreme (egg laying mammal) that is the most widespread native mammal in Australia. Echidnas have large home ranges (50ha) and are usually solitary except when they form breeding trains during winter. Echidnas use torpor (hibernation) in cold climates (including New England Tablelands) to save energy during winter- they often stop eating during the colder months and then eat large amounts during spring.
An echidna will use its fine sense of smell to find food and has a beak which is highly sensitive to electrical stimuli. Food (mostly ants, termites and in the New England, scarab beetle larvae) is generally abundant. It tracks down its prey and catches it with its long, sticky tongue. Echidnas do not have teeth and they grind their food between the tongue and the bottom of the mouth. Shelter is needed for protection from the weather and predators, as a nursery site and for torpor. Shelter is the most important thing that echidnas need in the environment, it is even more important than food. Leaf litter is also important as that is where invertebrates (such as ants) live. Echidnas scratch through leaf litter and fallen logs to find invertebrates.

Threats to echidnas include:

- Habitat destruction and degradation leading to local extinctions
- Fire
- Predation (mostly of the young) by snakes, large lizards, cats, dogs, foxes, pigs and dingoes.
- Road kill
- Disease

Method

- Listen to the story of the echidna from Aboriginal elder
- Learn to identify food resources (ant nests, fallen logs, termite mounds etc.) for the echidna
- Measure the length and width (m) of these potential food resources
- Use length and width to calculate area, then sum the area of all food resources to calculate total food resource area in the plot
- Divide total food resource area by the area of the plot to determine density of food resources for the echidna

Results and Discussion

- What is the density of food resources for the echidna in this area? Do you think this is a high or low density of food resources?
- What could change the density of food resources? How could they increase/decrease?
- Considering the information above, how can help to look after the echidna? Why would this be important to the Anaiwan and Banbai peoples?

ECHIDNA monitoring 20m x 20m quadrat

Quad name:

Date: **Recorded by:** **Present:**

Food resource (ant nest, fallen log, termite mound etc.)	**Width (m)**	**Length (m)**	**Area (m2)**
E.g. Ant nest	0.20	0.20	0.04
Sum of Echidna Food Resource Area			(m2)
Density of Food Resource	Food Resource Area (m2) / Plot Size (m2) =	=	400 (m2) / Food resources m2

Reference : http://www.environment.nsw.gov.au/resources/nature/Factsheet3Echidnas.pdf

White group – Habitat and fuel load (Janelle Wilkes)

Aims

In this group you will look at the available habitat which is on the ground and see if you can find any hollows in the trees. You will also calculate the volume of trees on the ground so you can approximate the fuel load.

Background

Many native animals use hollows shelter and food, nesting hollows, perching places and forage substrate, including birds, but also arboreal mammals (live mainly in trees), bats and marsupial mice. In NSW about 120 vertebrate species use tree hollows and most utilise dead trees as nest sites. As a general guide, from 3 to 10 hollow bearing trees, with as many as 30 hollows, may be needed per hectare to support a rich mix of species. On Mount Duval the older trees had 150 hollows per hectares, but the regrowth has only 8 hollows per hectare. Look up, can you see any hollows in the trees here? _____

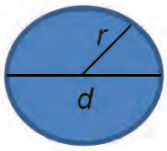
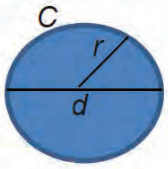
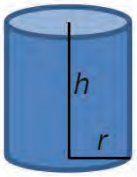
In addition, fallen dead wood also provides important habitat for invertebrate species that depend on decaying wood for their survival. Importantly these species play a pivotal role in recycling nutrients in forest and woodland ecosystems. The dead wood can be used as a food source, breeding and/or shelter by these invertebrates, and may also attract predators.

Can you think of any invertebrates that could be using the dead wood for shelter? _____

What could be a predator to those invertebrates? _____

References
https://www.environment.gov.au/biodiversity/threatened/nominations/ineligible-ktp/continuing-loss-trees-due-to-firewood-harvesting-practices
http://www.environment.nsw.gov.au/resources/nature/Factsheet5Treehollows.pdf

Hints: You might find these formulas handy

Diameter (d) and radius (r)	Circumference of circle (C)	Cylinder volume
$d = 2r$	$C = \pi d = 2\pi r$	$V = \pi r^2 h$
		

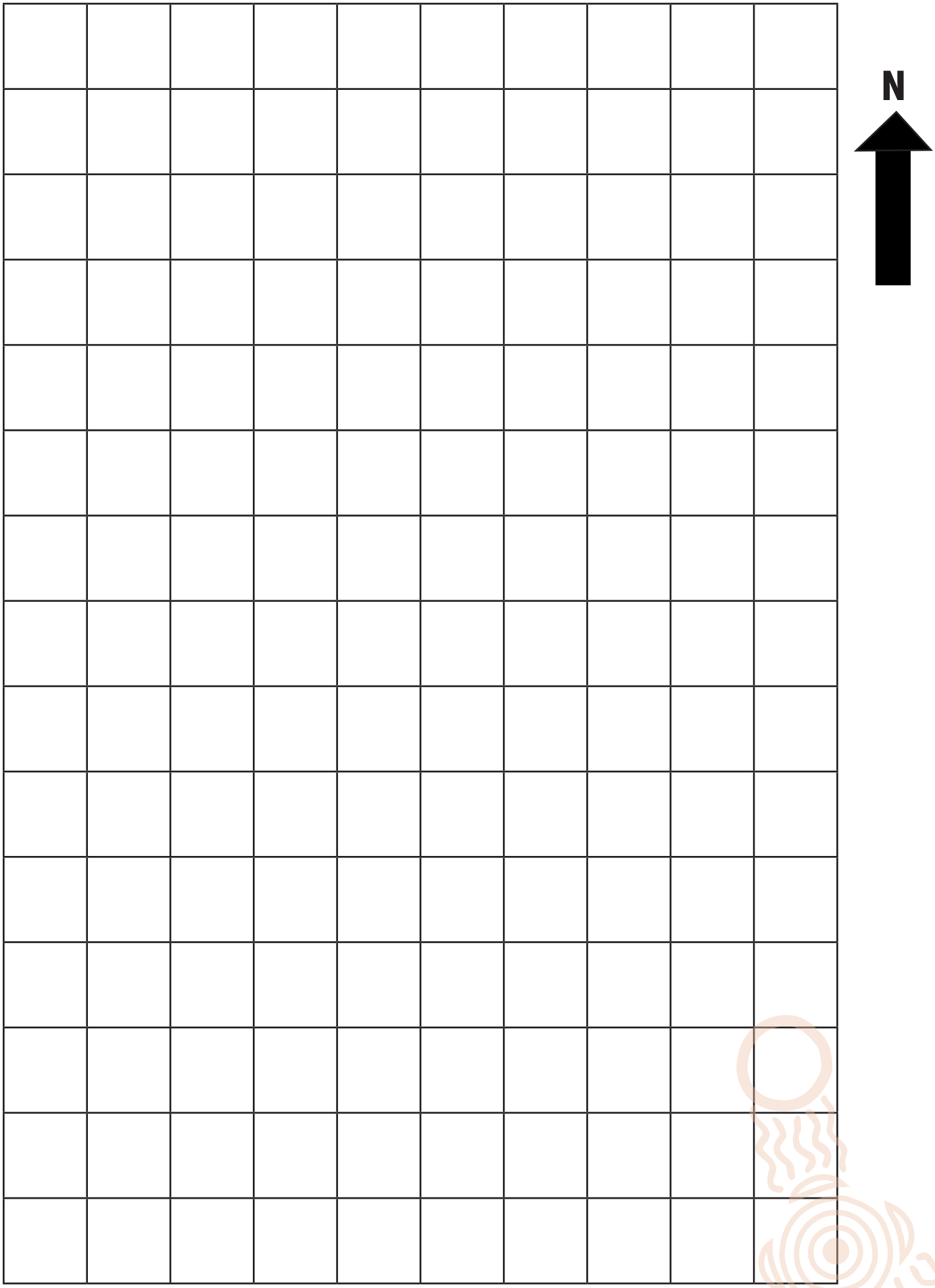
Methods

Ecologists are interested in the quantity of fallen dead wood as this will provide habitat but also is a fuel load. In this exercise you will approximate the volume of dead wood in your plot.

Break into groups of 2 or 3 students

1. Measure the fuel load of the fallen timber and include your calculations below.

2. Sketch where the fallen trees and branches are in the quadrat. Include the volume of fallen timber.



3 67 614 mE
66 32 846 mN

Pink group – Forest structure (Janelle Wilkes)

Aims

Determine the height of the trees, height to first branch and location of trees.

Background

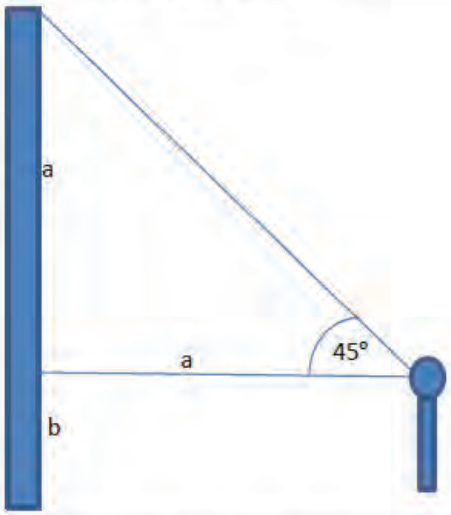
By looking at the forest structure ecologists can determine the age of the forest and the resources available for inhabitants. Older trees on average on Mount Duval have a diameter of 94 cm (DBHOB), branches have 30 cm diameter and the height to first branch is 4 m. In contrast, the regrowth on Mount Duval have a diameter of 43 cm (DBHOB), branches have 6 cm diameter and the height to first branch is 13 m. Both tree types are about 23 m. On Mount Duval the old growth forest had 60 stems per hectare. Can you see any of these older trees in the photo below?

Photo: Janelle Wilkes

Methods: 1. Choose a tree and calculate the height of the tree using a clinometer. Choose a method below.

Remember a square has equal lengths and half is 45 degrees, so when we stand 45 degrees from the tree on flat ground the horizontal distance to the tree is the same as the height of the tree. But as we are on slopping ground we need to take this into consideration too.

1. Using clinometer and tape.
Height of tree = a + b



Calculate A

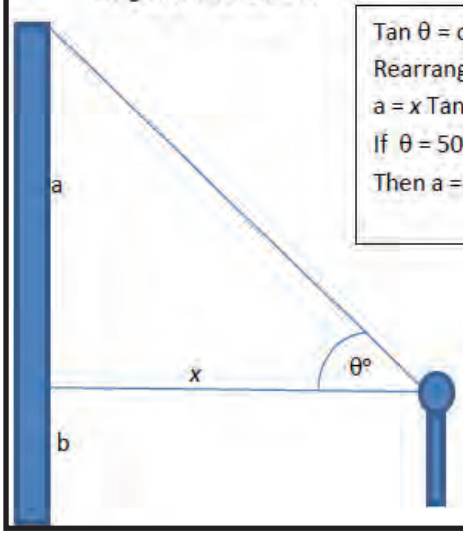
- Using clinometer, look at top of tree and walk out until you get to 45 degrees.
- Using tape measure, measure from person holding clinometer to tree (this gives a).

Calculate B

- Using the clinometer look at tree at 0 degrees. This is horizontal.
- Ask someone to hold their finger on the tree where you are looking. Measure from the ground to that point.

By adding a + b you know the height of the tree

2. Using clinometer, tape and trigonometry.
Height of tree = a + b



Tan θ = opposite / adjacent = a / x
Rearranging equation
a = x Tan θ
If θ = 50° and x = 15 m
Then a = 15 Tan 50° = 18 m

Calculate A

- Using clinometer, look at top of tree and record the degrees.
- Using tape measure, measure from person holding clinometer to tree (this gives x). Calculate a (a = x Tan 0)

Calculate B

- Using the clinometer look at tree at 0 degrees. This is horizontal.
- Ask someone to hold their finger on the tree where you are looking. Measure from the ground to that point.

By adding a + b you know the height of the tree

2. Using the same method above, calculate the height to the first branch.

3. Using the diagram below sketch the location of each tree to scale.
From the traverse line use the clap method on page 12 to work out the right angle to get a Northing and Easting.

Sketch the location of trees and diameters

3 67 620 mE 66 32 810 mN

Red group
Scats (Janelle Wilkes)
Aim
Identify what left the scats behind and map their location.

Background
By looking at animal scats (faeces) we can tell the biodiversity of the location, food resources and how often the animal may return to that place. Aboriginal people were expert hunters looking at scats, tracks and other traces when hunting.

Methods
1. For this activity wear gloves, do not touch the scats and wash your hands well at the end.

2.Break into groups of 2 or 3.

3.Using the photos below and the Field Guide Books identify what animal left the scats in your plot and decide which animal you'd like to record.

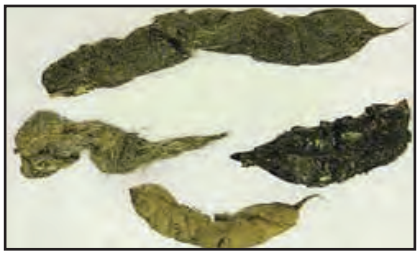
4. Place a tent peg in the middle of each cluster of scats as that would be from one animal. Plot their location on the next page, see over page for hints on how to do this.


Brush-Tailed Possum


Wombat


Koala


Eastern Grey Kangaroo


Fox


Echidna


Rabbit


Sheep

Source: "Track, Scats and Other Traces" /http://www.abc.net.au/science/scribblygum/september2004/gallery.htm; http://www.wildhelpers.com/animal-poo.html

Visual Resource

Images sourced from Wikipedia

Brush-Tailed Possum

Wombat

Koala

Eastern Grey Kangaroo

Rabbit

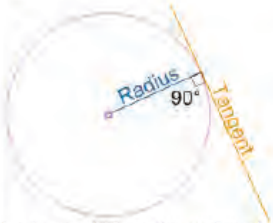
Echidna

Sheep

Fox

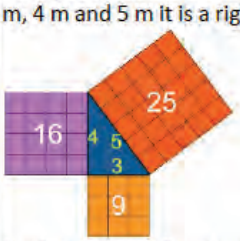
Hints how to measure a right angle in the field

Tangent - make an arc from your tent peg to the survey line using the fibreglass tape. Where the tape just touches the survey line (tangent) it is a right angle.



(http://www.mathsisfun.com/geometry/images/angle-tangent.gif)

Pythagorean theorem - the square of the hypotenuse is equal to the sum of the squares of the other two sides.
So if you measure a triangle with a length of 3 m, 4 m and 5 m it is a right angle triangle.



(https://metroplexmathcircle.files.wordpress.com/2014/11/pythagoras-3-4-5.gif)

Compass – the compass measures 360 degrees and so you are able to measure 90 degrees from your survey line to the peg.

(http://wme.cs.kent.edu/kimpton/img/compass.gif)

Clap method – stand straight, bring your arms up so they are horizontal (like the girl below). Turn hands 90 degrees. Bring your arms together at the same time in front of you to 'clap'. That will be a right angle.

(http://physie101.com/2016/02/22/physiepositions/)

	Departures		Final positions	
Animal	**How far East (m)**	**How far North (m)**	**Easting (m)**	**Nothing (m)**
eg. sheep	1.001	2.500	3 67 654.001	66 32 893.500

When we plot points on a map everything is measured in horizontal distance and we use coordinate systems so we can go back to that position.

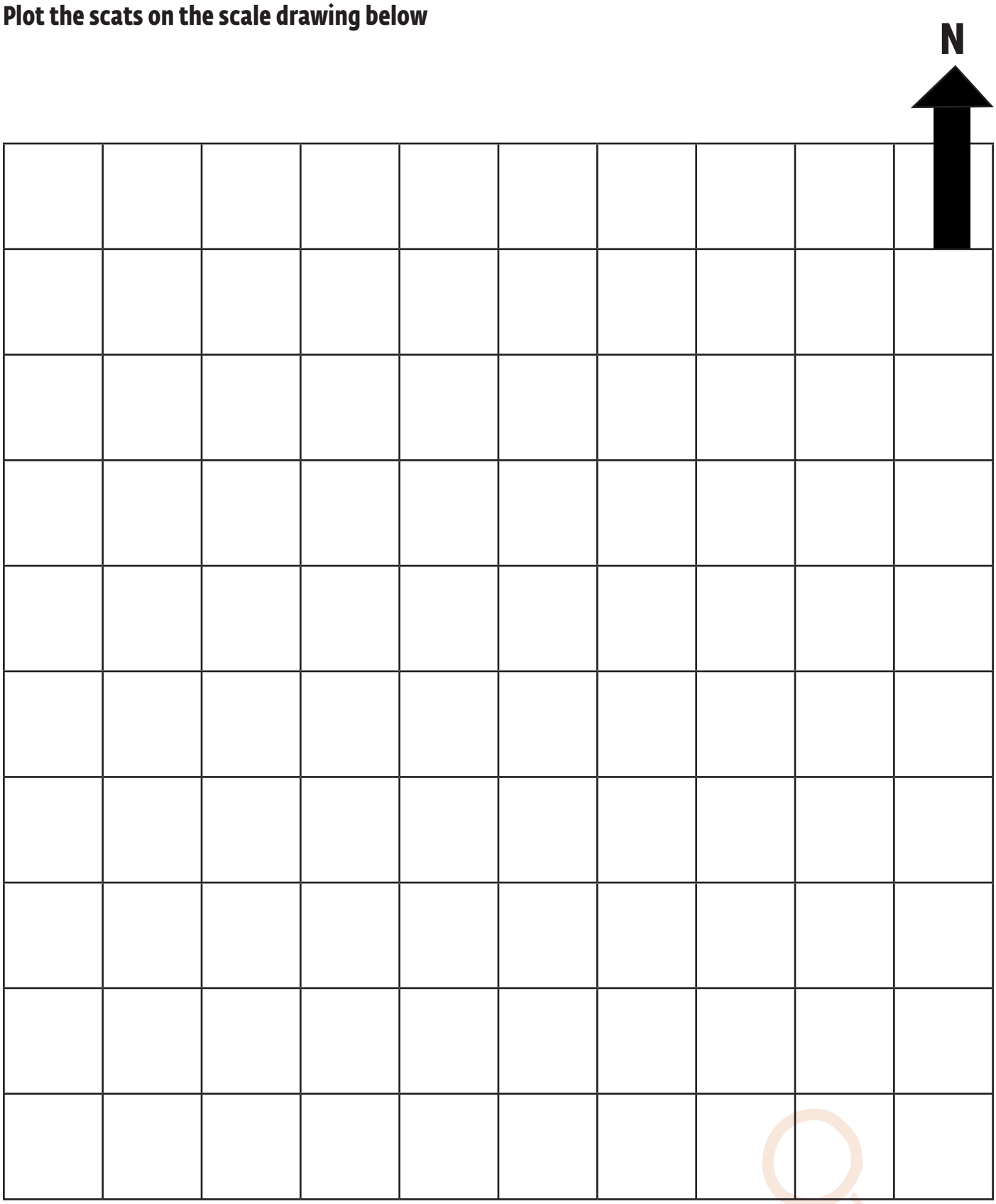
Today we are using the grid coordinates MGA94 Zone 56 which gives us readings very similar to a GPS. As an aside, because of tectonic drift Australia is moving to a new coordinate system. If you're interested look up MGA2020.

If the origin point is 3 67 653.000 mE, 66 32 891.000 mN and we want to know the location of the sheep scat.

From origin 3 67 653.000 mE + departure 1.001 m = 3 67 654.001 mE

From origin 66 32 891.000 mN + departure 2.500 m = 66 32 893.500 mN

Plot the scats on the scale drawing below



3 67 653 mE
66 32 891 mN

Indigenous games

Break into groups of 6 to play the following two games. You will need a recorder for each group to count the number of kicks.

Record how many times the ball is caught before the outer team catch the ball.

Resource
Edwards, K. and Meston, T. (2009) Yulunga: traditional Indigenous games, Australian Sports Commission, Canberra, ACT. https://www.sportingschools.gov.au/resources-and-pd/schools/yulunga Boogalah Pages 8-9 of document
Woggabaliri, Pages 34-35

Game 1

Table 1. Number of catches before the ball is caught by outer team

Create a frequency graph from this data for how many times the players catch the ball for

Round Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Team 1										
Team 2										

Create a frequency graph from this data for how many times the players catch the ball for team 1 and 2.

Did the teams improve with time?

Plot round number on the x-axis and number of kicks on the y axis.

You could compare the average or median number of kicks for each group in a table or graph. You also could add total number kicks for each group, and compare graphically.

Game 2
Record how many times the ball is kicked without touching the ground
Table 2. Number of kicks before the ball hits the ground.

Round Number	1	2	3	4	5	6	7	8	9	10
Number of kicks										

Additional Notes