Name _____

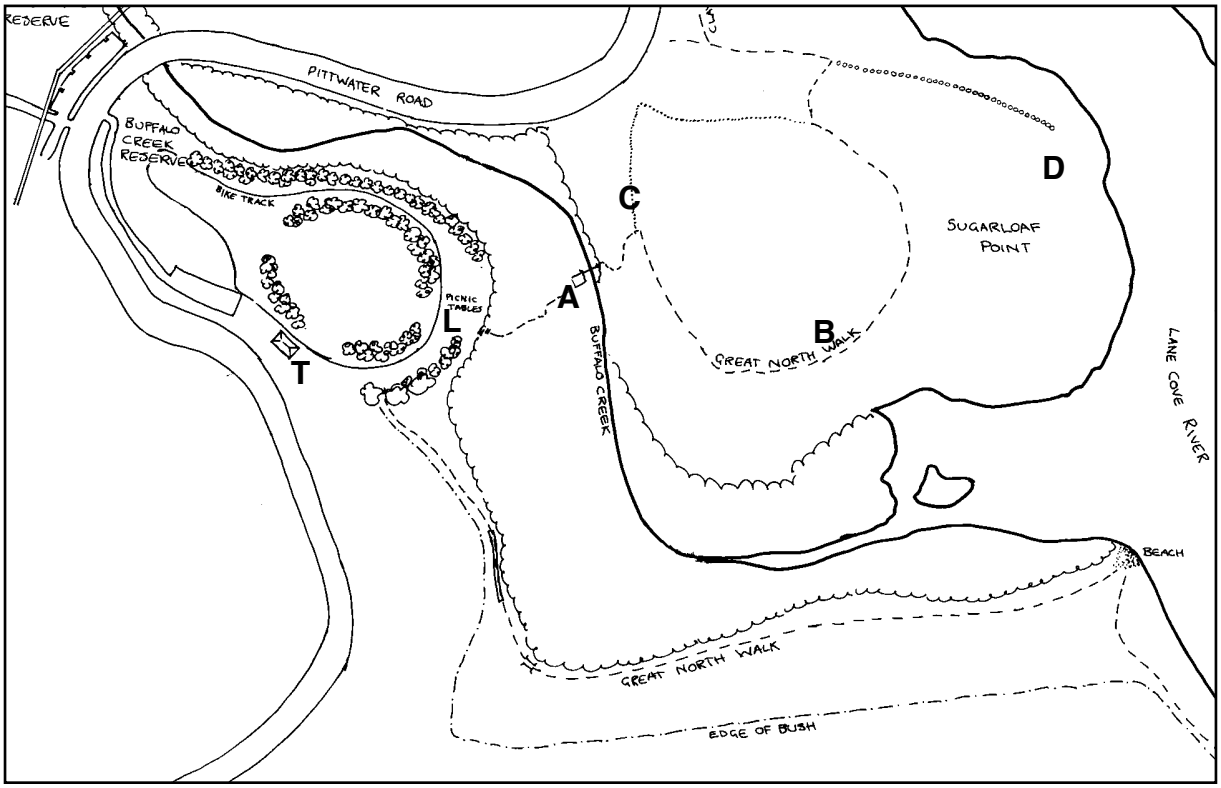
Natural Numbers

(*A day in the life of a national park ranger*)

Time:	Activity:
10.00 - 10.15	Arrival and introduction
10.15 - 11.15	Session 1
11.15 - 12.15	Session 2
12.15 - 1.00	Lunch (45 min)
1.00 - 2.00	Session 3
2.15	Conclusion and depart

Map Key:

A: Boardwalk site
B: Bushland site
C: Great North walk
D: Sugarloaf site
L: Lunch
T: Toilets



Why study maths at Buffalo Creek and Lane Cove National Park?

National park rangers are responsible for managing this area. Today we will be using our maths skills to gather data for the management of the environments of Lane Cove National Park and Buffalo Creek Reserve.

In the 1950s people didn't understand about the value of natural places and much of the site was buried under a garbage tip! The tip has since been made into a picnic area.

The Buffalo Creek boardwalk through the mangroves gives excellent access to the mangrove forest. At low tide you can observe estuary animals such as crabs and snails and during a spring high tide the area is crowded with hungry fish.

Buffalo Creek Reserve is connected to Sugarloaf Hill which is part of Lane Cove National Park and is home to the endangered Red-crowned Toadlet.

At Sugarloaf Point the banks of the river were damaged by sand mining in the 1960s but the eucalyptus forest is extremely well preserved.

Recording ‘Working Mathematically’ on your iPad

At each of the study sites you need to use the front camera on your iPad to record a **20-30 second video** of your group explaining what you have been doing.

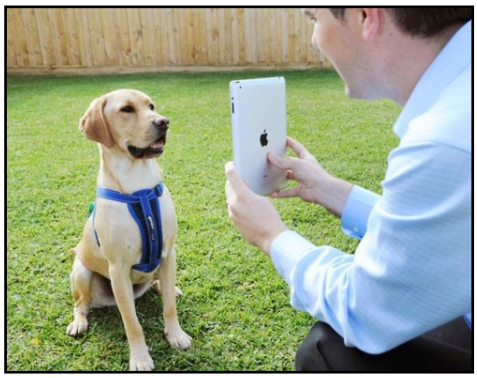
At each site the teacher will highlight some of the important information you will need.

Important terms and descriptions have also been underlined in your worksheet.

At the end of the day your teachers will be viewing these videos to get an idea of your maths communication skills, this may be counted as an assessment task.

Here is a list of the sorts of things you might talk about at each site:

- **Who** are you and **where** are you?
- **What** sort of information are you collecting?
- **Why** do rangers need this sort of information?
- **What** mathematical techniques did you use?
- **Were** any of these techniques better than others?
- **Can you think of better methods** to get the information needed?



Spare working space below:

Mangrove site

Name: _____

Part 1: Boardwalk budget

In a few years the upper planks of the current boardwalk will need replacing.

We need to estimate the cost to do this. Here is **one** method:

1. Measure how many planks fit in a one metre section: (*record answer to 2 decimal places*)
   _____
2. Measure the width of the boardwalk:_____
3. Calculate the length of timber needed for a 1m section of boardwalk: _____
   _____
4. If timber costs $8.40 per metre, how much will it cost to repair a 1m section of boardwalk? _____
   _____
5. Measure the entire length of the boardwalk from the steps to the bridge.
   (*Ignore the central platform, but measure all four sides of the square section.*)
   _____
6. How much would it cost to rebuild the whole boardwalk? Show your working.
   Allow an extra 10% for corners, bends, wide platform and carpentry errors.

Part 2: Crab abundance

A tourism company wants to build a new network of boardwalks in this mangrove forest. Before their plans can be approved or rejected by the local council they must submit extra information about the abundance of different species that live in this habitat. Today we are going to get some baseline data about crab abundance.

Your mission: Gather and process data for a Species Impact Statement

Your job is to measure the crab abundance in five representative zones spread between the average high tide mark to the low tide channel.

- Get into groups of about 4, then grab a 1 x 1m (1 m²) quadrat from the pile.
- Place the quadrat randomly within 5m of each marker flag and count the crab holes.
- Record your counts on the table below then copy them onto the class table.
- Calculate the average crab numbers for each zone marker flag.
- Calculate the range of values for each.

Sample zone:	Crab hole count:
1. King Tide	
2	
3. Average High Tide	
4	
5. Intermediate Tide	

Class mean:	Range:

Where do the crabs seem to prefer living? _____

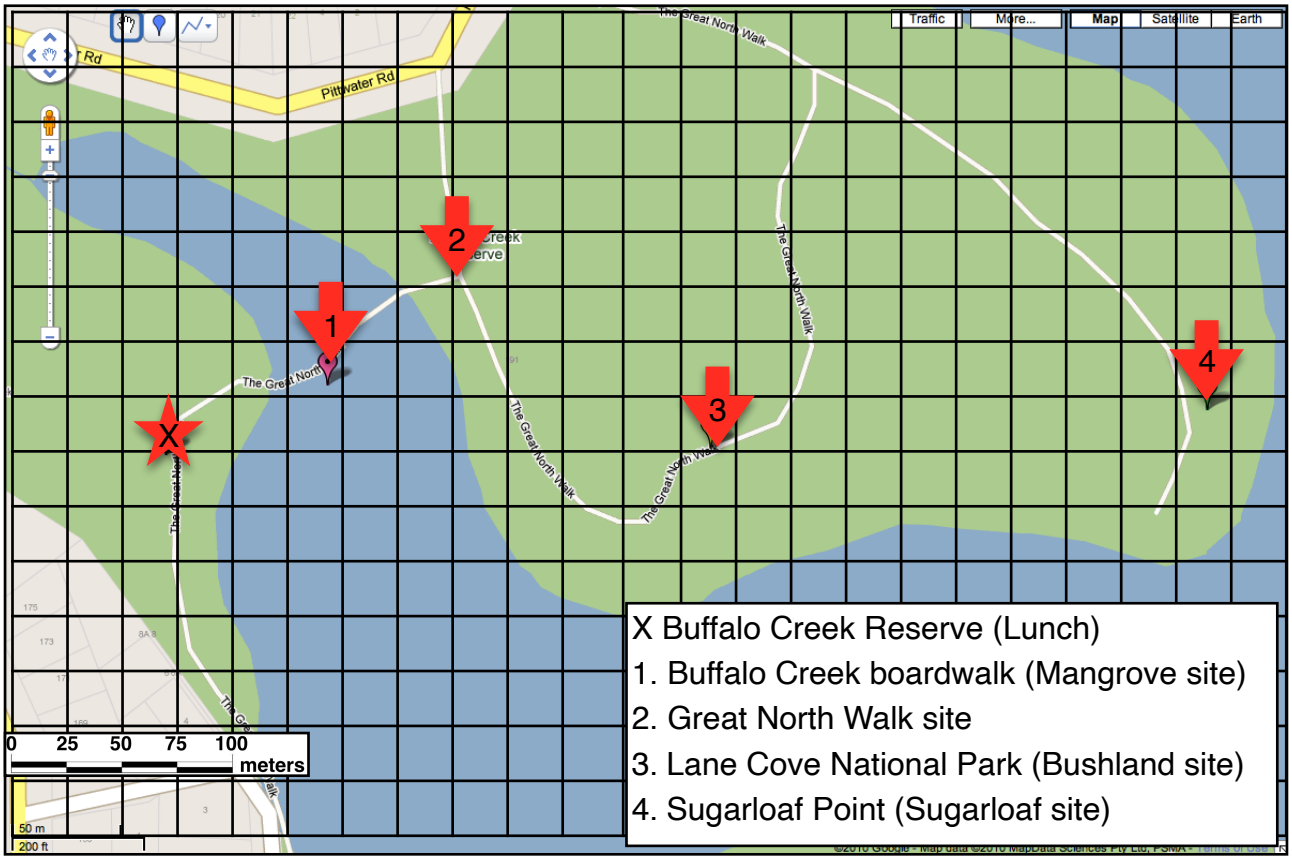
Part 3: Habitat area

The mangrove forest environment at Buffalo Creek Reserve covers 8.75 hectares.
A hectare is the area of a square that is 100m x 100m (ie: 10,000 m²)

1. Calculate the total area (in m²) of the mangrove ecosystem of Buffalo Creek below:

Great North Walk site

Name: _____



X Buffalo Creek Reserve (Lunch)
1. Buffalo Creek boardwalk (Mangrove site)
2. Great North Walk site
3. Lane Cove National Park (Bushland site)
4. Sugarloaf Point (Sugarloaf site)

,Scale: Each grid square is 25 x 25m

Visitors to national parks need information to help them plan their bushwalks.
Park rangers often install signs with track distance and estimated walking time.

Today we are walking between Buffalo Creek Reserve and Sugarloaf Point.
Use the map to answer questions 1 and 2.

1. Using a piece of string <u>estimate the distance</u> along the tracks from:

Point 1 to Point 3:
Point 3 to Point 4:

2. <u>Calculate</u> the time it will take to walk these distances at a speed of 4 km/h (4000 m/h)

Formula: Speed = $\frac{\text{distance}}{\text{time}}$ | **$s = \frac{d}{t}$** | **$t = \frac{d}{s}$**

Point 1 to Point 3:
Point 3 to Point 4:

Sugarloaf point site

Name: _____

Sugarloaf Point is part of Lane Cove National Park. If the national park rangers were planning to construct a building here then they must first get the plans approved.

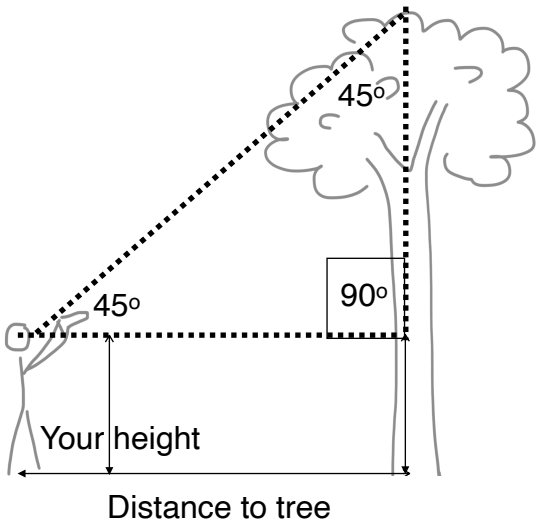
Let's assume that in this location buildings must blend in with the environment and for that reason they cannot be built higher than the surrounding trees at this site.

Today we are going to do some surveying work to determine the height of the trees at Sugarloaf Point as this is the maximum height that any new building can be built here.

Method:

A right-angled isosceles triangle is a right-angled triangle where two sides (and their corresponding angles) are equal.

If you can find a spot where your clinometer shows a 45° angle to the top of a tree then measure the distance from that spot to the tree then you can use the formula below to work out the height of the tree:



Tree height = Distance to tree + Your height

1. Calculate the height of:

Tree A: *(show your working)*

Tree B: *(show your working)*

2. Using the iPad method and something of known height calculate the same trees.

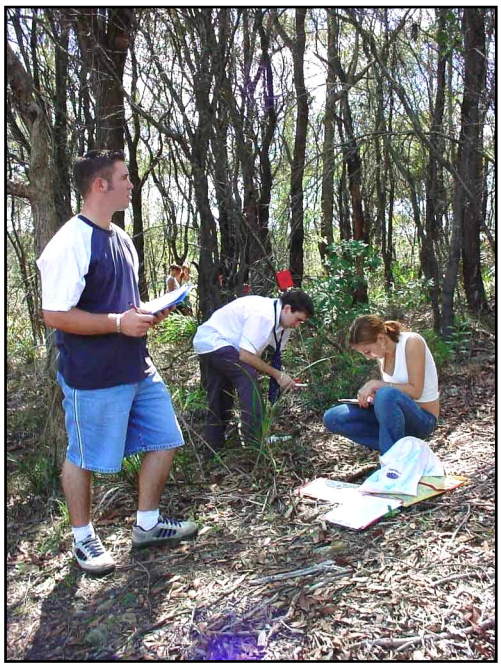
Tree A:

Tree B:

Bushland site

Name: _____

Lane Cove National Park is a valuable pocket of eucalypt bushland.



National park ranger staff work to look after the biodiversity (variety of plants and animals) in all of our national parks.

Rangers use invertebrates as a bio-indicator (*an indicator of the biodiversity of an area*) to investigate environmental health, eg food chains and webs.

Rangers prefer counting invertebrates because they are easy to sample, have great variety and abundance, play an important role in food chains and are sensitive to environmental changes.

Rangers make comparisons between invertebrate samples collected from various sites at the same time and also within the same area at different times.

The survey method you will use is a leaf litter survey within a 1m² area in a period of 5 minutes to collect ground dwelling invertebrates.

Part 1: Biodiversity survey

1. You will need to form a group of 4 to 6 people. Each group will be allocated a biodiversity survey zone marked by a numbered flag or cone.

2. You need to measure out two 1m x 1m (1m²) search areas on each side of the track.

3. Using the two invertebrate survey methods, conduct a precise 5 minute survey of your two survey areas.

4. In the table below, record the number of different species for each type of invertebrate.

Results for Zone No. _____

Invertebrate type	Insects (6 legs)	Arachnids (8 legs)	Others
Area 1 - left of track			
Area 2 - right of track			
Total			

4. Copy your total results to the class data table (either on the next page or iPad)

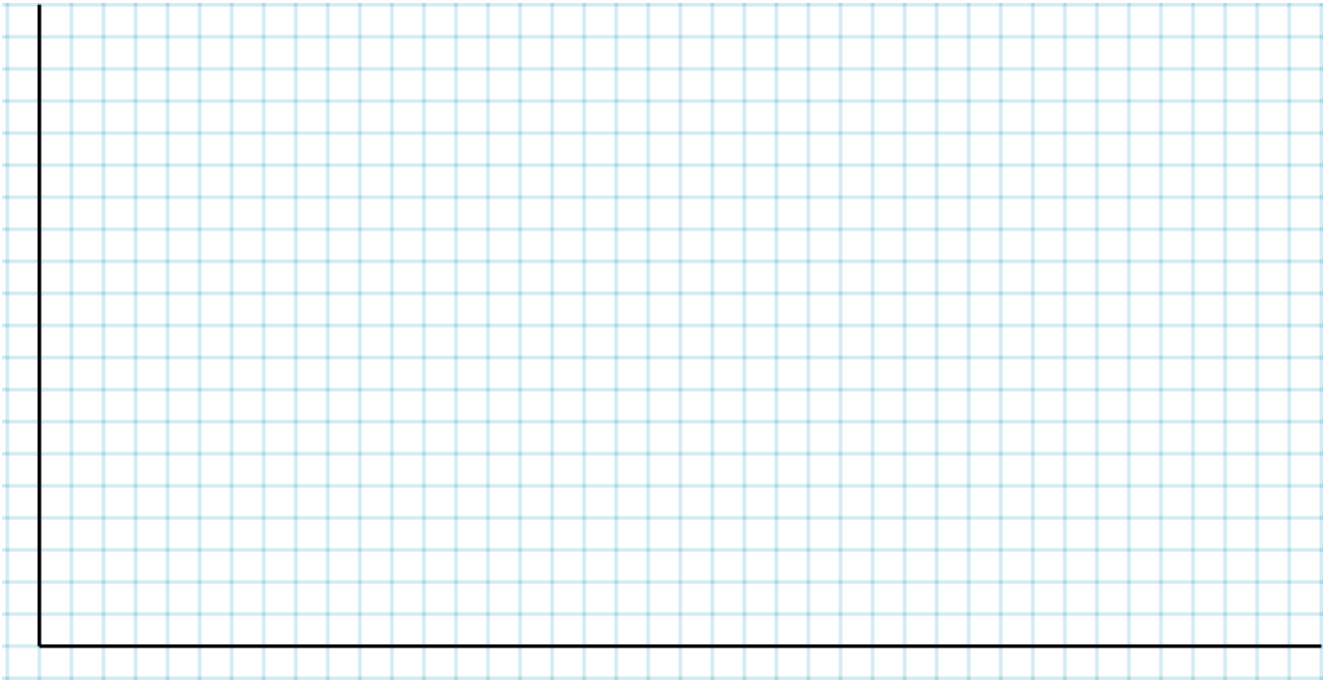
Part 2: Data analysis

(The methods below may be replaced by the statistics app, Numbers, on the iPad.)

1. Copy the class data table to the table below:

Survey Zone	Insects	Arachnids	Others	Total
A				
B				
C				
D				
E				
F				
Total:				

2. Graph the total number of invertebrates for each survey zone.



3. Calculate the total area sampled: _____

4. Calculate the average numbers of all invertebrate types per square metre at all sites.

Insects per m^2	Arachnids per m^2	Other invertebrates per m^2