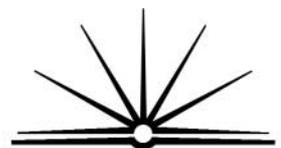
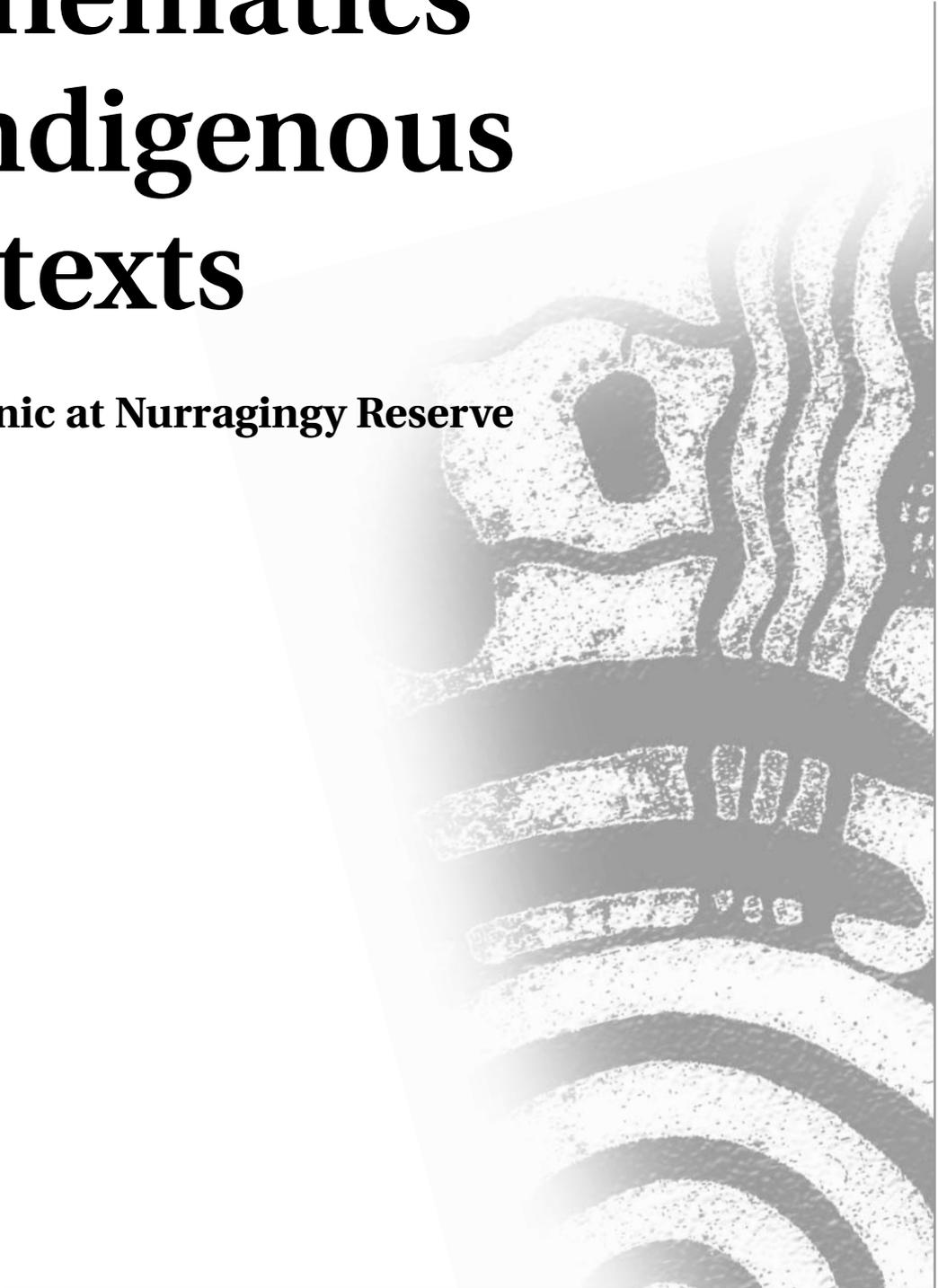


Mathematics in Indigenous Contexts

A Class Picnic at Nurragingy Reserve



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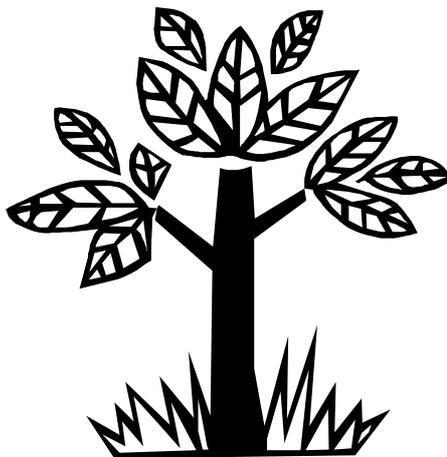
BOS

Mathematics Unit

Term: 3 Weeks 1–8

Unit Title:

*A Class Picnic at
Nurragingy Reserve*



Main Idea:

The main idea of this unit is to provide an effective learning environment for Aboriginal children. Here mathematics is removed from the classroom and incorporated in their surrounding community.

In conjunction with community members, the teacher and students have come together to establish a learning environment, which both recognises and actively utilises the Aboriginal child's knowledge and skills (Guider 1991, p 5).

All children need to identify the mathematical links with everyday situations. This unit will assist children to do this.

Children will be able to question mathematical concepts and explore the rationale behind mathematical ideas and develop a clearer understanding.

Outcomes:

By the end of this unit students should be able to:-

Working Mathematically Outcomes

Questioning

WMS2.1 Ask questions that could be explored using mathematics in relation to Stage 2 content.

Applying Strategies

WMS2.2 Select and use appropriate mental or written strategies, or technology, to solve problems.

Communicating

WMS2.3 Use appropriate terminology to describe, and symbols to represent, mathematical ideas.

Reasoning

WMS2.4 Check the accuracy of a statement and explain the reasoning used.

Reflecting

WMS2.5 Link mathematical ideas and make connections with, and generalisations about, existing knowledge and understanding in relation to Stage 2 content.

Measurement Outcomes

Length

MS2.1 Estimate, measure, compare and record lengths, distances and perimeters in metres, centimetres and millimetres.

Area

MS2.2 Estimate, measure, compare and record areas of surfaces in square centimetres and square metres.

Time

MS2.5 Read and record time in one-minute intervals and make comparisons between time units.

Space and Geometry Outcome

Position

SGS2.3 Use simple maps and grids to represent position and follow routes.

Data Outcome

Data

DS2.1 Gather and organises data, display data using tables and graphs, and interpret the results

Number Outcomes

NS2.1 Count, order, read and record numbers up to four digits

NS2.2 Use mental and written strategies for addition and subtraction involving two- three- and four-digit numbers

NS2.3 Use mental and informal written strategies for multiplication and division

Student Assessment

The following strategies will be used to assess the above outcomes:

- anecdotal observations of students during learning activities including listening to students' use of language
- observations of students' participation in a group activity
- explanations and demonstrations to others
- assessing samples of students' work
- checklists
- practical tasks
- students' journal and comments on the process of their solutions
- student/teacher interview discussions
- consideration of students' portfolios

Overview of Learning Activities

(See individual lesson plans for more detailed content)

Open-ended question to launch unit – What needs to be considered when planning a picnic? Week 1

Creating a metre square, in small groups Week 2

Using metre square students calculate the area needed to accommodate 28 children and 3 adults. Week 3

Students measure the perimeter of each picnic ground and list negatives and positives for each ground. Week 4

Students discuss findings and write justification as to why they have chosen a particular area. Students survey class and graph results. Week 5

Students draw maps of chosen picnic ground and outline the best way to utilise the picnic ground chosen; map out picnic area. Students in groups brainstorm other things they could do to add to their first concept map. Week 6

Students in groups plan a treasure hunt for a secret place using a compass and directions. Week 7

Students complete five rotational activities

1. Mapping out picnic area measuring area
2. Treasure Hunt following directions
3. Scavenger Hunt measuring lengths
4. Football Skills recording distances
5. Races recording times

...and have picnic. Week 8

Teacher Behaviour

- Recognise and affirm the contributions of all students.
- Ensure responsibilities and workload are shared between all members in group work.
- Help children to verbalise findings in appropriate mathematical terms.
- Encourage all students to attempt all tasks to the best of their ability.

Unit Evaluation

- Was the unit a suitable length?
- Were instructions clear and understood?
- Were there enough individual, group and pair activities?
- How well did students participate in the activities?
- Were students enthusiastic?
- Were students given enough opportunities to give feedback on content and activities?
- How well did students achieve outcomes?

The following methods of gathering answers to these questions will be employed:

- Portfolio of students' work – a collection of a range of works from students for analysis.
- Individual journals of student opinions, attitudes and understanding.
- Systematic observations of time spent on task.
- Records of student achievements.

Links with Other Key Learning Areas

ENGLISH: Students will:

- explore various aspects of verbal and nonverbal communication
- use writing to express mathematical understanding
- use spoken language to develop understanding
- use listening skills to understand set task and develop a deeper understanding while listening to peers.

PDHPE: Students will:

- participate in sporting activities
- participate in fitness activities.

HUMAN SOCIETY AND ITS ENVIRONMENT: Students will:

- explore a National Reserve.

SCIENCE: Students will:

- investigate the appearance of mini-beasts.

Resources

Mathematics Years K–6 Draft Syllabus, 2002

Week 1

Main Idea: Open-ended Question-
What do you need to consider when planning a picnic?

Stage: 2

Content Strands: Working Mathematically
Measurement

Outcomes:

WMS2.3 Uses appropriate terminology to describe, and symbols to represent, mathematical ideas.

MS2.2 Estimates, measures, compares and records areas of surfaces in square centimetres and square metres.

Assessment:

Each member of group contributes to a concept map.

Resources needed for lesson:

6 Large pieces of butcher's paper
28 felt pens
Question written on the board

Learning Activities:

- Students are divided into 5 groups of 6
- On large pieces of butcher's paper, students are asked to write everything they think they need to consider when planning a picnic.
- All students are encouraged to contribute

Evaluation:

- Did all students contribute?
- What were students focused on?
- Did area get a mention?

Week 2

Main Idea: How is the area we need for a picnic calculated?

Link to previous lesson:

Most groups mentioned the need for sufficient space for a picnic.

Stage 2

Content Strands: Measurement

Outcomes:

MS2.2 Estimates, measures, compares and records areas of surfaces in square centimetres and square metres.

Knowledge and Skills

Students learn about

- constructing a square metre

Working Mathematically

Students learn to

- question why two students may obtain different measurements for the same area
- recognises areas that are smaller than, about the same as and bigger than

Assessment:

Each student will explain in their journals how their group created a square metre.

Resources needed for lesson:

Newspaper

Sticky tape

Mathematics journals

5 metre rulers

Learning Activities:

- Students are divided into 5 groups of six.
- Students are asked to construct a square metre using tape, newspaper and a metre ruler.
- Groups present to class, how they constructed the square metre and any difficulties they encountered.
- Students are asked to write the process in their journals, individually.

Evaluation:

- Did students work as a group?
- What language if any was used?
- Were students able to explain process?
- Were students able to answer and understand that an area of one square metre need not be a square?

Questions for Aboriginal Community Tutors

- How did you feel about the activity?
- What did the students need to do to complete the activity?

Week 2 – Extra Lesson

Ongoing Assessment Lesson

Main Idea: How do you find the area of a particular space?
Does a square metre need to be in the shape of a square?

Link to previous lesson:

After constructing a square metre, most students still believed that a square metre needed to be in the shape of a square.

Stage 2

Content Strands: Measurement

Outcomes:

MS2.2 Estimates, measures, compares and records areas of surfaces in square centimetres and square metres

Knowledge and Skills

Students learn about

- estimating and measuring areas in square metres
- recording area in square metres
- using the abbreviation for square metres

Working Mathematically

Students learn to

- question why two students may obtain different measurements for the same area
- discuss and compare areas using some mathematical terms
- discuss strategies used to estimate area in square metres, eg visualising repeated units

Assessment:

Students will explain in their journals, how their group estimated and measured the class 'sitting floor space'.

Checklist.

Resources needed for lesson:

Newspaper square metres constructed in previous lesson
Mathematics journals
Metre rulers
Exercise books
Tote trays

Learning Activities:

- Students are divided into 6 groups of five. Each member of the group is given a responsibility (Leader, Observer, Encourager, Reporter or Recorder).
- Students are asked measure and record the area of the constructed square metre using:
 1. exercise books
 2. tote trays.
- Groups present to class their results and any difficulties they encountered.
- Students are asked to write the process in their journals, individually.
- Students are asked the questions:
‘What could we measure our sitting space in the classroom with?’
‘What would be more appropriate – books, tote trays or our constructed square metre?’
- In groups students are asked to estimate area in square metres and comment in journals about strategies used.
- In groups students are asked to measure area in square metres, only using constructed square metres and explain in journals how they calculated result.
- As a class students discuss strategies used.
- Teacher introduces the abbreviation for square metres.

Evaluation:

- Did students work as a group?
- What language if any was used?
- Were students able to explain process?
- Were students able to explain strategies used, like repeated addition, when estimating and measuring a particular area?
- Were students able to recognise that the area of one square metre need not be a square?

Questions for Aboriginal Community Tutors

- How did you feel about the activity?
- What strategies did the students use?

Week 3

Main Idea: How many square metres would be needed to accommodate our class for a picnic?

Link to previous lesson:

When the students listed what they needed to consider for a picnic, there was a mention of 'enough space'. How much is enough space?

Stage 2

Content Strands: Measurement
Number

Outcomes:

MS2.2 Estimates, measures, compares and records areas of surfaces in square centimetres and square metres

NS2.2 Uses mental and written strategies for addition and subtraction involving two-, three- and four-digit numbers

NS2.3 Uses mental and informal written strategies for multiplication and division

Knowledge and Skills

Students learn about

- estimating, measuring and comparing areas in square metres
- recording area in square metres
- using the abbreviation for square metres

Working Mathematically

Students learn to

- question why two students may obtain different measurements for the same area
- discuss and compare areas using some mathematical terms
- discuss strategies used to estimate area in square metres, eg visualising repeated units

Assessment:

Students will be observed and a checklist will be completed for the above indicators.

Resources needed for lesson:

One constructed square metre for each group
A large area (playground)
Checklist of Teacher Observations
5 footballs
5 pieces of chart paper
5 clipboards

Learning Activities:

- Divide students in 5 groups of 5 or 6.
- Ask students to estimate how many square metres they think would be needed for a class picnic and write their answer in their journals.
- Using the one square metre each group has made, students determine the space needed to accommodate all students for a class picnic (say 28 students and 3 adults).
- Students are asked to answer the following questions:
 1. How did your group work out the answer?
 2. What mathematics was involved?
 3. Did others in your group have different ideas?
- Each group is given a football and asked how they could determine the area they need to play a game of football, using another means.
- Class rejoins and each group collates information and results in poster form to present to class.
- Groups discuss in turn their poster with answers and how they obtained it.

Evaluation:

- Did students work well in their groups?
- What strategies did students use?
- Did students cooperate outside of the classroom?
- Did students use knowledge obtained from previous lesson in this lesson?

Questions for Aboriginal Community Tutors

- How did you feel about the activity?
- What did the students need to do to complete the activity?
- Did all students in the group contribute?

Week 4

Main Idea: What picnic ground at Nurragingy would be suitable to use for our picnic?

Link to previous lesson: Now that we have worked out how much space we need for our picnic we need to select an appropriate picnic ground.

Stage 2

Content Strands: Measurement
Space and Geometry
Data
Number

Outcomes:

MS2.1 Estimates, measures, compares and records lengths, distances, and perimeters in metres, centimetres and millimetres

SGS2.3 Uses simple maps and grids to represent position and follow routes

DS2.1 Gathers and organises data, displays data using tables and graphs, and interprets the results

NS2.1 Counts, orders, reads and records numbers up to four digits

Knowledge and Skills

Students learn about

MS2.1

- estimating, measuring and comparing lengths or distances using metres
- recording length using metres and centimetres
- recognising the features of an object associated with length, that can be measured eg length and breadth
- using the term perimeter to describe the total distance around a shape estimating and measuring the perimeter of two-dimensional shapes
- using a trundle wheel to measure lengths and distances

SGS2.3

- constructing a simple map or plan
- describing the location of an object
- drawing and describing a path or route on a simple map

DS2.1

- creating a simple table to organise data
- interpreting information presented in simple table

NS2.1

- ordering a set of numbers in ascending or descending order

Working Mathematically

Students learn to

MS2.1

- question why two students may obtain different measurements for the same length, distance and perimeter
- explain strategies used to estimate length or distance

- use a device to measure lengths or distances

- discuss the use of grids in the environment, eg Nurragingy map.
- use and follow positional and directional language

DS2.1

- pose questions that can be answered using the information from the table

Assessment:

Students, in pairs, will record measurements on a map. Students will also be recording in their journals the strategies used to estimate and order the areas of each of the picnic grounds, prior to visiting, using a map given. These will be used to assess students.

Resources needed for lesson:

Class set of maps of Nurragingy
Table for journals
5 clipboards
5 logbooks
6 stopwatches
6 enlarged copies of maps of Nurragingy
15 trundle wheels

Learning Activities:

- Discuss with students 'perimeter' and what it means – comes from the Greek word that means to measure the outside.
- Introduce to students the trundle wheel and what it does.
- Make the connection to previous lessons and the difficulty of measuring distances without using the same unit and instrument.
- Give each student a map of the picnic ground at Nurragingy and ask him or her to estimate the perimeter in metres of nominated picnic grounds.
- Divide students into the same groups as in previous lessons.
- Give each group a logbook and a stopwatch.
- Walk to Nurragingy and ask students to record the time it takes to get there (stress to students it is not a race).
- At Nurragingy, as a class visit each of the picnic areas and give each group 5 minutes to find the actual perimeter of the area using a trundle wheel and record on their maps.
- Ask each student to take note of the advantages and disadvantages of each picnic ground.
- As they progress from one picnic area to another, students draw path on map.
- Return to school, reminding students to time the trip.

Evaluation:

- Did students work well in their groups?
- Did students cooperate outside of the school?
- When evaluating picnic grounds did students look at measurement aspects? eg distance to toilets, how many bins ...?
- Did students use knowledge obtained from previous lessons in this lesson?

Questions for Aboriginal Community Tutors

- How did you feel about the activity?
- What did the students need to do to complete the activity?
- Did all students in the group contribute?
- How did you feel about going to Nurragingy?

Week 5

Main Idea: How do we choose the appropriate picnic ground?

Link to previous lesson: Students evaluated each picnic ground. So, which one do we choose?

Stage 2

Content Strands: Data
Number

Outcomes:

DS2.1 Gathers and organises data, displays data using tables and graphs, and interprets the results

NS2.1 Counts, orders, reads and records numbers up to four digits

Knowledge and Skills

Students learn about
DS2.1

- creating a simple table to organise data
- interpreting information presented in simple table
- constructing vertical and horizontal column graphs on grid paper using one-to-one correspondence
- interpreting information presented in column graphs

Working Mathematically

Students learn to
DS2.1

- pose questions that can be answered using the information from the table
- discuss the advantages and disadvantages of different representations of the same data

Assessment:

Students' work samples will be analysed and assessed.

Resources needed for lesson:

Data collected from previous lesson
Journals
Graph paper
20 copies of class roll
Worksheet

Learning Activities:

- Using the information collected at Nurragingy students discuss findings in their groups.
- Students individually choose a picnic area and write justification in their journals ensuring they use the information they have collected about the picnic area and the space needed for a picnic.
- Students are given a class roll and asked to survey students in the class as to the picnic ground they have chosen.
- With this information they construct a simple table and pose questions from the information in the table.
- With this information they construct a column graph and answer questions relating to the information in the graph.
- Students are asked to answer the following questions:
Is a table or a graph the best way to communicate what the best picnic ground is? Why?

Evaluation:

- Were students able to work individually to complete set tasks?

Questions for Aboriginal Community Tutors

- How did you feel about the activity?
- What did the students need to do to complete the activity?
- Did students work as well individually as in their group?

Week 6

Main Idea: What else does our selected picnic ground have to offer?

Link to previous lesson: Students have selected the picnic ground. So it's time to take a closer look.

Stage 2

Content Strands: Measurement
Space and Geometry

Outcomes:

MS2.1 Estimates, measures, compares and records lengths, distances and perimeters in metres, centimetres and millimetres

SGS2.3 Uses simple maps and grids to represent position and follow routes

Knowledge and Skills

Students learn about

MS2.1

- estimating, measuring and comparing lengths or distances using metres
- recording length using metres and centimetres
- recognising the features of an object associated with length, that can be measured eg length and breadth
- using a trundle wheel to measure lengths and distances

SGS2.3

- constructing a simple map or plan
- describing the location of an object
- drawing and describing a path or route on a simple map
- using simple coordinates to describe position
- using an arrow to represent north on a map

Working Mathematically

Students learn to

MS2.1

- question why two students may obtain different measurements for the same length, distance and perimeter
- use a device to measure lengths or distances
- discuss the use of grids in the environment, eg Nurragingy map
- use and follow positional and directional language

Assessment:

Students' justifications will be assessed and a checklist will also be used.

Resources needed for lesson:

Clipboards
Blank paper
Trundle wheels
Stopwatches

Learning Activities:

- Walk to Nurragingy Reserve and record time taken in log books.
- Revisit the nominated picnic ground and ask students to map out the ground using grid paper.
- Students will then measure and record distance to toilets and bins etc. They are also asked to mark out the best place for the picnic and game of football.
- Students are then asked to list other things that they could do, that would involve mathematics.
- Students return to school and record time taken.
- Students with the information obtained from their visit use simple coordinates to describe the position of each of the things on the picnic ground, eg at B2 you will find the toilets.
- Students write justifications for their plans.

Evaluation:

- Did students work well in their groups?
- Did students cooperate outside of the school?
- When mapping out ground, what strategies did students use?
- Did students use knowledge obtained from previous lessons in this lesson?

Questions for Aboriginal Community Tutors

- How did you feel about the activity?
- What did the students need to do to complete the activity?
- Did students find it difficult to list other mathematical things they could do?

Week 7

Main Idea: What else can we do?

Link to previous lesson: Students have listed a number of other mathematical things they could do. Let's investigate further.

Stage 2

Content Strands: Measurement
Space and Geometry

Outcomes:

MS2.1 Estimates, measures, compares and records lengths, distances, and perimeters in metres, centimetres and millimetres

SGS2.3 Uses simple maps and grids to request position and follow routes

Knowledge and Skills

Students learn about

MS2.1

- measuring and comparing lengths or distances using metres
- recording length using metres and centimetres
- using a trundle wheel to measure lengths and distances

SGS2.3

- using a compass to find north
- using an arrow to represent north on a map
- using a compass rose to indicate each of the key directions
- determining the directions N,S,E and W given one of the directions
- determine the directions NW, NE, SE and SW
- using N, S, E and W to describe the location of an object on a simple map, given a arrow that represents north
- using NW, NE, SE and SW to describe the location of an object on a simple map, given a compass rose

Working Mathematically

Students learn to

MS2.1

- question why two students may obtain different measurements for the same length, distance and perimeter
 - use a device to measure lengths or distances
- use and follow positional language

Assessment:

Each group's treasure plan will be assessed when implemented.

Resources needed for lesson:

15 Compasses

Stopwatches

Paper

Learning Activities:

- Walk to Nurragingy Reserve and record time taken in log books.
- Revisit the nominated picnic ground and ask students to use a compass and plan a treasure hunt for a 'Secret Place' to play on our picnic day.
- In planning a treasure hunt each group needs to find a starting point and list directions using NORTH, SOUTH, EAST and WEST, as well as NW, NS, SE, SW.
- When recording the distance in the selected direction they are to use the trundle wheel.
- Each plan is to have 8 different changes of direction.
- Each group keeps their plan to themselves.
- Return back to school, recording time taken.

Evaluation:

- Did students work well in their groups?
- Did students cooperate outside of the school?
- When planning their treasure hunt, did students understand the instructions given?
- Did students use knowledge obtained from previous lessons in this lesson?

Questions for Aboriginal Community Tutors

- How did you feel about the activity?
- What did the students need to do to complete the activity?
- Did the compass confuse students?

Week 8

Main Idea: The work is done! So what are we waiting for?

Link to previous lesson: Students have researched, evaluated, mapped, and planned our picnic. So let's have fun.

Stage 2

Content Strands: Measurement
 Space and Geometry
 Data

Outcomes:

MS2.1 Estimates, measures, compares and records lengths, distances and perimeters in metres, centimetres and millimetres

MS2.2 Estimates, measures, compares and records areas of surfaces in square centimetres and square metres

MS2.5 Reads and records time in one-minute intervals and makes comparisons between time units

SGS2.3 Uses simple maps and grids to represent position and follow routes

DS2.1 Gathers and organises data, displays data using tables and graphs and interprets the results

NS2.1 Counts, orders, reads and records numbers up to four digits

NS2.2 Uses mental and written strategies for addition and subtraction involving two-, three- and four-digit numbers

NS2.3 Uses mental and informal written strategies for multiplication and division

Knowledge and Skills

Students learn about

Working Mathematically

Students learn to

ALL INDICATORS FROM PREVIOUS LESSONS WILL BE REVISITED

Assessment:

Work samples

Resources needed for lesson:

15 Compasses
Stopwatches
Trundle wheels
Worksheets
Rulers
Footballs
Treasure maps
Scavenger list
Plastic bags
Red string
Green string
Witches hats

Learning Activities:

- Students will rotate in their groups and complete activities at five different workstations:
 1. Mapping out picnic area using trundle wheels and witches hats.
 2. Scavenger hunt students will be asked to collect the following items and place them in a named plastic bag:
 - 10 cm leaf
 - 16 cm twig
 - 40 mm blade of grass
 - 5 cm rock.
 3. Treasure hunt for Secret Place using plans made in previous lesson.
 4. Football skills. Recording distance of throw and kick using string:
 - red string for throw
 - green string for kick.
 5. Races. Recording times for:
 - running
 - jumping
 - side-stepping.
- Students rejoin for picnic.
- Return to school.

Evaluation:

- Did students work well as they rotated around the different activities?
- Did students cooperate outside of the school?
- Were all activities appropriate?
- Did students use knowledge obtained from previous lessons in this lesson?

Question for Aboriginal Community Tutors

- How did you feel about the activities?