To help make good decisions about health and physical activity

These materials are designed to engage students in a wide range of learning activities using the pedometer as the impetus for investigating, problem solving, collecting authentic data, working together and behaving ethically. As a result of their learning, students will have more information to make more informed choices about their health and physical activity and increased opportunities for successful learning for the Australian Curriculum Mathematics and other learning areas.
Counting on Maths materials began as one page of maths ideas from Maths for Learning Inclusion designed to support the Premier’s be active Challenge. It quickly became clear to me that a pedometer provided learning opportunities beyond just counting steps. There are rich possibilities for students to collect their own data, conduct investigations and explore ways to compare and analyse information while working together in order to make informed decisions about their personal health and physical activity.

The materials are also an opportunity for teachers to begin familiarising themselves with the draft Australian Curriculum Mathematics particularly the key message of Inquiry and Active Participation. The curriculum is written with the expectation that schools will ensure that all students benefit from access to the power of mathematical reasoning and be able to apply their mathematical understanding creatively and effectively.

It encourages teachers to facilitate students to become self-motivated, confident learners through inquiry and active participation in challenging and engaging experiences.

The Australian Curriculum aims to ensure students recognise connections between the areas of mathematics and other disciplines and appreciate mathematics as an accessible and enjoyable discipline to study.

Counting on Maths materials provide teachers with ideas, including cross curriculum opportunities which build on mathematics learning, for example:

**Design & Technology** - Planning and constructing a model of an alternative to the pedometer by designing a dance-meter or a laugh-meter etc?

**English** - Presenting an argument for and against e.g. physical fitness as a talk, as a poster, animation film etc

**Art** - Drawing a map of the area you walk over in the course of a week and illustrating it with photographs and drawings. Design symbols which represent steps you walked on each journey and/or navigation tools.

**ICT** - Using a range of creative software options to represent and compare data sets, in ways most likely to engage people.

**Health and PE** - the overall message of staying active and healthy.

Counting on Maths also provides teachers with examples of learning opportunities which promote inclusive pedagogies and provide opportunities to embed General Capabilities as described in draft Australian Curriculum. This resource also promotes assessment opportunities which support students to demonstrate what they know understand and can do in a variety of ways beyond paper and pen.

Special thanks to Doug Clarke (Australian Catholic University) and Matt Skoss a program colleague, who first told the story of Doug and his creative use of pedometers when working with students.

The materials grew, thanks to the input from Maths for Learning Inclusion Cluster Coordinators, especially Ann McMillan, Trish Boschetti, Jayne Foulds, Scott Blakemore, Vivienne McQuade and most particularly Jo Kennedy. Thanks also to Nathan Starling from Marion Primary, who enthusiastically trialled the draft materials with his 5/6 class.

Leah Cassidy and Lorna Fenech from the Premier’s be active Challenge also need to be thanked for their support for what was a germ of an idea through to publication.

We invite you to take the challenge, hook your pedometer to your belt, and get you and your students involved in having fun, learning together and staying active and healthy.

Barbara Reinfeld
Curriculum Manager
Learning Inclusion Team
To help maximise the learning opportunities and enjoyment of students and teachers we recommend that before you start, please take note of the following:

- **Make sure** students are introduced to and are familiar with the pedometer and its functions.
- **Let parents know** what you are planning to do. (See draft letter attached). You may want to suggest a family challenge via the school newsletter?
- **Reinforce** that this is **not** a competition but an opportunity to participate in physical activity, work together, take responsibility and do your best!

**Also remember…**

- **The importance of teachers modeling positive behaviours**: Teachers do not have to be athletes to be good role models for physical fitness, so get up and out there with the kids and do what you can!
- **Taking action**: an important aspect of this work is getting students to take some positive action as a result of their learning. This may include a display of photos, graphs and an article in the school newsletter, promotion film clip on the school website, a school challenge, a mural, dance, radio play or drama production promoting fitness and health which could be shared with the local community.
- **Ethical behaviours**: what does it mean to behave ethically? Challenging students to think about ethical behaviours e.g. cheating will bring another important perspective to the learning and introduce students to the **Australian Curriculum** General Capabilities, one of which is Ethical Behaviours.
Setting the scene:
There are multiple opportunities to explore cross-curriculum links, including in the examples provided, English, Design and Technology, and Art, Craft and Design. There is scope to develop General Capabilities, notably Literacy, Numeracy, Thinking skills, Creativity, Self management, Team work and Ethical behaviours.

Learning tasks
The word **pedometer** has two parts
1. ped
2. meter
How, or where could you find their meaning?
Discuss in groups/pairs what you think these words mean? Have a go at deciding on a definition.
Write your definition in your book/page along with a drawing or image of a pedometer which includes all the important features.

We all know what a pedometer is, and what it can do, so now think about what other ‘O-meters’ there might be, for example;

- **Dance-o-meter**
- **Swim-o-meter**
- **Read-o-meter**
- **Talk-o-meter**
- **Think-o-meter**
- **Eat-o-meter**
- **Laugh-o-meter** etc

**Design your own o-meter**
Draw a picture or make a model. Including details of all the important features.

Decide what it would measure or count?

Try to persuade the class that you or your team has a great idea!
Setting the scene:
It won’t take students long to figure out that they can shake the pedometer and increase the number of steps without moving a muscle!

Ethical behaviours is one of the General Capabilities in the Australian Curriculum. This is an opportunity to formally introduce students to the concept of behaving ethically, especially in relation to cheating, fairness and working together.

Student learning tasks:
It may be helpful to start the conversation by asking students what they understand by the term “cheating.”

Give students time to think and discuss this in pairs or small groups.

A class definition of cheating
Ask students where they might find a definition of a word. List these on the board.
Ask student groups to find three definitions (nouns and verbs) to share with the class. Decide on a class definition of cheating.
Discuss and develop guidelines for using the pedometer.
Use drawings or Comic Life software to illustrate the guidelines and send this home for parents.

Collecting data: Ask students to discuss the topic of cheating in small groups and in their groups come up with three questions (one per sticky note) they would like the class to either explore in their groups or discuss with the class. Each group brings their sticky notes to the whiteboard and group them in “like groups”. These are arranged as a table. Students collect data about which topics are most popular.

A debate: Use one of the big questions, or ideas that emerge from student discussion to facilitate a debate. Team work is emphasised and roles are assigned by the group.

---

definitions

NOUN
- Someone who leads you to believe something that is not true; [syn: deceiver, cheat, cheater, trickster, beguiler, slicker]
- The act of swindling by some fraudulent scheme; - Example: “that book is a fraud" [syn: swindle, cheat, rig]
- A deception for profit to yourself; [syn: cheat, cheating]

VERB
- Deprive somebody of something by deceit; - Example: "The con-man beat me out of $50"; “This salesman ripped us off!” -syn: cheat, rip off, chisel]
- Defeat someone through trickery or deceit; [syn: cheat, chouse, shaft, screw, chicane, jockey]
- Engage in deceitful behaviour; practice trickery or fraud; - Example: "Who's chiseling on the side?" [syn: cheat, chisel]
**Maths Vocabulary**

duration
length
approximate
estimate
accurate
count
count on
count back
measure
meter
metre
stride
kilojoules
imperial
compare
greater than
less than
range
maximum
minimum
average
median
mode
mean
tally
table
area
pace/stride
convert
beside
in front/behind
parallel
diagonal

---

**Pedometer**

**WORD WALL**

*meter and metre: they sound the same but what do they both mean?*
Pedometer user guide

Most pedometer have three main functions:
1. Counting steps
2. The distance covered by your steps
3. Calories burnt

Setting the scene:
Before using a pedometer students must first activate the various features. While features change for different models the following functions are designed as guide.
Find the **mode button** and press this to select the step counter, distance display and calorie consumption.
Next, set your **stride** by pressing the stride button to enter stride length setting in the distance display. The setting range is 30 – 150cm
To enter weight setting in calories consumption display. The setting range is 20 – 150kg

---

**Step Counter Function**
1. Press (mode) to enter step counter function.
2. Step number will activate automatically as you begin to move around.

**Distance Counter Function**
1. Before use, first key in stride length. Enter the figure on screen to make sure.
2. Press (stride set) key to enter stride length setting. Press (reset up) key to add figure, each press entered adds 5cm (metric). When keying in settings by holding the (reset up) key for more than 1 second, the figure will advance in units of 8 per second. Screen will return to normal automatically, 5 seconds after you finish pressing any key.

**Calorie Display Function**
1. Press (mode) key to enter calorie indicator display function.
2. Before you start, first key in your weight. Enter the figure on screen to make sure.
3. Press (stride set) key to enter weight setting. Press (reset up) key to add figure, each press enter add 1kg (metric) when keying in settings, by holding the (reset up) key for more than 1 second, the figure will advance in units of 8 per second. Screen will return to normal automatically, 5 seconds after you finish pressing any key.
Dear Parent / Caregiver,

The **Premier’s be active Challenge** is a programme designed to increase the physical activity levels of young people. The Challenge commenced in 2007 and is open to all South Australian children from Reception to Year 9 in government, non government and home schools. This year our school is entering the Challenge!

The Challenge requires participants to complete at least 60 minutes of physical activity daily for up to 10 weeks. This physical activity can take a multitude of forms ranging from active house work and walking to school, through to playing sport. Students simply need to record their daily activity online @ [www.pbac.sa.edu.au](http://www.pbac.sa.edu.au) or on paper and have their teacher approve this online. They will be recognised with a medal after they complete 4 weeks (a bronze medal in the first year, silver in the second and gold in the third). Schools that support students to complete 10 weeks of the Challenge may also be rewarded with one of 50 high achievement awards valued at $1000.

As a parent / caregiver you will have a vital role to play in this Challenge. Your encouragement, motivation and support for your child will make a real difference to the success of the Challenge. We hope that your child will be involved and if you support them in doing so please:

- sign the below acknowledgement form and return it to the school
- sign the activity diary to verify your child’s activity for the week
- provide encouragement and opportunities for your child to be active

Why not take the Challenge yourself!

Yours sincerely

As the parent of ______________________________________________
I will support him / her in the Premier’s be active Challenge.

Signed __________________________ Date ______________________

---

**A note for teachers**

If you intend for your students to be involved in the be active Challenge, we strongly suggest that you:

- have a **trial week** using the pedometers **before you start**, to give students the opportunity to “play” with the pedometer and establish class norms so that they are ready for a serious attempt to collect their data and improve their fitness.
- debrief at the end of the week and use for example, a PMI to encourage discussion about which strategies worked best, examine issues that arise etc.

This helps ensure students are ready to begin a serious data collection and understand the processes to support them doing their best. It also helps the teacher see potential pitfalls and problems beforehand.
While we have provided suggestions for particular tasks at particular year levels we need to remember that in any and every class there will be students at various stages of development, with various perspectives and understandings. It is essential therefore to check students’ prior learning and ensure learning tasks are initially within reach and develop into challenging learning for all learners.

**STRAND: Number and Algebra**

**Year 2 - Content and descriptions**

**Counting**
Say, understand and reason with number sequences increasing by twos, fives and tens from any starting point including using calculators

**Place value and numeration**
Recognise, model and represent numbers to 130, and read, write and order those numbers

**Year 3**

**Counting**
Understand and reason with number sequences increasing and decreasing by twos, fives and tens from any starting point, moving to other sequences, emphasizing patterns and explaining relationships

**Numeration**
Recognise, model, represent and visualise numbers initially to 1000 and then beyond, and read, write and order those numbers

**Place value**
Justify various uses of place value systems to describe numbers to 1000, using the hundreds and tens as units, and to partition and regroup those numbers to assist calculation and solve problems

**Relevant excerpts from the Achievement standard (Year 2)**
By the end of Year 2, students are able to understand the sequence of numbers to 130, recognising patterns in units of 10 and 100. They apply this understanding to efficiently represent collections larger than 100 and to partition numbers into units of tens and ones. They describe and connect patterns of twos, fives and tens, solve multiplicative problems and model everyday simple functions

**Relevant excerpts from the Achievement standard (Year 3)**
By the end of Year 3, students are able to understand place value to 1000 and connect this to comparing and ordering length, mass and capacity. They apply this understanding to choose efficient strategies (mental, written and calculator) to solve problems in everyday situations
YEARS 2 and 3
What do we want students to learn and where does it fit in AC Mathematics?

NUMBER AND ALGEBRA

What is the important idea or question?
Understanding our number system

NUMBER AND ALGEBRA

STRAND: Number and Algebra
Understanding our number system

By the end of Year 2, students are able to understand the sequence of numbers to 130, recognising patterns in units of 10 and 100.

By the end of Year 3, students are able to understand place value to 1000 and connect this to comparing and ordering length, mass and capacity. They apply this understanding to choose efficient strategies (mental, written and calculator) to solve problems in everyday situations.

Setting the scene:
Understanding the link between the abstract symbol of a number and the concrete experience of numbers.

In the trial of these materials it was interesting to note that even at year 5, some students had ‘aha’ moments when they made the connection between a number symbol, e.g. 130 and the experience of taking 130 steps.

Familiarise students with the functions of the pedometer and calculator so that all students can practice counting on, and back by twos, fives, tens and doubling from various starting points.

- Demonstrate methods of recording data e.g. tally, popsticks bundles of ten, counters on a grid.
- Students practice saying number sequences from different starting points.
- Students practice counting on the decade and off the decade and count back from different starting points.

Introduce students to open number lines.

Students are introduced to maths language which helps them compare and order number and length and to the use of the following terms:

- counting on—instead of add or plus
- counting back—instead of subtract or minus
- decade—instead of tens

Students wear their pedometers during a set period of time and together the class count out loud the number of steps.

Students record their steps using a variety of methods including arrow cards, MABs and paddlepop sticks etc.

One is a Snail Ten is a Crab by Sayre and Cecil– Walker Books
This is a wonderful resource to introduce students to counting on addition and as a starting point for using a pedometer and counting on their steps.

Ideas for learning tasks
STRAND: Number and Algebra

Students describe their position e.g. forward, behind, left, right and record their positions on a number line, or a class map and compare their position to at least three others. Lego people, ICTs, drawings, models, a role play, a song are just some ways students could choose to demonstrate their understandings of “position”.

Students use their calculators to start counting from any number increasing by twos, fives, threes and tens etc. and predict and count each time.

Example questions for students
My pedometer has 129 steps on it. If I take 12 more steps how many will it show?

I have walked in a triangle shape and taken 36 steps. How many steps would be on each side of the triangle?

If I doubled the number on my pedometer and added 15 more steps, what might my starting number have been?

Over a school week I have taken 1267 steps from home to school. How many steps might I have taken on my walk to school each day?

Use the “setting the scene” questions to generate additional learning tasks.

I have been very active this morning and have walked between 300 and 1000 steps. What questions will help you to guess my numbers?
E.g. - is it an odd number decade?
   - is it more than double 400?
   - is it greater than 600?

Arrow cards
YEAR 4 and 5  Explicit links to Australian Curriculum Mathematics

While we have provided suggestions for particular tasks at particular year levels we need to remember that in any and every class there will be students at various stages of development, with various perspectives and understandings. It is essential therefore to check students’ prior learning and ensure learning tasks are initially within reach and develop into challenging learning for all learners.

STRAND: Statistics and Probability

YEAR 4

Data investigation
Plan and undertake surveys, such as with the whole class, to answer questions posed, represent the data and report the results, including using ICT

Data representation
Construct, read, interpret and make connections between tables and simple graphs with many-to-one correspondence between data and symbols, including using ICTs

Relevant excerpts from the Achievement standard (Year 4)
By the end of Year 4, students are fluent with and evaluate the efficiency of mental and written strategies with one- and two-digit numbers and use these to solve problems …. Students pose questions that can be answered by data and plan and undertake data investigations, including the analysis of secondary data sets. They report their results using tables and graphs using one to one relationships between the data and the representation and evaluate their investigation

YEAR 5

Data investigation
Solve problems involving the collection of data over time, carry out the investigation and report the results, including using ICT and justify conclusions about the relationship between the variables

Summary Statistics
Identify the mode and median in lists and on dot points

Data Representation
Use and compare the effectiveness of a range of data representations including for specific situations

Understanding that data sets can be represented in different ways and that the most appropriate representation depends on the data and the questions needing to be answered

Using data representations to aid in making decisions, such as using tables to compare the costs of mobile phone plans

Relevant excerpts from the Achievement standard (Year 5)
They confidently solve realistic problems including those involving rate and ratio choosing appropriately written and mental strategies or calculators. They use estimation strategies to predict and check reasonableness of calculations. Students represent data choosing appropriate displays including stem and leaf plots and distinguish between sample and population data
YEARS 4 and 5
What do we want students to
learn and where does it fit in
AC Mathematics?

What is the important idea or
question?
There are lots of ways to
investigate and explore data

Australian Bureau of Statistics

Use the Australian Census as an
dexample of how data is collected
and used to inform public policy
and make life better for all
Australians.
The Australian Bureau of Statistics is
an excellent resource for teachers
and students. Teachers can
register students and do a mock
census and have access to a
range of interesting (real) data.
There are tutorials and lots more to
get student excited about surveys
and data.

www.sciencebuddies.org
This is an excellent site for teachers
& students to visit. It provides good
ideas for designing a good survey.

STRAND: Statistics and Probability

Students experience collecting a range of data and
use it to help them make decisions about their health
and fitness.

Setting the scene:
Collect a range of surveys to show students.
Introduce students to a range of different types of
surveys, and discuss how various approaches give
different data.

Design a survey with the class which provides data
about how active students/families are “at home”.

Find a list of “approved” activities for the Premier’s be
active Challenge. Discuss with students which activities
they predict the class do most.
Students could also collect data about:
• Which activities they have undertaken in the last
  week
• Which they do regularly (defining regularly)
• Which they wish they could do more

Collect the class data.
Which 10 are most popular?

Invite another class to do the same and compare the
data.

Contact a school/class in another part of the country or
another country altogether. Perhaps a country whose
language the class is learning or the home country of
one of the students.

Create a log book to record data. Could we use
mobile phones, digital camera or other ways to collect
this data?

Introductory questions for students:
Have students ever done a survey?
Why are surveys used?
Who uses them?
What problem are they trying to address?
What happens to the information? Who sees it?
What are the benefits for the people being surveyed?
Try to predict what information each type of survey
design wanted
What information is not being asked? Why?
<table>
<thead>
<tr>
<th>A</th>
<th>H</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active games</td>
<td>Hacky sack</td>
<td>Race walking</td>
</tr>
<tr>
<td>Active home chores</td>
<td>Hand tennis (four-square)</td>
<td>Racquetball</td>
</tr>
<tr>
<td>Aerobics</td>
<td>Health hustle</td>
<td>Rockclimbing</td>
</tr>
<tr>
<td>Aquarobics</td>
<td>Hide and seek</td>
<td>Rollerblading</td>
</tr>
<tr>
<td>Archery</td>
<td>Hip hop dancing</td>
<td>Rollerskating</td>
</tr>
<tr>
<td>Athletics</td>
<td>Hockey (field)</td>
<td>Rowing</td>
</tr>
<tr>
<td>B</td>
<td>Hockey (ice)</td>
<td>Rugby league</td>
</tr>
<tr>
<td>Badminton</td>
<td>Hopscotch</td>
<td>Rugby union</td>
</tr>
<tr>
<td>Basketball</td>
<td>Ice skating</td>
<td>Running/jogging</td>
</tr>
<tr>
<td>BMX/Bicycling</td>
<td>Jazz dancing</td>
<td></td>
</tr>
<tr>
<td>Bounding</td>
<td>Juggling</td>
<td></td>
</tr>
<tr>
<td>Calisthenics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canoeing</td>
<td>Kayaking</td>
<td></td>
</tr>
<tr>
<td>Chasey</td>
<td>Kickball</td>
<td></td>
</tr>
<tr>
<td>Cheerleading</td>
<td>Korfball</td>
<td></td>
</tr>
<tr>
<td>Chopping wood</td>
<td>Lacrosse</td>
<td></td>
</tr>
<tr>
<td>Circuit training</td>
<td>Lawn bowls</td>
<td></td>
</tr>
<tr>
<td>Circus skills</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climbing</td>
<td>Marching</td>
<td></td>
</tr>
<tr>
<td>Climbing stairs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climbing trees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cricket</td>
<td>Mini golf or putt putt</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Motorcross</td>
<td></td>
</tr>
<tr>
<td>Dancing (general)</td>
<td>Mountain biking</td>
<td></td>
</tr>
<tr>
<td>Diving</td>
<td>Mowing lawn</td>
<td></td>
</tr>
<tr>
<td>Dodge ball games</td>
<td>Netball</td>
<td></td>
</tr>
<tr>
<td>Dragon boat racing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>Orienteering</td>
<td></td>
</tr>
<tr>
<td>Equestrian</td>
<td></td>
<td></td>
</tr>
<tr>
<td>European handball (team)</td>
<td>Paddleball</td>
<td></td>
</tr>
<tr>
<td>Exercise equipment</td>
<td>Party (dancing)</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>Padel (dancing)</td>
<td></td>
</tr>
<tr>
<td>Fencing</td>
<td>Pilates</td>
<td></td>
</tr>
<tr>
<td>Fishing</td>
<td>Playground equipment</td>
<td></td>
</tr>
<tr>
<td>Flexibility exercises</td>
<td>Playing (active)</td>
<td></td>
</tr>
<tr>
<td>Football (Australian)</td>
<td>Pogo stick</td>
<td></td>
</tr>
<tr>
<td>Football (Gaelic)</td>
<td>Polo</td>
<td></td>
</tr>
<tr>
<td>Frisbee</td>
<td>Quoits</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gardening</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Golf</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gymnastics</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The teacher models how to use data to answer a question.

**Example questions**

How could we use data to improve our health and physical fitness?
What data could we collect?
- Pedometer– steps/distance
- Time spent in physical activity, e.g. playing sport, dancing, riding a bike etc.

Students develop and pose their own questions about an aspect of physical fitness.

Plan a class investigation using student generated data using pedometers over a period of time e.g. Monday to Friday.

What does the data tell us about our class?

What strategies could individuals and the class put in place to improve this data?

Trial the suggested strategies.

Repeat the data collection after two weeks and evaluate this secondary data to see if your strategies have been successful.

Choose a creative way to represent this data that gets people interested and asking questions.

**Create pictographs, column graphs, and dot plots using materials such as counters, written symbols and images.** Encourage students to be inventive using images and symbols from magazines or students own drawings or photographs, and using various software drawing programs.

Some of the hundreds of Clip Art images that could be used for pictographs etc.

---

**Counting on Frank** by Rob Clement, is a book with endless possibilities for discussions about mathematics.

Frank is a curious boy who loves to think about the world. He wonders about how many whales would fit in his house and if he grew as quickly as the gum tree in his yard, how tall he would be?

Frank works out averages, estimates and calculates his way through various problems, all the while enjoying the process of thinking.
While we have provided suggestions for particular tasks at particular year levels we need to remember that in any and every class there will be students at various stages of development, with various perspectives and understandings. It is essential therefore to check students’ prior learning and ensure learning tasks are initially within reach and develop into challenging learning for all learners.

**STRAND: Measurement and Geometry**

**YEAR 5**

**Location**
Describe locations and routes using a coordinate system such as road maps, the four main compass directions and the language of direction and distance

**Relevant excerpts from the Achievement standard (Year 5)**
They (students) can describe locations and routes and describe and demonstrate the effects of transformations

**YEAR 6**

**Location**
Describe and interpret locations and give and follow directions, using scales, legends, compass points, including directions such as NE and SW, distances, and grid references

**Relevant excerpts from the Achievement standard (Year 6)**
They confidently solve realistic problems including those involving rate and ratio choosing appropriately written and mental strategies or calculators. They use estimation strategies to predict and check reasonableness of calculations. Students represent data choosing appropriate displays including stem and leaf plots and distinguish between sample and population data
YEARS 5 and 6
What do we want students to learn and where does it fit in AC Mathematics?

What is the important idea or question?
There are lots of ways to collect data and show others what you have learnt.

STRAND: Measurement and Geometry

Use measurement and mapping activities to collect a range of data.

Setting the scene:
The pedometer provides opportunities for students to collect a range of data about various aspects of measurement including distance and time as well as health related data like kilojoules.

Introduce the language of direction and distance:

around
circumnavigate

behind
follow, at the rear

beside
next to, adjacent to, along side

direction
course, pathway, road, track, way

finish
end, close, terminate, conclude

follow
succeed, trail, track

over
above

start
begin, initiate, commence, set off

straight
direct, as the crow flies

through
via

turn
rotate, bear, veer

under
beneath, below

Introduce students to basic maps and practice reading and interpreting them using simple scales & legends & directions such as left, right, forward & backward.

Design a simple map of a familiar location such as the classroom, students own room, room in a favourite book or film or a dream room. Students practice identifying the relative position of key features.

Create and interpret simple maps with students to show position and pathways between objects.

Provide pairs/groups of students with a map of the school and yard. Ask them to identify (with coloured dots) which areas are e.g. the safest, the friendliest, the place where you play games, hang out with friends etc.

Compare the class data and demonstrate how this data could be collated.

Describe locations & routes using a coordinate system such as road maps, the four main compass directions & the language of direction & distance.

Describe & interpret locations & give & follow directions, using scale, legends, compass points, including directions such as NE & SW, & grid references.

www.googlemaps
Are a wonderful resource and can be adapted for a range of ideas presented in these materials.
YEAR 5 and 6
Ideas for learning tasks

Use metric units to estimate & compare length of steps & pathways.

Read an analogue &/or digital clock to estimate & compare time & distance between various locations.

Use the language of direction & distance.

Find various local and global destinations.

A student designed investigation for a walking trail
Students work in small groups or a whole class to collaboratively design, create and plot a pathway, walking trail, treasure hunt or orienteering trail for others to use e.g. students, tourists, families etc.

Students & teachers negotiate:
1. the purpose, length of time and number of checkpoints needed to be included in the pathway e.g. walking trail / treasure hunt / orienteering trail
2. a possible site e.g. local park, playground, school grounds etc.

While wearing their pedometer, students design an interesting pathway through a particular environment. Students measure the length and/or time. The pathway has the following features to allow others to monitor their steps, distance etc. and over time their improved performances:
- a start and a finish point
- a number of clearly visible checkpoints, identified by natural &/or manmade features along the way, time elapsed, length between

Create a simple map of the chosen site which may include some of the following features:
- the pathway
- the position of and pathways between objects
- a simple scale (e.g. steps per metre, steps per minute)
- a simple legend
- gridlines / coordinates
- compass points

Can we make a metre?
On a A3 sheet of paper, students plot a pathway from two random points, A and B. They then aim to mark a line exactly 100cms or 1 metre from one point to the other.

Tom Tom by Rosemary Sullivan and Dee Huxley, is a delightful picture book about Tom and his adventures. A feature of the book is the beautifully drawn map of Tom’s environment on the inside cover, which shows his various pathways through his country.

N.B.
www.googlemaps
STRAND: Statistics and Probability

Year 5
Data investigation
Solve problems involving the collection of data over time, carry out the investigation and report the results, including using ICT, and justify conclusions between variables
Summary statistics
Identify the mode and median in lists and on dot plots
Data representations
Use and compare the effectiveness of a range of data representations including for specific situations

Relevant excerpts from the Achievement standard (Year 5)
Students choose efficient mental and written strategies for calculations with whole numbers, solve additive problems with fractions and relate decimals and percentages. Students choose appropriate graphs for single variables data, and begin to represent change in data over time

Year 6
Data representations
Construct, read and interpret tables and graphs including ordered stem and leaf plots, and construct pie charts and other simple data displays including using technology

Relevant excerpts from the Achievement standard (Year 6)
By the end of Year 6, students are able to work with numbers including fractions and decimals to thousandths and apply their place value understanding to establish equivalences. They confidently solve realistic problems including those involving rate and ratio choosing appropriately written and mental strategies or calculators. They use estimation strategies to predict and check reasonableness of calculations. Students represent data choosing appropriate displays including stem and leaf plots and distinguish between sample and population data

Year 7
Data Measures
Determining mean, median and range and use of these measures to compare data sets explaining reasoning including using ICT
Data investigation
Investigate questions involving the collection of univariate and simple bivariate data, including the use of back-to-back stem plots and scatter plots

Relevant excerpts from the Achievement standard (Year 7)
Students conduct systematic data-based enquiry using univariate and bivariate data, choosing appropriate graphs, calculating measures of spread and relative frequencies from data
Year 8
Statistical measures
Use a mean or median from a sample to estimate the mean or median of a population and to recognise the limitation of samples.

Data investigation
Collect samples and construct tables and graphs including frequency columns graphs with and without technology for grouped data, and to select and justify the choice of measure of centre and spread used.

Relevant excerpts from the Achievement standard (Year 8)
By the end of Year 8, students are able to use number, algebraic conventions and formulas and apply this understanding to problem solving with ratios and scale, percentage increase and decrease, perimeters and areas of triangles, quadrilaterals and circles and volumes of triangular prisms. They use numerical and graphical summaries of data, interpret these to draw conclusions and calculate probabilities.

MMM placemat
These mean, medium, mode and range cards photocopied and laminated, make a good “placemat” for students to use while they work on this topic.

mean
The mean is the average or norm.
• Add up all of the values to find a total.
• Divide the total by the number of values you added together.

$$\text{mean} = \frac{2 + 2 + 3 + 5 + 5 + 7 + 8}{7} = \frac{32}{7} = 4.57$$

median
The median is the middle value.
• Put all of the values into order.
• The median is the middle value.
• If there are two values in the middle, find the mean of these two.

$$2, 2, 3, 5, 5, 7, 8$$

mode
The mode is the most frequent value.
• Count how many of each value appears.
• The mode is the value that appears the most.
• You can have more than one mode.

$$2, 2, 3, 5, 5, 7, 8$$

range
The range is the difference between the lowest and highest value.
• Find the highest and lowest values.
• Subtract the lowest value from the highest.

$$\text{range} = 8 - 2 = 6$$
YEARS 5-8
What do we want students to learn and where does it fit in AC?

STRAND: Statistics and Probability

Mean, median and mode
Students need to understand the difference between mean, median and mode including the symbols used to represent them.

Setting the scene:
A goal for the Premier’s be active Challenge is 13000 (thirteen thousand) steps for boys and 11000 (eleven thousand) steps for girls per day.

How might we find out if we are doing more (above) or less (below) or the same as the national recommended number of steps?

How do we compare our performance with others? Discuss all the ways.

Introduce students to a range of ways to collect, store and retrieve their personal data information including using information technologies e.g. mobile phones.

Use pedometers to find and record a week’s physical activity by the class.

Students enter data onto an Excel spreadsheets. They learn to sort and understand the purpose of different sorting requests. The data is used to practice finding the mean, medium and range and students become more confident in using these appropriately.

Students refer to the MMM placemat provided on the page 23 and 24.

Students discuss and analyse the information from the case study and then list all the things the data tells us.

Use samples of the data collected from using the pedometer and construct tables and graphs including frequency column graphs with and without technology for grouped data, and to select and justify the choice of measure of centre and spread used.

Use tables and graphs, identify the modal category.

Determine averages and spread of ungrouped data, using technology for large data sets e.g. the class log books for a week of physical activities by family and friends.

www.sparklebox.co.uk
A great resource for publishing posters, signs and labels etc
A class case study

The case studies approach is designed to encourage students to read and use data to help identify and solve problems. By using the experiences of others, students are encouraged to discuss and reflect on the data, the intercultural understandings, ethical behaviours of themselves and others. Students are encouraged to develop their own case study and analyse their own data to improve their health and fitness.

Student Case Study 1.

Ms Erin has a class of eight students. The school is in a remote part of South Australia.

The class are all very excited because when they came back from holidays they each received a pedometer to help improve their physical fitness and also improve their Maths knowledge and numeracy.

Ms Erin thinks fitness and Maths are both very important. The students will use their pedometer for one week and record their data to see what they can learn about their own physical fitness and that of the whole class.

In this class there are eight students, Shelle y and Bobby are six years olds, Elsie, Billy and Jack are seven, Matty, Jade and Sam are eight.

Shelly and Elsie are cousins and during the week they walk to school, and like to play lots of netball and swim in the community pool. On the weekend they visited their auntie’s place which meant they had to sit in the car for most of the day.

Billy and Bobby practice football every day before school. They always walk to school together with Billy’s dog and they both go swimming every afternoon. On the weekend Billy went with family to find bush tucker and camp near a waterhole where he swam with the other kids. Bobby plays with Shelly who lives next door.

Matty is a good swimmer and spends as much time as possible in the pool and swim holes. He also helps his old Nana and Pop by doing errands so he runs to the shops a lot.

One of Jack’s favourite things is building billy-carts and racing them with his friends. Jack is good at dancing and likes to watch and try all different types of dancing including what he sees on T.V. and the dancing the elders do.

Sam is happiest reading a book and listening to music. She usually gets a ride on the back of a friend’s bike when she has to get anywhere.
Investigating the data

Organising the data

Data can be organised in many different ways; tables, charts or graphs are just a few. Within the case study provided, there are many opportunities for children to explore different ways to work with data.

The table below identifies events (walking, swimming, playing, etc.), their names of the students, their ages, count and average count per age.

Now that we have this data sorted and presented in a table format, we can begin to analyse, draw conclusions and make recommendations for the students, if they want to achieve the goal of 10 000 steps per day.

<table>
<thead>
<tr>
<th>Age</th>
<th>Names</th>
<th>walk</th>
<th>netball</th>
<th>swim</th>
<th>auntie's place sit in car</th>
<th>walk to school</th>
<th>went to campsite</th>
<th>play</th>
<th>errands</th>
<th>billy carts</th>
<th>dancing</th>
<th>read</th>
<th>music</th>
<th>gets a ride</th>
<th>total</th>
<th>average count per age</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Shelley</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Bobby</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>4.5</td>
</tr>
<tr>
<td>7</td>
<td>Elsie</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Billy</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Jack</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>3.7</td>
</tr>
<tr>
<td>8</td>
<td>Matty</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Jade</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Sam</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>1.7</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>25</td>
<td></td>
</tr>
</tbody>
</table>

Making sense of the data

In the table above, a count was given to each event that occurred within the case study. However, there is no reference to the amount of steps taken.

In the table on the right, the events have been given a score to represent how many steps would be taken. The count then refers to the amount of times mentioned in the case study (as noted above).

Using this data, we can now begin to create graphs to represent our data.

<table>
<thead>
<tr>
<th>equivalent to (steps)</th>
<th>count</th>
<th>steps taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>walk</td>
<td>1000</td>
<td>2</td>
</tr>
<tr>
<td>netball</td>
<td>2000</td>
<td>2</td>
</tr>
<tr>
<td>swim</td>
<td>500</td>
<td>6</td>
</tr>
<tr>
<td>auntie's place sit in car</td>
<td>50</td>
<td>2</td>
</tr>
<tr>
<td>football</td>
<td>2000</td>
<td>2</td>
</tr>
<tr>
<td>walk to school</td>
<td>800</td>
<td>2</td>
</tr>
<tr>
<td>went to campsite</td>
<td>400</td>
<td>1</td>
</tr>
<tr>
<td>play</td>
<td>1000</td>
<td>2</td>
</tr>
<tr>
<td>errands</td>
<td>100</td>
<td>1</td>
</tr>
<tr>
<td>billy carts</td>
<td>1000</td>
<td>1</td>
</tr>
<tr>
<td>dancing</td>
<td>800</td>
<td>1</td>
</tr>
<tr>
<td>read</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>music</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>gets a ride</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>total</td>
<td></td>
<td>25</td>
</tr>
</tbody>
</table>
Investigating the data

Representing the data
Now that our data has been organised in a variety of ways, we can now use this information to make conclusions. In the pie graph we can see that the year sixes had a higher count than years seven and eight.

<table>
<thead>
<tr>
<th>Age</th>
<th>Average count per age</th>
</tr>
</thead>
<tbody>
<tr>
<td>six</td>
<td>4.5</td>
</tr>
<tr>
<td>seven</td>
<td>3.7</td>
</tr>
<tr>
<td>eight</td>
<td>1.7</td>
</tr>
</tbody>
</table>

Drawing Conclusions
In the graph below, we can begin to draw conclusions about the data; netball and football are very active sports that attract a higher number of steps and reading and listening to music are the least active activities.

Further investigations
Although there have been several data representations described so far, there are still many questions to be asked about the data and recommendations to be made. E.g. Which activity is most popular within the community and why, how can reading and listening to music give you steps, are the students reaching their 10 000 steps per day and if not, what do you recommend they do?
## Take the Challenge...Reap the Rewards!

As well as all the maths tasks described in this document students can also use their pedometer readings to participate in the Premier’s *be active* Challenge. After a minimum of four weeks of recording their physical activity students are rewarded with a medal.

### Overview

The Premier’s *be active* Challenge is open to all students from Reception to Year 9 in South Australian schools as well as home education students. The Challenge is to do at least **60 minutes** of physical activity on at least **5 days of the week** for at least **4 weeks**. Pedometer readings of 13,000 steps a day for boys and 11,000 for girls are regarded as equivalent to 60 minutes of physical activity.

The Premier’s *be active* Challenge commences each year on the first day of term one and concludes on the **last day of term three**. Schools may choose the weeks in which they do the Challenge each year. The Challenge is based on the *National Physical Activity recommendations for children and young people*. [http://www.health.gov.au/internet/main/publishing.nsf/Content/health-pubhlth-strateg-phys-act-guidelines](http://www.health.gov.au/internet/main/publishing.nsf/Content/health-pubhlth-strateg-phys-act-guidelines)

### Taking the Challenge

The first step is to visit the website [www.pbac.sa.edu.au](http://www.pbac.sa.edu.au) for teachers to register as coordinators then register their participants. There are then two possible options for recording students activities:

- **a)** Students can keep a paper record of the number of steps that they achieve during the weeks of the Challenge and the teacher can then approve them on-line.
- **b)** Students can record their pedometer steps on-line and then the teacher can approve them online.

### For more information

Visit the website [www.pbac.sa.edu.au](http://www.pbac.sa.edu.au) or contact us:

Leah Cassidy and Lorna Fenech  
Premier’s *be active* Challenge  
Department of Education and Children’s Services  
4th Floor, 31 Flinders St, ADELAIDE, 5000  
**P** 08 8226 4308  
**F** 08 8221 6617  
**M** 0401 121 098  
**E** leah.cassidy@sa.gov.au / lorna.fenech@sa.gov.au