Acknowledgements
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Scienceworks
2 Booker Street, Spotswood, Victoria 3015
Bookings: Phone (03) 9392 4819 between 8.30am and 4.30pm weekdays
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Sportsworks Map
Activity 1 – Racing Cathy
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Activity 7 – Race Paces
Activity 8 – Jump for it
Activity 9 – AFL Star
Activity 10 – Angles of Vision
Activity 11 – Get a Grip

Class Data Project
Sportspass

**Teacher Notes**

This education kit provides the basis for a unit of work focussed on levels 3 and 4 of the Victorian Essential Learning Standards (VELS) Mathematics domain and generally for similar levels of education in Australia. An excursion to the *Sportsworks* exhibit at Scienceworks is used to collect data for analysis both during the excursion and on return to school.

The *Sporty Maths* self-guided student program uses the hands-on activities in the *Sportsworks* exhibition at Scienceworks for students to measure and record data relating to aspects of their fitness. The data collected is collated back at school and used to investigate students' understanding in a variety of maths topics, including:

- Measurement
- Estimation
- Decimals
- Fractions
- Collecting and analysing data
- Graphing data

Students work in small groups to analyse parts of the data and share their findings with others. The *Sporty Maths* resource contains a variety of activities teachers can select and use whilst in the exhibition, depending on student and curriculum needs.

The activities are aligned to VELS standards and progression points in several dimensions of the Maths domain. Interpersonal Learning, Information and Communications Technology (ICT) and Science can all be incorporated and assessed also.

*Sporty Maths* is suitable for students in Years 3 – 7.

**Program Outline**

Please note that all *Sportsworks* exhibition based programs are led by you, the class teacher.

Activities may be completed in any order. If an exhibit is crowded, students should be advised to move on to the next one and return later. Once the set activities have been completed students should be encouraged to explore the other exhibits in Sportworks.

**Note to teachers**

There are some students who lack confidence or feel uncomfortable about their physical ability and/or taking part in competitive activities. In activities requiring students to race against a partner, try to match up students who are similar in size, strength and skills.

Explain to students they are gathering data not competing against each other so it is not necessary to be the fastest, strongest or best.
What to do before you visit

Research has shown that setting objectives for a museum visit is extremely important for students. It makes the purpose of the visit clear to them and assists their ability to focus and cooperate during the visit. See http://museumvictoria.com.au/scienceworks/Education/Learning-in-museums/

Decide which activity(s) students will complete while at Scienceworks. It is recommended that you choose to do either a few activities or the Class Data Project. There may not be enough time to complete all activities and teachers should select the appropriate activities for students complete while at Scienceworks.

Each Student Activity should have some discussion with students prior to the visit. As a class, students will need to make a number of decisions including:

- which tasks they will complete
- how they will go about collecting the information they need during their visit
- what form their final presentation will take

Creating interest in the subject is vital to a successful and enjoyable visit to Scienceworks. In order to assist you in this way, this education kit contains suggestions for activities you may choose to do prior to your visit.

Discuss how maths is used in everyday life. In what ways do we use maths in sport, other than for keeping scores?

Hold an introductory discussion with the class on statistics – where we find them, what they are used for, etc. Unpack ideas about the word average (mean) – how we use it in everyday language, and its particular meaning in maths.

Explain the difference between, mean (average), median and mode for a set of data discussing where each could be used and where the use of one would be better than the use of another.

Use the Excursion Checklist included in the teacher notes and ensure enough copies are made of the required activity(s) and/or Sportspass Results Card for everyone to record their individual measurements during your visit to Sportworks.
Excursion checklist

• **Book and confirm the details**
Check that the date and time of the proposed excursion, shown on your confirmation letter are correct.

• **Set a context for the excursion**
An excursion to Scienceworks will produce the best results if it is an integral part of a whole unit of work. See the school-based activities section and the resources section to help you prepare such a unit.

• **Select the most appropriate activities for your students**
This education kit contains 11 activities for use in the exhibition. A class data project is included for use at school with data that has been collected in the exhibition using a *Sportspass*. Teachers will need to select which activities their students will complete while at Scienceworks and/or what activities on the *Sportspass* will be completed for the class data project.

*Sportspass* is designed for recording individual performance at the various measurement activities in the *Test Yourself* area of Sportsworks. The *Sportspass* is suitable for all age levels.

You may adapt any of the material to suit the specific needs of your students.

• **Divide the class into pairs**
Scienceworks suggests students work in pairs, with several groups being overseen by a supervising adult.

There are activities in the Sportsworks exhibition which can lead to competition between students and comparisons of strength and skills. While for some students this is a very enjoyable aspect of the exhibition, for others, it can work against their full participation and enjoyment. This problem can be overcome by careful consideration of students when allocating pairs.

• **What to bring**
Make sufficient copies of chosen activity(s) and *Sportspass* sheets for your class.

Students need to bring their own clipboards and pens/pencils. One copy of the chosen activity(s) worksheet(s) and a copy of *Sportspass* should be provided to each student.
### Curriculum Links

Links to the Victorian Essential Learning Standards (VELS) for education in Australia.

<table>
<thead>
<tr>
<th>Strand</th>
<th>Domain</th>
<th>Dimension</th>
<th>Scienceworks and School Based Activities (*)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Discipline-based Learning</strong></td>
<td>Mathematics</td>
<td>Number</td>
<td>• Racing Cathy</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• You be the Judge</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Wheelchair Races</td>
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<td></td>
<td></td>
<td></td>
<td>• Reaction Times</td>
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<tr>
<td></td>
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<td></td>
<td>• Sharp Shooter</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Class Data Project</td>
</tr>
<tr>
<td></td>
<td>Space</td>
<td></td>
<td>• Angles of Vision</td>
</tr>
<tr>
<td></td>
<td>Measurement, Chance and Data</td>
<td></td>
<td>• Racing Cathy</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Wheelchair Races</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Reaction Times</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Sharp Shooter</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Measuring Up!</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Race Paces</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Jump for it!</td>
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<td></td>
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<td></td>
<td>• AFL Star</td>
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<td></td>
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<td></td>
<td>• Angles of Vision</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>• Get a Grip!</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>• Class Data Project</td>
</tr>
<tr>
<td></td>
<td>Working Mathematically</td>
<td></td>
<td>• Measuring Up!</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Race Paces</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• AFL Star</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Class Data Project</td>
</tr>
<tr>
<td><strong>Science</strong></td>
<td>Science Knowledge and Understanding</td>
<td>*</td>
<td>Class Data Project</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>* School-based activities</td>
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<td></td>
<td>Science at Work</td>
<td></td>
<td>* Class Data Project</td>
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<td></td>
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<td></td>
<td>* School-based activities</td>
</tr>
<tr>
<td><strong>Physical, Personal and Social Learning</strong></td>
<td>Interpersonal Development</td>
<td>Building Social Relationships</td>
<td>* All activities</td>
</tr>
<tr>
<td></td>
<td>Working in Teams</td>
<td></td>
<td>* All activities</td>
</tr>
<tr>
<td><strong>Interdisciplinary Learning</strong></td>
<td>Information and Communications Technology (ICT)</td>
<td>ICT for Visualising Thinking</td>
<td>* Class Data Project</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>* School-based activities</td>
</tr>
<tr>
<td></td>
<td>ICT for Communicating</td>
<td></td>
<td>* Class Data Project</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>* School-based activities</td>
</tr>
<tr>
<td><strong>Discipline-based Learning</strong></td>
<td>English</td>
<td>Reading</td>
<td>* All activities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Writing</td>
<td>* All activities</td>
</tr>
</tbody>
</table>

### VELS Progression Points for each Sporty Maths activity: Mathematics domain

**Dimensions:** Number (Num)  
Measurement, Chance and Data (M,C+D)  
Working Mathematically (WM)  
Space (S)

<table>
<thead>
<tr>
<th>Activity Number and Name</th>
<th>VELS Std/PG Pt</th>
<th>Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – Racing Cathy</td>
<td>Num 2.75</td>
<td>Use of place value (as the idea that ‘ten of these is one of those’) to determine the size and order of decimals to hundredths</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use algorithms for the addition and subtraction of numbers to two decimal places</td>
</tr>
<tr>
<td></td>
<td>Num 4.25</td>
<td>Conversion between ratio, fraction, decimal and percentage forms</td>
</tr>
<tr>
<td></td>
<td>M,C+D 3</td>
<td>Read digital time displays</td>
</tr>
<tr>
<td>2 - You be the Judge</td>
<td>Num 2.75</td>
<td>Use of place value (as the idea that ‘ten of these is one of those’) to determine the size and order of decimals to hundredths</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use algorithms for the addition and subtraction of numbers to two decimal places</td>
</tr>
<tr>
<td></td>
<td>Num 4.25</td>
<td>Expression of single digit decimals as fractions in simplest form and conversion between fraction and decimal forms</td>
</tr>
<tr>
<td></td>
<td>Num 4.5</td>
<td>Calculations involving operations with mixed numbers</td>
</tr>
<tr>
<td>3 - Wheelchair Races</td>
<td>Num 3</td>
<td>Use of place value (as the idea that ‘ten of these is one of those’) to determine the size and order of decimals to hundredths</td>
</tr>
<tr>
<td></td>
<td>M,C+D 3</td>
<td>Read digital time displays</td>
</tr>
<tr>
<td>4 - Reaction Times</td>
<td>Num 4</td>
<td>Comprehend the size and order of small numbers (to thousandths)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Place integers, decimals and common fractions on a number line</td>
</tr>
<tr>
<td></td>
<td>Num 4.25</td>
<td>Conversion between ratio, fraction, decimal and percentage forms</td>
</tr>
<tr>
<td></td>
<td>M,C+D 3.25</td>
<td>Identification of range for a set of data</td>
</tr>
<tr>
<td></td>
<td>M,C+D 3.75</td>
<td>Identification of the median for a set of data</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity Number and Name</th>
<th>VELS Std/PG Pt</th>
<th>Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 - Sharp Shooter</td>
<td>M,C+D 3.75</td>
<td>Calculation and analysis of the stability of a sequence of long run frequencies where the number of trials increases</td>
</tr>
<tr>
<td></td>
<td>M,C+D 4</td>
<td>Students describe and calculate probabilities using words, and fractions and decimals between 0 and 1.</td>
</tr>
<tr>
<td></td>
<td>Num 4.25</td>
<td>Expression of single digit decimals as fractions in simplest form and conversion between ratio, fraction, decimal and percentage forms</td>
</tr>
<tr>
<td></td>
<td>Num 5</td>
<td>Know the decimal and percentage equivalents for the unit fractions and find equivalent representations of fractions as decimals, ratios and percentages</td>
</tr>
<tr>
<td>6 - Measuring Up!</td>
<td>WM 2.5</td>
<td>Explanation and comparison of alternative computation methods</td>
</tr>
<tr>
<td></td>
<td>M,C+D 3</td>
<td>Estimate and measure length using appropriate instruments</td>
</tr>
<tr>
<td></td>
<td>M,C+D 3.25</td>
<td>They recognise and use different units of measurement including informal (for example, paces), formal (for example, centimetres) and standard metric measures (for example, metre) in appropriate contexts.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Read linear scales (for example, tape measures) in measurement contexts</td>
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<tr>
<td></td>
<td></td>
<td>Conversion between metric measurements for length</td>
</tr>
<tr>
<td>7 - Race Paces</td>
<td>M,C+D 2.25</td>
<td>Use of formal units of measurement; for example, metres to measure length, and hour, minute and second for time</td>
</tr>
<tr>
<td></td>
<td>WM 2.5</td>
<td>Application of estimations using personal units, such as pace length and arm span, and comparison with measures using formal units, such as metres and centimetres</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Explanation and comparison of alternative computation methods</td>
</tr>
<tr>
<td>8 - Jump for it!</td>
<td>M,C+D 3</td>
<td>Use a column or bar graph to display the results of an experiment</td>
</tr>
<tr>
<td>9 - AFL Star</td>
<td>M,C+D 3</td>
<td>Conduct chance experiments and display the results of these experiments</td>
</tr>
<tr>
<td></td>
<td>WM 4.5</td>
<td>Development of deductive proof to reach new conclusions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use of interpolation to make predictions</td>
</tr>
<tr>
<td>10 - Angles of Vision</td>
<td>M,C+D 3.25</td>
<td>Measurement of angles in degrees to the nearest 10°</td>
</tr>
<tr>
<td></td>
<td>S 3.25</td>
<td>Recognition of angles between lines particularly</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity Number and Name</th>
<th>VELS Std/PG Pt</th>
<th>Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>when lines are parallel or perpendicular</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 - Get a Grip!</td>
<td>M,C+D 4</td>
<td>Classify numerical data as discrete (from counting) or continuous (from measurement)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Present data in appropriate displays</td>
</tr>
<tr>
<td>Class Data Project</td>
<td>M,C+D 3.25</td>
<td>Estimation and measurement of angles in degrees to the nearest 10°</td>
</tr>
<tr>
<td></td>
<td>Num 3.5</td>
<td>Ordering of integers, positive fractions and decimals</td>
</tr>
<tr>
<td></td>
<td>M,C+D 3.5</td>
<td>Sorting of data using technology</td>
</tr>
<tr>
<td></td>
<td>WM 3.5</td>
<td>Incorporation of text, data, images and graphs using technology, to report the results of an investigation</td>
</tr>
<tr>
<td></td>
<td>M,C+D 3.75</td>
<td>Interpretation of pie charts and histograms</td>
</tr>
<tr>
<td></td>
<td>M,C+D 4</td>
<td>Present data in appropriate displays (for example, a pie chart for eye colour data and a histogram for grouped data of student heights).</td>
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<tr>
<td></td>
<td></td>
<td>Calculate and interpret measures of centrality (mean, median, and mode) and data spread (range).</td>
</tr>
<tr>
<td></td>
<td>M,C+D 4.25</td>
<td>Recognition of the mean value of a set of measurements as the best estimate, and that the range could represent the associated error</td>
</tr>
<tr>
<td></td>
<td>WM 4.25</td>
<td>Use of spreadsheets to manipulate data and generate graphs</td>
</tr>
<tr>
<td></td>
<td>WM 4.75</td>
<td>Communication of the results of a mathematical investigation in an appropriate form</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Creation and manipulation of tables and graphs using technology</td>
</tr>
</tbody>
</table>
Resources

Mathematics Terms and Concepts

<table>
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<tr>
<th>Concept</th>
<th>Definition</th>
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</thead>
<tbody>
<tr>
<td>Average</td>
<td>See Mean</td>
</tr>
<tr>
<td>Estimate</td>
<td>A close guess of the actual value, usually with some thought or calculation involved.</td>
</tr>
<tr>
<td>Mean</td>
<td>The mean is a calculated &quot;central&quot; value of a set of numbers. To calculate the mean add up all the numbers and divide by how many numbers there are. The mean is also called the average.</td>
</tr>
<tr>
<td>Median</td>
<td>The middle number (in a sorted list of numbers). Half the numbers in the list are less, and half the numbers are greater. To find the Median, place the numbers you are given in value order and find the middle number. The median lies on an actual number if there is an odd number of data pieces and in between the two middle numbers for an even number of data pieces.</td>
</tr>
<tr>
<td>Modal Group</td>
<td>Divide data into 6-12 groups, by starting at the low end of the data and going up in intervals of 5 or 10 (or greater, depending on the range) and circling the data in each interval with a marker. Eg. all Heights from 140-144, 145-149, 150-154, etc. The modal group is the interval with the most pieces of data in it.</td>
</tr>
<tr>
<td>Mode</td>
<td>The number that has the highest 'frequency' (i.e. appears the most times) is the mode. (Sometimes there will be no mode for a set of data or there may be more than one mode for a set of data).</td>
</tr>
<tr>
<td>Predict</td>
<td>Declare or indicate probable result in advance.</td>
</tr>
<tr>
<td>Prediction</td>
<td>Guess of the value of result yet to be obtained.</td>
</tr>
<tr>
<td>Range</td>
<td>The difference between the highest and lowest number.</td>
</tr>
</tbody>
</table>

Online Resources

Creating Charts using Microsoft Excel tutorials online:

General Microsoft Excel tutorials online:
http://www.baycongroup.com/el0.htm

Department of Education and Early Childhood Development Mathematics Domain:
Resource organisations

The Mathematical Association of Victoria
61 Blyth St
Brunswick, VIC 3056
Tel: 03 9380 2399
Fax: 03 93899 0399
Website: www.mav.vic.edu.au

Australian Mathematics Trust
University of Canberra
ACT 2601
Tel: 02 6201 5136
Fax: 02 6201 5052
Website: www.amt.canberra.edu.au

Family Maths Project Australia (FAMPA)
PO Box 317
Bulleen VIC 3105
Tel: 03 9852 0096
Fax: 03 9852 0096
Mobile: 0146 174 674

Australian Association of Mathematics Teachers Incorporated
GPO Box 1729
Adelaide SA 5001
Tel: 08 8363 0288
Fax: 08 8362 9288
Website: www.aamt.edu.au/
School-based activities

*Sporty Maths* can be used as a series of Maths activities that are completed within the *Sportworks* exhibition at Scienceworks, as a project where data collected at Scienceworks is collated and analysed on return to the classroom, or as part of an integrated program covering aspects of Mathematics, Science, Sport and a variety of other subjects. The material can be adapted as required to suit the needs of individual classes or students.

Pre-visit activities

Before coming to Scienceworks students should be familiar with how to make and record measurements using rulers, scales and timers. Units of measurement should be investigated and conversion between units introduced (millimetres to centimetres and metres, grams to kilograms, minutes to seconds).

- Using a ruler measure:
  - How wide is your book?
  - How wide is your desk?
  - How wide is the door?
  - How long is the room you are in?

  Compare the measurements, what units did you use to measure each item? Did you use the same units for each item? If not, why not? Is it easier to use different units for different sized objects? Write each of your measurements in mm, cm and metres.

Students should be familiar with the concepts of difference (larger number - smaller number) and combined number (number 1 + number 2 + number 3). An introduction to decimal and mixed numbers, percentages, ratio, and rounding is also recommended.

Before visiting Scienceworks

Students should also be familiar with the activities they will be doing with partner(s) in the Sportworks exhibition. For example, the *Sportspass* and class data project or a selection of the student worksheets:

- Activity 1 – Racing Cathy
- Activity 2 – You be the Judge
- Activity 3 – Wheelchair Races
- Activity 4 – Reaction Times
- Activity 5 – Sharp Shooter
- Activity 6 – Measuring up
- Activity 7 – Race Paces
- Activity 8 – Jump for it
- Activity 9 – AFL Star
- Activity 10 – Angles of Vision
- Activity 11 – Get a Grip

Post-visit activities

Research and activities can be used to extend students knowledge and understanding either before or after your visit to Scienceworks. Some ideas for further research and activities are:

- Research Cathy Freeman:
  - What can you find out about her life?
  - What events did she compete in?
  - What records did she set?
  - What medals did she win?

• Research a selection of track (and/or field) records:
  Who set them and when?  Graph them over time.
  What is the trend in your graph?
  What do you think this is due to?

• Find out how Gymnastics is scored at the Olympics.
  What are the judges looking for?
  How are the scores calculated?
  Investigate the scoring system used for diving.
  How is this the same or different to gymnastics?

• What events do wheelchair athletes compete in?  Compare their records to the records for
  'able bodied' events.

• How accurate are Australia's top netballers are when shooting goals?  What maths is used
  to describe their accuracy?

• Investigate the nervous system and how it is involved in our 'reaction times'.
  How quickly can messages (nerve signals) travel around the body?
  Is there a limit to how fast the human reaction time can be?

• Design an experiment to measure reaction times to sound instead of light.

• Investigate ratio and proportion in the body.  Some theories you could test are:
  - Is a person's arm span the same as their height?
  - Is a person's height 1.618 times the distance from their navel to the ground?
    (1.618 is known as the 'golden' ratio)
  - Is the distance from elbow to wrist the same as foot length?

• Find out how forensic scientists and anthropologists use the lengths of certain bones to
  determine how tall or old people were.
Sportworks Exhibition Floor Plan

**Activity 1: Racing Cathy**

**Collecting the Data**

**What to Do:** Go to the Sprint Track
- Line up on the start line with your partner.
- When you hear the starting gun race to the finish line.
- Make sure you stay in your lane!
- Look up above the finish line to see your time.

Write your time here: ______________________

Write your partner's time here: ______________________

Write Cathy's time here: ______________________

**Looking at the Data:**

1. Write the three times in order from slowest to fastest. Under the times write your name, your partner's name, and 'Cathy'.

Times: ______________________  ______________________  ______________________

Names: ______________________  ______________________  ______________________

2a. What is the difference between your time and your partner's time?

Difference = ______________________

b. If you, your partner and Cathy ran in a relay, what would be your combined time?

Combined time = ______________________

The times at the finish line are displayed as decimal numbers.

3a. Write the decimal times as fractions or mixed numbers

<table>
<thead>
<tr>
<th>Your time</th>
<th>Partner</th>
<th>Cathy</th>
</tr>
</thead>
</table>

b. How many different ways can you write the three fractions? Put your answers in the box below.

<table>
<thead>
<tr>
<th>Your Time</th>
<th>Partner</th>
<th>Cathy</th>
</tr>
</thead>
</table>
ACTIVITY 2: You Be The Judge!

Collecting the data

What to Do
- Ask another pair of students to join you and your partner.
- Go to the gymnastics exhibit.
- Three of you will be judges while the fourth person will listen out for the coach’s score.
- The scores for each judge are displayed above the screen. Press ‘Clear’ on the keypad until they show ‘0’. Now you are ready!

Watch the routine and listen to the judge’s commentary.
At the end of the routine, use the keypad to enter the score you would give the gymnast.
Your score will come up on the display above the screen.
The coach’s score will appear on the screen.

Write down the four scores in the boxes below.

Judge 1          Judge 2    Judge 3          Coach

Looking at the data

1. Write the four scores in order from lowest score to highest score.

__________ , __________ , __________ , __________

2. What is the combined score of the 3 judges and the coach?

Combined Score: ________________

3. Calculate the difference between the lowest and the highest scores.

Difference: _________________

4. Write each of the scores as a fraction or mixed number in simplest form.

Judge 1          Judge 2    Judge 3          Coach

5. For the gymnasts on the screen, a score of 10 is a ‘perfect’ score.
Looking at the coaches score, how far off a ‘perfect score’ was the gymnast you saw?

Give your answer as:
(i) a decimal        (ii) a fraction

ACTIVITY 3: Wheelchair Races  

Name: ____________________

Collecting the data

What to Do

- Go to the Wheelchair Race.
- Ask another pair of students to join with you and your partner.
- Two of you will have a wheelchair race.
- The other two record their partner’s finishing time in the box below. (The time is shown on the top left hand corner of the screen.)
- Swap places and record your partner's time for them on their sheet.

My race time:

[Box for time entry]

Looking at the data

1. Draw an arrow pointing to the number of minutes in the time. Write ‘minutes’ next to the arrow.

2. Draw an arrow pointing to the number of seconds in the time. Write ‘seconds’ next to the arrow.

3. Circle the part of the time that is less than one second.

4. Write the part you have circled as a fraction of a second.
**ACTIVITY 4: Reaction Times**

**Collecting the data** *(collect more data below)*

**What to Do**

- Go to the *Body Talent - Quick Reactions* exhibit in the ‘Test Yourself’ section.
- Follow the directions and measure your reaction time three times.

Ask your partner to write each of your times in the boxes below.

```
_________________  ,  ___________________  ,  ___________________
```

**Looking at the data**

1a. Write you’re three times in order from slowest to fastest.
(Remember – ‘slowest’ does not mean ‘smallest!’)

```
_________________  ,  ___________________  ,  ___________________
```

b. Round off each of your times to the nearest hundredth.

```
_________________  ,  ___________________  ,  ___________________
```

c. Show your ‘rounded off’ times on the number line below.

![Number line](image)

```
0.1  0.15  0.2  0.25  0.3  0.35  0.4  0.45  0.5
```

d. Write each of your times in question 1b as fractions. Simplify the fractions if possible.

**Collecting more data**

Measure your reaction time two more times. Ask your partner to write each time in the space below.

```
_________________  ,  ___________________
```

**Looking at more data**

2a. Write out the five reaction times in a line from smallest (fastest) to largest (slowest)

```
_________________  ,  ___________________  ,  ___________________  ,  ___________________  ,  ___________________  
```

b. Put a circle around the median number in the line above.

c. Find the range of your reaction time data.

**To see how important reaction times are in sport, go and try the *Virtual Soccer Goalie* exhibit when you have finished your activities!**
**ACTIVITY 5: Sharp Shooter**

**Before the activity**

**What to Do**
- Go to the **Netball** ring.
- You and your partner will each have at least 5 shots at goal.
- Before you take your shots, predict how many you will get in by filling in the sentence below.

1a. I predict I will get ______ out of 5 shots in the ring.

b. Write your prediction as:
   - (i) a fraction
   - (ii) a decimal
   - (iii) a percentage
   - (iv) a ratio of goals to total number of shots

**Collecting the data**
- To shoot for goal, stand in front of the ring with your toes just touching the wood.
- Have 5 shots.
- As you shoot, ask your partner to record your shots in the table below, by placing a tick or cross in the right column.
- If you don’t get any in after 5 shots, keep shooting until you do get one.
- Swap with your partner and record their shots.

<table>
<thead>
<tr>
<th>Shot Number</th>
<th>Ball went in ring</th>
<th>Ball hit ring</th>
<th>Ball missed ring completely</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Looking at the data**

2. Now:
- Write your number of goals as a fraction of the number of shots you had.
- Write this fraction as a decimal, as a percentage and as a ratio (number of goals to the total number of shots), if you can.

<table>
<thead>
<tr>
<th>Number of Goals</th>
<th>Number of Shots</th>
<th>Result as a Fraction</th>
<th>Result as a Decimal</th>
<th>Result as a Percentage</th>
<th>Result as a Ratio</th>
</tr>
</thead>
</table>
3. Comment on how accurate your prediction was. Use your fraction, decimal percentage or ratio numbers to help you compare them.

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

4. Compare your results to your partners.

Looking at these results, who is the more accurate goal shooter? Give a reason for your answer.
_______________ is the more accurate shooter, because_______________________________
______________________________________________________________________________

5. If you had one shot at goal what is the probability:

a. the ball will go in the ring?

b. the ball will hit the ring?

c. the ball will completely miss the ring?

6. If you had 20 shots at goal, how many goals do you think you would get?

Give a reason for your answer.
______________________________________________________________________________
______________________________________________________________________________

7. Many sports such as netball, football and tennis, use percentages to describe a player’s performance. Why do you think percentages are used, instead of fractions, decimals or ratios?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

ACTIVITY 6: Measuring Up!  
Name: ________________________

Collecting the data

What to Do
Go to these exhibits in the ‘Test Yourself’ section: 1. Compare your proportions,  
3. Measure your height and  
4. Measure your arm span

These pictures will help you find them.

- At each exhibit, you will measure a part of your body using the instructions at the exhibit.
- Before you start measuring, write down an estimate (a guess), in centimetres (cm), in the first column of table below.
- Write down your measurements next to the estimates in the table.
- At Exhibit 1 measure your Hand Span (from the thumb to the little finger when your hand is stretched out) in centimetres
- At Exhibit 3 measure your Height in centimetres
- At Exhibit 4 measure your Arm Span (stretch out your arms and measure from finger tip to finger tip) in centimetres
- Record your partner’s measurements in the table as well.

<table>
<thead>
<tr>
<th>Body Part</th>
<th>My Estimate (cm)</th>
<th>My Measurement (cm)</th>
<th>My Partner’s Measurement (cm)</th>
<th>My Measurement (m)</th>
<th>My Partner’s Measurement (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand Span</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arm Span</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Looking at the data

1a. For which body part was your estimate closest to your measurement? ____________  
   b. Use numbers to describe how close it was____________________

2a. For which body part was your measurement closest to your partner’s measurement?  
   __________________
   b. Use numbers to describe how close it was._____________________

3. Many people think that a person’s arm span is the same as their height.  
   How close is your arm span to your height? ________________

4. Convert your measurements from centimetres (cm) to metres (m) and write them in the correct column of the table (previous page).

5a. Estimate: About how many ‘hand spans’ tall are you? ________  
   b. Could you work this out exactly?  
   c. Describe what you would do.

6. A cricket pitch is about 20m long. Look at your height and estimate how many of ‘you’, laid end to end, could fit along a cricket pitch. Describe how you could work this out exactly.
ACTIVITY 7: Race Paces

Collecting the data

What to Do

Go to the Sprint Track
- Line up on the start line with your partner.
- When you hear the starting gun, race to the finish line.
- Make sure you stay in your lane!
- Look up above the finish line to see your time.

Write your time here: __________

1a. What units are used for measuring the race times?
__________________

Source: Rob Blackburn, Paoli Smith

b. Have a look
Look at the racetrack you have just run down. Estimate, only by looking, how many metres it is from start to finish.

Write your 'looking' estimate here: __________

c. Pace it out
Now walk alongside the track and ‘pace out’ the length from start to finish. Use your paces to improve your estimate.

Write your ‘pacing’ estimate here: __________

d. What is it really?
Ask your teacher or a Scienceworks staff member how long the racetrack actually is, and write it down.

Actual length of the racetrack: __________

Looking at the data

2. How close was I?
Compare your estimates to the actual length of the track. How close was your best estimate to the actual length of the track? Use numbers to help you describe your answer.
ACTIVITY 8: Jump For It!

Collecting the data

Go to Body Talent - Explosive Power.
It’s Exhibit 8 in the ‘Test Yourself’ section.

Follow the instructions and jump as high as you can.
Record the height of three jumps for you and three for your partner in the table below.

<table>
<thead>
<tr>
<th>Jump</th>
<th>Me</th>
<th>My Partner</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. What units are the jumps measured in? _______________

Looking at the data:

2a. Show your and your partners results as a bar graph on the grid below.
(Provide labelled axes and scale)

(b) Name two sports where it would be useful to have ‘Explosive Power’.

________________________   ________________________
ACTIVITY 9: AFL Star

Collecting the data

What to do

Go to the Football Handpass exhibit with Adam Cooney.
- You will have 5 goes at handpassing the football through the hole.
- Agree with your partner where you will stand to do the handpassing – it should be at least two big steps away from the hole.
- Before you start, predict how many handpasses you will get in the hole by filling in the sentence below.

1a. I predict I will get ______ out of 5 shots in.

b. As you shoot, ask your partner to record your shots in the table below, by placing a tick in the right column to show what happened.

c. Swap with your partner and record their shots.

<table>
<thead>
<tr>
<th>Shot Number</th>
<th>Went in</th>
<th>Ball hit side of the hole but didn’t go in</th>
<th>Ball missed hole completely</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Looking at the data:

2a. Comment on how accurate your prediction was  
________________________________________________________________________
________________________________________________________________________

b. If you had 20 handballs, do you think you would get more in?

c. How many would you get?
   Explain your answer.
ACTIVITY 10: Angles Of Vision

Collecting the data
Go to Body Talent - Wide Vision. It's Exhibit 12 in the ‘Test Yourself’ section.

1a. Follow the instructions to measure your ‘Angle of Vision’ for your left eye.

Angle = ________º

(b) Now measure the Angle of Vision for your right eye.

Angle = ________º

Source: Tim Byrne

Looking at the data

2a. Draw your eyes at the centre of the circle, looking straight ahead at the 0º mark.

- Show the angle of vision for each eye by drawing a straight line from the eye to the edge of the circle.
- Label each angle with its number of degrees

b. Colour in the space inside your angles to show your complete ‘field of vision’.

3. What is your Total ‘field of vision’? _______________
ACTIVITY 11: Get A Grip!

Collecting the data

Go to Grip Strength. It’s Exhibit 13 in the ‘Test Yourself’ section. Hold down the ‘On’ button until a zero is showing.

Follow the instructions to measure the grip strength of your left and right hand, and your partner’s left and right hand. Record your results in the table below.

<table>
<thead>
<tr>
<th>Hand</th>
<th>Me</th>
<th>My Partner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Looking at the data

1. Is this data discrete (counting) or continuous (measurement)?

2. Draw and label a graph that compares the grip strength of your hands to your partner’s hands.

3a. Is there a difference between your right and left hand? _______

   b. How big is it? _______

   c. Why do you think this is? ____________________________________________

Class Data Project

Students use the Sportworks exhibition at Scienceworks to measure and record data about their own abilities. Data collected by the class is collated back at school where students work in small groups to analyse the data and share their findings.

At Scienceworks

Students use a ‘Sportspass’ to record their personal data in the ‘Test Yourself’ section of the Sportworks exhibition. There may not be enough time to complete all 13 stations and still see the rest of the exhibition, so go through the Sportpass with students beforehand and decide which stations the students will collect data from and how many pieces of data they will record at each station.

Groups of students will need to be broken up and started at different stations.

Back at School

Collecting the data

1. Give every student several sticky-backed notes. On the board, write large headings for each category of data the students collected on the Sportpass (‘Hand Width’, ‘Height’ etc). Ask students to write each category on an individual note, and their particular measurement for that category. (If students recorded more than one measurement, they could choose their best one, or give the mean, if they are able to easily calculate it).

2. Students come up to the board and place their sticky notes under each category. Check that you have the class number of ‘stickies’ under each heading.

Analysing the data

3. Choose one set of data to work through and model the calculations with the whole class. With students help, line up stickies in one line across the board from smallest number to largest. Organising the data this way makes it easier to do the following calculations:

Median – find the middle number (counting in from both ends is a nice visual way). Point out that the median lies on an actual number if there is an odd number of data pieces and in between the two middle numbers for an even number of data pieces.

Mean – add up the numbers on the line of stickies, and divide by how many stickies there are. Note that it is daunting to do one long sum without errors (by hand or calculator); it is easier to add up a few numbers at a time, and then sum these totals.

Mode – look through the line for any numbers that are the same and circle them or stack them up. The number that has the highest ‘frequency’ (i.e. appears the most times) is the mode. (Sometimes there will be no mode for a set of data or there may be more than one mode for a set of data).

Range – find the difference between the highest and lowest number.

Modal Group - divide data into 6-12 groups, by starting at the low end of the data and going up in intervals of 5 or 10 (or greater, depending on the range) and circling the data in each interval with a marker. Eg. all Heights from 140-144, 145-149, 150-154, etc.

The modal group is the interval with the most pieces of data in it.

A frequency table can now easily be drawn up.

Graphing Data

- Stacking the stickies in each interval one above the other creates an instant frequency histogram.

- Forming a circle out of the line of stickies, then drawing lines from the centre out to form each sectors for each interval creates an instant pie graph.

These can be done kinaesthetically with the students themselves each taking their own piece of data and lining up in order from largest to smallest value.

To form a frequency histogram, students line up in groups behind large cards marked with each interval of the data and placed in a line on the ground.

To make a pie graph, take the original, ordered line of students and bend them around in a circle. Use string radiating out from the centre of the circle to form the pie graph sectors – get students at the ends of each interval to hold them.

Discussing the angle made by each sector and the number of students in each sector leads to how to calculate angles for drawing the pie graph

\[
\text{(no. of students in the interval)} / \text{(no. of students in class)} \times 360°
\]

(Level 5: Dot Plots and Stem and Leaf Plots can also be modelled using the sticky notes. A double Stem and Leaf Plot can be used to compare two groups of students in the class eg. boys and girls)

Once all the required calculations have been modelled, break the class up into work groups of 3 or 4 students. Assign each group at least one category of data to work on, and give them all the sticky notes from that particular category. (Some groups may be able to handle more than one group of data).

Students work together to calculate each of the statistics required and create frequency tables and graphs.

When data has been collated groups (or the class) should discuss the difference between the values obtained for mean, median and mode and the significance of each. Which gives the best estimate of the value? What does the range tell you?

ICT

Excel can be used to display the collected data in tables and graphs. Functions such as ‘Sum’ and ‘Sort’ may be used to further analyse the collected data. If students have some experience, they may be able to construct Excel formulae for Mean, Median and Mode.

A central file or a Wiki may be used for groups to share their calculations with the rest of the class.

Including pictures of the sports where each attribute would be useful (or pictures taken by the students at Scienceworks) produces a colourful visual presentation for the class.

Science

Choose one of the categories of data (e.g. Reaction Time, Jump Height, Upper Body Strength, Hand-Eye Coordination, Grip Strength).

Research the types of sports in which this attribute could be an advantage and why.

Interpersonal Learning

Students work collaboratively when handling data and producing their presentation product.
Presentation of Data

There are many ways data can be presented. A visual interpretation of the data collected can be shown by:

1. Tracing around the body of a group member to produce a life size poster.
   - Label five or six of the types of data and the part of the body they pertain to.
   - Place Mean or Average values next to the labels.
   - The poster could be labelled ‘The Average Student in Class 6C’.
   - Inside the poster could contain selected graphs, tables and calculations.

2. Data may also be presented using a slide show or PowerPoint presentation that could include photographs taken while at Scienceworks as well as data collected.

3. A presentation may be created using Excel including charts and graphs comparing individual and class data.

These are a few options for how you can present your data, can you think of another way?