Exploring the mathematics framework
Measurement sense
Statistical investigations
Exploring two aspects

- Consider your programme
- Consider a student
- Connect the aspect to the NZC and the NS

Using PaCT efficiently
Activity 1: Order the “big ideas” that underpin each set of illustrations
| 6<sup>th</sup> | The students derive measurements of area and of the volume of cuboids ... |
| 2<sup>nd</sup> | The students make multiple comparisons between objects ... |
| 4<sup>th</sup> | The students estimate and measure using the commonly used standard ... |
| 3<sup>rd</sup> | The students use numbers and a non-standard unit ... |
| 1<sup>st</sup> | The students physically manipulate objects to directly compare them ... |
| 7<sup>th</sup> | The students deduce and use formulae to measure perimeter, area and volume ... |
| 5<sup>th</sup> | The students measure length, capacity and weight by selecting an appropriate measuring device. .. |
Measurement sense

Measurement sense

Our measurement work was focused around supermarket products. Ben likes to be very precise when he reads scales, even those that do not have all the numbers. He gets right down so he can eyeball them, and systematically works out values by interpreting the increments. He knows most of the measurement abbreviations too. Whether he is measuring length, working out volume or weighing, he certainly knows the importance of aligning the start of a measurement with zero. He even compensated for the difference when the scales were not initially at zero! Working out perimeter was straightforward for him too, because he added the pairs of parallel sides, although he needs to be reminded that the unit of measurement here is centimetres.
Measurement sense
Measurement sense: linking to National Standards

Where would you place the end of year 8 standard?

Where would you place the after one year standard?
| After 1 | compare the lengths, areas, volumes or capacities, and weights of objects directly |
| After 2 | compare the lengths, areas, volumes or capacities, and weights of objects and the durations of events, using self-chosen units of measurement |
| After 3 | measure the lengths, areas, volumes or capacities, and weights of objects and the duration of events, using linear whole-number scales and applying basic addition facts to standard units |
| End 4  | measure the lengths, areas, volumes or capacities, weights, and temperatures of objects and the duration of events, reading scales to the nearest whole number and applying addition, subtraction, and simple multiplication to standard units |
| End 5  | measure time and the attributes of objects, choosing appropriate standard units and working with them to the nearest tenth |
| End 6  | measure time and the attributes of objects, choosing appropriate standard units |
Statistical investigations

Activity: Order the illustrations
Tipurangi (unintentional gift)

Annotation

Ewan participates in an investigation and can answer an investigative question but he is not able to explain his reasoning.

Problem: Tipurangi (unintentional gift)

Room Rima are maintaining their small class garden. They talk about useful plants that sow their own seeds and grow in their garden (chickweed for ointment, puha or milk thistle is eaten, dandelion makes tea, and clover flowers help the bees to make honey).

The children pull out and display the plants they collect from their garden.
Class pets

Annotation

Siale participates in a statistical investigation posed by her teacher and contributes appropriately to the data display. She can correctly interpret the display, demonstrating an understanding of how the whole data set (rather than her own answer alone) can be used to answer the investigative question.

Problem: Class pets

Room Kākāriki are discussing the possibility of getting a class pet. The teacher poses the following investigative question: “What class pet do children in Room Kākāriki want?” The teacher draws up a chart and asks the students to complete the following task:

*Decide which class pet you would most want and put a tick in the row beside that pet.*

<table>
<thead>
<tr>
<th>Class Pet</th>
<th>Ticks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frog</td>
<td>✓</td>
</tr>
<tr>
<td>Fish</td>
<td>✓✓</td>
</tr>
<tr>
<td>Mouse</td>
<td>✓✓✓</td>
</tr>
</tbody>
</table>
Sizing up families

Annotation

Jake collects whole-number data to answer a question posed by his teacher. He makes an appropriate graph to present his findings. He can discuss these findings with his teacher and gives an appropriate answer to the investigative question.

Problem: Sizing up families

The Room 4 social science inquiry focus is on families. As part of their study, the class discusses ways of collecting data and explores the features of a tally chart, a bar graph and a dot plot. The teacher then asks:

*How big are our families? Collect data to answer this question and present your findings.*

Student Response

Jake draws up the following chart and asks everyone to write in it the number of people living in their house:

<table>
<thead>
<tr>
<th>Name</th>
<th>Number of People in House</th>
<th>Name</th>
<th>Number of People in House</th>
<th>Name</th>
<th>Number of People in House</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sally</td>
<td>6</td>
<td>Casey</td>
<td>6</td>
<td>Jeremy</td>
<td>4</td>
</tr>
<tr>
<td>James</td>
<td>4</td>
<td>Jermaine</td>
<td>5</td>
<td>Philip</td>
<td>4</td>
</tr>
<tr>
<td>Hope</td>
<td>5</td>
<td>Kairos</td>
<td>4</td>
<td>Jake</td>
<td>3</td>
</tr>
<tr>
<td>Sia</td>
<td>8</td>
<td>Ysnf</td>
<td>5</td>
<td>Hayley</td>
<td>4</td>
</tr>
<tr>
<td>Tia</td>
<td>4</td>
<td>Alli</td>
<td>7</td>
<td>Grace</td>
<td>5</td>
</tr>
</tbody>
</table>
Sleepy heads

Annotation

Simone notices something interesting in the data she is given (different bedtimes and wake times), which leads her to pose an “I wonder” question. She turns this into an investigative question that she can answer using statistical data. Her question is a summary question because it requires a summary or descriptive answer for a group of data (Simone’s class).

Simone collects and collates whole-number data to answer her question. She displays her results using a stem-and-leaf graph, a tally chart (or frequency table) and a bar graph. All these displays help Simone answer her question. Simone indicates she could also have used a dot plot to display this data.

Simone communicates her findings in context and can draw an appropriate conclusion to answer her question. She explores other interesting information from her data.

Problem: Sleepy heads

The students in Room 9 have just participated in CensusAtSchool New Zealand. The teacher gives them a copy of their class data and asks them to complete the following task:

Pose an investigative question to explore this data and carry out your statistical investigation.

<table>
<thead>
<tr>
<th>Bedtime</th>
<th>Wake time</th>
<th>Bedtime</th>
<th>Wake time</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.15 p.m.</td>
<td>6.45 a.m.</td>
<td>8.00 p.m.</td>
<td>7.00 a.m.</td>
</tr>
<tr>
<td>10.00 p.m.</td>
<td>6.00 a.m.</td>
<td>10.00 p.m.</td>
<td>8.00 a.m.</td>
</tr>
</tbody>
</table>
Investigating hamstrings

Annotation

Eliza poses a comparison statistical investigation (comparing flexibility before and after exercise). She collects multivariate measurement data (the variables are before and after, and the measure is hamstring flexibility in centimetres). Eliza uses two different displays to analyse her data and chooses the more appropriate display (a dot plot) to answer her question. She communicates her findings in context.

Problem: Investigating hamstrings

The teacher asks the students to complete the following task:

*Pose a question that can be answered by conducting a statistical investigation. Carry out the investigation and present your findings.*

Student Response

Eliza’s work sample is as follows:

*Question: Does exercise improve hamstring flexibility?*
Changes in technology usage

Annotation

Mavish poses questions about a wider population (year 9 students across New Zealand) and takes a sample of this group (rather than collecting all the data from a smaller group such as her class or school). Her sample data is multivariate time-series data (the variables are each of the various items of technology, and the data is collected over time, in this case from 2003 to 2011). Mavish uses a line graph to analyse the data, looking for patterns within (noticing increases and plateaux), between (comparing different technologies) and beyond (making predictions for the future). Her conclusions generalise her findings within the context.

Problem: Changes in technology usage

The students in this class have completed the 2011 CensusAtSchool New Zealand survey. The teacher gives them the following task:

Explore the data from current and past years of CensusAtSchool New Zealand and pose investigative questions that can be answered with the data.

Student Response

Mavish's work sample is as follows:

Question

How has technology usage for year 9 students in New Zealand changed over time?

Plan

Take random samples of 100 year 9 students in New Zealand in each of the 2003, 2005, 2007, 2009 and 2011 data sets and use the random sampler from CensusAtSchool New Zealand at www.censusatschool.org.nz
Statistical investigations: linking to National Standards

Where would you place the end of year 8 standard?