Developing students’ inferential reasoning:

Stories from Statistics classes 2010

# Plenary presentation: 2 December 2010

Statistics Teachers Day

Auckland Mathematics Association and Department of Statistics, The University of Auckland



## What should I say?

# Presenters:

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Material available: <http://www.censusatschool.org.nz/> Look under new curriculum, then informal inference.

**SHAPE ACTIVITIES**

|  |  |  |
| --- | --- | --- |
| **Sketch of Shape** | **Quick kid’s description** | **Context** |
| 1. |  |  |
| 2. |  |  |
| 3. |  |  |
| 4. |  |  |
| 5. |  |  |
| 6. |  |  |
| 7. |  |  |
| 8. |  |  |
| 9. |  |  |

CONTEXTS:   
School attendance-percentage half days Hours worked weekly (SURF) Right foot length-cm (C@S)  
Skips in 30 secs - Yr5-8 (C@S) Household debt (SURF) Reaction time-secs(C@S)  
Weight Great Spotted Kiwi-kg (Kiwi Kapers) Hair length-cm (C@S) Birth Month (C@S)

Ages of **all** the people in our school



Time to get to school (pupils)



Car prices on TradeMe



Year of manufacture of registered cars



Source: S Wright

**The Thinking Routine and Framework**

***What information can you get from this plot?***

***What evidence do you have for saying that?***

**Teacher Activity Example 1:**



|  |  |
| --- | --- |
| Information | Evidence |
|  |  |
|  |  |
|  |  |
|  |  |

Source: L Smith

**Teacher Activity Example 2:**

– Does the new formula *tend to* give a shorter relief time to patients?

heaache dot plot.tif

|  |  |
| --- | --- |
| Information | Evidence |
|  |  |
|  |  |
|  |  |
|  |  |

Source: L Smith

**Teacher Example Activity 3:**

– Do weights of male kiwis tend to be greater than weights of female kiwis?



|  |  |
| --- | --- |
| Information | Evidence |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

Source: L Smith

**Using shape to tell the story**

**Give pairs of students a plot**

**Part One:**

In pairs, write a full description of your plot

- Use statistical terminology where appropriate

- Write in terms of the context

- Give some idea of *x*-values

**Part Two:**

Give your description to another pair

- Don’t let them see your plot

- Ask them to sketch the distribution from your description

Full description:

Draw sketch of shape of graph from description.



**Travel times to the airport**

Amanda travels to the airport regularly in her job as a sales consultant. Sometimes she travels by bus, sometimes by shuttle, sometimes by taxi. She takes a sample of the time it takes to get there, in minutes.

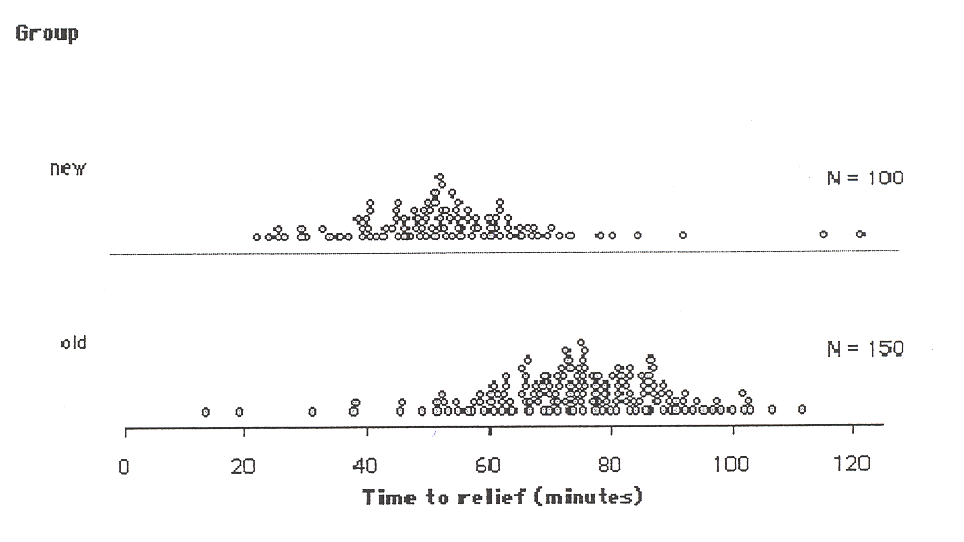


1. What does each dot on the dot plot represent?
2. What information about travel times to the airport can you get from this plot?

1. a) If you had to choose one dot which is a typical time for journey to the airport by taxi, which dot would you choose? **Mark it on the graph**. Do the same for a journey to the airport by shuttle and the same for a journey by bus.
2. How did you decide where to put the dots in Question 3?
3. Put a circle around the **middle 50%** of the shuttle travel times. Repeat for the other vehicles.
4. Write a sentence comparing the travel times for each vehicle using the word AVERAGE.
5. Write a sentence comparing the travel times for each vehicle using the word VARIATION.
6. Write a summary of the results for Amanda recommending which way to travel to the airport.

Source: L Smith

What a headache! Student handout



What does each dot represent?

What is the longest time a patient takes to get headache relief with the old formula?

What is the shortest time a patient takes to get headache relief with the new formula?

Mark a dot which is a **typical time** for a patient to get relief with the old formula.

Mark a dot which is a typical time for a patient to get relief with the new formula.

How did you decide where to put your crosses?

Put a circle around the times it takes for the middle 50% of patients to get headache relief from the old formula.

Put a circle around the times it takes for the middle 50% of patients to get headache relief from the new formula.

Were enough patients tested to make a comparison between the two formulas? Does it matter that a different number of patients were used with each formula?

What conclusion would you draw about the new formula? Explain why.

Source: L Smith

# GEMS OF IDEAS – for things we didn’t have time to share

## Three bear hugs activities

Bear Hugs 1: summary type investigative questions introduction

<http://www.censusatschool.org.nz/classroom-activities/bear-hugs-1/>

Bear Hugs 2: relationship type investigative questions introduction

<http://www.censusatschool.org.nz/classroom-activities/bear-hugs-2/>

Bear Hugs 3: comparison type investigative questions introduction

<http://www.censusatschool.org.nz/classroom-activities/bear-hugs-3/>

## Familiarisation with the variables being used

Get students to do the CensusAtSchool survey (you would probably use the current year’s questionnaire). The survey is updated and repeated every two years. If it is the survey year, then get them to complete the survey online in the survey period. For 2011 the survey period is: May 2 to June 10 (six weeks only).

If you are planning on using a different database, for example, 2009 or 2005 then it is best to use the questionnaire associated with that database. All the databases, their variables, the questions and links to various tools can be found at: <http://www.censusatschool.org.nz/resources/data-analysis-tools/>

Information on collecting the different measures can be found at: <http://www.censusatschool.org.nz/2009/information-packs/> look for the making measures.doc

Students could explore the databases further by being taken to the computer room and after a brief introduction allowing them to “play” with the data viewer. The data viewer currently has the 2009; 2007; 2005 C@S databases as well as the kiwi kapers database: <http://www.censusatschool.org.nz/2010/data-viewer/>

Help is available at: <http://www.censusatschool.org.nz/2009/data-viewer/help/>

Providing the opportunities for students to do these activities can provide some good diagnostic information for you as their teacher.

# Senior Secondary Guides – Mathematics and Statistics

## Senior Secondary Guides for Mathematics and Statistics are on TKI

<http://seniorsecondary.tki.org.nz/Mathematics-and-statistics>

#### Changes in particular to the statistics strand:

<http://seniorsecondary.tki.org.nz/Mathematics-and-statistics/Achievement-objectives/Statistics-What-has-changed>

## Statistics Achievement Objectives:

<http://seniorsecondary.tki.org.nz/Mathematics-and-statistics/Achievement-objectives/Achievement-objectives-by-level>

Navigate to statistics AOs and to the different levels, 6, 7 & 8.

Each AO has:

### Indicators

Indicators are examples of the behaviours and capabilities that a teacher might expect to observe in a student who is achieving at the appropriate level. Teachers may wish to add further examples of their own.

### Context elaborations

Context elaborations are possible contexts for learning, with a suggestion of how they might be used with the focus achievement objective.  
The listed context elaborations are examples only. Teachers can select and use entirely different contexts in response to local situation, community relevance, and students’ interests and needs.

Under the context elaborations you will find quite a few examples of material developed to support the changes in the curriculum in statistics. This is a good place to go for material for year 12, the material is useful even for current AOs.

## Statistics glossary

A comprehensive glossary has been developed for the statistics strand and is located on TKI. There are links from the statistics AOs directly to the glossary where a term is used in both places.

<http://seniorsecondary.tki.org.nz/Mathematics-and-statistics/Glossary>

Currently to download and print the entire glossary (GlossaryStatsFinal.doc) go to:

<http://aucksecmaths.wikispaces.com/Saturday+2010#L3> (Under Term 3 presentation for AMA Saturday morning workshops)

## List of activities in stats AOs.

S6-1

* Growing scatterplots – uses CensusAtSchool data and looks at relationships between neck and wrist circumferences
  + Teaching notes
  + WORD[Growing scatterplots (WORD 318 KB)](http://seniorsecondary.tki.org.nz/content/download/1410/11089/version/1/file/01growingscatter.doc)
  + PDF[Data cards (PDF 14 KB)](http://seniorsecondary.tki.org.nz/content/download/1411/11092/version/1/file/02AInstructionsDataCards.pdf)
  + WORD[Scatter plot grid (WORD 259 KB)](http://seniorsecondary.tki.org.nz/content/download/1485/11327/version/1/file/scatterplotgrid.doc)
* Sleeping sheep – collecting reaction times, using a web-based application, for comparison
  + Teaching notes
  + WORD[Sleeping sheep or are you a turbo-charged cheetah? (WORD 839 KB)](http://seniorsecondary.tki.org.nz/content/download/1412/11095/version/1/file/04sleepingsheep.doc)
  + WORD[Instruction sheet for sheep reaction times (WORD 1 MB)](http://seniorsecondary.tki.org.nz/content/download/1413/11098/version/1/file/05instructionsheetsheep.doc)
  + [Sleeping sheep](http://www.bbc.co.uk/science/humanbody/sleep/sheep/reaction_version5.swf)
* You can’t fool me by giving me a cheap cola. Explores experiments and comparisons
  + Example of student performance
  + WORD[You can’t fool me by giving me a cheap cola! (WORD 121 KB)](http://seniorsecondary.tki.org.nz/content/download/1414/11101/version/1/file/07cheapcola.doc)
* Do boy babies tend to be heavier at birth than girl babies? Comparisons using dot plots and box plots
  + Example of student performance
  + WORD[Baby weights (WORD 124 KB)](http://seniorsecondary.tki.org.nz/content/download/1415/11104/version/1/file/08babyweights.doc)
  + http://seniorsecondary.tki.org.nz/extension/tki-sec/design/tki-sec/images/icons/icon-default.gif[Baby weights fathom file ( 13 KB)](http://seniorsecondary.tki.org.nz/content/download/1416/11107/version/1/file/09babyweights.ftm)
  + EXCEL[Baby weights spreadsheet (EXCEL 36 KB)](http://seniorsecondary.tki.org.nz/content/download/1417/11110/version/1/file/10babyweights.xls)
* Does practice make perfect? Relationships and comparisons using box plots and scatter plots
  + Example of student performance
  + WORD[Does practice make perfect? (WORD 172 KB)](http://seniorsecondary.tki.org.nz/content/download/1418/11113/version/1/file/11practiceperfect.doc)

S6-2

* The achievement objective relies on the use of current media reports. Context will change from week to week depending on what is current, both in terms of national and international interest, and interest to teenagers. For example: “Speed is the biggest killer on New Zealand's roads, and young people and motorcyclists are the leading casualties, Ministry of Transport research shows.” NZ Herald 2009
  + WORD[Using the Critical Questions evaluate an article (WORD 66 KB)](http://seniorsecondary.tki.org.nz/content/download/1420/11119/version/1/file/02road_deaths.doc)
  + [Biggest killers on our roads revealed](http://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=10598593)
  + [Motor Vehicle Crashes in New Zealand 2008](http://www.transport.govt.nz/research/MotorVehicleCrashesinNewZealand2008/).
* Figure this activities – a variety of different short activities that introduce ideas around evaluating others reports.
  + WORD[Figure this (WORD 54 KB)](http://seniorsecondary.tki.org.nz/content/download/1421/11122/version/1/file/05figurethis_stats.doc)
  + [Figure this](http://www.figurethis.org/challenges/math_index.htm)

S6-3

* Is this die fair?
  + WORD[Fair dice (WORD 142 KB)](http://seniorsecondary.tki.org.nz/content/download/1423/11130/version/1/file/01Fairdice.doc)
  + EXCEL[Fair dice spreadsheet (EXCEL 758 KB)](http://seniorsecondary.tki.org.nz/content/download/1424/11133/version/1/file/02fairdice.xls)
  + http://seniorsecondary.tki.org.nz/extension/tki-sec/design/tki-sec/images/icons/icon-default.gif[Fair dice fathom file ( 18 KB)](http://seniorsecondary.tki.org.nz/content/download/1425/11136/version/1/file/03fairdice.ftm)
* Exploring Paper, Scissors, or Rock
  + WORD[Paper, scissors rock (WORD 155 KB)](http://seniorsecondary.tki.org.nz/content/download/1426/11139/version/1/file/04paperscissorsrock.doc)
  + http://seniorsecondary.tki.org.nz/extension/tki-sec/design/tki-sec/images/icons/icon-default.gif[Paper, scissors rock fathom file ( 26 KB)](http://seniorsecondary.tki.org.nz/content/download/1427/11142/version/1/file/05PaperScissorsRock.ftm)
* Quiz or no quiz
  + WORD[Quiz or no quiz (WORD 117 KB)](http://seniorsecondary.tki.org.nz/content/download/1428/11145/version/1/file/06quizorno.doc)
* Exploring spinners
  + WORD[Spinners (WORD 166 KB)](http://seniorsecondary.tki.org.nz/content/download/1429/11148/version/1/file/07spinners.doc)
  + http://seniorsecondary.tki.org.nz/extension/tki-sec/design/tki-sec/images/icons/icon-default.gif[Spinners fathom file ( 67 KB)](http://seniorsecondary.tki.org.nz/content/download/1430/11151/version/1/file/08spinners.ftm)
* Sum of two dice
  + WORD[Sum of two dice (WORD 137 KB)](http://seniorsecondary.tki.org.nz/content/download/1431/11154/version/1/file/09sumtwodice.doc)
  + EXCEL[Fair dice spreadsheet 2 (EXCEL 758 KB)](http://seniorsecondary.tki.org.nz/content/download/1432/11157/version/1/file/10fairdice.xls)

S7-1

* Kiwi Kapers – uses a simulated data set of Kiwis to explore some of the big ideas.
  + Sampling variation and making inferences
    - Teaching notes
      * WORD[Kiwi Kapers 1 (WORD 283 KB)](http://seniorsecondary.tki.org.nz/content/download/1435/11170/version/1/file/01kiwikapers.doc)
    - Data cards
      * PDF[Great spotted data cards (PDF 35 KB)](http://seniorsecondary.tki.org.nz/content/download/1436/11173/version/1/file/02Bgreatspotteddatacards.pdf)
      * PDF[North Island brown data cards 1 (PDF 39 KB)](http://seniorsecondary.tki.org.nz/content/download/1437/11176/version/2/file/02CNorthIslandBrownDataCards1.pdf)
      * PDF[North Island brown data cards 2 (PDF 22 KB)](http://seniorsecondary.tki.org.nz/content/download/1438/11179/version/1/file/02DNorthIslandBrownDataCards2.pdf)
      * PDF[Tokoeka data cards (PDF 43 KB)](http://seniorsecondary.tki.org.nz/content/download/1439/11182/version/1/file/02ETokoekaDataCards.pdf)
      * EXCEL[Kiwi data cards spreadsheet 1 (EXCEL 868 KB)](http://seniorsecondary.tki.org.nz/content/download/1470/11275/version/1/file/02Akiwidatacards.xls)
    - Information about the variables
      * WORD[Kiwi population information (WORD 55 KB)](http://seniorsecondary.tki.org.nz/content/download/1440/11185/version/1/file/03kiwipopcodesinfo.doc)
    - Population graphs and statistics
      * WORD[Kiwi population graphs and statistics (WORD 44 KB)](http://seniorsecondary.tki.org.nz/content/download/1441/11188/version/1/file/04popngraph%26stats.doc)
    - Blank dot plot sheet for collecting weights
      * WORD[Weight samples (WORD 47 KB)](http://seniorsecondary.tki.org.nz/content/download/1442/11191/version/1/file/05weightsamples.doc)
    - Kiwi data in Excel
      * EXCEL[Kiwi populations (EXCEL 99 KB)](http://seniorsecondary.tki.org.nz/content/download/1443/11194/version/1/file/06kiwipopexcel.xls)
    - Kiwi data in Fathom
      * http://seniorsecondary.tki.org.nz/extension/tki-sec/design/tki-sec/images/icons/icon-default.gif[Kiwi populations ( 80 KB)](http://seniorsecondary.tki.org.nz/content/download/1444/11197/version/1/file/07kiwipopfathom.ftm)
  + Deciding on the sample size
    - Teaching notes
      * WORD[Kiwi Kapers 2 (WORD 124 KB)](http://seniorsecondary.tki.org.nz/content/download/1445/11200/version/1/file/08kiwikapers2.doc)
    - Student worksheet
      * WORD[Deciding how to use a sample (WORD 249 KB)](http://seniorsecondary.tki.org.nz/content/download/1446/11203/version/1/file/09kiwistudentfathom.doc)
    - Fathom taking samples
      * http://seniorsecondary.tki.org.nz/extension/tki-sec/design/tki-sec/images/icons/icon-default.gif[Taking samples ( 88 KB)](http://seniorsecondary.tki.org.nz/content/download/1447/11206/version/1/file/10kiwipopsample.ftm)
    - Example of output (different sample sizes)
      * WORD[Kiwi population sample 2, part 1 (WORD 83 KB)](http://seniorsecondary.tki.org.nz/content/download/1448/11209/version/2/file/11sampleskiwi2part1.doc)
    - Fathom collecting sample medians
      * http://seniorsecondary.tki.org.nz/extension/tki-sec/design/tki-sec/images/icons/icon-default.gif[Kiwi population sample 2 ( 109 KB)](http://seniorsecondary.tki.org.nz/content/download/1449/11212/version/1/file/12kiwipopsample2.ftm)
    - Example of output (sample medians)
      * Median

WORD[Sample medians (WORD 61 KB)](http://seniorsecondary.tki.org.nz/content/download/1450/11215/version/2/file/13mediancollection.doc)

* + - Example of output (collation of class medians)
      * WORD[Collation of class medians (WORD 66 KB)](http://seniorsecondary.tki.org.nz/content/download/1451/11218/version/1/file/14classmedians.doc)
  + Introduction to stratified sampling
    - Teacher notes
      * WORD[Sampling stuff (WORD 144 KB)](http://seniorsecondary.tki.org.nz/content/download/1452/11221/version/1/file/15samplingstuff.doc)
    - Dot plot blank sheet for collecting heights
      * WORD[Height sample sheet (WORD 43 KB)](http://seniorsecondary.tki.org.nz/content/download/1453/11224/version/1/file/16heightsamples.doc)
    - Data cards (see Kiwi Kapers)
    - Kiwi population (excel)
      * EXCEL[Kiwi populations (stratified sampling) (EXCEL 99 KB)](http://seniorsecondary.tki.org.nz/content/download/1457/11236/version/2/file/18kiwipopexcel.xls)
    - Fathom taking samples
      * http://seniorsecondary.tki.org.nz/extension/tki-sec/design/tki-sec/images/icons/icon-default.gif[Kiwi populations (stratified sampling) ( 85 KB)](http://seniorsecondary.tki.org.nz/content/download/1460/11245/version/1/file/19kiwipopsampstuff.ftm)
    - Example of output (samples)
      * WORD[Examples of output (stratified sampling) (WORD 59 KB)](http://seniorsecondary.tki.org.nz/content/download/1461/11248/version/1/file/20samplestuff5samples.doc)
    - Fathom taking counts of species
      * http://seniorsecondary.tki.org.nz/extension/tki-sec/design/tki-sec/images/icons/icon-default.gif[Taking count of species ( 106 KB)](http://seniorsecondary.tki.org.nz/content/download/1462/11251/version/1/file/21kiwipopsample5.ftm)
  + PPDAC cycle – using stratified sampling
    - Teacher notes
      * WORD[Sampling stuff 2 (WORD 215 KB)](http://seniorsecondary.tki.org.nz/content/download/1463/11254/version/1/file/22samplingstuff2.doc)
    - Student worksheet
      * WORD[Sampling - Auckland secondary school (WORD 25 KB)](http://seniorsecondary.tki.org.nz/content/download/1464/11257/version/1/file/23studentsheetschool.doc)
    - School population (fathom)
      * http://seniorsecondary.tki.org.nz/extension/tki-sec/design/tki-sec/images/icons/icon-default.gif[School population ( 152 KB)](http://seniorsecondary.tki.org.nz/content/download/1465/11260/version/1/file/24school1.ftm)
    - School population (excel)
      * EXCEL[School population (EXCEL 146 KB)](http://seniorsecondary.tki.org.nz/content/download/1466/11263/version/1/file/25schoolpop.xls)
    - Fathom file for taking sample
      * http://seniorsecondary.tki.org.nz/extension/tki-sec/design/tki-sec/images/icons/icon-default.gif[Taking sample ( 161 KB)](http://seniorsecondary.tki.org.nz/content/download/1467/11266/version/1/file/26schoolsample.ftm)
    - Fathom file used for teacher notes
      * http://seniorsecondary.tki.org.nz/extension/tki-sec/design/tki-sec/images/icons/icon-default.gif[Fathom file for teachers notes ( 90 KB)](http://seniorsecondary.tki.org.nz/content/download/1468/11269/version/1/file/28kiwipopstratsample.ftm)
* Two further examples that can be used for the entire statistical inquiry cycle. Set up for sampling
  + The kiwi population is the same as used in Kiwi Kapers and introduction to stratified sampling:
    - Fathom file for taking sample
      * http://seniorsecondary.tki.org.nz/extension/tki-sec/design/tki-sec/images/icons/icon-default.gif[Kiwi populations ( 80 KB)](http://seniorsecondary.tki.org.nz/content/download/1444/11197/version/1/file/07kiwipopfathom.ftm)
    - Kiwi population (excel)
      * EXCEL[Kiwi populations (EXCEL 99 KB)](http://seniorsecondary.tki.org.nz/content/download/1443/11194/version/1/file/06kiwipopexcel.xls)
    - Information about variables
      * WORD[Kiwi population information (WORD 55 KB)](http://seniorsecondary.tki.org.nz/content/download/1440/11185/version/1/file/03kiwipopcodesinfo.doc)
  + SURF Income survey from Statistics New Zealand:
    - Fathom file for taking sample (look under sampling stuff 3 heading)
      * http://seniorsecondary.tki.org.nz/extension/tki-sec/design/tki-sec/images/icons/icon-default.gif[Fathom file for taking sample ( 48 KB)](http://seniorsecondary.tki.org.nz/content/download/1469/11272/version/1/file/31surfsample.ftm)
    - [SURF Income survey data set](http://www.stats.govt.nz/methods_and_services/schools_corner/SURF%20for%20schools/dataset.aspx)
    - [Information about variables](http://www.stats.govt.nz/methods_and_services/schools_corner/SURF%20for%20schools/dataset.aspx)

S7-2: See kiwi kapers material for S7-1

S7-3

* The legal blood alcohol level and the relative risk of having a fatal crash of 15–19 year olds compared to 30+ year olds:
  + Student activity
    - WORD[Blood alcohol levels in fatal crashes (WORD 87 KB)](http://seniorsecondary.tki.org.nz/content/download/1473/11284/version/1/file/02relativeriskExemplar.doc)
  + Relative risk of 15–20 year olds having a traffic accident compared to 55–60 year olds. See [Ministry of Transport Crash Facts](http://www.transport.govt.nz/research/CrashFacts/)

S7-4

* Compare graphs of data from real-life measurement variables, for example, heights, leaf length, birth weight, Census at School measurements, and note similarities and differences
  + WORD[Armspans (WORD 266 KB)](http://seniorsecondary.tki.org.nz/content/download/1397/11034/version/1/file/01armspans.doc)
* Sampling with and without replacement should be introduced with probability trees, starting with simple concrete situations, such as drawing counters from a bag.
  + WORD[Drawing counters from a bag (WORD 86 KB)](http://seniorsecondary.tki.org.nz/content/download/1398/11037/version/2/file/02counters.doc)
* Investigate the number of cereal packets required to obtain a full set of animal cards using appropriate technology
  + WORD[Number of cereal packets (WORD 151 KB)](http://seniorsecondary.tki.org.nz/content/download/1399/11040/version/1/file/03cerealboxes.doc)

S8-1

* Water taste test – this activity provides an introduction to experimental design through the students undertaking a poorly designed experiment.
  + WORD[Water taste test (WORD 219 KB)](http://seniorsecondary.tki.org.nz/content/download/1486/11330/version/1/file/02water_taste.doc)
* Memory test – this activity looks at the two different types of experimental design, two independent groups and paired comparisons.
  + WORD[Memory test (WORD 847 KB)](http://seniorsecondary.tki.org.nz/content/download/1401/11046/version/1/file/03experiment_memory_test.doc)
  + EXCEL[Memory test (EXCEL 28 KB)](http://seniorsecondary.tki.org.nz/content/download/1402/11049/version/1/file/04memory_test.xls)

S8-2: Activity still to come.

S8-3

* Critiquing causal-relationship claims – this activity explores causal-relationship claims and suggests questions students could ask in evaluating and critiquing causal-relationship claims
  + Teaching notes

WORD[Critiquing causal-relationship claims (WORD 75 KB)](http://seniorsecondary.tki.org.nz/content/download/1404/11063/version/1/file/01causal_claims.doc)

* Margin of error – this activity explores the use of margin of error in the media
  + Teaching notes

WORD[Use of ‘margin of error’ in the media (WORD 133 KB)](http://seniorsecondary.tki.org.nz/content/download/1405/11066/version/1/file/02margin_of_error.doc)

S8-4

* Examples of student activities for calculating probabilities
  + WORD[Calculating probabilities of independent, combined and conditional events (WORD 46 KB)](http://seniorsecondary.tki.org.nz/content/download/1406/11069/version/1/file/01ProbabilityobjectiveAL8.doc)
* Examples of student activities for expected values
  + WORD[Investigate situations that involve elements of chance (WORD 104 KB)](http://seniorsecondary.tki.org.nz/content/download/1407/11072/version/1/file/02ExpectedvalueObjectiveBL8.doc)
* Examples of student activities for distributions
  + WORD[Applying distributions such as the Poisson, binomial, and normal (WORD 39 KB)](http://seniorsecondary.tki.org.nz/content/download/1408/11075/version/1/file/03DistributionsobjectiveCL8.doc)