

# Writing Statistics (or really any) Internal Assessments

# Why?

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**Sheer boredom** – marking the same internal assessment is soul destroying



# Rumours

FLEETWOOD MAC  
RUMOURS



# Why?

- **Sheer and utter boredom** – assessing the same contexts and data sets year after year is soul-destroyingly boring
- Writing Internal assessments is a valuable tool to **add to your repertoire** of teaching skills, and let's face it, makes you so much more employable
- **Hones and develops your content knowledge** of the standards more than any other professional development on offer
- Allows you to write and **develop relevant and useful resources** for teaching – you do not have to find resources in the black hole that is the internet
- Firmly embeds you in the **‘mind of the student’** – you will have to consider student engagement, content knowledge and the different levels needing to be demonstrated.
- You will become an **expert in the standard** – it's actually pretty cool. The students recognise this and will respect this.
- It is very awesome to be able to say to students **“Because I wrote the damn thing!”**

# When?

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The **NZAMT writing camp** is the best professional development you can ever get.

The year before, ***seriously the year before***. Having an assessment ready the year before enables lesson planning, development of resources and peace of mind.

Or, at least **the term before** so teachers are aware of the context, content and for moderation purposes

# How - Part 1 - The standards

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Stage one of gathering all your information:

**www.nzqa.govt.nz** - *this will form the basis of the schedule*

**www.**

**ncea.tki.org.nz/Resources-for-Internally-Assessed-Achievement-Standards** - *this will give a framework for the assessment*

**www.nzqa.govt.nz/ncea/subjects/mathematics/clarifications/** - *this will aid in the schedule development and teacher judgement*

# How - Part 1 - Parts of the standard - Explanatory Notes

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**This is the section of the standard which links to the NZC.**

## Explanatory Notes

1 This achievement standard is derived from Level 6 of *The New Zealand Curriculum*, Learning Media, Ministry of Education, 2007, and is related to the material in the *Teaching and Learning Guide for Mathematics and Statistics*, Ministry of Education, 2010 at <http://seniorsecondary.tki.org.nz>. The achievement standard is aligned to the following achievement objectives taken from the Statistical Investigation thread of the Mathematics and Statistics learning area:

- plan and conduct surveys and experiments using the statistical enquiry cycle
  - determining appropriate variables
  - cleaning data
  - using multiple displays, and re-categorising data to find patterns, variations, in multivariate data sets
  - comparing sample distributions visually, using measures of centre, spread, and proportion
  - presenting a report of findings;

**Bullet point 1 explains where the standard is aligned to the NZC - this should form the content of your teaching and learning.**

# How - Part 1 - Bullet point 2 of the standard

Shows Levels of Achieved, Merit and Excellence

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Bullet point 3 shows a levels of Achieved, Merit and Excellence. It was a while before we/I understood how to read a standard and actually apply it. (several years)

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*Using the statistical enquiry cycle* involves using each component of the statistical enquiry cycle to make comparisons.

*Using the statistical enquiry cycle with justification* involves linking aspects of the statistical enquiry cycle to the context and the population and making supporting statements which refer to evidence such as summary statistics, data values, trends or features of visual displays.

*Using the statistical enquiry cycle with statistical insight* involves integrating statistical and contextual knowledge throughout the statistical enquiry cycle, and may involve reflecting on the process or considering other explanations for the findings.



# How - Part 1 - Bullet point 3 of the standard

- 3 Students need to be familiar with the statistical enquiry cycle to investigate a given multivariate data set, which involves:
- investigating data that has been collected from a survey situation
  - posing an appropriate comparison question using a given multivariate data set
  - selecting and using appropriate display(s)
  - giving summary statistics such as the five summary values (minimum, maximum, median, quartiles)
  - discussing features of distributions comparatively, such as shape, middle 50%, shift, overlap, spread, unusual or interesting features
  - communicating findings, such as informal inference and supporting evidence, in a conclusion.

This section of the standard describes the content of the **statistical enquiry cycle** that the students need to be familiar with.

Achieved - Using **each component** of the statistical enquiry cycle to make comparisons.

Merit - Linking aspects of the statistical enquiry cycle to the **context and the population** and **making supporting statements** which refer to evidence such as summary statistics, data values, trends or features of visual displays.

Excellence - **Integrating statistical and contextual knowledge** throughout, and may involve **reflecting on the process** or **considering other explanations** for the findings.

# How - Part 2 - The tki website -

<http://ncea.tki.org.nz/Resources-for-Internally-Assessed-Achievement-Standards/Mathematics-and-statistics>

You must modify the tki assessments - they cannot be used “off the shelf”

## Please note:

These resources are guides to effective assessment and should not be used as actual assessment.

These are publicly available resources so educational providers (including teachers and schools) must modify them to ensure that student work is authentic.

Teachers will need to set a different context or topic to be investigated; identify different texts to read or perform; or change figures, measurements or data sources to ensure that students are demonstrating that they can apply what they know and can do.

# How - Part 2 - The tki website - The Teacher Guidelines

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**Read the Teacher guidelines:** They contain valuable information on how to carry out a consistent and valid assessment.

**Context/setting** – This explains the data set and the contextual settings – these can be adjusted by the teacher

**Conditions** – This explains how the assessment could be administered with respect to assessment timings, writing questions and readiness for the standard

**Resource requirements** – This explains the information required by the students to complete the assessment and possible indications for starting student on the assessment

# How - Part 2 - The tki website - The Student Instructions

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**The Student Instructions** - This will always follow the Statistical Enquiry Cycle:

**Introduction:** Describes the context and conditions to the students

**Task:** Problem, Plan and Data, Analysis and Conclusion

**Student Resource:** Data sets and explanations of variables

# How - Part 2 - The tki website - The Schedule

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Assessment schedule: Mathematics and Statistics 91035 Census At School			
Teacher note: You will need to adapt this assessment schedule to include examples of the types of responses that can be expected.			
+	Evidence/Judgements for Achievement	Evidence/Judgements for Achievement with Merit	Evidence/Judgements for Achievement with Excellence
	The student has investigated a given multivariate data set using the statistical enquiry cycle. The student has;	The student has investigated a given multivariate data set using the statistical enquiry cycle with justification,	The student has investigated a given multivariate data set using the statistical enquiry cycle with statistical insight.

The **first part** of the evidence section comes from the levels from the standard – **Bullet Point Two**.

# How - Part 2 - The tki website - The Schedule

<p>The student has:</p> <ul style="list-style-type: none"> <li>investigated data that has been collected from a survey situation</li> <li>posed an appropriate comparison question using a given multivariate data set</li> <li>selected and used appropriate display(s)</li> <li>given summary statistics such as the five summary values (minimum, maximum, median, quartiles)</li> <li>discussed features of distributions comparatively, such as shape, middle 50%, shift, overlap, spread, unusual or interesting features</li> <li>communicated findings, such as informal inference and supporting evidence, in a conclusion.</li> </ul> <p>For example:  <b>Problem</b>  <i>The question is a comparison question that clearly identifies the population, the groups, the variables. The nature of the comparison is shown by the use of words such as "tends to" or "usually" etc.</i>  <b>Analysis</b></p>	<p>justification. The student has:</p> <ul style="list-style-type: none"> <li>produced a response that gives evidence of linking components of the statistical enquiry cycle to the context and/or populations, and referring to evidence such as sample statistics, data values, or features of visual displays</li> <li>investigated data that has been collected from a survey situation</li> <li>posed an appropriate comparison question using a given multivariate data set</li> <li>selected and used appropriate display(s)</li> <li>given summary statistics such as the five summary values (minimum, maximum, median, quartiles)</li> <li>discussed features of distributions comparatively, such as shape, middle 50%, shift, overlap, spread, unusual or interesting features</li> <li>communicated findings, such as informal inference and supporting evidence, in a conclusion.</li> </ul>	<p>statistical insight. The student has:</p> <ul style="list-style-type: none"> <li>produced a response that gives evidence of integrating statistical and contextual knowledge throughout the statistical enquiry cycle, and may involve reflecting on the process or considering other explanations for the findings.</li> <li>investigated data that has been collected from a survey situation</li> <li>posed an appropriate comparison question using a given multivariate data set</li> <li>selected and used appropriate display(s)</li> <li>given summary statistics such as the five summary values (minimum, maximum, median, quartiles)</li> <li>discussed features of distributions comparatively, such as shape, middle 50%, shift, overlap, spread, unusual or interesting features</li> <li>communicated findings, such as informal inference and supporting evidence, in a conclusion.</li> </ul>
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The **second part** of the evidence section comes from description of the statistical enquiry cycle - **Bullet Point Three.**

# How - Part 2 - The tki website - The Schedule

The **third part** of the evidence is the explanation of the requirements of the statistical enquiry cycles at the various levels. The ‘step-ups’ have been bolded.

There will also be an **example based on the context/dataset** - which must be changed

<p>For example: <b>Problem</b> The question is a comparison question that clearly identifies the population, the groups, the variables. The nature of the comparison is shown by the use of words such as “tends to” or “usually” etc. <b>Analysis</b> Dot plots and box and whisker plots are produced Summary statistics have been found. At least two features of the distributions have been discussed comparatively. <b>Conclusion</b> Findings, such as an informal inference, are communicated that include the population, the groups, the variable and the nature of the inference. The inference is consistent with the position of the medians relative to the boxes.</p>	<p>For example: <b>Problem</b> The question is a comparison question that clearly identifies the population, the groups, the variables. The nature of the comparison is shown by the use of words such as “tends to” or “usually” etc. <b>Analysis</b> Dot plots and box and whisker plots are produced Summary statistics have been found. At least two features of the distributions have been discussed comparatively. <b>The discussion of the features is justified with reference to evidence from the displays and summary statistics.</b> <b>Conclusion</b> Findings, such as an informal inference, are communicated that include the population, the groups, the variable and the nature of the inference. The inference is <b>justified by referring to the position of the medians relative to the boxes.</b></p>	<p>For example: <b>Problem</b> The question is a comparison question that clearly identifies the population, the groups, the variables. The nature of the comparison is shown by the use of words such as “tends to” or “usually” etc. <b>Analysis</b> Dot plots and box and whisker plots are produced Summary statistics have been found. At least two features of the distributions have been discussed comparatively. The discussion of the features is justified with reference to evidence from the displays and summary statistics. <b>The discussion of the features is integrated with appropriate contextual knowledge.</b> <b>Conclusion</b> Findings, such as an informal inference, are communicated that include the population, the groups, the variable and the nature of the inference. The inference is justified by referring to the position of the medians relative to the boxes. <b>The findings are integrated with appropriate contextual knowledge. There may be evidence of considering other explanations for the findings.</b></p>
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# How - Part 3 - The Clarifications - What? There's more?

You will also need to check your interpretation of the tki schedule alongside the **standard clarifications** on the NZQA website to ensure your assessment conditions such as a '*named populations*' and required quality of student responses are reflected in the Task and Schedule.

This is often updated – and this is advertised via Facebook, the Network of Enterprise newsletter and Principal's Nominee's newsletters. Making checking the clarifications part of the assessment writing process is key to staying up to date.

## Mathematics and Statistics clarifications

Show: [Mathematics and Statistics homepage](#) | [All Mathematics and Statistics clarifications](#)

### 91035: Investigate a given multivariate data set using the statistical enquiry cycle

Updated May 2019. The section dealing with 'Data' has been re-formatted.

An understanding of the difference between sample and population is required at all levels.

#### Data

The provided data set is a sample from a named population and needs to allow for choice of both the category variable and the numerical variable. The sample sizes need to be appropriate for the rule that is being used to make the call. If the " $\frac{3}{4}$  -  $\frac{1}{2}$ " rule is used, then both sample sizes need to be between 20 and 40.

If the "overall visible spread" rule is used, then both sample sizes need to be around 30 (the critical fraction is then  $\frac{1}{3}$ ), or around 100 (the critical fraction is now  $\frac{1}{5}$ ).



# Take a trip down Memory Lane

Do you remember how we printed all the reports in the olden days and brought them home for marking !!!!!

Booking/ Fighting for the computer labs at the beginning of the term/year.

God forbid if you were a new teacher and didn't know how to book computer labs.



# Take a trip down Memory Lane

The way we conduct and do Statistics assignments has evolved so much in the last 10 years.

Now there is mainly online marking .No printing of paper saving Amazonian amounts of trees.

We are happy as well because we can give feedback during the writing/editing process.



# Take a trip down Memory Lane

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All the students fighting to print the assessment at the end of the period.

There was always ONE student who lost all their work.

The ancient printer which died half-way through the assessment.



**And more importantly, the regurgitated, garbled and often incomprehensible reports produced by the students.**

# Assessing the assessments

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Checklists with the schedules distilled into A5/A4 sheets to return to students are popular.

We experimented with Doctopus and Goobric – see MRGS Sophie Wright’s excellent presentation from 2018 [here](#). And we really enjoyed them.

Marking procedures differ from school to school.



# Buddy writing assessments is the best use of teacher time

Having constructed a DRAFT assessment  
= it is a good idea for both to write  
an assessment together.

This puts you in the mind of the  
student - it allows you to understand  
the cognitive load on students to  
complete the reports. Is an eye  
opener.

This is confronting so adhere to  
professional boundaries and ensure  
new teachers are supported.

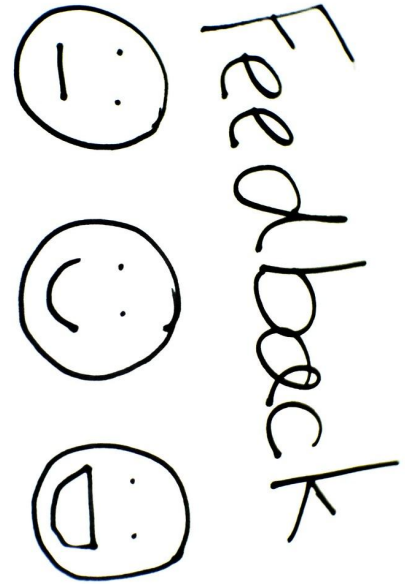


# Check teachers are aware of conditions of assessments

Distribute assessments to teachers for feedback - we use different coloured paper in teacher's pigeon holes.

Feedback can be spotty - this could change with the new standards where teachers could be strongly encouraged to complete reports and give their own feedback.

Assessment meetings before the teaching of the standard are ideal - saves difficult conversations later on.



## Be Nice To Each Other!

# Data Sets - where to find them?

Any link put in this slideshow will obsolete by the end of this session.

NZAMT + Facebook + Conferences + Friends + Stealing

New Zealand's privacy laws + aggregated data.

Statistics New Zealand is great for Time Series data.

Recommend a variety of data sets for students to choose what interests them and reduces the desire to commit murder after reading the 30th assessment.





# Writing End-Of-Year exams

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A good buddy choice is an old hack who has been exam writing for too long. And a bright young thing with lots of energy eager for professional development.





# My Journey - Writing AS91267 Probability

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As a new teacher, I started as a student . I listened and buddied up with an experienced teacher while continuously asking questions and chatting.

**Step 1** - I did all the workbook exercises and text book exercises teaching level 2 probability. ( Just like a student) and learnt all the skills.

**Step 2** - Learnt there were 3 sections: Probability Trees, Tables, Risk and the Normal distribution

**Step 3** - Did All the past 5 year exam papers and looked at requirements for A,M, E for each section. I compared each years paper to the previous years and compared styles in each section. Compared A,M, E between scripts

# The Process 6-10 weeks

We buy from SINCOS, KOHIA and also look at the  
NZAMT papers.



Two people, one is the writer of the paper and the other experienced teacher is the moderator

First person/ writer is given a printout of the standard, paper, schedules and clarifications. Then we amalgamate the papers into a coherent DRAFT assessment.

The first person constructs the assessment.

Sometimes the papers bought to amalgamate are not well-written and we have to write questions from scratch.

# Putting the paper together/ Writing external script

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This is a big task.

Time frame is about 3-4 weeks.



Writer must have all three sections(Q1, Q2 & Q3). While writing, compare the questions for each sections we set with NZQA past exam papers.

Each section must have a nice flow to it with Achieved, Merit and Excellence questions.

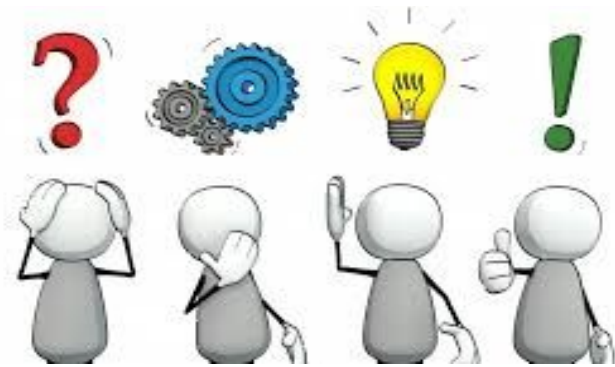
# Context of the Questions

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Most important.

Students must be able to understand this and it must be New Zealand based.

Compare A, M, E questions set in each section with NZQA past exam papers. ( Compare level of difficulty, style , context and must keep in mind that it is for derived grades)






# Paper is written with the schedule

Once the script is written, The writer does the script + schedule themselves. Checks how long it takes the writer to do the script, fixing any grammatical errors etc before it goes to the moderator for checking.

The moderator does the paper and provides relevant feedback

Time frame for moderator is 1-2 weeks .

Moderator checks the paper and sees that it meets the standard.Meeting!!! If it does not, then ..... 

# After moderator checks and says - the paper is ok !!

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The script with the schedule then goes  
to all teachers teaching the standard.

1-2 weeks ( could be longer)

They are asked for feedback/ comments.

Teachers are also asked to do the script as students, time  
themselves. Look the schedule as well. Count points etc



They can either say **YAY** !!!! OR

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NAY

Moral of the story.

Be Nice To Each Other

