Teaching statistical report-writing for Level 3 internal assessments

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Background Quiz

a) How long have you been teaching mathematics?
b) How long have you been teaching statistics?
c) How confident do you feel teaching trigonometry?
   Very confident  Confident  Not confident  Very unconfident
d) How confident do you feel teaching statistical report-writing?
   Very confident  Confident  Not confident  Very unconfident
Plan

Introduction

Report writing
  • Issues
  • Strategies

Statistics Learning Centre resources

Questions
I’m Nicola Ward Petty

Lecturer in Operations Research at University of Canterbury for 20 years. Included applied statistics to commerce students.

Now director of the Statistics Learning Centre.
Welcome to Statistics Learning Centre

What we offer
(for everyone)

Join or Login
(students & teachers)

Read our Blog
(for teachers)

Free resources
(students & teachers)

Stats Videos
(for students)

StatsLC News
(for teachers)

statsLC.com
Discuss with your neighbour. (Don’t all start at number 1)

1. Why is it important for students to be able to write good statistical reports?

2. How well are your students doing at writing reports? Why are they not doing as well as you would like them to?

3. What are you doing to help them develop their report-writing skills?

4. Why is it difficult for mathematics teachers to teach report-writing?
1. Why is it important for students to be able to write good statistical reports?

• You don’t realise whether you understand or not until you try to write it down. The process is important.

• Better critics of other reports

• Useful skill for employment – report writing, and whole literacy thing

• Required for marking!
4. Why is it difficult for mathematics teachers to teach report-writing?

• Not used to teaching or assessing written English
• May feel uncomfortable and lacking in skills
• Few resources available to help
• May be unconvinced of the necessity of the task
• The students themselves are not happy with writing
Activity

Look at the output from iNZight.

It is monthly retail sales in $m (or possibly billion) in the USA of different categories. Raw data. (Like carrots I like my data raw.)

Write down a good sentence and a not so good sentence about the output from iNZight.

Share your sentences with your neighbour(s).

Choose your best and worst sentences and write on OHP.
Time series output

- **Book**: The graph shows the trend, raw data, and trend plus seasonal data over time. The seasonal effects graph on the right indicates peaks in sales during certain months.

- **Jewelry**: Similar trend and seasonal data graphs are shown, with seasonal effects indicating peaks in sales during specific months.

- **Sporting**: The trend and seasonal data graphs are present, and the seasonal effects graph highlights peaks in sales during particular months.

The graphs illustrate how different categories show varying patterns in sales over time and across months.
Evaluating sentences

All sentences in a report should be:

Correct

- statistics
- grammar
- usage of technical words

Relevant, necessary

- relate to the context
- don’t include unnecessary details – put some in an appendix

Understandable

- Would a regular person who doesn’t know about statistics understand it?
Statistics Learning Centre provides writing guides for all four internal standards:

- Time Series
- Bivariate
- Formal Inference
- Experimental Design

You are free to use them for educational purposes, but must show the branding.

Give us feedback if you think we have missed something!

Go to [www.statslc.com](http://www.statslc.com) to enrol, or email n.petty@statslc.com
Practice, practice, practice

- Small exercises for homework, peer review
- Warm-up sentences at the start of class
- Write ALL the time while doing the analysis
- Work with an English teacher – get them to explain about verbs and fragments
- “Fill in the gaps”
- Give examples and formats
- On-line activities (NZStats 3 from Statistics Learning Centre) (an example is on the next two slides)
Interpreting a bivariate model: Fast food

The following graph is included in a report on how the energy content (measured in kilojoules) in an item of fast food is related to the amount of fat (in grams).

The output said:

**Linear Trend**

\[ \text{Energy} = 44.08 \times \text{Fat} + 471.75 \]

**Correlation = 0.84**

Use the graph and output to answer the following questions.

A good title for this report would be: ___________

The slope coefficient for Fat is ___________ (2 d.p.).

The intercept is ___________ (2 d.p.).

This means that for each extra ___________ by ___________ (1 d.p.) on average.

The intercept tells us ___________

If we have a menu item with 10g of Fat, we would expect its total kJ of energy to be around ___________ (to the nearest 100).
The output said:

**Linear Trend**

Energy = 44.08 * Fat + 471.75
Correlation = 0.84

Use the graph and output to answer the following questions.

A good title for this report would be: Bivariate Investigation

The slope coefficient for Fat is 44.08 (2 d.p.).

The intercept is 471.75 (2 d.p.).

This means that for each extra gram of fat, the energy in the food item increases by 44.08 (1 d.p.) kJ on average.

This makes sense because fat has a high energy content.

The intercept tells us that a menu item with no fat will have 471 kJ of energy on average.

If we have a menu item with 10g of Fat, we would expect its total kJ of energy to be around 540 (to the nearest 100).

Check

You need to multiply the 10 by 44.08, then add 471.75
Mark 0 out of 2
Features of NZ Stats 3

- Immediate Feedback
- Easy access – any device
- Up-to-date and responsive
- Engaging – will have “badges” soon
- A bargain price!
How to use NZ Stat 3

Homework
• Teachers assign a certain activity or quiz for homework.
• Students can show their completion by printing out the results.

Classroom enrichment
• Use the activities in class time to complement other work.
• “flipped” classroom

Review
• The exercises in NZ Stats 3 can be used repeatedly.
• Large database so students get a different test each time.
• Students can also track their own progress.
• Good for Scholarship as includes all standards.

Help with assignments
• NZ Stats provides guidelines and practice in report-writing
Talk to me about our discounted “early adopters” site licences.

www.statsLC.com
Available courses

**NZ Stats 3**
Teacher: Nicola Ward Petty

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**NZ Stats 3 - a year's help**

NZ Stats 3 supports NCEA level 3 Statistics, with video, exercises, notes and activities.

**Free trial access until 30 June 2013.**

To get free trial access, click on Login (in the top right hand corner) and create a new account. After responding to a validation email, login, then self-enrol, using the enrolment key, "freetrial" (without the quotes.)

When your free trial expires, you can pay $29.50 to maintain access for the rest of 2013.

Teachers should contact n.petty@statisc.com for permanent free access.

The Time Series (3.8), Bivariate Investigations (3.9) and Formal Inference (3.10) are ready to use now, and Experimental Design (3.11) is in the pipeline. Materials are being added all the time. All materials for the external standards will be completed in time for exam review.

To see when other sections will be complete, click on **NZ Stats News**.

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**AtMyPace: Statistics**
Teacher: Shane Dye
Teacher: Nicola Ward Petty

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**Help in learning statistics**

AtMyPace: Statistics has been developed to help with the difficult concepts in most statistics courses.

This is not a stand-alone course, but rather concentrates on the ideas, as a support to a course.

The online version here costs $20US, whereas there is an iOS version for about $7 US.

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3.08 Time Series

Investigate Time Series Data
This section teaches the basic principles of time series analysis particularly using the inZight software. There is a strong emphasis on understanding the analysis and producing a report. Resources include videos, databases, handouts, quizzes and a step-by-step guide.

Understanding Time Series Analysis
A gentle introduction with a short video and a learning quiz.

Video: Understanding Time Series Analysis
Learning Quiz: Understanding Time Series Analysis (Quiz 3.08.01)
The video and the learning quiz cover the same ideas, and reinforce your learning.

How to analyse Time Series using inZight
A combination of video, learning quiz and notes to help you learn. The dataset is included so you can try it out yourself.

Notes: A guide to time series analysis using inZight 070.rnp
Video: Time Series Analysis using inZight
Learning Quiz: Time Series Analysis using inZight (Quiz 3.08.02)
RetailINZTS4.csv: a set of four time series in inZight format 56.rnp

Datasets to explore and learn from
These datasets are formatted ready for use on inZight.

Information on Time Series datasets 55.rnp
Time series datasets

Trend and Seasonality
These two learning quizzes are a fun, interactive way to learn about trend and seasonality. Keep trying them until you get them all correct.
Video made specifically for NZ Stats 3. Introduces the main concepts of Time Series Analysis.
Learning Quiz: Understanding Time series Analysis (Quiz 3.08.01)

This is a series of True/False questions to review the basic concepts introduced in the video of the same name. The questions change, so you can do the quiz again. Make sure you read the feedback, even if you get the questions correct.

Grading method: Highest grade

Summary of your previous attempts

<table>
<thead>
<tr>
<th>Attempt</th>
<th>State</th>
<th>Grade / 100</th>
<th>Review</th>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Finished</td>
<td>90</td>
<td>Review</td>
<td>Great - you seem to understand these ideas.</td>
</tr>
</tbody>
</table>

Highest grade: 90 / 100.

Overall feedback

Great - you seem to understand these ideas.
Instant Feedback

Question 1
Correct
Mark 10 out of 10

Time series analysis provides insights into the real life phenomenon measured, and can be used for predicting future behaviour.

Select one:
- True
- False

Correct, this statement is true. This is a good summary of the purpose of time series analysis.

Correct
Marks for this submission: 10/10.

Question 2
Correct
Mark 10 out of 10

A time series is a set of numerical measurements of the same entity, taken at equally spaced intervals over time.

Select one:
- True
- False

Correct, this statement is true. This is a good description of a time series. You can tell a graph of a time series because it always have a time scale along the horizontal axis and the measurement on the vertical axis.

Correct
Marks for this submission: 10/10.

Question 3
Incorrect
Mark 0 out of 10

Time series data can only be collected yearly, quarterly, or monthly.

Select one:
- True
- False

No, this statement is false. All sorts of time intervals are possible in time series, so long as they are evenly spaced. (or nearly, like monthly, which isn’t exactly evenly spaced.)

Incorrect
Marks for this submission: 0/10.

Finish attempt...
Seasonality occurs in quarterly, monthly and annual data.

Select one:
- True
- False

Check

No, this statement is false. Seasonality occurs when there is a repeated pattern in the data which occurs at regular intervals. Annual data is collected just once each year, whereas seasonal patterns usually repeat every year.

Incorrect
Marks for this submission: 0/10. This submission attracted a penalty of 10.

Cycles occur when the series follows an up and down pattern, that is not seasonal.

Select one:
- True
- False

Check

Correct, this statement is true. Cycles can be of varying length, which makes them more difficult to detect than seasonality.

Correct
Marks for this submission: 10/10.

Can be sat multiple times with different questions – until all correct!
Summary of test

**Quiz navigation**
- Show all questions on one page
- Finish review

**Quiz Details**
- **Started on**: Friday, 3 May 2013, 9:13 PM
- **State**: Finished
- **Completed on**: Friday, 3 May 2013, 9:16 PM
- **Time taken**: 2 mins 51 secs
- **Grade**: 30 out of a maximum of 100
- **Feedback**: Keep trying - and remember to read the feedback on each question.

**Question 1**
- **Correct**: True
- **Mark**: 10 out of 10
- **Flag question**: 
- **Answer**: Time series analysis provides insights into the real life phenomenon measured, and can be used for predicting future behaviour.
- **Feedback**: Correct, this statement is true. This is a good summary of the purpose of time series analysis. The correct answer is 'True'.
- **Marks for this submission**: 10/10

**Question 2**
- **Correct**: True
- **Mark**: 10 out of 10
- **Flag question**: 
- **Answer**: A time series is a set of numerical measurements of the same entity, taken at equally spaced intervals over time.
Progress indicators

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Notes for iNZight


iNZight can be downloaded from [http://www.statlab.auckland.ac.nz/iNZight/index.html](http://www.statlab.auckland.ac.nz/iNZight/index.html)

**Step 1**
Click on START_iNZight.VIF.bat

**Step 2**
Click on Run.INZight.

**Step 3**
Click on Data IN/OUT.
Learning Quiz

You have a set of data which is five years of monthly sales of icecream from a successful company.

How many observations do you have? 60

What length is the seasonal pattern? This is the number of periods before the pattern repeats. Put 1 if you think it will not show seasonality. 12

What trend would you expect to see? Probably an upward trend

Correct
Marks for this submission: 20/20.
Trend and Seasonality

These two learning quizzes are a fun, interactive way to learn about trend and seasonality. Keep trying them until you get them all correct.

Learning Quiz: Principles of Time Series (Quiz 3.8.03)
These True-False statements help you to learn the concepts and vocabulary of time series analysis. The questions change, so try the quiz several times and make sure you read the feedback.

Learning Quiz: Trend and seasonality (Quiz 3.06.04)
These questions get you to think about whether a series is likely to have trend or seasonality. The questions change, so try the quiz several times and make sure you read the feedback.

Step-by-step: Analyse Time Series

Step-by-step: analysis of two time series: Regional guest nights (SBS 3.06.101)
Step-by-step is like having a private tutor take you through the process one step at a time. And you can do this over and over.

Writing a Time Series Report

A combination of video, learning quiz and notes to help with your assignment.

Video: How to Write a Time Series Report
Notes: How to write a report on a time series analysis 73.9KB
Learning Quiz: Writing Time Series Reports (Quiz 3.08.10)

Example of a Time Series Report

A combination of video, learning quiz and model report for further help with your assignment.

Video: Example of a Time Series Report
Notes: Example of a Time Series Report 61.7KB
Learning Quiz: Report on Recreational Goods Series (Quiz 3.08.11)
This lesson will take you step-by-step through analysing a time series using INZght. All of the output will be shown as graphics, so you do not need to have INZght running. However you should work through the analysis yourself on INZght when you can.

The data for this analysis is in the file: AccentNZTS12.xlsx
It contains monthly guest nights by region in thousands.

First we open INZght and import the relevant data file.
This picture shows the screen once the dataset has been imported.

How do we get to the Time Series analysis?

Select one:
- Click on Data IN/OUT
- Click on Advanced, then select Time Series
- Drag the ‘Month’ variable to Variable 1

Check
Interpreting output

We click on the button "Compare Series".

This is the output:

We will be examining these graphs over the next few questions. You can right-click on the image, then save to the desktop if you wish.

We have chosen these two series to look at because they have similarities and differences.

Which region has more guests staying in it?
We will be examining these graphs over the next few questions. You can right click on the image, then save to the desktop if you wish. We have chosen these two series to look at because they have similarities and differences. Which region has more guests staying in it?

Select one:

- Nelson/Marlborough/Tasman
- Otago

Correct: The monthly guest nights for Otago fluctuate between about 100,000 and 600,000 whereas the monthly guest nights for Nelson/Marlborough/Tasman vary between about 60,000 and 380,000.

- They are both about the same.
- There isn't enough information on this graph to be able to tell.

Check

Marks for this submission: 4/4.

Question 4

The two series cover about sixteen years.

Select one:

- True
- False

Check

No, this statement is true. You can see by looking at the year values along the bottom, and counting the annual peaks. Or if you look at the data file you can see that the series starts in July 1996 and ends in September 2012.

Incorrect

Marks for this submission: 0/4. This submission attracted a penalty of 4.

Question 5

Nelson/Marlborough/Tasman is showing a stronger upward trend than Otago.

Select one:

- True
- False

Check

Not complete

Marks out of 4

Flag question