



OFFICE OF TASMANIAN  
ASSESSMENT, STANDARDS  
& CERTIFICATION

Tasmanian Certificate of Education  
External Assessment 2016

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# GENERAL MATHEMATICS

## (MTG315115)

### PART 1 – Bivariate Data Analysis

Time: 36 minutes

Pages:	12
Questions:	3
Attachments:	Information Sheet

#### Candidate Instructions

1. You **MUST** make sure that your responses to the questions in this examination paper will show your achievement in the criteria being assessed.
2. Answer **ALL** questions. Answers must be written in the spaces provided on the examination paper.
3. You should make sure you answer all parts within each question so that the criterion can be assessed.
4. This examination is 3 hours in length. It is recommended that you spend approximately 36 minutes in total answering the questions in this booklet.
5. The 2016 External Examination Information Sheet for General Mathematics can be used throughout the examination. No other written material is allowed into the examination.
6. All written responses must be in English.

On the basis of your performance in this examination, the examiners will provide results on each of the following criteria taken from the course statement:

**Criterion 4** Demonstrate knowledge and understanding of bivariate data analysis.

Section Total:	/36
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# Additional Instructions for Candidates

Logical and mathematical presentation of answers and the statement of the arguments leading to your answer will be considered when assessing this part.

You are expected to provide a calculator approved by the Office of Tasmanian Assessment, Standards and Certification.

For questions worth 1 mark, whilst no workings are required, markers may consider appropriate step(s) taken to come to an answer.

For questions worth 2 or more marks, markers will look at the presentation of answer(s) and at the argument(s) leading to the answer(s).

For questions worth 3 or more marks, you are **required to show** relevant working.

**Spare diagrams have been provided in the back of the booklet for you to use if required.**

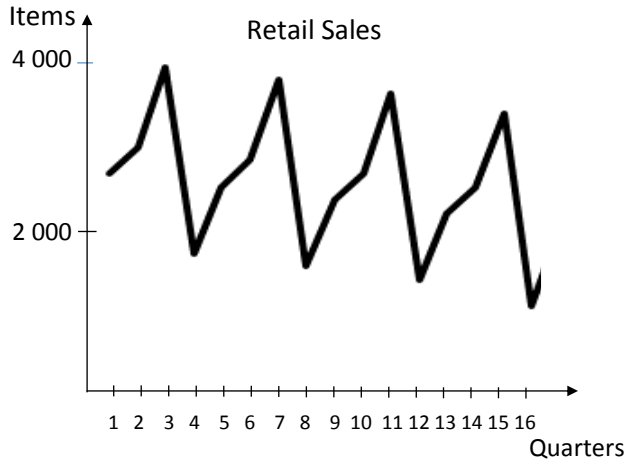
**If you use either of these spare diagrams you MUST indicate you have done so in your answer to that question.**

**Question 1** (approximately 5 minutes)

- (a) Using two of the terms shown below, describe the **trend** and the **secular** (long term) **trend** indicated in the two graphs below: (2 marks)

**trend terms:** seasonal, cyclic, or random,

**secular trend terms:** upwards, a downwards or no long-term trends.



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- (b) The quarterly electricity usage of a household, in kilowatt hours (kWh), and some seasonal index and deseasonalised quarterly usage figures related to these are shown in the table below. (3 marks)

Quarter	1	2	3	4
Electricity usage (kWh)	220	421	400	147
Seasonal index	0.60		1.27	0.68
Deseasonalised Electricity Usage (kWh)	367		315	216

- (i) Determine the seasonal index for **quarter 2**.

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- (ii) Deseasonalise the electricity usage for quarter 2 and hence determine which quarter used the least amount of electricity in seasonally adjusted terms.

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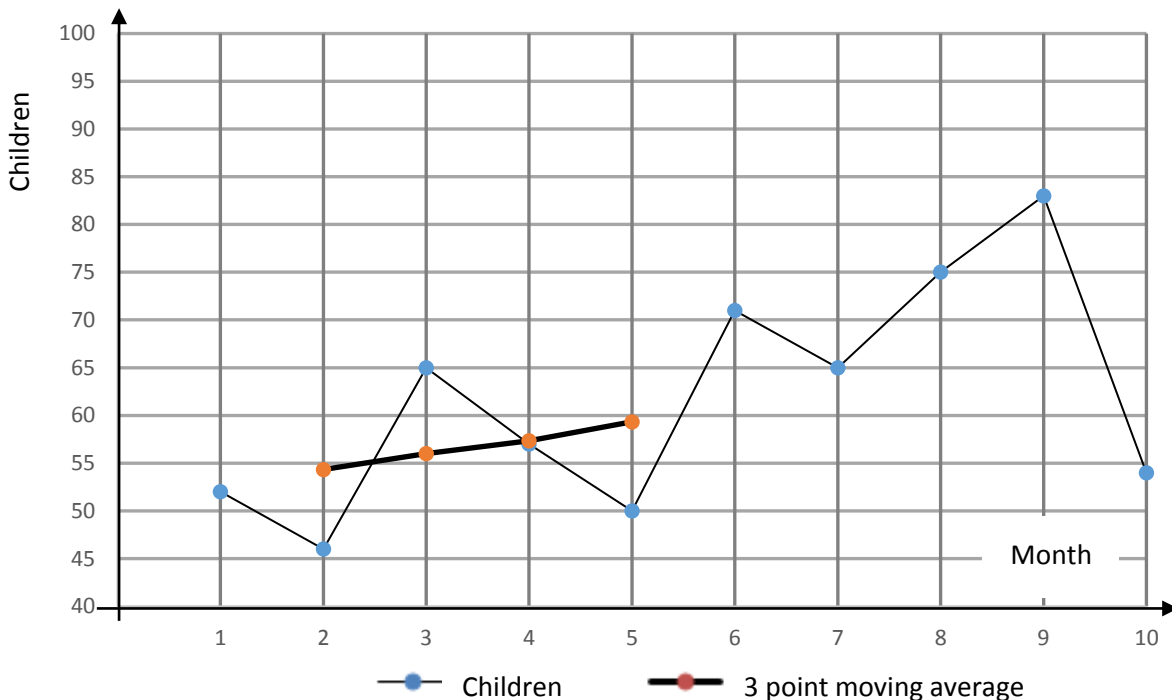
**Question 2** (approximately 14 minutes)

A new child care centre opened in January. The number of children attending on the **first day** of each month is shown in the table below.

- (a) (i) Calculate the missing 3-point moving average figures and include these in the table below. (Give your numbers to one decimal place.) (2 marks)

Month	Month number	Children	3-pt moving average
January	1	52	
February	2	46	54.3
March	3	65	56.0
April	4	57	57.3
May	5	50	59.3
June	6	71	
July	7	65	
August	8	75	
September	9	83	
October	10	54	

- (ii) Include the missing 3-point moving average figures on the graph below. (2 marks)



Question 2 continues.

**Question 2 (continued)**

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- (b) Determine the equation of the **trend line** for the **3-point moving average** of the number of children attending the child care centre. (Give your numbers to one decimal place.) (2 marks)

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- (c) Use your equation from part (b) to forecast the number of children that would be attending in October of the (same) year. (Give your answer to the nearest whole number.) (2 marks)

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- (d) The child care centre manager finds that they cannot cater for more than 100 children on a regular basis. Showing algebraic workings, predict in which **month** this could occur for the first time. (3 marks)

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- (e) Consider your answers to parts (c) and (d). Comment on the **reliability** of your answers. (3 marks)

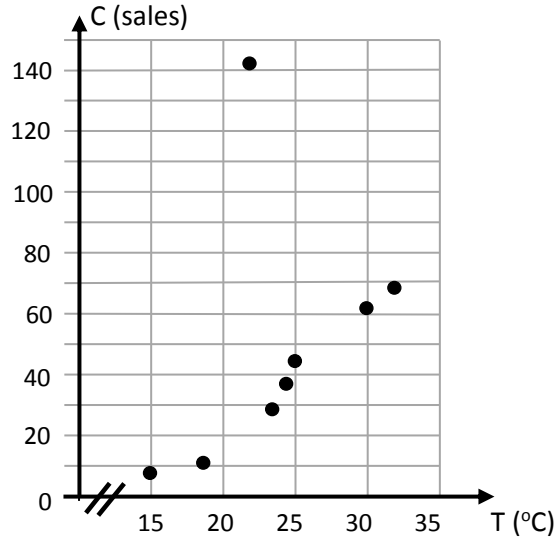
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**Question 3** (approximately 17 minutes)

Sam runs a small seaside shop. He is interested to see if the number of cold drinks he sells is dependent on the temperature of the day.

Sam records the number of cold drinks (C) he sells against the temperature (T) of the day for a period of nine days. The data he collected is shown in the table and the graph below.

Temperature (°C) T	Cold drinks sold C
15	7
18	11
22	142
23	29
24	37
25	44
30	62
32	68



Sam found the equation of the **line of best fit** and the **correlation coefficient** for this data to be:

$$C = 3.01 T - 21.13 \quad r = 0.3941$$

- (a) Explain the gradient and the y-intercept in context of the variables Sam investigated. Comment on their relevance. (3 marks)

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- (b) Write a conclusion based on the correlation coefficient. (2 marks)

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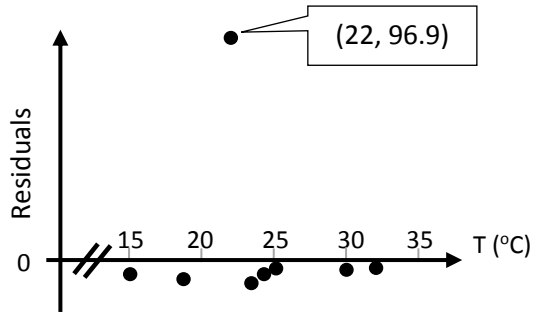
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Question 3 continues.

**Question 3 (continued)**

(c) The residuals plot for this linear model and the point (22, 96.9) are shown below.



(i) Interpret the **residual point** (22, 96.9), in terms of the variables being investigated. (2 marks)

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(ii) Explain the effect that this point value (22, 142) has on the linear model Sam found. (2 marks)

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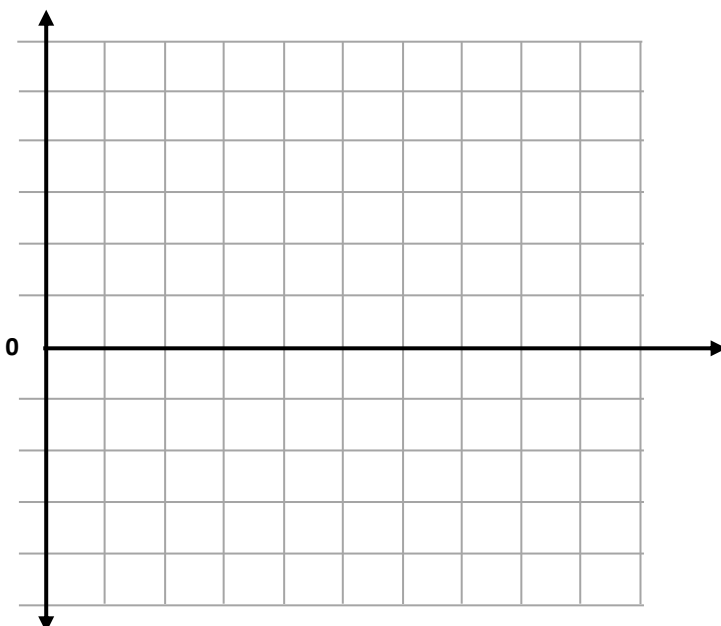
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(d) **Remove** the point (22, 142) from the original data point opposite and determine the: (2 marks)

New linear equation: .....

New correlation coefficient: .....

(e) Prepare a scaled **residual plot** for the new linear model you have found in in part (d). (3 marks)



**Question 3 continues.**

**Question 3 (continued)**

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- (f) On the basis of your answers to parts (d) and (e), state whether or not the linear equation you have found in (d) models this data well or otherwise. Give reasons for your choice. (3 marks)

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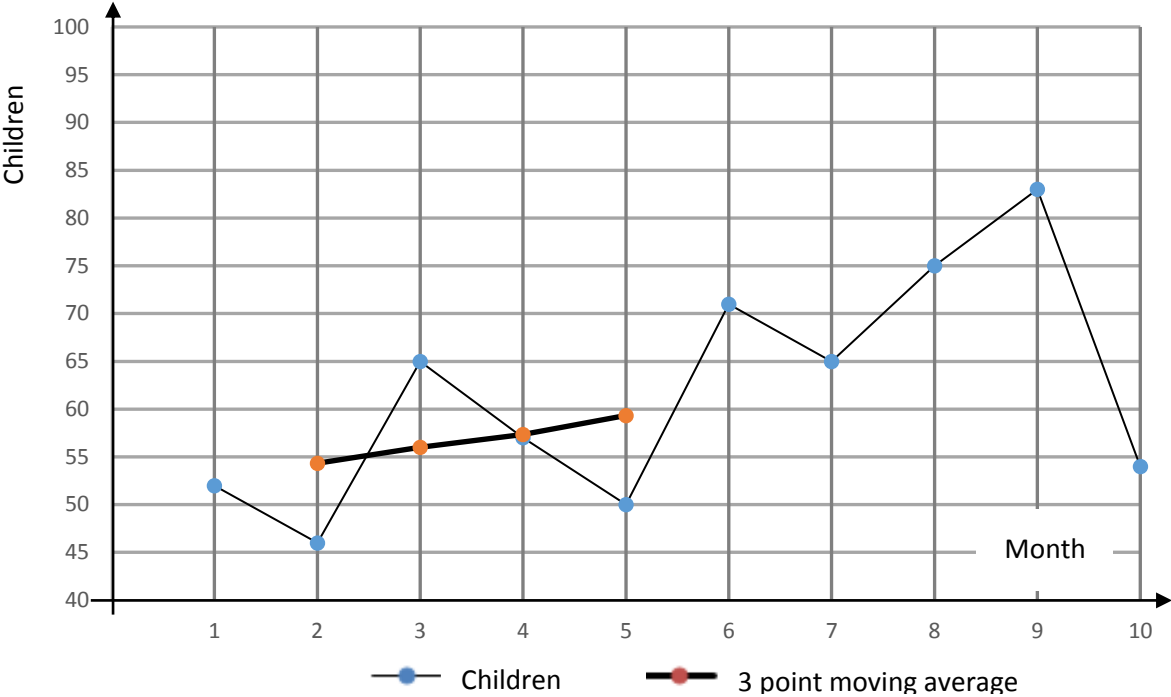
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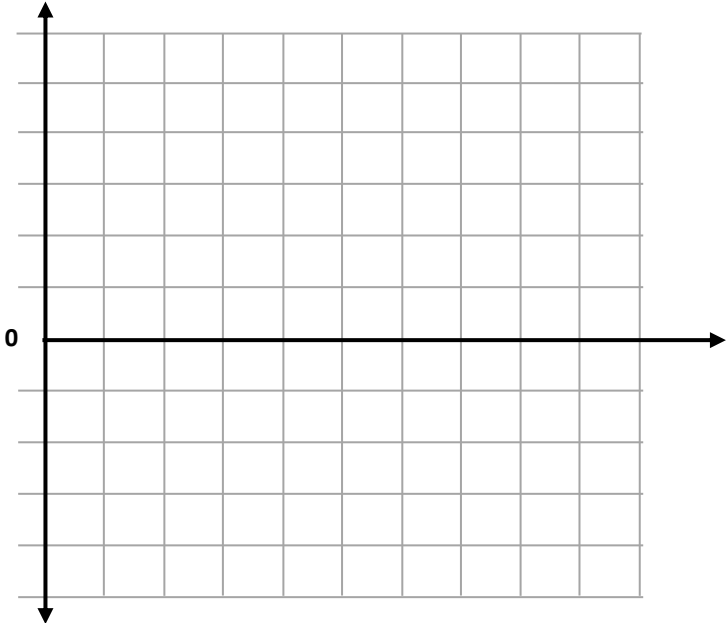


SPARE DIAGRAMS

Question 2 (a) (i)



Question 3 (e)



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