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| Name: |  | | | |  | |
| Baldivis logo cropped | **Mathematics Applications Unit 3 & 4 Year 12**  **2020 Practical Application 1**  **Topic – Bivariate Data** | | | |  | |
| **Equipment:** | *SCSA Formula sheets, CAS calculator,* Urban Population Growth and Yearly CO2 Emissions from Australia. | | | | | | |
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| **Date out:** | | *Week \_\_\_\_ Date \_\_\_\_\_\_\_\_* | **Date Due:** *Week \_\_\_\_Date \_\_\_\_\_\_\_\_\_\_* |  | |
| **Weighting:** | | *5% of the year* |

**Take Home Component**

Use the data in the Australian context from <https://www.gapminder.org/data/> concerning:

* **Urban Population Growth (Annual Percent)**
* **Yearly CO2 Emissions (1000 metric tonnes)**

**Task A**

You will need to use the historical data for Australia concerning the above two categories using an appropriate range of years.

**Task B**

Using the results from your data analysis make a prediction of the level of CO2 emissions in Australia in the year 2050. Examine the reliability of this prediction and comment on Australia’s commitment to zero net emissions by 2050.

**Presentation**

Produce a report on the trend(s) identified between urban population growth and yearly carbon dioxide emissions in Australia. The maximum length of this report is 5 pages including relevant tabular and graphical representations of data used for analysis.

Include all relevant sources of information in a bibliography.

This Investigation covers your knowledge and skills in the area of:

**Topic 3.1: Bivariate data analysis**

**The statistical investigation process**

* 3.1.1 review the statistical investigation process: identify a problem; pose a statistical question; collect or obtain data; analyse data; interpret and communicate results

**Identifying and describing associations between two categorical variables**

* 3.1.2  construct two-way frequency tables and determine the associated row and column sums and percentages
* 3.1.3  use an appropriately percentaged two-way frequency table to identify patterns that suggest the presence of an association
* 3.1.4  describe an association in terms of differences observed in percentages across categories in a systematic and concise manner, and interpret this in the context of the data

**Identifying and describing associations between two numerical variables**

* 3.1.5  construct a scatterplot to identify patterns in the data suggesting the presence of an association
* 3.1.6  describe an association between two numerical variables in terms of direction (positive/negative), form (linear/non-linear) and strength (strong/moderate/weak)
* 3.1.7  calculate, using technology, and interpret the correlation coefficient (*r*) to quantify the strength of a linear association

**Fitting a linear model to numerical data**

* 3.1.8  identify the response variable and the explanatory variable for primary and secondary data
* 3.1.9  use a scatterplot to identify the nature of the relationship between variables
* 3.1.10  model a linear relationship by fitting a least-squares line to the data
* 3.1.11  use a residual plot to assess the appropriateness of fitting a linear model to the data
* 3.1.12  interpret the intercept and slope of the fitted line
* 3.1.13  use the coefficient of determination to assess the strength of a linear association in terms of the explained variation
* 3.1.14  use the equation of a fitted line to make predictions
* 3.1.15  distinguish between interpolation and extrapolation when using the fitted line to make predictions, recognising the potential dangers of extrapolation
* 3.1.16  write up the results of the above analysis in a systematic and concise manner

**Association and causation**

* 3.1.17  recognise that an observed association between two variables does not necessarily mean that there is a causal relationship between them
* 3.1.18  identify possible non-causal explanations for an association, including coincidence and confounding due to a common response to another variable, and communicate these explanations in a systematic and concise manner

**The data investigation process**

* 3.1.19 implement the statistical investigation process to answer questions that involve identifying, analysing and describing associations between two categorical variables or between two numerical variables