# Mathematics Standard Year 11

# Sample Assessment Task Statistical Analysis

## Statistical Analysis: Investigating National Data

***Sample for implementation for Year 11 from 2018***

### Context

Students have engaged in learning for the subtopic, Data Analysis. They have participated in activities to develop knowledge of the concepts of statistical analysis, and skills to solve a variety of problems.

Students will require approximately five hours of independent preparation; including time during class to discuss the notification and task requirements.

The task notification includes four questions. A booklet containing the four questions and marking guidelines will be handed out with the notification.

An adjusted version of this assessment task has also been included to meet the needs of a student with disability. Read the [student’s case study](http://educationstandards.nsw.edu.au/wps/portal/nesa/11-12/Diversity-in-learning/stage-6-special-education/case-studies/kai).

### Notes to teacher

Throughout the development of the task, teachers should monitor authorship and the progress of student work. All responses will be submitted on the same day.

When student feedback is provided after marking, there will be opportunity to discuss the challenges of the task with the class and consider future learning activities to assist student learning.

The marking guidelines provided at the end of this document illustrate an approach for how marks may be allocated to student responses. Discuss the marking guidelines with students as part of the feedback provided upon completion of the task.

# Statistical Analysis: Investigating National Data

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| --- | --- | --- |
| Task 2 | Weighting: 30% | Timing: Term 2, Week 5 |
| Outcomes assessed  * represents information in symbolic, graphical and tabular form MS11-2 * develops and carries out simple statistical processes to answer questions posed MS11-7 * uses appropriate technology to investigate, organise and interpret information in a range of contexts MS11-9 * justifies a response to a given problem using appropriate mathematical terminology and/or calculations MS11-10 | | |
| Nature of the task This task involves the collection, exploration, display, analysis and interpretation of data to identify and communicate information. It comprises four questions.   * Complete the four questions in the Investigating National Data Booklet provided and submit a hard copy to your teacher by the due date. * Complete and submit digital files as described in the National Data Booklet. These files must be emailed to your teacher before 5 pm on the day the assignment is due.   While doing this assessment you are permitted to use:   * the resources as stated in the Investigating National Data Booklet * your own class notes * a calculator and a computer. | | |
| Marking criteria You will be assessed on how well you:   * accurately follow statistical analysis process. * select and use appropriate mathematical processes, technologies and language to investigate, organise and interpret data * provide reasoning and justification related to the statistical analysis processes followed. | | |
| Feedback provided  * The teacher will provide feedback outlining strengths and areas for improvement to build on knowledge, understanding and skills for future learning. | | |

#### Student Name:

## Investigating National Data Booklet

##### Question 1 – 7 marks

Graduate Careers Australia (GCA) is the leading authority on graduate employment issues in Australia ([www.graduatecareers.com.au](http://www.graduatecareers.com.au)). Every year, GCA performs a national survey that examines graduate activity after they have completed their degree. Key findings and a summary of the data collected are published in the *GradStats* research report section of the GCA website each year. To complete Question 1, you are required to download the publication *GradStats* 2015 from the research reports section on the GCA website.

|  |  |  |
| --- | --- | --- |
|  | Understanding, Fluency and Communication | Marks |
| (a) | Prepare a table using a spreadsheet to show the data from Table 5 in the *GradStats* 2015 publication. Paste a screen shot or clip of your completed spreadsheet in the space below. | **1** |
| (b) | Is the data represented in Table 5 numerical discrete, numerical continuous or categorical? Include a reason for your choice. | **1** |
| (c) | Construct a Pareto chart in your spreadsheet to represent this data. Paste a screen shot or clip of your chart below. | **2** |
| (d) | Consider the advertisement entitled ‘Know Your Worth’ on page 11 of the report. List at least three mathematical observations about the purpose and validity of the visual display and provide justification for your response. | **3** |
| (e) | Save a copy of your spreadsheet and chart in a file using the following naming protocol: yourname\_q1.filetype |  |

##### Question 2 – 13 marks

The Australian Government Bureau of Meteorology provides information and climate data for Australia (<http://www.bom.gov.au/climate/data/>). For Question 2, you are required to generate *Weather and Climate* data for a location of your choice.

|  |  |  |
| --- | --- | --- |
|  | Understanding, Fluency and Communication | Marks |
| (a) | Select the ‘Daily weather observations’ about *Weather and Climate* using the drop down menu. Choose a weather station in a location that interests you and then select ‘Get the data’. From the information that appears below the table, select a month and year to ensure that you investigate the weather for a whole month.   1. What is the station number from which you selected the data? 2. What month and year are you investigating? 3. Copy the displayed data into a spreadsheet to assist you with the following tasks. | **1** |
| (b) | The column headings in the table have been abbreviated. A list of column meanings can be found at <http://www.bom.gov.au/climate/dwo/IDCJDW0000.shtml>.  Use this information to describe the type of variable recorded as:   1. Rain: 2. DIR: 3. CLD: | **3** |
| (c) | 1. In your spreadsheet, add a column with the heading **DIFF** that calculates the difference between the maximum and minimum daily temperatures.   Using your spreadsheet or calculator, calculate the population mean and population standard deviation for the variable you have called DIFF.   1. Population mean = 2. Population standard deviation = | **2** |
| (d) | With or without the use of graphing software, construct a pair of parallel box-plots to compare the maximum and minimum temperatures for the month.  Note: If you have used graphing software, save your file using the following naming protocol: yourname\_boxplotsq2e.filetype | **3** |
|  | Problem Solving, Reasoning and Justification |  |
| (e) | Are there any outliers in the data for DIFF? Support your answer with reasoning and calculations. | **2** |
| (f) | Compare and contrast the two box-plots constructed for maximum and minimum temperatures. | **2** |
| (g) | Save your spreadsheet and box-plots in a file using the following naming protocol: yourname\_q2.filetype |  |

##### Question 3 – 4 marks

The Australian Bureau of Statistics (ABS) is Australia’s national statistical agency, providing trusted official statistics on a wide range of matters of importance to Australia.

Question 3 involves exploring unemployment rates for the Australian labour market using the following link: [Table showing Monthly Australian Labour data from 2007-2014](http://www.abs.gov.au/websitedbs/CaSHome.nsf/Home/Economy+Datasets#E3)

|  |  |  |
| --- | --- | --- |
|  | Understanding, Fluency and Communication | Marks |
| (a) | Copy table Eco4 into a spreadsheet.  Using the data labelled Unemployment rate (%), choose a suitable graphical representation to illustrate the data for males and females from Sept 1994 to Dec 2013. Copy your display into the space below. | **1** |
|  | Save your spreadsheet and graphical representation in a file using the following naming protocol: yourname\_q3.filetype |  |
|  | Problem Solving, Reasoning and Justification |  |
| (b) | Explain why you made this choice of graphic display. | **1** |
| (c) | Use your graph to discuss the trends in the unemployment rate for males and females during this period of time. | **2** |

##### Question 4 – 10 marks

|  |  |
| --- | --- |
| Problem Solving, Reasoning and Justification | Marks |
| An anonymous donor who has a passion for cricket has invited you to help choose the recipient of a large donation to promote cricket in Australia. The donor wants the donation to go to either the men’s or women’s national cricket teams.  Using the records of series results for the past 10 years, prepare a report for your client, recommending the team to whom the donation should go with reasons for that recommendation. Your submission may include:   * graphs * sets of summary statistics * calculations of summary statistics.   Women’s national cricket series results can be found at:  <http://stats.espncricinfo.com/ci/engine/records/team/series_results.html?class=10;id=289;type=team>  Men’s cricket series results can be found at:  <http://stats.espncricinfo.com/australia/engine/records/team/series_results.html?class=1;id=2;type=team>  Submit your report with this Investigating National Data Booklet.  Save any digital files that form part of your submission using the following naming protocol: yourname\_q4.filetype | **10** |

**End of task**

### Marking Guidelines

The four parts of the marking guidelines align with the four parts of the task.

|  |  |  |
| --- | --- | --- |
| Question 1 Understanding, Fluency and Communication | | Marks |
| (a) | Completed spreadsheet | **1** |
| (b) | Correct answer supported by a correct reason | **1** |
| (c) | One mark for a correct bar chart  One mark for a correct line to make into a correct Pareto chart | **2** |
| (d) | One mark for each correct observation, supported by a correct reason | **3** |

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| --- | --- | --- |
| Question 2 Understanding, Fluency and Communication | | Marks |
| (a) | * Statement of station number * Statement of month and year * Correct spreadsheet that is related to stated station number, month and year. | **1** |
| (b) | * Correct description of the variable recorded as “Rain” * Correct description of the variable recorded as “DIR” * Correct description of the variable recorded as “CLD” | **1**  **1**  **1** |
| (c) | * Instruction only * Correct answer * Correct answer | **2** |
| (d) | * Correct box plot for maximum temperature * Correct box plot for minimum temperature * Box plots drawn on the same axes parallel to each other | **1**  **1**  **1** |
| Question 2 Problem Solving, Reasoning and Justification | | Marks |
| (e) | * Demonstrates of an understanding of criteria used to identify an outlier * Demonstrates the justifying of particular values as outliers according to the criteria identified | **1**  **1** |
| (f) | * Compares the five number summary between the two box plots (median, quartiles, lower and upper bounds) and considers the implications * Compares the range and interquartile range between the two box plots and considers the implications of that. | **1**  **1** |

|  |  |  |
| --- | --- | --- |
| Question 3 Understanding, Fluency and Communication | | Marks |
| (a) | * Displays a correct and suitable graphical representation | **1** |
| Question 3 Problem Solving, Reasoning and Justification | | Marks |
| (b) | * Justifies the choice of display that demonstrates an understanding of the statistical analysis involved in the display | **1** |
| (c) | * Makes a correct statement regarding the unemployment trends for males * Makes a correct statement regarding the unemployment trends for females | **1**  **1** |

|  |  |
| --- | --- |
| Question 4 Problem Solving, Reasoning and Justification | |
| A student: | Mark range |
| * demonstrates a thorough understanding of the mathematics involved in solving the problem * uses appropriate mathematical processes in solving the problem without error * communicates in a concise and systematic manner and justifies conclusions using appropriate mathematical language, notation and symbols | **8–10** |
| * demonstrates understanding of the mathematics involved with appropriate calculations with either a minor arithmetic or calculation error OR all mathematical calculations have been carried out without error but the final conclusion is incorrect * communicates in a concise and systematic manner and justifies conclusions using some mathematical language, notation and symbols | **5–7** |
| * demonstrates progress towards a solution with some error * demonstrates a developing understanding of what it means to work mathematically with some use of mathematical language, notation and/or symbols | **3–4** |
| * demonstrates a limited understanding of the mathematics involved in solving the problem * demonstrates a limited use of mathematical language | **1–2** |

#### Student Name:

## Investigating National Data Booklet

Personalised adjustments ([**Case study: Kai**](http://educationstandards.nsw.edu.au/wps/portal/nesa/11-12/Diversity-in-learning/stage-6-special-education/case-studies/kai))

##### Question 1 – 7 marks

Graduate Careers Australia (GCA) is the leading authority on graduate employment issues in Australia ([www.graduatecareers.com.au](http://www.graduatecareers.com.au)). Every year, GCA performs a national survey that examines graduate activity after they have completed their degree. Key findings and a summary of the data collected are published in the *GradStats* research report section of the GCA website each year.

What you need to do:

To complete Question 1, use the table of data (Table 5) and advertisement (‘Know Your Worth’) provided to you by your teacher.

|  |  |  |
| --- | --- | --- |
|  | Understanding, Fluency and Communication | Marks |
| (a) | Create a table in a spreadsheet to show the data from Table 5.  Paste a screen shot or clip of your completed spreadsheet in the space below. | **1** |
| (b) | What type of data is represented in Table 5? (circle the correct response)   1. Numerical discrete (data that is counted). 2. Numerical continuous (data that is measured). 3. Categorical (data that can be placed into categories).   Provide a reason for your choice. | **1** |
| (c) | Construct a Pareto chart in your spreadsheet to represent this data. Paste a screen shot or clip of your chart below. | **2** |
| (d) | Read the advertisement, ‘Know Your Worth’. Answer the questions below.   1. What do the burgers illustrate in the advertisement? 2. What is the purpose of the advertisement? How do you know? 3. How reliable is the advertisement? Why? | **3** |
| (e) | Save a copy of your spreadsheet (a) and chart (c) in a file and name it: yourname\_q1.filetype |  |

##### Question 2 – 13 marks

The Australian Government Bureau of Meteorology provides information and climate data for Australia (<http://www.bom.gov.au/climate/data/>).

|  |  |  |
| --- | --- | --- |
|  | Understanding, Fluency and Communication | Marks |
| (a) | Use the data supplied by your teacher on the daily weather observations for a particular location in Sydney to answer the questions below.   1. What is the station number from which you selected the data? 2. What month and year are you investigating? 3. Copy the data into a spreadsheet to assist you with the following tasks. | **1** |
| (b) | The column headings in the table have been abbreviated. A list of column meanings can be found at <http://www.bom.gov.au/climate/dwo/IDCJDW0000.shtml>.  Use this information to describe the type of variable recorded as:   1. Rain: 2. DIR: 3. CLD: | **3** |
| (c) | 1. In your spreadsheet, add a column with the heading **DIFF** in between the columns ‘TEMPS’ and ‘RAIN’. 2. Use the formula "=A1-B1" to calculate the difference between the maximum and minimum temperatures each day. Add this data into the column labelled ‘DIFF’. 3. Calculate the population mean and population standard deviation for the variable you have called DIFF.   Population mean =  Population standard deviation = | **2** |
| (d) | With or without the use of graphing software, construct a pair of parallel box-plots to compare the maximum and minimum temperatures for the month (use the data in the maximum and minimum columns).  Note: If you have used graphing software, save your file and name it: yourname\_boxplotsq2e.filetype | **3** |
|  | Problem Solving, Reasoning and Justification |  |
| (e) | Are there any **outliers** (a value that is much smaller or larger than the other values) in the data for DIFF? Support your answer with reasoning and calculations. | **2** |
| (f) | Compare and contrast the two box-plots. | **2** |
| (g) | Save your spreadsheet and two box-plots in a file using the following naming protocol: yourname\_q2.filetype |  |

##### Question 3 – 4 marks

The Australian Bureau of Statistics (ABS) is Australia’s national statistical agency, providing trusted official statistics on a wide range of matters of importance to Australia.

Question 3 involves exploring unemployment rates for the Australian labour market using the following link: [Table showing Monthly Australian Labour data from 2007-2014.](http://www.abs.gov.au/websitedbs/CaSHome.nsf/Home/Economy+Datasets#E3)

What you need to do:

Your teacher will give you table Eco4 from this site to answer the following questions.

|  |  |  |
| --- | --- | --- |
|  | Understanding, Fluency and Communication | Marks |
| (a) | Copy table Eco4 into a spreadsheet.  Using the data labelled Unemployment rate (%), choose a suitable graphical representation to illustrate the data for males and females from Sept 1994 to Dec 2013. Copy your display into the space below. | **1** |
|  | Save your spreadsheet and graphical representation in a file and name it: yourname\_q3.filetype |  |
|  | Problem Solving, Reasoning and Justification |  |
| (b) | Explain why you chose this graphic display. | **1** |
| (c) | Use your graph to discuss the **trends** (patterns) in the unemployment rate for males and females during this period of time. | **2** |

##### Question 4 – 10 marks

An anonymous donor who has a passion for cricket has invited you to help choose the recipient of a large donation to promote cricket in Australia. The donor wants the donation to go to either the men’s or women’s national cricket teams.

Women’s national cricket series results can be found at:

<http://stats.espncricinfo.com/ci/engine/records/team/series_results.html?class=10;id=289;type=team>

Men’s cricket series results can be found at:

<http://stats.espncricinfo.com/australia/engine/records/team/series_results.html?class=1;id=2;type=team>

|  |  |
| --- | --- |
| Problem Solving, Reasoning and Justification | Marks |
| Prepare a report for the donor recommending which team should get the donation. Use the records of series results for the past 10 years to make your recommendation.  Follow the outline below to prepare your report:   1. Introduction  * the purpose of the report (why you are writing it) * what statistics you are using in your report  1. Analysis  * prepare two parallel box plots to illustrate the men’s and women’s series results for the past 10 years * summarise the five key data points from the box plots  1. Recommendation  * recommend which cricket teams (men’s or women’s) should get the donation * provide reasons for your recommendation.   Submit your report with this Investigating National Data Booklet.  Save any digital files that form part of your submission and name them: yourname\_q4.filetype | **10** |

**End of task**

### Marking Guidelines

The four parts of the marking guidelines align with the four parts of the task.

|  |  |  |
| --- | --- | --- |
| Question 1 Understanding, Fluency and Communication | | Marks |
| (a) | Completed spreadsheet | **1** |
| (b) | Correct answer supported by a correct reason | **1** |
| (c) | Correct bar chart.  Correct line to make into a correct Pareto chart. | **1**  **1** |
| (d) | One mark for each correct observation, supported by a correct reason | **3** |

|  |  |  |
| --- | --- | --- |
| Question 2 Understanding, Fluency and Communication | | Marks |
| (a) | * Statement of station number * Statement of month and year * Correct spreadsheet that is related to stated station number, month and year. | **1** |
| (b) | * Correct description of the variable recorded as “Rain” * Correct description of the variable recorded as “DIR” * Correct description of the variable recorded as “CLD” | **1**  **1**  **1** |
| (c) | * Instruction only * Correct answer * Correct answer. | **2** |
| (d) | * Correct box plot for maximum temperature. * Correct box plot for minimum temperature. * Box plots drawn on the same axes parallel to each other. | **1**  **1**  **1** |
| Question 2 Problem Solving, Reasoning and Justification | | Marks |
| (e) | * Demonstrates an understanding of criteria used to identify an outlier. * Demonstrates the justification of particular values as outliers according to the criteria identified. | **1**  **1** |
| (f) | * Compares the five number summary between the two box plots (median, quartiles, lower and upper bounds) and considers the implications of that. * Compares the range and interquartile range between the two box plots and considers the implications of that. | **1**  **1** |

|  |  |  |
| --- | --- | --- |
| Question 3 Understanding, Fluency and Communication | | Marks |
| (a) | * A correct and suitable graphical representation. | **1** |
| Question 3 Problem Solving, Reasoning and Justification | | Marks |
| (b) | * A justification for the choice of display that demonstrates an understanding of the statistical analysis involved in the display. | **1** |
| (c) | * Makes a correct statement regarding the unemployment trends for males. * Makes a correct statement regarding the unemployment trends for females. | **1**  **1** |

|  |  |
| --- | --- |
| Question 4 Problem Solving, Reasoning and Justification | |
| A student: | Mark range |
| * demonstrates a thorough understanding of the mathematics involved in solving the problem * uses appropriate mathematical processes in solving the problem without error * communicates in a concise and systematic manner and justifies conclusions using appropriate mathematical language, notation and symbols | **8–10** |
| * demonstrates understanding of the mathematics involved with appropriate calculations with either a minor arithmetic or calculation error OR all mathematical calculations have been carried out without error but the final conclusion is incorrect * communicates in a concise and systematic manner and justifies conclusions using some mathematical language, notation and symbols | **5–7** |
| * demonstrates progress towards a solution with some error * demonstrates a developing understanding of what it means to work mathematically with some use of mathematical language, notation and/or symbols | **3–4** |
| * demonstrates a limited understanding of the mathematics involved in solving the problem * demonstrates a limited use of mathematical language | **1–2** |