

Maths Applied 3/4 - Data Investigation

Level 3 & 4 Data		
Criterion 2	Criterion 8	Criterion 10
Teacher Comments		

Several ancient civilisations (including Babylonian, Egyptian and Hebrew) used the cubit as a measure of length. A cubit was the length of the forearm from the tip of the middle finger to the elbow. The official length for the ancient Egyptians was about 530 mm, for the ancient Romans 445 mm and for the Hebrews 447 mm. In the English system it is 460 mm.



In this investigation you will measure the cubit length for each student in the class, prepare a frequency distribution table and a bar graph and frequency polygon.

Equipment you will need:

Tape measure

Blutac or sticky tape

Empty bookshelf or similar appropriate place to make measurements.

Graph paper



I suggest you use an empty shelf on a bookshelf at an appropriate height. Attach a tape measure to one end of the shelf with blutac or sticky tape. Take turns to measure and record the length of the forearm of each student on the class by placing the elbow into the end of the bookshelf where the tape is at 0 cm. Place the hand with the palm flat on the shelf along the tape. Read off the tape where the middle finger comes to. Make your measure to the nearest mm. Record your results on the next page.

Cubit measurement for students in Maths Applied 3/4

Length (mm)	Tally	Frequency	Class Centre
395-404			39.95 cm
405-414			
415-424			
425-434			
435-444			
445-454			
455-464			
465-474			
475-484			
485-494			
495-504			
505-514			
515-524			
525-534			
535-544			
545-554			

Present this information in a bar graph and as a frequency polygon.

Answer the following:

1. What is the modal class of your distribution? _____
2. What is the median? _____
3. What is the range? _____
4. Use your calculator to determine the mean of your distribution. Write your answer here. _____

From the results for your class, which of the official cubit measures (ancient Egyptian, ancient Roman, Hebrew , English) do you think is the most accurate and why?

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1. Go to http://www.prb.org/pdf05/05WorldDataSheet_Eng.pdf, and download a copy of the Population reference Bureau's Data Sheet
2. Select 10 countries from Europe and 10 countries from Africa
3. Record in a table the average Life Expectancy for each of your selections
3. Construct a back-to-back stem-and-leaf diagram of your data
4. For each of the two continents, calculate the mean and median Life Expectancy. Find also the upper and lower quartiles
5. Construct side-by-side box and whisker plots for each of Europe and Africa
6. Write a report on what your diagrams tell you about Life Expectancy in Europe and Africa. What reasons can you give for any differences between the two continents you notice.

①

In 1885, 1000 baby girls around Australia were identified for a survey to see how long they lived. Their ages at death were noted, with the following results:

Age	Number
0 - 9	68
10 - 19	27
20 - 29	35
30 - 39	51
40 - 49	80
50 - 59	151
60 - 69	224
70 - 79	253
80 - 89	74
90 - 99	32
100 and over	5

- Construct a cumulative frequency ogive on graph paper.
- From your graph determine the median, lower quartile and upper quartile.
- What is the interquartile range of this distribution?
- Explain why the 0-9 age group is so high compared with the age groups that follow it.

②

Statistics on the number of cars entering the Freycinet National Park near Coles Bay on the East Coast of Tasmania were recently recorded over a four week period.

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
180	161	180	160	200	202	245
200	176	192	165	189	249	240
176	190	193	174	205	241	235
212	175	162	193	187	192	221

- By dividing the data into two groups; Group WEEK for the weekdays and Group END for the weekend days, draw a back to back stem and leaf plot.
- Calculate the upper and lower quartiles for each group.
- Using the same scale, draw box and whisker plots for each group for comparison purposes.
- Write brief comments on a comparison of the two sets of data.

MAP 3/4 Chance & Data - Computer Investigation

1. Plan, organise and complete activities
2. Use statistical methods to analyse data associated with populations and samples
3. Select and use technologies

In this activity, you will go to the Australian Bureau of Statistics Website and complete a series of tasks based on data that is provided for you. You will not only gain an understanding of the concept of *chance*, but will use technology to develop skills in preparing and interpreting *data*.

The following is a link to the PDF file you need to complete the activity:

[http://www.abs.gov.au/websitedbs/D3310116.NSF/4a255eef008309e44a255eef00061e57/ec03f30964e795b5ca256dcc007c2598/\\$FILE/Statsercise%204,%202003.pdf](http://www.abs.gov.au/websitedbs/D3310116.NSF/4a255eef008309e44a255eef00061e57/ec03f30964e795b5ca256dcc007c2598/$FILE/Statsercise%204,%202003.pdf)

Your teacher will provide you with the *data sheet* needed to complete this activity. This needs to be submitted for assessment. It can also be obtained and completed online using the link below. Your teacher will instruct you on which method they would prefer you to do.

[http://www.abs.gov.au/websitedbs/D3310116.NSF/4a255eef008309e44a255eef00061e57/ec03f30964e795b5ca256dcc007c2598/\\$FILE/Statsercise%202003%20-%20Dataset.xls](http://www.abs.gov.au/websitedbs/D3310116.NSF/4a255eef008309e44a255eef00061e57/ec03f30964e795b5ca256dcc007c2598/$FILE/Statsercise%202003%20-%20Dataset.xls)

On page two of the first link, there is instructions. Read through these carefully. These are very clear and outline exactly what you have to do.

Activity 1 and 2 should be completed on your *data sheet*. You will need a die to carry this part out.

Once you have completed these activities there are some questions for you to attempt on the site.

Teacher note: the data sheet can be completed and then assessed online, but print it out and have your students show you if you prefer a hard copy of their work

You may prefer to verbally direct your students to the site. If you go to the Australian Bureau of Statistics site (www.abs.gov.au), you can then link to:

Education Resources

Teacher tolls and classroom activities

Students' activities

Statsercise

Statsercise Archives

Then scroll down to the activity (2003)

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Maths Applied 3/4 - Data Investigation

A Leafy Assignment

Sensibly track to the bush and select a large gum tree. Each person is to choose 4-5 leaves in a range of sizes to measure.



- *Measure each leaf length to the **nearest mm**.*
- *Record the results as a class set on the board.*
- *Copy the class results down as a set of “raw” data.*

Using the class set of raw data:

1. *Produce a **frequency distribution table** of the data by first deciding on a suitable group size. Include a mid-point column, an fx column and a cumulative frequency column.*
2. *Plot a **frequency histogram** of the results and add a polygon to this.*
 - (a) *Label the modal group on the histogram.*
3. *Use your table to calculate the mean leaf size for the data. Show working.*
4. *Now type all the separate leaf lengths into List 1 in STAT mode and use the GC to calculate the mean of the data.*
5. *Discuss why the two mean values from Q3 and Q4 are different.*

Then.....

6. *Plot a **cumulative frequency histogram** with an **ogive** and a **percentile axis**.*
 - (a) *Find the median, the upper and lower quartiles on the graph **from the ogive** (use a dashed line). Write a sentence for each explaining what they mean.*
 - (b) *Calculate the inter-quartile range and show this on the percentile axis.*
 - (c) *What percentages of the leaves are 85mm or smaller? (show on the graph)*
 - (d) *If you had to collect the smallest 20% of the leaves what would be the largest leaf size collected? Show this on your graph.*

7. Construct a **stem and leaf plot** using a group size of 10 mm. Remember to show a key. (Don't forget: you can sort the data in List 1.)
8. Use the GC to list a 5-figure summary of the data.
9. Using the five figure summary, produce a box and whisker diagram showing a scale axis and all relevant points.
10. Describe what the Box plot tells you about the sizes of the leaves collected.
11. Compare the upper and lower quartiles with your cumulative frequency graph. Are they the same? Explain any differences.
12. Another class did not want to damage the tree and only picked up leaves from the ground. Discuss how this may affect the box and whisker plot.
13. Using the same scale in Q9, add in a different colour where you think the Box plot for the "picked-up leaves" would be positioned

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Assignment A – Marriages

Compare the age at marriage for males and females in 1984 and 2004

In this assignment you will construct cumulative frequency tables and ogives four times, i.e. males 1984, males 2004, females 1984, females 2004. In each case use your ogive to find the median, upper quartile, lower quartile and inter-quartile range. Also use your graphical calculator to find the mean age of marriage for each group.

Write a paragraph summarizing your findings.

Australian Bureau of Statistics

cat. no. 3306.0.55.001 Marriages, Australia
2004

Table 1. SELECTED MARRIAGE INDICATORS (a), Australia, Selected years, 1984 - 2004(b)

		1984	1994	1999	2000	2001	2002	2003	2004
BRIDEGROOM									
Age-specific marriage rates (e)									
Age group (years)									
19 and under	rate	3.1	1.2	1.1	1.0	0.9	0.8	0.8	0.8
20-24	rate	55.8	33.6	27.2	25.6	21.9	21.0	19.2	18.7
25-29	rate	49.2	52.8	52.2	51.6	47.2	46.3	46.4	47.6
30-34	rate	23.4	29.1	33.1	33.6	30.8	32.4	33.5	35.5
35-39	rate	13.4	14.8	17.5	17.3	16.3	17.1	17.5	18.8
40-44	rate	9.3	9.4	10.1	10.5	9.7	10.0	10.3	10.6
45-49	rate	7.2	7.3	7.7	7.6	7.0	7.4	7.4	7.8
50 and over	rate	3.5	3.5	3.6	3.6	3.3	3.5	3.5	3.6
BRIDE									
Age-specific marriage rates (e)									
Age group (years)									
19 and under	rate	18.6	6.5	5.2	5.0	4.2	4.0	3.8	3.4
20-24	rate	73.3	54.3	45.6	43.0	37.2	35.8	34.0	33.3
25-29	rate	35.9	47.4	52.4	51.9	48.1	48.6	49.2	52.6
30-34	rate	16.6	21.5	26.1	27.1	25.5	27.2	28.0	29.5
35-39	rate	10.0	11.1	12.9	13.2	12.0	13.0	13.5	14.1
40-44	rate	7.3	7.5	8.0	8.1	7.3	7.6	7.9	8.3
45-49	rate	5.6	5.7	6.1	6.2	5.7	6.0	5.9	6.2
50 and over	rate	1.9	1.9	1.9	2.0	1.8	2.0	2.0	2.1

Assignment B – Deaths by Age, Marital Status

Consult the ABS website for the relevant data.

Compare the total deaths in 2004 for males and females. You will need to construct two cumulative frequency tables and ogives. In each case use your ogive to find the median, upper quartile, lower quartile and inter-quartile range. Also use your graphical calculator to find the mean age of death for males and females.

Using the statistics for males over 40 only, compare the age at death of those never married with those who were married. Once again you will need to construct two cumulative frequency tables and ogives. In each case use your ogive to find the median, upper quartile, lower quartile and inter-quartile range. Also use your graphical calculator to find the mean age of death for each group.

Write a paragraph summarizing your findings.

Investigation - Data & CensusAtSchool

Name: Due Date

Level 3 & 4 Data		
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Data & CensusAtSchool



A computer is needed to do this investigation.

The activities set require can only be completed if you have been given some background in the use of **Microsoft Excel** to generate statistical data. Background in generating data sets from the **CensusAtSchool** section of the **Australian Bureau of Statistics** web site is also necessary. The following web address will get you to the CensusAtSchool site.

<http://www.abs.gov.au/websitedbs/cashome.nsf/Home/Home>

Comparing Heights Across Grades

Task 1

This first task will allow you to look at the increasing height of students as they move from grade 4 through to grade 12.

Generate 200 results for the following groups from the random generator in the CensusAtSchool website:

- Grade 4s
- Grade 6s
- Grade 8s
- Grade 10s
- Grade 12s

You should now have five sheets saved, one for each of the grade groups.

The following steps only briefly describe what is required. Some experience in using **Excel** is essential.

- **Copy** and **Paste** the columns relating to student height from each of the generated spreadsheets into a new **Work Book**.
- Use functions in Microsoft Excel to determine the Mean (**Average**), **Median** and **Mode** for each of the grades (it will be helpful to arrange your columns in ascending order).
- Make sure that you have considered results that realistically fall outside the expected range of results.
- Produce suitable **charts** from the Mean, Median and Mode data.
- Comment on the noticeable trends that you see in the data and how these compare to what you might have expected. Also discuss why you may not have included all the data that you obtained from CensusAtSchool. Answer the following two questions: Have students finished growing in grade 10? What would you need to do to find out whether students have stopped growing in year 11? Now devise two questions of your own and answer them.

Task 2

Choose one of the opinion questions asked in the survey. Use this question to determine differences in opinion between students in each of the states.

- **Copy** and **Paste** the columns relating to the student opinion question from each of the generated spreadsheets into a new **Work Book**.
- Use the **CountIf** function in Microsoft Excel to count each of the different responses that students made. Make sure these results are assembled into a meaningful table.
- Produce suitable **chart/s** showing the differences or similarities in responses that students round Australia have made.
- In a paragraph or two, comment on the noticeable trends that you see in the data. Try and speculate on why there maybe similarities and differences in the data.

Task 3

Using the CensusAtSchool random generator, devise your own activity, generating suitable tables of information, charts, trends and the conclusions that you draw from them. Negotiate with your teacher the appropriateness of your study before you commence work on it.

In Conclusion

Print out and assemble all the work generated in the three tasks and clip to this assignment.

Maths Applied 3/4 - Data Investigation

		Level 3 & 4	
Criterion 1	Criterion 2	Criterion 8	Criterion 10

This investigation requires you to do some web research to find statistics relating to road crash rates. You will need to study the information and then draw conclusions from the data. The website for the Department of Transport and Regional services is

www.atsb.gov.au/publications/2003/pdf/stats_Aust_9.pdf

The website for the “kids and cars “research

www.kidsandcars.org

1. From the road fatalities, exposure data and road fatality rates, Australia, 1925 to 2002 compare the number of registered vehicles with the population, draw a graph and use a trend line to investigate whether the number of registered vehicles has increased in response to the increase in population. You may do this using the graphing technique on Excel.

2. Use a trend line to investigate whether the number of fatalities has increased from 1925 to 2002.

3. Is it more dangerous to drive in Tasmania or Victoria?

Answer this by comparing two box and whisker plots of the data given between 1950 and 2002.

4. Use Excel to create a graph which summarises the number of road fatalities by road type in Tasmania between 1950 and 2002. Suggest reasons for the increase.

Study the information in the graphs on the kidsandcars website. How do most injuries occur. Find comparable information from Australia and make a comparison between the two countries.

Show the two countries using a pie chart.

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Investigation - Chance and the Weather

Name _____ Teacher _____

Level 3 & 4 Chance		
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Teacher Comments		

Chance and Data and weather forecasting

Introduction

In this activity we will use the Internet to access The Bureau of Meteorology website at the following address

http://www.bom.gov.au/lam/Students_Teachers/climprob/ws3.htm

Here you will find activities in probability, chance and data. Including pie charts with random number generator.

In this activity you will

- analyse experiments to determine the theoretical probability of events;
- carry out experiments involving chance to estimate the probability of events and to simulate situations;
- interpret and evaluate information contained in tables, visual displays and databases
- report on methods of data collection



[Data Collection and Sampling](#)

Part 1: Data Collection and Sampling

Select **Data Collection and Sampling** from the main **Index**.

(* Note: Some articles are from the “**new**” for 2002 section)

You are required to answer the following questions for an article in this section:

- (a) Is this article from a sample or from the whole population?
- (b) Is this sample voluntary in nature? Why would this be important?
- (c) Are the conclusions fair ones for the whole affected population or not?

CLICK



for the following **article** below:

Forget apples, we are now potentates of potato land. (new)

Check your answers in each case by CLICKING



for **Discussion**.



[Data Representation](#)

Part 2: Data Representation

Return to the Main Index page and then CLICK on this section.

(* Note: Some articles are from the “**new**” for 2002 section)

In this section we will look at the various forms in which data can be graphed and the ways in which it can be skewed to misrepresent!

You are required to answer the following questions for an article in this section:

- (a) What does the graph show?
- (b) Why was the data displayed in this way?
- (c) Is this representation misleading? Explain.

CLICK



for of the **article** below:

Basic parliamentary salaries.

Check your answers in each case by CLICKING



for **Discussion**.



Part 3: Data Reduction

Return to the Main Index page and then CLICK on **Data Reduction**.

(* Note: Some articles are from the “new” for 2002 section)

In this section an article is provided which shows how statistics is used to support arguments.

You are required to answer the following questions for an article in this section:

- | |
|---|
| <ul style="list-style-type: none">(a) What statistic does the article contain?(b) Does the statistic make sense?(c) What conclusion(s) are drawn? |
|---|

CLICK



for of the **article** below:

Gadgets on standby eat more power. (new)

Check your answers in each case by CLICKING



for **Discussion**.



Part 4: Inference

Return to the Main Index page and then CLICK on **Inference**.

(* Note: Some articles are from the “new” for 2002 section)

You are required to answer the following questions for an article in this section:

In this section an article is provided which shows various aspects of drawing conclusions from data.

- | |
|--|
| <ul style="list-style-type: none">(a) Does the article explain how the information was obtained for the study?(b) Are you confident of the conclusion?(c) Was the sample size appropriate in your opinion? |
|--|

CLICK



for of the **article** below:

Thin thighs don't come in jars.

Check your answers in each case by CLICKING



for **Discussion**.

Maths Applied 3/4 - Data Investigation

Guess the Marbles – game and investigation

Resources:

This game and investigation makes use of the *Probability Simulation* application, which should be pre-installed on TI83 Plus and TI84 Plus graphics calculators. If not present, it can be downloaded from:

http://education.ti.com/educationportal/sites/US/productDetail/us_prob_sim_83_84.html

Only one calculator is required for each table of players.

The game

Suggested number of players: 3 to 5.

In the following instructions, square brackets are used to indicate a key to be pressed, e.g.

[APPS]

For each round:

The roundleader:

Goes to the main menu for Probability Simulation:

Simulation

1. Toss coins

2. Roll Dice

...etc

[OPTN]

Set random seed to any new integer, e.g. 31425

[OK]

Choose 3: Pick Marbles

[SET]

Types: 5

[ADV]

Choose the number of marbles of each type (different from last round), so that total marbles is 10:

e.g. Marble	A	1
	B	5
	C	3
	D	1
	E	0

Record this combination of marbles on the scoresheet, and fold over so other players can't see it.

[OK]

[OK]

[PICK] - this is the first pick, and opens up the [+10] option on the menu.

Pass the calculator to the next player.

Each player in turn (but skipping the roundleader)

Add 10 picks, by pressing [10+]

If player wishes, they can make a guess at the numbers of each type of marble:

If *correct*, this player gets two points, roundleader records the total number of picks, and a new round starts with new roundleader. To find the number of picks:

[ESC]

[TABL]

Read off last number in PICK column

[GRPH] to return to graph

If *wrong*, roundleader gets one point, and calculator goes to next player.

As you can see, there are incentives not to guess too early or too late.

Questions and discussion

- 1) Select one of the combinations of marbles that you actually used in the game, e.g.
 - A 1
 - B 5
 - C 3
 - D 1
 - E 0
 - a) Calculate the theoretical probability of getting each type of marble on any one pick.
 - b) How many picks were made before someone guessed the right combination?
 - c) **Level 4** question: Why do you think that so many picks were required?
- 2) Did the number of picks go up or down (or both) as players got more experience? How could you plot these figures to see if there is a trend?
 - 3) What are the mean and median number of picks required for a correct guess?

Guess the Marbles – Score Sheet

	PLAYER 1	PLAYER 2	PLAYER 3	PLAYER 4	PLAYER 5	NUMBER OF PICKS FOR CORRECT GUESS	SECRET COMBINATION				
							A	B	C	D	E
ROUND 1	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER						
ROUND 2	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER						
ROUND 3	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER						
ROUND 4	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER						
ROUND 5	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER						
ROUND 6	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER						
ROUND 7	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER						
ROUND 8	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER						
ROUND 9	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER						
ROUND 0	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER	<input type="checkbox"/> ROUND LEADER						
TOTAL SCORE							FOLD				