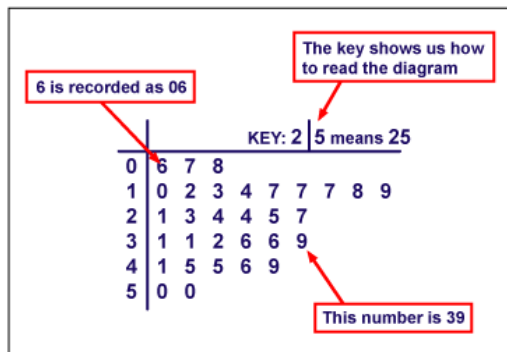


Goals



Weekly Goals:

By the end of the week you should be able to:

Classify data

- Identify examples of categorical data (EMA01)
- Identify examples of numerical data (EMA02)

Data representation and interpretation

- Display categorical data in tables and column graphs (EMA03)

Theoretical Components

Resources:

PDF file: Week 1 Notes and Exercises

Knowledge Checklist

- Classifying data – categorical, numerical
- Frequency tables
- Column graphs
- Using spreadsheets

Order

1. Work through the Week 1 notes
2. Work through the Exercises
3. Submit your Google Sheet for Exercise 3 through the assignment on Google Classroom
4. Complete the Portfolio Task
5. Complete the reflection at the end of the booklet.

Practical Components

There are 3 Exercise Sets in this week's booklet.

Read any notes and worked examples before you begin.

A weekly Google Form (Quiz) and Mathspace.co task(s) **may** also be used to check your engagement and progress each week.

Remember to check Google Classrooms and Mathspace.co

Portfolio Task

See the last page of your booklet

QFO

Quiz/Forum/Other

None this week.

Classifying and Presenting Data

Statistics involves the collection of information. This is usually called data and collected in the form of numbers. This data is then organised – usually into tables and then analysed. This analysed data is used to pick out trends (eg is the average daily temperature rising) and importantly to make predictions (eg the average temperature of the earth in 50 years).

TYPES OF DATA

There are two main types of data.

Categorical data – also called qualitative data – is data that is grouped into categories such as colour of cars or favourite TV shows.

Numerical data – also called quantitative data – is information that is counted or measured such as the number of goals scored or height.

Example

Classify each of the following as categorical or numerical.

- a) type of pet
- b) your part-time job salary
- c) heights of people
- d) favourite TV shows

Solution

- a) involves words or categories – categorical data
- b) involves numbers – numerical data
- c) involves measurement – numerical data
- d) involves words or categories – categorical data

EXERCISE 1

Classify each type of data as numerical (N) or categorical (C)

- a) number of people in our class
- b) number of pets in a family
- c) most popular sports
- d) ages of people
- e) types of cancer
- f) colours of cars passing a particular location each day
- g) number of cars passing a particular location each day
- h) route numbers on a bus
- i) goals scored in a football match
- j) favourite types of fast food
- k) time taken to get to school
- l) distances between suburbs

REPRESENTING CATEGORICAL DATA - FREQUENCY TABLES AND COLUMN GRAPHS

The **frequency** of a particular data value is the number of times the data value occurs. For example, if four students have a score of 80 in mathematics, and then the score of 80 is said to have a frequency of 4. The frequency of a data value is often represented by f .

A **frequency table** is constructed by arranging collected data values in ascending order of magnitude with their corresponding frequencies.

Example

Heidi asked a group of her fellow students which night of the week they would prefer to have the school ball. She recorded the responses as T (Thursday), F (Friday), Sa (Saturday) and Su (Sunday). This is her data.

F, F, T, Sa, F, Sa, F, Sa, Sa, F, Sa, T, Sa, F, F, T, T, Su, F, Sa, T, Sa, F, F, F, F, T, T

Arrange this data in a frequency table.

Solution

To construct a frequency table, we proceed as follows:

Step 1:

Construct a table with three columns. The first column shows what is being arranged in ascending order (i.e. the day of the week – from Thursday to Sunday).

Day of the week	Tally	Frequency
Thursday		
Friday		
Saturday		
Sunday		

Step 2:

Go through the list of data. The first one in the list is F, so put a tally mark against Friday in the second column. The second one in the list is F, so put another tally mark against Friday in the second column. The third one in the list is T, so put a tally mark against Thursday in the third column as shown below.

We continue this process until all marks in the list are tallied.

Day of the week	Tally	Frequency
Thursday		
Friday		
Saturday		
Sunday		

Step 3:

Count the number of tally marks for each day and write it in third column. The finished frequency table is as follows:

Day of the week	Tally	Frequency
Thursday		7
Friday		12
Saturday		8
Sunday		1
Total		28

Remember:

We use the following steps to construct a frequency table:

Step 1:

Construct a table with three columns. Then in the first column, write down all of the data values in ascending order of magnitude.

Step 2:

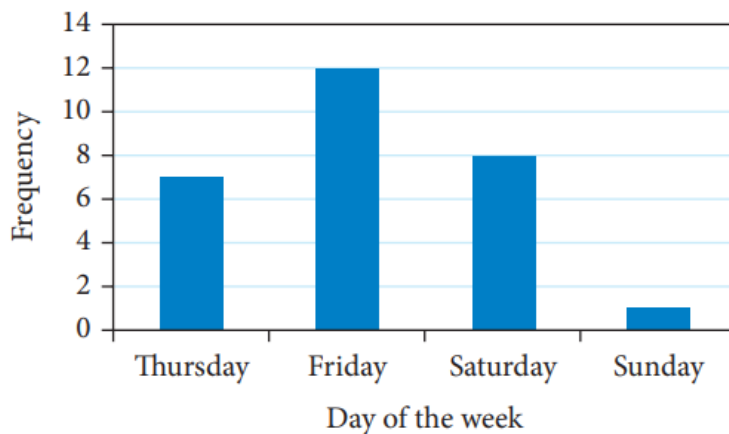
To complete the second column, go through the list of data values and place one tally mark at the appropriate place in the second column for every data value. When the fifth tally is reached for a mark, draw a horizontal line through the first four tally marks as shown for in the above frequency table. We continue this process until all data values in the list are tallied.

Step 3:

Count the number of tally marks for each data value and write it in the third column.

A **column graph** can then be used to provide a visual representation of the data.

The column graph for the above example is below:



The horizontal axis will be the days of the week.

The vertical axis will be the frequency.

Columns will have spaces between them.

EXERCISE 2

Q1. Tina surveyed a selection of homes in her suburb to find out the ages of each child. She recorded the data as B for babies up to 2 years, P for pre-schoolers, I for those who attend infant school and O for children older than 8 years. This is the data:

B B O I O O B P P P O B I I O O I I I P O B B O I
P O O P I P P O B I I O P O O B I P B I

a) Arrange the data in a frequency table.

Ages	Tally	Frequency
Total		

b) What category of children contains the largest number of children?

c) What percentage of children in the survey are babies?

Q2. Tina also undertook a survey of the number and type of pets owned by the families. She used D for dog, C for cat, M for mice, R for reptile, F for fish, O for other and N for none. The results were:

R O F D D D R C C M D C N D D O R C C D
F N O N D N D D C M M D M N D N M C D C

a) Arrange the data in a frequency table

b) What percentage of people had mice as a pet?

c) Construct a bar chart of the data.

Q3. A survey of the colour of cars that passed Hawker College was made over a two-hour period. The results were listed as black B, white W, blue b, silver S, red R, green G and other O. The results were as follows:

R B O W G	B B W O b	W S O R B	W b S O R	O W B b R
B b W B R	G S B S R	B G S R W	S b B G W	b S B W S

a) Construct a frequency table for this data. (add a 4th column to be filled in Part b)

b) In the 4th column give the percentage breakdown of each colour. Show working.

c) Construct a column graph of this data.

USING SPREADSHEETS TO DISPLAY CATEGORICAL DATA

We can also use technology to summarise and display categorical data.

Example: A survey is taken of a group of Math students' eye colour. The results are as follows:

Blue, Brown, Green, Hazel, Hazel
Blue, Blue, Brown, Green, Brown

The raw data is entered into the Google Sheet as follows:

	A
1	Eye colour
2	blue
3	brown
4	green
5	hazel
6	hazel
7	blue
8	blue
9	brown
10	green
11	brown

To create a frequency table:

1. Select the cells with source data you want to use. Important: Each column needs a header.
2. In the menu at the top, click **Data** > **Pivot table**.
3. In the pop-up box, select where you want the pivot table to appear. Insert to existing sheet and select a cell for the table to appear. Click create.
4. In the side panel, next to "Rows" or "Columns," click Add, then choose a value.
5. In the side panel, next to "Values," click Add, then choose the value you want to see over your rows or columns.
6. You can change how your data is listed, sorted, summarized, or filtered. Next to what you want to change, click the Down Arrow ▾. We want "COUNTA" to count the frequencies.
7. Your frequency table should now be complete. Change the heading of the 2nd column from COUNTA to frequency.

The frequency table is as follows:

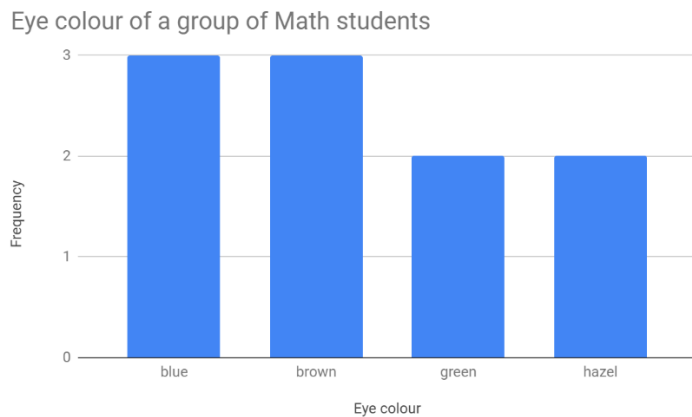
Eye colour	Frequency
blue	3
brown	3
green	2
hazel	2
Grand Total	10

The screenshot shows the 'Pivot table editor' panel in Google Sheets. The data source is 'Sheet1!A1:A11'. The 'Rows' section has 'Eye colour' selected. The 'Values' section has 'Eye colour (Frequency)' selected, with 'Summarise by' set to 'COUNTA' and 'Show as' set to 'Default'. The 'Show totals' checkbox is checked. There are 'Add' buttons for Rows, Columns, Values, and Filters.

To create a chart:

1. Highlight the data in the frequency table (including the headings but excluding the grand total).
2. In the menu at the top, click **Insert** > **Chart**
3. A chart will appear. In the side panel, under “Chart type,” click the down arrow and select the chart you want to use to display your data.
4. You can customise your chart (including the title) by clicking on the “customise” tab on the side panel.

A column graph of the data is as follows:



EXERCISE 3

Use Google Sheets to answer the following questions. Submit your Google Sheet via the assignment on Google Classroom.

Q1. Peter recorded the methods that students in his year use to travel to school. He recorded the data as W for walk, R for ride a bike, B for travel by bus, C for travel by car and T for train travel. This is his data:

B B C T W	R W W T C	T T C B R	W W R R R
W W C R B	B W T W R	W W B R B	R W W T C
R R W W T	C W R W W	C B W W R	R R W B R
W R R W C	T R W W B	R R C B T	W R R B C

- Arrange this data in a frequency table.
- Display your data in a column chart.
- What is the most common way for students in Peter's year to travel to school?
- What is the least common travel method?

Q2.

Anna is organising a guessing competition with a jar of jelly beans. She counted the colours of the jelly beans in the jar.

Colour	Red	Black	Purple	Pink	Orange	White
Frequency	110	50	20	40	60	80

Display this data as a column graph.

Q3.

Jasmine asked thirty students in Year 11 'What is your preferred brand of car?'

Her results are shown below and coded as follows: Holden = H, Ford = F, Toyota = T, Mitsubishi = M, Subaru = S, Other = O

H H T F F F M T O S T H H H F S M T T H F F H H O S T M H F

- Arrange Jasmine's data in a frequency table.
- Display your data in a bar chart.
- What is the most popular choice of car amongst these students?
- What percentage of students preferred Mitsubishi?

Olympic Records

Below are ten graphs showing how Olympic records have changed over time in ten athletic events.

Can you deduce which event each graph represents?

The list of the ten events is given, in no particular order, to help you deduce which event belongs to each graph.

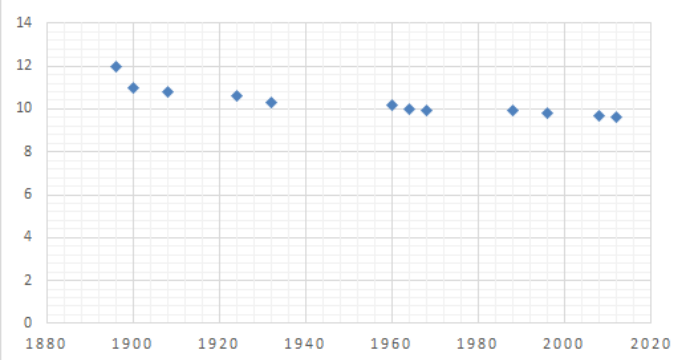
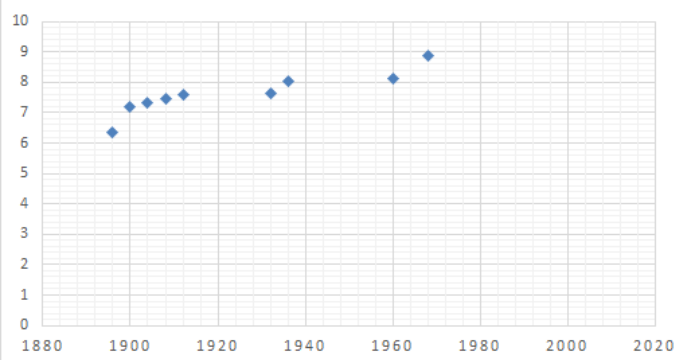
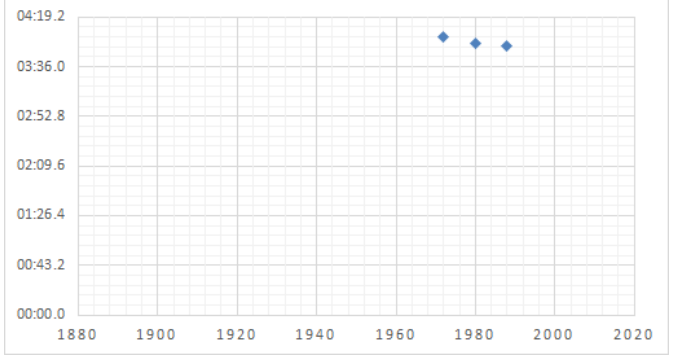
1. Men's High Jump
2. Women's 10,000 metres
3. Men's 100 metres
4. Women's High Jump
5. Men's Long Jump
6. Men's Decathlon
7. Men's 4 x 100 metres relay
8. Women's 100 metres,
9. Men's Javelin
10. Women's 1500 metres

Determine what the units might be on the vertical axis for each graph?

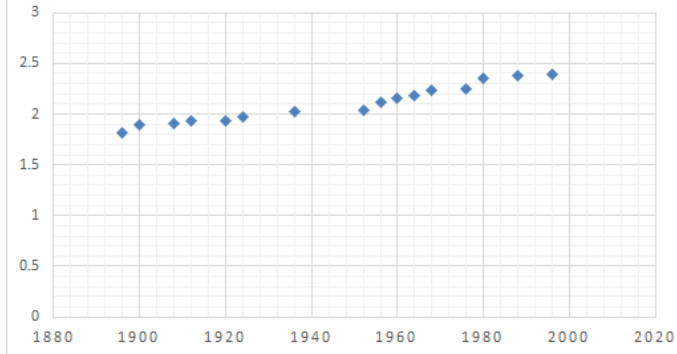
Some graphs show a decreasing trend and some an increasing trend? Identify those graphs and describe the trend.

Are there any unusual features on any of the graphs? What might be a plausible explanation for them?

Be sure to write up your solutions next to each graph listing the **event**, labelling the **vertical axis with the appropriate units**, and discussing any increasing or decreasing trends and any **unusual features** (with explanations).

Graph	Description																												
<p style="text-align: center;">GRAPH 1</p>  <table border="1" data-bbox="167 235 853 593"> <caption>Data for GRAPH 1</caption> <thead> <tr> <th>Year</th> <th>Value</th> </tr> </thead> <tbody> <tr><td>1890</td><td>12.0</td></tr> <tr><td>1900</td><td>11.0</td></tr> <tr><td>1910</td><td>10.8</td></tr> <tr><td>1920</td><td>10.5</td></tr> <tr><td>1930</td><td>10.2</td></tr> <tr><td>1940</td><td>10.0</td></tr> <tr><td>1960</td><td>10.0</td></tr> <tr><td>1970</td><td>9.8</td></tr> <tr><td>1980</td><td>9.8</td></tr> <tr><td>1990</td><td>9.8</td></tr> <tr><td>2000</td><td>9.8</td></tr> <tr><td>2010</td><td>9.5</td></tr> <tr><td>2020</td><td>9.5</td></tr> </tbody> </table>	Year	Value	1890	12.0	1900	11.0	1910	10.8	1920	10.5	1930	10.2	1940	10.0	1960	10.0	1970	9.8	1980	9.8	1990	9.8	2000	9.8	2010	9.5	2020	9.5	<p>Event:</p> <p>Vertical Axis and Units:</p> <p>Features:</p>
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<p style="text-align: center;">GRAPH 2</p>  <table border="1" data-bbox="167 840 853 1198"> <caption>Data for GRAPH 2</caption> <thead> <tr> <th>Year</th> <th>Value</th> </tr> </thead> <tbody> <tr><td>1890</td><td>6.5</td></tr> <tr><td>1900</td><td>7.0</td></tr> <tr><td>1910</td><td>7.2</td></tr> <tr><td>1920</td><td>7.5</td></tr> <tr><td>1930</td><td>7.5</td></tr> <tr><td>1940</td><td>7.5</td></tr> <tr><td>1950</td><td>7.5</td></tr> <tr><td>1960</td><td>8.0</td></tr> <tr><td>1970</td><td>8.5</td></tr> <tr><td>1980</td><td>9.0</td></tr> </tbody> </table>	Year	Value	1890	6.5	1900	7.0	1910	7.2	1920	7.5	1930	7.5	1940	7.5	1950	7.5	1960	8.0	1970	8.5	1980	9.0	<p>Event:</p> <p>Vertical Axis and Units:</p> <p>Features:</p>						
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<p style="text-align: center;">GRAPH 3</p>  <table border="1" data-bbox="167 1444 853 1803"> <caption>Data for GRAPH 3</caption> <thead> <tr> <th>Year</th> <th>Time (HH:MM.SS)</th> </tr> </thead> <tbody> <tr><td>1970</td><td>04:19.2</td></tr> <tr><td>1980</td><td>03:36.0</td></tr> <tr><td>1990</td><td>03:36.0</td></tr> </tbody> </table>	Year	Time (HH:MM.SS)	1970	04:19.2	1980	03:36.0	1990	03:36.0	<p>Event:</p> <p>Vertical Axis and Units:</p> <p>Features:</p>																				
Year	Time (HH:MM.SS)																												
1970	04:19.2																												
1980	03:36.0																												
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GRAPH 4

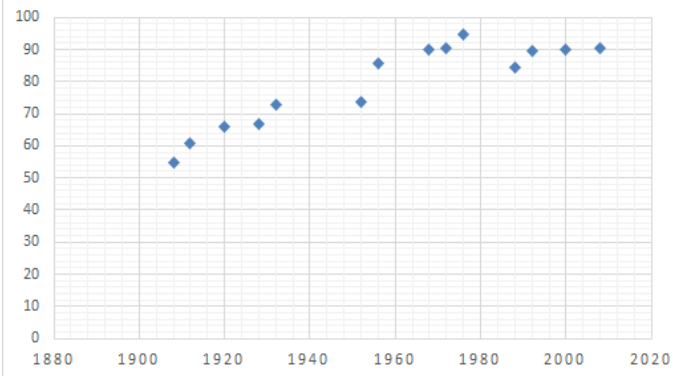


Event:

Vertical Axis and Units:

Features:

GRAPH 5

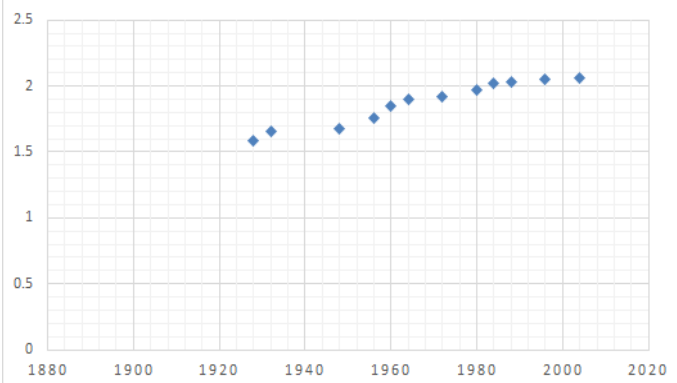


Event:

Vertical Axis and Units:

Features:

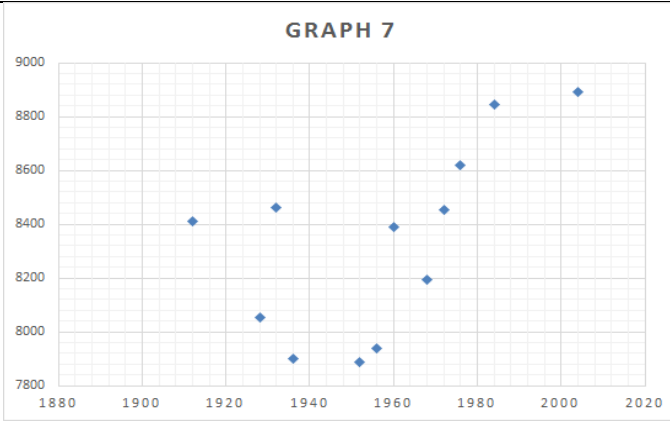
GRAPH 6



Event:

Vertical Axis and Units:

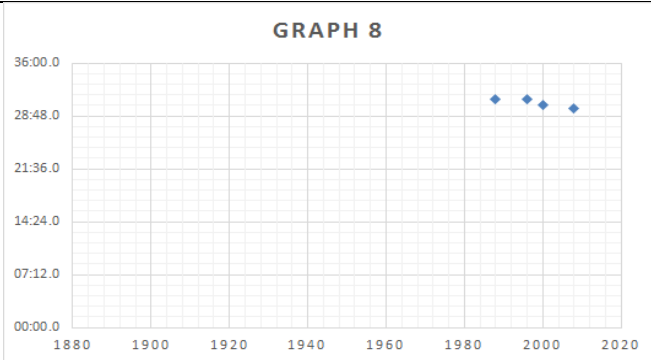
Features:



Event:

Vertical Axis and Units:

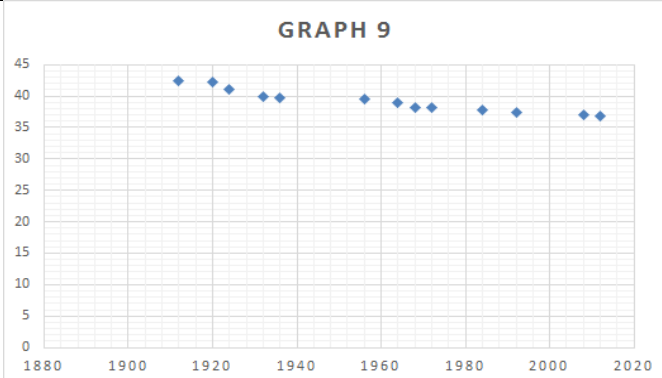
Features:



Event:

Vertical Axis and Units:

Features:

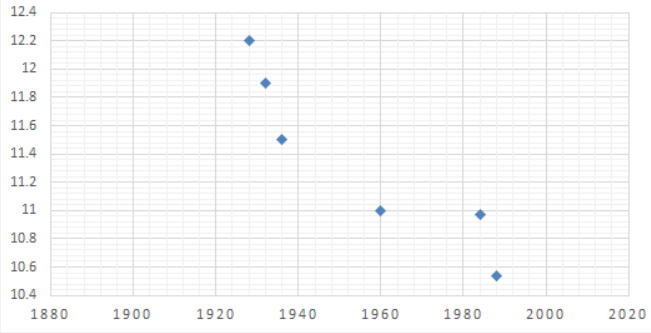


Event:

Vertical Axis and Units:

Features:

GRAPH 10



Event:

Vertical Axis and Units:

Features:

MARKING RUBRIC

Week 1

Name:

CRITERIA	EXPECTATIONS	POSS	MULT	GIVEN	TOTAL
Practical	Student completes practical work, including exercises and other tasks, of the brief to an acceptable standard set by the teacher.	2	3		/6
Portfolio Task	Student completes the portfolio task of the brief to an acceptable standard set by the teacher.	2	2		/4
Reasoning and Communication	Student responses are accurate and appropriate in presentation of mathematical ideas in different contexts, with clear and logical working out shown.	4	-		/4
Concepts and Techniques	Student submitted work selects and applies appropriate mathematical modelling and problem-solving techniques to solve practical problems, and demonstrates proficiency in the use of mathematical facts, techniques and formulae.	4	-		/4
	Submission Guidelines				
Timeliness	Student submits the exercises, any other tasks and portfolio by the set deadline. See scoring guidelines for specific details.	2	-		/2
				FINAL	/20

Student Reflection: How did you go with this week’s work? What was interesting? What did you find easy? What do you need to work on?