



Name: _____

Class Teacher: _____

ORANGE HIGH SCHOOL

Year 12 Standard 2 Mathematics

Task 1 Investigation

Outcomes Assessed

MS2-12-1 - uses detailed algebraic and graphical techniques to critically evaluate and construct arguments in a range of familiar and unfamiliar contexts

MS2-12-2 - analyses representations of data in order to make inferences, predictions and draw conclusions

MS2-12-6 - solves problems by representing the relationships between changing quantities in algebraic and graphical forms

MS2-12-7 - solves problems requiring statistical processes, including the use of the normal distribution and the correlation of bivariate data

MS2-12-9 - chooses and uses appropriate technology effectively in a range of contexts, and applies critical thinking to recognise appropriate times and methods for such use

Weighting: 20%

Due: This assignment must be handed in at the library between 8.30am and 9am (before the first morning bell) on **Thursday 23rd November (Week 7)**

Penalties as per assessment booklet

Failure to submit the assignment within the negotiated timeframe may result in an N-award in Standard 2 Mathematics. Zero marks will be awarded if the Assessment Task is submitted late, unless an Illness/Misadventure or application for extension form has been submitted.

Please complete the top section of the following receipt and remove from booklet in preparation for submission.

Higher School Certificate Assessment Submission Receipt

Student's Name: _____

Student's Signature: _____

Class Teacher: _____

Submission Date: _____

Assessment Task Title: Task 1 – Investigation Assignment **Subject Name:** Standard 2 Mathematics

Received to the Library by: _____

Year 12 Standard 2 Mathematics Investigation

Nature of the task

Buying a car is exciting and stressful. A car can provide freedom, mobility and independence! However, it can also be a complicated and expensive experience. In this assignment, you will investigate different vehicles, purchasing options and road statistics to create and analyse data to help you make a positive decision. This investigation task will require you to utilise your research skills and apply content knowledge of the Budgeting and Household Expenses, Simultaneous Linear Equations and Bivariate Data Analysis Topics.

Submission

Please complete all questions and show all working in the booklet provided.

Disclaimer

Please note that Section 3 of this assessment requires you to analyse statistics on road deaths in Australia.

Marking criteria

Marks for each question will be clearly shown next to each question.

Please note: each section can contain a range of topics.

Budgeting & Household Expenses	/25
Simultaneous Linear Equations	/14
Bivariate Data Analysis	/11
TOTAL	/50

Section 1 – Car Comparison

1. You are required to research and compare two cars of your own choice.
 - a. Use the research and comparison tool on Redbook.com.au to complete the following table.
For further instructions, see **Appendix A**.

(3 marks)

	Option 1	Option 2
Vehicle Type		
Year		
ANCAP Safety		
Fuel Type <i>Must be petrol or diesel</i>		
Price		
Distance Per Tank Fuel Consumption <i>Use the 'Combined' fuel consumption rate given</i>		
Regular Service Due <i>List the number of km's</i>		
Probationary Plate Status <i>In NSW</i>		

- b. Review the data collected in your table above and select which car you are going to purchase. Write a short paragraph outlining why you made this decision.

(2 marks)


Chosen Vehicle: _____ Option Number: _____

2. Using your selected vehicle, you are to complete the following calculations. Remember to show all working and include appropriate units.

a. Using your fuel consumption listed above, calculate how many litres of fuel your car will use to travel 250 km to Sydney.

(1 mark)

b. The average fuel price in Australia is given below.

	Unleaded 91 – 174.9 cents/litre Diesel – 212.4 cents/litre
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How much will a return trip to Sydney cost in your new car?

(2 marks)

c. When you buy a new or used vehicle, you must pay a tax to the Australian Government. This is known as Stamp Duty. For the value of your chosen vehicle, calculate the amount of stamp duty payable given the following conditions.

Stamp duty = \$3 per \$100 or part \$100.

(2 marks)

3. Complete a comprehensive car insurance estimate on <https://www.nrma.com.au/>. Use the information below and the instructions in Appendix B.

'Your friend who is the same gender as you is looking for some car insurance. They live in NSW and want comprehensive cover. They are wanting the policy to start on the 10th of December 2023. They have seen some of the research you have done and decided to buy your chosen car. Use the details you have found on Redbook to fill in the quote. Your friend usually drives less than 5,000 kms per year.

Your friend lives at number 1 Summer Street, Orange, NSW, 2800. They will be storing the car in the garage. The chosen car meets the registration requirements in NSW. The car will be used as a private vehicle only with no finance owing. It will be insured under their name.

Some details about your friend:

They are not an existing NRMA member. They are the same gender as you. Their date of birth is 1/01/1999.

They got their license at age 17 and have made zero motor claims in the last 3 years, nor have they had their license cancelled or suspended or had insurance refused.

They do not have roadside assistance, nor would they like it added to this quote. They will be the only person driving the car.'

- a. What is their comprehensive insurance estimate?

(1 mark)

- b. Your friend decides to put aside some savings every week to cover their comprehensive car insurance. How much do they need to save each week? Round your answer to the nearest cent.

(2 marks)

- c. List two factors that would affect this insurance premium as a beginner driver in Australia.

(2 marks)

Section 2 – Friends & Finances

Your friend, Johnny, is also looking to buy a new car for his part-time job as an Uber Driver. He comes to you for some advice.

1. Johnny has been given two financing options by a local car dealership to buy a used car worth \$20 000.

Option A: A 11% deposit and then an additional \$480 per month for 5 years.

Option B: No deposit and fortnightly repayments of \$250 for 5 years.

- a. How much deposit would Johnny have to pay on Option A?

(1 mark)

- b. Determine the total cost of Option A.

(1 mark)

- c. Determine the total cost of Option B.

(1 mark)

- d. Use the rules provided below to complete the table of values showing the yearly amount of interest paid for Option A and Option B. Graph each line on the axes provided.

(4 marks)

Option A

$$I = 2200n$$

where I is the interest and n is the number of years.

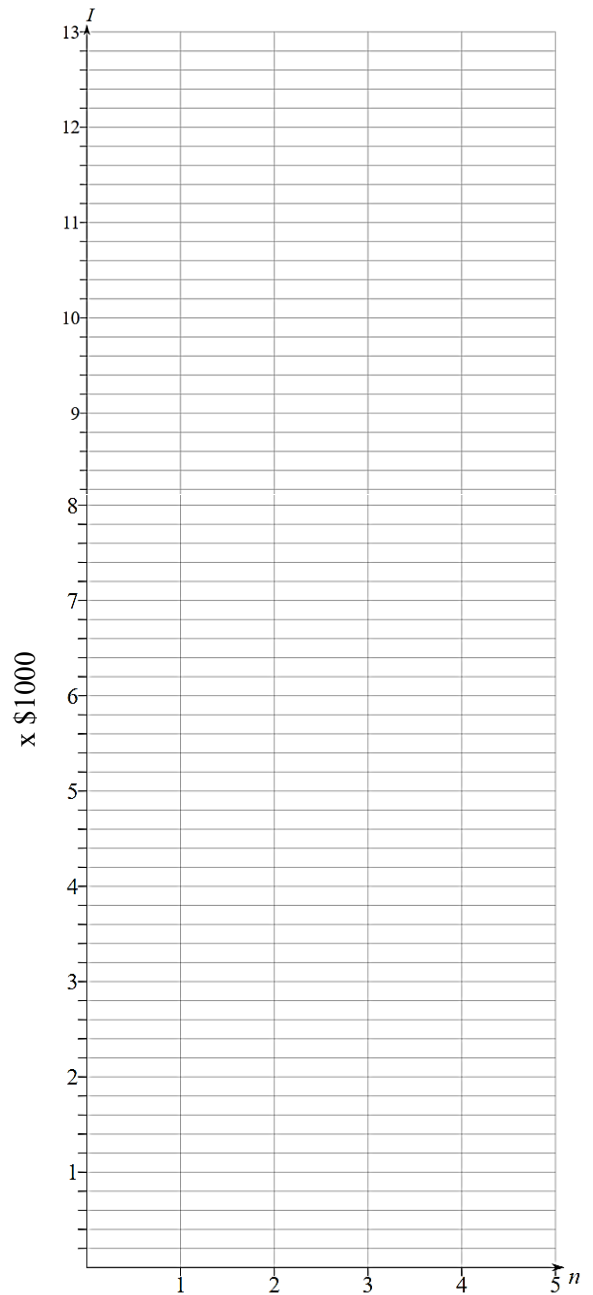
n	1	2	3	4	5
I					

Option B

$$I = 2500n$$

where I is the interest and n is the number of years.

n	1	2	3	4	5
I					



- e. Using the graph above, find how much interest would Johnny have paid on Option A after 2.5 years.

(1 mark)

- f. Which option should Johnny take? Calculate how much money he would save.

(2 marks)

2. Johnny has created a weekly budget summary for his income and expenses. Some of the weekly totals are missing.

(4 marks)

Income		Expenses	
Salary	\$1284.23	Rent	\$450
Part-time (UBER)	\$498.55	Groceries	\$254.70
Investments	\$93.78	Car Insurance	\$
Bonus	\$15.50	Motor Vehicle Costs	\$141.75
		Phone Bill	\$
		Recreation	\$226.80
		Work-related costs	\$53
		Clothing	\$82.60
		Electricity and Water	\$
		Gas	\$58.72
		Vet Bills	\$35.89
		Balance	\$
Total	\$1 892.06	Total	\$1892.06

- a. Use the information given below to complete the table before balancing the budget.

Johnny has just received his quarterly bills for both electricity and water. His electricity bill was \$473.68 and his water bill was \$173.46. For the purpose of this task, assume the bill will be the exact same for the other quarters this year. He also received his monthly phone bill which was \$89.50.

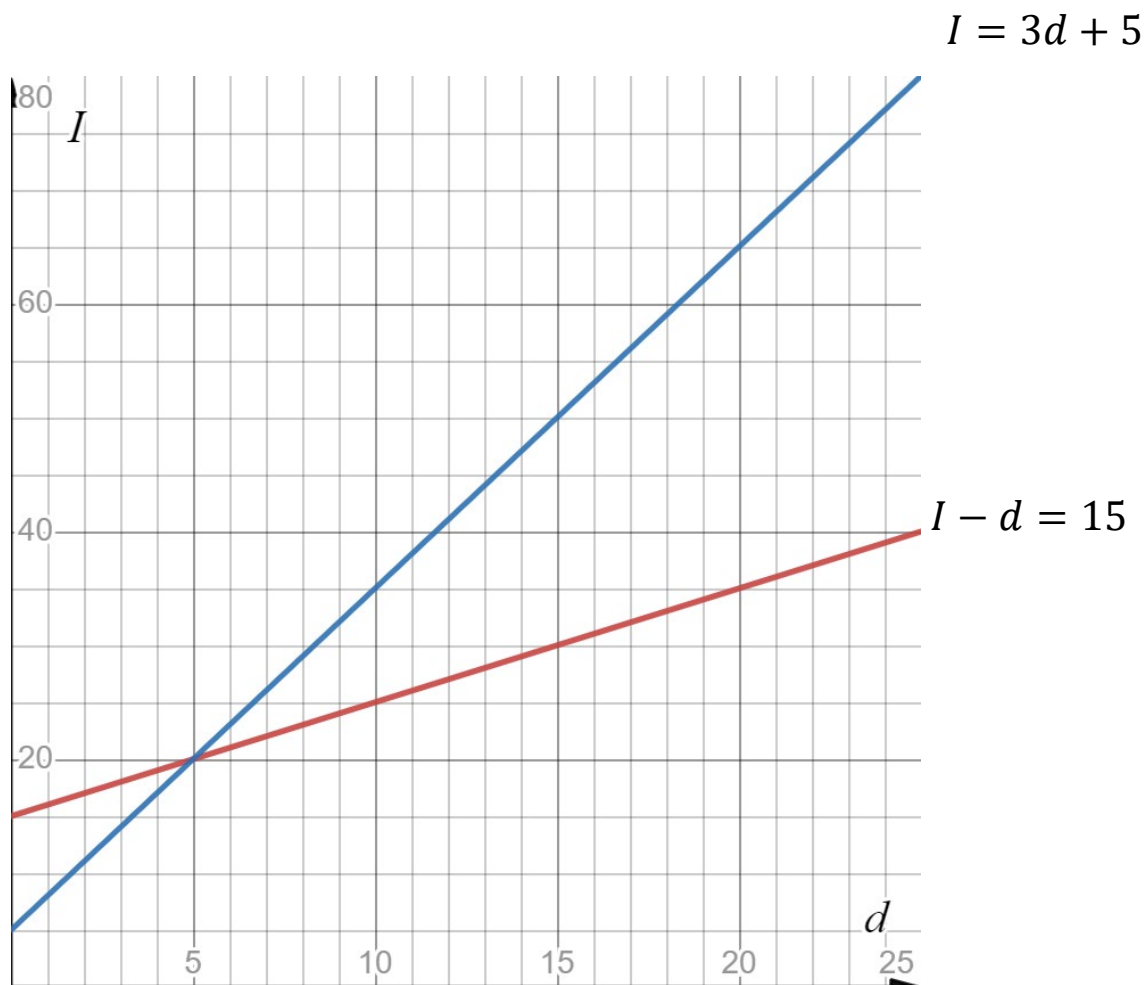
His car insurance premium is \$1294.61 p.a.

- b. Suggest 2 ways that Johnny could save more money per week.

(2 marks)

3. Johnny works part-time as an Uber driver. His income is split into two categories, a fuel allowance from Uber based on trip duration, calculated using the formula $I - d = 15$ and a charge from the client for kilometres travelled, calculated using the formula $I = 3d + 5$. Let I be the income earned and d be the distance travelled in kilometres.

This information has been graphed on the axes below.



- a. What is the point of intersection?

(2 marks)

- b. Using your graph, determine what length of trip is most beneficial for Uber and its drivers.

(1 mark)

- c. One of your friends has claimed that a Taxi is cheaper than an Uber. You want to put this claim to the test.

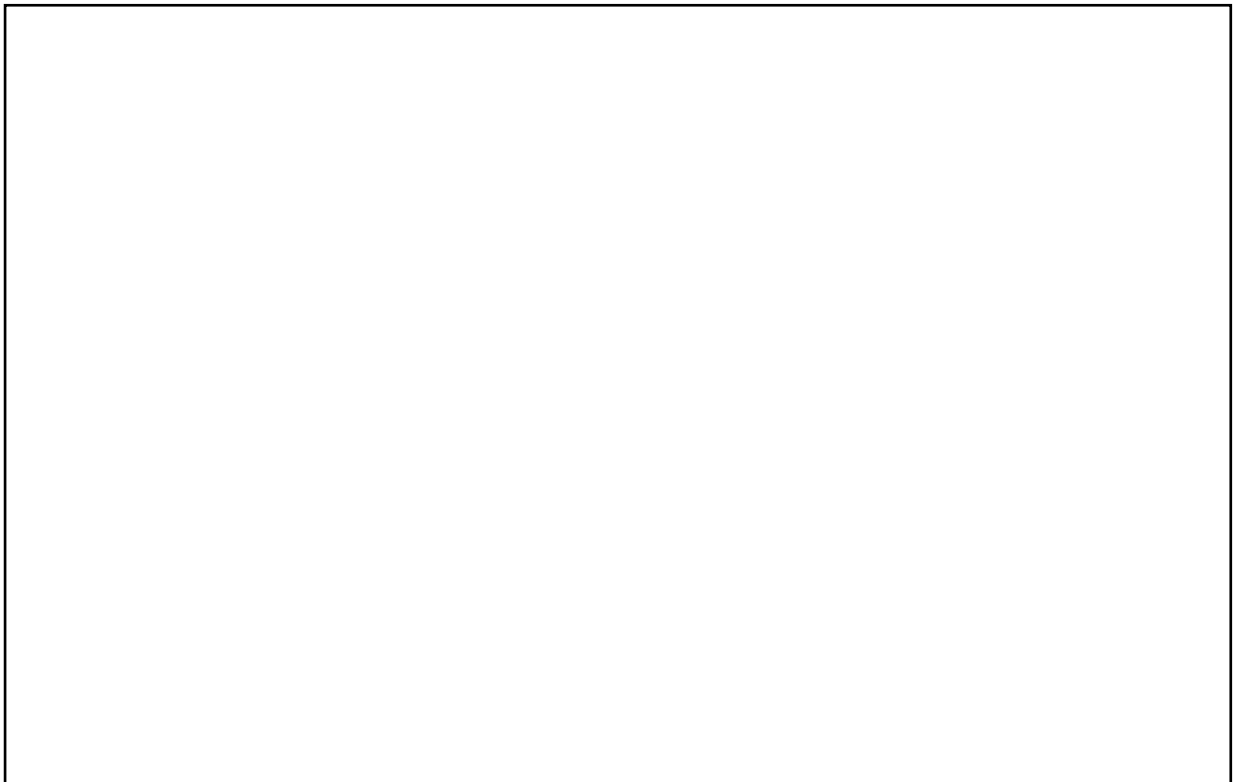
It is known that a taxi has a flag fall of \$6.50 and a meter that charges an additional \$1.50 for every kilometre travelled.

- I. Write an equation for the income, I , earned by a taxi driver per kilometre, d , travelled.

(1 mark)

- II. Graph your equation in the space below showing a distance range of 0 km – 5 km. You may choose to use an online graphing calculator such as Geogebra or Desmos for this task. If so, please screen shot and glue in the space provided.

(1 mark)



- III. Determine which form of transportation, Uber or Taxi, is more cost-effective for its clients when travelling for 5 kilometres or less. Use the formula you developed in part (I) and the Uber formula given below to aid your comparison.

$$I = 3d + 5 \quad \text{Uber}$$

(2 marks)

4. The table below shows Johnny's fuel consumption at different speeds.

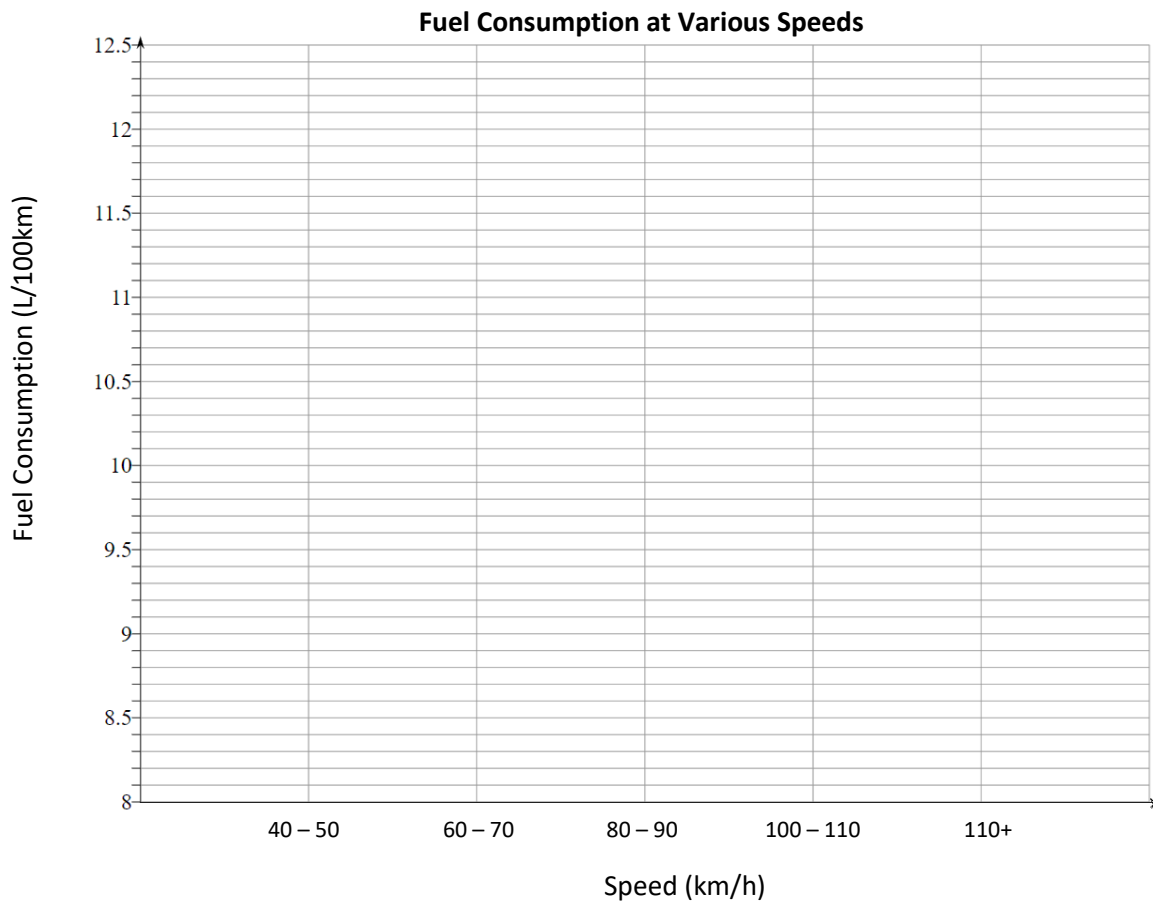
Fuel Consumption L / 100 km	40km/h - 50km/h	60km/h - 70km/h	80km/h – 90km/h	100km/h – 110km/h	110+
Record 1	11.4	10.9	9.3	10.4	11.8
Record 2	12.0	10.2	8.6	9.7	12.1
Record 3	11.0	10.0	9.5	10.0	11.6

a. If Johnny spends the majority of his time travelling at speeds between 40 and 70km/h, calculate his average fuel consumption using the data provided.

(1 mark)

b. Create a scatter plot on the axes below to represent this data.

(3 marks)



c. Describe the association between fuel consumption and speed travelled.

(2 marks)

d. During which speed range does the car have the best fuel efficiency?

(1 mark)

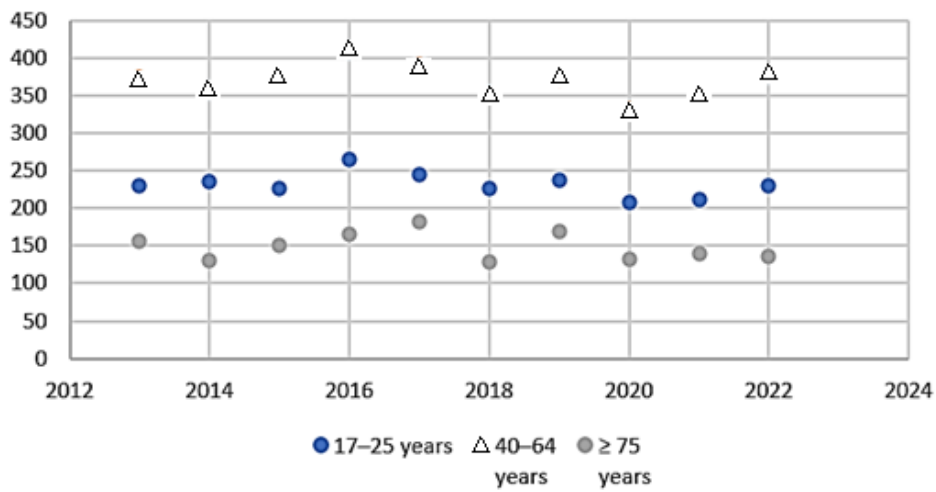
e. At the end of a trip, Johnny has a fuel consumption of 10.1L/100km. Use your graph to determine which potential speed ranges he could have been driving on this trip.

(2 marks)

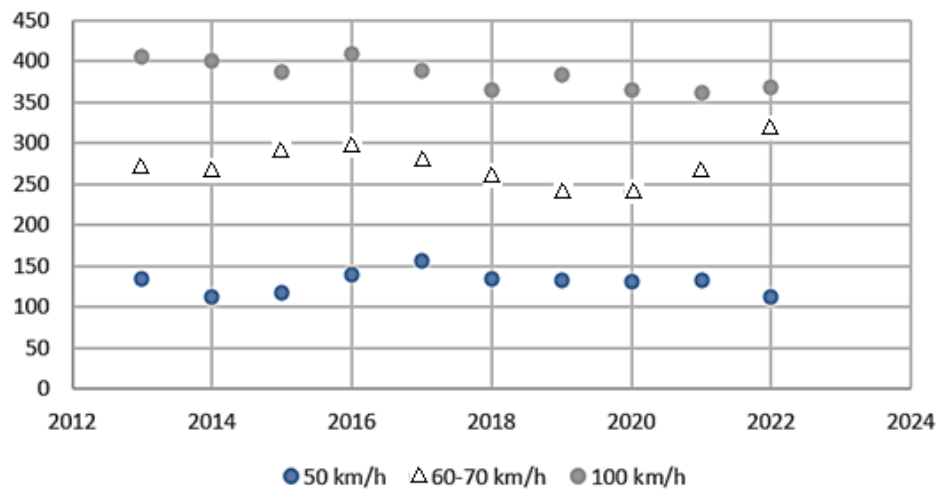
Section 3 – Scary Statistics

The following graphs have created using real data from the BITRE series of annual road crash statistical report. It presents the annual count of road deaths in Australia.

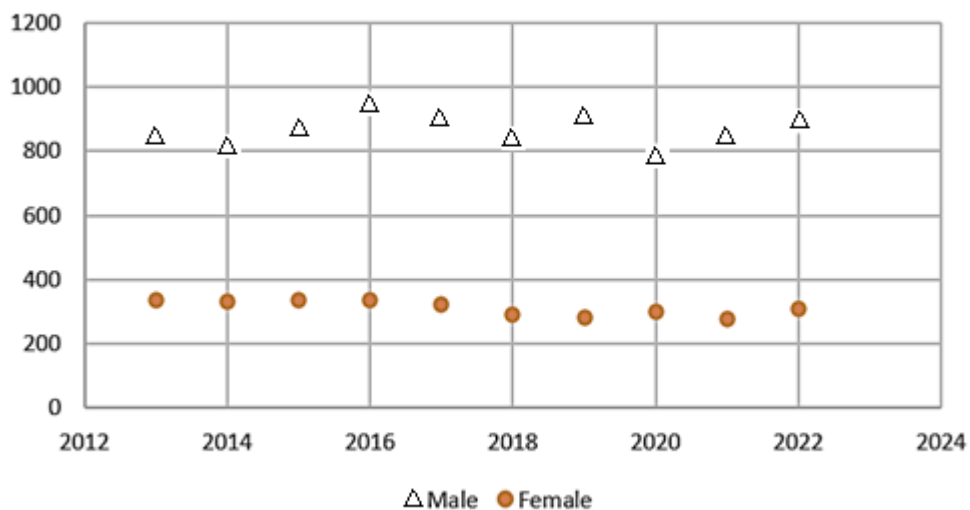
Deaths by Age Group



Deaths by Posted Speed Limit



Death by Gender



Appendix A

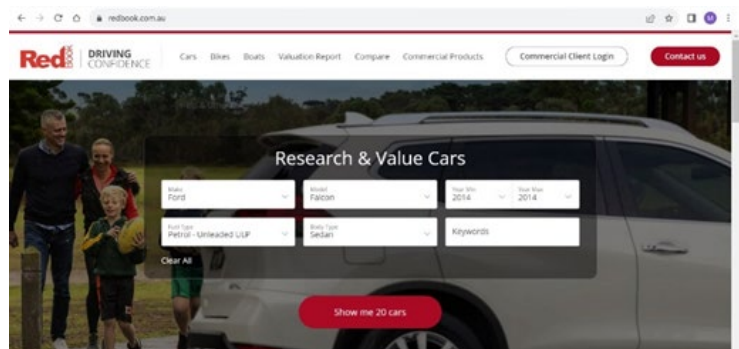
RedBook Instructions

1. Search, 'Redbook', in your browser.

You should come to a page that looks like this.

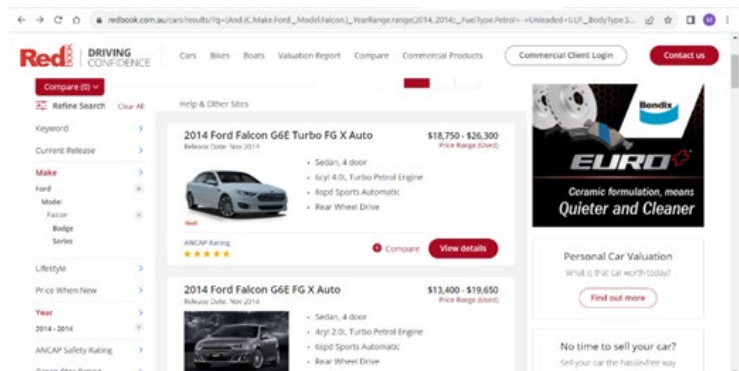
Enter the details of a car of your choice. Such as the one to the right.

Click show me cars.



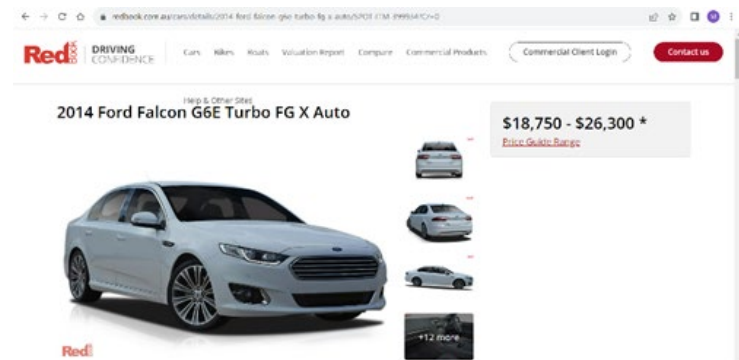
2. You should now see a screen such as this.

Click on the 'View Details' button.



3. You should now see a screen like this.

Scroll through the page and beware that you may need to explore the features and specifications tabs and further tabs within there to find the information required.



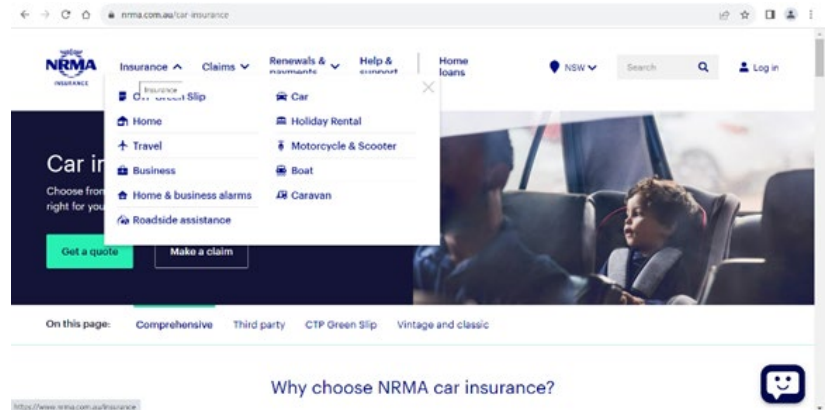
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Appendix B

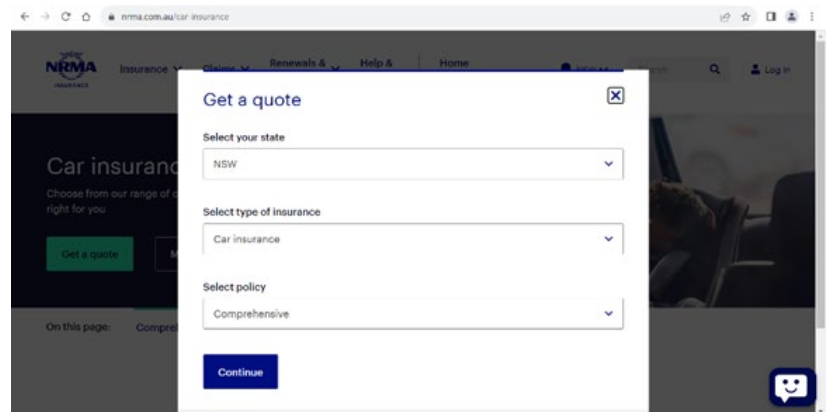
NRMA Instructions

1. Search, 'NRMA Car Insurance', in your browser.

You should get to a screen like this. Please click on the 'Insurance', tab and then click, 'Car', and then the 'Get a quote', button.



2. Fill out the data in the window using the information given in the task. Click 'Continue', when done.



3. The website will then ask a range of questions. All the information you need to answer the questions is in the task.

