

College ABCD

Assignment

Assessment Period:	2022 S2
Course:	ESSENTIAL MATHEMATICS
Unit:	Unit 2: Essential Mathematics (1.0)
Accreditation:	A
Weight:	25%
Maximum Mark:	79
Due Date:	01 Aug

Assessment Conditions

The task is to be completed in class and at home. It should be completed and submitted electronically no later than 3:30 PM on the due date, through the school LMS with the declaration of own work form attached.

Additional Information

Assessment Criteria

Students will be assessed on the degree to which they demonstrate

- *Concepts and Techniques* - knowledge of mathematical facts, techniques and formulae presented in the unit. Appropriate selection and application of mathematical skills in mathematical modelling and problem solving.
- *Reasoning and Communication* - ability to use reasoning to support solutions and conclusions. Interpretation and communication of mathematical ideas in a form appropriate for a given use or audience.

Student Feedback

Verbal and/or written feedback will be given within two weeks of submission

Instructions

- Write your name and your teacher's name on each page submitted.
- Answer all questions, labelling each clearly.
- Show all working, as part marks may be awarded, where sufficient demonstration of your understanding is evident.
- Leave answers in exact form unless otherwise stated.
- Write in blue or black pen only. Sketch all graphs using a pencil and a ruler, showing appropriate features.
- If your work is word processed, ensure correct mathematical notation is used e.g. MS equation editor

Other Applicable Policies

BSSS and School policies on academic integrity and on penalties for late submission, as noted on the unit outline, apply.

For penalties for late and non-submission of work

Review [BSSS Policy and Procedure Manual 4.3.10](#) for more details.

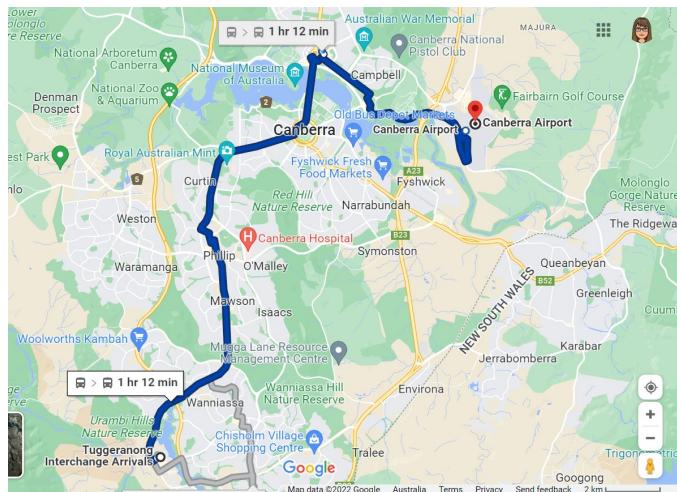
For academic integrity

Review [BSSS Policy and Procedure Manual 4.3.12](#) for more details.

Starting Place: Tuggeranong Town Centre, ACT

Travelling to: Sydney Botanic Gardens (Succulent Garden), Obelisk Bay, Chinatown, Kinokuniya Sydney Bookstore

Public Transportation Option:



Bus 4 departing from Tuggeranong Interchange platform 8 at 7:14am to Legislative Assembly, London Circuit arriving 7:44am (bus cost \$5.87)

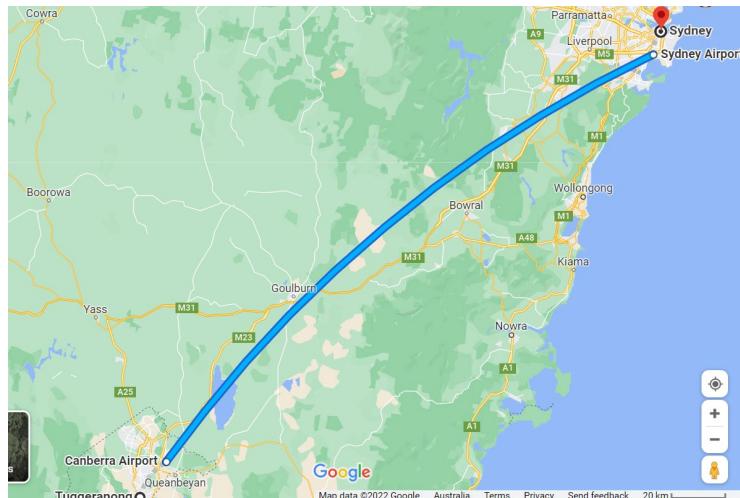
Walk from Legislative Assembly London Circuit to London Act after Akuna Street to catch Bus 3 to the Airport departing at 7:59am and arriving at Canberra Airport at 8:22 am

Walk into Canberra Airport catch QANTAS Flight 1458 8:40am to Sydney arriving 9:35am (cost \$675) flight time 55 minutes

CT1 Q-A level

Selects and applies mathematical techniques to solve routine and non-routine problems in a variety of complex contexts.

Student researched, calculated and designed a trip meeting calculations requirements. Student failed to submit screenshot of correct timetables impacting on rubric results.



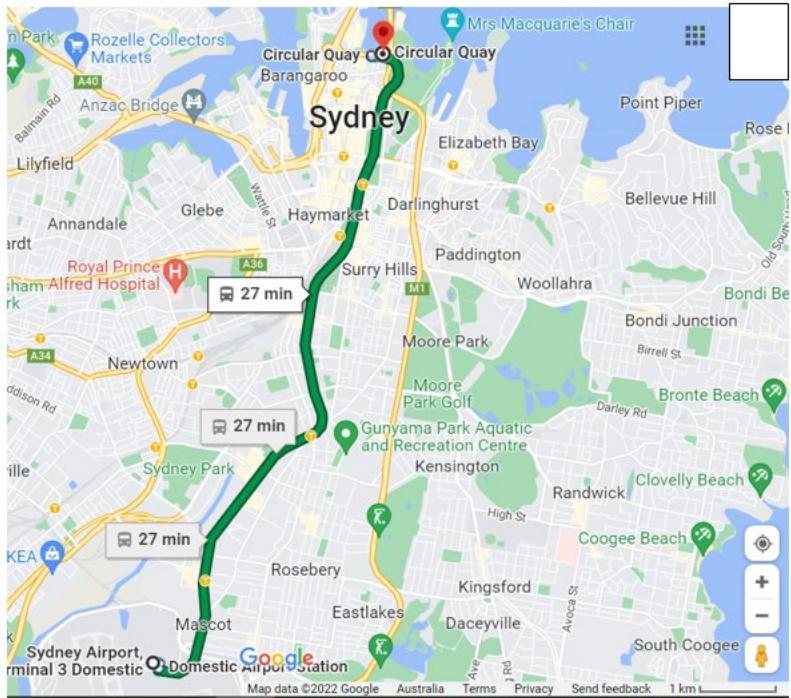
Arrive Sydney Kingsford Smith Airport at 9:35am

Walk to Train station underground at Sydney Domestic Terminal

CT3 Q-A level

Uses digital technologies effectively to solve routine and non-routine problems in a variety of contexts.

Student effectively used Google Maps to find appropriate maps with appropriate scale and screenshots these as required.



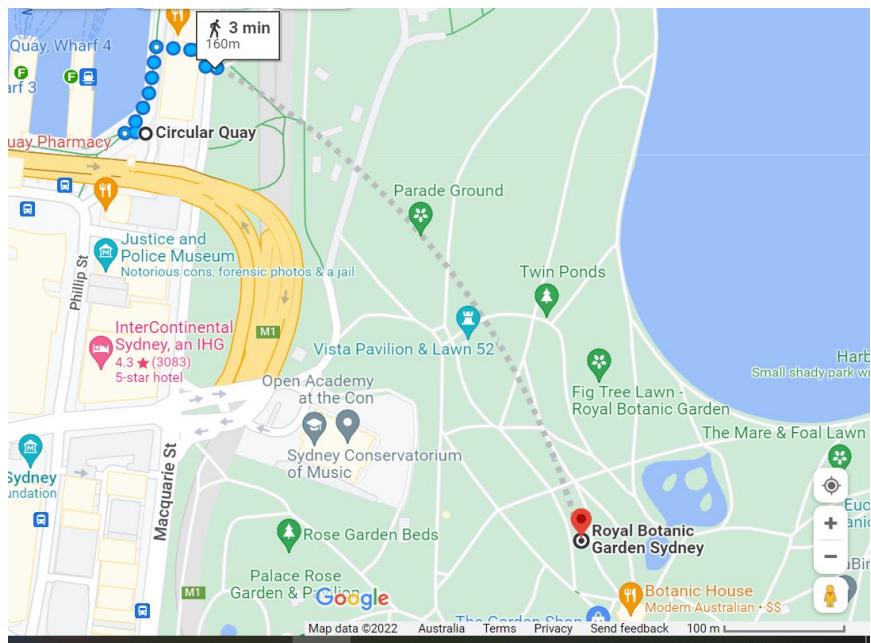
RC 4

Student has clearly provided safety concerns and how they intend to address those.

Take 10:08 train on T8 to arrive at Sydney Circular Quay 10:32 am taking 23 minutes and costing \$18.39

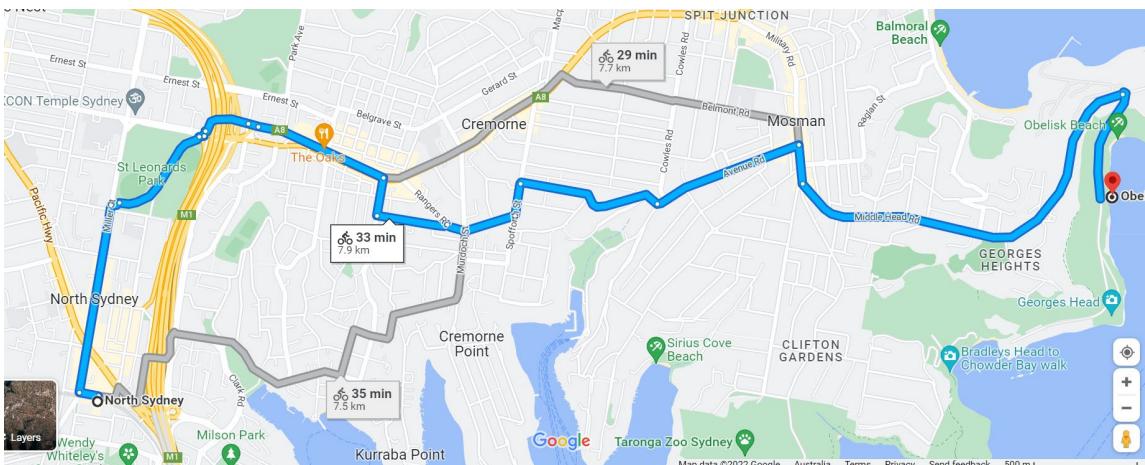
Depart Circular Quay train station and walk to Sydney Botanic Gardens I am mostly interested in seeing the [Succulent gardens](#). I have allocated 1 hour 20 minutes to spend at the Sydney Botanic Gardens.

Student has clearly communicated where they intend to go with travel details required and justification for their choices.



Depart Circular Quay train station at 12:04pm (platform 1) to Wynyard Station at 12:09pm depart train and follow signs for platform 3-4 get back on train header to Linfield and get off at North Sydney Train station (platform 4) at 12:20pm cost of train ticket on Opal is \$2.24.

At North Sydney train station, hire a [Lime Bike](#) or scooter being sure to wear helmet (cost \$16.99 for a 24 hour pass) and ride from North Sydney train station to Obelisk Bay following one of the routes as indicated below. Arrive at Obelisk Bay at 12:55pm. Have a packed picnic lunch and explore Obelisk Bay.

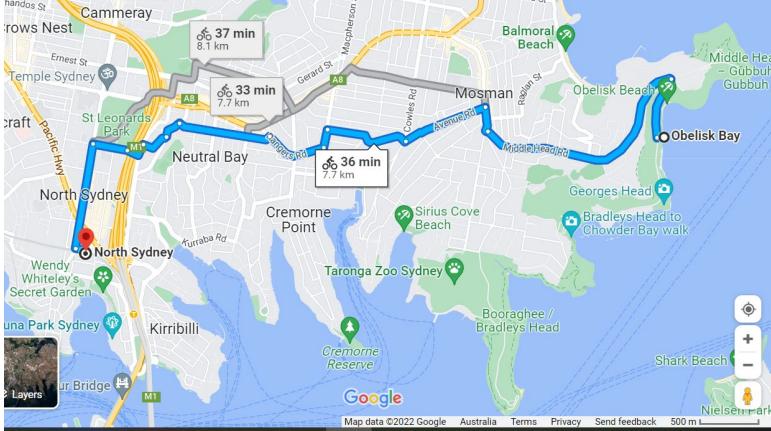


Obelisk Bay is known for having Australian Indigenous rock carvings of fish and hunting tools have been found near the remains of shell midden. Indigenous Australian who spoke Guringai language lived there prior to European arrival in 1788. Within less than 10 years, 90% of the population in this Northern Harbour area had wiped out by smallpox.



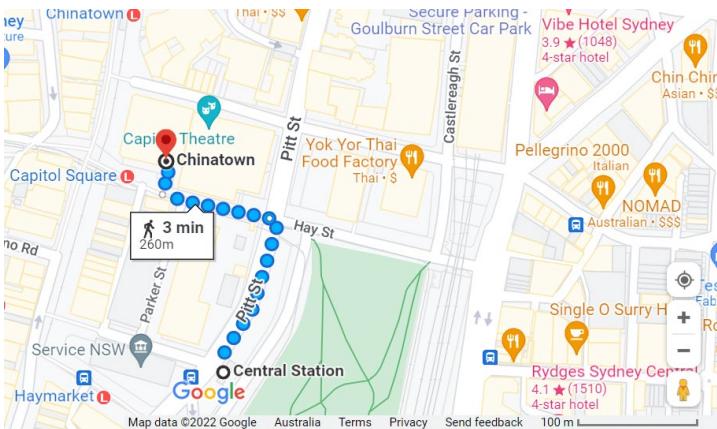
Student has recognised and valued the history, culture traditions and language of the Aboriginal and Torres Strait Islander Peoples from Obelisk Bay area.

Depart Obelisk Bay around 2:00pm to head back to North Sydney train station and leave Lime Bike Behind.



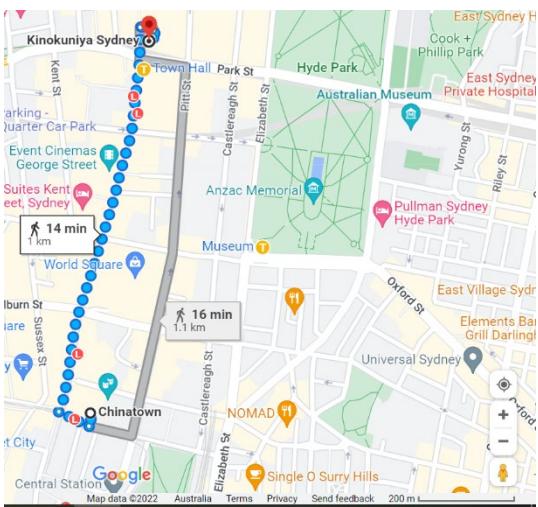
Go to platform 1 at North Sydney Station to get the 2:42pm train to Penrith via Central. Ride this train for 4 stops (13 minutes) and get off at 2:55 pm cost of train ticket on Opal is \$2.75.

From Central train station walk to Chinatown and spend some time wandering around looking at the sites and taking in the smells and sounds. (1 hour)



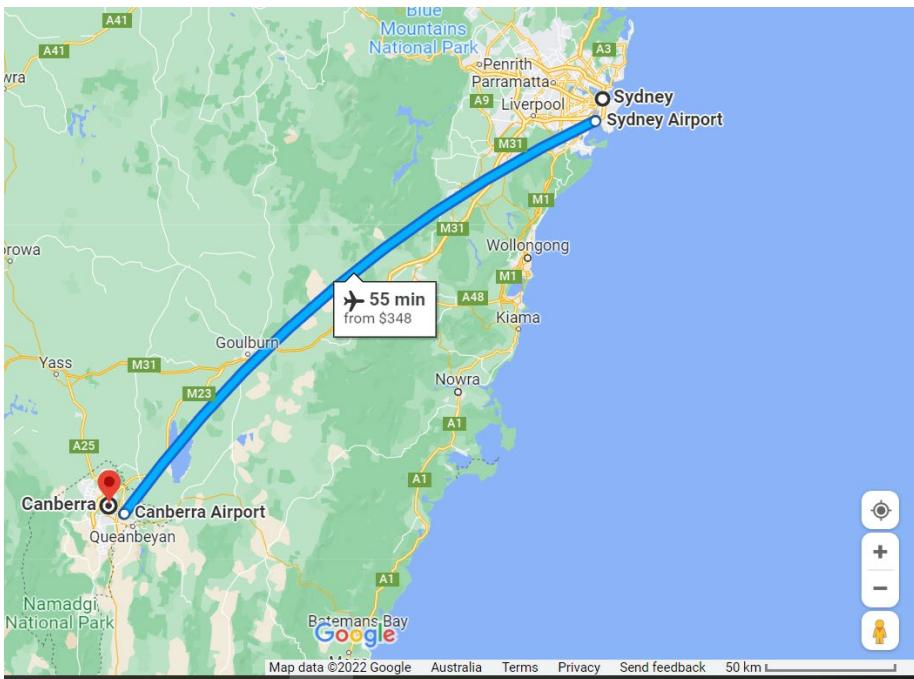
Student has provided details regarding platforms, costs and timing of required public transportation. Unfortunately, they did not provide evidence of these public transportation timetables resulting in a lower result on the rubric.

At around 4:00pm start heading north from Chinatown to my favourite Bookstore in Sydney that sells heaps of Anime and Manga. The walk should take about 15 minutes and is 1 km long up George Street. Arrive at [Kinokuniya Sydney](#) at 4:15pm. Kinokuniya is a Japanese Bookstore chain with over 80 stores across the globe (spend 1 hour 30 minutes and lots of \$ in bookstore) Depart bookstore at 5:45pm.



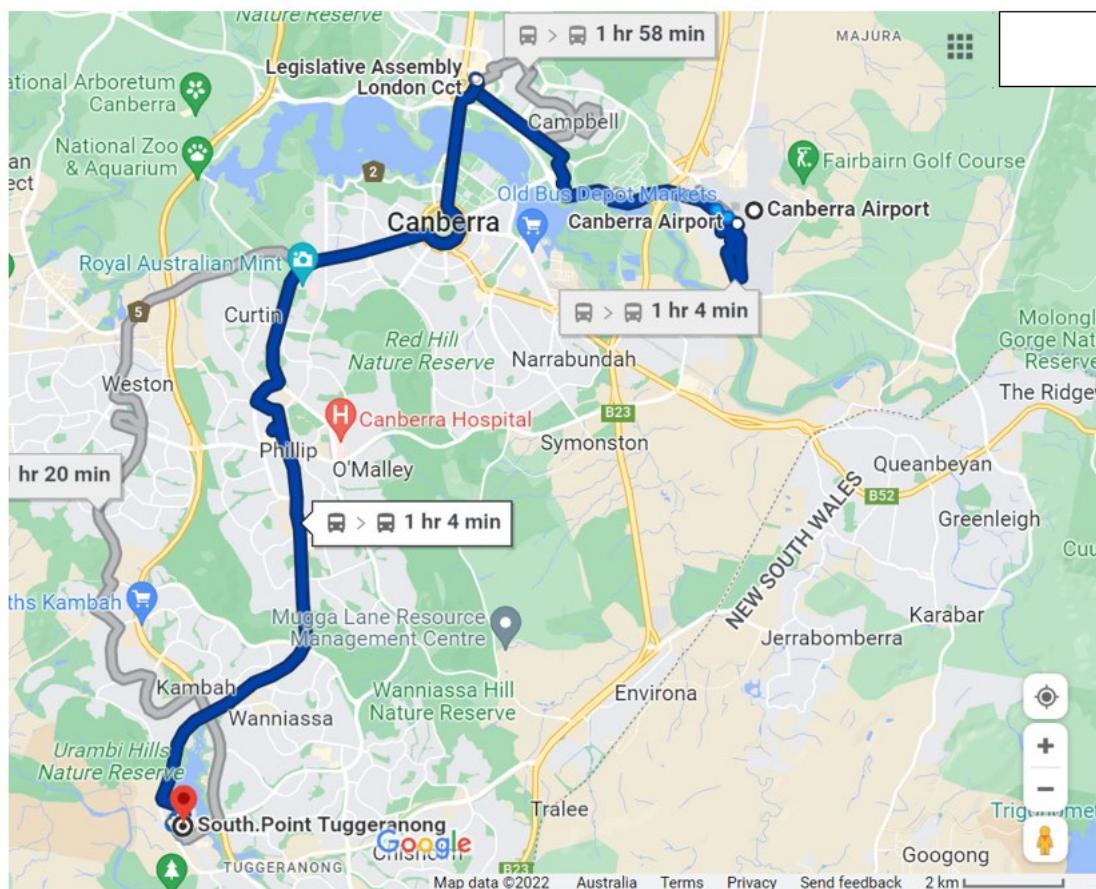
Walk from bookstore to Townhall Train station (3 minutes) walking across George Street into Queen Victoria Building and down the stairs. At Town Hall Station catch the 5:55 train to Macarthur via Airport from platform 6 for 8 stops (taking 23 minutes) to Domestic Airport Station at 5:59 pm cost of train ticket on Opal is \$18.39.

From Domestic Airport Station get on QANTAS Flight 1451 departing Sydney at 7:35pm and arriving at Canberra airport at 8:30pm (cost is \$675).



Student has again provided details regarding platforms, costs and timing of required public transportation. Unfortunately, they did not provide evidence of these public transportation timetables resulting in a lower result on the rubric.

Walk to Canberra Airport Bus stop and catch the 9:17pm Bus 3 to Spence (11 stops and 18 minutes) get off at Legislative Assembly London Circuit at 9:35pm. Needing to be mindful it is dark in Canberra at this time and need to be careful of where I am walking (about 1 minute) while heading northwest on London Circuit towards Ainslie Place bus stop will be on the left. At 9:40pm take Bus 4 to Tuggeranong and remain on for 14 stops and 30 minutes to arrive at Tuggeranong Interchange arrivals at 10:12pm (bus cost \$5.87).



Total Costs Public Transportation

Bus ticket Tuggeranong to Canberra Airport	\$5.87
Flight Canberra to Sydney	\$675
Train ticket from Sydney Domestic Airport to Circular Quay	\$18.39
Botanic Gardens	Free Entry
Train ticket from Circular Quay to North Sydney	\$2.24
Lime Bike Rental	\$16.99
Train ticket from North Sydney to Central Train station	\$2.75
Train ticket from Townhall to Sydney Domestic Airport	\$18.39
Flight from Sydney to Canberra	\$675
Bus ticket from Canberra Airport to Tuggeranong town centre	\$5.87
Total transportation costs:	\$1420.50
Snacks and drinks while travelling	\$50
Money spent at Kinokuniya	\$100
Total Other Costs	\$150
Total cost per person for trip	\$1570.50

Itinerary Public Transportation Option

Start	Activity	End	Time waiting for next activity
7:14am	Bus from Tuggeranong to Airport	8:22am	18 minutes
8:40am	Flight to Sydney	9:35am	13 minutes
10:08am	Train from Domestic Terminal to Circular Quay	10: 31am	4 minutes walking to Botanic Gardens
10:35am	Time at Sydney Botanic Gardens	11:55am	9 minutes
12:04pm	Train from Circular Quay to North Sydney Train station	12:20pm	2 minutes to rent bike
12:22pm	Ride rental bike from North Sydney Train Station to Obelisk Bay	12: 55pm	
12:55pm	Picnic and time exploring Obelisk Bay	2:00pm	
2:00pm	Ride rental bike from Obelisk Bay to North Sydney Train Station	2:33pm	9 minutes
2:42pm	Train from North Sydney to Central Train Station	2:55pm	
3:00pm	Exploring Chinatown	4:00pm	
4:00pm	Walk from Chinatown to Kinokuniya	4:15pm	

4:15pm	Time spent in Kinokuniya	5:45pm	
5:45pm	Walk from bookstore to train station	5:48pm	
5:55pm	Train from Townhall Station to Sydney Domestic Terminal	6:18pm	8 minutes waiting for train
7:35pm	Flight from Sydney to Canberra	8:30pm	1 hour 17 minutes waiting for flight
9:17pm	Bus from Canberra airport to Tuggeranong	10:12pm	47 minutes waiting but bus
	Arrive Home in Tuggeranong at 10:12pm		

Student has communicated their plans in a clear and easy to read format with details required for another party to use the itinerary successfully to replicate the planned excursion.

Private Transportation Option: 2015 Toyota Rav 4 (fuel conception about 6.5L/100km)

Depart Tuggeranong 7:00am

Driving Directions:

Follow Monaro Hwy, Majura Pkwy/M23 and Federal Hwy to M31 in Yarra
1 hr 5 min (99.4 km)

Follow M31 and M5 to Sir John Young Cres in Sydney. Take the exit towards City N from M1

2 hr 6 min (207 km)

Stop at Marulan Rest Stop, Petrol and Food area for a rest for the driver. This is 1 hour 30 minutes into the journey on the way there and 1 hour 50 minutes into the journey on the way back meeting the recommended stop every 2 hours for driver safety.

Continue along Sir John Young Cres. Take Bent St and Cumberland St to George St in The Rocks--Arrive Sydney carpark at 155 George Street at 10: 40am.

Driving distances and petrol calculations

Total distance travelled by car is 308km one way and 3 hours 20 minutes average driving time plus 20 minute break at Marulan takes the total travel time to 3 hours 40 minutes.

308km distance travelled / 100 = $3.08 \times 6.5L = 20.02$ L of petrol used each way.

Total of 40.04L of petrol used in total

Average cost of petrol \$2.12/L = \$84.88 (both directions)

Student is communicating mathematical techniques clearly and with appropriate language.

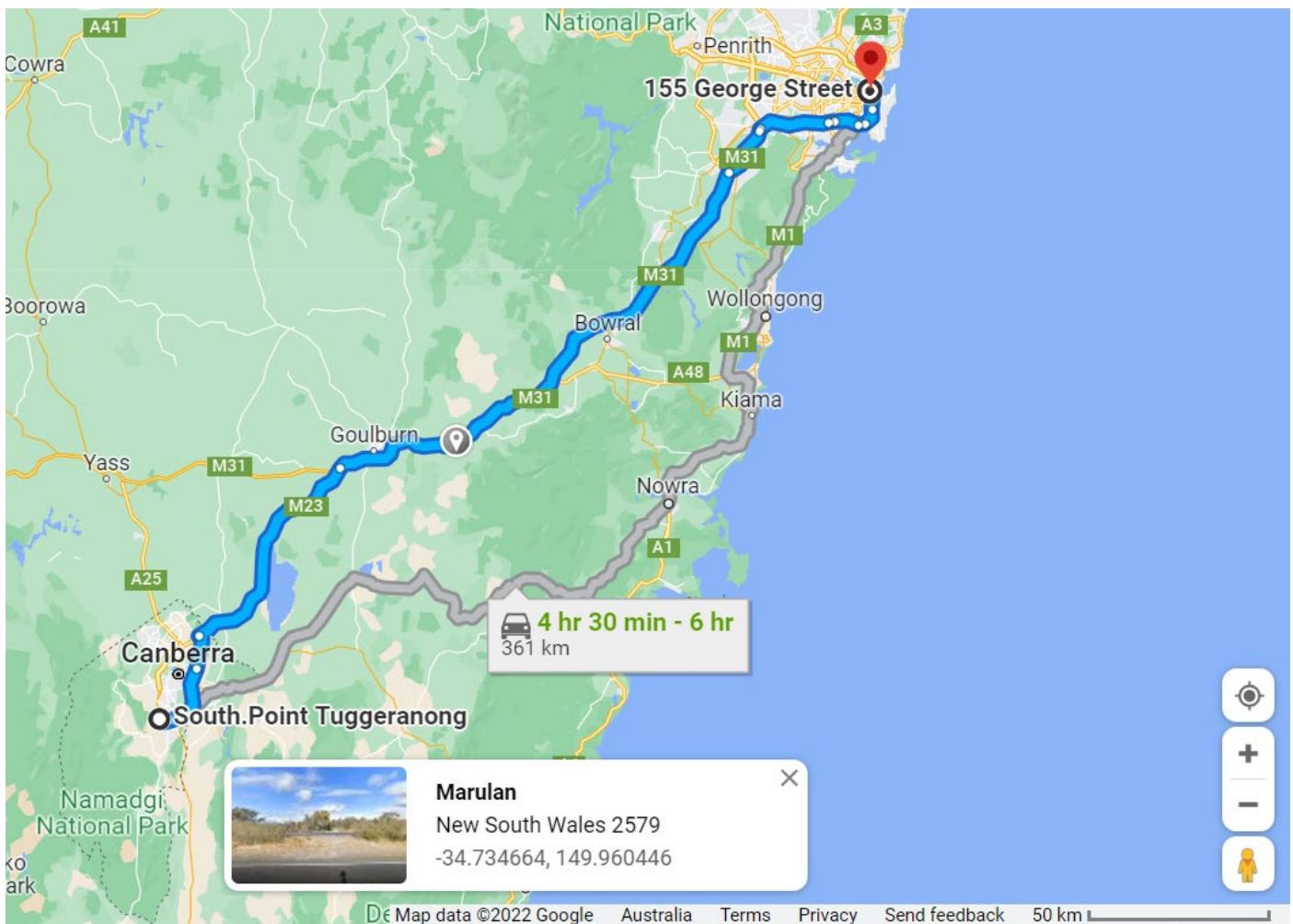
Parking in Sydney:

Sydney Wilson Parking

155 George Street

Sydney, NSW

Booking online \$29 for all day Saturday planning to leave the car here and use public transport to get around Sydney for ease of driving and saving money on parking at multiple venues.



Toll breakdown by motorway

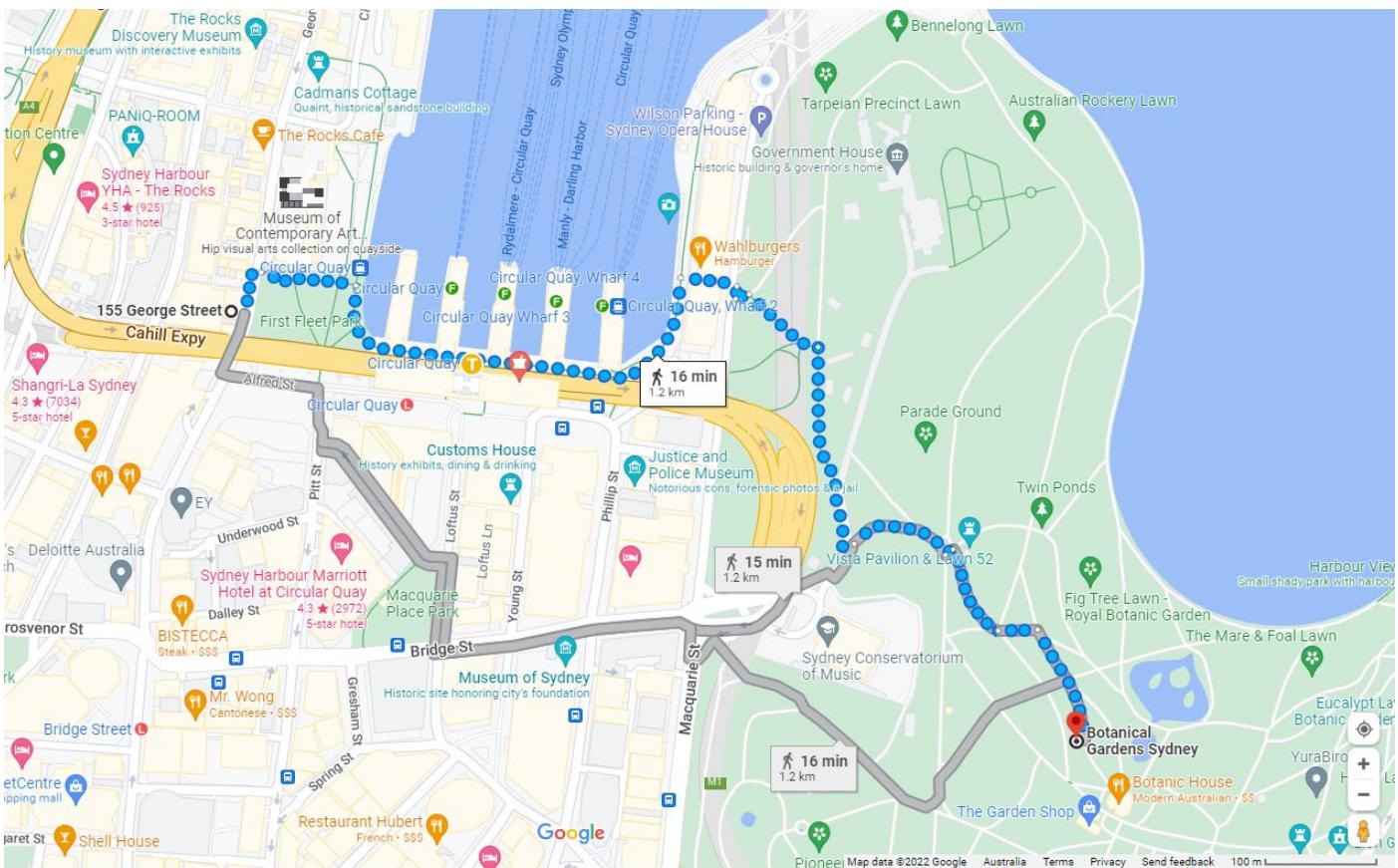


An accessible data table of the toll summary is also available

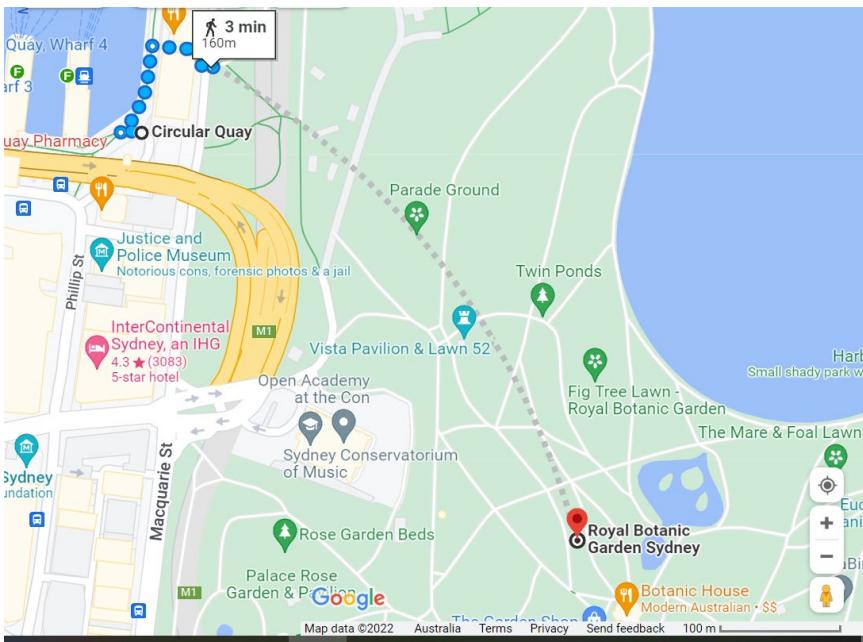
Motorway	Class A	Class B
M5 E-way ↗	\$5.12	\$15.35
M5 East Transurban Link ↗	\$7.52	\$22.56
Eastern Distributor Transurban Link ↗	\$8.74	\$17.47
Cross City Tunnel - Main Transurban Link ↗	\$6.27	\$12.54
Total	\$27.65	\$67.92

Cost of Tolls from Hume Highway to Sydney CBD Road Tolls (class A) cost one way \$27.65

From 10:45 am depart Sydney Wilson Parking from 155 George Street to walk to Sydney Botanic Gardens by walking around First Fleet Park and Circular Quay as indicated on the map below. This walk should take 16 minutes, arriving at the Gardens at 11:01am. I am mostly interested in seeing the [Succulent gardens](#) and have allocated 1.5 hours to spend at the Sydney Botanic Gardens.

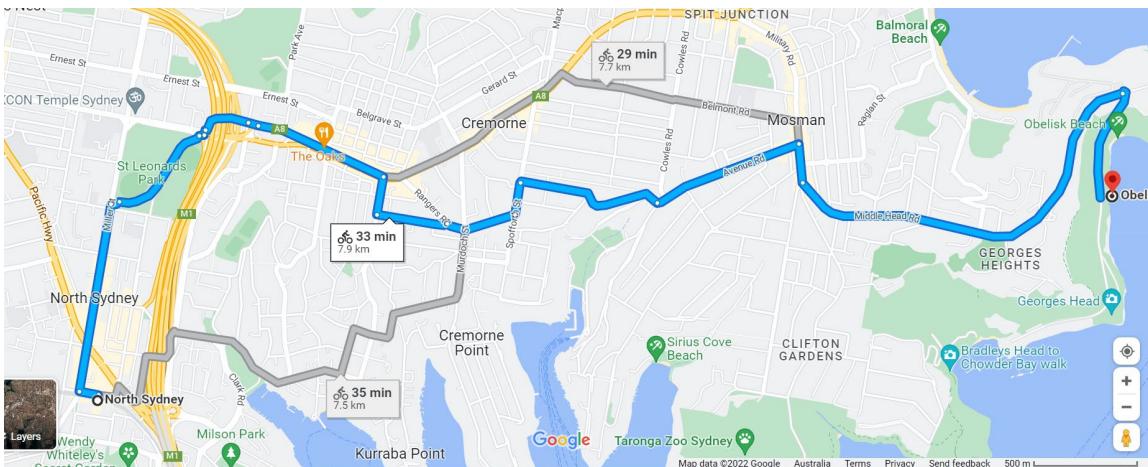


Depart Sydney Botanic Gardens at 12:31 and walk to Circular Quay Train station:



Depart Circular Quay train station at 12:42 (platform 1) to Wynyard station (12:46) then change trains to platform 4 and get on train departing at 12:50 to Gladesville and get off at North Sydney train station (platform 4) at 1:01pm cost of train ticket on Opal is \$2.24.

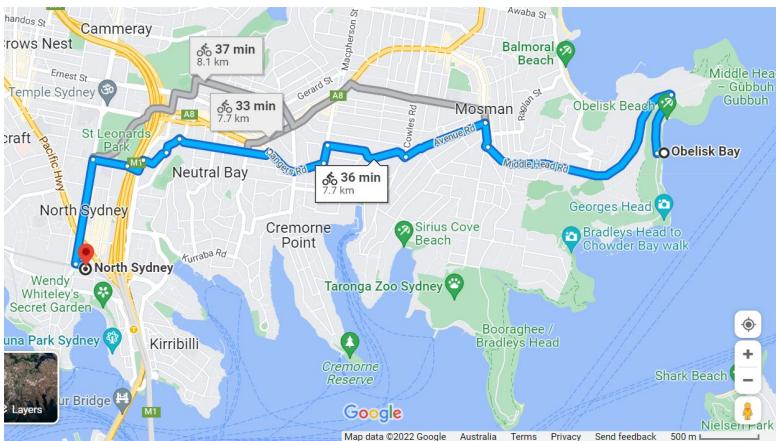
At North Sydney train station, hire a [Lime Bike](#) or scooter being sure to wear helmet (cost \$16.99 for a 24 hour pass) and ride from North Sydney train station to Obelisk Bay following one of the routes as indicated below. Arrive at Obelisk Bay at 1:35pm. Have a packed picnic lunch and explore Obelisk Bay.



Obelisk Bay is known for having Australian Indigenous rock carvings of fish and hunting tools have been found near the remains of shell midden. Indigenous Australian who spoke Guringai language lived there prior to European arrival in 1788. Within less than 10 years, 90% of the population in this Northern Harbour area had wiped out by smallpox.

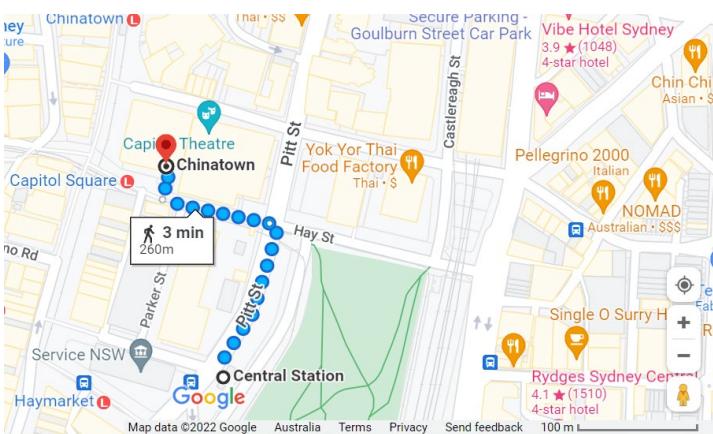


Depart Obelisk Bay around 2:15pm to head back to North Sydney train station and leave Lime Bike Behind.

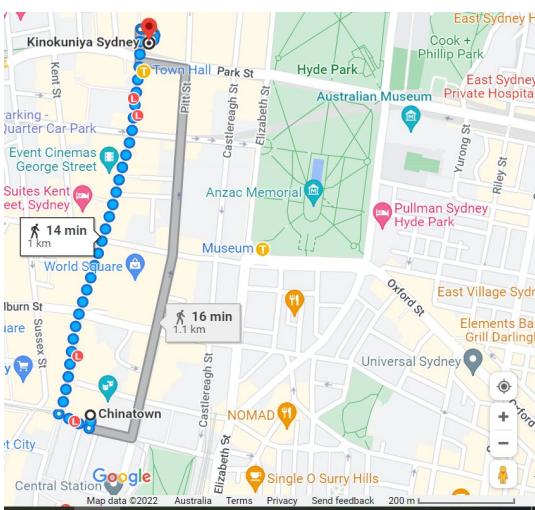


Go to platform 1 at North Sydney Station to get the 2:53pm train to Berowra via Gordon via Central. Ride this train for 4 stops (13 minutes) and get off at 3:05 pm cost of train ticket on Opal is \$2.75.

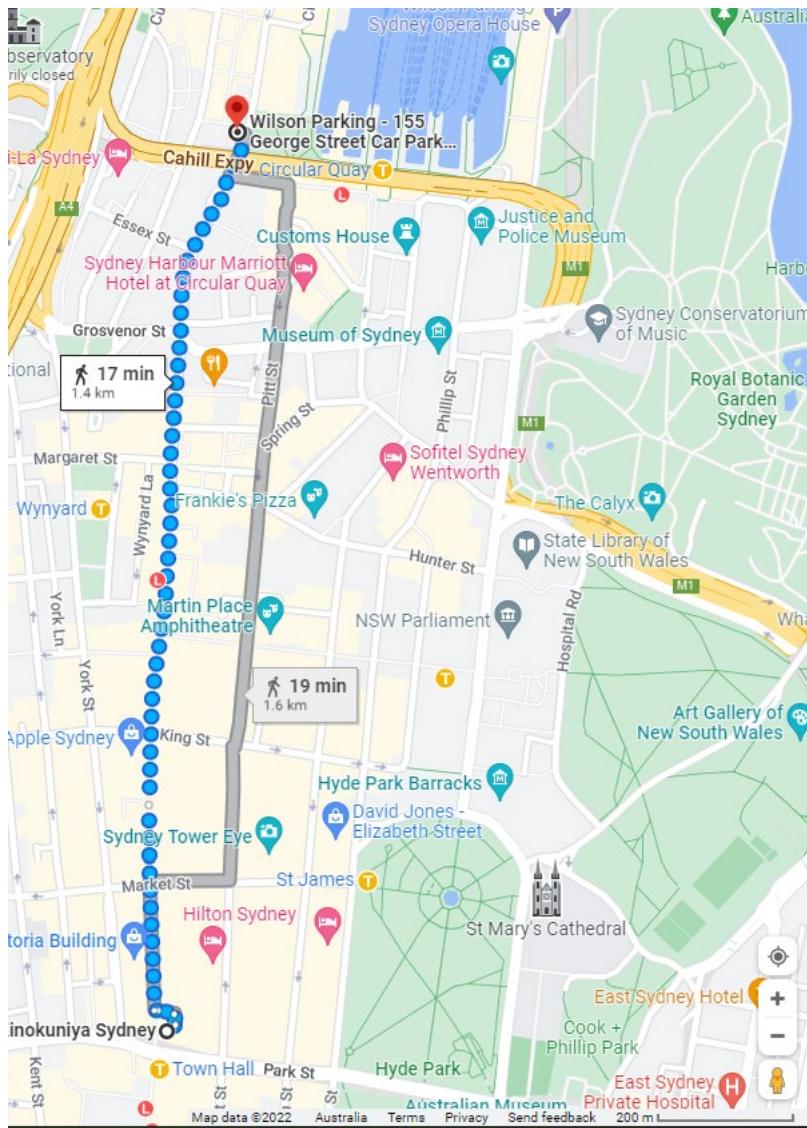
From Central train station walk to Chinatown and spend some time wandering around looking at the sites and taking in the smells and sounds. (1 hour)



At around 4:05pm start heading north from Chinatown to my favourite Bookstore in Sydney that sells heaps of Anime and Manga. The walk should take about 15 minutes and is 1 km long up George Street. Arrive at [Kinokuniya Sydney](#) at 4:20pm. Kinokuniya is a Japanese Bookstore chain with over 80 stores across the globe (spend 1 hour 15 minutes and lots of \$ in bookstore) Depart bookstore at 5:00pm.



Depart bookstore at 5:35pm. And head north again on George Street back to where car is parked at 155 George Street by 5:55pm



Depart parking garage at 6:00pm

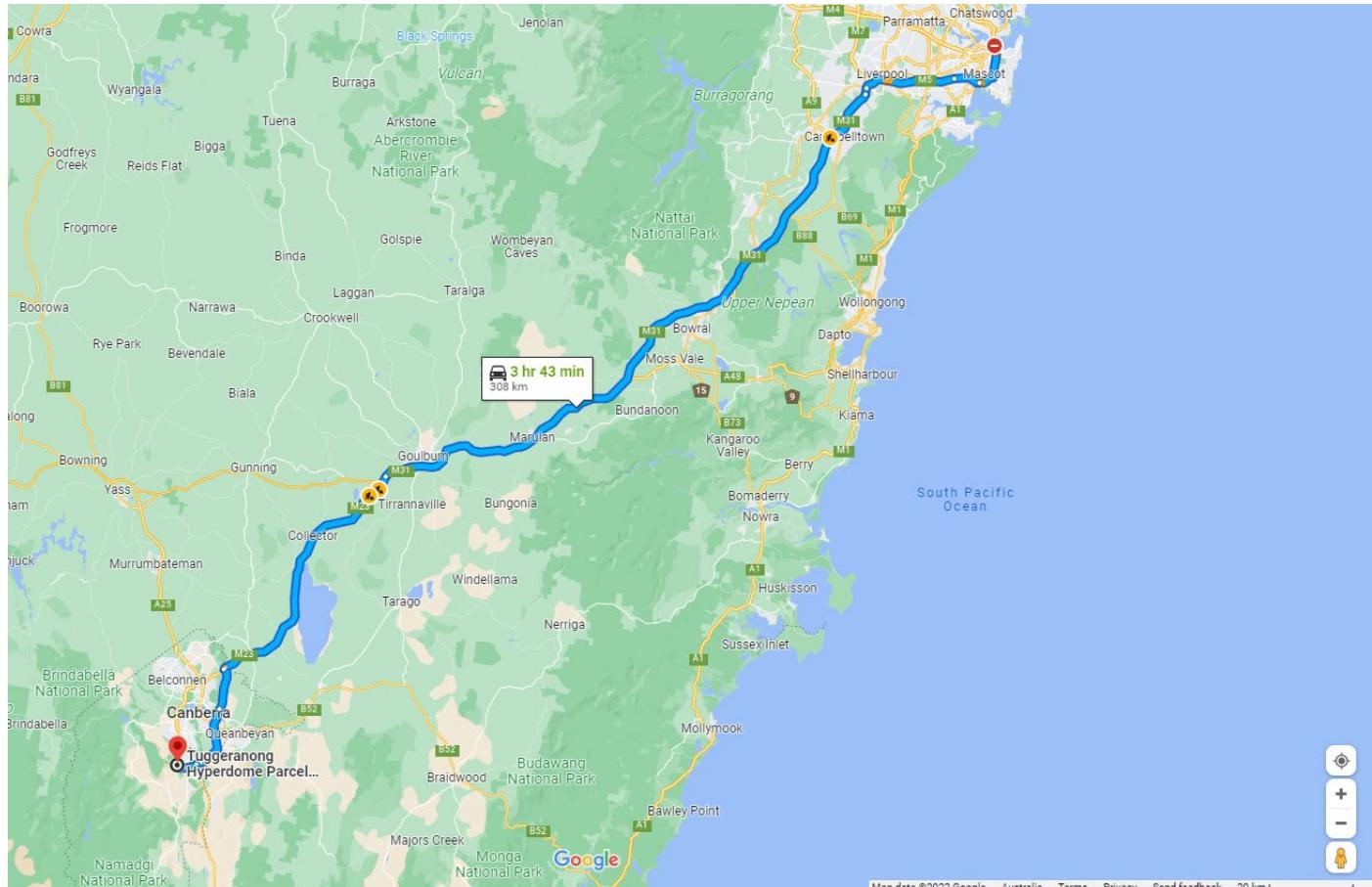
Get on M1 in Sydney from George Street and Bridge Street Follow M5 and M31 to Marulan (1 hour 51 minutes)

Arrive at 7:51pm at Marulan take a break for the driver and any other passengers for 20 minutes.

Depart Marulan at 8:11pm to get back on the Hume Highway and then Federal Highway to Monaro Highway at Isabella Drive depart Monaro Highway. Remain on Isabella Drive into Anketell Street into Tuggeranong Centre arriving at 10:03pm.

Tolls on the way back to Canberra:

Toll breakdown by motorway		
An accessible data table of the toll summary is also available		
	Class A	Class B
Cross City Tunnel - Main	\$6.27	\$12.54
Transurban Link ↗		
M5 East	\$7.52	\$22.56
Transurban Link ↗		
M5	\$5.12	\$15.35
E-way ↗		
Total	\$18.91	\$50.45



Total Costs Private Vehicle

Fuel costs 308 km travelled Rav 4 fuel economy at 6.5L/100km $308/100 \times 6.5 = 20.02$ L of fuel used one way Total Fuel used = 40.04 Cost of Fuel: \$2.12/L 40.04×2.12	\$84.88
Tolls from Canberra to Sydney	\$27.65
Parking Cost in Sydney	\$29.00
Train ticket from Circular Quay to North Sydney	\$2.24
Lime Bike Rental	\$16.99
Train ticket from North Sydney to Central	\$2.75

Tolls from Sydney to Canberra	\$18.91
Total Transportation Costs	\$182. 42
Snacks and drinks while travelling	\$50
Money spent at Kinokuniya	\$100
Total Other Costs	\$150
Total cost for 1 person for trip	\$332.42
Transport Cost for each additional person \$2.24 + \$16.99 + \$2.75	\$21.98

Itinerary Private Vehicle Option

Start	Activity	End	Time waiting for next activity
7:00am	Drive from Tuggeranong to Sydney (includes 20 minutes rest stop in Marulan)	10:40am	3 hours 20 minutes driving time plus 20 minutes rest break
10:45	Depart car park walk to Sydney Botanic Gardens spend time exploring	12:31pm	11 minutes
12:42	Train from Circular Quay to North Sydney Train station	1:01pm	2 minutes to rent bike
1:03pm	Ride rental bike from North Sydney Train Station to Obelisk Bay	1:35pm	
1:35pm	Picnic and time exploring Obelisk Bay	2:15pm	
2:15pm	Ride rental bike from Obelisk Bay to North Sydney Train Station	2:48pm	5 minutes
2:53pm	Train from North Sydney to Central Train Station	3:05pm	
3:05pm	Exploring Chinatown	4:05pm	
4:05pm	Walk from Chinatown to Kinokuyina	4:20pm	
4:20pm	Time spent in Kinokuniya	5:35pm	
5:35pm	Walk from bookstore to car park	5:55pm	5 minutes
6:00pm	Drive from Sydney back to Canberra	10:03pm	3 hours 43 minutes driving plus 20 minute driver break
	Arrive Home in Tuggeranong at 10:03pm		

Comparison:

Cost:

The two options had a significant difference in cost which was not surprising as flying is always expensive.

The cost per person for public transportation was \$1570 per person. Any additional person going on the same trip would pay an additional \$1570.

The cost for the first person to travel on the private transportation option would be \$332.42 and each additional person would then cost only \$21.98. There of course would be a maximum of 4 additional people on the trip to fit into the Rav 4 as indicated.

Time:

The two options did not have a significant difference in total time of the trip. The public transportation option started at 7:14am from Tuggeranong and returned home at 10:12pm, a total time of 16 hours and 58 minutes. The private transportation option started at 7:00am from Tuggeranong and returned home at 10:03pm, a total of 17 hours and 3 minutes. The total difference in time between the two trips only being 5 minutes which was quite surprising. There was a long wait at Sydney airport for the flight from Sydney to Canberra. It surprised me that there were so few options in the evening for this flight.

Distance Travelled:

The distance travelled between the two options would probably be quite similar. The flying distance is 236km and the driving distance is 308km. The remainder of both options is nearly the same.

Average speed:

The public transportation option using an airplane and travels from Canberra to Sydney which in flight distance is 236 km and takes 55 minutes.

$$236\text{km} \div \frac{55}{60} = 257.5\text{km/hour}$$

The private transportation option uses a car and travels from Tuggeranong to Sydney centre which is a driving distance of 308 km and takes 3 hour 20 minutes

$$308 \div 3 \frac{20}{60} = 92.4\text{km/hour}$$

The average speed for the two options is quite different (a difference of 165.1km/hour)

Convenience:

I think the driving option would be more convenient as you have control over if you need to stop along the way and there is a lot more waiting time with the public transportation option, especially on the way back to Canberra where you need to

RC2 Q-A level

Communicates mathematical information in oral, written and/or multimodal forms, which are well reasoned, using accurate and appropriate language.

Student demonstrates clear comparisons of similarities and contrasts of differences using reference to accurate mathematical calculations. Communication is well reasoned and used appropriate mathematical language.

wait at Sydney airport for 1 hour and 17 minutes for the flight and then wait at Canberra airport for 47 minutes for the bus to Tuggeranong. If you consider cost to be a convenience the private vehicle option is also much more convenient.

Safety:

Overall, both options have their pluses and minuses with regard to safety. The public transportation option has the person waiting in Civic in the dark for a while to change buses. The private vehicle option has the person driving for quite a long time in the dark to get home. And both options include riding a bike on some very bust roads in Sydney but do mention using a helmet.

Which mode of Travel would I choose?

I would take the private vehicle option over the public transportation option. Mostly due to the cost. Although driving and parking around Sydney can be challenging, I think the itinerary where you drive to Sydney then park the car for the day and then use public transportation to get around is the best of both option as it uses a mixture of private and public transportation options. If I were travelling on my own, I think the drive back from Sydney to Canberra would be quite tiring as the itinerary covers a very busy day with lots of walking and bike riding etc and I would probably prefer to spend the night somewhere in Sydney and drive back the next day for safety reasons and this option would still be much cheaper than the flight, especially if I shared the cost of a hotel room with my friend. Although I would also need to budget more for parking and food in that scenario as well.

Student has provided well-reasoned and accurate communication of their mathematical information.

Reflection:

I did not start writing this assignment straight away, I did some thinking about where I would want to go first. As I have been working with my Nan in the garden lately, I am interested in succulents and cactuses and thought that seeing a wider variety of them in Sydney would be fun. I love the Kinokuniya Bookstore and always try to get there whenever my family travels to Sydney. I did not really know of any of the places we had to choose for our picnic place and chose Obelisk Bay at random but it does look like a nice place to visit.

I then started investigating the Murray's Bus from Canberra to Sydney but could not find a map of the route they take so I changed to a different form of public transportation – flying. I was quite surprised by the number of flights from Canberra to Sydney were not direct flights. I was also surprised there were not more of them in the evening times and the cost of the flights.

I then did my research on Google Maps and even though I have been to Sydney many times with my family, looking on the maps gave me a better idea of where things were as I usually just follow my mum.

In total I used my time ok, I did probably do too much thinking at the beginning meaning that the comparison was a bit rushed. It was also a little hard to keep track of all the times and I ended up writing them out on a piece of paper while I was researching.

RC3 Q-B level

Reflects on own thinking and learning, analyses inter and intrapersonal skills including planning, time management, use of appropriate strategies to work independently and collaboratively.

Student shows some good reflection regarding their management of time and resources. Student identified where difficulties were met and how they were managed.

References:

<https://www.google.com/maps>

<https://www.transport.act.gov.au/tickets-and-myway/fares>

<https://www.webjet.com.au>

<https://transportnsw.info/>

<https://www.rbgtsyd.nsw.gov.au/visit/things-to-see-do/unmissable-gardens/the-succulent-garden>

<https://artsandculture.google.com/story/first-nations-stories-of-sydney-harbour-sydney-harbour-federation-trust/qQWBtKqqUV9cFQ?hl=en>

https://en.wikipedia.org/wiki/Obelisk_Beach

<https://kinokuniya.com.au/about-us/#:~:text=In%201996%2C%20Kinokuniya%20launched%20its,shopping%20center%20on%20George%20Street>

<https://roads-waterways.transport.nsw.gov.au/sydney-motorways/toll-calculator/index.html>

[https://www.wilsonparking.com.au/parking-locations/new-south-wales/sydney-cbd/155-george-st-car-park/?carParkFeature="](https://www.wilsonparking.com.au/parking-locations/new-south-wales/sydney-cbd/155-george-st-car-park/?carParkFeature=)

<https://www.airmilescalculator.com/distance/syd-to-cbr/>

Student has provided a list of websites but has not detailed what information was found at these sites.