Is the public swimming pool a profitable investment?

Maths Talent Quest VIC INVESTIGATION, 2020

Table of Contents:

Introduction and Reasons of Choosing
Aim and Hypothesis
Pool shape and view
Digging the pool
Pool measurements
Tiling of the pool
Birds eye view
Finding an area with a profiting opportunity
Resizing the land
Finding an estimate of entrants
Lifeguards hiring
Chlorine and water prices
Water evaporation
Seating Areas
Total Budget
Investment 1
Conclusion
Reflection
Mathematical Concepts
Bibliography

Introduction:

Making money in the public industry has never been harder, as many of these facilities around us start to close down as they cannot remain standing. Businesses are suffering to make a profit. People are starting to wonder whether these public facilities are earning money.

This investigation focuses particularly on the costs of maintaining a commercial pool and if the public admissions will cover the costs. It will conclude on whether our public facilities are set up to make a profit or if they are doomed to lose money.

Why I chose this topic.

I chose this topic because of the increasing handover of organisations and authority of, namely swimming pools. This affects the community, as swimming pool handovers have happened locally to my suburb. Handovers of this large scale usually are caused from small revenue, to investments that have been paid off, resulting in debt.

In this investigation, I put myself in the situation where I have loaned a large amount of money in order to try to build a profitable business. The results of handing over a swimming pool can be catastrophic, like increased fees and once introduced, the community is to suffer. So this investigation will uncover how to make sure your swimming pool does not become a burden and debt.

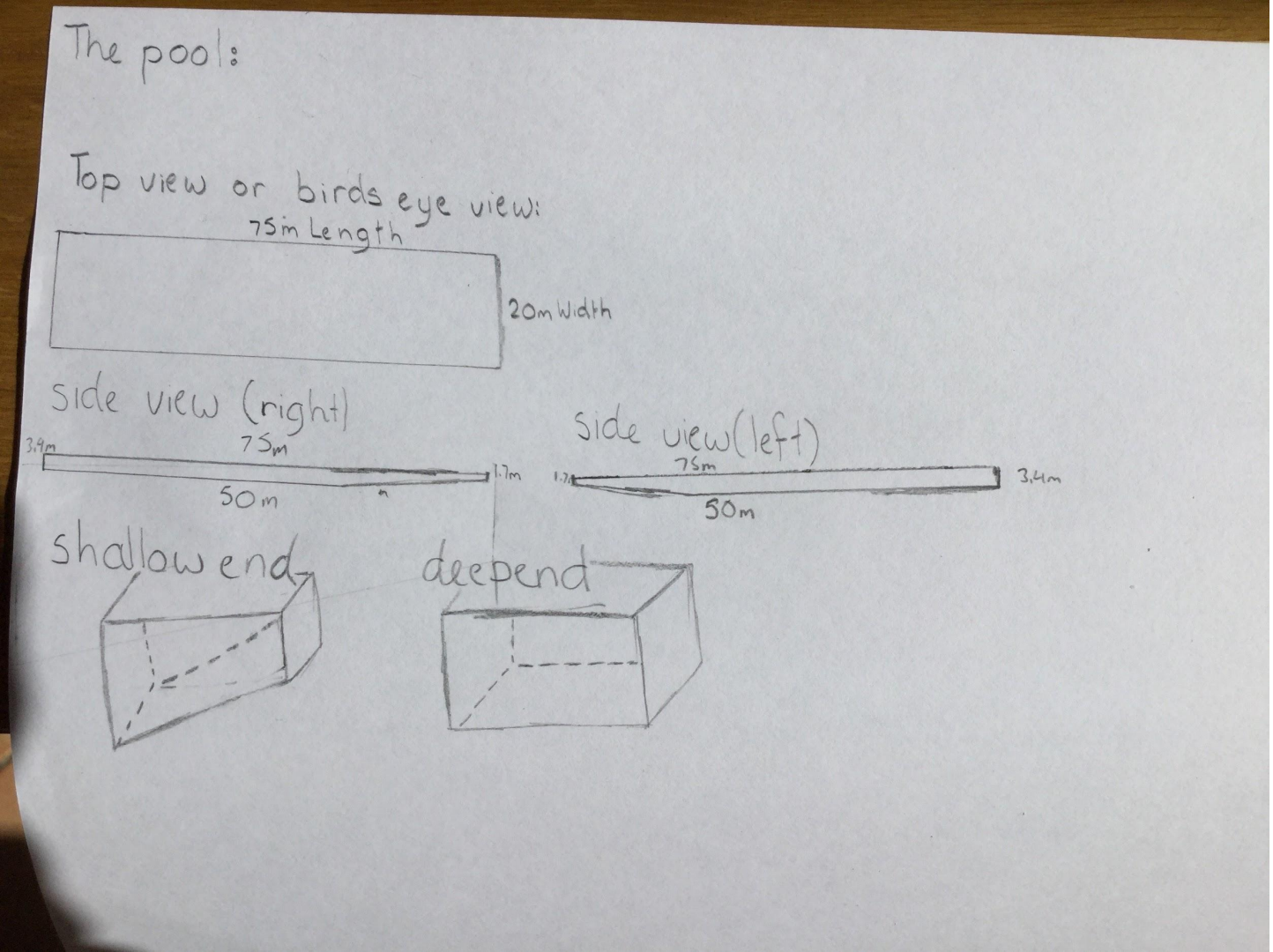
Aim: My aim will be to uncover how public facilities, namely the swimming pool may be not profiting in terms of how they operate and the fees and expenses that are usually paid by the general public are not enough to support the business.

To do this, I will generate a theoretical swimming pool with all concepts included and thought of to determine whether public swimming pools are really worth their expense.

Hypotheses -

- Hypothesis 1: I believe that swimming pools spend over 4 million upon their emergence and take over $200,000 a year to maintain.
- Hypothesis 2: I estimate that the swimming pool takes an estimated 5 years to generate revenue and come out of debt.

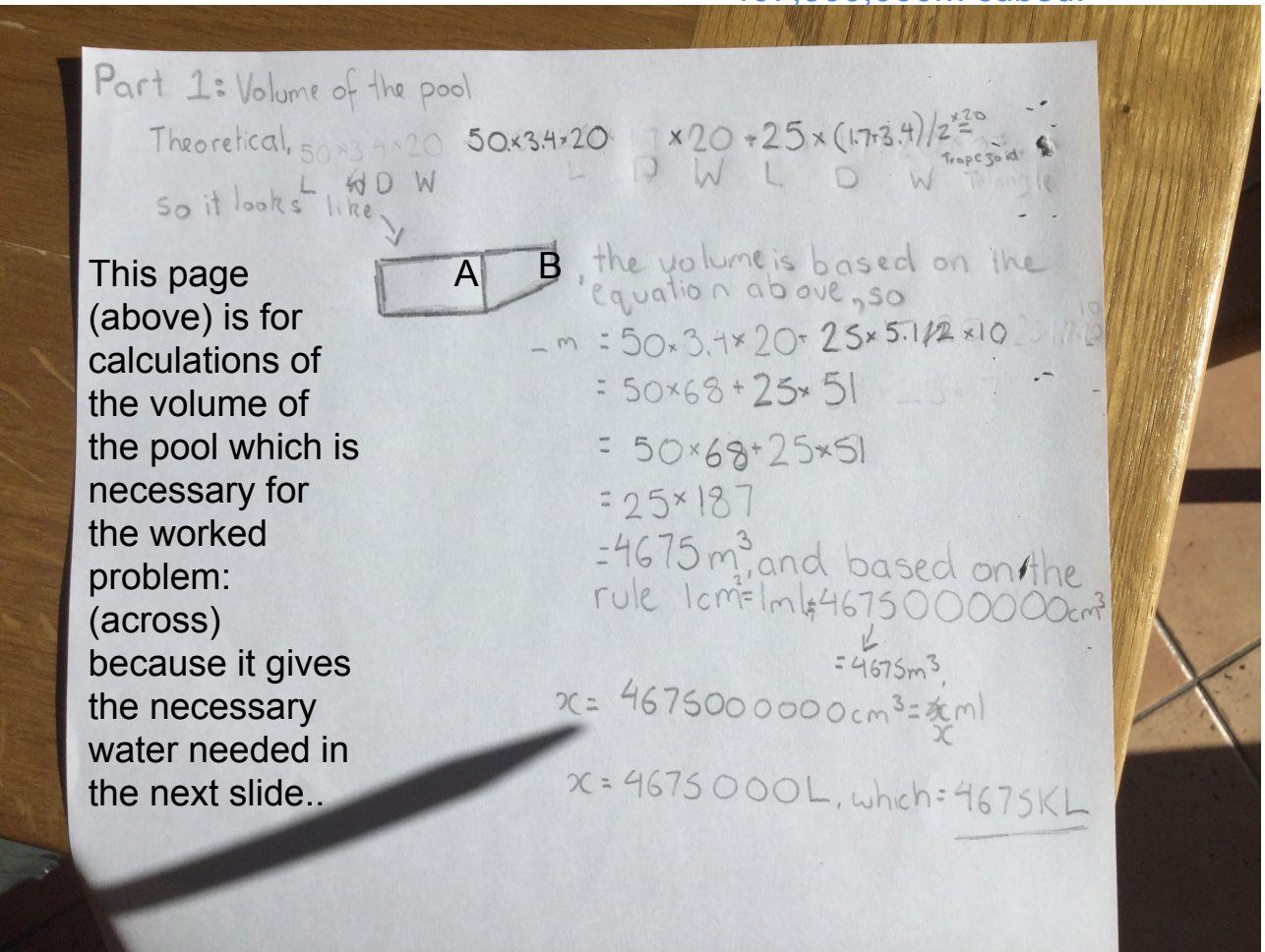
HYPOTHESIS



Pool Measurements with bird eye view and side views, provided with measurements to help the viewer better understand the next several slides, as they calculate how much it costs to dig the area of the pool.

Pool Measurements

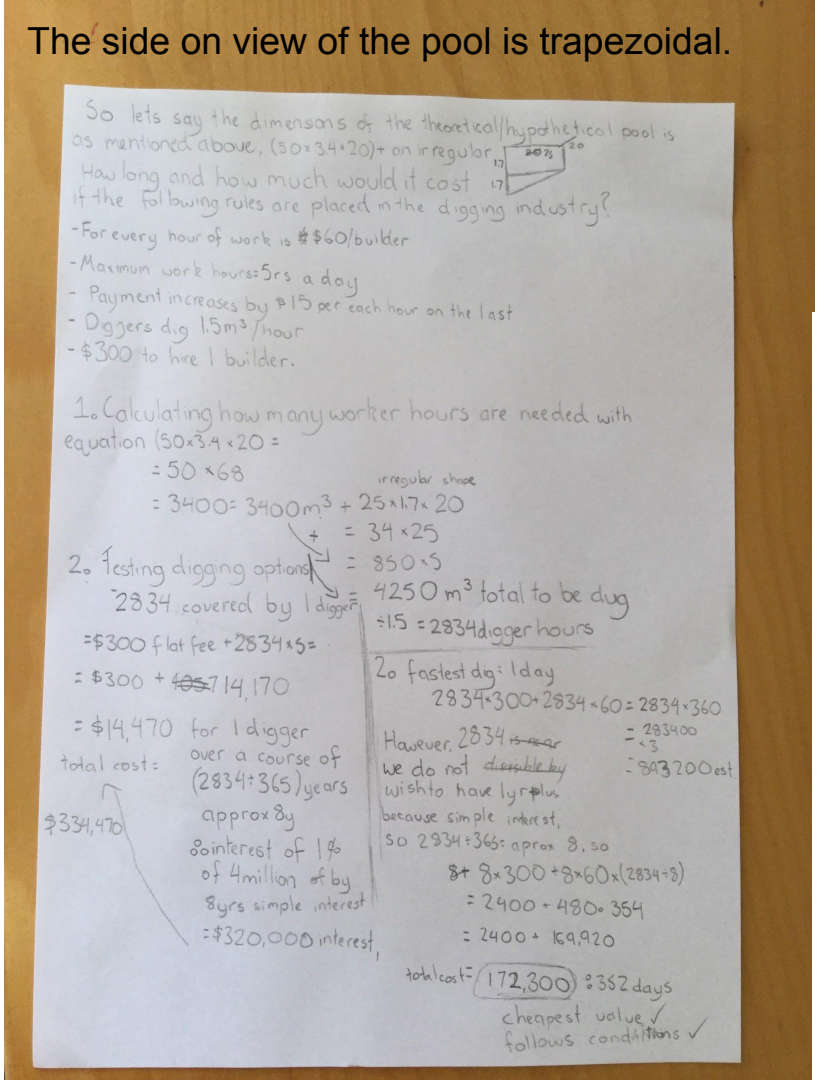
Total capacity 4,675 KL, volume 467,500,000m cubed.

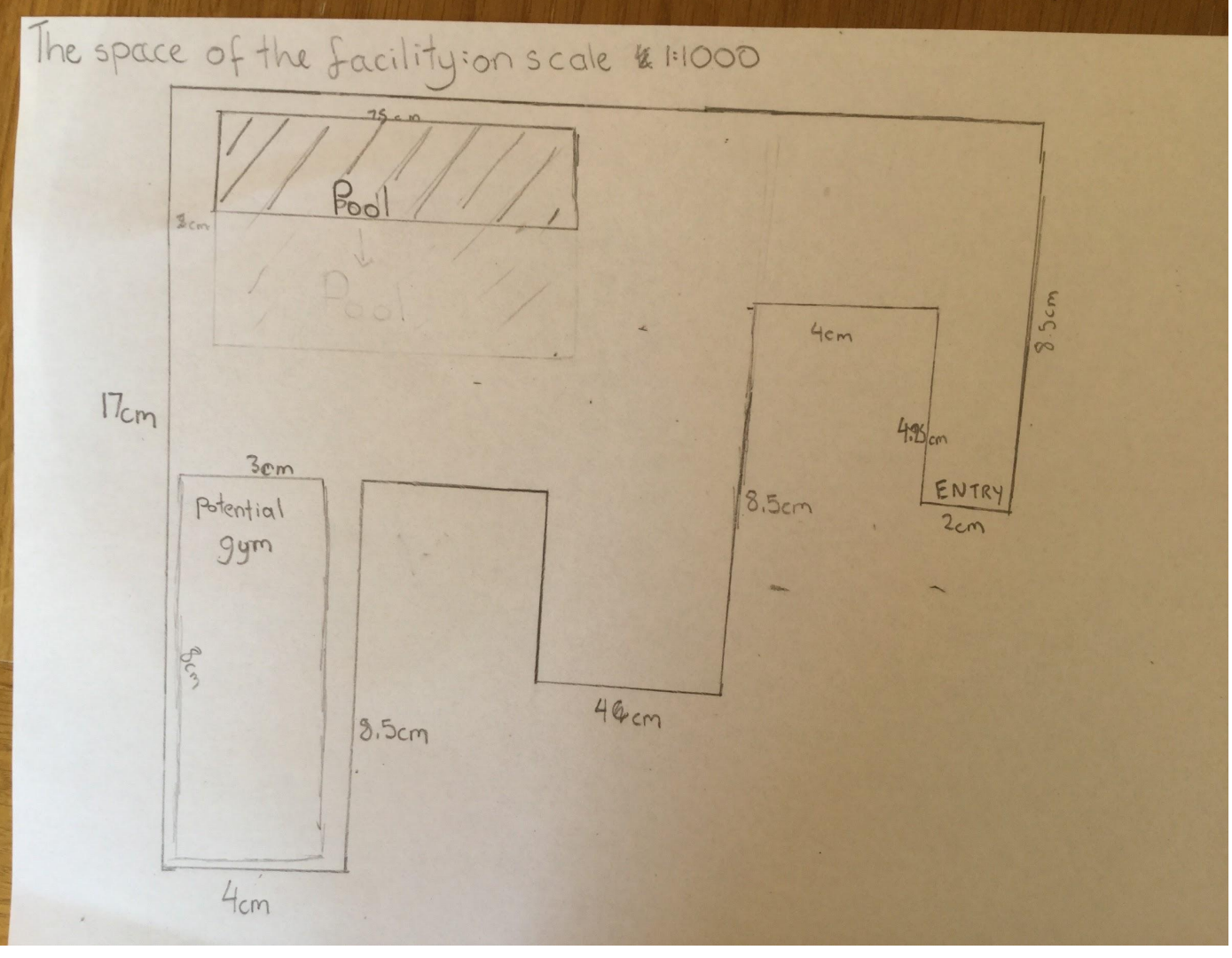


This page (above) is for calculations of the volume of the pool which is necessary for the worked problem: (across) because it gives the necessary water needed in the next slide..

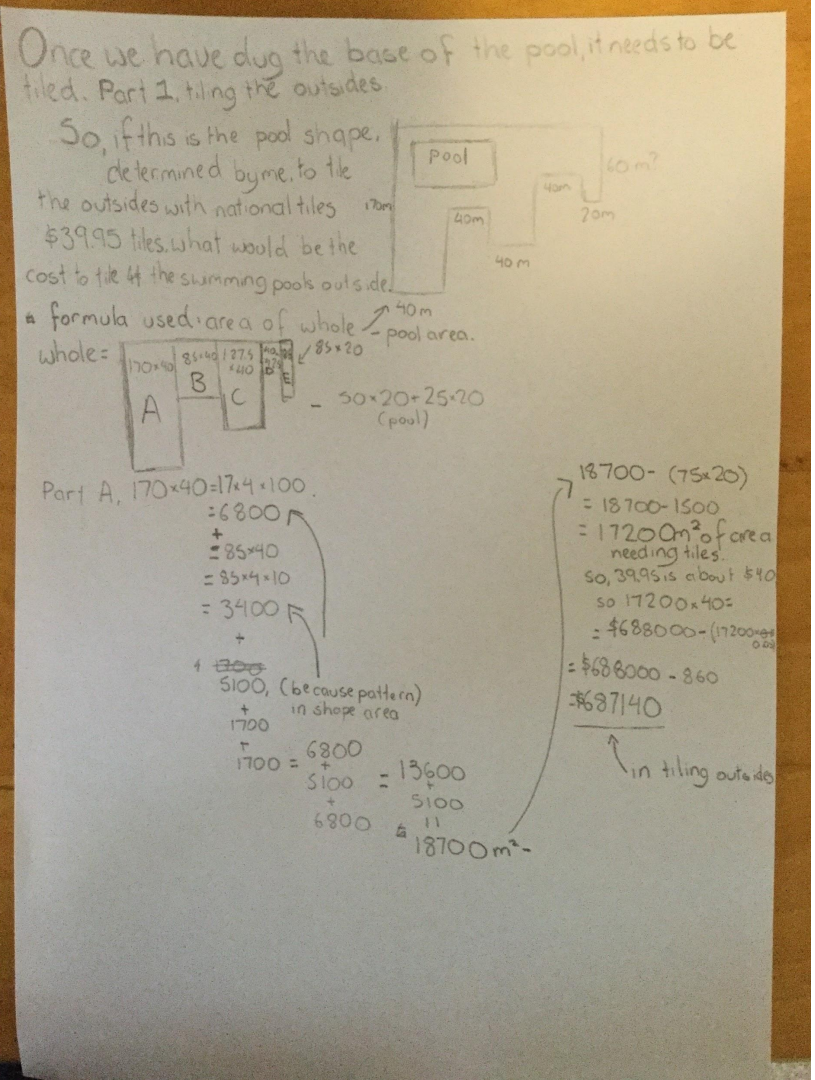
Digging the pool. Every pool needs to have been dug: whether it's natural or manmade. This time, to create a hypothetical pool I took the area and calculations of the pool to find how much it would cost to dig it out and how long. Using some estimates of quotes (6), it cost me a total of $172,300 in 352 days to have completed the digging of the pool.

The side on view of the pool is trapezoidal.





The space of the facility rationed to 1:1000: A scaled drawing with Entry point, pool size and place and a potential gym: See slides 26+...

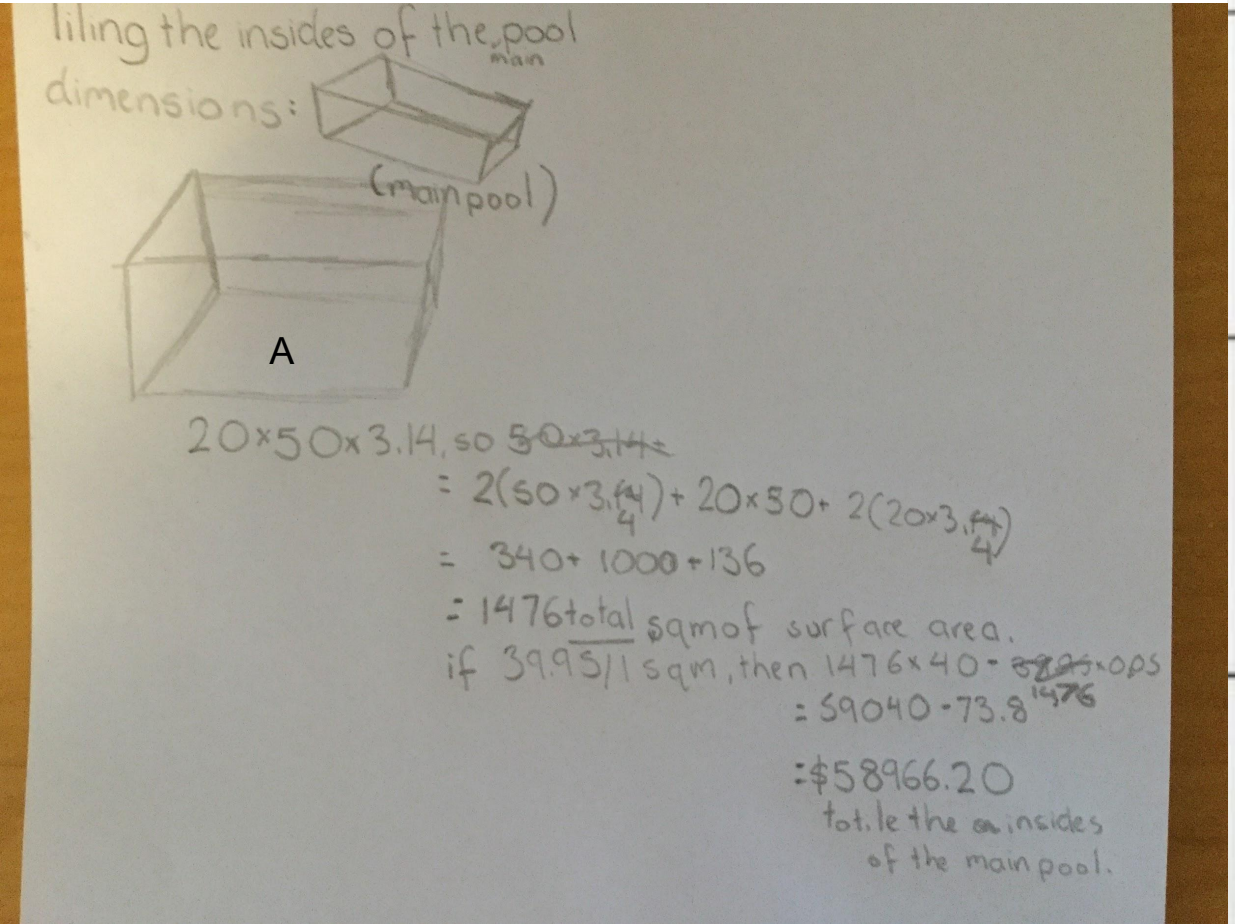


Tiling the outside of the pool

All swimming pools that I have been to have tilling and after I finished the digging process, I can start to tile the outside areas.

The total cost of tiling the outside of the pool will be: $687,140

Tiling insides of the pool

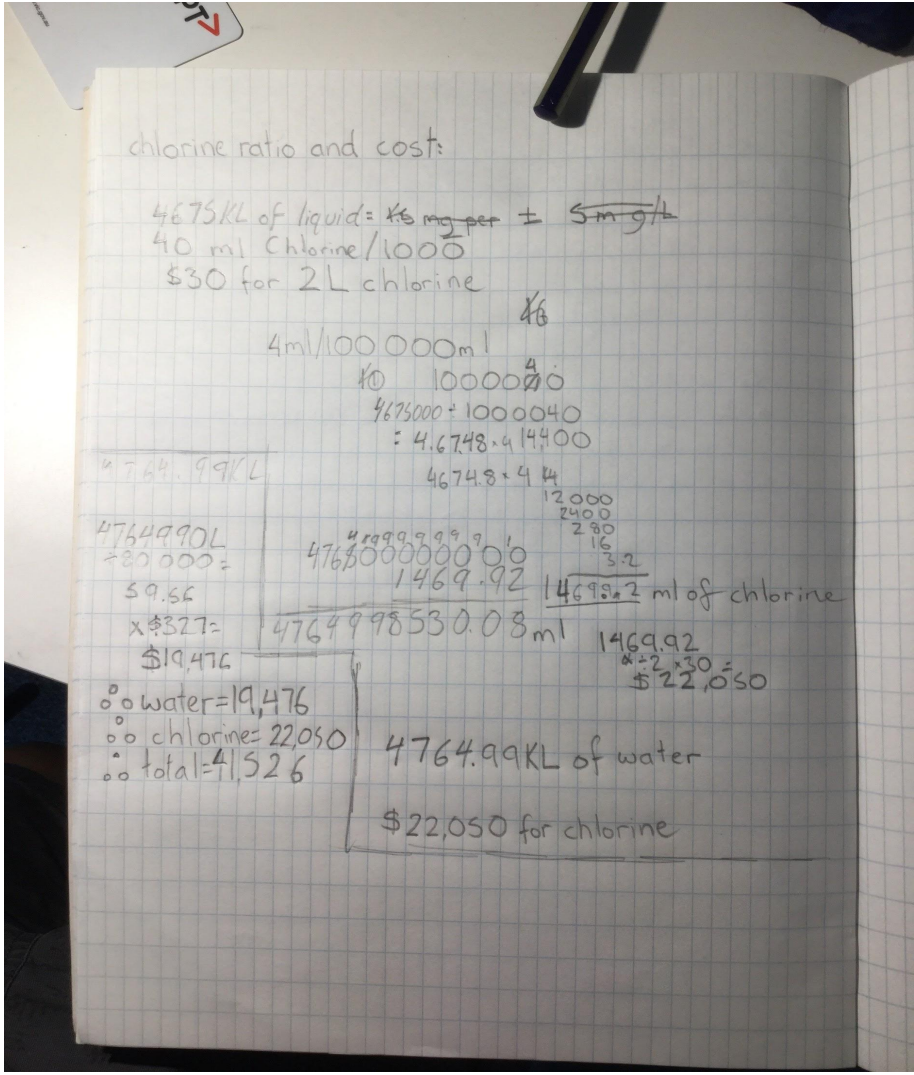


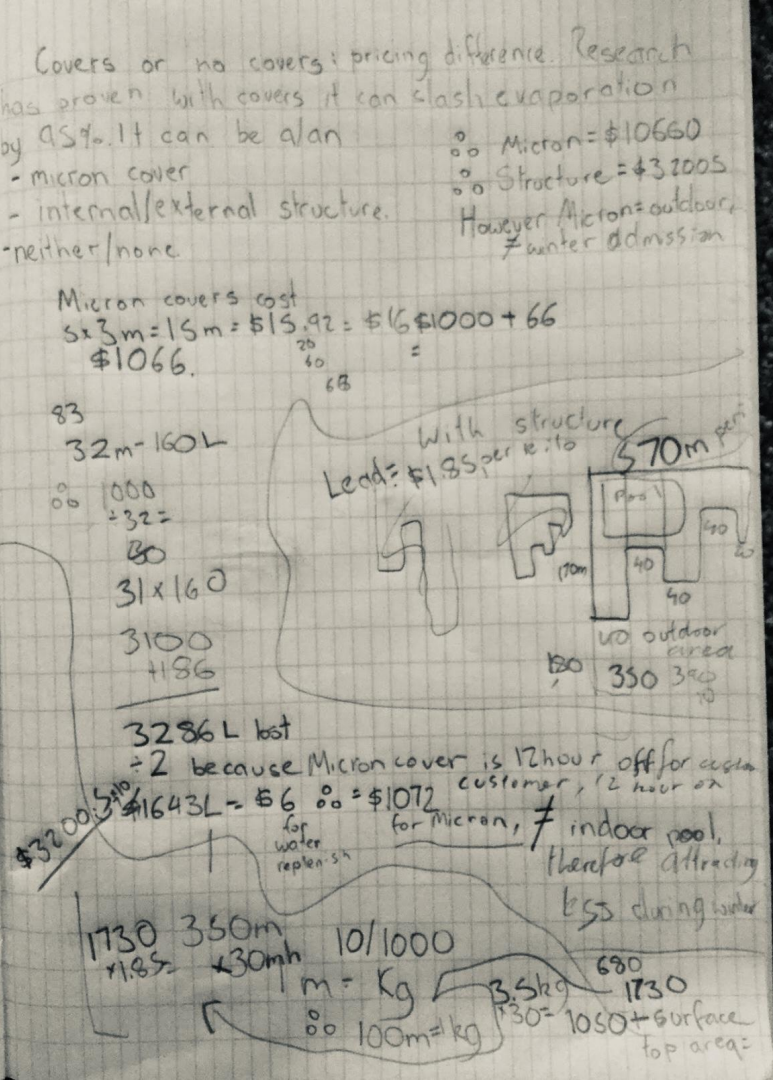
Most pools are tiled, as a safety precaution, so Icalculated that it costs $58,966.20 to tile the surface are (insides) of the main pool.

Hiring Lifeguard- per annum

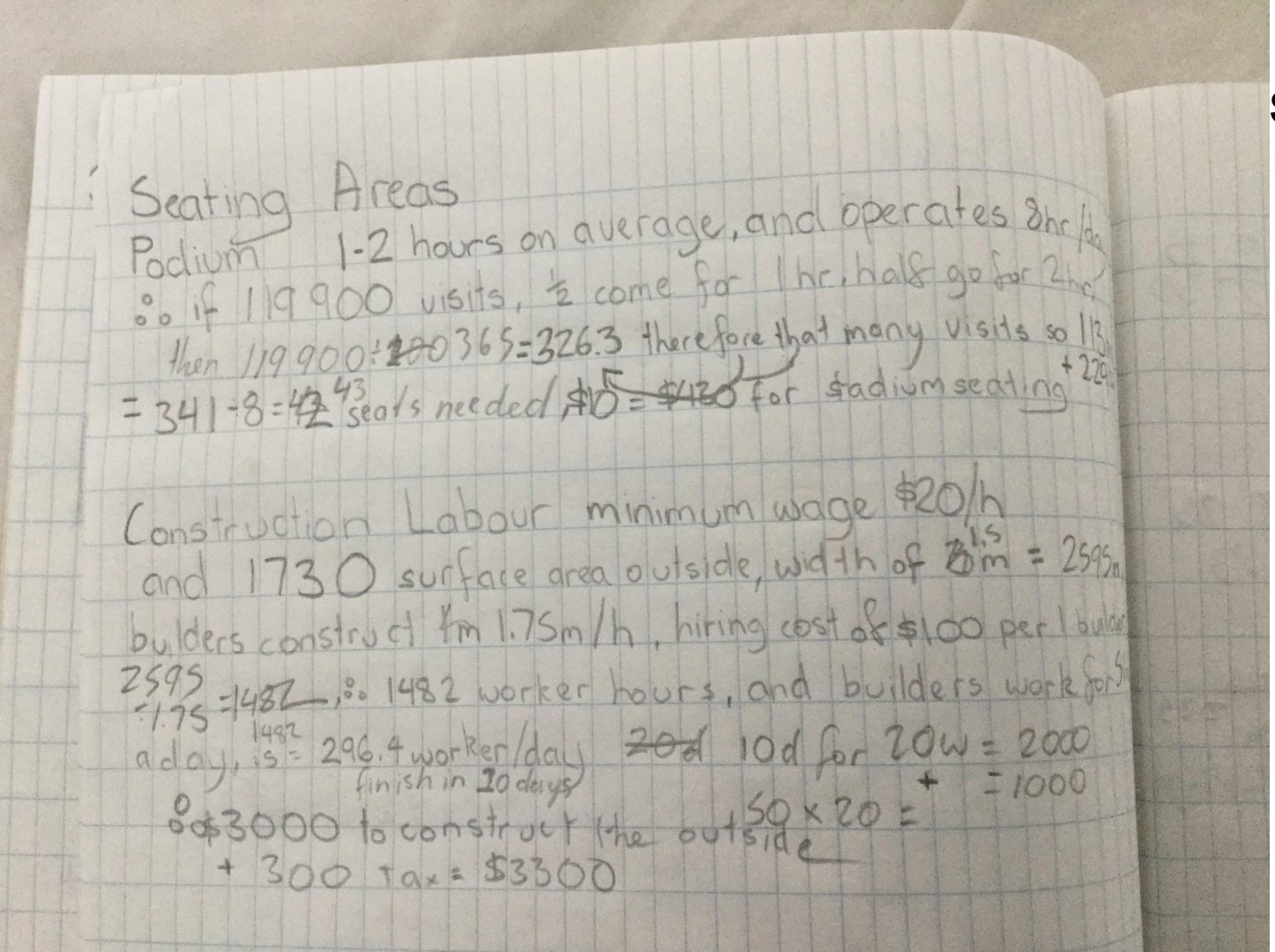
Each lifeguard booked is a $215 flat fee for up to 3 hours. Each additional half hour is $36/half hour ($72 per hour) billed to the nearest half hour each lifeguard. Therefore if the swimming pool needs 4 lifeguards working on a 8 hour shift, with 3 present at any given moment how much would I pay? 24 lifeguard hours divide 4 = 6 hours pp $215 + 72 x 3 = $216 + 215 = $431x 4 = $1724 x 365 days = $629, 260, and given a 20% discount (from a deal given by the lifeguarding agency at footnote(5) in the bibliography)= $503, 408

Chlorine Ratios: After looking up ratios needed for water and chlorine. Chlorine is necessary to keep hygiene in the swimming pool, so with a ratio of 630L of water for 2L of chlorine means a total cost for liquids (water and chlorine): $19,476 for water and $22,050 for chlorine, totalling up $41,526.





Covers or no covers evaporation: I calculated whether having covers would be cheaper (micron cover) and resized a 15 square metre area of covers to the needed area for the pool to prevent a high evaporation rate. So I decided to build an external structure of metal iron which didn't cost much, so I calculated the surface area and labour costs and it cost $3,200 which is the cheapest option.



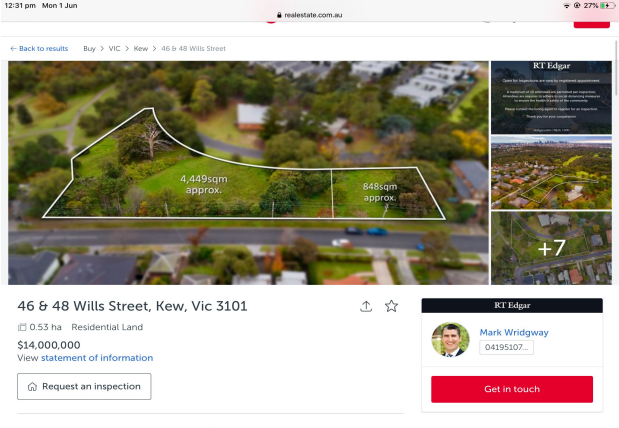
Seating areas and as mentioned finding how many people go there: I used the common knowledge that people spend 1 - 2 hours there so I divided visits: 119,000 by 365 (days) and then found that if ½ people go there for 1 hour, and the other ½ go for 2 hours, you get 341 hours divide by 8 and that's approximately how many chairs you need. Totalling $3,300 (43 chairs) with tax.

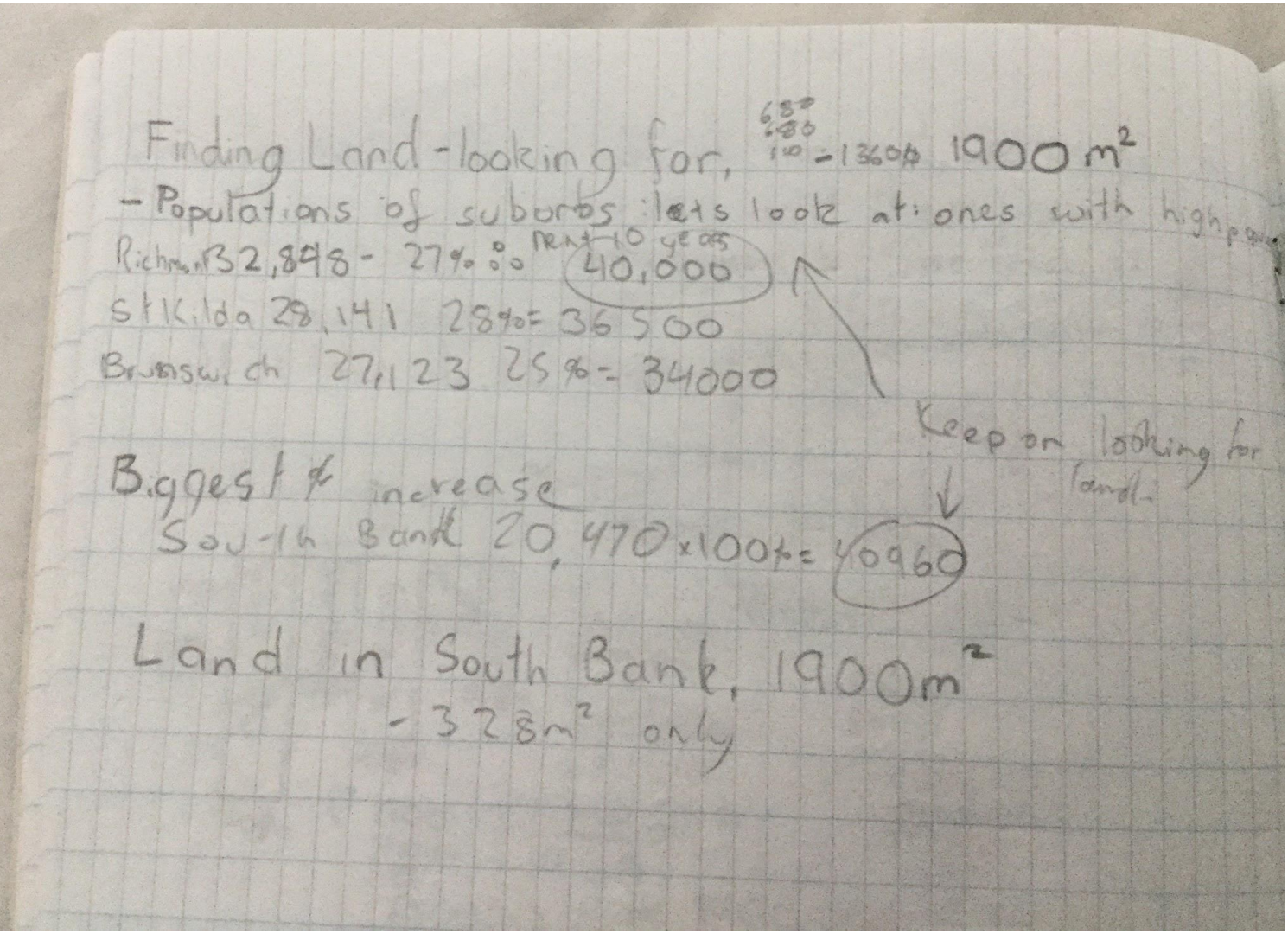
Finding suitable land: with a high population.

I had a look at the prices in these growing suburbs and you should know that the more people that are in that suburb the more entrance there will be four people who want to go swimming. However after I compare and found that the highest ones were Southbank and Richmond I could not find any land there on Realestate.com, and resorted to finding a 12 million dollar 4,500 sqm land in Kew, which I needed to downsize. The next slide is me working out the population growth in the suburbs with a high growth rate or population.

Suburb, population,kids per family, new entrants, growth rate

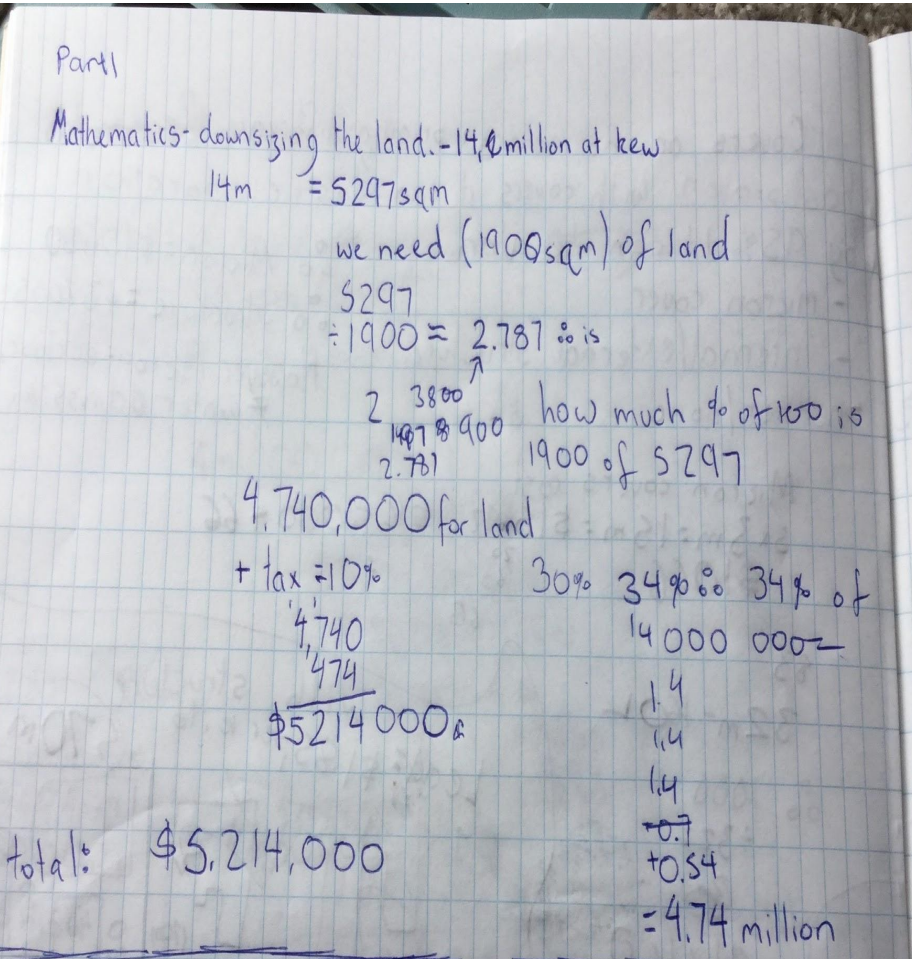
Carlton	20,575	1.8	11,314.3	61%
South Yarra - East	22,677	2.5	9,008.8	57%
Fitzroy	11,464	1.4	8,319.3	24%
Prahran-Windsor	21,391	2.9	7,362.5	21%
St Kilda East	17,625	2.4	7,302.7	11%
Collingwood	9,144	1.3	7,216.5	58%
St Kilda	28,141	3.9	7,213.8	28%
North Melbourne	22,086	3.2	6,797.4	61%
Flemington	10,662	1.6	6,744.7	26%
Southbank	20,470	3.1	6,658.4	107%
Elwood	16,509	2.6	6,166.5	14%
Port Melbourne	17,370	2.8	6,227.1	24%
Seddon-Kingsville	9,709	1.7	5,778.1	17%
Brunswick East	11,766	2.2	5,427.1	50%
Kensington	11,526	2.1	5,368.4	28%
Richmond	32,848	6.2	5,287.4	27%



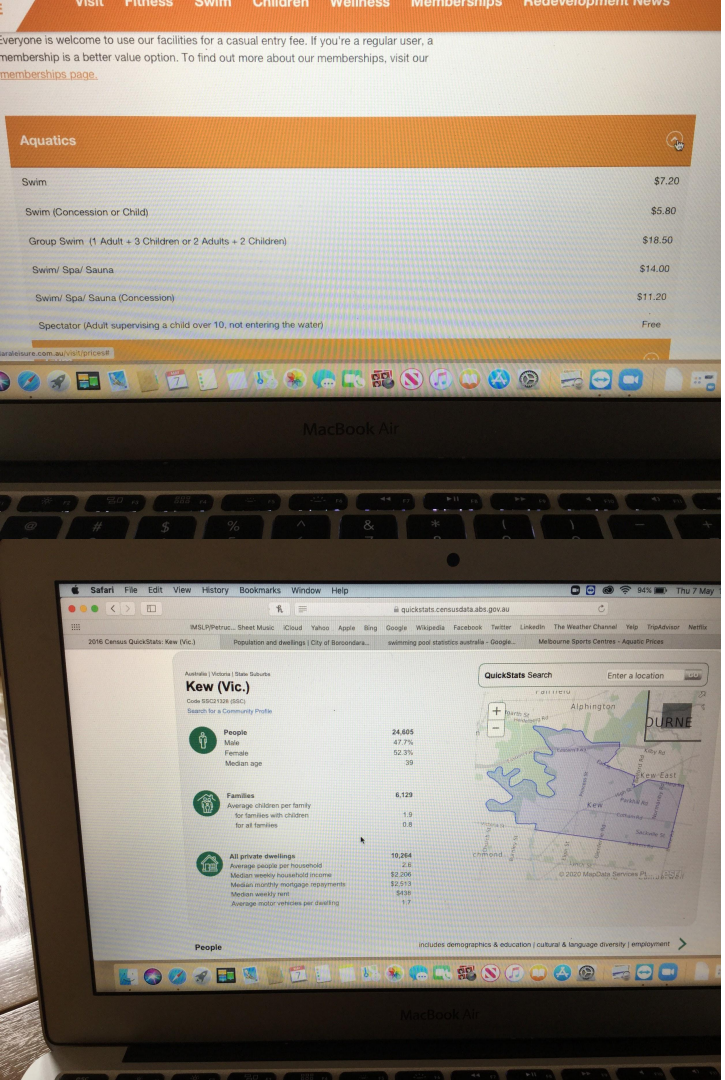


Calculating a suburb with a high growing and high population based on a table in the last side.

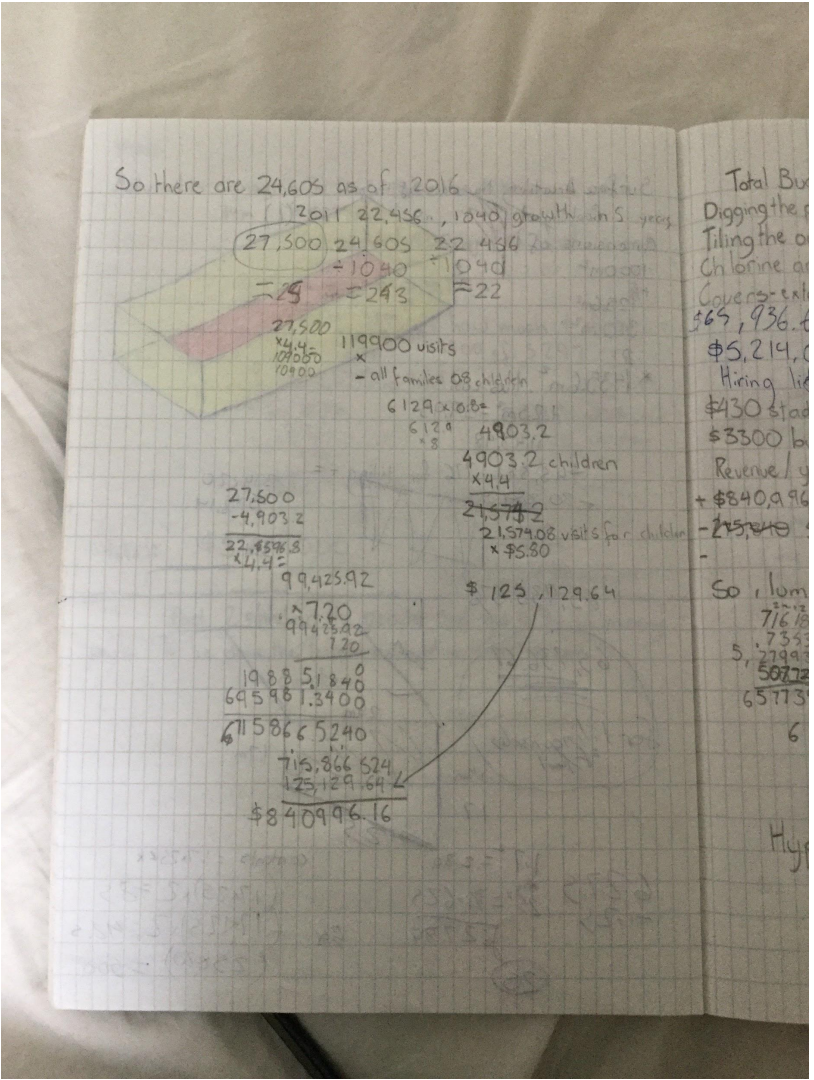
However there was no land in Southbank or Richmond, who have high population which means higher revenues, so I went on real estate and found a big enough land in Kew, and found their population a few slides later.



Resizing big land into preferred size: So, as from a few slides ago, I found parkland costing $14,000,000 and needed to resize it from is 5,297 sqm to the needed 1,900 sqm, so that several millions could be saved. It cost $5.124 million dollars with 10% of tax being only 34% of the $14 million.



Population in Kew, used to determine how many people that go to the swimming pool every year to find the yearly revenue: I used the known rates that 4.4 times people go to the swimming pool over ½ year on average and found the cost from a local Kew website and found how many kids and adults as they were entirely different prices.I found that the swimming pool would hypothetically earn $840,996.16 at the ½ of the financial year. (without side costs implemented yet)

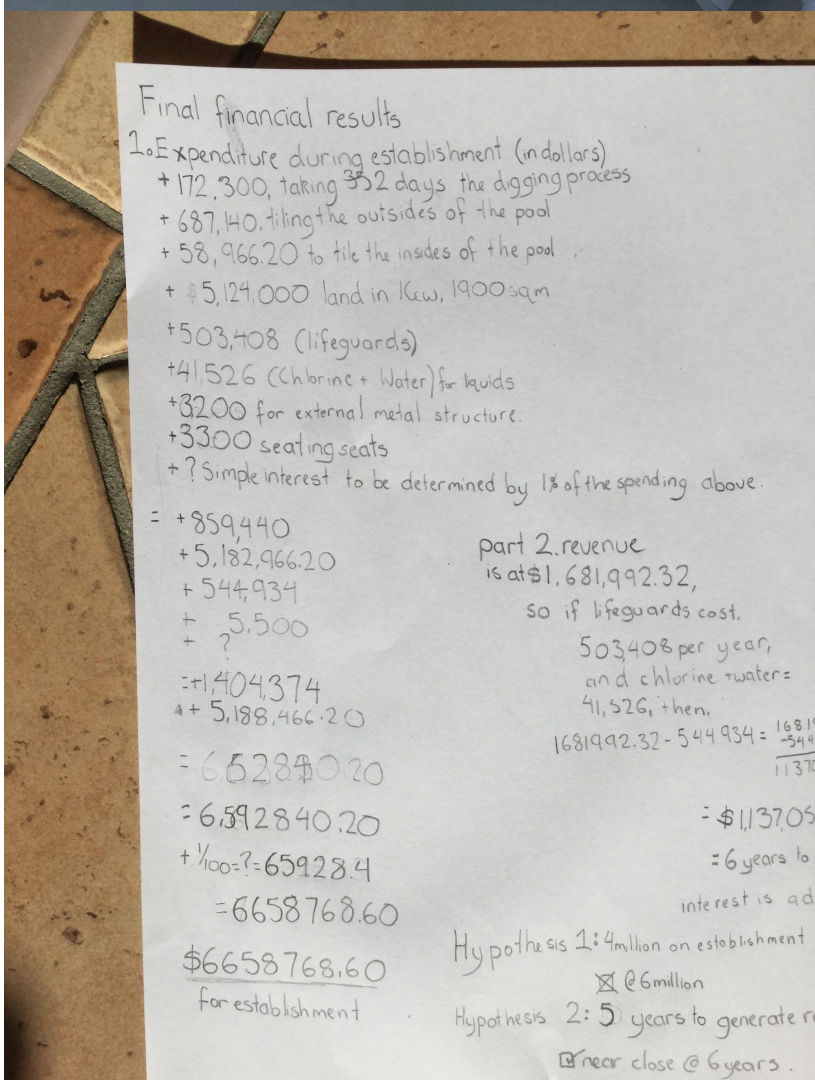


Working out revenue

Based on report saying people tend to go to the swimming pool 4.4 times per half year, I calculated that within the kids population of Kew, there would be the number of children times 4.4, then at 21,574.08 visits for children at $5.80 dollars, I did separate the age groups as prices from Kew swimming pool differed entirely, and for adults, the number of adults x 4.4 visits = 22,596.8 times $7.20 dollars. Which gives me a total of $840,996.16 x 2, as there are two semesters, so I got $1,681,992.32 per annum.

Final Financial Calculation and results- Part 1.

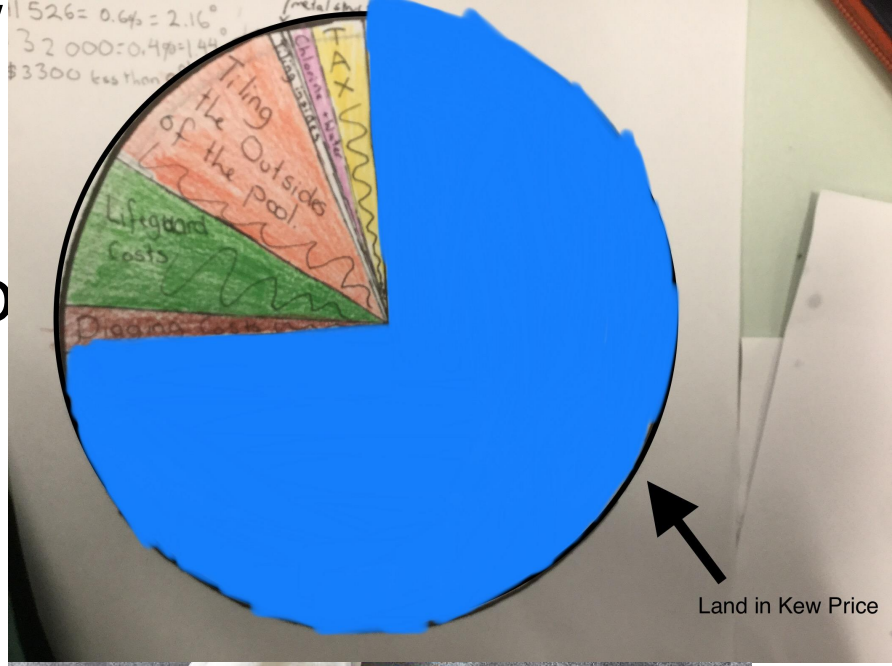
All costs included, I totalled $6,658,768.60 as the expenditure for to establish the pool. So, theoretically my $4 million estimate to launch the pool is not accurate, because it takes $6.658768.60 to establish a swimming pool - there's not much than can be done to reduce the cost to $4 million given that the land itself already costs $5 million.



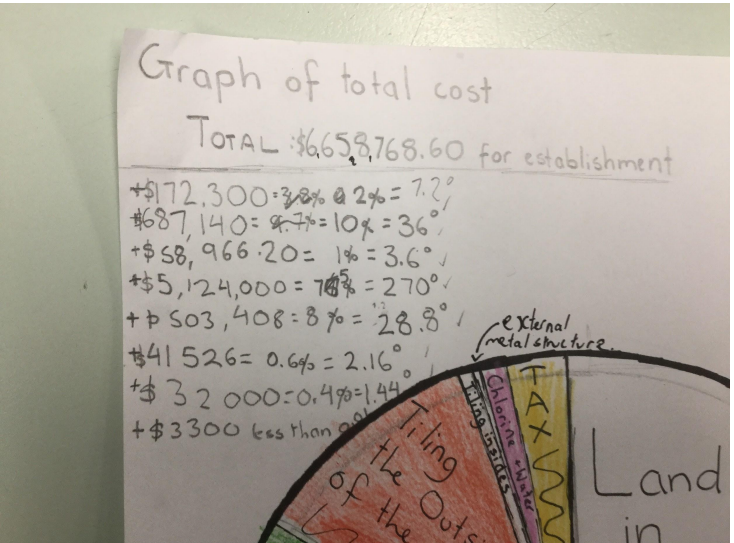
Simple Interest Formula

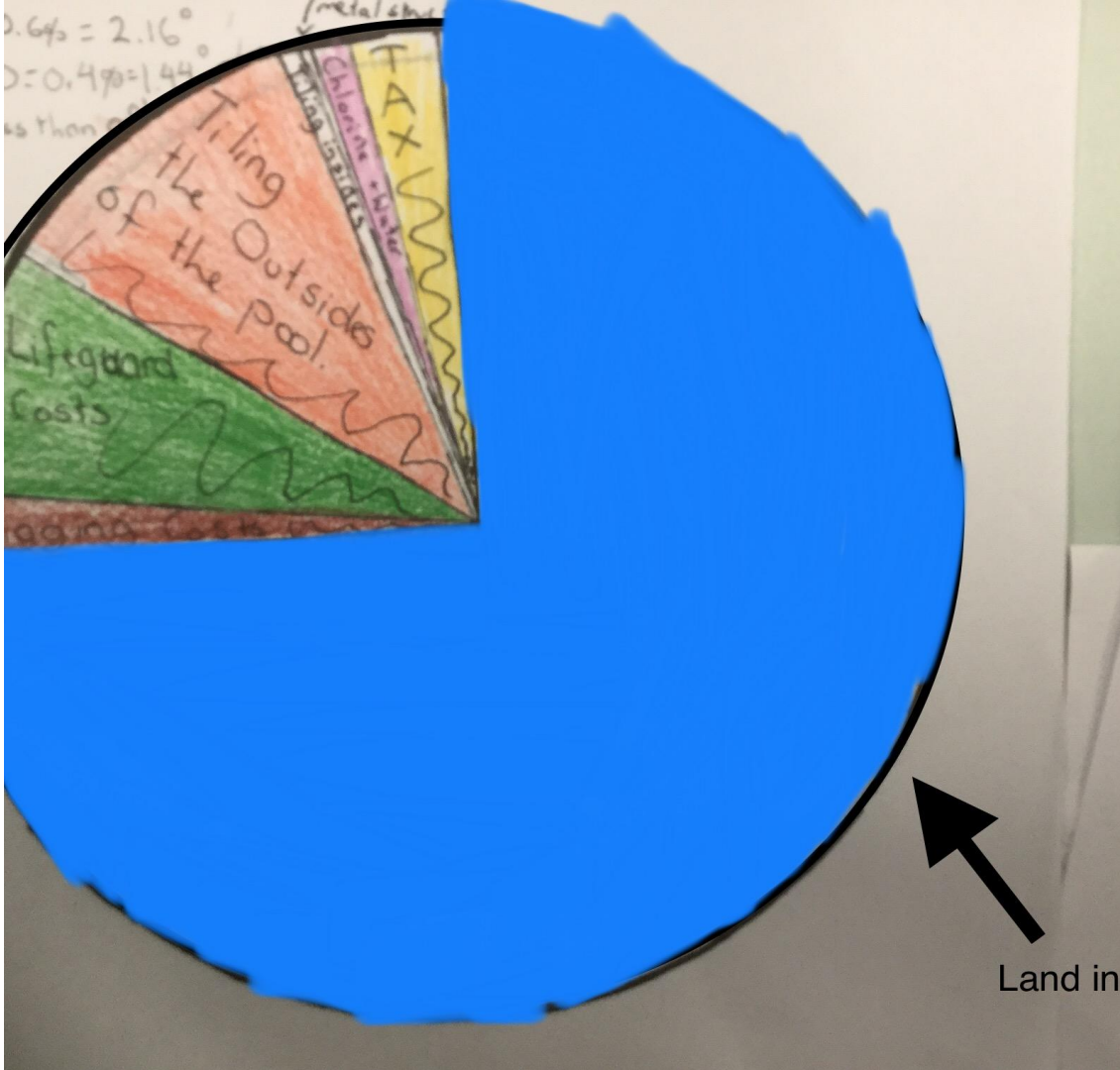
Simple interest is the total investment, as seen on the final financial results slide as symbol x is determined by the report of the expenditure based on past slides and is 1% of the lump sum that will be the loan which the simple interest is derived from. I calculated it would be costing $65,928.4 for simple interest as it is 1/100 of the final financial report.

I created a graph to show how much the expenditure of establishing a swimming pool costs in a non- biased graph to better help the viewer understand how I plan to spend the money and how much percent it really is, (e.g, land costs around 75%, so if we had preowned land, then we could save 75% of the total cost.)



A pie graph of the expenditure of total costs is provided. The largest section is the price of land, whilst seating is less than 0.01% of the total cost.





Bar graph of Expense to establish a pool.

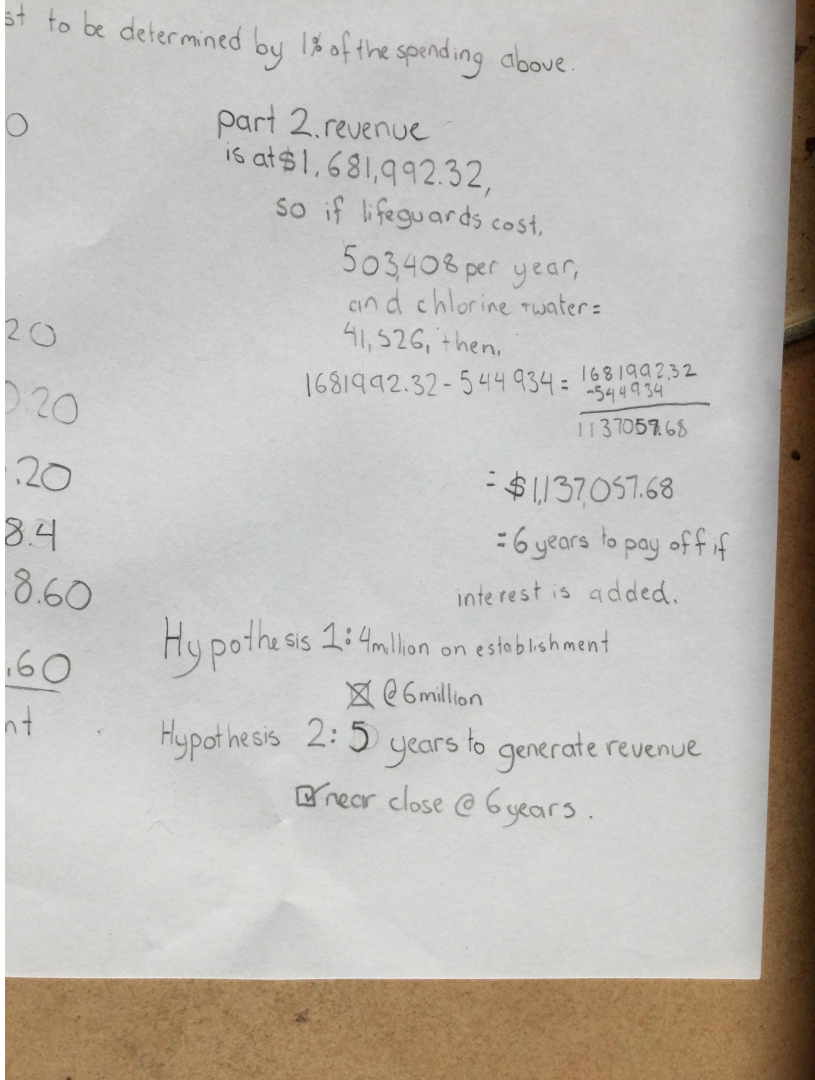
I tried to make this information as not skewed as much as possible, but mistakes occasionally happen.

Bar graph interpretation

My interpretation of the bar graph is that land in Kew costs an expensive five million, one hundred twenty four thousand dollars, the highest bar/ sector in the graph.
The lowest cost is the external metal structure, hardly visible to see on the graph, situated at $3,200, just one hundred dollars less than $3300, the price of the seats.
An observation I made was that if all the other costs were added up, they were around the ratio of 1 cost (excluding land price) : 3 costs (only price of land)

Final Financial Calculation and results- Part 2.

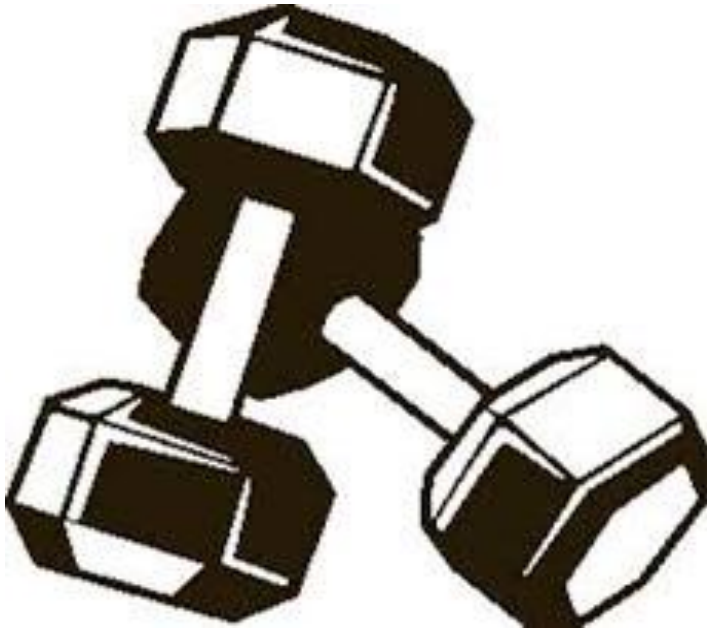
My second hypothesis was near correct after I calculated revenue and found how many years to pay back the debt was around 6 years had simple interest occurred. My hypothesis, being five years is although close, incorrect. Now, I want to see if I can anyhow correct hypothesis 2, being that we can not save money on Hypothesis 1, so we must do what we can when we can. My first investment will be the gym, usually situated in swimming pools, and although it will not hypothetically attract more customers, it will be another investment, that hopefully will boost hypothesis 2.



Investment No.1: calculating costs of a gym Part 1: Equipment and area.

The equipment at the gym costs between $200 and $5,000 per strength rack, see (7), so if I decide to give the gym a maximum budget of $40,000 then there would need to be 5 fitness machines, and 10 racks to facilitate around 20 people at once.

So, for that I will take the median value of each of these strength rack costs and use that as a fair estimate of a price to pay for each one. To use the strength racks as an example, the median of $200 and $5,000 is $2,600. To have 10 strength racks, I then multiply that value by 10 which is $26,000. This is quite excessive! Now, on the next slide, I will calculate the median prices for the machines.



Investment No.1: calculating costs of a gym Part 1:Continued.

In this slide, I will calculate the average prices for the other machine in order to determine the cost of the 5 fitness machines which will be used to find a total cost for gym equipment.

The final cost of all the equipment needed for the gym is 26,000 dollars in strength racks plus 8,250 dollars in machines, so $34,250 would be spent in the gym to accommodate about 20 people at a time.

- Elliptical machine: $1,000-$3,000
- Stairmaster: $2,000-$4,000
- Free weights: $500-$2,000
- Bench press $200-$500

Median: $2000
Median: $3000
Median: $1250
Median: $350

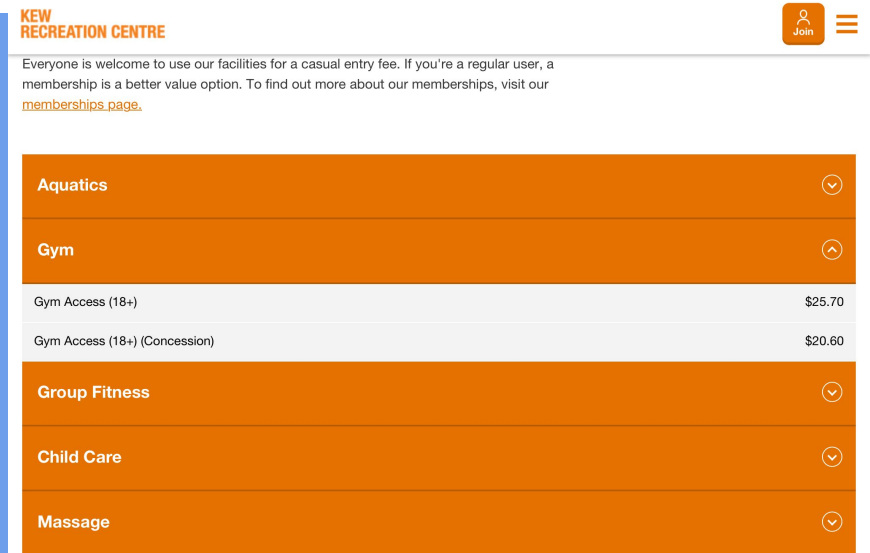
Average $1,650

Finally, we need to multiply 1,650 by 5 in order to purchase 5 machines - which is $8,250.

Part 2: Pricing on entry and entrants

At the Kew recreation centre, where I get my pricing insights, it costs $25.70 for gym access for non concession adults. About 18% of actually go to the gym, so if they go 1 times a year, see footnote 9, then considering the aim to get Hypothesis 2 correct, we could fit in 1 time for 18/100 of the people.

So, Kew, as mentioned has a population of 22,596 adults, and if 18% go the gym 24 times a year, how much would I earn in a year = 22, 596 x 0.18= 4067, x 25.70 equals $104,753.2 dollars per annum, and to our happiness, the equipment only needs to be be replaced once in some 10 years.

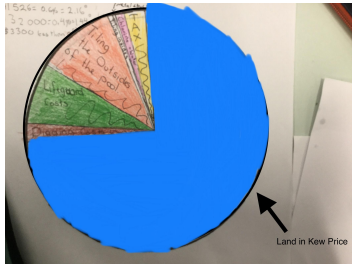


Part 3: Is running a gym a profitable investment?

Yes, the total earnings were in the equation $104753.2 -34250 = x, and x is the profit from a year of a gym equaling $70503.2, so now we put this in the total budget and find that the equipment does not need to be replaced and that you earn $104753.2 per year after the first. So if it was to be five years of a gym, it would cost $70503.2 plus 4(104753.2) equals 489516., so applied to the five years of maintaining a gym, obtained from the financial results section is 1137057 dollars, so x 5 is $5,685,285 dollars plus $489516 is $6174801 dollars. Which is just around 500 thousand off our hypothesis 2. Let's do investment 2!!!

Discussion

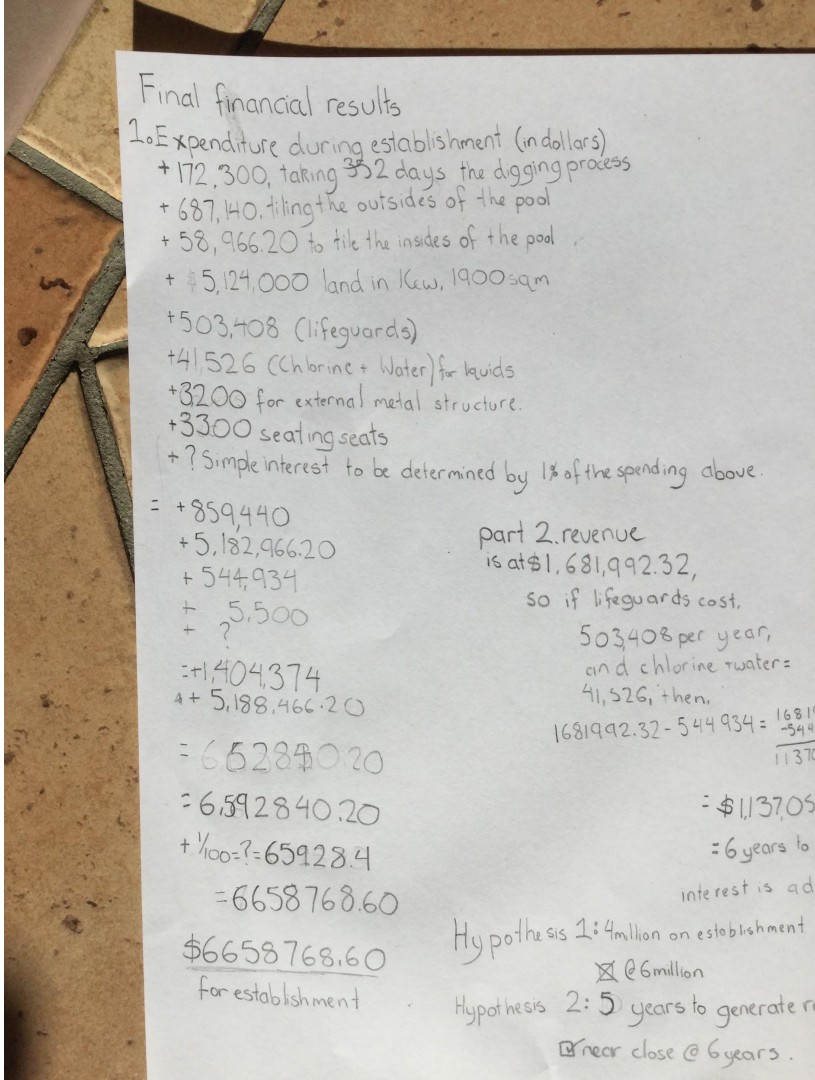
Managing a swimming pool since its establishment and first year costs about $6.5 million given the investor/ builder starts on scratch (needing to buy land and furniture).



I found the generated revenue per annum, I calculated that it would take over 6 years to generate actual revenue, which is highly dependent how populated the area is.

Discussion: Part 2

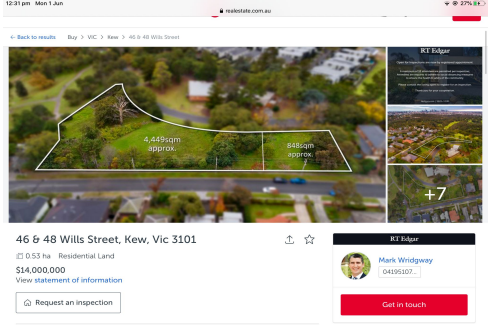
Reflecting back on this investigation, without a lump sum of money, a privately established swimming pool for the public is not actually worth it, given you could spend some 6 years spending your money on a more profitable investment.



Conclusion

I learnt that establishing a swimming pool takes over $6.5 million , and this value is only closely estimated, and to generate revenue in a suburb with an available land space big enough to suit the necessary 1900 sqm is not worth time and money.

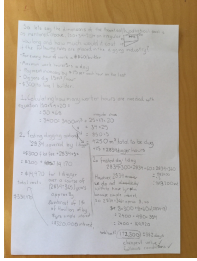
It takes over 6 years to generate revenue, if you were given an sum of money with simple interest (like this investigation) unless you are specifically trying to lesuirise your area, e.g. being the council, or a leisure group.



Conclusion: Continued

My hypotheses, namely hypothesis 2 was proven near correct, whilst hypothesis 1 was not, and my aim was achieved as I have uncovered whether swimming pools are profitable.

Analysis



An example of analysis would be the digging of the pool- I tested out whether one person, given the high fees of $300 per builder compared to $60/h, would be cheaper than the other options, and surely it was, but a high interest rate stopped it (based on a large investment). Next, I tried to minimise the time by hiring too many diggers, and that took too much, so thinking mathematically, I hired enough builders not to compile interest by going over the one year mark and managed to save a fortune.

Using this thinking, is the only way to find the true costs and profit of swimming pools.

Reflection

In this investigation, I found that many considerations are based on pricing and time, and without fully thinking about the final result can mean thousands and in rare cases, ten of thousands of dollars lost due to not thinking mathematically.

I highly do not recommend building a public swimming pool from scratch, but leaving it to those who are entrusted to keep our area leisurely.

List of mathematical concepts included

- Area and Perimeter - used to calculate the surface area of the pool sides and outside of the pool area. Perimeter was used to calculate the pricing of an external metal structure. (Slides 15, 10 and 7 in particular)
- Volume and Capacity - used to determine how much water and space the pool has. (Especially Slide 8)
- Resizing and rationing - used to find the closest estimation of the price of the land and drawing a scaled and rationed birds eye view of the facility. (Slide 19)
- Time and work (Speeds) - used when determining how long digging the pool and building a structure took. (Slide 9 in particular)

List of mathematical concepts included: Continued

- Using percentages - used to find population growth rates and percentage of land I would use for the pool. (Slide 18 in particular)
- Money and costs - used to determine the pricing of many features and the total price of the swimming pool. (Slides 21,22, 28 in particular, although used in nearly all slides)
- Fractions - used to find simple interest. (Slide 22)
- Graphing and Drawing: used for birds eye view, and other views, (slide 7, a little in 8, 10, some in 12 and slide 15.)

Acknowledgements:

- Mr H, being a helpful teacher like none other.
- All the other Grade 6 Teachers (approving work when Mr. H was unavailable)
-
- And any other websites seen in this slideshow.

Bibliography

1. www.quickstats.censusdata.gov.au (finding populations)
2. https://www.domain.com.au/living/the-real-cost-of-a-swimming-pool-how-to-calculate-your-cost-per-swim-20180316-h0xgkq/
3. https://premierpoolsandspas.com/how-long-does-a-pool-take-to-build/
4. https://www.unitywater.com/residential/manage-your-water-usage/pool-and-spa-fill-guide
5. https://www.happyswimmers.com/metro_service/australia-lifeguard-service/melbourne-and-suburbs-lifeguard-for-hire-service/
6. https://www.google.com.au/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwihy-W48ubpAhU_4HMBHYQQASwQFjAAegQIBBAB&url=https%3A%2F%2Fwww.serviceseeking.com.au%2Fblog%2Fcost-of-excavation-and-earthmoving%2F&usg=AOvVaw1yVLLI7T0ddt4e9uiO5Xy4
7. https://www.onefitstop.com/community/how-much-does-it-cost-to-start-a-gym/
8. https://kew.boroondaraleisure.com.au/visit/prices
9. https://www.google.com.au/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwiqv-jI_OfpAhX6yDgGHfFPB2YQFjABegQIDBAE&url=https%3A%2F%2Fwww.glofox.com%2Fblog%2F10-gym-membership-statistics-you-need-to-know%2F&usg=AOvVaw0XHsOtkXSOh2D8QU60EyTM
10. https://www.fixr.com/costs/sauna-installation