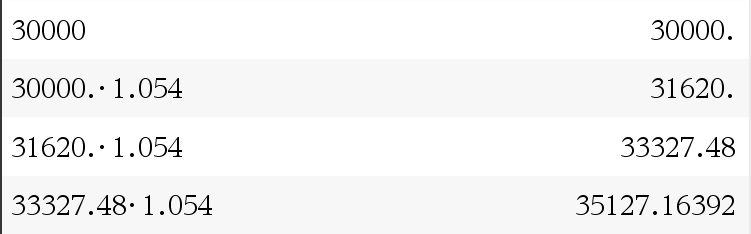
University Choice:

You are studying a mechanical engineering course in university. The course you are doing cost $30,000. You then take out a HELP loan which charges an interest rate of 5.4% compounding yearly.

V0 = $30,000 Vn+1 = 1.054Vn

1. What is the principle of the recurrence relation shown above? **$30000 -**

****2. Recursively find what the value of the loan will be after 3 years (To the nearest cent)? **$35127.16 -**

**Graphical user interface

Description automatically generated with low confidence**3. How much interest would have built up after 5 years of the loan (to the nearest cent)?  **$9023.33 –**

You have found your first job at an automobile shop, Cars R’us. The job pays $15 an hour and also pays a $80 commission for each car you fix. For every shift you work for 5 hours and average 3 fixed cars per shift.

4. Let Vn be the value of the total pay per shift, n be the amount of shifts you work. Write down a recurrence relation that models the amount you earn after n shifts. **V0 = $0 Vn+1 = Vn + $315**

5. If you only work 3 shifts a week, how much would you have earned in 3 weeks? **$2835 – Vn = $315\*(3\*3)**

6. Find how many weeks it would take to earn past $10,000? **11 weeks –**

**1 week = $315\*3 = $945, $10000/$945 = 10.58 therefore 11 weeks.**

Suddenly your family member requires a medical visit. After examination, it has been decided that she will need to be hospitalized which totals a cost $12,000. The private hospital requires you to pay of the fee within 8 weeks.

7. The number of hours and shifts you work stay the same. How many cars will you have to repair per week to be able to pay of this hospitalization fee (to the nearest car)? **16 cars - $12,000/8 = $1500 per week, $1500 – $75\*3 = $1275, $1275/$80 = 16 cars.**

After 5 years on the job, you have $30,000 saved to spend so you decide to invest it into the share market. You see that ‘Cody’s Tech’, a technology company, grows at a rate of 11.4% per year on average.

8. Write a recurrence relation that models your investment after n years.

**V0 = $30000 Vn+1 = 1.114Vn**

Graphical user interface, application

Description automatically generated9. Using the financial calculator, find the value of your investment after 5 years, to the nearest cent. **$51469.18 -**

You decide that ‘Cody’s Tech’ is very trustworthy and safe. So, you invest $50,000 more into the company from your second savings account.

10. What is the total value of your investment in the company now? (to the nearest cent) **$101469.18 = $51,469.18 + $50,000**

Turns out that ‘Cody’s Tech’ was found to be involved in illegal activities, and in a short span of 2 years your investment (Question 10 to the nearest cent) has fallen to be only worth $10,000

**Graphical user interface, application

Description automatically generated**11. Using the financial solver, find the annual depreciation rate that would have been required to have made the value of your investment fall to $10,000 in 2 years. Round the rate to 4 significant figures. **68.61% p.a.**

After that absurd loss you decide that you will never touch any form of gambling, even if it is a 50/50 game. So you change your mind and instead you will invest the $75,000 that was saved for the share market into a bank account instead. You find a bank that gives back 3.5% interest per annum compounding monthly.

12. Calculate the monthly interest rate to 5 significant figures. **0.29167% = 3.5/12**

**Table

Description automatically generated with low confidence**13. Recursively find the amount in the account after ⅓ of a year to the nearest cent. **$75878.84 –**

Graphical user interface

Description automatically generated14. Find how many years it would take for the account to grow to $100,000 (to the nearest year, use finance solver to aid)? **8 years = 98.777624627322 months /12**

After saving up $100,000, you decide to stay in Taiwan with your relatives. All of this money will be invested into an annuity investment. You require the annuity to provide you with monthly payments of $1500 to cover for your rent and living expenses.

15. Using the finance solver, what is the annual interest rate, to 3 significant figures, required to be if your annuity is to be exhausted after 7 years? **6.81%** **-**

Graphical user interface

Description automatically generated

Your final years have come, and you still have a very large amount of money in your bank account. Like the great and kind father you are, you decide to invest a large proportion of your wealth to a family account which will be accessible by your children only after your death. You put in $350,000 with monthly additions of $500. The bank gives the account 3.25% interest per annum compounding monthly.

16. Model this investment in a recurrence relation where Vn is the value of the account after n months. Round the R value to 5 significant figures.

**V0 = $350000 Vn+1 = 1.0027Vn + $500 , R = 1+(0.0325/12)**

Graphical user interface, application

Description automatically generated17. Using the financial calculator, determine the balance of the account after 5 years, to the nearest cent. **$444193.85 -**

After the 5 years, your favorite grandchild is about to start school. You want to support him by paying off his yearly school fees because you want him to succeed like you did in your younger years. Over the 12 years of schooling, each year is averaged out to be a cost of $4455. You want to prioritize his education, so you take out half of the balance (Q.17 to the nearest cent) in the family account to invest into a perpetuity. (Round half of the balance to the nearest cent)

18. Using the financial solver, what is the minimum annual interest rate required for the perpetuity to be able to pay off the school fee yearly (to 4 significant figures)? **2.006% -**

**Graphical user interface

Description automatically generated**

222096.92

Job Choice:

You are a person who loves to eat and cook food, so you decide to look for a job at a restaurant. You become the head chef at Martin’s Restaurant which pays you $1200 every week. But with every week you also have to pay $200 rent and $300 worth of living expenses.

19. Write down a recurrence relation that models the total amount you have left over after paying off all the other expenses. Where Vn is the total amount after n weeks.

**V0 = $0 Vn+1 = V­n + $700**

20. What would be the amount saved after 2 years using the formula Vn = $700n where Vn is the total amount after n weeks? **$72800 = $700 \* 52 \* 2**

Table

Description automatically generatedTable

Description automatically generatedTable

Description automatically generatedTable

Description automatically generatedTable

Description automatically generatedTable

Description automatically generated21. You want to save up for a new car which costs $25,000. Using a recurrence relation model, calculate the number of weeks it would take to save up this amount. **36 weeks -**

Congratulations! You have bought the car that you have saved so hard for. But just like every car, its value depreciates very quickly. The depreciation rate of your car is 12.5% per annum compounding monthly. The recurrence relation below models the depreciation of the car after n months.

V0 = $25,000 Vn+1 = 0. 9896Vn

**Background pattern

Description automatically generated**22. Use the recurrence relation to find the value of the car after months 1,2,3 (to the nearest cent). **$24740, $24482.70, $24228.08**

23. Calculate the value of the car after 5 years to the nearest cent. **$13351.23-$25000\*(0.9896)^(60)**

Table

Description automatically generated with low confidenceA picture containing table

Description automatically generatedA picture containing table

Description automatically generatedA picture containing table

Description automatically generated24. You want to sell the car before its value depreciates under $10,000. Recursively determine how many months it would take and what the value of the car is after it has depreciated under $10,000. **88 months, $9963.05 = 25000** **\*(0.9896)^(88)**

You have found a lovely partner. Both of you decide to invest some money into a bank account. The amount both of you invest is a total of $20,000. The bank pays the account 3% interest per annum compounding monthly.

Graphical user interface

Description automatically generated25. Using the finance calculator, determine the balance of the account after 3 years to the nearest cent. **$21881.03**

26. Find how much interest was earned after the first 2 years( to the nearest cent). **$1235.14 = $21235.14088524 - $20000, $21235. 14088524 = $20000\*(1.0025)^(24)**

You and your partner are about to welcome new-born twins to this world. You both want to make a future account for them so you both decide to add $200 to your account every week. You only start depositing the $200 after the balance of your account has reached $22,000. Note the bank has now changed its terms to 3% pa compounding weekly.

27. Using the financial solver, given that the terms of the loan have changed to 3% pa compounding weekly, to find the value of the account after 5 months (to the nearest cent). **$26635.91**

**N:5/12\*52=65/3**

**I:3**

**PV:-22000**

**Pmt:-200**

**FV:26635.91**

**p/y:52**

**c/y:52**

28. How much interest was earned in month 3 (to the nearest cent)? **$60.51**

**First 2 months:**

**N:2/12\*52**

**I:3**

**PV:-22000**

**Pmt:-200**

**FV:23847.415166585 – copy this and paste into PV for the start of the third month**

**c/y:52**

**p/y:52**

**Third month**

**N:1/12\*52**

**I:3**

**PV:-23847.415166585**

**Pmt:-200**

**FV:24774.59142975**

**c/y:52**

**p/y:52**

**you have paid – 1/12\*52\*200 = $866.66666667**

**Change in balance = $24774.59142975-$23847.415166585 = $927.17626**

**Interest = $927.17626-$866.6666667 = $60.51**

Fast forward 5 years and your children are now to soon start school. You want to set up a perpetuity so that every week $50 can be used as their lunch money.

29. How much money would the perpetuity provide yearly? **$2600 = 52\*$50**

30. If the interest on the perpetuity is 4% per annum compounding weekly, how much needs to be invested so that $50 can be used by the children every week? **$65000 = 50/(0.04/52)**

**Graphical user interface

Description automatically generated**31. If you only have $55,000 to invest, what would be the minimum interest rate per annum required for this perpetuity to be able to produce $50 a week? (Use the financial solver, rate to 3 significant figures) **4.73% -**

You want to buy a property for yourself and your wife in Japan which costs $150,000 Aud. You don’t have enough money to buy the property yet, so you negotiate with your bank, which you have been very loyal to for most of your life, to allow an interest-only loan. The annual interest rate of the negotiated interest-only loan concluded to be 7.15% compounding monthly.

32. What would be the monthly payment of the interest-only loan? To the nearest cent. **$893.75 = $150,000 \* (0.0715/12)**

33. 4 years later, you and your wife now have enough to fully pay off the loan. Find the total amount of interest you have paid over the 4 years. **$42900 = 893.75\*48**

On average, the value of houses in Japan rises 2.4% per annum. You and your wife have owned the property for a total of 15 years now.

34. Including the bought price of the property and the total amount of interest paid, using the financial solver to aid you, determine what the total profit would be if you sold the property right now? (To the nearest cent)

**$21187.15 = $214087.15390589– ($150000+$42900)**

Graphical user interface, application

Description automatically generated