VCE General Mathematics Unit 3

Area of Study 2: sample modelling or problem-solving task: Recursion and financial modelling (superannuation)

The modelling or problem-solving task is to be of 2–3 hours’ duration over a period of one week.

Introduction

A context such as the following could be used to develop a task which involves using real data as a basis for modelling superannuation final payout figures under various parameters, where students have some input into the selection of parameter values to develop scenarios.

In preparation for this task, data should be gathered on trend estimates for full time adult average weekly ordinary time earnings for people wishing to retire at age 67 see [ABS](https://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/6302.0Main+Features1May%202015?OpenDocument).

Data should also be collected on estimated superannuation pay out figures for full-time workers at a range of ages. See [Moneysmart](https://moneysmart.gov.au/how-super-works/superannuation-calculator).

Part 1

Assume Casey is an adult born on 1 July 1992, currently working full time on average adult weekly earnings and wishing to retire at age 67. Casey has a nil superannuation balance, will not make any additional superannuation contributions, and has the compulsory employer superannuation contributions invested in a fund with medium fees and a ‘balanced’ investment profile.

1. Use the data collected to determine Casey’s weekly earnings at age 67 if earnings remain consistent with the average adult weekly earnings, and trend estimates for weekly earnings and growth in weekly earnings remain consistent over the time of her working life. Use a relation or formula to define a suitable final weekly earnings function for a combination of age, current earnings and estimated rate of earnings growth. Graphically represent the growth in Casey’s weekly earnings over her working life (start date next birthday on 01 July 2017 and end date 67th birthday on 01 July 2059).
2. Use the data collected to determine the estimated superannuation balance at retirement age for Casey. Use a suitable relation or formula to define a suitable superannuation end balance function for a combination of age, salary and employer contributions. Graphically represent the growth of the superannuation balance over the working life of Casey, taking into account all considerations pertaining to superannuation in the profile of Casey above.
3. Graphically compare the growth of the superannuation end balance if Casey decides to make set additional contributions of an amount determined by you over the term of Casey’s working life (for example, $200.00 per month). Reflect this change in Casey’s additional contributions in the recurrence relation in b. above.
4. Calculate the difference in end superannuation balances for Casey from b. and c. above.

Part 2

Compulsory employer superannuation (SG) contribution rates are typically fixed for a certain period and may vary over time. Assume that the employer contribution rate will increase to 12% from 01 July 2017 onwards.

1. Determine the new end superannuation balance for Casey based on these changes to the employer’s superannuation contributions based on the superannuation profile for Casey in Part 1.
2. Graphically represent the altered growth of Casey’s superannuation balance using the start date and end date details from Part 1, a.
3. Calculate the differences in end superannuation balances for Casey from Part 1b. and Part 1c.

Part 3

Consider and explore the changes to Casey’s superannuation end balance if different investment strategies were adopted for the duration of Casey’s working life (see, for example: [Superguide](https://www.superguide.com.au/comparing-super-funds/choosing-a-super-fund) and [Australian Super](https://www.australiansuper.com/compare-us/our-performance).

Areas of study

The following content from the areas of study is addressed through this task.

|  |  |  |
| --- | --- | --- |
| **Unit 3** | | |
| **Area of study** | **Topic** | **Content dot points** |
| Discrete mathematics | Compound interest investments and loans | 1, 2, 3, 4 |

Outcomes

The following outcomes, key knowledge and key skills are addressed through this task.

|  |  |  |
| --- | --- | --- |
| **Unit 3** | | |
| **Outcome** | **Key knowledge dot point** | **Key skills dot point** |
| 1 | 1, 2, 3, 4 | 1, 2, 3, 4, 5 |
| 2 | 1, 2, 3, 4 | 2, 4 |
| 3 | 1, 2, 3, 4, 5, 7 | 1, 3, 4, 5, 6, 9, 10, 11, 12 |