 Modelling an annuity using technology

Accessing the ICT resources

These activities use a Microsoft excel spreadsheet, investigation-m1-1.XLSX

Activities can be completed using the appropriately named worksheet. For example, activity 1 part 1 can be completed using the worksheet Activity\_1\_Part\_1.

Alternatively, students can code their own solutions using the templates provided and named appropriately. For example, activity 1 can be completed using Activity\_1\_Template.

Activity 1 – superannuation and savings

Background information

A superannuation account or a savings account is common interaction students have with a financial institution.

This activity will allow students to model a superannuation account based on the assumption that regular contribution is made.

Students can investigate the effect of changing the interest rate, amount or frequency of each contribution on the duration or value of the investment.

To gain an understanding of the basic concepts of a savings account or superannuation account, students can view the NESA resource, [Mathematics Advanced Year 12 Sample unit: Financial mathematics Resource 3 Superannuation simulation](http://educationstandards.nsw.edu.au/wps/portal/nesa/11-12/stage-6-learning-areas/stage-6-mathematics/mathematics-advanced-2017)

1. Use the appropriate worksheet to complete various scenarios to consider the following situations:
2. If you change your contribution, how will it affect the future value and present value of the investment? Hint: You may like to consider the impact of doubling or tripling your contribution.
3. If you change the interest rate of the investment, how will it affect the future value and present value of the investment? Hint: You may like to consider the impact of doubling or tripling the interest rate.
4. If you change the frequency of the contribution, how will it affect the future value and present value of the investment? Hint: You may like to consider the impact contributing weekly instead of fortnightly.
5. What considerations with regards to the risk of an investment should you examine when comparing investments with differing rates of return?
6. Compare two investments, Option 1 with a contribution fortnightly and Option 2 being weekly but with a contribution half the size. How will this change impact the future value of the investment?
7. Explain your result in part d).
8. Use the appropriate worksheet to complete various scenarios to consider the following situations:
9. With consideration of a set savings goal, if you change your contribution, how will it affect the duration of the investment? Hint: You may like to consider the impact of doubling or tripling your contribution.
10. With consideration of a set savings goal, if you change the interest rate earned, how will it affect the duration of the investment? Hint: You may like to consider the impact of doubling or tripling the interest rate.
11. Compare two investments, Option 1 with a contribution fortnightly and Option 2 being weekly but with a contribution half the size. How will this change impact the duration of the investment?
12. Explain your result in part c).
13. These simulations have modelled an investment that will increase in value at a constant rate. Is this realistic? Why?

Activity 2 – a loan

Background information

The establishment and maintenance of a loan is a common interaction people have with a financial institution when purchasing items such as a car or house.

This activity will allow students to model a loan based on a fixed interest rate and regular contribution.

Students can investigate the effect of changing the interest rate, amount or frequency of each contribution on the duration or value of the loan. This model is for a maximum of 30 years, a common maximum term of a home loan

To gain an understanding of the basic concepts of a loan, students can view the NESA resource, [Mathematics Advanced Year 12 Sample unit: Financial mathematics Resource 4 Time payment simulation](http://educationstandards.nsw.edu.au/wps/portal/nesa/11-12/stage-6-learning-areas/stage-6-mathematics/mathematics-advanced-2017)

Students can also construct a model of a home loan using the NESA resource, [Mathematics Advanced Year 12 Sample unit: Financial mathematics Resource 5 Reducible home loan](http://educationstandards.nsw.edu.au/wps/portal/nesa/11-12/stage-6-learning-areas/stage-6-mathematics/mathematics-advanced-2017)

Use the appropriate worksheet to complete various scenarios to consider the following situations:

1. If change your repayment, how will it affect the duration of the loan? Hint: Start with a defined duration to work out the repayment required. You may like to consider the impact of doubling or tripling the repayment.
2. If the interest rate paid is adjusted, how will it affect the duration of the loan and the total amount repaid? You may like to consider the impact of doubling or tripling the interest rate.
3. A person is commonly paid fortnightly. Consider a loan with a monthly repayment. What is the impact on the duration of the loan if you pay half the monthly amount each fortnight?

Activity 3 – retirement income stream

Background information

When retiring individuals will have a superannuation balance. Some people decide convert this into a regular income stream.

This activity will allow students to model such an income stream and consider the impact of the interest rate, amount and frequency of an income stream and their impact on the duration of such an income stream.

Use the appropriate worksheet to complete various scenarios to consider the following situations:

1. If change your withdrawal, how will it affect the duration of the annuity? Hint: Start with a defined duration to work out the withdrawal required. You may like to consider the impact of doubling or tripling the withdrawal.
2. If the interest rate received is adjusted, how will it affect the duration of the annuity? You may like to consider the impact of doubling or tripling the interest rate.

Activity 4 – can you afford to retire?

This activity will allow students to consider a scenario involving both the retirement and working phase of life.

1. Consider your requirements at retirement.
2. What age do you wish to retire at?
3. Predict your weekly expenses in retirement.
4. What lump sum at retirement will provide an income stream at retirement to enable you to maintain your desired standard of living assuming you live to your life expectancy?
5. Imagine you are 40, earn the medium income and have a current superannuation balance of $\_\_\_\_\_\_\_.
6. What contribution will you need to make to ensure you meet your lump sum at retirement?
7. Will you need to contribute more than your compulsory superannuation contribution to meet your retirement goal?
8. What are the limitations of this model?