 Year 12 Mathematics Standard 1

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Unit title

Depreciation and Loans (MS-F3)

Duration

2 weeks (based on 6 x 40 minute lessons per week)

Rationale

Financial mathematics involves the application of knowledge, skills and understanding of number in relation to earning, spending, investing, saving and borrowing money. Knowledge of financial mathematics enables students to analyse different financial situations, to calculate the best options for given circumstances, and to solve financial problems. The study of financial mathematics is important in developing students’ ability to make informed financial decisions, to be aware of the consequences of such decisions, and to manage personal financial resources effectively.

Topic focus

The principal focus of this subtopic is to gain an understanding of credit cards and reducing balance loans and that an asset may depreciate in value over time rather than appreciate.

Students develop their understanding of credit and loans in order to make informed financial decisions.

Within this subtopic, schools have the opportunity to identify areas of Stage 5 content which may need to be reviewed to meet the needs of students.

Prior knowledge required

* Indices
* Compound interest
* Simple interest

Language considerations

* Terminology encountered in this topic may include:
* Account balance
* Annual fee
* Annual interest rate
* Billing cycle
* Compound interest
* Credit
* Credit card
* Credit card statement
* Daily interest rate
* Declining balance method
* Depreciation
* Depreciation rate
* Fee
* Interest-free period
* Interest payable
* Interest rate
* Minimum payment
* Percentage annual interest
* Rate
* Repayment

Outcomes

A student:

* MS1-12-5 makes informed decisions about financial situations likely to be encountered post-school
* MS1-12-9 chooses and uses appropriate technology effectively and recognises appropriate times for such use
* MS1-12-10 uses mathematical argument and reasoning to evaluate conclusions, communicating a position clearly to others

Assessment

Some strategies for formative assessment could include:

* Reflecting on students’ responses to a class discussion
* Beginning the lesson with a few questions on content from previous lessons before progressing
* Having students write their own questions on a topic or having them write a specific number of questions with the same answer
* [3-2-1 Exit slips](http://www.theteachertoolkit.com/index.php/tool/3-2-1)
* [Chalk Talk Routine](http://www.santeesd.net/cms/lib/CA01000468/Centricity/Domain/12/VT_ChalkTalk.pdf)
* [Red, Yellow, Green Cups](http://www.sstr2.org/Downloads/Cups%20as%20student%20feedback.pdf); students could also indicate beside the questions their level of understanding using the letters, R, Y or G.
* [Mindmaps](https://emedia.rmit.edu.au/learninglab/content/how-create-mind-map)

| Content | Teaching and learning strategies and evidence of learning | Resources |
| --- | --- | --- |
| Calculate the depreciation of an asset using the declining-balance method, using the formula , where  is the salvage value of the asset after  periods,  is the initial value of the asset,  is the depreciation rate per period expressed as a decimal, and  is the number of periods, and realise that this is the compound interest formula, with a negative value for  AAM | Key ideas:* The compound interest formula is  where  is the future value,  is the present value,  is the rate of depreciation, and  is the number of compounding time periods.
* Assets depreciate when their value decreases over time. Not all assets depreciate (such as most houses). Some examples of assets that depreciate are most cards, electronic devices, and furniture.
* When an asset depreciates in value, we can use the compound interest formula with a negative value for .

Activities:* Use the compound interest formula (with a negative value for ) and a calculator to calculate the depreciation of an asset.
 | [Compound interest](https://www.mathsisfun.com/money/compound-interest.html) |
| * Use technology to investigate depreciating values, numerically and graphically
 | Key ideas:* We can use digital technology to investigate the depreciation of the value of our assets, such as Excel or Google Sheets.
* We can use tables and graphs to investigate depreciating values.

Activities:* Use the depreciation of an asset calculator to:
	+ Enter a principal amount
	+ Enter a rate of depreciation
	+ Enter a number of time periods
	+ Calculate and compare depreciating values
	+ Graph the depreciation of a value (the rate of depreciation versus the value remaining)
 | Resource 1 – Depreciation of an Asset Calculator* This is a spreadsheet that can be used to calculate depreciating values. The user can enter the principal, rate of depreciation, and the number of time periods.
 |
| Recognise a reducing balance loan as a compound interest loan with periodic repayments and use a spreadsheet to model a reducing balance loan | Key ideas:* Car loans are personal loans with a fixed monthly repayment. These loans are reducing balance loans and may be paid off in less time than the original term by increasing the monthly repayments, or by making additional payments.
* A reducing balance loan is a compound interest loan with periodic repayments.

Activities:* Students use hand-held calculators to create a table of loan repayments for the first few repayments of a loan.
* Given a row in a table of loan repayments, students generate the next row using a hand-held calculator.
* Students use digital technology such as a spreadsheet to calculate the next row, or a particular value for a row/column, in a table of loan repayments. For example, calculate the next row (such as when ) in the loan repayment table in resources.
 | Resource 2 – Reducing Balance Loan Spreadsheet |
| * Recognise that a smaller or additional repayment may affect the term and cost of your loan
 | Key ideas:* Spreadsheets can be used to simulate loans and to make related formulae easier to understand and implement. Spreadsheets allow the user to perform ‘what if’ analyses; for example, to compare the interest earned on an investment for various periods and interest rates.

Activities:* Use the reducing balance loan sheet to calculate the effect of making a smaller repayment to the term and cost of the loan.
* Use the reducing balance loan sheet to calculate the effect of making an additional repayment to the term and cost of the loan.
 | Resource 2 – Reducing Balance Loan Spreadsheet |
| * Use an online calculator to investigate the effect of the interest rate, the repayment amount or the making of an additional lump-sum payment, on the time taken to repay a loan
 | Key ideas:* Online calculators can be used to investigate the effect of the interest rate, the repayment amount or the making of an additional lump-sum payment, on the time taken to repay a loan.

Activities:* Use the MoneySmart ‘How can I repay my home loan sooner?’ calculator to investigate the effect of the interest rate, the repayment amount or the making of an additional lump-sum payment, on the time taken to repay a loan.
* Use another online calculator (such as the ones listed in Resources) or another produced by another bank to complete the same activity.
 | [How much will my mortgage repayments be?](https://www.moneysmart.gov.au/tools-and-resources/calculators-and-apps/mortgage-calculator#!how-much-will-my-repayments-be) (MoneySmart)* This allows the user to make additional payments.
* The user cannot make lump-sum payments.

[Home Loan Repayments Calculator](https://www.commbank.com.au/digital/home-buying/calculator/home-loan-repayments) (CommBank)* This allows the user to make additional payments.
* The user cannot make lump-sum payments.

[Personal Loan Repayments Calculator](https://www.commbank.com.au/digital/calculators/personal-loan-repayment-calculator/) (CommBank)* This does not allow the user to make additional lump-sum payments or to adjust the payment amounts.
* Can be used to compare the effects of interest rates on the repayment amount.
 |
| Recognise credit cards as an example of a reducing balance loan and solve practical problems relating to credit cards | Key ideas:* Credit cards are an example of a reducing balance loan.
* Comparison of compound interest formula with the reducing balance loan model.
* Explore the fees and charges involved with credit cards.
 | N/A |
| * Identify the various fees and charges associated with credit card usage
 | Key ideas:Fees and charges associated with credit card usage include:* Purchase interest rate – This is the interest rate charged on purchases. Some cards come with an interest-free period on purchases.
* Cash advance interest rate – This is the interest rate charged when you withdraw cash or transfer funds from your credit card account, as well as when you make cash equivalent transactions such as gambling or money transfers.
* Balance transfer interest rate – This is a reduced interest rate charged when you transfer a balance from another bank’s credit card or a store card to another bank credit card for a set period of time.
* Annual fee – This is charged once each year.
* Additional cardholder fee – This is charged on some types of card once each year if you have additional cardholder.
* Cash advance fee – This is charged if you withdraw cash or transfer funds from your credit card and when you make cash equivalent transactions such as gambling or money transfers.
* International transaction fee – This is charged if you make a purchase or obtain a cash advance (whether in a foreign currency or Australian dollars) while overseas, or in Australia (for example, online) where there is an overseas connection, as the merchant, or the financial institution or entity processing the transaction, is located overseas.
* Late payment fee – This is charged if you don’t make your minimum payment by the payment due date.
* Overlimit fee – This is charged when a bank first allows you to exceed your credit card limit in a statement period.
* Emergency issue/lost/replacement card fee – This is charged if an emergency replacement card needs to be delivered to you while you’re overseas.

Activities:* Use the terminology matching quiz – print the spreadsheet out, then cut out and use as a matching exercise.
 | [What types of rates and fees apply to my credit card?](https://www.commbank.com.au/support/faqs/449.html) (CommBank)[An Easy Guide to Credit Card Fees and Charges](https://www.commbank.com.au/personal/credit-cards/card-fees-charges.html) (CommBank)[Credit Card Fees](https://www.finder.com.au/credit-cards/credit-card-fees) (Finder)Resource 3 – Terminology Matching Quiz |
| * Compare credit card interest rates with interest rates for other loans
 | Key ideas:* Credit cards usually have higher interest rates than other types of loans.

Activities:* Pick one bank or lending institution and compare the interest rates that they offer for both credit cards, car loans, and mortgages.
 | [Compare Interest Rates (Canstar)](https://www.canstar.com.au/interest-rate-comparison/)[Compare Interest Rates (InfoChoice)](http://www.infochoice.com.au/banking/):* Compare interest rates across financial products from a range of providers.
 |
| * Interpret credit card statements, recognising the implications of only making the minimum payment
 | Key ideas:* If you only make the minimum payment each month, you will pay more interest and it will take you longer to pay off your balance.

Activities:* Use the websites linked in resources to identify key features of a credit card statement that students would use if they had a credit card.
* Create a wordbank with definitions.
 | [Reading your credit card statement](https://www.anz.com.au/personal/credit-cards/using/managing/statement/) (ANZ)[Your guide to statements](https://www.commbank.com.au/personal/credit-cards/manage/your-card/your-guide-to-statements.html) (CommBank)[How to read a credit card statement](https://www.finder.com.au/understanding-credit-card-statement-features) (Finder) |
| * Understand what is meant by an interest-free period
 | Key ideas:* 55 (or another amount) days of interest-free refers to the maximum number of interest-free days that are available on a purchase. To attain the full 55 days interest-free, a purchase would need to be made on the first day of the statement period.
* Not every bank is the same when it comes to the way in which interest is calculated when the closing balance is not paid in full.
	+ In some cases, when the closing balance is not paid in full, interest would be calculated from the day that the purchase was made and all interest-free days for that month are forfeited if the balance is not paid.
	+ A different approach is where if the closing balance is not paid in full, they only calculate interest charges from the date the statement was issued, rather than the date that the purchase was made.

Activities:* Watch the video on ‘What does 55 days interest-free really mean?’
* Students develop their own example of how many interest-free days they would have on a purchase.
* Does the amount of days in the month affect your interest-free days?
 | [What does interest free period mean?](https://www.tmbank.com.au/faq/cards/What-does-interest-free-period-mean) (Teachers Mutual Bank)[What does 55 days interest-free really mean?](https://www.finder.com.au/what-does-55-days-interest-free-really-mean) (Finder)[How do interest-free days work on credit cards?](https://www.canstar.com.au/credit-cards/how-do-interest-free-days-work-on-credit-cards/) (Canstar)[Making the most of interest free days](https://www.westpac.com.au/personal-banking/credit-cards/manage/fees-interest/interest-free-days/) (Westpac) |
| * Calculate the compounding interest charged on a retail purchase, transaction or the outstanding balance for a given number of days, both with and without the use of technology AAM
 | Key ideas:* We can use the compound interest formula or a spreadsheet to calculate the interest charged on a retail purchase.

Activities:* Students can use the ‘Credit Card Interest Calculator’ spreadsheet to discover the cost of credit card interest fees by adjusting amounts in the yellow boxes.
 | [Credit Card Interest Calculator](https://drive.google.com/open?id=1mmKt5pw2MHXMZj1A6Gcv-WOWgGYfTT9Q5fqWaqqCpw0) |

Reflection and evaluation