 Year 12 Mathematics Standard 1

| MS-F3 Depreciation and Loans | Unit duration |
| --- | --- |
| 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. | 3 weeks |

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

Related Life Skills outcomes: MALS6-5, MALS6-6, MALS6-13, MALS6-14 |

| Prerequisite knowledge | Assessment strategies |
| --- | --- |
| * Student should have completed MS-F1 Money Matters and MS-F2 Investments and thus have an understanding of compound interest, interest rates as well as fees and charges associated with banking.
 | Some strategies for formative assessment could include:* 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)
* [Mindmaps](https://emedia.rmit.edu.au/learninglab/content/how-create-mind-map)
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All outcomes referred to in this unit come from [Mathematics Standard Stage 6](https://syllabus.nesa.nsw.edu.au/mathematics-standard-stage6/) Syllabus
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Glossary of terms

| Term | Description |
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| declining balance method | The declining balance method, also known as the reducing balance method, is an accelerated depreciation method that records larger depreciation expenses during the earlier years of an asset’s useful life, and smaller ones in later years.$S=V\_{0}(1-r)^{n}$ , where $S$ is the salvage value of the asset after $n$ periods, $V\_{0}$ is the initial value of the asset, $r$ is the depreciation rate per period expressed as a decimal, and $n$ is the number of periods |
| depreciation | Depreciation is a decrease in the value of an asset over time. |
| minimum payment | Credit card terms require you to pay at least the minimum payment by the due date each month. This payment is the lowest amount you can pay on your credit card to avoid penalties. Minimum payments are typically calculated as a percentage of your outstanding balance plus any fees that have been added to your balance. |
| reducing balance loan | A reducing balance loan is a compound interest loan where the loan is repaid by making regular payments and the interest paid is calculated on the amount still owing (the reducing balance of the loan) after each payment is made. |

| **Sequence** | **Content** | **Suggested teaching strategies and resources**  | **Date and initial** | **Comments, feedback, additional resources used** |
| --- | --- | --- | --- | --- |
| Introduction to declining balance method of deprecation(2 lessons) | * Calculate the depreciation of an asset using the declining-balance method, using the formula $S=V\_{0}(1-r)^{n}$ , where $S$ is the salvage value of the asset after $n$ periods, $V\_{0}$ is the initial value of the asset, $r$ is the depreciation rate per period expressed as a decimal, and $n$ is the number of periods, and realise that this is the compound interest formula, with a negative value for $r$ **AAM Paperclip icon** Critical and creative thinking icon
* Use technology to investigate depreciating values, numerically and graphically Critical and creative thinking icon  Information and communication technology capability icon
 | Examining depreciation * The teacher can introduce the concept of depreciation by showing the [what is depreciation](https://www.youtube.com/watch?v=OrBNusmnDxQ) video
* The teacher then leads a discussion on what items commonly depreciates and why.
* Using a basic example such as a car depreciates from $30000 to $20000, the teacher defines
* depreciation
* depreciated value
* amount of depreciation
* The teacher describes then compares and contrasts the two methods of depreciation.
* straight line method (examined in MS-F1)
* declining balance method
* Student activity: Students establish a spreadsheet to show how an item depreciates under each method.
* Students can graph the results and compare the shape of each graph.
* Students can discuss when one method may be better than the other. Consider an asset you own and want to sell compared to claiming depreciation as a tax offset. **Resource:** comparing-methods-of-depreciation.XLSX
* There are opportunities to explore the tax implications of the depreciation of business assets.

**Applying the declining-balance method** * The teacher develops the formula for declining balance depreciation by considering repeated multiplication by (1−r)

 $S=V\_{0}(1-r)^{n}$ * Students compare this to the compound interest formula.
* Student activity: Comparing the depreciation of cars.
* Students read the Canstar article [top 10 cars that depreciate slowly](https://www.canstar.com.au/car-loans/top-10-cars-depreciate-slowly/) to find cars that depreciate more slowly than others. Discuss possible reasons for this.
* Students use [redbook](https://www.redbook.com.au/) to find the purchase price and current estimated value of a vehicle and use this information to determine the rate of depreciation and examine the accuracy of the claims made in the Canstar article.
* Students compare the amount of depreciation of motor vehicles for different ages of the vehicles. Note: The depreciation in the first year of a new car can exceed 35% and often levels out to between 7% and 10% per annum after the first three years.
* Sample questions:
* James bought a boat for $50 000 which depreciates at a rate of 15% p.a. How much will it be worth after 4 years?
* Geoff bought a tractor for $130 000 which depreciates at 20% p.a. By how much has the tractor depreciated after 8 years?
* Rita purchased a Holden Barina for $14 900. If it depreciates at a rate of 25% p.a., when will the car be worth half of its purchase price?
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| Introduction to loans(1 lesson) | * Recognise a reducing balance loan as a compound interest loan with periodic repayments and use a spreadsheet to model a reducing balance loan **Paperclip icon**  Information and communication technology capability icon Personal and social capability icon
* Recognise that a smaller or additional repayment may affect the term and cost of your loan Personal and social capability icon
 | **I**ntroducing loans * The teacher introduces the concept of a loan and could show the [what is a loan](https://www.investopedia.com/terms/l/loan.asp) video.
* The teacher defines terminology used with loans including the amount borrowed, monthly repayments, fees, interest, total repaid and reducing balance loan.
* The teacher discusses a mortgage and other loans, such as car loans. These are reducing balance personal loans with a fixed monthly repayment. It may be paid off sooner than the original term by increasing the monthly repayments, or by making additional payments.

Modelling loan scenarios * Student activity: Students model a reducing balance loan table using a spreadsheet. The minimum repayments can be calculated using the [money smart](https://www.moneysmart.gov.au/tools-and-resources/calculators-and-apps/mortgage-calculator#!how-much-will-my-repayments-be) website. Students should:
* compare repayments on loans from a number of lending institutions
* consider both home loans and personal loans
* use a graph of the amount outstanding to determine when the loan will be half paid.

**Resource:** reducing-balance-loan.XLSX * Students can use their spreadsheet to examine real life scenarios such as:
* what if you pay interest only?
* what if you pay double the minimum repayment?
* what if the there is an interest rate rise?
* what if more than the minimum monthly repayment is paid?
* what if there is an interest rate rise in the case where more than the minimum monthly repayment is already being paid?
* Student activity: Students to consider “How much do you need to earn to buy a house in different parts of Australia?” using the following assumptions:
* 20% deposit
* the median house price for that area
* a 25 or 30 year loan period
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| Investigating the effect of changes to a loan(1 lesson) | * Recognise a reducing balance loan as a compound interest loan with periodic repayments and use a spreadsheet to model a reducing balance loan **Paperclip icon**  Information and communication technology capability icon Personal and social capability icon
* 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  Information and communication technology capability icon
 | **Investigating paying loans off sooner*** 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.
* Student activity: Use the [MoneySmart ‘How can I repay my home loan sooner?](https://www.moneysmart.gov.au/tools-and-resources/calculators-and-apps/mortgage-calculator#!how-can-i-repay-my-loan-sooner)’ calculator to investigate:
* the effect of an increase or decrease in the interest rate,
* the effect of increasing the repayment amount, or making an additional lump-sum payment,
* The effect of changing the time taken to repay a loan.
* Student activity: Compare these results with another online calculator (such as the ones listed below) Resources
* [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)
* [Home Loan Repayments Calculator](https://www.commbank.com.au/digital/home-buying/calculator/home-loan-repayments) (CommBank)
* [Personal Loan Repayments Calculator](https://www.commbank.com.au/digital/calculators/personal-loan-repayment-calculator/) (CommBank)
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| Introduction to credit cards(1 lesson) | * Recognise credit cards as an example of a reducing balance loan and solve practical problems relating to credit cards
 | Introduction to credit cards* The teacher introduces students to credit cards by students reading:
* the money smart [credit card factsheet](https://www.moneysmart.gov.au/media/283208/cfs-credit-cards-and-store-cards.pdf)
* the money smart [website](https://www.moneysmart.gov.au/borrowing-and-credit/credit-cards)
* The teachers leads a discussion to
* examine the pros and cons of using a credit card.
* identify the consequences of having an interest free card but not paying it off in the interest free period.
* identify the various fees and charges associated with credit card usage. This can include interest, monthly fees, annual fees, reward program fees, surcharge fees at point of purchase.
* Student activity: Students use the [credit card simulator game](https://www.channelone.com/feature/credit-card-simulator-game/) to investigate how long it will take them to pay their purchases back.
* Student activity: Examine credit card use in Australia using [credit card statistics](https://www.finder.com.au/credit-cards/credit-card-statistics). Students can
* Compare the purchase size on debit and credit cards
* examine and graph the number of credit cards, average debt, average debt costing interest, average amount of annual purchases per card.
* Students should be able to create a spreadsheet to simulate a credit card statement, including the calculation of the interest payable and the minimum payment due.
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| Credit card fees and charges(1 lesson) | * Recognise credit cards as an example of a reducing balance loan and solve practical problems relating to credit cards
* Identify the various fees and charges associated with credit card usage Literacy icon Personal and social capability icon
 | Identifying fees and charges* The calculation of interest and other credit card charges varies between the different issuers of credit cards. Interest is typically charged for retail purchases, cash advances, balance transfers and the amount still owing from the previous month. In this course, the same interest rate will be assumed to apply for all transaction types, and students will be required to calculate interest for amounts still owing from the previous month, cash advances and retail purchases, but not for balance transfers.
* 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.
* Student activity: Use the terminology matching quiz – print the spreadsheet out, then cut out and use as a matching exercise.Resource: terminology-matching-quiz.XLXS

Additional Resources[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) |  |  |
| Investigating credit card interest rates(1 lesson) | * Recognise credit cards as an example of a reducing balance loan and solve practical problems relating to credit cards
* Compare credit card interest rates with interest rates for other loans Personal and social capability icon
 | * For interest calculations on credit cards, compound interest is to be assumed. It is also to be assumed that interest is calculated on the daily outstanding account balance for each transaction and is applied at the end of the statement period. The daily interest rate is used for this calculation.
* Student activity: Pick one bank or lending institution and compare the interest rates that they offer for both credit cards, car loans, and mortgages.
* Students should realise that credit cards have higher interest rates than loans.
* Students could also compare credit card interest rates to other lending schemes like AfterPay
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| Interpreting credit card statements(1 lesson) | * Recognise credit cards as an example of a reducing balance loan and solve practical problems relating to credit cards
* Interpret credit card statements, recognising the implications of only making the minimum payment Literacy icon Personal and social capability icon
 | Examining credit card statements * Teachers should discuss how to calculate the number of days when interest is charged, paying particular attention to the inclusive dates.
* Student activity: Students look at the [How to read a credit card statement](https://www.aie.org/managing-your-money/how-to-track-your-money/reading-credit-card-statement/) (AIE) and consider:
* What is the due date for payment?
* What amount needs to be paid to ensure no interest is charged?
* Why is there an overdue fee?
* If only the minimum payment is made, how long will this particular bill (providing no further transactions occur) take to be paid off? Why?
* What is the phone number that should be used if repayments can’t be made?
* What is the credit limit of this card?
* What interest will be charged if this account is paid in full on 20 March that year?
* Students should compare this statement to those found at [How to read a credit card statement (ANZ)](https://www.anz.com.au/personal/credit-cards/using/managing/statement/), [How to read a credit card statement (CommBank)](https://www.commbank.com.au/credit-cards/manage/credit-card-statements.html) to see the similar features and layout of each statement
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| Investigating interest free periods(1 lesson) | * Recognise credit cards as an example of a reducing balance loan and solve practical problems relating to credit cards
* Understand what is meant by an interest-free period
 | Introducing interest free periods* 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.
* Student activity: Watch the video on [What does 55 days interest-free really mean?](https://www.finder.com.au/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?

Additional Resources[What does interest free period mean?](https://www.tmbank.com.au/faq/cards/What-does-interest-free-period-mean) (Teachers Mutual Bank)[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) |  |  |
| Calculating interest on credit cards(2 lessons) | * Recognise credit cards as an example of a reducing balance loan and solve practical problems relating to credit cards
* 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**  Information and communication technology capability icon
 | **Calculations involving credit cards** * The teacher defines the assumptions made when completing interest calculations involving credit cards:
* interest is calculated using compound interest.
* interest is calculated on the daily outstanding account balance for each transaction
* interest is applied at the end of the statement period and the daily interest rate is used for this calculation.
* the daily interest rate is the annual percentage rate divided by 365.

Note: Calculations should include both fees and interest free periods. * Student activity: Students can use the ‘[Credit Card Interest Calculator](https://drive.google.com/open?id=1mmKt5pw2MHXMZj1A6Gcv-WOWgGYfTT9Q5fqWaqqCpw0)’ spreadsheet to discover the cost of credit card interest fees by adjusting amounts in the yellow boxes
* Student activity: Comparing credit cards and loans:
* Students compare and contrast the rates, fees and interest rate periods of 3 banks “low rate” credit cards using appropriate calculations.
* Students digitally create a graphical representation comparing the use of two credit cards with different interest rates for the same purchases.
* Students choose a credit card and compare its rates and fees with a car loan and personal loan from the same bank. Students discuss the advantages and disadvantages of each.
* Sample problem:
* Shannon bought shoes for her wedding for $150 on 20 June using a credit card. Compound interest was charged at a rate of 19.49% p.a. for purchases on the credit card. No other purchases were made on this account. There was no interest-free period. What amount was paid when Shannon paid the account in full on 6 July?
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Reflection and evaluation

Please include feedback about the engagement of the students and the difficulty of the content included in this section. You may also refer to the sequencing of the lessons and the placement of the topic within the scope and sequence. All ICT, literacy, numeracy and group activities should be recorded in the ‘Comments, feedback, additional resources used’ section.