

Reaching goals: What's involved?

Year 10

This unit is aligned with the following Australian Curriculum learning areas:
Mathematics, supported by Economics and Business



ASIC's
MONEYSMART Teaching



ASIC

Australian Securities & Investments Commission

Copyright information

Websites: asic.gov.au, moneysmart.gov.au

Creative Commons

This resource is available under the Creative Commons licence (BY-NC-SA). Under this licence, the material is available for free use and adaption so that educators can use, adapt and re-publish material from the resource without seeking the permission of ASIC.

Copyright notice



This work is based on materials that constitute copyright of the Australian Securities and Investments Commission and is licensed under a **Creative Commons Attribution Non-Commercial Share Alike 3.0 Australia Licence**. For an explanation of what this licence allows you to do please refer to the Creative Commons website at creativecommons.org.au.

You must include this statement on any adaption of the resource:

This work is licensed under a Creative Commons Attribution Non-Commercial Share Alike 3.0 Australia Licence (see: creativecommons.org/licenses/by-nc-sa/3.0/au/legalcode). A Legal Notice applies to the use of these materials, see: Legal Notice: moneysmart.gov.au/copyright

The material in this resource is made available for the purpose of providing access to general information about consumer and financial literacy education and is not professional advice. If you intend to rely on the material, you should obtain advice relevant to your particular circumstances to evaluate its accuracy, currency and completeness.

Some material may include or summarise views, standards or recommendations of third parties. ASIC does not endorse such material and its inclusion does not indicate that ASIC recommends any course of action.

ASIC requests that if you re-publish this work that you notify ASIC by email moneysmartteaching@asic.gov.au. We are interested in hearing how people are using and adapting the materials.

CAL exemption

This resource is exempt from collection by copyright agencies and is a free resource for educational institutions.

Note

All links were correct at the time of publication, however, due to the dynamic nature of the internet ASIC cannot guarantee they will remain correct.

Reaching goals: What's involved?

Year level	10
Duration of unit	10.5 hours*
Learning areas	Mathematics focus supported by Economics and Business

Unit description

Cathy and Dinuka are Year 10 students who are planning to go on a holiday together after they finish school at the end of Year 12. They will need some money to fund their holiday. Planning for the holiday leads them to think about financial planning – goal setting, saving, borrowing, investing, working with compound interest, good and bad credit, depreciation and inflation.

In this unit, students investigate the effects of compound interest, derive the compound interest formula and apply it in a variety of contexts that have implications for financial planning. While this unit does not describe the process of financial planning, the considerations encountered are a pre-requisite for any further work in constructing a financial plan.

Enduring understandings/Deep learnings

- ▶ Setting goals and planning for the future can help us get what we want.
- ▶ Compound interest can help us reach our goals faster.
- ▶ The compound interest formula can be applied in a range of financial contexts.
- ▶ There are risks and rewards involved in borrowing money.

Prerequisite skills

To undertake this unit, students require an understanding of:

- ▶ simple interest
- ▶ discount
- ▶ commission
- ▶ loss and profit
- ▶ appreciation/depreciation
- ▶ Excel programs – designing spreadsheets

Note

Additional exercises may be required to practice and reinforce concepts used in this unit. If Excel spreadsheets cannot be accessed, consider using freely available similar spreadsheet applications for use on iPad, such as Google Sheets.

** Timings are provided as a guide only. Teachers will tailor the activities to suit the capabilities and interests of their class. The unit and student worksheets can be adapted to your needs.*

Links

The following table provides the relevant links to the Australian Curriculum learning areas, achievement standards and general capabilities.

Australian Curriculum learning areas and achievement standards	
Mathematics	Content descriptions <ul style="list-style-type: none"> ▶ Strand: Number and Algebra <ul style="list-style-type: none"> — Sub-strand: Money and Financial Mathematics <ul style="list-style-type: none"> ○ Connect the compound interest formula to repeated applications of simple interest using appropriate digital technologies (ACMNA229) — Sub-strand: Patterns and Algebra <ul style="list-style-type: none"> ○ Substitute values into formulas to determine an unknown (ACMNA234) ▶ Strand: Statistics and Probability <ul style="list-style-type: none"> — Sub-strand: Data representation and interpretation <ul style="list-style-type: none"> ○ Investigate and describe bivariate numerical data where the independent variable is time (ACMSP252) ○ Identify everyday questions and issues involving at least one numerical and at least one categorical variable, and collect data directly and from secondary sources (ACMSP228) ○ Compare data displays using mean, median and range to describe and interpret numerical data sets in terms of location (centre) and spread (ACMSP283)
	Achievement standards <p>By the end of Year 10, students recognise the connection between simple and compound interest. They solve problems involving linear equations and inequalities. They make the connections between algebraic and graphical representations of relations. Students solve surface area and volume problems relating to composite solids. They recognise the relationships between parallel and perpendicular lines. Students apply deductive reasoning to proofs and numerical exercises involving plane shapes. They compare data sets by referring to the shapes of the various data displays. They describe bivariate data where the independent variable is time. Students describe statistical relationships between two continuous variables. They evaluate statistical reports.</p> <p>Students expand binomial expressions and factorise monic quadratic expressions. They find unknown values after substitution into formulas. They perform the four operations with simple algebraic fractions. Students solve simple quadratic equations and pairs of simultaneous equations. They use triangle and angle properties to prove congruence and similarity. Students use trigonometry to calculate unknown angles in right-angled triangles. Students list outcomes for multi-step chance experiments and assign probabilities for these experiments. They calculate quartiles and inter-quartile ranges.</p>

Economics and business

Content descriptions

▶ Strand: Knowledge and understanding

- Factors that influence major consumer and financial decisions and the short- and long-term consequences of these decisions (ACHEK053)

▶ Strand: Skills

- Sub-strand: Questioning and research
 - Develop questions and hypotheses about an economic or business issue or event, and plan and conduct an investigation (ACHES055)
 - Gather relevant and reliable data and information from a range of digital, online and print sources (ACHES056)
- Sub-strand: Interpretation and analysis
 - Analyse data and information in different formats to explain cause-and-effect relationships, make predictions and illustrate alternative perspectives (ACHES057)
- Sub-strand: Economic reasoning, decision-making and application
 - Generate a range of viable options in response to an economic or business issue or event, use cost-benefit analysis and appropriate criteria to recommend and justify a course of action and predict the potential consequences of the proposed action (ACHES058)
 - Apply economics and business knowledge, skills and concepts in familiar, new and hypothetical situations (ACHES059)
- Sub-strand: Communication and reflection
 - Present reasoned arguments and evidence-based conclusions in a range of appropriate formats using economics and business conventions, language and concepts (ACHES060)
 - Reflect on the intended and unintended consequences of economic and business decisions (ACHES061)

Achievement standards

By the end of Year 10, students explain why and how governments manage economic performance to improve living standards. They give explanations for variations in economic performance and standards of living within and between economies. They **analyse factors that influence major consumer and financial decisions and explain the short- and long-term effects of these decisions**. They explain how businesses respond to changing economic conditions and improve productivity. Students evaluate the effect of organisational and workforce management on business performance.

When researching, students develop questions and formulate hypotheses to frame an investigation of an economic or business issue or event. They gather and analyse reliable data and information from different sources to identify trends, explain relationships and make predictions. Students generate alternative responses to an issue, taking into account multiple perspectives. They use cost benefit analysis and appropriate criteria to propose and justify a course of action. They apply economics and business knowledge, skills and concepts to familiar, unfamiliar and complex hypothetical problems. Students develop and present evidence-based conclusions and

reasoned arguments incorporating different points of view. **They use appropriate texts, subject-specific language, conventions and concepts. They analyse the intended and unintended effects of economic and business decisions and the potential consequences of alternative actions.**

General capabilities

Literacy

- ▶ Navigate, read and view a wide range of more demanding subject-specific texts with an extensive range of graphic representations
- ▶ Interpret and evaluate information within and between texts, comparing and contrasting information using comprehension strategies
- ▶ Use pair, group and class discussions and formal and informal debates as learning tools to explore ideas, compare solutions, evaluate information and ideas, refine opinions and arguments in preparation for creating texts
- ▶ Use comprehensive knowledge of the structure and features of learning area texts to comprehend and compose complex texts in innovative ways, using conventions for citing others

Numeracy

- ▶ Use different ways to represent very large and very small numbers including scientific notation
- ▶ Solve and model problems involving complex data by estimating and calculating using a variety of efficient mental, written and digital strategies
- ▶ Evaluate financial plans to support specific financial goals

ICT

- ▶ Use advanced search tools and techniques or simulations and digital models to locate or generate precise data and information that supports the development of new understandings
- ▶ Select and use ICT to articulate ideas and concepts, and plan the development of complex solutions
- ▶ Design, modify and manage complex digital solutions, or multimodal creative outputs or data transformations for a range of audiences and purposes
- ▶ Select and use a range of ICT tools efficiently and safely to share and exchange information, and to collaboratively and purposefully construct knowledge

Critical and Creative Thinking

- ▶ Pose questions to critically analyse complex issues and abstract ideas
- ▶ Clarify complex information and ideas drawn from a range of sources
- ▶ Speculate on creative options to modify ideas when circumstances change
- ▶ Assess risks and explain contingencies, taking account of a range of perspectives, when seeking solutions and putting complex ideas into action
- ▶ Identify, plan and justify transference of knowledge to new contexts
- ▶ Analyse reasoning used in finding and applying solutions, and in choice of resources

Personal and Social Capability

- ▶ Reflect on feedback from peers, teachers and other adults, to analyse personal characteristics and skill sets that contribute to or limit their personal and social capability
- ▶ Critically analyse self-discipline strategies and personal goals and consider their application in social and work-related contexts
- ▶ Develop and apply criteria to evaluate the outcomes of individual and group decisions and analyse the consequences of their decision making

- ▶ Articulate their personal value system and analyse the effects of actions that repress social power and limit the expression of diverse views

Cross-curriculum priorities

N/A

Proficiency strands

- ▶ **Understanding**
 - Students understand the difference between compound and simple interest. They understand the concepts of appreciation, depreciation and inflation. Students understand the difference between a flat rate of interest and a reducible rate.
- ▶ **Fluency**
 - Students calculate compound interest using a variety of methods and find depreciation using a formula.
- ▶ **Problem Solving**
 - Students use a spreadsheet to investigate reducible interest. They solve problems related to consumer and financial mathematics using appropriate formulas and calculations.
- ▶ **Reasoning**
 - Students deduce the compound interest formula by relating compound interest to simple interest calculations. They explore the advantages and disadvantages of financial decisions by considering and calculating possible outcomes.

Diversity of learners

The Australian Curriculum is based on the assumptions that each student can learn and that the needs of every student are important. These needs are shaped by individual learning histories and abilities as well as personal, cultural and language backgrounds, and socio-economic factors. Teachers may adapt or plan additional learning activities depending on the multiple, diverse, and changing needs of their students.

National Consumer and Financial Literacy Framework

(Note: the student learnings in the National Consumer and Financial Literacy Framework are divided into, and are applicable over, bands covering two chronological years.)

Dimension	Student learnings by the end of Year 10
Knowledge and understanding	<ul style="list-style-type: none"> ▶ Identify and explain strategies to manage personal finances ▶ Explain the various factors that may impact on achieving personal financial goals ▶ Explain how over-reliance on credit can impact on future choices ▶ Analyse and explain the range of factors affecting consumer choices ▶ Identify types of consumer and financial risks to individuals, families and the broader community, and ways of managing them
Competence	<ul style="list-style-type: none"> ▶ Investigate the financial decisions required at significant life-stage events ▶ Discuss the differences between 'good' and 'bad' debt, including manageability of debt and its long-term impact ▶ Analyse relevant information to make informed choices when purchasing

	goods and services and/ or to resolve consumer choices
Responsibility and enterprise	<ul style="list-style-type: none"> ▶ Apply informed and assertive consumer decision-making in a range of 'real-life' contexts ▶ Appreciate that there is often no one right answer in making financial decisions because these depend on individual circumstances, preferences and values ▶ Understand and explain the legal responsibilities of taking on debt, including the consequences of not paying

Sequenced teaching and learning activities

Introducing	Resources
<p>Activity 1 Constructing scenarios (60 minutes)</p> <p>Students identify questions and considerations that need to be addressed when people plan for their financial future. A variety of scenarios are explored, enabling students to see how financial planning is relevant to a range of life stages and situations.</p>	<ul style="list-style-type: none"> ▶ Video: 'Money makes the world go around' – https://www.youtube.com/watch?v=YKmwgMD7i6I ▶ Notebook for recording notes throughout the unit
<p>Assessment: Diagnostic This activity allows teachers to gauge students' levels of awareness about financial planning.</p>	

Developing	Resources
<p>Activity 2 Saving: Investing compound interest (120 minutes)</p> <p>Students use a compound interest calculator to explore the effects of compound interest. This allows students to deduce the way that compound interest works. They calculate compound interest by using repeated simple interest calculations, and compare these two forms of interest.</p>	<ul style="list-style-type: none"> ▶ Online compound interest calculator: moneysmart.gov.au/tools-and-resources/calculators-and-apps/compound-interest-calculator ▶ Worksheet 1: Using a compound interest calculator ▶ Worksheet 2: Investigating compound interest
<p>Activity 3 Arriving at the compound interest formula (2 x 60 minutes)</p> <p>Students use a spreadsheet to calculate compound interest. The nature of the calculations involved motivates students to consider how repeated simple interest calculations can be generalised to a mathematical formula.</p>	<ul style="list-style-type: none"> ▶ Microsoft Excel or other spreadsheet application, e.g. Google Sheets ▶ Worksheet 3: Using a spreadsheet to calculate compound interest ▶ Worksheet 4: Generalising expressions of compound interest
<p>Activity 4 Applying the compound interest formula (120 minutes)</p> <p>Students apply the compound interest formula in the context of inflation and depreciation. Students discuss these concepts and their relevance to financial planning.</p>	<ul style="list-style-type: none"> ▶ Worksheet 5: Applying the compound interest formula to inflation ▶ Worksheet 6: Investigating depreciation ▶ Printout (per student) of article 'Good vs bad debt': money.howstuffworks.com/personal-finance/debt-management/debt1.htm ▶ Digital credit and debt resources: — moneysmart.gov.au/teaching/teaching-

Developing	Resources
	<p>resources/moneysmart-rookie-for-educators#credit</p> <p>or in the under 25s section of the MoneySmart website</p> <p>moneysmart.gov.au/life-events-and-you/under-25s/credit-and-debt</p>
<p>Assessment: Formative</p> <p>Collect 'Worksheet 6: Investigating depreciation' to assess students' understanding of the formula and its use, and to determine further learning needs.</p>	
<p>Activity 5 Borrowing money (120 minutes)</p> <p>Students apply the compound interest formula in the context of borrowing money, and use a spreadsheet to investigate the way that reducible interest is calculated. Students consider the effects of extra and more frequent repayments.</p>	<ul style="list-style-type: none"> ▶ Worksheet 7: Applying the compound interest formula to borrowing ▶ Actual or created credit card statements showing information about the effects of different amounts of repayment ▶ Video: 'Credit Hangover – MoneySmart Rookie' <p>https://www.youtube.com/watch?v=hIZwFuOPxiM</p>

Culminating	Resources
<p>Activity 6 Revisiting scenarios (90 minutes)</p> <p>Students explain how the five financial topics covered in this unit can influence financial planning.</p>	<ul style="list-style-type: none"> ▶ Worksheet 8: How do we plan for the future? ▶ Notes from Activity 1 ▶ Completed worksheets ▶ Savings goals calculator <p>moneysmart.gov.au/tools-and-resources/calculators-and-apps/savings-goals-calculator</p> <ul style="list-style-type: none"> ▶ Credit card calculator <p>moneysmart.gov.au/tools-and-resources/calculators-and-apps/credit-card-calculator</p>
<p>Assessment: Summative</p> <p>This activity provides teachers with feedback on the understanding students have gained from the unit. Criteria for assessment are provided.</p>	

Assessment rubric

This rubric is intended as a guide only. It can be modified to suit teachers' needs and to be integrated into existing assessment systems. Teachers may also wish to collect the worksheets as work samples for individual student folios.

Student's name: _____

Skill	Relevant content description(s)	Relevant activities and worksheets	Competent	Developing at level	Needs further development	Notes
The student can use an online interest calculator to explore the effects of compound interest	Connect the compound interest formula to repeated applications of simple interest using appropriate digital technologies (ACMNA229)	Activity 2 Worksheet 1	The student independently and successfully follows instructions for entering and amending information on an online compound interest calculator to obtain results. The student also uses the calculator to solve problems that have not been modelled (for example, Q8(b) and Q9)	The student, with some assistance, follows instructions for entering and amending information on an online compound interest calculator to obtain results	The student requires significant teacher guidance to follow instructions for entering and amending information on an online compound interest calculator to obtain results	
The student can use a calculator to determine compound amount and interest by repeated application of simple interest	See ACMNA229 above	Activity 2 Worksheet 1	The student applies use of repeated simple interest with both annual and monthly rates to calculate savings account balances correctly. The student accurately compares balances using both compound and simple interest payments	The student applies use of repeated simple interest with both annual and monthly rates to calculate savings account balances. Occasional errors are corrected with little or no assistance. The student compares balances using both compound and simple interest payments	With teacher guidance, the student applies use of repeated simple interest with both annual and monthly rates to calculate savings account balances	

Assessment rubric (cont)

Skill	Relevant content description(s)	Relevant activities and worksheets	Competent	Developing at level	Needs further development	Notes
The student can use a spreadsheet to calculate compound interest	See ACMNA229 above	Activity 3 Worksheet 3	The student independently follows instructions for entering information and formulas on a spreadsheet to obtain the correct results	The student, with some assistance, follows instructions for entering information and formulas on a spreadsheet to obtain results	The student requires significant teacher guidance and support to follow instructions for entering information and formulas on a spreadsheet to obtain results	
The student can deduce and apply the formula for compound interest	See ACMNA229 above	Activity 3 Worksheet 4	The student independently considers the use of repeated simple interest calculations to correctly deduce and apply an algebraic formula for compound amount	With teacher demonstration, the student considers the use of repeated simple interest calculations to deduce and apply an algebraic formula for compound amount with some success	The student copies the algebraic formula for compound amount modelled by the teacher, but has little success applying it	
The student can apply the compound interest formula to solve problems related to borrowing money	See ACMNA229 above	Activity 5 Worksheets 7 and 8	The student independently applies the compound interest formula to successfully solve problems involving credit cards and reducible interest loans. The student uses both calculator and spreadsheet to determine correct answers	The student, with some assistance, applies the compound interest formula to solve problems involving credit cards and reducible interest loans. The student uses a calculator to determine answers, but requires assistance to use a spreadsheet	The student requires teacher guidance to apply the compound interest formula to problems involving credit cards and reducible interest loans. The student uses a calculator to attempt some answers	

Assessment rubric (cont)

Skill	Relevant content description(s)	Relevant activities and worksheets	Competent	Developing at level	Needs further development	Notes
The student can substitute values of P , r and n in applications of the compound interest formula	Substitute values into formulas to determine an unknown (ACMNA234)	Activity 4 Worksheets 5 and 6	The student substitutes values of P , r and n correctly in the formulas for inflation and depreciation to calculate all answers correctly	The student substitutes values of P , r and n in the formulas for inflation and depreciation to calculate answers. Occasional errors are corrected with little or no assistance	The student requires teacher guidance to substitute values of P , r and n correctly in the formulas for inflation and depreciation in order to calculate an answer	
The student can investigate and describe a relationship between variables	Investigate and describe bivariate numerical data where the independent variable is time (ACMSP252)	Activity 2 Worksheet 1	The student accurately interprets generated tables and graphs to clearly explain how/why the amount of compound interest changes over time	The student interprets generated tables and graphs to give some explanation of how/why the amount of compound interest changes over time	The student attempts to interpret generated tables and graphs, but an explanation of how/why the amount of compound interest changes over time is unclear	
The student can explain how the five financial topics covered in this unit can influence financial planning	Suggested Summative assessment ACMNA229 ACMNA234 ACMSP252	Activity 6 Worksheet 9 (includes assessment criteria)	Part 1 The student adds at least three relevant questions related to each of the five topics to their list Part 2 The student describes a realistic scenario where financial planning is relevant. The student addresses each of the five financial	Part 1 The student adds questions related to each or most of the five topics to their list, but not all questions may be relevant Part 2 The student describes a scenario where financial planning is relevant. The student addresses most of the five financial topics and some	Part 1 The student adds one or two questions related to some of the five topics to their list Part 2 The student chooses a scenario, but the relevance of financial planning is not clear. The student attempts to address a few of the five financial topics	

Assessment rubric (cont)						
Skill	Relevant content description(s)	Relevant activities and worksheets	Competent	Developing at level	Needs further development	Notes
			<p>topics and relevant considerations are included</p> <p>Part 3 The student identifies a possible financial goal and gives at least three reasons why or why not what has been learnt in this unit will or will not help them in achieving this goal</p>	<p>appropriate considerations are included</p> <p>Part 3 The student identifies a possible financial goal and gives one or two reasons why or why not what has been learnt in this unit will or will not help them in achieving this goal</p>	<p>and one or two considerations are included</p> <p>Part 3 The student identifies a financial goal that may be possible, but has difficulty in reasoning how work in this unit will or will not help them in achieving this goal</p>	

Teacher notes

Activity 1

Constructing scenarios (60 minutes)

As an introduction to explaining the importance of acquiring consumer and financial literacy skills, teachers could show and discuss the video 'Money makes the world go around' <https://www.youtube.com/watch?v=YKmwgMD7i6I> and explain that this unit is part of a series of units that will help students become more consumer and financially literate.

Scenario

Cathy and Dinuka are Year 10 students. They are planning to go on a holiday after they complete school in 2 years' time and will need some money at the end of Year 12 to fund their holiday. They are wondering how best to do this.

Group activity

Cathy and Dinuka need to do some financial planning so that they will have enough money for their holiday.

- ▶ As a group, brainstorm other scenarios where people plan for their financial future. Include people of different age groups.
- ▶ Students choose one of their scenarios and write a list of questions that would help the people involved to plan for their future. For example:
 - How much do they currently earn?
 - How much have they already saved?
 - How much money will they need?

Students then explain the mathematics that would be involved in answering at least two of the questions on their list. They identify the operations that would be used and provide an example of a calculation.

- ▶ Record the scenarios and questions in notebooks as they will be needed again in Activity 6.

Students explain the scenario they have chosen and report on their answers to the class. Assess students' understanding of index notation (including in algebraic expressions), substitution into formulas and the calculation of simple interest. Revision of these concepts and skills, as necessary, will assist students in completing the remaining tasks.

A motivating short-term goal, such as a holiday, can be helpful in encouraging good savings habits. However, the benefit of saving for longer-term goals also needs to be highlighted. For example:

- Cathy and Dinuka might use their savings to support moving out of home, if required for work or study opportunities
- they may use their savings for educational expenses, once they leave school.

These decisions would be more beneficial in the long-term as they could positively affect future income and life experiences. Students will develop an understanding that good financial management supports the choices an individual can make to enhance personal wellbeing both now and in the future.

Students should retain their scenarios and associated questions posed in this activity, and completed worksheets for use in Activity 6.

Videos and resources

ASIC's MoneySmart Rookie suite of materials and resources has been designed to equip young people transitioning into adulthood with the motivation and tools to manage their money with confidence. The suite features videos, case studies, animations and activities designed to provide engaging real-life learning. These were developed in consultation with young people.

Support resources for educators include a community educator guide, Year 9 and 10 lesson plans mapped to the Australian curriculum, introductory videos and interactive 'convo' activities that allow young people to practise important conversations with people they will need to deal with, such as real estate agents and salespeople. Materials for young people are located at moneysmart.gov.au/teaching/teaching-resources/moneysmart-rookie-for-educators

There are six topics in the MoneySmart Rookie suite:

- First car
- Credit and debt
- Mobile phone ownership
- Moving out of home
- Online financial transactions
- First job

Activity 2

Saving: investigating compound interest (120 minutes)

Scenario

Cathy and Dinuka will need some money for their holiday. Cathy suggested that they open savings accounts so that they can save money for their holiday and earn interest.

Dinuka is thinking of depositing \$600 into a savings account, and Cathy is thinking of depositing \$300.

- ▶ Ask the class if they have heard of compound interest.
 - What do they know about it?
 - Can they explain the difference between compound interest and simple interest?

This difference between compound interest and simple interest will become clear to students as they work through **Worksheet 1: Using a compound interest calculator** and **Worksheet 2: Investigating compound interest**. The worksheets are designed to help students understand that compound interest is calculated based on the existing amount in a bank account. Simple interest, which is always calculated based on the principal, is covered in ASIC's MoneySmart Teaching Year 9 Mathematics Unit.

- ▶ Students complete **Worksheet 1: Using a compound interest calculator**. The online calculator can be found at moneysmart.gov.au/tools-and-resources/calculators-and-tools/compound-interest-calculator
- ▶ Class discussion on completion of **Worksheet 1: Using a compound interest calculator**:
 - Discuss students' answers to questions 4 and 7. These questions are designed to help students understand the nature of compound interest.
 - Discuss the way that the graph is coloured.
 - What happens to the ratio of the interest to the balance over time?
- ▶ Students complete **Worksheet 2: Investigating compound interest**.
- ▶ Discuss the difference between compound and simple interest, and the answers students provided to questions 1 b, c and d.
 - What is the difference in the way simple and compound interest are calculated?
 - Which type of interest is more favourable to the customer?
 - In question 1c, how much less interest is earned if the interest is not compounded?

In **Worksheet 2: Investigating compound interest**, bank fees are not taken into account. Bank fees are considered in the MoneySmart Teaching Year 8 and Year 9 Mathematics Units. For this unit, they are omitted so that the compound interest formula can be deduced.

- ▶ Students use existing knowledge or online research to answer the following question:
 - What are the types of services for which banks charge a fee?
 - In **Worksheet 2: Investigating compound interest**, question 1, identify where fees might be charged and how much these fees might be.

Activity 3

Arriving at the compound interest formula (120 minutes)

Revise the basic use of a spreadsheet, including:

- the way that individual cells are referenced (e.g. "A1")
- the way that blocks of cells are referenced (e.g. "A1:C5")
- the use of formulas, including the "*" and "/" symbols for multiplication and division respectively (e.g. "=A2/A1")
- the use of built-in formulas (e.g. "=MAX(A1:A10)").

In **Worksheet 2: Investigating compound interest**, answers were often rounded to the nearest 5 cents, and these rounded answers were used in subsequent calculations. This is realistic as it is what banks do. This rounding will be avoided from now on, in order to simplify the process and make it possible to arrive at a formula.

- ▶ Students complete **Worksheet 3: Using a spreadsheet to calculate compound interest**. If necessary, read through the explanations in questions 9 and 11 with the class.
 - Check students' answers to question 18.
- ▶ Extension: Change the spreadsheet so that the monthly interest rate is recorded in cell "F1". When this cell is changed, the values in the spreadsheet should reflect the new interest rate. Students could research absolute referencing (e.g. F\$1) to assist them.
- ▶ Students discuss the following in pairs, then share their answers with the class:
 - Explain, in your own words, the meaning of the spreadsheet formula "=1.003*B4".

- Explain, in your own words, why so many formulas of this type were used in column B of the spreadsheet.

A pre-requisite for understanding the compound interest formula is the realisation that compound interest can be calculated using repeated multiplication. This understanding is emphasised in the first two questions of the group discussion above and in question 1 of **Worksheet 4: Generalising expressions of compound interest**.

- ▶ Students complete **Worksheet 4: Generalising expressions of compound interest**. Question 1 could be completed as a class before question 2 is attempted in small groups.
 - Discuss students' answers to the questions in the worksheet.
 - Alert students to the similarities and differences between the answers to question 1d and question 2d.
 - Ask students what each number in each of these answers represents [principal, interest rate as a decimal, number of time periods].
 - Deduce the compound interest formula.
 - Provide opportunities for students to practice using the formula.

Activity 4

Applying the compound interest formula (120 minutes)

Scenario

'I've just checked holiday prices online, and I've taken inflation into account. Even with the interest we will earn on our savings account, we won't have enough money for the holiday we want,' Cathy said.

'That's okay, Cathy. I have a plan,' said Dinuka. 'I'm going to buy a computer soon, but I can sell it before our holiday if we need extra money.'

- ▶ Class discussion: Cathy mentions inflation.
 - What is inflation? (Note: Inflation is investigated in ASIC's MoneySmart Teaching Year 9 Mathematics Unit)
 - Why is it important to take inflation into account when we plan for the future?
- ▶ Students complete **Worksheet 5: Applying the compound interest formula to inflation**.
- ▶ Class discussion on completion of **Worksheet 5: Applying the compound interest formula to inflation**:
 - What are some examples of items that lose their value (depreciate) over time?
 - What are some examples of items that gain value (appreciate) over time?
 - How can we predict if an item will appreciate or depreciate over time?
 - How certain or uncertain can these predictions be?

- ▶ Students complete **Worksheet 6: Investigating depreciation**. Collect students' solutions to assess their understanding of the formula to determine further learning needs.
- ▶ Class discussion after reviewing students' solutions:
 - Question 2: Paolo's situation is a common, but avoidable one for young people.
 - Discuss students' answers to question 2d. Why it is generally a risk to borrow money to buy an asset that will depreciate over time?
 - There are some circumstances where, for financial reasons, people borrow money to buy a depreciating asset. Can you think of some of these circumstances?
 - Discuss the fact that Paolo has borrowed from the car dealer and the implications of this.
 - Paolo is now in debt.
 - If Paolo needs to apply for a loan he will need to declare this debt and it may impact on his eligibility for further borrowing.
 - There will be legal ramifications if he is unable to pay back the borrowed money, or fails to make a repayment.
 - Why are some loans (e.g. some home loans) considered to be a 'good' debt?
- ▶ Activity in pairs:
 - Read the article 'Good vs bad debt' at <https://money.howstuffworks.com/personal-finance/debt-management/debt1.htm>
 - Brainstorm scenarios that demonstrate good debt and scenarios that demonstrate bad debt.
 - Each pair shares one of their scenarios with the class.
- ▶ View videos on credit and debt at moneysmart.gov.au/teaching/teaching-resources/moneysmart-rookie-for-educators and also in the under 25s section at <https://www.moneysmart.gov.au/life-events-and-you/under-25s/credit-and-debt>
- ▶ Students can consider questions on borrowing and credit in the quizzes on money topics at moneysmart.gov.au/tools-and-resources/quizzes
- ▶ Further research can be undertaken by exploring the contents of the Borrowing and credit tab on the MoneySmart website moneysmart.gov.au/borrowing-and-credit

Activity 5

Borrowing money (120 minutes)

Scenario

Cathy felt that she would need more money for her holiday. 'I guess if I don't have enough I could get a loan,' she told her mother.

'I don't think that's a good idea,' her mother said. 'If you borrow money it doesn't make your holiday more affordable, in fact it makes it more expensive'.

'More *expensive*?' Cathy asked.

- ▶ Class discussion: Why would borrowing money make the holiday more expensive?
- ▶ Students complete **Worksheet 7: Applying the compound interest formula to borrowing**.

- ▶ Discuss part c of the example on the worksheet. Alert students to the fact that although \$100 was repaid, the debt decreased by only half that amount. Some points for discussion:
 - When we save, compound interest works in our favour but when we borrow it works against us.
 - Some people make repayments on their credit card, but their debt does not decrease. How could this be possible? (use real or created credit card statements for students to explore various scenarios of repayment)
- ▶ Watch and discuss the video 'Credit hangover – MoneySmart Rookie – <https://www.youtube.com/watch?v=hIZwFuoPxiM>
- ▶ Group activity: Banks and other established financial institutions offer variable rates of interest, but some lenders offer a flat rate. Research online the answers to the following questions:
 - What is the difference between variable rates of interest and flat rates of interest?
 - A variable rate has some advantages to the borrower. What are they?
- ▶ Class discussion:
 - Some lenders allow borrowers to make extra repayments. Why does making extra repayments at the beginning of a loan save more money than making extra repayments at the end of a loan?
 - Why is it cheaper to pay back a loan with fortnightly repayments than with monthly repayments?
- ▶ Activity in pairs: Cathy's mother explains to Cathy that borrowing money for a holiday may not be a good idea. Role-play this discussion with your partner.

Activity 6

Revisiting the scenarios (90 minutes)

- ▶ Group activity: Students work in their Activity 1 groups and complete **Worksheet 8: How do we plan for the future?**
- ▶ Students may refer to:
 - ASIC's MoneySmart Savings Goal Calculator moneysmart.gov.au/tools-and-resources/calculators-and-apps/savings-goals-calculator
 - ASIC's MoneySmart Credit Card Calculator moneysmart.gov.au/tools-and-resources/calculators-and-apps/credit-card-calculator

Worksheets

Worksheet 1: Using a compound interest calculator

A compound interest calculator can help us understand how much money we will have in a savings account in the future. It can also help us understand how compound interest works.

1. Type 'MoneySmart compound interest calculator' into a search engine to find the MoneySmart compound interest calculator. Use this calculator to complete the questions in this worksheet.
2. Suppose Dinuka deposits \$600 into a savings account that pays 5% compound interest each year. Use the calculator to find how much money she would have after 3 years. Dinuka's 'initial deposit' is \$600 and she makes no further deposits, so there are no regular deposits and no withdrawals.

3. Find the amount of interest that Cathy would earn if she opened a savings account with a \$300 deposit and made no further deposits or withdrawals for 6 years. Assume that the compound interest rate is 4% p.a.

4. Use the figures in question 3, but change the number of years in the calculator to 20. This change makes it easier to notice that the 'steps' in the graph are not all the same size.

- a. What do the 'steps' represent?

- b. Describe how the size of the 'steps' changes over time.

Worksheet 1: Using a compound interest calculator (cont)

5. Using a monthly compound frequency instead of an annual compound frequency, calculate the answers to the following questions.

a. Dinuka deposits \$600 into a savings account that pays 5% compound interest per year paid monthly. How much money would Dinuka have after 3 years?

b. Cathy deposits \$300 into a savings account that pays 4% compound interest per year, paid monthly.

i How much would Cathy have after 6 years?

ii How much would Cathy have after 20 years?

6. Dinuka deposits \$600 into her savings account, which pays 5% interest, and decides to increase her savings by depositing \$10 per month to her account to ensure she has enough for her holiday. She does not withdraw any money.

a. Calculate how much money Dinuka would have saved after 3 years:

i using compound interest paid monthly _____

ii using compound interest paid annually _____

b. Calculate how much money Dinuka would have saved after 20 years:

i using compound interest paid monthly _____

ii using compound interest paid annually _____

c. Would you choose to have compound interest paid monthly or annually? Explain your answer.

Worksheet 1: Using a compound interest calculator (cont)

- d. What difference does it make to Dinuka’s savings for her holiday, by depositing \$10 each month into her savings account and having the interest paid monthly, compared to her savings plan in question 5a? How much extra does Dinuka have after 3 years of her new savings plan?

7. Change the setting on the calculator so that:

- the initial deposit is \$300
- there are no additional deposits
- the interest rate is 6% compounded annually
- the term is 6 years.

- a. Use the calculator to complete the second column in the table below. You can find the correct balances by hovering your computer mouse over the graph.

Year	Balance (\$)	Interest earned over the 12-month period (\$)
0	300	0
1	318	18
2	337	19
3		
4		
5		
6		
Total interest earned		\$

Worksheet 1: Using a compound interest calculator (cont)

- b. The third column contains the amount of interest earned in that year. For example \$18 of interest is earned in the first year, and \$19 of interest is earned in the second year. Complete the third column in the table.
- c. Explain how the interest earned changes over time. Can you suggest why it changes in this way?

8. Suppose you saved your money in a moneybox at home, and you were able to save \$10 each month (with no initial deposit).

- a. How much money would you save per year? (This is your regular deposit in the calculator.)

- b. If you put this \$10 per month into a bank and the interest rate was 6% p.a. how many years would it take for your balance to be \$5000?

- c. When you reach this balance, how much interest would you have earned?

9. At an interest rate of 6%, how much money would you need to invest each year to be a millionaire when you are 60 years old?

Worksheet 2: Investigating compound interest

Example:

Dinuka is considering a savings account at SalvoBank. The account has an interest rate of 4%, compounded annually. Suppose that Dinuka deposits \$600 into this account and does not withdraw any money for several years.

- a. How much money will Dinuka have in her account after 1 year?

Solution:

After 1 year, the bank will pay her interest at a rate of 4% p.a.

So, Dinuka will have 104% of \$600

$$600 \times 1.04 = 624$$

Dinuka will have \$624 in her account after 1 year.

- b. How much money will Dinuka have in her account after 2 years?

Solution:

At the end of the first year, there is \$624 in Dinuka's account.

At the end of the second year, she is again paid interest at a rate of 4% p.a.

$$624 \times 1.04 = 648.96$$

Round this to the nearest 5 cents.

Dinuka will have \$648.95 in her account after 2 years.

- c. How much money will Dinuka have in her account after 3 years?

Solution:

At the end of the second year, there is \$648.95 in Dinuka's account.

At the end of the third year, she is again paid interest at a rate of 4% p.a.

$$648.95 \times 1.04 = 674.908$$

Round this to the nearest 5 cents.

Dinuka will have \$674.90 in her account after 3 years.

Worksheet 2: Investigating compound interest (cont)

1. At TyroBank the interest rate for a savings account is 3.8%, compounded annually.
 - a. If Dinuka deposited \$600 into this account, how much money would she have in her account after:
 - i. 1 year? _____
 - ii. 2 years? _____
 - iii. 3 years? _____
 - b. Explain why Dinuka earns more compound interest each year.

 - c. If the bank account earns 3.8% *simple* interest p.a., would you expect Dinuka to have more or less money in her account after 3 years than calculated in question a (iii)?

 - d. Check your answer to question c by calculating the amount of money Dinuka would have in her account if the bank paid 3.8% *simple* interest p.a. Show your calculation in the box below.

2. Many savings accounts are compounded monthly. SalvoBank offers a savings account with a 3.6% p.a. interest rate, compounded monthly.
 - a. If the interest rate is 3.6% per year, find the percentage interest per month.

Name: Class: Date:

Worksheet 2: Investigating compound interest (cont)

b. If Dinuka opens this account with a deposit of \$600, how much money will she have in her account after:

i. 1 month? _____

ii. 2 months? _____

iii. 3 months? _____

Worksheet 3: Using a spreadsheet to calculate compound interest

1. Read the following information.

Dinuka opens a savings account with a \$600 deposit. The interest on the savings account is 0.3% per month, compounded monthly. Find how much money Dinuka will have in her account after 3 years.

2. Open Microsoft Excel.
3. Type "Principal:" into cell B1. The principal is the amount of money that Dinuka starts with in her savings account.
4. Type 600 into cell C1.
5. We are going to work out how much money Dinuka has in her account each month. Type "Month" in cell A3 and "Account balance" in cell B3. Make these cells bold, as they are column headings.
6. Type 0, 1 and 2 in cells A4, A5 and A6, respectively.

	A	B	C
1		Principal:	600
2			
3	Month	Account balance	
4	0		
5	1		
6	2		
7			
8			
9			

7. Click and drag over cells A4, A5 and A6 and notice that a small square appears at the bottom right corner of the highlighted rectangle. Drag this square downwards to row 28.
8. Dinuka opens the account with a principal of \$600. In cell B4 type "=C1" and press Enter.
9. Cell B5 will contain the amount of money in Dinuka's account after 1 month. At the end of the month, Dinuka's account receives interest at a rate of 0.3%. This means that her account will contain 100.3% of \$600. Using a decimal number instead of a percentage, this would be 600×1.003 . In cell B5, type "=1.003*B4" and press Enter.

Worksheet 3: Using a spreadsheet to calculate compound interest (cont)

10. Click and drag to select cells B4 to B28. Right-click on your selection and choose 'Format Cells'. Choose 'Currency' as the category, specify 2 decimal places and click 'OK'.
11. Cell B6 will need to contain the amount of money in Dinuka's account at the end of the second month.

We can see from our spreadsheet that at the end of the first month Dinuka had \$601.80 in her account.

At the end of the second month, Dinuka is paid 0.3% interest.

This means that her account will contain 100.3% of \$601.80.

Using a decimal number instead of a percentage, this would be 601.80×1.003 .

In cell B6, type `"=1.003*B5"` and press Enter.

12. Add a formula to cell B7. You will know you are correct when cell B7 displays \$605.42.
13. Add formulas to cells B8 and B9.
14. There is a fast way to 'insert' these formulas. Click on cell B5 again. Notice the small black square at the bottom right corner of the cell. Drag this down to row 28.
15. Click on some cells in column B to see their formulas. Are the formulas correct?
16. Based on your spreadsheet, how much money will Dinuka have in her account after:
 - a. 5 months? _____
 - b. 12 months? _____
 - c. 24 months? _____
17. Calculate the amount of interest Dinuka will have received after 24 months.

18. Adjust your spreadsheet to find how much Dinuka would have in her account after 24 months if she had opened the account with \$900 instead of \$600. (Hint: You will only need to change the value of one cell.)

Worksheet 4: Generalising expressions of compound interest

1. Cathy opens a savings account with a \$300 deposit. The interest on the account is 0.2% per month, compounded monthly. She makes no further withdrawals or deposits.

a. Complete the following table:

Month	Account balance
0	300
1	
2	
3	
4	

b. What operation (addition, subtraction, multiplication or division) did you use to find the missing numbers in the table?

c. Find Cathy's account balance after 15 months if she makes no withdrawals or further deposits during that time. (Hint: Use your answer to question b to deduce a faster way than extending the table.)

d. Write an algebraic expression for Cathy's account balance after n months.

e. How would the answer to question d change, if Cathy's initial deposit into the account was \$350?

f. How would the answer to question d change, if the monthly interest rate was 0.25%?

g. How would the answer to question d change, if Cathy's initial deposit was \$2000 and the monthly interest rate was 0.32%?

Worksheet 4: Generalising expressions of compound interest (cont)

2. Dinuka opens a savings account with a \$600 deposit. The interest on the savings account is 4% p.a., compounded yearly.

a. Complete the following table:

Year	Account balance
0	600
1	
2	
3	
4	

b. To find the missing values in the table above, Dinuka can multiply each previous value by a certain number. What is this number?

c. Without extending the table, find Dinuka's account balance after 10 years if she makes no further deposits or withdrawals.

d. Write an expression for Dinuka's account balance after n years.

e. How would the answer to question d change, if Dinuka's initial deposit was \$6000 and the annual interest rate was 5%?

Worksheet 5: Applying the compound interest formula to inflation

Example:

The inflation rate is about 3.5% each year. Suppose that 5 years ago an item cost \$45. How much would you expect it to cost today?

Solution:

The cost starts at \$45 and increases by 3.5%, five times. So:

$$P = 45, r = 0.035 \text{ and } n = 5$$

$$\begin{aligned} A &= P(1 + r)^n \\ &= 45 \times (1 + 0.035)^5 \\ &= 53.44588375 \end{aligned}$$

After 5 years, we would expect the item to cost approximately \$53.45.

1. Dinuka finds a holiday package that costs \$750. Assuming 3.6% inflation p.a., how much would this holiday be worth in 2 years from now?

2. The inflation rate is about 4.5% each year. Suppose that 10 years ago an item cost \$200. How much would you expect it to cost today?

3. The inflation rate is about 2.5% each year. Suppose that 7 years ago an item cost \$350. How much would you expect it to cost today?

4. The inflation rate is about 3.5% each year. Suppose that 5 years ago an item cost \$45. How much would you expect it to cost today?

5. The inflation rate is about 7.5% each year. Suppose that 10 years ago an item cost \$20. How much would you expect it to cost today?

Worksheet 6: Investigating depreciation

Example:

Dinuka would like to buy a computer. She plans to sell it in 2 years' time because she will need some extra money for her holiday. She visits a showroom and finds the model she wants for \$1600.

- a. If the computer depreciates in value at a rate of 16% p.a., how much will her computer be worth when she plans to sell it in 2 years' time?

Solution:

The price starts at \$1600 and *decreases* by 16%, 2 times.

The rate (r) will be negative because the price is decreasing. So:

$$P = 1600, r = -0.16 \text{ and } n = 2$$

$$\begin{aligned} A &= P (1 + r)^n \\ &= 1600 \times (1 - 0.16)^2 \\ &= 1128.96 \end{aligned}$$

In 2 years' time, we would expect her computer to be worth approximately \$1130 (to the nearest \$10).

- b. Find Dinuka's loss if she sold the computer for the amount in question a.
Dinuka's loss is the difference between the cost price and the selling price.

$$1600 - 1130 = 470$$

Dinuka's loss is \$470.

1. Suppose Dinuka found another computer for sale that was already 3 years old. In other words, it had already depreciated over the past 3 years and its current price was \$500.

- a. If this computer also depreciates in value at a rate of 16% p.a., how much will it be worth when she plans to sell it in 2 years' time?

Worksheet 6: Investigating depreciation (cont)

b. Find Dinuka's expected loss when she sells this second-hand computer.

c. How does this loss compare to the loss she would incur if she bought the more expensive computer in the example above?

d. Why do older items depreciate more slowly than newer items?

e. Suppose Dinuka bought this cheaper computer and sold it in 2 years' time, and put the price difference of \$1100 into a bank account that pays 5% compound interest p.a.

i. How much money will she have in 2 years' time (note: include the sale price of her computer and the amount she will have in her bank account)?

ii. Compare this to the amount of money she would have if she bought the more expensive computer and sold it 2 years later.

2. Dinuka's older cousin Paolo has \$300 in savings and is considering borrowing money to buy a car. Paolo has found a car dealer that will allow him to pay only \$300 up front, followed by monthly payments of \$90 for 6 years.

a. If the car is worth \$3600, find how much interest Paolo will pay. In other words, how much more than \$3600 will Paolo pay the car dealer?

b. What simple interest rate will Paolo be paying per year?

Worksheet 6: Investigating depreciation (cont)

- c. Explain why it would be a lot cheaper for Paolo to save money before buying rather than to buy on these terms.

- d. Suppose that after Paolo loses his job 12 months after buying the car.

- i. How much money will he still owe the car dealer?

- ii. Assuming a depreciation rate of 16% per year, how much might Paolo hope to sell his car for?

- iii. What are some reasons that Paolo might be unable to sell the car for the price you found in question ii, and may need to lower his asking price?

Worksheet 7: Applying the compound interest formula to a borrowing

Example:

Suppose Cathy purchases a holiday package that costs \$760 using a credit card with an interest rate of 13% p.a., compounded monthly.

- a. What monthly interest rate is equivalent to 13% p.a.?

Solution:

$$13 \div 12 = 1.0833$$

The monthly interest rate is 1.0833% (correct to 4 decimal places).

- b. What debt will Cathy have on her credit card 3 months after the purchase, if she has made no repayments?

Solution:

Her debt starts at \$760 and increases 3 times by 1.0833%. So:

$$P = 760, r = 0.010833 \text{ and } n = 3$$

$$\begin{aligned} A &= P (1 + r)^n \\ &= 760 \times (1 + 0.010833)^3 \\ &= 784.9677731 \end{aligned}$$

After 3 months, her debt would be \$784.95 (to the nearest 5 cents).

- c. Suppose that 6 months after the purchase, Cathy is able to make a repayment of \$100, and that this is her first repayment. What debt would she then have on her credit card?

Solution:

Cathy will be charged interest for 6 months.

Her debt starts at \$760 and increases 6 times by 1.0833%. So:

$$P = 760, r = 0.010833 \text{ and } n = 6$$

$$\begin{aligned} A &= P (1 + r)^n \\ &= 760 \times (1 + 0.010833)^6 \\ &= 810.7558 \end{aligned}$$

After 6 months, her debt would be \$810.75 (to the nearest 5 cents).

Cathy pays back \$100 of this debt.

$$810.75 - 100 = 710.75$$

Cathy now owes \$710.75.

Worksheet 7: Applying the compound interest formula to a borrowing (cont)

1. Suppose Cathy purchased a cheaper holiday package costing \$520 and was able to find a credit card with an interest rate of 12% p.a.
 - a. How much will Cathy owe on her credit card 4 months after the purchase date, if she has made no repayments?

 - b. Suppose that 6 months after the purchase, Cathy is able to make a repayment of \$100, and that this is her first repayment.
 - i. What debt would she have on her credit card after this payment?

 - ii. How much less than her original debt is this?

2. Using ASIC's MoneySmart credit card calculator moneysmart.gov.au/tools-and-resources/calculators-and-apps/credit-card-calculator to help Cathy reduce her debt, answer the following questions.
 - a. How much will Cathy have to pay each month, to pay her debt in:
 - i. 2 years: _____
 - ii. 1 year: _____
 - b. If she pays only the minimum monthly payment how long will it take for her to pay off the debt?

3. Suppose Cathy purchased a holiday for \$5000 and the interest on her credit card is 12% p.a. If she pays only the minimum payment each month:
 - a. How long will it take to pay off the debt?

 - b. How much interest would she end up paying?

 - c. How much would she have to pay each month to pay off the debt within 2 years?

Name: Class: Date:

Worksheet 8: How do we plan for the future? (cont)

Criteria for assessment

Task 1:

- ▶ Relevant questions were added to the list that was generated in activity 1.
- ▶ At least three questions relating to each of the five topics were included.

Task 2:

- ▶ A realistic scenario, where financial planning is relevant, was described.
- ▶ Each of the five financial topics was addressed and relevant considerations were included.

Task 3:

- ▶ A possible financial goal was identified.
- ▶ At least three reasons were given as to why or why not what has been learnt in this unit will or will not help in achieving this goal.

Solutions

Worksheet 1

Use an online compound interest calculator (it will probably round answers to whole dollars)

1. Use online compound interest calculator: moneysmart.gov.au/tools-and-resources/calculators-and-apps/compound-interest-calculator
2. \$695
3. The interest that Cathy would earn is \$80
Total savings = \$380
Initial deposit = \$300
Therefore, $380 - 300 = \$80$ interest earned.
4. a. The steps represent the interest earned.
Total savings after 20 years = \$657
Initial deposit = \$300
Therefore, $657 - 300 = \$357$ the interest earned over the 20 years.
b. The size of the steps increases over time because the amount on which the interest is calculated and added to is increasing each year.
5. a. \$697, this is \$2 more than if interest was compounded annually as in question 2 (\$695)
b. i. \$381, this is \$1 more than if interest was compounded annually as in question 3 (\$380)
ii. \$667, this is \$10 more than if interest was compounded annually as in question 4 (\$657)
6. a. i. \$1084
ii. \$1073
Note: Interest paid monthly over 3 years earns \$11 more than if paid annually over 3 years.
b. i. \$5738
ii. \$5560
Note: Interest paid monthly over 20 years earns \$178 more than if paid annually over 20 years.
c. Compound interest paid monthly will increase your savings more quickly than if paid annually.
d. Initial deposit of \$600 with compound interest of 5% p.a. paid monthly over 3 years and no other deposits or withdrawals would have a total saving of \$697.
By depositing \$10 per month, Dinuka increases her savings over the 3 years to \$1084 – an additional saving of \$387.

7. a. and b.

Year	Balance (\$)	Interest earned over the 12-month period (\$)
0	300	0
1	318	18
2	337	19
3	357	20
4	379	22
5	401	22
6	426	25
Total interest earned		\$126

c. The interest earned increases over time because the principal (the amount of money on which the interest is calculated) keeps increasing as the yearly interest is deposited to it.

8. a. $\$10 \times 12 = \120

b. Using the online calculator with \$10 deposited each month and interest calculated yearly – trial/enter 21 years and result will show \$4799; trial/enter 22 years and result will show \$5207. So, the answer is 22 years.

c. Interest = Total \$5207 less regular deposits of \$2640 (or $\$10 \times 264$ months) = interest earned of \$2567

9. Assume the student is 15 years old now, and invests for 45 years.

Assume the initial balance is \$0, and use trial and error by entering different regular yearly deposit amounts. Discuss what % of annual wages/salary should be put aside for savings.

Try \$5000 per year.

\$5000 invested for 45 years at 6% p.a. compounding yearly will amount to approximately \$1 063 718 after 45 years.

Worksheet 2

1. a. i. $600 \times 1.038 = \$622.80$ (\$623 rounded)

ii. $622.8 \times 1.038 = \$646.47$ (\$646 rounded)

iii. $646.47 \times 1.038 = \$671.04$ (\$671 rounded)

b. The compound interest is added to the principal after each year, thus the principal grows and interest for the next year is calculated on this increased (compounded) principal.

c. Dinuka would have less money in her account because simple interest each year will be calculated on a principal of \$600. Simple interest is not added to the principal each year.

d. Simple interest on \$600 at 3.8% for 3 years = $600 \times .038 \times 3 = \68.40 .
So, Dinuka would have \$668.40 in her account.

2. a. $3.6\% \div 12 = 0.3\%$ or $0.036 \div 12 = 0.003$

- b. i. $600 \times 1.003 = \$601.80$
 ii. $601.8 \times 1.003 = \$603.61$
 iii. $603.61 \times 1.003 = \$605.42$

Worksheet 3

16. a. \$609.05
 b. \$621.96
 c. \$644.72
17. Interest = $644.72 - 600 = \$44.72$
18. Dinuka would have \$967.09 in her account after 24 months.

Worksheet 4

1. a.

Month	Account balance
0	300
1	300.60
2	301.20
3	301.80
4	302.40

- b. Multiplication is used
- c. $300 \times 1.002^{15} = \309.13
- d. 300×1.002^n
- e. 350×1.002^n
- f. 300×1.0025^n
- g. 2000×1.0032^n

2. a.

Year	Account balance
0	600
1	624.00
2	648.96
3	674.92
4	701.92

- b. Multiply by 1.04
- c. $600 \times 1.04^{10} = \$888.15$

- d. 600×1.04^n
 e. 6000×1.05^n

Worksheet 5

(answers rounded correct to 2 decimal places)

1. $750 \times (1 + 0.036)^2 = \804.97
2. $200 \times (1 + 0.045)^{10} = \310.59
3. $350 \times (1 + 0.025)^7 = \416.04
4. $45 \times (1 + 0.035)^5 = \53.45
5. $20 \times (1 + 0.075)^{10} = \41.22

Worksheet 6

1.
 - a. $500 \times (1 - 0.16)^2 = \352.80 (or, approximately \$350, to the nearest \$10)
 - b. Expected loss: $\$500 - \$350 = \$150$
 - c. This loss is \$320 less than if she bought the more expensive computer.
 - d. Older items are not worth as much to begin with, so the depreciation when calculated in dollars will be less.
 - e.
 - i. $1100 \times (1 + 0.05)^2 = \1212.75
 So, Dinuka will have \$1562.75 ($\$1212.75 + \350)
 - ii. $1600 \times (1 - 0.16)^2 = \1128.96 or \$1130 (rounded).
 Dinuka would have approximately \$430 less after 2 years if she bought the more expensive computer ($1562.75 - 1130 = \$432.75$)
2.
 - a. Paolo will borrow \$3300 and will pay back \$6480 ($90 \times 12 \times 6 = 6480$). So, he will pay \$3180 in interest.
 - b. Simple Interest (SI) = $PRT \div 100$.
 So, $R = SI \times 100 \div P \div T$
 $3180 \times 100 \div 3300 \div 6 = 16.06\%$ p.a.
 - c. If Paolo saves more, then he would not have to borrow as much money and would pay less interest. Interest rates are high when buying on terms.
 - d.
 - i. $(90 \times 12 \times 6) - (90 \times 12) = \5400
 - ii. $3600 \times (1 - 0.16) = \3024
 - iii. The car may be damaged or mechanically unsound or not a popular brand choice for second-hand car buyers.

Worksheet 7

1.
 - a. Interest = 1% per month = 0.01
 $520 \times (1 + 0.01)^4 = \541.11 (or \$541.10 rounded)
 - b.
 - i. $520 \times (1 + 0.01)^6 - 100 = \451.99 (or \$452 rounded)

- ii. Using \$710.75 from Example c:
 $710.75 - 452 = \$258.75$ less than her original debt

- 2. a. i. \$25 per month
ii. \$47 per month

- b. 2 years 7 months

- 3. a. 18 years 11 months

- b. Total payments – original cost = interest paid
 $9315 - 5000 = \$4315$

- c. approx \$238 per month

Worksheet 8

See assessment rubric for marking criteria. Responses will vary for individual students.