

Money and financial mathematics: Year 8

MATHEMATICS CONCEPTUAL NARRATIVE

Leading Learning: Making the Australian Curriculum work for us
by bringing CONTENT and PROFICIENCIES together



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The ‘AC’ icon indicates the Australian Curriculum: Mathematics content description(s) addressed in that example.



The ‘From tell to ask’ icon indicates a statement that explains the transformation that is intended by using the task in that example.

More information about ‘Transforming Tasks’:
http://www.aclleadersresource.sa.edu.au/index.php?page=into_the_classroom



Look out for the purple pedagogy boxes, that link back to the SA TfEL Framework.



The ‘Bringing it to Life (BitL)’ tool icon indicates the use of questions from the *Leading Learning: Making the Australian Curriculum Work for Us* resource.

Bringing it to Life (BitL) key questions are in bold orange text.

Sub-questions from the BitL tool are in green medium italics – these questions are for teachers to use directly with students.

More information about the ‘Bringing it to Life’ tool:
http://www.aclleadersresource.sa.edu.au/index.php?page=bringing_it_to_life



Throughout this narrative—and summarised in ‘**Money and financial mathematics’ from Year 1 to Year 10** (see page 14)—we have colour coded the AC: Mathematics year level content descriptions to highlight the following curriculum aspects of working with money and financial mathematics:

- ◆ Recognise, order and count money
- ◆ Investigate and calculate with money
- ◆ Create plans and review financial decisions
- ◆ Solve problems relating to financial matters.

What the Australian Curriculum says about ‘Money and financial mathematics’

Content descriptions

Strand | Number and algebra.

Sub-strand | Money and financial mathematics.

Year 8 ♦ | ACMNA189

Students solve problems involving profit and loss, with and without digital technologies.

Year level descriptions

Year 8 ♦ | Students calculating accurately with simple decimals, indices and integers; recognising equivalence of common decimals and fractions including recurring decimals.

Year 8 ♦ | Students formulate, and model practical situations involving ratios, profit and loss.

Year 8 ♦ | Students justifying the result of a calculation or estimation as reasonable.

Achievement standards

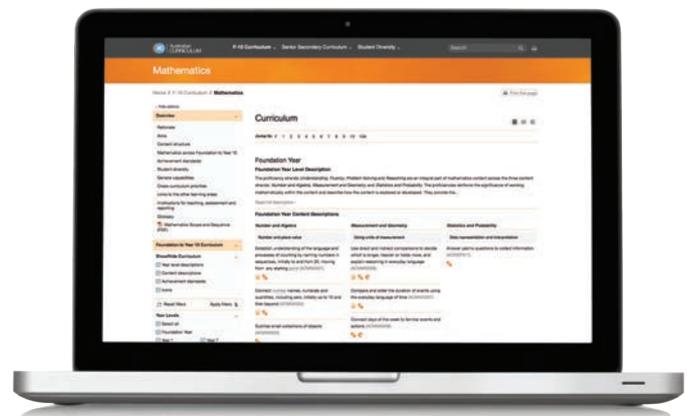
Year 8 ♦ | Students solve everyday problems involving rates, ratios and percentages.

Year 8 ♦ | Students solve problems involving profit and loss.

Numeracy continuum

Estimating and calculating with whole numbers

End of Year 8 ♦ | Students identify and justify ‘best value for money’ decisions. (Use money)



Source: ACARA, Australian Curriculum: Mathematics, Version 8.1

Working with Money and financial mathematics

Important things to notice about this sub-strand of the Australian Curriculum: Mathematics and numeracy continuum

What we are building on and leading towards in Year 8 'Money and financial mathematics'

In Year 7 students calculate percentages of quantities and express one quantity as a percentage of another.

In Year 8 students calculate percentage increases and decreases and solve problems involving profit and loss.

In Year 9 students solve problems using simple interest.

In Year 10 students bring together their knowledge of percentages and indices to develop an understanding of compound interest.

- While the creating and reviewing of financial plans in light of financial goals **is not** significantly emphasised in the AC content descriptions, **notice it is a focus in the numeracy continuum**. The references to 'solving problems' in real numbers and number and place value, that are evident in the Year level descriptions and the achievement standards, could certainly encompass learning opportunities for students in financial literacy.

Engaging learners

Classroom techniques for teaching Money and financial mathematics

MoneySmart Teaching

Young people (even if they are not money earners) are significant, if not critical, consumers in our financial society. Hence, there is an opportunity to explore a wide range of contexts that they are familiar with, but not necessarily informed about: credit cards, phone plans, internet purchases, currency conversions, etc.

ASIC's **MoneySmart Teaching** website is a good starting point to inform your learning design to support students in creating their own knowledge in real-life financial contexts:

<http://tiny.cc/SecondaryMoneySmart>

\$20 Boss

It is engaging to involve students in Business Enterprise programs like the one run by the Foundation for Young Australians (FYA), \$20 Boss.

Designed to make life easier for teachers and support them to bring the curriculum to life, \$20 Boss is a nationwide in-school challenge that aims to inspire and develop entrepreneurial skills and passion in young Australians. It can be delivered both through an online platform,

or through traditional class-based activities:
<https://www.fya.org.au/programs/20boss/>



From tell to ask

Transforming tasks by modelling the construction of knowledge (Examples 1–3)

The idea that education must be about more than transmission of information that is appropriately recalled and applied, is no longer a matter for discussion. We know that in order to engage our students and to support them to develop the skills required for success in their life and work, we can no longer rely on a ‘stand and deliver’ model of education. It has long been accepted that education through transmission of information has not worked for many of our students. Having said this, our classrooms do not necessarily need to change beyond recognition. One simple, but highly effective strategy for innovation in our classrooms involves asking ourselves the question:

What information do I need to tell my students and what could I challenge and support them to develop an understanding of for themselves?

For example, no amount of reasoning will lead my students to **create the terminology and symbolic representations relating to business calculations** for themselves. They need to receive this information in some way. However, it is possible my students can be challenged with questions that will result in them identifying **profitable situations and wise consumer decisions**, so I don’t need to instruct that information.

At this stage of development, students can foster an understanding of percentages as they relate to profit and loss. When teachers provide opportunities for students to make decisions about percentages in business contexts, they require their students to generalise from those decisions. Telling students which calculations to make, removes this natural opportunity for students to make conjectures, and verify connections that they notice when making good financial decisions.

When we are feeling ‘time poor’ it’s tempting to believe that it will be quicker to tell our students a formula, rather than ask a question (or series of questions) and support them to establish a formula for themselves. Whether this is true or not really depends on what we have established as our goal. If our goal is to have students recall and apply a particular formula during the current unit of work, then it probably is quicker to tell them the formula and demonstrate how to apply it. However, when our goal extends to wanting students to develop conceptual understanding, to learn to think mathematically, to have a self-concept as a confident and competent *creator* and *user* of mathematics, then telling students the formulae is a false economy of time.

When we challenge our students to *establish* theorems, we model that algebra can be powerful and useful. We provide our students with an authentic context for working algebraically. Telling students formulae removes this opportunity for students to generalise.

Curriculum and pedagogy links

The following icons are used in each example:



The ‘**AC**’ icon indicates the Australian Curriculum: Mathematics content description(s) addressed in that example.



The ‘**Bringing it to Life (BitL)**’ tool icon indicates the use of questions from the *Leading Learning: Making the Australian Curriculum Work for Us* resource.

The Bringing it to Life tool is a questioning tool that supports teachers to enact the AC: Mathematics Proficiencies: http://www.acleadersresource.sa.edu.au/index.php?page=bringing_it_to_life



The ‘**From tell to ask**’ icon indicates a statement that explains the transformation that is intended by using the task in that example.

This idea of moving ‘From tell to ask’ is further elaborated (for Mathematics and other Australian Curriculum learning areas) in the ‘Transforming Tasks’ module on the *Leading Learning: Making the Australian Curriculum work for Us* resource: http://www.acleadersresource.sa.edu.au/index.php?page=into_the_classroom



Look out for the purple pedagogy boxes, that link back to the SA TfEL Framework.

From tell to ask examples

Example 1: Going to the cinema – profit and loss Students solve problems involving profit and loss, with and without digital technologies.	ACMNA189 ♦
Example 2: Duelling discounts – best value Students solve problems involving profit and loss, with and without digital technologies.	ACMNA189 ♦
Example 3: Mobile phone bills – premium services Students identify and justify 'best value for money' decisions. (End Year 8: Use money)	NC LEVEL 5 ♦

Example 1: Going to the cinema – profit and loss



ACMNA189

Students solve problems involving profit and loss, with and without digital technologies.



Questions from the BitL tool

Understanding proficiency:

Can you answer backwards questions?

Can you represent/calculate in different ways?

Reasoning proficiency:

In what ways can you communicate?

In what ways can your thinking be generalised?



Instead of **telling** students about an optimal situation, we can challenge students to explore different options in a systematic way for themselves, by **asking** questions.

This activity is from the NRIC website.

This task requires the students to work backwards, and provides further opportunities to extend the challenge. The monetary values in this problem are in English pounds (GBP), but can easily be re-labelled as dollars; or you may decide to take this opportunity to discuss different currencies and exchange rates.

Backwards questions

A 'backwards' question requires a little more thinking about than a standard application question. We ask this type of question to challenge students to work flexibly with a concept. There are many ways that teachers can do this. Two possible options include asking questions where students need to complete missing information and asking questions that start by giving the students an answer.



The link to this problem on the NRIC site is:
<http://nrich.maths.org/10868>

Example 2: Duelling discounts – best value



ACMNA189

Students solve problems involving profit and loss, with and without digital technologies.



Questions from the BitL tool

Understanding proficiency:

What patterns/connections/relationships can you see?
Can you represent/calculate in different ways?

Reasoning proficiency:

In what ways can your thinking be generalised?
What can you infer?



Instead of **telling** students about an optimal situation, we can challenge students to explore different options in a systematic way for themselves, by **asking** questions.

This activity is a **Three-Act Maths Task** from Dan Meyer's blog. It can be presented to students along with the question, *What's the first question that comes to mind?*

This is an activity that challenges students to consider which coupon is the better deal, and whether it is always the case.

The **duelling discounts** activity can be accessed at: <http://threeacts.mrmeyer.com/duellingdiscounts/>



Example 3: Mobile phone bills – premium services



NC LEVEL 5 ♦

Students identify and justify ‘best value for money’ decisions. (End Year 8: Use money)



Questions from the BitL tool

Understanding proficiency:

What connections can you see?

Reasoning proficiency:

In what ways can you communicate?



Instead of **telling** students about the dangers of signing up for premium services, we can challenge students to explore different options in a systematic way for themselves, by **asking** questions.

The ASIC website resource, **MoneySmart Teaching**, aims to develop consumer and financial literacy capabilities in young Australians. MoneySmart Teaching uses real-life financial contexts for learning. The website can be accessed at:

<http://tiny.cc/SecondaryMoneySmart>



The following digital activity, **Premium services**, can be accessed at:

<https://www.moneysmart.gov.au/teaching/teaching-resources/digital-activity-premium-services>



You might want to introduce this learning by asking students to share any experiences they may have had, or heard of, with unexpected mobile phone bills; or if there are popular TV programs currently airing that encourage viewers to vote by text.

After the discussion, ask students to watch the digital resource and determine if they think it would be appropriate, or valuable, for Year 7 students to view.

Consider whether this might be an opportunity to collect some data from other students in the school regarding their experiences and knowledge about premium services, and connecting money and finance with statistics.

Proficiency: Problem Solving

Proficiency emphasis and what questions to ask to activate it in your students (Examples 4–6)

Problems are described in the AC: Mathematics as ‘meaningful’ or ‘unfamiliar’. Students of *all* abilities and ages should be provided with experiences of both meaningful and unfamiliar problems.

Meaningful problems

Meaningful problems are set in a context that a student can project themselves into. It may be that the mathematics and strategy being applied is familiar to the student or the problem relates to their own life experience. Connecting with a context does not mean that the students have to see it as ‘fun’ nor does it have to relate to an immediately practical situation from daily life.

Students can connect with a problem through provocations such as the use of manipulatives (either physical or digital) or through a dramatisation (eg, a story, interesting background information, a video clip). The intention is to give students the opportunity to work as a mathematician would work, in a context that they can access at their current stage of development.

Unfamiliar problems

Fundamentally there are two groups of unfamiliar problems:

- Problems for which the students would not be able to say that they had done a similar example previously, they would therefore need to create an approach (develop a strategy).
- Problems in which the students develop a new piece of knowledge. They begin the problem by applying the knowledge/skills that they have and they complete the problem having recombined that knowledge to form a new piece of understanding.

Growth mindset: Learning that not knowing is the beginning of a learning opportunity

Unfamiliar problems tend to provoke a response of, ‘I don’t know’, or ‘I’m not sure’. Students respond differently to this feeling; some shut down, others begin to ask, ‘But how could I work that out?’

In developing powerful learners we are aiming for all of our students to learn that ‘not knowing’ is the *beginning of a learning opportunity* and that the first move that they need to make on the journey to finding out more is to ask, ‘What could I do to work this out?’

Engaging in problem solving supports the move *from tell to ask*

Instead of **telling** students:

- the problem to solve
- the information they’ll need
- the steps they should take.

We can **ask students to identify**:

- the problem to solve
- the information they’ll need
- a possible process to use.

Proficiency: Problem Solving examples

Example 4: Tree tops – optimal planting

Students solve problems involving profit and loss, with and without digital technologies. Students identify and justify ‘best value for money’ decisions. (End Year 8: Use money)

ACMNA189 ◆
NC LEVEL 5 ◆

Example 5: Dandy candies – minimising cost

Students identify and justify ‘best value for money’ decisions. (End Year 8: Use money)

NC LEVEL 5 ◆

Example 6: Fish biz – running a business

Students evaluate financial plans to support specific financial goals. (End Year 10: Use money)

NC LEVEL 6 ◆

Example 4: Tree tops – optimal planting



ACMNA189

Students solve problems involving profit and loss, with and without digital technologies.

NC LEVEL 5

Students identify and justify 'best value for money' decisions. (End Year 8: Use money)



Questions from the BitL tool

Problem Solving proficiency:

Interpret; Model and plan; Solve and check, Reflect.

Reasoning proficiency:

What can you infer?

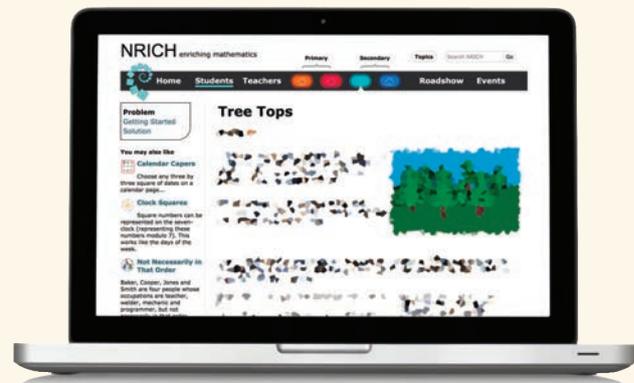


Instead of **telling** students about an optimal situation, we can challenge students to explore different options in a systematic way for themselves, by **asking** questions.

This activity is from the NRIC website.

In this task, money is in English pounds (GBP). Rather than changing the task before students consider the problem, you can use this is an opportunity to discuss different monetary systems and conversions.

The link to this problem on the NRIC site is:
<http://nrich.maths.org/918>



Example 5: Dandy candies – minimising cost



NC LEVEL 5 ♦

Students identify and justify 'best value for money' decisions. (End Year 8: Use money)



Questions from the BitL tool

Problem Solving proficiency:

Interpret; Model and plan; Solve and check, Reflect.

Reasoning proficiency:

What can you infer?



Instead of **telling** students about an optimal situation, we can challenge students to explore different options in a systematic way for themselves, by **asking** questions.

This activity is a **Three-Act Maths Task** from Dan Meyer's blog: 101 questions. It can be presented to students along with the question, *What's the first question that comes to mind?*

This is an activity that challenges students to consider which coupon is the better deal, and whether it is always the case.

You can add a stronger financial aspect to this task by asking students to incorporate the cost of the cardboard and ribbon for wrapping the candies.

The **dandy candies** activity can be accessed at: <http://www.101qs.com/3038>



Identifying the question to solve

The group can share questions and sort them into mathematical and non-mathematical questions. Then, of the mathematical questions, students can sort their questions into those that cannot be answered with the given information and those that could be answered using the given information, or additional information that could be inferred.

Dan Meyer has a technique, that we have seen many teachers adopt when generating and collecting questions from students. First, he asks students to individually write down questions that come to mind. Then, as he invites students to share their questions, he writes students' names next to the questions. He also asks if anyone else likes that question ie 'Did you write it down, or if you didn't, perhaps you still think that it's a good question'. Through doing this, both Dan and his class get a sense of the questions that are of interest to the students.

Example 6: Fish biz – running a business



NC LEVEL 6 ♦

Students evaluate financial plans to support specific financial goals. (End Year 10: Use money)



Questions from the BitL tool

Problem Solving proficiency:

**Interpret; Model and plan;
Solve and check, Reflect.**

Reasoning proficiency:

What can you infer?



Instead of **telling** students about an optimal situation, we can challenge students to explore different options in a systematic way for themselves, by **asking** questions.

This activity is from the Scootle website.

In this activity, students manage the stock and finances of a fish distribution company. The goal is to maximise profits after trading for three months. Their role is to check the bank balance and stock levels, pay bills, keep customers satisfied, order wholesale stock, take retail orders, deliver stock and issue invoices.

This activity is ideal for group work. Recording accurately and planning ahead is essential to keeping the business afloat.

The **Fish biz** activity can be accessed at:
<http://www.scootle.edu.au/ec/viewing/L5203/index.html>

A similar example (involving cash flow and credit) appears in the *Money and financial mathematics: Year 9* narrative.



Connections between ‘Money and financial mathematics’ and other maths content

There are many opportunities to connect to other content in the AC: Mathematics, when we use Money and financial mathematics as a starting point.

Here are just some of the possible connections that can be made:

Mathematics: Year 8	
Whilst working with Money and financial mathematics, connections can be made to:	How the connection might be made:
Students carry out the four operations with rational numbers and integers, using efficient mental and written strategies and appropriate digital technologies. ACMNA183	Refer to: Example 1: Going to the cinema – profit and loss Example 2: Duelling discounts – best value Example 4: Tree tops – optimal planting
Students solve a range of problems involving rates and ratios, with and without digital technologies. ACMNA188	Refer to: Example 1: Going to the cinema – profit and loss Example 2: Duelling discounts – best value Example 6: Fish biz – running a business
Students solve linear equations using algebraic and graphical techniques. They also verify solutions by substitution. ACMNA194	Refer to: Example 1: Going to the cinema – profit and loss Example 4: Tree tops – optimal planting
Students use formulas to solve problems involving volume. ACMMG198	Refer to: Example 5: Dandy candies – minimising cost
Students investigate techniques for collecting data, including census, sampling and observation. ACMSP284	Refer to: Example 3: Mobile phone bills – premium services Example 6: Fish biz – running a business
Students explore the practicalities and implications of obtaining data through sampling, using a variety of investigative processes. ACMSP206	Refer to: Example 3: Mobile phone bills – premium services

Making connections

We know that when our students meet a concept frequently and in different contexts, they have a greater chance of developing understanding. With this in mind, it is our responsibility to help our students to make these connections by intentionally designing tasks that connect a number of different content descriptions. Alternatively, connections can be made through questioning individuals, or small groups of students.

‘Money and financial mathematics’ from Year 1 to Year 10

The AC: Mathematics year level content descriptions shown here have been colour coded to highlight the following curriculum aspects of working with Money and financial mathematics:

Recognise, order and count money ♦

From Year 1 to Year 3 students recognise, order and count money.

Investigate and calculate with money ♦

From Year 3 to Year 10 students investigate and calculate with money.

Create plans and review financial decisions ♦

From Year 5 to Year 7 students create simple financial plans.

Solve problems relating to financial matters ♦

From Year 8 to Year 9 students solve problems relating to financial matters.

Year level	‘Money and financial mathematics’ content descriptions from the AC: Mathematics
Year 1 ♦	Students recognise, describe and order Australian coins according to their value. ACMNA017
Year 2 ♦	Students count and order small collections of Australian coins and notes according to their value. ACMNA034
Year 3 ♦ ♦	Students represent money values in multiple ways and count the change required for simple transactions to the nearest five cents. ACMNA059
Year 4 ♦	Students solve problems involving purchases and the calculation of change to the nearest five cents with and without digital technologies. ACMNA080
Year 5 ♦	Students create simple financial plans. ACMNA106
Year 6 ♦	Students investigate and calculate percentage discounts of 10%, 25% and 50% on sale items, with and without digital technologies. ACMNA132
Year 7 ♦ ♦	Students investigate and calculate ‘best buys’, with and without digital technologies. ACMNA174
Year 8 ♦	Students solve problems involving profit and loss, with and without digital technologies. ACMNA189
Year 9 ♦	Students solve problems involving simple interest. ACMNA211
Year 10 ♦	Students connect the compound interest formula to repeated applications of simple interest using appropriate digital technologies. ACMNA229

Numeracy continuum: Estimating and calculating with whole numbers

End Foundation	Use money: Recognise the different value of coins and notes in the Australian monetary system.
End Year 2	Use money: Identify and use combinations of coins and notes for simple purchases.
End Year 4	Use money: Estimate the change from simple purchases.
End Year 6	Use money: Create simple financial plans, budgets and cost predictions.
End Year 8	Use money: Identify and justify ‘best value for money’ decisions.
End Year 10	Use money: Evaluate financial plans to support specific financial goals.

Source: ACARA, Australian Curriculum: Mathematics, Version 8.1

Resources

NRICH website

<http://nrich.maths.org>

In this conceptual narrative we have highlighted the possibility of using tasks from an organisation called NRICH enriching mathematics.

The NRICH website contains a large collection of high quality maths problem solving tasks, together with suggestions about content that may be related to the task, ways to get started and different (valid) solutions that have been submitted by students from around the world.



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Dan Meyer's blog: 101 questions

<http://www.101qs.com>

Dan's blog contains images and short films that can be presented to students along with the question: *What's the first question that comes to mind?*

A spreadsheet of *Dan Meyer's Three-Act Maths Tasks* can be accessed at <http://bit.ly/DM3ActMathTasks>.



Scoutle

<https://www.scoutle.edu.au/ec/p/home>

This website has over 20,000 quality-assured digital learning resources aligned to the Australian Curriculum. You can filter your search to uncover a wealth of relevant teaching and learning items.



MoneySmart Teaching

<http://tiny.cc/SecondaryMoneySmart>

MoneySmart Teaching is a comprehensive strategy to develop consumer and financial literacy capabilities in young Australians. MoneySmart Teaching uses real-life financial contexts for learning.



Start Smart

<http://www.startsmart.com.au/Secondary/program-overview>

The **Start Smart Secondary program** offers a suite of workshops developed for students in Years 7–11. Each workshop focuses on a different topic in depth and explores financial concepts such as understanding the impact of financial choices, getting your first job and managing your mobile phone as well as basic investment principles, savings goals and budgeting.

The Secondary program is an interactive learning experience that is designed to engage students and empower them to make confident financial choices.



Do you want to feel more confident about the maths you are teaching?
Do you want activities that support you to embed the proficiencies?
Do you want your students thinking mathematically rather than just doing maths?

If you answered **yes** to any of these questions, then this resource is for you.

Packed full of examples, along with questions you can ask students as they engage in their learning, this resource supports you to develop confidence in teaching the Australian Curriculum: Mathematics.

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