

Essential Mathematics 2019 v1.1

IA3 mid-level annotated sample response

September 2018

Problem-solving and modelling task

This sample has been compiled by the QCAA to assist and support teachers to match evidence in student responses to the characteristics described in the instrument-specific standards.

Assessment objectives

This assessment instrument is used to determine student achievement in the following objectives:

1. select, recall and use facts, rules, definitions and procedures drawn from Fundamental topic: Calculations and Unit 4 Topics 1 and 3
2. comprehend mathematical concepts and techniques drawn from Fundamental topic: Calculations and Unit 4 Topics 1 and 3
3. communicate using mathematical, statistical and everyday language and conventions
4. evaluate the reasonableness of solutions
5. justify procedures and decisions by explaining mathematical reasoning
6. solve problems by applying mathematical concepts and techniques drawn from Fundamental topic: Calculations and Unit 4 Topics 1 and 3.

Instrument-specific standards

Formulate	Solve	Evaluate and verify	Communicate	Grade
The student work has the following characteristics:				
<ul style="list-style-type: none"> documentation of appropriate assumptions accurate documentation relevant observations accurate translation of all simple and complex aspects of the problem by identifying mathematical concepts and techniques. 	<ul style="list-style-type: none"> accurate use of complex procedures to reach a valid solution discerning application of simple and complex mathematical concepts and techniques relevant to the task accurate and appropriate use of technology. 	<ul style="list-style-type: none"> evaluation of the reasonableness of solutions by considering the results, assumptions and observations documentation of relevant strengths and limitations of the solution and/or model justification of decisions made using mathematical reasoning. 	<ul style="list-style-type: none"> correct use of appropriate technical vocabulary, procedural vocabulary and conventions to develop the response coherent and concise organisation of the response, appropriate to the genre, including a suitable introduction, body and conclusion. 	A
<ul style="list-style-type: none"> statements of appropriate assumptions statements of relevant observations translation of simple and complex aspects of the problem by identifying mathematical concepts and techniques. 	<ul style="list-style-type: none"> use of complex procedures to reach a reasonable solution application of simple and complex mathematical concepts and techniques relevant to the task appropriate use of technology. 	<ul style="list-style-type: none"> statements about the reasonableness of solutions by considering the context of the task statements about relevant strengths and limitations of the solution and/or model statements about decisions made relevant to the context of the task. 	<ul style="list-style-type: none"> use of technical vocabulary, procedural vocabulary and conventions to develop the response organisation of the response, including a suitable introduction, body and conclusion. 	B
<ul style="list-style-type: none"> statement of assumptions statement of observations translation of simple aspects of the problem by identifying mathematical concepts and techniques. 	<ul style="list-style-type: none"> use of simple procedures to make some progress towards a solution application of simple mathematical concepts and techniques relevant to the task use of technology. 	<ul style="list-style-type: none"> statement about the reasonableness of solutions statement about strengths and/or limitations of the solution and/or model statement about decisions made. 	<ul style="list-style-type: none"> use of some appropriate language and conventions to develop the response adequate organisation of the response. 	C
<ul style="list-style-type: none"> statement of an assumption or an observation translation of some simple aspects of the problem by identifying mathematical concepts and techniques. 	<ul style="list-style-type: none"> application of some simple procedures, mathematical concepts or techniques superficial use of technology. 	<ul style="list-style-type: none"> statement about a decision and/or the reasonableness of a solution. 	<ul style="list-style-type: none"> use of everyday language to develop a response basic organisation of the response. 	D
<ul style="list-style-type: none"> statement of an assumption, observation or translation of an aspect of the problem. 	<ul style="list-style-type: none"> inappropriate use of technology or procedures. 	<ul style="list-style-type: none"> inappropriate statement about a decision or the reasonableness of a solution. 	<ul style="list-style-type: none"> unclear and disjointed organisation of the response. 	E

Task

Context

Albert Einstein reportedly said, 'Compound interest is the eighth wonder of the world. He who understands it, earns it. He who doesn't, pays it.'

An important aspect of managing money is understanding how to make the most of compound interest and loans. Compound interest means interest is earned on the interest. Over time, this can mean a significant return on investments. Loans are often used to buy a house or a car. However, it is important to ensure that the repayments can be made.

Charlotte is 21 and has just started a full-time job. For her 21st birthday, her grandparents gave her some money to either invest or put towards buying a car or a house.

As Charlotte's financial adviser, you must help her decide how to best use her money to achieve her financial goals.

Task

You are to develop recommendations for Charlotte to help her achieve two of her financial goals. Her goals include:

1. buying a car
2. paying off her credit card debt
3. establishing a savings account
4. buying a house.

Your teacher will give you Charlotte's current financial information, including:

- her gross annual salary
- her current credit card debt
- the amount of money Charlotte received from her grandparents.

Your response will be in the form of a report to give to Charlotte. The report should outline different options and considerations for her financial goals so Charlotte can prioritise them.

Sample response

Criterion	Grade awarded
Formulate Assessment objectives 1, 2, 5	C
Solve Assessment objectives 1, 6	
Evaluate and verify Assessment objectives 4, 5	
Communicate Assessment objective 3	

The annotations show the match to the standard descriptors of the instrument-specific standards.

<p>Formulate [B]</p> <p>statements of appropriate assumptions</p>	<p>Assumptions</p> <ul style="list-style-type: none"> • Her income remains the same for the next few years. • She doesn't sustain an injury that will prevent her from working. • There are no global financial meltdowns. • Interest rates are the same the whole time. • She has no children to support or any other major expenses.
<p>Formulate [B]</p> <p>statements of relevant observations</p>	<p>Financial goals and current information</p> <p>Financial goals:</p> <ol style="list-style-type: none"> 1. buying a car 2. paying off your credit card debt <p>Financial status:</p> <ol style="list-style-type: none"> 1. Gross annual salary: \$71 546 2. Credit card debt: \$1555 3. One-off gift of money from grandparents: \$8000
<p>Formulate [C]</p> <p>translation of simple aspects of the problem by identifying mathematical concepts and techniques</p>	<p>Interest and repayments calculations</p> <p>Online calculators have been developed by banks using the formula for compound interest to help plan repayments and make sure you can afford a loan. The principles of simple interest and compound interest have been used to perform the calculations that are the basis of the advice in this report.</p>
<p>Formulate [B]</p> <p>statement of relevant observation</p>	<p>Financial goals</p> <p>1. Buying a car</p> <p>You have identified a Suzuki Swift as a car you are interested in buying. A 2016 GLX Auto priced at \$17 980 has been used as the basis for this</p>

analysis and discussion.



Image: Suzuki Swift Red EMS, Creative Commons Attribution 3.0,
https://commons.wikimedia.org/wiki/File:Suzuki_Swift_Red_EMS.jpg accessed Feb 22, 2018.

Formulate [C]

translation of simple aspects of the problem by identifying mathematical concepts and techniques

Solve [C]

use of technology

Only online software used.

Communicate [B]

use of technical vocabulary, procedural vocabulary and conventions to develop the response

A five-year personal loan

A personal loan to purchase this vehicle, at an interest rate of 14.99% p.a. for 5 years, using NAB's online 'Personal loan repayment calculator' produces the following results:

Amount borrowed: \$17 980

Loan term: 5 years

Interest = \$7679

Your monthly repayments would be \$428.

2. Managing the credit card

You currently have \$1555 on your credit card. The interest rate is 19.74% with a fee of \$30. An online calculator will be used to calculate total repayments using these values.

Solve [C]

use of technology

Only online software used.

Evaluate and verify [C]

statement about the reasonableness of solutions

statement about limitations of the solution and/or model

Communicate [B]

use of technical vocabulary, procedural vocabulary and conventions to develop the response

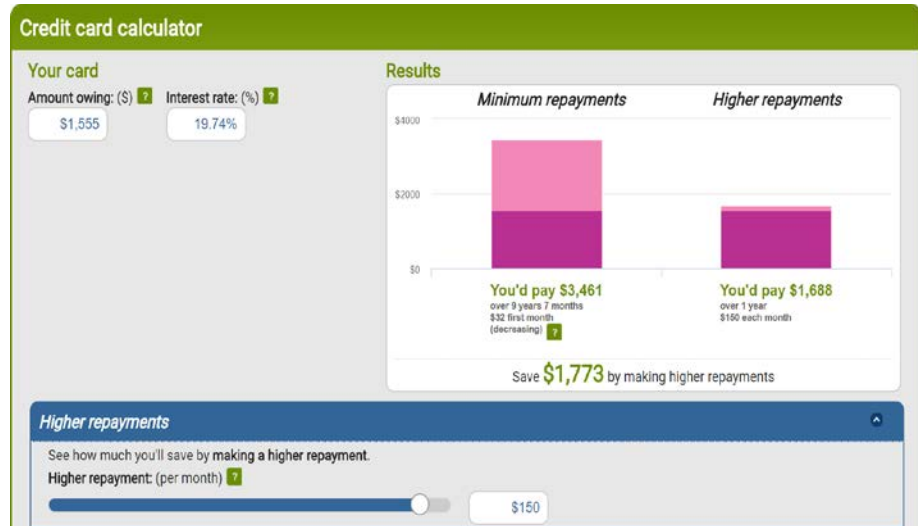
Solve [C]

use of simple procedures to make some progress towards a solution

Simple calculation error is present.

Evaluate and verify [C]

statement about decisions made



Source: ASIC, 'Credit card calculator', www.moneysmart.gov.au/tools-and-resources/calculators-and-apps/credit-card-calculator

Using the online calculator, paying \$150 per month will take exactly one year to pay off. This seems like a reasonable amount of time.

A possible issue with this proposed repayment schedule is that you may need to purchase something with the card therefore increasing the total debt.

For this calculation, I have used an interest rate of 4.39% over 25 years and borrowed the full amount. Using the NAB home loan online calculator, your repayments will be \$1731 per month and the total interest payable will be \$204 379.

Below are the calculations for monthly expenditure:

Car repayments = \$428

Credit Card repayments = \$150

Total monthly income = \$5962.16

Therefore, remaining budget = $\$5962.16 - \$578 = \$5384.16$

The money left over after paying the car repayments and credit card debt is \$5384.16. According to Business Insider Australia, 30% of your income should be allocated to 'living' costs. This includes luxury items and non-essentials.

Solve [C]

application of simple mathematical concepts and techniques relevant to the task

use of simple procedures to make some progress towards a solution

Communicate [C]

adequate organisation of the response

no description of how final conclusion was reached

30% of \$5384.16

= \$1615.25

Total debt repayments + living costs = \$578 + \$1615.25

= \$2193.25

Therefore, after total repayments and living expenses you will have \$3170.91, which means all your goals are achievable.