

Essential Mathematics 2019 v1.1

Unit 1 sample assessment instrument

September 2018

Problem-solving and modelling task

This sample has been compiled by the QCAA to assist and support teachers in planning and developing assessment instruments for individual school settings.

Schools develop internal assessments for each senior subject, based on the learning described in Units 1 and 2 of the subject syllabus. Each unit objective must be assessed at least once.

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 1 Topic 1: Number
2. comprehend mathematical concepts and techniques drawn from Fundamental topic: Calculations and Unit 1 Topic 1: Number
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 1 Topic 1: Number.

Subject	Essential Mathematics
Technique	Problem-solving and modelling task
Unit	1: Number, data and graphs
Topic	Fundamental topic: Calculations 1: Number

Conditions			
Duration	5 weeks (including 10 hours of class time)		
Mode	Written report	Length	<ul style="list-style-type: none"> • up to 8 pages (including tables, figures and diagrams) • maximum of 1000 words • appendixes can include raw data, repeated calculations, evidence of authentication and student notes (appendixes are not to be marked)
Individual/group	Individual	Other	—
Resources available	The use of technology is required, e.g. <ul style="list-style-type: none"> • spreadsheet program • scientific calculator • computer/internet. 		
Context			
You are a contestant on the reality TV program <i>Steel cook Australia</i> . You are a team leader and have been given the task of catering for a dinner party.			
Task			
<p>This task requires you to:</p> <ul style="list-style-type: none"> • choose a recipe • adjust the recipe to cater for the number of dinner party guests • calculate the cost of purchasing the ingredients used in the recipe. <p>Each guest will pay \$7 to cover the cost of the meal and you must not exceed this budget. Dry ingredients (e.g. flour, sugar), sauces and oils needed in your recipe are supplied for you and do not need to be purchased.</p> <p>Your recipe must include vegetables and at least one of the following ingredients:</p> <ul style="list-style-type: none"> • red meat • poultry • fish/seafood • eggs • nuts/seeds • legumes/beans. <p>You will present your teammates with a plan that outlines the recipe and your modifications. You will persuade your teammates that your plan will succeed by:</p> <ul style="list-style-type: none"> • explaining your mathematical reasoning, providing reasons for the choices you make • making decisions about the concepts, techniques and technology you will use to develop a solution • using estimation and rounding skills, and checking calculations to consider if refinements are required. <p>You must use a different recipe from other students in your class and school.</p> <p>Your teacher will tell you the number of guests attending the dinner party.</p>			

To complete this task, you must:

- use your knowledge of the Topic 1: Number subject matter to investigate the problem
- ensure you cover both simple and complex subject matter
- ensure your response demonstrates characteristics in the instrument-specific standards
- develop a unique response in a coherent and concise written format that is appropriate to the genre, and includes a suitable introduction, body and conclusion
- show all calculations to support your response
- follow the approach to problem-solving and mathematical modelling used in the syllabus
- use a spreadsheet to demonstrate how you can easily adapt the recipe.

Stimulus

International Mathematical Modeling Challenge, 'Adapting a recipe',
www.immchallenge.org.au/files/IM2C_sample_problem_Adapting_a_recipe.pdf

Recipe websites:

- *Allrecipes Australia*, <http://allrecipes.com.au>
- *Taste.com.au*, www.taste.com.au
- *Best Recipes.com.au*, www.bestrecipes.com.au
- *delicious.*, www.delicious.com.au

Checkpoints

- One week after issue date: Check student progress.
- Two weeks after issue date: Students email evidence of their progress to teacher.
- Three weeks after issue date: Teacher provides general feedback to the class.
- Four weeks after issue date: Students email a draft to teacher. Teacher provides written feedback.
- Five weeks after issue date: Students submit their final response.

Feedback

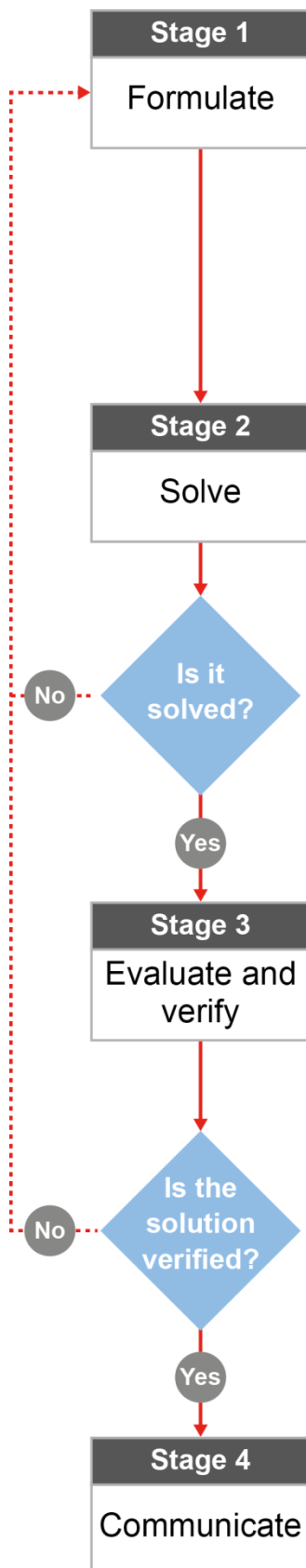
Authentication strategies

- The teacher will provide 10 hours of class time for task completion.
- Students will each produce a unique response by using individualised recipes and producing individualised plans.
- Students will provide documentation of their progress at checkpoints during class time and email two progress updates to their teacher (progress updates will not be marked or annotated by teacher).
- Students must acknowledge all sources.
- Students must submit a declaration of authenticity.

Scaffolding

The task-specific approach to problem-solving and modelling must be used (see next page).

Approach to problem-solving and mathematical modelling



In this task, you will adapt a recipe to cater for guests at a dinner party.

Describe how you plan to solve the problem and document any appropriate assumptions, variables and observations. Include:

- a copy of the recipe, including how many people the recipe serves in its original form
- how many people are coming to the dinner party (provided by the teacher — this must differ from the number the original recipe serves)
- how you will cost the recipe so that you don't exceed your budget
- how you have included the specified ingredients.

Apply previously learnt mathematical procedures, concepts and techniques to solve the problem. It is important that you demonstrate the highest level of mathematics you can achieve.

Remember to develop your solution from the assumptions and observations identified in Stage 1.

Include calculations to show:

- your understanding of ratios, including correct notation
- how to express a ratio in its simplest form
- total costs and available budget
- an appropriate use of technology, e.g. using a spreadsheet for multiple or repeated calculations.

Include a list of the increased quantity of each ingredient needed to cater for the number of guests. Identify the ratios you used to determine the numerical value for each ingredient.

Is your solution a reasonable and valid response? Evaluate your results and make a judgment about your response.

Document the strengths and limitations of your solution. Consider any issues that may be relevant, e.g. changes to preparation and cooking time for the number of serves, access to the required equipment or cost of the meal and available money.

Explain all procedures used and decisions made.

Communicate using appropriate language. Refer to the calculations you included in previous sections. Your plan should be communicated clearly and concisely, and include an introduction, body and conclusion. Include headings and, if appropriate, an appendix at the end of the plan.

Ensure you have:

- used mathematical and everyday language, without spelling and grammatical errors
- demonstrated an efficient use of technology
- written a conclusion that discusses your results
- included any recommendations.