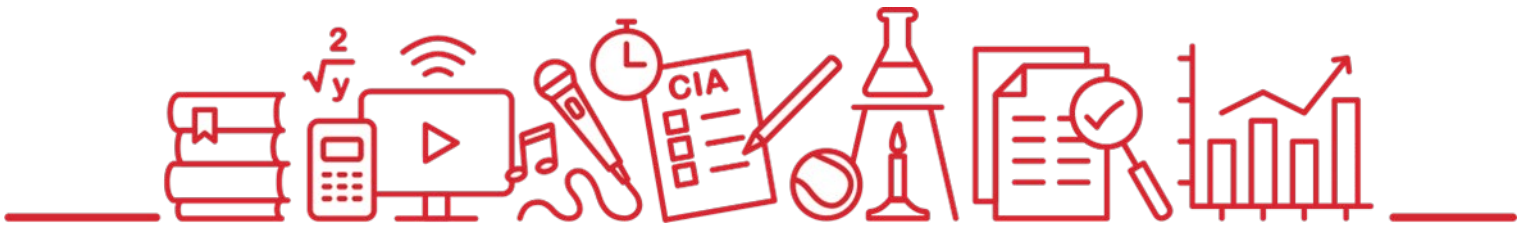
Essential Mathematics subject report

2022 cohort

February 2023



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For all Queensland schools

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Contents

Introduction

Throughout 2022, schools and the QCAA worked together to further consolidate the new Queensland Certificate of Education (QCE) system. The familiar challenges of flood disruption and pandemic restrictions were managed, and the system continued to mature regardless.

We have now accumulated three years of assessment information, and our growing experience of the new system is helping us to deliver more authentic learning experiences for students. An independent evaluation will commence in 2023 so that we can better understand how well the system is achieving its goals and, as required, make strategic improvements. The subject reports are a good example of what is available for the evaluators to use in their research.

This report analyses the summative assessment cycle for the past year. It also gives readers information about:

- how syllabus objectives have been applied in the marking of assessments, as appropriate
- patterns of student achievement.

The report promotes continuous improvement by:

- identifying effective practices in the design and marking of valid, accessible and reliable assessments
- recommending where and how to enhance the design and marking of valid, accessible and reliable assessment instruments
- providing examples, including those that demonstrate best practice.

Schools are encouraged to reflect on the effective practices identified for each assessment, consider the recommendations to strengthen assessment design and explore the authentic student work samples provided.

Audience and use

This report should be read by school leaders, subject leaders and teachers to:

- inform teaching and learning and assessment preparation
- assist in assessment design practice
- assist in making assessment decisions
- help prepare students for external assessment.

The report is publicly available to promote transparency and accountability. Students, parents, community members and other education stakeholders can use it to learn about the assessment practices and outcomes for General subjects (including alternative sequences (AS) and Senior External Examination (SEE) subjects, where relevant) and General (Extension) subjects.

Report preparation

The report includes analyses of data and other information from endorsement, confirmation and external assessment processes. It also includes advice from the chief confirmer, chief endorser and chief marker, developed in consultation with and support from QCAA subject matter experts.

Subject data summary

Subject completion

Note: All data is correct as at 31 January 2023. Where percentages are provided, these are rounded to two decimal places and, therefore, may not add up to 100%.

Number of schools that offered the subject: 454.

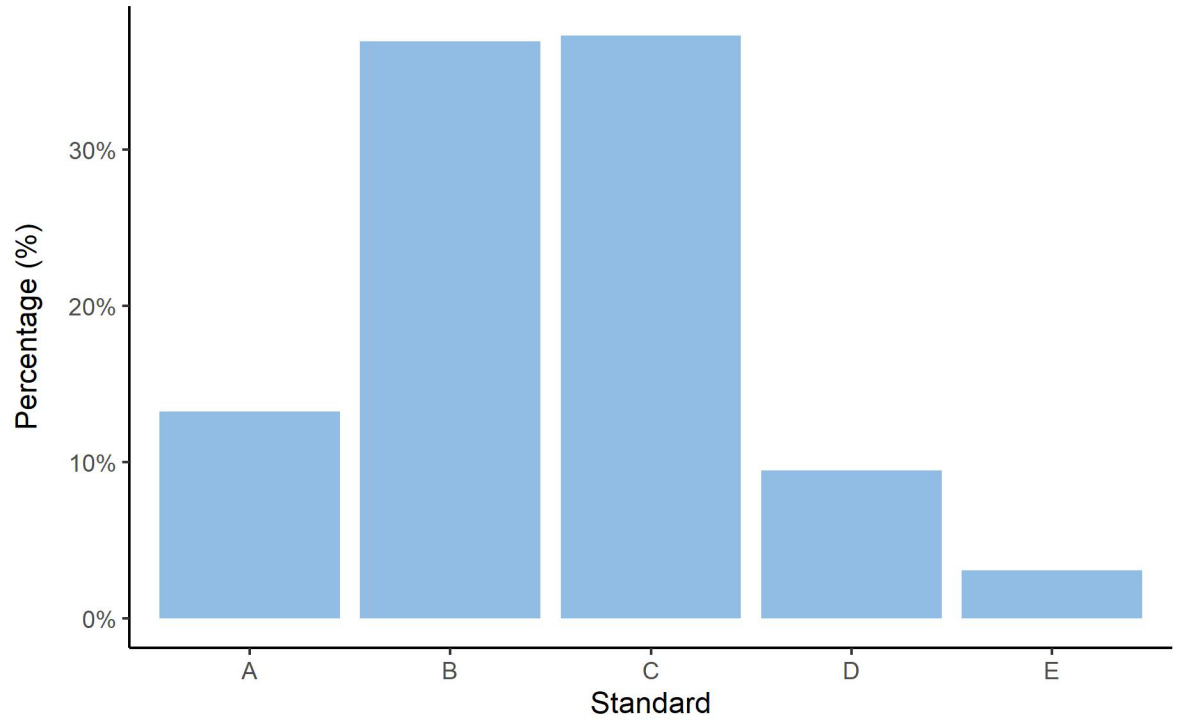
Completion of units	Unit 1	Unit 2	Units 3 and 4
Number of students completed	18 357	18 535	16 401

Units 1 and 2 results

Number of students	Satisfactory	Unsatisfactory
Unit 1	15 393	2964
Unit 2	15 982	2553

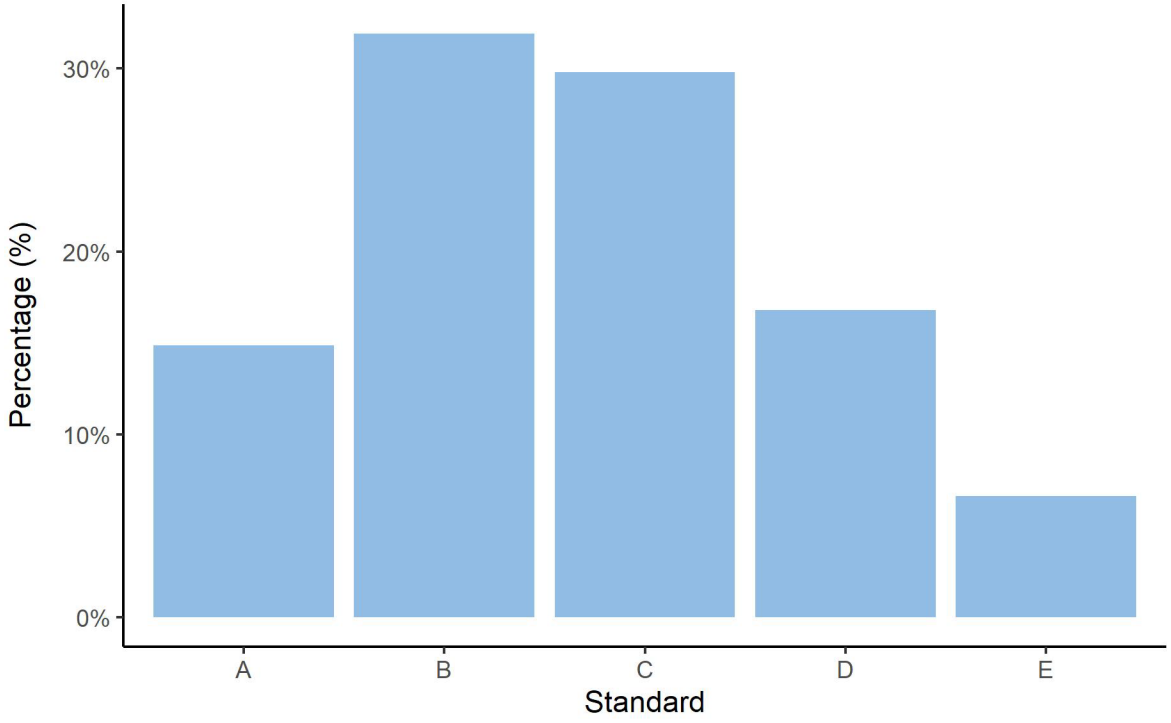
Units 3 and 4 internal assessment (IA) results

IA1 total



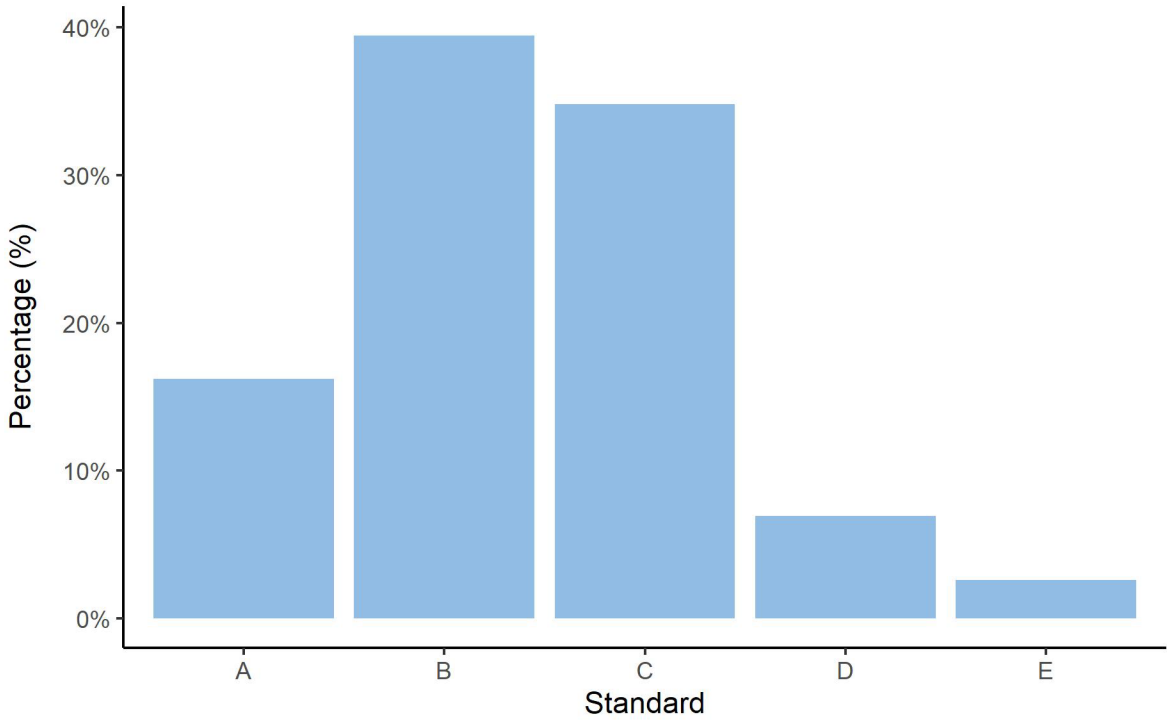
IA2 (CIA) standards

IA2 total



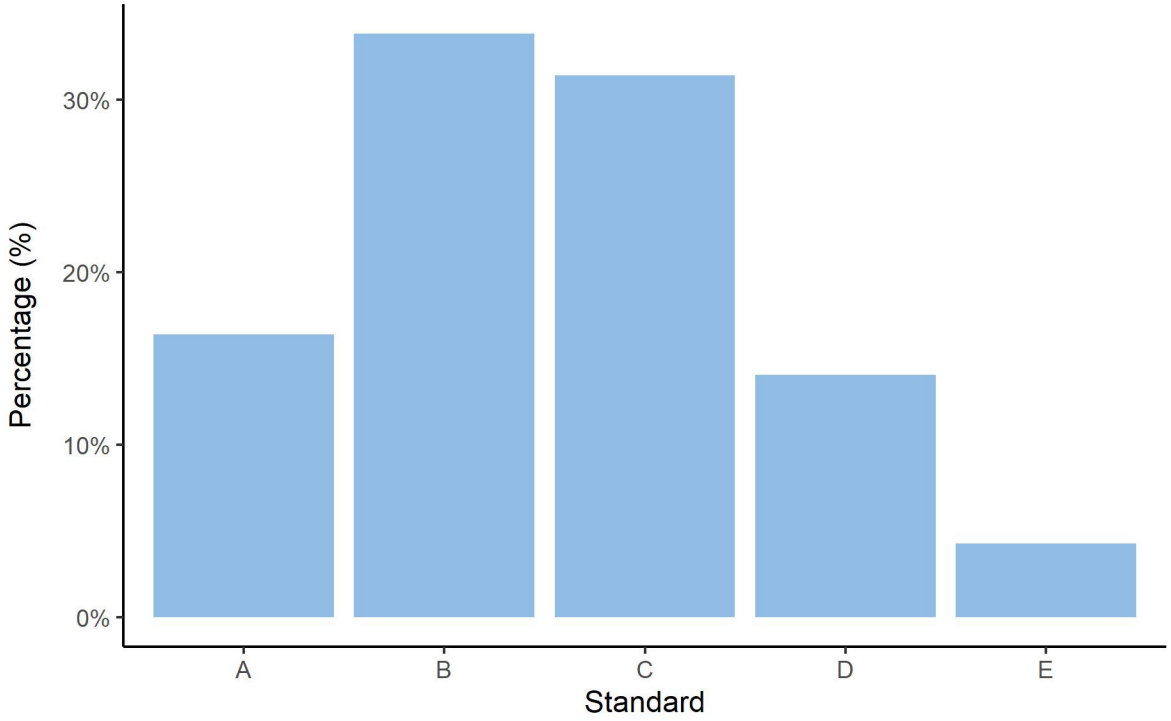
IA3 standards

IA3 total



IA4 standards

IA4 total



Final subject results

Distribution of standards

The number of students who achieved each standard across the state is as follows.

Standard	A	B	C	D	E
Number of students	1639	6906	6712	1062	82

Internal assessment

The following information and advice relate to the assessment design and assessment decisions for each internal assessment (IA) in Units 3 and 4. These instruments have undergone quality assurance processes informed by the attributes of quality assessment (validity, accessibility and reliability).

Endorsement

Endorsement is the quality assurance process based on the attributes of validity and accessibility. These attributes are categorised further as priorities for assessment, and each priority can be further broken down into assessment practices.

Data presented in the Assessment design section identifies the reasons why IA instruments were not endorsed at Application 1, by the priority for assessments. An IA may have been identified more than once for a priority for assessment, e.g. it may have demonstrated a misalignment to both the subject matter and the assessment objective/s.

Refer to the quality assurance tools for detailed information about the assessment practices for each assessment instrument.

Percentage of instruments endorsed in Application 1

Number of instruments submitted	IA1	IA3	IA4
Total number of instruments	466	471	471
Percentage endorsed in Application 1	52%	50%	27%

Applied quality assurance

Applied quality assurance meetings occurred to provide feedback and advice to schools about the judgments of student work completed for Unit 3 (IA1 and CIA) and the quality of the school's submission. The feedback was provided to schools using the *Quality assurance advice to schools* form. Schools used this advice to inform their judgments for IA3 and IA4.

Internal assessment 1 (IA1)

Problem-solving and modelling task

This assessment focuses on the interpretation, analysis and evaluation of ideas and information. It is an independent task responding to a particular situation or stimuli. While students may undertake some research in the writing of the problem-solving and modelling task, it is not the focus of this technique. This assessment occurs over an extended and defined period. Students will use class time and their own time to develop a response.

This problem-solving and modelling task must use subject matter from the Fundamental topic: Calculations and at least one of the following topics in Unit 3:

- Topic 1: Measurement
- Topic 2: Scales, plans and models
- Topic 3: Summarising and comparing data.

Assessment design

Validity

Validity in assessment design considers the extent to which an assessment item accurately measures what it is intended to measure and that the evidence of student learning collected from an assessment can be legitimately used for the purpose specified in the syllabus.

Reasons for non-endorsement by priority of assessment

Validity priority	Number of times priority was identified in decisions*
Alignment	114
Authentication	34
Authenticity	27
Item construction	14
Scope and scale	117

*Each priority might contain up to four assessment practices.

Total number of submissions: 466.

Effective practices

Validity priorities were effectively demonstrated in assessment instruments that:

- provided opportunities for students to develop a unique response, e.g. the task was sufficiently open-ended, or provided individual datasets or forecasts enabling students to make choices about how to use the data and what mathematical concepts and techniques were relevant to solve the problem
- featured realistic and authentic contexts that engaged the learning experiences of students, e.g. the task focused on a specific and manageable project in the school or wider community

- included detailed checkpoints that reflected syllabus conditions and academic integrity guidelines to authenticate student responses, such as when and how teachers would provide feedback on one draft.

Practices to strengthen

It is recommended that assessment instruments:

- align specifically to Unit 3 subject matter, e.g. researching costings and producing a budget should not be a focus of the task
- provide opportunities for students to demonstrate all assessable objectives without having to address multiple components within the task, e.g. all assessable objectives can be demonstrated in a report requiring a scale drawing of a backyard with two distinct features rather than a scale drawing of a complete house plan including fixtures
- are sufficiently different from modelling problems in textbooks and QCAA sample assessment instruments that provide sample responses, so as not to compromise the authenticity of student work
- avoid scaffolding or instructions that direct students to use specific mathematical concepts or techniques and lead students to a particular solution, e.g. frame scaffolding as prompting questions rather than a list of directed instructions for how to complete the task.

Accessibility

Accessibility in assessment design ensures that no student or group of students is disadvantaged in their capacity to access an assessment.

Reasons for non-endorsement by priority of assessment

Accessibility priority	Number of times priority was identified in decisions*
Bias avoidance	2
Language	21
Layout	1
Transparency	21

*Each priority might contain up to four assessment practices.

Total number of submissions: 466.

Effective practices

Accessibility priorities were effectively demonstrated in assessment instruments that:

- used relevant diagrams, stimulus material and images
- referred to or attached the approach to problem-solving and mathematical modelling flowchart (Syllabus section 1.2.4).

Practices to strengthen

It is recommended that assessment instruments:

- feature a specific task or issue that is written in a straightforward manner and explicit about the nature of the problem, e.g. aligns language used to the instrument-specific standards

- only include information relevant to the current year's problem-solving and modelling task, e.g. scaffolding should not contain unrelated information from a previously used task
- use appropriate language and mathematical terminology and are free of punctuation, grammatical, spelling and typographical errors.

Additional advice

- When developing the IA1 task description, schools are encouraged to consider what possible elements are expected in a student's response to ascertain whether students will be able to demonstrate all the characteristics in the descriptors of the instrument-specific standards. This does not require teachers to write a full solution. This process will also allow teachers to identify stimulus material required to complete the task.

Assessment decisions

Reliability

Reliability is a judgment about the measurements of assessment. It refers to the extent to which the results of assessments are consistent, replicable and free from error.

Number of submissions received and reviewed: 478

Effective practices

Accuracy and consistency of the application of the instrument-specific standards for this IA was most effective when:

- the performance-level descriptors in the instrument-specific standards were clearly annotated to indicate the relevant characteristics that best matched the evidence in the student response. The pattern of evidence across the four criteria was then used to determine an overall on-balance grade, not a separate grade for each criterion
- there was accurate distinction between *simple* and *complex* aspects of the problem by identifying mathematical concepts and techniques in the response to the Formulate and Solve criteria, e.g. [complex] subject matter includes interpreting different forms of two-dimensional representations of three-dimensional objects, including nets of prisms, constructing scale drawings by hand and using software packages, calculating surface areas of familiar prisms and pyramids as well as irregular solids
- for the Evaluate and justify criterion, judgments matched to the A standard performance-level descriptors took into account the use of mathematical reasoning and supporting evidence in the student response as an indication of evaluation, documentation and justification of (as opposed to statements about) the reasonableness of solutions, strengths and limitations of the solution and decisions made
- there was alignment between the characteristics annotated for the Communicate criterion and the qualities in student work regarding use of appropriate vocabulary and conventions to develop the response, and organisation of the response, including a suitable introduction, body and conclusion, e.g. responses matched to the A or B standard performance-level descriptors showed the use of
  - correct shape names and terms such as perimeter, surface area, median and spread
  - appropriate choices of units and superscripts to indicate correct units for quantities such as area and volume
  - headings and/or useful introductory sentences to logically structure sections of the response.

Samples of effective practices

The following excerpts have been included:

- to demonstrate the effective use of annotations on the instrument-specific standards to show that a response to the endorsed task has been matched to descriptors in each criterion and has been judged, on balance, to be an A-grade response, even though some characteristics were matched to B standard performance-level descriptors
- to show evidence in a response judged as being the use of mathematical reasoning to evaluate the reasonableness of solutions
- to show how marking decisions matched evidence of the correct use of appropriate vocabulary and conventions to develop a response, which is organised using a suitable introduction, body and conclusion.

Formulate	Solve	Evaluate and verify	Communicate	Grade
The student work has the following characteristics:				
• documentation of appropriate assumptions • accurate documentation of relevant observations • accurate translation of all simple and complex aspects of the problem by identifying mathematical concepts and techniques.	• 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.	• 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.	• 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
• statements of appropriate assumptions • statements of relevant observations • translation of simple and complex aspects of the problem by identifying mathematical concepts and techniques.	• 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.	• 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.	• use of technical vocabulary, procedural vocabulary and conventions to develop the response • organisation of the response, including a suitable introduction, body and conclusion.	B
• statement of assumptions • statement of observations • translation of simple aspects of the problem by identifying mathematical concepts and techniques.	• 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.	• statement about the reasonableness of solutions • statement about strengths and/or limitations of the solution and/or model • statement about decisions made.	• use of some appropriate language and conventions to develop the response • adequate organisation of the response.	C
• statement of an assumption or an observation • translation of some simple aspects of the problem by identifying mathematical concepts and techniques.	• application of some simple procedures, mathematical concepts or techniques • superficial use of technology.	• statement about a decision and/or the reasonableness of a solution.	• use of everyday language to develop a response • basic organisation of the response.	D
• statement of an assumption, observation or translation of an aspect of the problem.	• inappropriate use of technology or procedures.	• inappropriate statement about a decision or the reasonableness of a solution.	• unclear and disjointed organisation of the response.	E

My solution is considered reasonable because I have applied the BCC requirements to ensure accuracy. I have conducted all my solutions through excel as well as using a scientific calculator, this shows that the mathematical procedure is correct and reliable therefore appropriate. The car parks had enough room to fit the 87 spaces required, after concluding this design thus assumption was proven correct. The observation of requiring extra space for the Taxi, service bay and disability parking spaces was accurate, this was because the BCC needs for these parkings to be placed at the front of the shopping centre. needed to meet the Brisbane City Council requirements. The result for the carpark was adequate because it met all BCC requirements.

Introduction

An interior designer is assisting the students' family with a small renovation and would like the students' input on the redesign of their bedroom. The report required the student to write to the interior designer with a proposal idea for the student's bedroom. The bedroom design should be innovative, realistic, and achievable. The proposal must include a scale drawing of the floor plan, the calculations and materials needed for the wall coverings and flooring, the selection of bedroom furniture, the location of the doors, windows, and furniture, and an evaluation of the proposal idea for the bedroom based on its reasonableness.

Practices to strengthen

To further ensure accuracy and consistency of the application of the instrument-specific standards for this IA, it is recommended that:

- when making judgments in the Formulate criterion, a clear distinction is made between 'documentation' and 'statement', and 'assumptions' and 'observations'. In this criterion
  - clear demonstration of the 'documentation of appropriate assumptions' should include assumptions related to the student's model/solution and evidence to support the assumptions. This could be in the form of a reference or identification of historical data relating to the topic, or by providing coherent reasoning for why an assumption is necessary, its likely effect on the model/solution, and/or the impact of not making the assumption
  - clear demonstration of 'accurate documentation of relevant observations' should provide evidence to support observations (information/data) used in a student's solution, such as explaining how the observations were collected, the source of the observations, what made the observations valid and reliable, or identifying a specific feature of an observation that made it relevant to the solution, e.g. because of the applicable accessibility requirements for ramps — specifically around different ramp gradients (areas of incline) for different ramp lengths.

Additional advice

- Make judgments, using the instrument-specific standards from the syllabus, by clearly annotating (e.g. highlighting, ticking, circling or crossing out) each characteristic to show how it matches qualities in the student response, e.g. highlight the Standard A descriptor for 'justification of decisions' because supporting evidence was used and cross out the Standard C descriptor for 'statement about strengths and/or limitations of the solution' because this was not provided. These annotations provide useful feedback to students to assist them to improve.
- Use the pattern of evidence in the annotated instrument-specific standards to determine an on-balance grade. Do not alter the wording of the instrument-specific standards. Do not assign marks to arrive at an overall result. Do not determine a grade for each criterion. Only one result should be entered into Student Management.
- Make judgments on only the permissible word length and page count required by the syllabus. If a submitted response exceeds the syllabus conditions, and redaction has not occurred before a judgment is made, mark from the beginning of the response, but mark only the evidence in the student response that meets the assessment conditions for response length. Annotate the response to indicate the evidence used to determine the grade, and indicate this on the appropriate criteria on the instrument-specific standards.

Internal assessment 2 (CIA)

Common internal assessment (CIA)

The CIA is common to all schools and is developed by the QCAA. Schools are able to administer this assessment during the CIA phase chosen by the school in Unit 3 once it has been provided by the QCAA. It is administered flexibly under supervised conditions and is marked by the school according to a QCAA-developed common marking scheme. The CIA is not privileged over the school-developed summative assessment.

Assessment design

The assessment instrument was designed using the specifications, conditions and assessment objectives described in the Summative internal assessment 2: Common internal assessment section of the syllabus. The examination consisted of one paper with two parts: simple (Part A) with nine short response items (40 marks) and complex (Part B) with two short response items (10 marks).

The examination assessed subject matter from Unit 3. Questions were derived from the context of all Unit 3 topics.

The assessment required students to respond to short response items.

Assessment decisions

Assessment decisions are made by markers matching student responses to the common internal assessment marking guide (CIAMG).

Effective practices

Overall, students responded well to:

- simple familiar questions by selecting, recalling and using facts, rules, definitions and procedures and communicating using mathematical, statistical and everyday language and conventions
- the scaffolded parts of simple familiar and complex familiar problems requiring comprehension and application of mathematical concepts and techniques to solve problems
- the instrument by attempting the full range of questions across all Unit 3 topics, following examination instructions to show mathematical reasoning and/or working to support answers to questions worth more than one mark, and writing plausible responses in the provided spaces in the question and response book.

Samples of effective practices

Short response

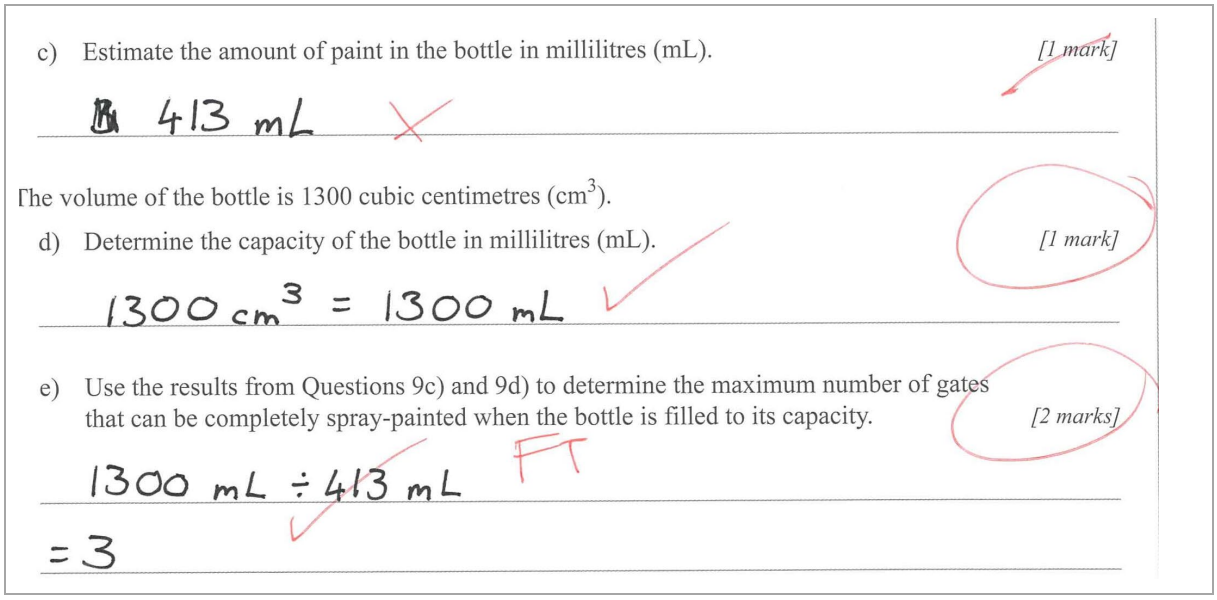
The following excerpt is Question 9c), 9d) and 9e) from Part A (Phase 2). It required students to estimate and determine the amount of paint in a spray bottle and apply the calculation and rounding strategies to determine a maximum number of gates to be completely spray-painted when the bottle is filled to its capacity.

Effective student responses:

- used the diagram of a spray bottle to estimate the amount of paint in the range of 390 mL to 410 mL
- converted volume in cubic centimetres to capacity in millilitres
- used multiplication or division to calculate the maximum number of gates that can be spray-painted from a full bottle.

The following excerpt has been included:

- to demonstrate how the teacher clearly indicated that no marks were recorded for 9c) because the response does not match the mark allocation statement in the marking guide
- to show that follow-through (FT) marks, allowed in the marking guide due to error/s in prior working, were appropriately awarded in 9e) where the student used an incorrect value (413 mL) from 9c), but demonstrated correct conceptual understanding and skill to calculate a maximum number of gates by dividing and rounding down to a whole number
- to demonstrate the importance of clearly recording the number of marks awarded for each part of each question, and not relying on counting ticks to total the marks. The teacher has circled the total awarded marks for each part to clearly indicate that 9d) was awarded 1 mark and 9e) was awarded 2 marks, which is the accurate number of marks when the response is matched to the mark allocation statements in the marking guide. Even though only one tick is shown on the response for the calculation in 9e), the value in the response has been correctly rounded down to a whole number.



c) Estimate the amount of paint in the bottle in millilitres (mL). *[1 mark]*

413 mL

The volume of the bottle is 1300 cubic centimetres (cm^3).

d) Determine the capacity of the bottle in millilitres (mL). *[1 mark]*

$1300\ cm^3 = 1300\ mL$

e) Use the results from Questions 9c) and 9d) to determine the maximum number of gates that can be completely spray-painted when the bottle is filled to its capacity. *[2 marks]*

$1300\ mL \div 413\ mL$ FT

$= 3$

The following excerpt has been included:

- to demonstrate the correct application of the mark cut-offs in the instrument-specific standards to determine the correct grade allocation. The total mark of 40 out of 50 marks is clearly written on the student response, and the correct corresponding mark cut-off and grade are clearly annotated. Because the total awarded, i.e. 40 marks, is not greater than 40 marks but is greater than 30 marks, the response is awarded a B grade. While the descriptors have not been used to determine the grade, they may have been highlighted (this is optional) to provide feedback to the student.

Instrument-specific standards — Common internal assessment

Foundational knowledge and problem solving	Cut-off (marks)	Grades
The student work has the following characteristics		
• comprehensive selection, recall and use of simple and complex facts, rules, definitions and procedures; comprehension and clear communication of simple and complex mathematical concepts and techniques; evaluation of the reasonableness of solutions and use of mathematical reasoning to justify procedures and decisions; and proficient application of simple and complex mathematical concepts and techniques to solve problems	> 40	A
• selection, recall and use of simple and some complex facts, rules, definitions and procedures; comprehension and communication of simple and some complex mathematical concepts and techniques; evaluation of the reasonableness of some solutions using mathematical reasoning; and application of simple and some complex mathematical concepts and techniques to solve problems	> 30	B
• selection, recall and use of simple facts, rules, definitions and procedures; comprehension and communication of simple mathematical concepts and techniques; discussion of the reasonableness of solutions using mathematical reasoning; and application of simple mathematical concepts and techniques to solve problems	> 20	C
• some selection, recall and use of facts, rules, definitions and procedures; basic comprehension and communication of mathematical concepts and techniques; some discussion of the reasonableness of solutions; and inconsistent application of mathematical concepts and techniques	> 10	D
• isolated and inaccurate selection, recall and use of facts, rules, definitions and procedures; disjointed and unclear communication of mathematical concepts and techniques; superficial discussion of the reasonableness of solutions.	≥ 0	E

$\frac{40}{50}$ = B.

Practices to strengthen

It is recommended that when preparing students for the CIA, teachers consider:

- reviewing past and mock CIAs to allow students familiarity with the type of questions in terms of the degree of difficulty, e.g. differences between simple familiar, complex familiar and complex unfamiliar type questions
- reviewing past and mock CIAs to allow students familiarity with the allocation of marks and particular formatting of certain questions, e.g. a 1-mark question may only require one-word or one-number responses
- encouraging students to attempt to respond to as many questions as possible rather than leaving them blank could attract more marks to the paper, e.g. stating relevant formulas based on the information contained in the questions could be awarded 1 mark.

Internal assessment 3 (IA3)

Problem-solving and modelling task

This assessment focuses on the interpretation, analysis and evaluation of ideas and information. It is an independent task responding to a particular situation or stimuli. While students may undertake some research in the writing of the problem-solving and modelling task, it is not the focus of this technique. This assessment occurs over an extended and defined period. Students use class time and their own time to develop a response.

The problem-solving and modelling task must use subject matter from the Fundamental topic: Calculations and at least one of the following topics in Unit 4:

- Topic 1: Bivariate graphs
- Topic 2: Probability and relative frequencies
- Topic 3: Loans and compound interest.

Assessment design

Validity

Validity in assessment design considers the extent to which an assessment item accurately measures what it is intended to measure and that the evidence of student learning collected from an assessment can be legitimately used for the purpose specified in the syllabus.

Reasons for non-endorsement by priority of assessment

Validity priority	Number of times priority was identified in decisions*
Alignment	92
Authentication	52
Authenticity	44
Item construction	41
Scope and scale	85

*Each priority might contain up to four assessment practices.

Total number of submissions: 471.

Effective practices

Validity priorities were effectively demonstrated in assessment instruments that:

- had clear and concise instructions on what was expected in completing the assessment instrument and identified the topic/s from which students needed to independently select the subject matter to solve the problem
- provided stimulus material relevant to the task, such as suitable websites and sample datasets that did not require students to undertake extensive research, e.g. relevant stimulus material was age appropriate for language and readability and aligned to the context and task descriptions

- included the statement, 'The approach to problem-solving and mathematical modelling in the syllabus must be used', or where a school chose to use a task-specific flowchart, any changes to the generic flowchart aligned with the context and task
- included checkpoints to indicate that feedback would be provided on only one draft
- used authentication strategies, such as progress checks, to monitor the authorship of student work.

Practices to strengthen

It is recommended that assessment instruments:

- provide cues that allow students to independently address all stages of the problem-solving and mathematical modelling approach, e.g. frame scaffolding as prompting questions rather than a list of directed instructions for how to complete the task
- provide opportunities for students to respond to a specific task or issue set in a context that highlights a real-life application of mathematics, e.g. an investigative case study requires a specific purpose such as developing a proposal or making a recommendation.

Accessibility

Accessibility in assessment design ensures that no student or group of students is disadvantaged in their capacity to access an assessment.

Reasons for non-endorsement by priority of assessment

Accessibility priority	Number of times priority was identified in decisions*
Bias avoidance	16
Language	26
Layout	9
Transparency	13

*Each priority might contain up to four assessment practices.

Total number of submissions: 471.

Effective practices

Accessibility priorities were effectively demonstrated in assessment instruments that:

- contained a scenario or context that was accessible and relevant for young people so as to avoid language and bias issues.

Samples of effective practices

There are no student response excerpts because either the student/s did not provide permission or there were third-party copyright issues in the response/s.

Practices to strengthen

It is recommended that assessment instruments:

- use appropriate language and mathematical terminology and are free of punctuation, grammatical, spelling and typographical errors
- only include information relevant to the current year's problem-solving and modelling task, e.g. scaffolding should not contain unrelated information from a previously used task.

Additional advice

- Schools are encouraged to use the 'Print preview' function within the Endorsement application in the QCAA Portal to check the assessment instrument is well presented with appropriate page breaks and other formatting features. See *Developing summative internal assessment instruments: Endorsement user guide*, available from the Endorsement application in the QCAA Portal.

Internal assessment 4 (IA4)

Examination — short response

This assessment is a supervised examination in two parts: simple (Part A) and complex (Part B). The examination assesses the application of a range of cognitions to a number of items, drawn from all Unit 4 topics. Student responses must be completed individually, under supervised conditions and in a set timeframe.

Assessment design

Validity

Validity in assessment design considers the extent to which an assessment item accurately measures what it is intended to measure and that the evidence of student learning collected from an assessment can be legitimately used for the purpose specified in the syllabus.

Reasons for non-endorsement by priority of assessment

Validity priority	Number of times priority was identified in decisions*
Alignment	199
Authentication	0
Authenticity	10
Item construction	53
Scope and scale	187

*Each priority might contain up to four assessment practices.

Total number of submissions: 471.

Effective practices

Validity priorities were effectively demonstrated in assessment instruments that:

- used questions that were relevant to the school context, and sufficiently different from both textbook questions and QCAA sample questions to ensure responses would be the student's own work and not rehearsed, e.g. providing screenshots of online calculators to complete or probability questions relevant to adolescent interests
- were free from mathematical errors and unnecessary stimulus, e.g. images of currency are not required for a question about compound interest.

Practices to strengthen

It is recommended that assessment instruments:

- representatively sample subject matter from all Unit 4 topics and, where relevant, focus on subject matter that was not assessed in the problem-solving and modelling task
- assess subject matter within the scope of the syllabus, e.g. syllabus subject matter does not include calculating the gradient and y-intercept of a line of best fit or a linear equation

- are of suitable scope and scale, using an appropriate number of questions to be answered in the set time, matched to the degree of difficulty and assessing Unit 4 subject matter
- assess subject matter specified in the syllabus as '[complex]' for complex familiar and complex unfamiliar questions (see Syllabus section 1.2.5)
- provide opportunities for students to demonstrate all syllabus objectives, in particular, Objective 4: Evaluate the reasonableness of solutions, and ensure the mark allocation in the marking scheme reflects the assessment of this objective
- include complex unfamiliar items matching the degree of difficulty so relationships and interactions have a number of elements, and all the information to solve the problem is not immediately identifiable, i.e. not having a series of parts that step students through the problem, and not providing cues that indicate the procedure to use, or diagrams or graphs that simplify the nature of the problem.

Accessibility

Accessibility in assessment design ensures that no student or group of students is disadvantaged in their capacity to access an assessment.

Reasons for non-endorsement by priority of assessment

Accessibility priority	Number of times priority was identified in decisions*
Bias avoidance	27
Language	64
Layout	20
Transparency	20

*Each priority might contain up to four assessment practices.

Total number of submissions: 471.

Effective practices

Accessibility priorities were effectively demonstrated in assessment instruments that:

- provided adequate response space for each question, including providing multiple Cartesian planes or images for students to use if they made a significant error on their first attempt
- were constructed in a way that ensured the layout within questions and across the instrument was not distracting. The 'Print preview' function within the Endorsement application can be used to check that visual elements (e.g. tables of values, scatterplots) are accessible and fit on a single page. See *Developing summative internal assessment instruments: Endorsement user guide*, available from the Endorsement application in the QCAA Portal.

Samples of effective practices

There are no student response excerpts because either the student/s did not provide permission or there were third-party copyright issues in the response/s.

Practices to strengthen

It is recommended that assessment instruments:

- are proofread for punctuation, grammatical, spelling and typographical errors
- use mathematical terminology that matches syllabus subject matter, e.g. association vs. correlation
- utilise authentic and unbiased contexts that do not require specialist knowledge or experiences to access the problem.

Additional advice

- Ensure that every item in the examination is contextualised according to syllabus specifications.
- Provide a correct marking scheme that indicates clearly how marks will be allocated. This assists schools to check the scope and scale of the assessment, such as time allocation, adequacy of response space and match to the identified degree of difficulty.