Queensland Curriculum and Assessment Authority

Specialist Mathematics 2019 v1.2

IA1: Sample assessment instrument 1

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

Student name

Student number

Teacher

Issued

Due date

Marking summary

Criterion	Marks allocated	Provisional marks
Formulate	4	
Solve	7	
Evaluate and verify	5	
Communicate	4	
Overall	**20**	

Conditions

Technique	Problem-solving and modelling task
Unit	Unit 3: Mathematical induction, and further vectors, matrices and complex numbers
Topic/s	Topic 2: Vectors and matrices
Duration	4 weeks (including 3 hours of class time)
Mode/length	Written: Up to 10 pages (including tables, figures and diagrams) and a maximum of 2000 words
Individual/group	A unique response must be developed by each student
Other	Use of technology is required and must go beyond simple computation or word processing
Resources	The technology used can include scientific calculator, graphics calculator (CAS or non-CAS), spreadsheet program and/or other mathematical software

Context

Each week in the media, sporting commentators give their ‘expert tips’ on the likely winners of upcoming games, but how accurate are these predictions? According to Daniel Colasimone, reporter and producer for ABC Grandstand, ‘The world of sport never fails to surprise us, which is why trying to make predictions about it is a fool’s game’.

Colasimone, D 2015, ‘Unreliable 2016 sporting predictions: Tim Cahill, cricketing Mitchells, Nat Fyfe and Sharni Layton star’, *ABC News*, www.abc.net.au/news/2015-12-31/2016-sporting-predictions/7060172. Used with permission.

Task

You will be given a link to a website that contains data about every round of a completed sports competition. Use an appropriate sample of the data to develop a model that will enable you to ‘predict’ the winning teams in at least three subsequent rounds of the competition.

This task poses the challenge — can a mathematics student predict a set of sporting results more accurately than the so-called ‘experts’?

Checkpoints

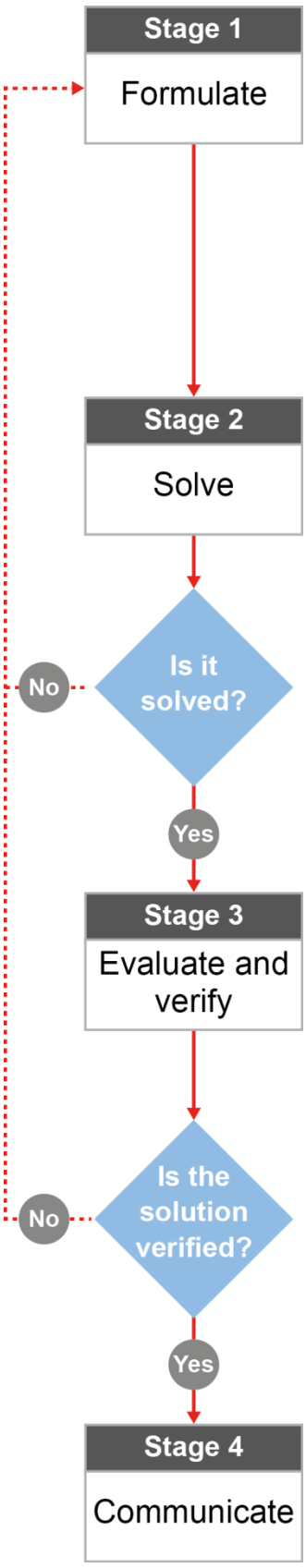
- ☐ One week after issue date: Students email evidence of their progress to their teacher.
- ☐ Two weeks after issue date: Students email a draft for feedback. General feedback on drafts is provided to the class, but no individual corrections are made.
- ☐ Three weeks after issue date: Students email evidence of their progress to their teacher.
- ☐ Four weeks after issue date: Students submit their final response.

Authentication strategies

- You will be provided class time for task completion.
- You will each produce a unique response by using individualised data and producing a unique report.
- You will provide documentation of your progress at indicated checkpoints.
- Your teacher will ensure class cross-marking occurs.
- You will use plagiarism-detection software to submit your response.
- You must acknowledge all sources.
- You must submit a declaration of authenticity.

Scaffolding

The approach to problem-solving and mathematical modelling must be used.



Select a sample number of rounds from a given dataset of sporting results from a particular competition. Then design a plan using this data to solve the problem of 'predicting' winning teams in at least three subsequent rounds of the competition. Translate the problem into a mathematically purposeful representation by determining the applicable mathematical and/or statistical principles, concepts, techniques and technologies that are required to make progress with the problem. Identify and document appropriate assumptions, variables and observations, based on the logic of a proposed solution and model.

Select and apply mathematical and statistical procedures, concepts and techniques previously learnt to solve the mathematical problem of 'predicting' winning teams in at least three subsequent rounds of the competition through your model. Synthesise and refine your model, and generate and test hypotheses with secondary data and information. Solutions can be found using algebraic, graphic, arithmetic and/or numeric methods, with or without technology.

Once a possible solution has been achieved, consider the reasonableness of the solution and the utility of the model in terms of the problem. Evaluate your results and make a judgment about the solution to the problem in relation to the original requirement of successfully 'predicting' winning teams in at least three subsequent rounds of the competition.

This will involve exploring the strengths and limitations of the solution and/or model. Where necessary, this will require going back through the process to further refine your model to provide a valid solution.

This stage emphasises the importance of methodological rigour and the fact that problem-solving and mathematical modelling is not usually linear and involves an iterative process.

Clearly and fully communicate your development of solutions and models to the problem of 'predicting' winning teams in at least three subsequent rounds of the competition. Communicate your findings systematically and concisely using mathematical, statistical and everyday language, including through a suitable introduction, body and conclusion. Draw conclusions by discussing the key results and the strengths and limitations of the solution and/or model. Offer further explanation, justification and/or recommendations, framed in the context of the initial problem

Instrument-specific marking guide (IA1): Examination — Problem-solving and modelling task (20%)

Criterion: Formulate

Assessment objectives

1. select, recall and use facts, rules definitions and procedures drawn from Unit 3 Topics 2 and/or 3
2. comprehend mathematical concepts and techniques drawn from Unit 3 Topics 2 and/or 3
5. justify procedures and decisions by explaining mathematical reasoning

The student work has the following characteristics:	Marks
• documentation of appropriate assumptions • accurate documentation of relevant observations • accurate translation of all aspects of the problem by identifying mathematical concepts and techniques.	3–4
• statement of some assumptions • statement of some observations • translation of simple aspects of the problem by identifying mathematical concepts and techniques.	1–2
• does not satisfy any of the descriptors above.	0

Criterion: Solve

Assessment objectives

1. select, recall and use facts, rules, definitions and procedures drawn from Unit 3 Topics 2 and/or 3
6. solve problems by applying mathematical concepts and techniques drawn from Unit 3 Topics 2 and/or 3

The student work has the following characteristics:	Marks
• accurate use of complex procedures to reach a valid solution • discerning application of mathematical concepts and techniques relevant to the task • accurate and appropriate use of technology.	6–7
• use of complex procedures to reach a reasonable solution • application of mathematical concepts and techniques relevant to the task • use of technology.	4–5
• use of simple procedures to make some progress towards a solution • simplistic application of mathematical concepts and techniques relevant to the task • superficial use of technology.	2–3
• inappropriate use of technology or procedures.	1
• does not satisfy any of the descriptors above.	0

Criterion: Evaluate and verify

Assessment objectives

4. evaluate the reasonableness of solutions
5. justify procedures and decisions by explaining mathematical reasoning

The student work has the following characteristics:	Marks
• 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.	4–5
• statements about the reasonableness of solutions by considering the context of the task • statements of relevant strengths and limitations of the solution and/or model • statements about decisions made relevant to the context of the task.	2–3
• statement about a decision and/or the reasonableness of a solution.	1
• does not satisfy any of the descriptors above.	0

Criterion: Communicate

Assessment objective

3. communicate using mathematical, statistical and everyday language and conventions

The student work has the following characteristics:	Marks
• 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, which can be read independently of the task sheet.	3–4
• use of some appropriate language and conventions to develop the response • adequate organisation of the response.	1–2
• does not satisfy any of the descriptors above.	0