

## Stage 1 General Mathematics

### Assessment Type 2: Mathematical Investigation

#### A Network Problem

In this topic (Matrices and Networks) you have studied ways of solving several different types of network problems. For this investigation you are required to devise a network problem of your own, set in a context from your local environment. For the purposes of this investigation, 'local environment' means somewhere you are familiar with – it could be in your home or school grounds, local council area or it could include the whole state or country. This will depend on the problem you choose to solve. Your mathematical investigations will be recorded in a report. The suggested format for the report is provided on the second page.

##### Part 1: Formulate the problem to be solved

You have a great deal of choice here. Some possible examples are given below to get you started. Check your proposed problem with the teacher before proceeding to Part 2.

Example 1: The students at your school have requested that drinking fountains fed from a rainwater tank be placed at convenient places around the grounds. Using a map of the school, decide where the fountains would be located and how they can be connected to the tank in the most cost efficient way.

Example 2: A charity walk is planned for your council area. Part of the proposed route has all the walkers passing through a local park that has a network of paths of different widths. Analyse the maximum possible flow rate of people through the park and report to the council on the implications of your findings.

Example 3: You are planning a road trip between two major cities in Australia (or towns in your state). There are several routes that can be taken without backtracking. Determine the 'best' route to take using a variety of different 'costs' (such as distance, time, road conditions, number of tourist attractions available, etc) along each of the arcs of the road network.

##### Part 2: Solve the basic problem

Create the network diagram from the information you have collected and solve the problem(s) you have posed.

##### Part 3: Investigate the effects of possible changes

Devise one or more changes to conditions in the initial problem, and make a prediction about the possible effect these changes would have on the original solution. These changes to conditions could include:

- Restrictions on the original conditions
- Using a different algorithm to find the solution
- Possible upgrades to improve the solution to the original problem.

##### Part 4: Conclusion

Analyse and compare your results from Parts 2 and 3 above, including the reasonableness of your prediction. Your discussion should include a consideration of the effects of simplifying assumptions and the limitations on the practicality or reliability of your solution.

Your report on the mathematical investigation should include the following:

- an outline of the problem to be explored
- the method used to find a solution
- the application of the mathematics, including
  - generation or collection of relevant data and/or information, with a summary of the process of collection
  - mathematical calculations and results, using appropriate representations
  - discussion and interpretation of results, including consideration of the reasonableness and limitations of the results
- the results and conclusions in the context of the problem
- a bibliography and appendices, as appropriate.

The format of an investigation report may be written or multimodal.

The investigation report should be a **maximum of 8 pages** if written, or the equivalent in multimodal form.

### Concepts and Techniques

The specific features are as follows:

- CT1 Knowledge and understanding of concepts and relationships
- CT3 Application of mathematical models

### Reasoning and Communication

The specific features are as follows:

- RC1 Interpretation of mathematical results
- RC2 Drawing conclusions from mathematical results, with an understanding of their reasonableness and limitations
- RC3 Use of appropriate mathematical notation, representations, and terminology
- RC4 Communication of mathematical ideas and reasoning to develop logical arguments
- RC5 Forming and testing of predictions

## Performance Standards for Stage 1 General Mathematics

	Concepts and Techniques	Reasoning and Communication
<b>A</b>	<p><b>Comprehensive knowledge and understanding of concepts and relationships.</b></p> <p>Highly effective selection and application of mathematical skills, techniques, and algorithms to find efficient and accurate solutions to routine and complex problems in a variety of contexts.</p> <p><b>Successful development and application of mathematical models to find concise and accurate solutions.</b></p> <p>Appropriate and effective use of electronic technology to find accurate solutions to routine and complex problems.</p>	<p>Comprehensive interpretation of mathematical results in the context of the problem.</p> <p>Drawing logical conclusions from mathematical results, with a comprehensive understanding of their reasonableness and limitations.</p> <p>Proficient and accurate use of appropriate mathematical notation, representations, and terminology.</p> <p>Highly effective communication of mathematical ideas and information reasoning to develop logical and concise arguments.</p> <p>Formation and testing of appropriate predictions, using sound mathematical evidence.</p>
<b>B</b>	<p><b>Some depth of knowledge and understanding of concepts and relationships.</b></p> <p>Mostly effective selection and application of mathematical skills, techniques, and algorithms to find mostly accurate solutions to routine and some complex problems in a variety of contexts.</p> <p><b>Attempted development and successful application of mathematical models to find mostly accurate solutions.</b></p> <p>Mostly appropriate and effective use of electronic technology to find mostly accurate solutions to routine and some complex problems.</p>	<p>Mostly appropriate interpretation of mathematical results in the context of the problem.</p> <p>Drawing mostly logical conclusions from mathematical results, with some depth of understanding of their reasonableness and limitations.</p> <p>Mostly accurate use of appropriate mathematical notation, representations, and terminology.</p> <p>Mostly effective communication of mathematical ideas and information reasoning to develop mostly logical arguments.</p> <p>Formation and testing of mostly appropriate predictions, using some mathematical evidence.</p>
<b>C</b>	<p><b>Generally competent knowledge and understanding of concepts and relationships.</b></p> <p>Generally effective selection and application of mathematical skills, techniques, and algorithms to find mostly accurate solutions to routine problems in different contexts.</p> <p><b>Application of mathematical models to find generally accurate solutions.</b></p> <p>Generally appropriate and effective use of electronic technology to find mostly accurate solutions to routine problems.</p>	<p>Generally appropriate interpretation of mathematical results in the context of the problem.</p> <p>Drawing some logical conclusions from mathematical results, with some understanding of their reasonableness and limitations.</p> <p>Generally appropriate use of mathematical notation, representations, and terminology with reasonable accuracy.</p> <p>Generally effective communication of mathematical ideas and information reasoning to develop some logical arguments.</p> <p>Formation of an appropriate prediction and some attempt to test it using mathematical evidence.</p>
<b>D</b>	<p><b>Basic knowledge and some understanding of concepts and relationships.</b></p> <p>Some selection and application of mathematical skills and techniques to find some partially accurate solutions to routine problems in context.</p> <p><b>Some application of mathematical models to find some accurate or partially accurate solutions.</b></p> <p>Some appropriate use of electronic technology to find some accurate solutions to routine problems.</p>	<p>Some interpretation of mathematical results.</p> <p>Drawing some conclusions from mathematical results, with some awareness of their reasonableness.</p> <p>Some appropriate use of mathematical notation, representations, and terminology, with some accuracy.</p> <p>Some communication of mathematical ideas information with attempted reasoning and/or arguments.</p> <p>Attempted formation of a prediction with limited attempt to test it using mathematical evidence.</p>
<b>E</b>	<p><b>Limited knowledge or understanding of concepts and relationships.</b></p> <p>Attempted selection and limited application of mathematical skills or techniques, with limited accuracy in solving routine problems.</p> <p><b>Attempted application of mathematical models, with limited accuracy.</b></p> <p>Attempted use of electronic technology, with limited accuracy in solving routine problems.</p>	<p>Limited interpretation of mathematical results.</p> <p>Limited understanding of the meaning of the results or their reasonableness.</p> <p>Limited use of appropriate mathematical notation, representations, or terminology, with limited accuracy.</p> <p>Attempted communication of mathematical ideas and information, with limited reasoning.</p> <p>Limited attempt to form or test a prediction.</p>

