**NZQA**

**Approved**

Achievement standard: 91029 Version 3

Standard title: Apply linear algebra in solving problems

Level: 1

Credits: 3

Resource title: Stock to go

Resource reference: Mathematics and Statistics VP-1.4 v2

Vocational pathway: Primary Industries

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| Quality assurance status | These materials have been quality assured by NZQA.  NZQA Approved number A-A-02-2015-91029-02-7266 |
| Authenticity of evidence | Assessors/educators must manage authenticity for any assessment from a public source, because learners may have access to the assessment schedule or exemplar material.  Using this assessment resource without modification may mean that learners’ work is not authentic. Assessors/ educators may need to change figures, measurements or data sources or set a different context or topic to be investigated or a different text to read or perform. |

Vocational Pathway Assessment Resource

Achievement standard: 91029

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Learner instructions

# Introduction

This assessment activity requires you to apply linear algebra in solving problems in relation to costs for stock transport.

You are going to be assessed on how you apply linear algebra, using extended abstract thinking, when investigating the costs of different transport firms. You are required to communicate your solutions clearly and accurately.

The following instructions provide you with a way to structure your work so you can demonstrate what you have learnt and achieve success in this standard.

Assessor/educator note: It is expected that the assessor/educator will read the learner instructions and modify them if necessary to suit their learners.

# Task

Dan wants to know the cost of transporting the stock he will be selling in the autumn.

Resource A has the trucking costs from two local transport firms and Resource B shows the numbers of stock Dan plans to sell.

For each stock type, represent the costs from the two local transport firms using the same representation (for example equations or graphs).

Recommend which firm Dan should use for transporting all of his stock.

Recommend the cattle numbers for which it would be cheaper to use Ashley Transport.

How could Ashley Transport change their quote so that they are competitive for transport of large numbers of lambs, ewes and cattle? Suggest at least two ways in which they could realistically change their prices to be competitive. Include specific examples of the rates they could use.

# Resources

## Resource A: Transport costs

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| --- | --- |
| **Country Transport**  **Cattle**  $35 a head plus a fixed charge of $100 | **Ashley Transport**  **Cattle**  C = 38h + 10 where C is the cost in dollars and h is the number of head of cattle |
| **Ewes**  $3.50 a head plus a fixed charge of $50 | **Ewes**  $4 a head |
| **Lambs**  $2 a head plus a fixed charge of $125 | **Lambs**  $2.50 a head |

## Resource B: Stock to be sold

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| --- | --- |
| **Description of stock** | **Number of animals** |
| Annual draft ewes | 280 |
| Store lambs | 300 |
| Cattle | 35 |

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Assessor/Educator guidelines

# Introduction

The following guidelines are supplied to enable assessors/educators to carry out valid and consistent assessment using this internal assessment resource.

As with all assessment resources, education providers will need to follow their own quality control processes. Assessors/educators must manage authenticity for any assessment from a public source, because learners may have access to the assessment schedule or exemplar material. Using this assessment resource without modification may mean that learners' work is not authentic. The assessor/educator may need to change figures, measurements or data sources or set a different context or topic. Assessors/educators need to consider the local context in which learning is taking place and its relevance for learners.

Assessors/educators need to be very familiar with the outcome being assessed by the achievement standard. The achievement criteria and the explanatory notes contain information, definitions, and requirements that are crucial when interpreting the standard and assessing learners against it.

# Context/setting

This activity requires learners to apply linear algebra, using extended abstract thinking, to investigate quotes from different firms for transporting stock.

# Conditions

Learners will work independently on the activity.

# Resource requirements

Learners are expected to have access to appropriate technology.

# Additional information

Assessors/educators need to ensure that learners are familiar with any context specific vocabulary used in this resource.

# Assessment schedule: Mathematics and Statistics 91029 – Stock to go

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| Evidence/Judgements for Achievement | Evidence/Judgements for Achievement with Merit | Evidence/Judgements for Achievement with Excellence |
| The learner applies linear algebra in solving problems by:   * selecting and using a range of methods * demonstrating knowledge of algebraic concepts and terms * communicating solutions which would usually require only one or two steps   The learner needs to select and correctly use at least three different linear algebra methods in solving problems  For example:  The learner could:   * + form linear models for Country Transport   + use a formula to calculate a cartage cost for specified stock   + use simultaneous equations to determine when cattle transport for Ashley Transport and Country Transport cost the same   + graph linear models for the firms.   *The examples above are indicative of the evidence that is required.* | The learner applies linear algebra, using relational thinking, in solving problems by involving one or more of:   * selecting and carrying out a logical sequence of steps * connecting different concepts and representations * demonstrating understanding of concepts * forming and using a model   and also relating findings to the context, or communicating thinking using appropriate mathematical statements  For example:  The learner has recommended a firm for transporting the stock, recommended the cattle numbers for which Ashley Transport are cheaper. The learner has started to investigate different charges for Ashley Transport for them to be more competitive for larger stock numbers.  *The examples above are indicative of the evidence that is required.* | The learner applies linear algebra, using extended abstract thinking, in solving problems by involving one or more of:   * demonstrating understanding of abstract concepts * developing a chain of logical reasoning, or proof * forming a generalisation   and also using correct mathematical statements, or communicating mathematical insight  For example:  The learner has recommended a firm for transporting the stock and recommended cattle numbers for which Ashley Transport is cheaper.  The learner has fully described new charge rates for Ashley Transport and justified that they are more competitive for larger stock numbers.  *The examples above are indicative of the evidence that is required.* |

Final grades will be decided using professional judgement based on an examination of the evidence provided against the criteria in the Achievement Standard. Judgements should be holistic, rather than based on a checklist approach.