# Achievement Standard

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| **Subject Reference** | Mathematics and Statistics 3.15 | | | | |
| **Title** | Apply systems of simultaneous equations in solving problems | | | | |
| **Level** | 3 | **Credits** | 3 | **Assessment** | Internal |
| **Subfield** | Statistics and Probability | | | | |
| **Domain** | Algebra | | | | |
| **Status** | Registered | **Status date** | | 4 December 2012 | |
| **Planned review date** | 31 December 2018 | **Date version published** | | 4 December 2012 | |

This achievement standard involves applying systems of simultaneous equations in solving problems.

**Achievement Criteria**

| Achievement | Achievement with Merit | Achievement with Excellence |
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| • Apply systems of simultaneous equations in solving problems. | • Apply systems of simultaneous equations, using relational thinking, in solving problems. | • Apply systems of simultaneous equations, using extended abstract thinking, in solving problems. |

**Explanatory Notes**

1 This achievement standard is derived from Level 8 of *The New Zealand Curriculum,* Learning Media, Ministry of Education, 2007; and is related to the achievement objective:

- Form and use systems of simultaneous equations, including three linear equations and three variables, and interpret the solutions in context

in the Mathematics strand of the Mathematics and Statistics Learning Area. It is also related to the material in the *Teaching and Learning Guide for Mathematics and Statistics*, Ministry of Education, 2012, at http://seniorsecondary.tki.org.nz.

This standard is also derived from *Te Marautanga o Aotearoa*. For details of the *Marautanga* achievement objectives to which this standard relates, see the Māori version of the standard.

2 *Apply systems of simultaneous equations in solving problems* involves:

- selecting and using methods
- demonstrating knowledge of concepts and terms
- communicating using appropriate representations.

*Relational thinking* involves one or more of:
- selecting and carrying out a logical sequence of steps
- connecting different concepts or representations
- demonstrating understanding of concepts
- forming and using a model;

and also relating findings to a context, or communicating thinking using appropriate mathematical statements.

*Extended abstract thinking* involves one or more of:
- devising a strategy to investigate or solve a problem
- identifying relevant concepts in context
- developing a chain of logical reasoning, or proof
- forming a generalisation;

and also using correct mathematical statements, or communicating mathematical insight.

3 *Problems* are situations that provide opportunities to apply knowledge or understanding of mathematical concepts and methods. Situations will be set in real-life or mathematical contexts.

4 Methods include a selection from those related to:
- forming systems of simultaneous equations
- solving systems of simultaneous equations
- the nature of solutions to systems.

5 Conditions of Assessment related to this achievement standard can be found at www.tki.org.nz/e/community/ncea/conditions-assessment.php.

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**Replacement Information**
This achievement standard replaced unit standard 5262 and AS90644.

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**Quality Assurance**

1 Providers and Industry Training Organisations must have been granted consent to assess by NZQA before they can register credits from assessment against achievement standards.

2 Organisations with consent to assess and Industry Training Organisations assessing against achievement standards must engage with the moderation system that applies to those achievement standards.

Consent and Moderation Requirements (CMR) reference 0233

# Paerewa Paetae

**Aronga** Pāngarau 3.15

**Ingoa** Te whakamahi whārite tukutahi mō ngā taurangi e toru hei whakaoti rapanga

**Kaupae** 3 **Whiwhinga** 3 **Aromatawai** Ā-roto

**Marau akoranga** Te Marautanga o Aotearoa

**Kokonga akoranga** Pāngarau

**Mana rēhita** **Te rā i mana ai**

**Te rā e arotakengia ai** 31 Hakihea 2018 **Te rā i puta ai**

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## Te Hononga ki te Marautanga

I ahu mai tēnei paerewa paetae i te Taumata 8 o *Te Marautanga o Aotearoa*, i whakaputaina e Te Pou Taki Kōrero i te tau 2008.

## Whāinga Paetae

*Te Whārite me te Kīanga*

*8 Ka tuhi, ka whakamahi pūnaha whārite tukutahi, ka whai wāhi mai kia toru ngā whārite rārangi, kia toru hoki ngā taurangi, ka whakamārama hoki i te otinga i runga i te āhua o te horopaki.*

E hono ana ki te Papa Whakaako mō te Pāngarau kei te pae tukutuku nei:
http://tmoa.tki.org.nz/Te-Marautanga-o-Aotearoa/Taumata-Matauranga-a-Motu-Ka-Taea

## Te Hononga ki *The New Zealand Curriculum* (NZC)

I ahu mai hoki tēnei paerewa paetae i *The New Zealand Curriculum*. Mō ngā kōrero e pā ana ki ngā whāinga paetae o te NZC e hāngai ana ki tēnei paerewa, tirohia te putanga reo Pākehā o te paerewa.

## Te Hononga ki ngā Tikanga Aromatawai

Arā ngā Tikanga Aromatawai mō tēnei paerewa paetae, kei te:
http://tmoa.tki.org.nz/Te-Marautanga-o-Aotearoa/Taumata-Matauranga-a-Motu-Ka-Taea

**Paerewa Paetae**

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|---|---|
| **Paetae**<br>Te whakaoti whārite tukutahi mō ngā taurangi e toru hei whakaoti rapanga. | Hei tohu i te paetae:<br>• Ka whiriwhiri, ka whakamahi i ētahi tikanga whānui hei whakaoti rapanga.<br>• Ka whakaatu mōhiotanga ki ngā huatau me ngā kupu e hāngai ana hei whakaoti rapanga.<br>• Ka tūhono i ētahi huatau rerekē.<br>• Ka whakamārama i ngā otinga mēnā kotahi, e rua rānei ngā mahi o roto i te tikanga i whakamahia ai. |
| **Kaiaka**<br>He kaiaka te whakaoti whārite tukutahi mō ngā taurangi e toru hei whakaoti rapanga. | Hei tohu i te kaiaka:<br>• Ko te whakaaro tūhonohono te mea nui. Arā, kia kotahi, nui ake rānei o ēnei:<br>– ka whiriwhiri, ka whakatutuki raupapatanga mahi arorau hei whakaoti rapanga.<br>– ka tūhono i ētahi huatau rerekē, i ētahi whakaahuahanga rerekē rānei hei whakaoti rapanga.<br>– ka whakaatu māramatanga ki ngā huatau e hāngai ana<br>– ka hanga, ka whakamahi tauira.<br>• Ka tūhono i ngā otinga ki tētahi horopaki, ka whakamahi rānei i ngā kīanga pāngarau hei whakawhitiwhiti whakaaro. |
| **Kairangi**<br>He kairangi te whakaoti whārite tukutahi mō ngā taurangi e toru hei whakaoti rapanga. | Hei tohu i te kairangi:<br>• Ko te whakaaro waitara te mea nui. Arā, kia kotahi, nui ake rānei o ēnei:<br>– ka waihanga rautaki hei tūhura, hei whakaoti rānei i tētahi rapanga.<br>– ka tautohu i ngā huatau e hāngai ana ki te horopaki.<br>– ka whakaputa i tētahi raupapatanga whakaaro arorau, i tētahi hāponotanga rānei.<br>– ka hanga whakawhānuitanga.<br>• Ka whakamahi i ngā kīanga pāngarau tika hei whakawhitiwhiti i te aroā pāngarau. |

**Kōrero Āpiti**

1 E whai ake nei ngā whakamārama o ngā tino kupu, kīanga rānei:

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| rapanga | Ko ngā āhuatanga o ia rā, ngā āhuatanga pāngarau rānei ka whai wāhi mai te whakamahinga o te mātauranga pāngarau, o ngā huatau pāngarau, o ngā tikanga pāngarau rānei. |

2 Kia taunga te ākonga ki ngā tikanga o te pūnaha whārite tukutahi:
- ka tuhi pūnaha whārite tukutahi
- ka whakaoti pūnaha whārite tukutahi
- ka whakamārama i te āhua o ngā otinga i puta i te pūnaha whārite
- tukutahi. Mā b2 - 4ac te āhua o te otinga e tohu.

Kuputaka:

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| aroā pāngarau | mathematical insight |
| kīanga pāngarau | mathematical statement |
| whakaaro arorau | logical thinking, reasoning |
| whakaaro tūhonohono | relational thinking |
| whakaaro waitara | abstract thinking |

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**He Kōrero mō te Whakakapi**

Koinei hei whakakapi i te paerewa 5262 me te paerewa paetae 90644.

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**Tātari Kounga**

1 Me mātua whakamana ngā Kaituku Akoranga me ngā Whakahaere Whakangungu Ahumahi e te Mana Tohu Mātauranga o Aotearoa ka rēhita ai i ngā hua ka puta mai i ngā aromatawai ki ngā paerewa paetae.

2 Ko ngā Kaituku Akoranga me ngā Whakahaere Whakangungu Ahumahi kua mana, ā, e aromatawai ana i ā rātou hōtaka ki ngā paerewa paetae, me uru rātou ki ngā pūnaha whakaōrite e tika ana mō aua paerewa paetae.

Ko te tohutoro ki te Mahere Whakamana, Whakaōritenga hoki 0233