Achievement Standard

Subject Reference	Mathematics and Statistics 2.14				
Title	Apply systems of equations in solving problems				
Level	2	**Credits**	2	**Assessment**	Internal
Subfield	Mathematics				
Domain	Algebra				
Status	Registered	**Status date**	19 November 2015		
Planned review date	31 December 2020	**Date version published**	19 November 2015		

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

Achievement Criteria

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

Explanatory Notes

1 This achievement standard is derived from Level 7 of *The New Zealand Curriculum,* Learning Media, Ministry of Education, 2007; and is related to the achievement objectives
- form and use linear and quadratic equations
- form and use pairs of simultaneous equations, one of which may be non-linear

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, 2010 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 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 and terms
- 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 and using a pair of simultaneous equations, one of which is non-linear
- forming and using a system of linear inequations
- connecting different representations of equations or inequations
- interpreting solutions of a system of equations or inequations in context.

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

Replacement Information

This achievement standard and AS91261 replaced AS90284, AS90806, AS90809, and unit standard 5246.

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 2.14				
Ingoa	Te whakamahi whārite tukutahi hei whakaoti rapanga				
Kaupae	2	**Whiwhinga**	2	**Aromatawai**	Ā-roto
Marau akoranga	Te Marautanga o Aotearoa				
Kokonga akoranga	Pāngarau				
Mana rēhita	Kua rēhitatia	**Te rā i mana ai**	19 Whiringa-ā-rangi 2015		
Te rā e arotakengia ai	31 Hakihea 2020	**Te rā i puta ai**	8 Hakihea 2015		

Te Hononga ki te Marautanga

I ahu mai tēnei paerewa paetae i te Taumata 7 o *Te Marautanga o Aotearoa*, i whakaputaina e Te Pou Taki Kōrero i te tau 2008.

Whāinga Paetae

Te Taurangi me te Tuanaki, Te Whārite me te Kīanga
6 Ka rāwekeweke i ngā kīanga taurangi hautanga, taupūtanga, taupūtanga kōaro hoki.
8 Ka tuhi, ka whakamahi whārite tukutahi, he rārangi-kore tētahi o ngā whārite.

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

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

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 whārite tukutahi:
- Ka tuhi, ka whakamahi hoki i ngā whārite tukutahi. He wā ōna ka whakamahi i ngā whārite rārangi $y = x$ me ngā whārite pūrua $y = x^2$.
- Ka tūhono i ngā kitenga o ngā whārite me ngā tōrite.
- Ka whakaatu māramatanga ki ngā otinga ka hua mai i ngā whārite me tōna hāngaitanga ki te horopaki.

Kuputaka:

aroā pāngarau	mathematical insight
kīanga pāngarau	mathematical statement
whakaaro tūhonohono	relational thinking
whakaaro waitara	abstract thinking

He Kōrero mō te Whakakapi

Koinei me te paerewa paetae AS91261 hei whakakapi i ngā paerewa paetae AS90284, AS90806 me AS90809, me te paerewa 5246.

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