Achievement Standard

Subject Reference	Mathematics and Statistics 3.1				
Title	Apply the geometry of conic sections in solving problems				
Level	3	**Credits**	3	**Assessment**	Internal
Subfield	Mathematics				
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 the geometry of conic sections in solving problems.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
• Apply the geometry of conic sections in solving problems.	• Apply the geometry of conic sections, using relational thinking, in solving problems.	• Apply the geometry of conic sections, 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:

- Apply the geometry of conic sections

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 the geometry of conic sections 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:

- graphs and equations of the circle, ellipse, parabola, and hyperbola
- Cartesian and parametric forms
- properties of conic sections
- tangents and normals.

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 replaced unit standard 20661 and AS90639.

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 3.1				
Ingoa	Te whakamahi i ngā tikanga āhuahanga o te motunga koeko				
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**		

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 Taurangi me te Tuanaki, Te Tauira me te Pānga

1 Ka whakamahi i ngā tikanga āhuahanga o te motunga koeko.

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 i ngā tikanga āhuahanga o te motunga koeko.	Hei tohu i te paetae: • Ka whiriwhiri, ka whakamahi i ētahi tikanga whānui hei whakaoti rapanga. • Ka whakaatu mōhiotanga ki ngā huatau me ngā kupu e hāngai ana hei whakaoti rapanga. • Ka tūhono i ētahi huatau rerekē. • 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 i ngā tikanga āhuahanga o te motunga koeko.	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 i ngā tikanga āhuahanga o te motunga koeko.	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 āhuahanga o te motunga koeko:
- te whārite me te kauwhata o ngā porohita, ngā unahi, ngā pororapa me ngā pūwerewere
- ka tuhi hei taunga tukutuku, hei whārite taurangi e toru hoki
- te āhua o ngā motunga koeko
- ngā pātapa me ngā rārangi hāngai ki ngā pātapa.

Kuputaka:

aroā pāngarau	mathematical insight
kīanga pāngarau	mathematical statement
pororapa	ellipse
pūwerewere	hyperbola
taunga tukutuku	Cartesian coordinates
unahi	parabola
whakaaro arorau	logical thinking, reasoning
whakaaro tūhonohono	relational thinking
whakaaro waitara	abstract thinking
whārite taurangi e toru	parametric equation

He Kōrero mō te Whakakapi

Koinei hei whakakapi i te paerewa 5265 me te paerewa paetae 90635

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