

Achievement Standard

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| Subject Reference | Mathematics and Statistics 3.4 | | |
| Title | Use critical path analysis in solving problems | | |
| Level | 3 | Credits | 2 |
| | | Assessment | Internal |
| Subfield | Mathematics | | |
| Domain | Geometry | | |
| Status | Registered | Status date | 4 December 2012 |
| Planned review date | 31 December 2020 | Date version published | 17 November 2016 |

This achievement standard involves using critical path analysis in solving problems.

Achievement Criteria

| Achievement | Achievement with Merit | Achievement with Excellence |
|---|--|---|
| <ul style="list-style-type: none"> Use critical path analysis in solving problems. | <ul style="list-style-type: none"> Use critical path analysis, with relational thinking, in solving problems. | <ul style="list-style-type: none"> Use critical path analysis, with extended abstract thinking, in solving problems. |

Explanatory Notes

Version 2 was republished in January 2017 to correct the introductory statement.

- 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:
 - Develop network diagrams to find optimal solutions, including critical paths 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.

- Use critical path analysis 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:
 - precedence tables
 - network diagrams
 - critical events
 - scheduling
 - float times.
- 5 Conditions of Assessment related to this achievement standard can be found at www.tki.org.nz/e/community/ncea/conditions-assessment.php.

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.

Paerewa Paetae

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|------------------------|--|-----------------|--------------------------|------------|--------|
| Aronga | Pāngarau 3.4 | | | | |
| Ingoa | Te whakamahi tikanga kimi ara tino whaitake hei whakaoti rapanga | | | | |
| Kaupae | 3 | Whiwhinga | 2 | Aromatawai | Ā-waho |
| Marau akoranga | Te Marautanga o Aotearoa | | | | |
| Kokonga akoranga | Pāngarau | | | | |
| Mana rēhita | Kua rēhitatia | Te rā i mana ai | 4 Hakihea 2012 | | |
| Te rā e arotakengia ai | 31 Hakihea 2020 | Te rā i puta ai | 17 Whiringa-ā-rangi 2016 | | |

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 Taura me te Pānga

5 *Ka tuhi hoahoa rauara hei whiriwhiri i te otinga e tino whaihua ana, ka whakamārama hoki i ngā ara matua.*

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 Paearu Aromatawai

Arā ngā Paearu 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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| <p>Paetae Te whakamahi tikanga kimi ara tino whaitake hei whakaoti rapanga.</p> | <p>Hei tohu i te paetae:</p> <ul style="list-style-type: none"> • 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. |
| <p>Kaiaka He kaiaka te whakamahi tikanga kimi ara tino whaitake hei whakaoti rapanga.</p> | <p>Hei tohu i te kaiaka:</p> <ul style="list-style-type: none"> • Ko te whakaaro tūhonohono te mea nui. Arā, kia kotahi, nui ake rānei o ēnei: <ul style="list-style-type: none"> – 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. |
| <p>Kairangi He kairangi te whakamahi tikanga kimi ara tino whaitake hei whakaoti rapanga.</p> | <p>Hei tohu i te kairangi:</p> <ul style="list-style-type: none"> • Ko te whakaaro waitara te mea nui. Arā, kia kotahi, nui ake rānei o ēnei: <ul style="list-style-type: none"> – 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:

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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. |
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2 Kia taunga te ākonga ki ngā tikanga kimi ara tino whaitake:

- ngā tūtohunga raupapatanga kaupapa
- ngā hoahoa rauara
- ngā kaupapa tino whaitake
- te wātaka hei whai atu
- te hononga o te hoahoa rauara ki te wātaka: āhea tatari ai, āhea kōkiri ai

Kuputaka:

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|--------------------------------|-----------------------------|
| aroā pāngarau | mathematical insight |
| kaupapa tino whaitake | critical events |
| kīanga pāngarau | mathematical statement |
| tūtohunga raupapatanga kaupapa | precedence tables |
| whakaaro arorau | logical thinking, reasoning |
| whakaaro tūhonohono | relational thinking |
| whakaaro waitara | abstract thinking |

ātari 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

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