

Te Papa Whakaako Pāngarau
Taumata 6 Te Marautanga Pāngarau o Aotearoa
Taumata 1 NCEA

Ngā Ihirangi

Ngā Kōrero Whakataki

He aha tēnei mea te pāngarau?
Te wāhi nui ki te pāngarau i tō tātou ao
Ngā whāinga nui mō te pāngarau
Te hononga o te pāngarau me te marau ā-kura
Te reo matatini o te Pāngarau
Te hononga o te marautanga pāngarau me te marautanga mathematics
Te papa whakaako mathematics

Te Marautanga Pāngarau

Ngā huatau pāngarau matua o te Taumata 6
Ngā whāinga paetae
he whakamārama i ngā kupu pāngarau

Te Whakaako i te Pāngarau

Te wāhi nui ki te reo
Te whakamahere
He tauira mahere
Te Tau
Te Taurangi
Te Āhuahanga
Te Tauanga
Te whakaoti rapanga
Te wāhi nui ki te horopaki

Te Aromatawai

He mātāpono mō te aromatawai i roto i te pāngarau
Te āhua o ngā ngohe aromatawai
Te aromatawai me ngā paerewa paetae o te NCEA

Ngā Paerewa Paetae o te NCEA

Te mahere o ngā paerewa paetae
Te hononga ki te marautanga
He tauira ngohe aromatawai mō ngā paerewa paetae ā-roto

Ngā Kōrero Whakataki

He Aha Tēnei Mea te Pāngarau?

Ko te pūtaka o te pāngarau, ko te tūhura, ko te whakamahi i ngā tauira me ngā pānga e puta ake ana i ngā rahinga, i ngā huinga raraunga, i ngā āhuatanga mokowā, i ngā āhuatanga rānei e pā ana ki te wā.

Ko te tangata whai mātauranga i te pāngarau:

- he whaihua tana whakamahi i te pāngarau i roto i āna kaupapa o ia rā – i te kāinga, i ngā wāhanga ako katoa o te kura, i te marae, i te hāpori whānui anō hoki;
- e huaki ana tōna hinengaro ki te whakamahi i te pāngarau hei painga mōna me ngā kaupapa ka whai wāhi atu ia;
- e huaki ana ngā huarahi hei whaitanga māna i ngā tūranga mahi huhua.

Te Wāhi Nui ki te Pāngarau i tō tātou Ao

He āwhina nui kei roto i te pāngarau me ngā tikanga o te pāngarau e mārama ai te tangata ki tōna ao, e whai whakaaro arorau, auaha anō hoki ia ki ngā momo kaupapa huhua. **Nō reira he wāhi nui tō te pāngarau e pakari ai te hinengaro o te tangata.**

He ātaahua te ao pāngarau. Arā ngā āhuatanga mīharo hei whakaihiihi i te tangata, hei tūhura, hei pākiki māna. Ko ētahi āhuatanga ka pā ki te ao kikokiko, ko ētahi, he whakaaro waitara kei muri e hāpai ana i te ao kikokiko. **Nō reira he wāhi nui tō te pāngarau hei whakawhānui i te hinengaro o te tangata.**

Ahakoia huri ki hea, kitea ai te mātauranga pāngarau e whakamahia ana i roto i ngā mahi o ia rā, i roto i ngā kaupapa ako katoa o te kura, i roto hoki i ngā tūranga mahi whānui tonu. **Nō reira he wāhi nui tō te pāngarau e rangatira ai te noho a te tangata ki tōna ao.**

Ngā Whāinga nui mō te Pāngarau

- Kia mārama ki ngā [huatau matua](#) o roto i te pāngarau.
- Kia whai pūkenga ki te whakaoti [rapanga pāngarau](#)
- Kia mārama ki [te reo matatini o te pāngarau](#) Kia pūkākā te ahi o te hia mōhio, o te pākiki ki roto i te ākongā.

Te Hononga o te Pāngarau me te Marau ā-Kura

He tino whai tikanga kia tūhonoa te pāngarau ki te marau ā-kura. Arā, me āta wānanga e te kura te wāhi ki te pāngarau e tutuki ai tā te kura e whai ana, kia puta ko te āhua o te ākongā e hiahiatia ana. Ko ngā hononga matua pea, ko ēnei:

- ko te wāhi ki te pāngarau hei whakaohoho, hei whakapakari, hei whakawhānui i te hinengaro o te ākongā;
- ko te wāhi ki te pāngarau e tutuki ai i te ākongā āna mahi i ia rā, e noho rangatira ai ia ki tōna ao;
- ko te wāhi ki te pāngarau hei huaki i ngā kūaha ki ngā ara mātauranga me ngā momo tūranga mahi whānui;
- ko te wāhi ki te pāngarau hei whakapakari i te reo Māori o te ākongā;
- ko te wāhi ki te pāngarau e hāpaitia ai ngā kaupapa o te whānau, o te hapū, o te iwi.

Te Reo Matatini o te Pāngarau

Ko te reo matatini o te pāngarau, koia ko ngā kupu, ko ngā tohu, ko ngā whakaahuahanga maha e kawea ai te mātauranga me te whakaaro pāngarau. He wāhi nui ki te reo matatini o te pāngarau i roto i te marautanga.

Hei tauira:

- Ko ngā kupu motuhake o te pāngarau, pērā i te whārite, te taurangi, te waeine, te whakarea me te huhua noa atu.
- Ko ngā momo rerenga kōrero he auau te whakamahia i roto i te pāngarau, pērā i te hāngūtanga, me te whakatairite.
- Ko ngā tohu, pērā i te ° mō te putu, te % mō te ōrau, te ÷ mō te whakawehe, me te huhua noa atu.
- Ko ngā whakaahuahanga, pērā i ngā momo kauwhata, ngā momo rārangi tau, te tūtohi, te pūnaha tukutuku, me te huhua noa atu.

Te Hononga o te Marautanga Pāngarau me te Marautanga Mathematics

I ngā taumata 6, 7 me te 8, e rite ana te nuinga o ngā whāinga paetae o te marautanga pāngarau, me te marautanga mathematics i te reo Ingarihi. E toru ngā wāhi e rerekē ana:

- Karekau he whāinga o te marautanga mathematics e hāngai ana ki te reo matatini, pērā i tō te marautanga pāngarau i te reo Māori.
- Karekau he whāinga o te marautanga mathematics e hāngai ana ki te whakamahinga o te pāngarau, pērā i tō te marautanga pāngarau i te reo Māori.
- Karekau he whāinga o te marautanga mathematics e hāngai ana ki ngā tikanga matatika o te tūhuratanga tauanga, pērā i tō te marautanga pāngarau i te reo Māori.

Nā runga anō i te ōrite o tētahi ki tētahi, he pērā anō ngā paerewa paetae. Arā, he ōrite ngā paerewa paetae pāngarau me ngā paerewa paetae mathematics mō te 1.1 ki te 1.13. Ko te mea e rerekē ana ko ngā tauira ngohe aromatawai, kia hāngai tonu ki ngā horopaki e taunga ana ngā ākongā o te kura rumaki ki te reo Māori. E rua atu anō ngā paerewa

Papa Whakaako Pāngarau L1 v1 draft

paetae pāngarau, ko te 1.14 e hāngai ana ki te whakamahinga o te pāngarau, me te 1.15 e hāngai ana ki te reo matatini o te pāngarau.

Te Papa Whakaako Mathematics

Kei te Papa Whakaako Mathematics i te reo Ingarihi ētahi kōrero hei āwhina i te pouako e mahi mai ana i ngā kura rumaki i te reo Māori. Hei āpitihanga kōrero ērā ki ngā kōrero kei roto i tēnei Papa Akoranga e arotahi ana ki te whakaako i te pāngarau i te reo Māori. Koia nei te pae ipurangi:

[Curriculum Guide](#)

Te Marautanga Pāngarau

Ngā Huatau Pāngarau Matua o te Taumata 6

[All underlined words in this section of the document are in the Papa Kupu at the end of the Papa Whakaako]

Te Tau

Arā ngā āhuatanga huhua o tō tātou ao e whakamahia ai te tau hei tautohu rahinga, ā, he ture, he tikanga rānei hei tūhonohono i ēnei rahinga.

Hei tauira, ko te kakapa o te manawa, ko ngā kaute i ngā kēmu hākinakina, ko te whakarite kai hei whāngai manuhiri, ko te piki me te heke o te tai.

Kei tēnei taumata, ko te tūhura me te whakamahi i ngā momo pānga riterite, pānga kōaro, ngā taupūtanga tōraro me ngā taupūtanga hautau. Ka noho ko te matatau o te ākongā ki te mātauranga me ngā rautaki tau, hei tūāpapa mōna e eke taumata ai ia i ngā taumata o te taurangi.

Te Taurangi

Ko tā te whārite taurangi, he whakaata i tētahi rapanga, he tūhono hoki i ngā taurangi o roto i te rapanga, ā, mā te whakaoti i te whārite e whiriwhiria ai te otinga o te rapanga. Ka taea te hononga o ētahi taurangi te whakaatu hei whārite, hei tūtohi, hei kauwhata anō hoki. Arā ngā tikanga e hāngai ana ki te rāwekeweke whārite taurangi e puta ai he otinga. Ko te mātauranga me ngā rautaki tau hei tūāpapa mō ēnei tikanga taurangi. Ko te tikanga matua, kia ōrite te rāwekeweke i ia taha o te whārite hei whakamāmā kia pūmau tonu te ōritenga, ā, kia hua mai ai te uara o ngā taurangi.

Hei tauira:

Ko te whārite hei tātai i te moni hua mō te hoko tihāte tāmoko:

$$\begin{aligned} H &= 15t - 7t - 2t - 175 \\ &= 6t - 175 \end{aligned}$$

- Ko te H hei tohu i te moni hua.
- Ko te t hei tohu i te maha o ngā tihāte ka hokona atu.
- E \$7 te utu hei hoko mai i ia tihāte.
- E \$2 hei tāmoko i ia tihāte.
- \$15 te utu e hokona atu ana ngā tihāte.
- \$175 te utu hei whakarite i te pūrere tā i te moko.

Ina whakaaturia tētahi whārite taurangi ki te kauwhata rārangi, ko te rōnaki o te rārangi hei tohu i te pāpātanga o te whiti.

Te Ine

Ko te huatau matua o te ine kei tēnei taumata, ko te maha o ngā mati whai tikanga o tētahi inenga hei tohu i te tōtika o taua inenga. Ko te horopaki o te

rapanga hei tohu i te tōtika o te inenga e hiahiatia ana, ā, ko te tōtika hoki o te taputapu ine tētahi atu āhuatanga hei whakaaroaro.

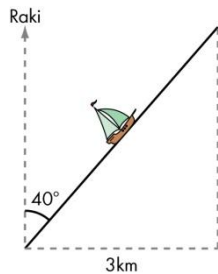
Hei tauira:

Mēnā 10,000 mita te roa o tētahi whakataetae omaoma, ā, ka 10,000 tāngata ka mātakitaki i te omaoma, tērā pea e 5 ngā mati whai tikanga o te 10,000m (kua inea ki te 1 mita e pātata ana), engari e 2 noa iho pea ngā mati whai tikanga o te 10,000 tāngata (kua tatauria ki te mano e pātata ana).

Te Hanga

I tēnei taumata, ka whakamahia ngā āhuatanga waitara o ngā momo āhua hei whakaoti rapanga. Hei tauira:

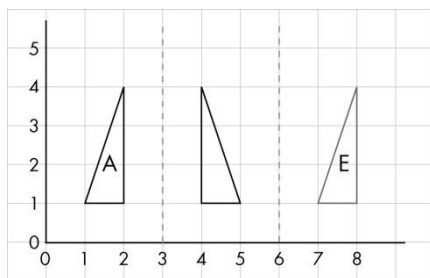
- Ko te tātai i te rōrahi o te raima hei hanga i te papa o tētahi hēti miraka kau, he porowhita tōna āhua.
- Ko te tātai i te tawhiti o tētahi haere i runga i te mōhio ki te ahunga o taua haere me te tawhiti whakaterāwhiti:



$$\begin{aligned} \text{tawhiti} &= \frac{3}{\cos 50^\circ} \\ &= 4.7\text{km} \end{aligned}$$

Te Panoni

E whā ngā panoni matua, ko te whakaatanga, te hurihanga, te nekenga me te whakarahinga. He maha ngā huarahi e tutuki ai tētahi panoni. Hei tauira:



E hua mai ai te mātātuhi E i te mātāōroko A:

- me neke whakatematau kia 6 ngā wehenga o te tukutuku;
- me whakaata rānei i te rārangi $x = 3$, kātahi i te rārangi $x = 6$.

He tikanga hei tautohu i tēnā, i tēnā o ngā panoni, ā, he āhuatanga ka noho pūmau, he āhuatanga anō ka rerekē i raro i tēnā me tēnā o ngā panoni:

Te panoni	Hei tautohu i te panoni	Ngā āhuatanga ka noho pūmau	Ngā āhuatanga ka rerekē
te whakaatanga	• te rārangi whakaata	• te horahanga	• te wāhi noho

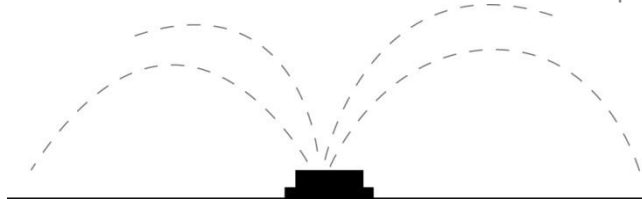
		<ul style="list-style-type: none"> • te roa o ngā rārangi • te whakarara o ngā rārangi • te rahi o ngā koki • te āhua • ngā pūwāhi e noho ana ki te rārangi whakaata 	<p>(hāunga ngā pūwāhi i te rārangi whakaata)</p> <ul style="list-style-type: none"> • te ahunga
te hurihanga	<ul style="list-style-type: none"> • te pū hurihanga • te rahi (koki) o te hurihanga 	<ul style="list-style-type: none"> • te pū o te huringa • te horahanga • te roa o ngā rārangi • te whakarara o ngā rārangi • te rahi o ngā koki • te āhua • te ahunga 	<ul style="list-style-type: none"> • te wāhi noho (hāunga te pū o te huringa)
te nekenga	<ul style="list-style-type: none"> • te ahunga o te nekenga • te tawhiti o te nekenga 	<ul style="list-style-type: none"> • te horahanga • te roa o ngā rārangi • te whakarara o ngā rārangi • te rahi o ngā koki • te āhua • te ahunga 	<ul style="list-style-type: none"> • te wāhi noho
te whakarahinga	<ul style="list-style-type: none"> • te pū o te whakarahinga • te taurahi 	<ul style="list-style-type: none"> • te whakarara o ngā rārangi • te rahi o ngā koki • te āhua • te ahunga 	<ul style="list-style-type: none"> • te horahanga • te roa o ngā rārangi

Te Wāhi me te Ahunga

Ka whakamahia ngā āhuatanga waitara o ngā momo huanui hei whakaoti rapanga.

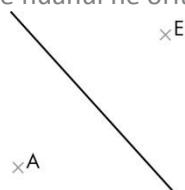
Hei tauira:

Ko te whiriwhiri i te rohe ka mākū i te hurihuri o te pūrere tuku wai.



E whā ngā momo huanui matua hei tiroiro i tēnei taumata:

- Ko te porowhita – he ōrite te tawhiti o ngā pūwāhi katoa o te porowhita ki te pū o te porowhita.
- Ko te huanui he ōrite te tawhiti mai i ētahi pūwāhi e rua:



He ōrite te tawhiti o te A me te E ki ia pūwāhi o te rārangi.

- Ko te huanui he ōrite te tawhiti mai i tētahi rārangi:



- Ko te huanui he ōrite te tawhiti mai i ētahi rārangi pūtahi e rua:



Te Tauanga

He āwhina nui te tauanga kia mārama ai tātou ki tētahi kaupapa. Ko te wāhi anō ki te taurangitanga o ngā raraunga tētahi huatau matua, waihoki ko ngā āhuetanga o te tīpako hei whakaata i te taupori, me te āhua o te hora o ngā raraunga.

Hei tauira:

Ko te kohikohi raraunga e pā ana ki te maha o ngā tuatua kei tētahi wāhi o te takutai i te takanga o ngā tau, hei āwhina i te whāomotanga o taua pātaka kai.

Ia rā, puta ai he kōrero tauanga i ngā nūpepa, i te pouaka whakaata, i ngā mōhēni rānei, ā, ko te āhehi ki te whakamāori i aua tauanga i runga i te tirohanga arohaehae tētahi pūkenga tino whaihua.

Te Tūponotanga

I tēnei taumata, ko tā te tūponotanga, he tiro tiro i ngā putanga o tētahi mahi, o tētahi āhuetanga rānei, me te kaha, te ngoikore rānei o tēnā putanga, o tēnā. Ka whakamahia he hautau kei waenganui i te kore me te tahi, he ōrau rānei mai i te 0% ki te 100% hei whakaatu i te tūponotanga o tētahi putanga.

He mea nui te tiro tiro me te tātai i te tūponotanga o ngā putanga o tētahi pāpono i roto i te ao pakihi, i te ao hākinakina, i roto hoki i ētahi kēmu maha, pērā i te uka me te 500.

He rerekē te tuari tātai o ngā putanga o tētahi horopaki tūponotanga i te tuari whakamātau o ngā putanga, waihoki he taurangirangi ngā putanga whakamātau. Hei tauira, ko te pīrori mataono tau:

E 6 ngā pīroritanga	Ngā putanga					
	1	2	3	4	5	6
putanga tātai	1	1	1	1	1	1
whakamātau 1	2	0	1	1	0	2
whakamātau 2	1	0	0	2	3	0
whakamātau 3	1	1	2	1	1	0
whakamātau 4	1	3	0	1	2	0

[All underlined words in this section of the document are in the Papa Kupu at the end of the Papa Whakaako]

Ngā Whāinga Paetae

E whai ake nei ngā whāinga paetae o te taumata 6 o te marautanga pāngarau, me te whakamārama anō i te tikanga o ētahi o ngā kupu.

Te Reo Matatini o te Pāngarau

Ka whakawhitiwhiti whakaaro, ka āta wānanga te ākonga i āna mahi pāngarau, mā te kupu (ā-waha, ā-tuhi), mā te tohu, me ngā momo whakaahuahanga. He mea nui tēnei hei tautoko i te whakatutukitanga o ngā whāinga paetae e pakari anō ai te whakaaro arorau, te whakaaro arohaehae, te whakaaro whaitake me te auahatanga o te ākonga e hāngai ana ki tēnei taumata.

Te Whakamahinga o te Pāngarau

Ka mārama te ākonga, ka arohaehae hoki ia i ngā tini whakamahinga o te pāngarau e hāngai ana ki tōna hapori. Me kākahu anō ngā whāinga paetae ki ngā momo horopaki maha o te ao whānui.

Te Tau me te Taurangi

Ka whakaoti rapanga, ka whakatauiria pūāhua:

Te Mātauranga Tau me ngā Rautaki Tau

1. Ka whakamahi pānga rārangi hāngai, pānga rārangi kōaro hoki.
2. Ka whakawhānui taupū, kia hāngai ki ngā tau tōpū me ngā hautau.
3. Ka whakamahi pāpātanga whakaputu o ia rā.
4. Ka whakamahi rautaki tau ki te whiriwhiri otinga tino whaihua.
5. Ka mārama ki te whaitakenga o te otinga o tētahi rapanga.

Te Whārite me te Kīanga

6. Ka tuhi, ka whakaoti whārite rārangi, tōrite rārangi, whārite pūrua, whārite taipū māmā, whārite tukutahi, kia rua ngā taurangi.

Te Pānga me te Taurira

7. Ka whakawhānui i ngā tikanga paheko tau, me ngā tikanga taupū.
8. Ka tūhono i te kauwhata, te tūtohi me te whārite ki ngā pānga rārangi, pānga pūrua, pānga taipū māmā e kitea mai ana i ngā taurira tau me ngā taurira mokowā.
9. Ka tūhono i te pāpātanga o te whiti ki te rōnaki o tētahi kauwhata.

Te Ine me te Āhuahanga

Ka whakaoti rapanga, ka whakatauiria pūāhua:

Te Ine

1. Ka whakatutuki inenga kia hāngai tonu te tōtika o te ine ki te horopaki.
2. Ka whakamahi i ngā hononga o ngā waeine o te pūnaha ngahuru, tae atu ki ngā hononga o ngā waeine mō ngā āhuatanga rerekē.
3. Ka whakamahi ture tātai hei whiriwhiri i te rōrahi o ngā momo poro, ngā koeko me ngā poi.

Te Hanga

4. Ka whakaputa, ka whakamahi i ngā tikanga koki o te porowhita.
5. Ka aro ki ngā āhua ōrite, ā, ka whakamahi whakaaro pānga riterite hei tātai i tētahi tapa.
6. Ka whakamahi ōwehenga pākoki me te ture a Pythagoras i ngā pūāhua ahu-2, ahu-3 hoki.

Te Wāhi me te Ahunga

7. Ka whakamahi papa taunga, mahere rānei ki te whakaatu taunga pātahi me ngā rohe o roto i ētahi huanui e rua, nui ake rānei.

Te Panoni

8. Ka whakatairite, ka whakamahi i ngā panoni papa-tahi, papa-maha hoki.
9. Ka tātari tauira hangarite mā te whakaatu i ngā panoni i hangaia ai aua tauira.

Te Tauanga

Ka whakaoti rapanga, ka whakatauiria pūāhua:

Te Tūhuratanga Tauanga

1. Ka whai i ngā tikanga mō te tūhuratanga tauanga ki te whakamahere, ki te whakatutuki tūhuratanga:
 - ka parahau i ngā taurangi me ngā waeine;
 - ka whakatau i ngā pūtakenga o te taurangitanga, pērā i te whakamahi tīpako matapōkere;
 - ka whakamahi whakaari tauanga matatini ki te tautohu, ki te whakawhiti whakaaro mō ngā āhuatanga horopaki, pērā i te ia, ngā hononga taurangi, me ngā taurangitanga o roto, o waenganui hoki i ngā tuari raraunga;
 - ka whakaputa hīkaro ōpaki mō te taupori ka hua ake i ngā raraunga;
 - ka whakamahi whakaari raraunga me ngā waeine ki te parahau i ngā whakakitenga ka hua ake i te tūhuratanga;
 - ka mārama ki ngā tikanga matatika e hāngai ana.

Te Aroā Tauanga

2. Ka arohaehae i ngā pārongo tauanga ka puta i ngā pāhotanga, mā te tūhono i ngā whakaari raraunga, ngā tauanga, ngā tukanga me ngā tūponotanga ki ngā pārongo.

Te Tūponotanga

3. Ka tūhura pūāhua tūponotanga:
 - ka whakatairite i ngā tuari tātai me ngā tuari whakamātau, me te aro anō ki te rahi o te tīpako;
 - ka tātai tūponotanga i ngā pūāhua e whai wāhi mai ana te raraunga motumotu.

Te Whakaako i te Pāngarau

Te Wāhi nui ki te Reo

“Ko ngā kupu hou te oranga o te reo, engari kia mau ki tā te Māori whakatakoto i te kupu.” He kōrero tēnei nā Tīmoti Karetū i te tau 1984, i kauhautia ai ki te hui ā-tau o Te Ātaarangi, i tū ki Rūātoki.

Mā ngā kupu hou e tutuki ai te whakawhitiwhiti kōrero i roto i ngā horopaki hou. Ko te pāngarau tētahi horopaki hou mō tō tātou reo ina tīmata mai ai te whakamahinga o te reo Māori hei reo whakaako i te pāngarau i te ngahuru tau 1980. Ka tae rā anō ki te tau 1996 kātahi ka whakaputaina te marautanga pāngarau tuatahi e kapi ai ngā taumata katoa o te kura tuatahi me te kura tuarua.

Nō reira kua maha ngā kupu pāngarau hou i te wā poto noa iho. Ko te nuinga o ngā kupu kua whakaaraa ake i te puna kupu o te reo Māori, pērā i te kupu ‘kauwhata’. Ko te tikanga taketake o te kauwhata, he anga ka hangaia ki te rākau hei whakairinga mō te ika, mō te aha atu. I roto i te pāngarau, he anga anō te kauwhata hei whakairi raraunga e kitea ai te hononga o tētahi taurangi ki tētahi.

Ko tētahi mahi nui a te pouako he āta whāngai i te reo o te pāngarau, arā, ko te pouako pāngarau he pouako reo anō hoki. Ko te reo te huarahi matua e tutuki pai ai te mahi whakaako. Nō reira, e tika ana kia āta whakaaro te pouako me pēhea te whakairo i ana kōrero i mua tonu i te wā ako. Arā pea, he kimi atu i ngā kupu, i ngā whakamārama, i ngā pātai hei whakamahi māna i roto i tana akoranga. He mea nui te taurira reo o te pouako, te reo tāruarua o te pouako e hopukina ai e te ākongā ngā kupu hou o te pāngarau me te āhua o te whakatakoto tika i te kupu.

E rua pea ngā momo whakaako matua:

- Mā te āta whakamahi i te reo pāngarau e hopukina ai e te ākongā, arā, kia mōmona te taiao reo e noho nei te ākongā.
- Mā te āta whakaako i te reo

E whā pea ngā āhukatanga matua e hopukina ai e te ākongā te reo ka āta whakamahia e te pouako:

- Kia haere tahi ngā kupu, ngā pikitia, ngā whakaari ā-tinana i roto i ngā whakamārama a te pouako.
- Hoki atu, hoki atu kia tāruarua e te pouako ngā kupu whai tikanga.
- Hoki atu kia kōrero anōtia te kōrero a te ākongā, ka whakatika ai.
- Kia pakari anō ngā pūkenga hopu reo o te ākongā, pērā i te whakarongo pūkari a te taringa.

Ko ngā momo hanga reo ka whakamahia e te pouako tētahi atu āhukatanga hei āta whakaaro māna. Ko te whāinga kia mārama te huatau pāngarau o roto i te kōrero, kia whāngai hoki ngā momo hanga reo e hāngai ana, hei whakamōmona i te reo o te ākongā. Hei taurira, e whā ngā tuhituhinga o te rapanga māmā e whai ake nei e kitea ai ngā momo hanga reo e taea ana:

- E \$856 te pūtea a Raniera. Ka **pau i a ia** te \$138. E hia tāra ka toe mai?

Papa Whakaako Pāngarau L1 v1 draft

- E \$856 te pūtea a Raniera. Ka pau i a ia te \$138 **ki te** hoko papa wīra **mōna**. E hia tāra ka toe mai?
- E \$856 te pūtea a Raniera. Ka pau i a ia te \$138 ki te hoko koti hou **mōna**, **kia** mahana **ai** ia i ngā rā o te hōtoke. E hia tāra ka toe mai?
- E \$856 te pūtea a Raniera. **Ko tāna**, **he** tuku i te \$138 **hei** moni aroha ki te rū whenua i Ōtautahi. **Pēhea nei** te rahi o tana pūtea e toe mai ana?

Te Whakamahere

Ko ētahi āhuatanga matua o te whakamahere:

- he waihanga i te raupapatanga o ngā mahi ako e hāngai ana ki te taumata o te ākongā;
- he āta whakaaro ki te reo hei whakamahi mā te pouako, hei ako anō hoki mā te ākongā;
- he whakaatu i ngā huatau pāngarau e ākona ana;
- he āta whakaaro i te hononga o ngā mahi ako ki ngā akoranga o mua;
- he tiki atu i ngā momo horopaki e taunga ana te ākongā, koia hei kawē i ngā huatau pāngarau e whakaakona ana;
- he whakarite i te maha o ngā momo mahi rerekē i roto i te akoranga kotahi, hei ara ako rerekē e hāngai ana ki tēnā ākongā ki tēnā. Hei tauira: ko te whakamahi rauemi ōkiko; ko te whakaatu i ngā momo whakaahuahanga maha pērā i te rārangi tau, te kauwhata me te hoahoa rerenga; ko te mahi takitahi i ētahi wā, te mahi ā-rōpū i ētahi atu wā.

Mā te āta whakamahere i ngā akoranga e pai ake ai te panuku o te ākongā i ngā taumata hei ekenga māna. He mea nui te wairua whakawhanaunga kei waenganui i te pouako me te ākongā e hāpaitia ai tōna kiritau, kia whakapono ia ki a ia anō, kia māia, kia mauritau hoki ia ki āna mahi ako.

Mā roto anō hoki i te whakamahere ka tūhonoa ngā whāinga o te marau ā-kura, me ngā whāinga paetae o te marautanga pāngarau ā-motu. Koia pea hei tūāpapa mō te hōtaka pāngarau o te kura, ā, ka taka mai i reira ngā aromatawai paerewa paetae o te NCEA hei mahi mā ngā ākongā. He mea nui kia kua e riro ko ngā paerewa paetae o te NCEA te pūtakenga o te hōtaka pāngarau, kia noho ko ngā parewa paetae tētahi o ngā hua ka puta i te hōtaka whakaako.

He Taura Mahere

E whā ngā taura mahere e whai ake nei, e hāngai ana ki ngā whenu o te marautanga. He taura noa iho e kitea ai ētahi o ngā āhuatanga hei aro mā te pouako i roto i āna mahi whakamahere.

Te Tau – He Akonga Tau

Te Taurangi - He Akonga Taurangi

Te Āhuahanga - He Akoranga Āhuahanga

Te Tauanga - He Akoranga Tauanga

Te Whakaoti Rapanga

Ko te whakaoti rapanga kei te pokapū o te marautanga pāngarau. Arā, te kōrero nei kei te upoko o ngā whenu katoa, “Ka whakaoti rapanga, ka whakatauirā pūāhua”. Ko tā te rapanga he kukume i ngā whakaaro pāngarau o te ākongā:

- kia matapae i ngā otinga;
- kia hanga rautaki, kia hanga i te ara hei whakaoti māna i te rapanga;
- kia whakatau tata i ngā otinga;
- kia tūhonoa, kia whakamahia ōna maramara mātauranga maha;
- kia whakaaro auaha;
- kia whakaaro arorau.

He mea nui kia aro ki ngā rautaki, ki ngā tukanga, ki te ara ka whāia e te ākongā hei whakaoti i te rapanga, kua e aro ki te otinga noa iho me te tere o te ākongā. Mā te tono kia whakamāramahia e te ākongā t/āna rautaki e mārama ake ai ia ki ngā tikanga pāngarau o roto.

Ko tā te mahi whakaoti rapanga he whakawhanake i ngā āhuetanga ako me ngā pūkenga ako whaihua o te ākongā:

- te whakarongo pīkari;
- te āta whakaaroaro i ngā kōrero me ngā mahi a tētahi atu;
- te whakawhitiwhiti kōrero;
- te tūhura me te whakamātau whakaaro;
- te mahi ngātahi me te rōpū;
- te mahi i tōna kotahi;
- te māia;
- te pukumahy;
- te pākiki
- te hiamōhio.

E tika ana kia hāngai tonu te rapanga ki te taumata whakaaro o te ākongā, me te paku wero anō hei kukume i a ia ki te taumata o runga ake. He pai pea kia māmā te tīmatanga e whaihua ai tā te ākongā urutomo atu ki te rapanga.

Kia māmā, kia mārama te tuhinga o te rapanga me tōna horopaki. Arā:

- kia pūtakea mai te rapanga i ngā horopaki e taunga ana te ākongā, ngā horopaki o tōna ao;
- kia pūtakea mai rānei te rapanga i tētahi horopaki pāngarau;
- kia riro ko te horopaki hei āwhina i te ākongā kia mārama ki te pāngarau, kua te pāngarau e ngaro i roto i te horopaki o te rapanga.

Te Wāhi Nui ki te Horopaki

I ētahi wā, mēnā ka kākahutia te huatau pāngarau e ākona ana ki tētahi horopaki e taunga ana te ākonga, kātahi ka mārama ake te ākonga ki te kaupapa. Ko tētahi atu āhuatanga whaihua o te horopaki, ko te whakapiki pea i te hiahia o te ākonga ki tana mahi pāngarau ina e kitea mai ana tētahi kaupapa e ngākaunui ana ia.

Hei tauira pea o tētahi rapanga hei tūhura i te tikanga o tēnei mea te toharite, i runga anō i tētahi kaupapa e taunga ana te ākonga (arā, te whutupōro):

E ono ngā kēmu a Piri Weepu i te whakataetae whutupōro o te ao i te tau 2011. Ū tonu te 75% o ana whana kōura i ēnei kēmu e ono katoa. Tuhia ki tētahi tūtohi te maha o ana whana i tēnā kēmu i tēnā, me te maha o ngā whana i ū:

kēmu	1	2	3	4	5	6
ngā whana katoa	8	6	5	9	...	
ngā whana i ū						

Te Aromatawai

He Mātāpono mō te Aromatawai

Ko tā te aromatawai he kōhi kōrero, he kōhi whakaaro, he kōhi taunakitanga e pā ana ki te mōhio o te ākongā ki te pāngarau, me ōna pūkenga ki te whakamahi i taua mōhio tanga ki te whakaoti rapanga.

E rua ngā take matua mō te aromatawai i roto i te pāngarau:

- hei whakaatu i te mōhio o te ākongā ki te pāngarau;
- hei whakapiki i te mahi a te pouako.

Ka whakamahia ngā hua o te aromatawai hei arotake, hei tiro tiro i te ekenga panuku o te ākongā, hei āwhina ki te whakamahere i ngā akoranga o muri mai, hei whakawhitiwhiti kōrero hoki ki te ākongā me tōna whānau. Mā konei e pai ake ai te ako, e eke taumata ai te ākongā.

I hua mai ngā mātāpono e whai ake nei i ngā mahi whakahou i te marautanga pāngarau me te kaupapa o Te Poutama Tau i whakahaerehia ai i ngā kura tuatahi me ētahi wharekura, tīmata mai ai i te tau 2003. Kei te hono hoki ēnei mātāpono ki te rangahautanga BES¹.

1. Ko te aromatawai tētahi wāhanga o te mahi whakaako. Ko tā te pouako he tiro tiro, he āta whakaaroaro i ngā mahi a te ākongā i ngā wā katoa, koia hei tūāpapa mō te aromatawai.
2. Ko te mōhio ngaiotanga o te pouako te mea nui e whaihua ai te aromatawai. Mā tana mōhio ki te ākongā, ki te kaupapa o te pāngarau, ki te whakaako hoki i te pāngarau e tika ai tana aromatawai i te ākongā.
3. Kia whai wāhi te ākongā ki te whakaatu i tana mōhio, i ōna pūkenga i roto i ngā mahi aromatawai. Kaua te aromatawai e aro noa iho ki ngā mea kāore e taea e te ākongā.
4. Ko te āhua o te ngohe aromatawai, kia rite ki tētahi mahi ako kua waia kē te ākongā, kaua e noho hei mahi tauhou ki a ia.
5. Kia hāngai tonu te aromatawai pāngarau ki te whānuitanga o te mōhio o te ākongā, me tana āhei ki te tūhonohono i ngā mea e mōhio ana ia ki te whakaoti rapanga.
6. Ko ngā aromatawai katoa, he whakatau tata i te mōhio o te ākongā ki te whakatutuki i ngā pātai, i ngā ngohe rānei o roto i te aromatawai, i taua wā tonu o te aromatawai. Arā kē atu ngā āhuatanga o waho e pāngia ana ki te angitu o te ākongā, pērā i te tau o tōna hinengaro, tōna tinana me tōna wairua.

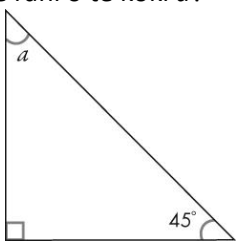
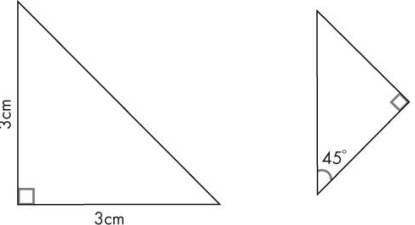
¹ [Anthony, G., & Walshaw, M. \(2009\). Assessment for learning \(pp. 17-18\). Effective pedagogy in mathematics. Educational Practices. Belley: Gonnet Imprimeur](#)

E whai ake nei ko ētahi tauira o ngā momo aromatawai pāngarau e taea ana. Ko te mea tuatahi te mea matua e tino mōhio ai te kaiako i te ekenga taumata a te ākonga:

- ko te āta mātakitaki, te āta whakarongo tonu a te pouako i ngā mahi pāngarau a te ākonga i ia rā;
- ko ngā tuhituhi me ngā kōrero a te ākonga i tana pukapuka, i ana tūhurātanga rānei;
- ko te angitu o te akonga ki te whakaoti i tētahi ngohe, i tētahi rapanga rānei, me āna whakamārama;
- ko ngā momo aromatawai ā-motu, pērā i ngā paerewa paetae o te NCEA;
- ko te whakamātautau ōkawa.

Te Āhua o ngā Ngohe Aromatawai

Ko te mea nui kia puta i tētahi mahi aromatawai, ko te mōhio o te ākongā ki ngā huatau pāngarau e tirohohia ana, ehara ko te whakautu tika noa iho. Hei taurira, anei ētahi pātai aromatawai e rua, ko tētahi, he pāpaku noa iho te tirohoro i te mōhio o te ākongā ki te tapeke o ngā koki o tētahi tapatoru. E huaki ana te pātai tuarua kia whakaputaina e te ākongā āna mōhio katoa mō te tapatoru, ā, kia tūhonohono anō i aua mōhioanga. Mā te whakautu a te ākongā ki te pātai tuarua e tino mārama ai te kaiako ki te mōhio o te ākongā ki ngā tikanga o te tapatoru. He iti noa iho te māramatanga ka puta i te pātai tuatahi:

<p>Pātai 1: E hia putu te rahi o te koki a?</p>  <p>A right-angled triangle with a right angle symbol at the bottom-left vertex. The bottom-right angle is labeled 45°. The top-left angle is labeled a.</p>	<p>Pātai 2: Kōrerohia mai ngā mea katoa mō ēnei tapatoru e rua nei:</p>  <p>Two right-angled triangles. The first triangle has a right angle symbol at the bottom-left vertex, a vertical leg labeled 3cm, and a horizontal leg labeled 3cm. The second triangle has a right angle symbol at the top-right vertex and a 45° angle at the bottom-left vertex.</p>
---	--

Te Aromatawai me ngā Parewa Paetae o te NCEA

E tino hāngai ana te āhua o ngā mahi aromatawai mō ngā paerewa paetae ā-roto ki ngā mātāpono me ngā kōrero o runga ake nei. Arā:

- He tūhuratanga, he rapanga rānei te āhua o ngā ngohe aromatawai, hei whakaoti mā te ākongā, hei whakamārama māna i ngā rautaki me ngā tikanga ka whakamahia e ia. Ko tā te ngohe aromatawai he tonu, he whakatenatena i te ākongā kia whakaaturia tōna mōhiotanga me ōna pūkenga katoa e hāngai ana.
- Mā te mōhio ngaiotanga o te pouako e whakatauria ai te taumata ka ekea e te ākongā, mēnā ko te paetae, ko te kaiaka, ko te kairangi, ko te kore rānei i tutuki.
- Ka whakatauria te ekeanga taumata o te ākongā i runga tonu i te kounga o āna kōrero, o āna whiriwhiringa, ehara i te mea ko te whakautu tika noa iho te mea nui.
- Kei te pouako tonu te whiriwhiri i te horopaki mō ngā ngohe aromatawai.
- Mō te nuinga o ngā ngohe, he raupapatanga mahi hei whakatutuki, ka mutu, mā te ākongā tonu e āta whakaaro te rautaki hei whakaoti māna i te rapanga.

Ngā Paerewa Paetae o te NCEA

Te Mahere o ngā Paerewa Paetae

Kei tēnei hononga pae ipurangi, te mahere o ngā paerewa paetae pāngarau mō ngā taumata 1 ki te 3 (arā, ko ngā taumata 6 ki te 8 o te marautanga):

[Mahere Paerewa Paetae Pāngarau – Taumata 1 -3](#)

Tekau mā rima katoa ngā paerewa paetae pāngarau o te Taumata 1 (arā, te Taumata 6 o te Marautanga). He mea whakamāori ngā paerewa paetae Ingarihi 1.1 ki te 1.13. E hāngai ana te 1.14 me te 1.15 ki te kura reo Māori, arā, he rangahautanga tētahi, ko tētahi e aro ana ki te reo.

E whā ngā paerewa paetae (o roto i te 15) ka aromatawaia mā te whakamātautau ā-waho, ko ērā atu he aromatawai ā-roto. Koinei te whakarāpopototanga mō te Taumata 1. Pāwhiria te tau motuhake kia peka atu ki taua paerewa paetae:

tau motuhake	ingoa	whiwhinga	momo aromatawai
91026	1.1 Te whakamahi whakaaro tau whaitake hei whakaoti rapanga	4	ā-roto
91027	1.2 Te whakamahi tikanga taurangi hei whakaoti rapanga	4	ā-waho
91028	1.3 Te tūhura i ngā hononga o te tūtohi, te whārite me te kauwhata	4	ā-waho
91029	1.4 Te whakamahi tikanga taurangi rārangi hei whakaoti rapanga	3	ā-roto
91030	1.5 Te whakamahi tikanga ine hei whakaoti rapanga	3	ā-roto
91031	1.6 Te whakamahi whakaaro āhuahanga hei whakaoti rapanga	4	ā-waho
91032	1.7 Te whakamahi tikanga tapatoru hāngai hei whakaoti rapanga ine	3	ā-roto

91033	1.8 Te whakamahi whakaahuahanga āhuahanga hei whakaoti rapanga	3	ā-roto
91034	1.9 Te whakamahi āhuahanga panoni hei whakaoti rapanga	2	ā-roto
91035	1.10 Te whakamahi i ngā tikanga tūhuratanga tauanga hei tūhura i tētahi huinga raraunga matatini	4	ā-roto
91036	1.11 Te whakamahi i ngā tikanga tūhuratanga tauanga hei tūhura raraunga tau matarua	3	ā-roto
91037	1.12 Te whakaatu māramatanga ki te tūponotanga me te raraunga	4	ā-waho
91038	1.13 Te tūhura pūāhua tūponotanga	3	ā-roto
91655	1.14 Te whakaoti rangahautanga pāngarau i runga i te tautāwhi a te pouako	3	ā-roto
91656	1.15 Te whakaatu mōhioatanga ki te reo matatini o te pāngarau	3	ā-roto

Te Hononga ki te Marautanga

Ka pūtakea mai ngā paerewa paetae o te NCEA i Te Marautanga o Aotearoa. Ko tā ngā paerewa paetae he aromatawai i te mōhio o te ākongā ki ngā āhuatanga o roto i ngā whāinga paetae o te marautanga. Pāwhiria te paerewa paetae kei raro iho nei kia kitea ai tōna hononga ki ngā whāinga paetae o te Taumata 6 o te marautanga pāngarau:

Te Paerewa Paetae	Te Whenu	Ngā pūkenga me te mātauranga o roto i ngā whāinga paetae
1.1 Te whakamahi whakaaro tau whitake hei whakaoti rapanga	Te Tau me te Taurangi	<ul style="list-style-type: none"> • Ka whakamahi pānga rārangi me te whai wāhi mai o te whakaaro whitake. • Ka whakamahi tau toitū, tauwehe pātahi, taurea pātahi, taupū hoki (me te pūtakerua). • Ka mārama ki ngā momo paheko hautau, tau ā-ira, ōrau, tau tōpū hoki. • Ka whakamahi pāpātanga, ōwehenga hoki. • Ka mōhio ki ngā whakawhitinga whānui o ngā hautau, tau ā-ira, ōrau hoki. • Ka mōhio, ka whakamahi tānga ngahuru, mati whai tikanga, whakaawhiwhinga, uara tū ā-ira hoki. • Ka whakamahi pānga rārangi, pānga rārangi kōaro hoki. • Ka whakawhānui taupū kia hāngai ki ngā tau tōpū me ngā hautau. • Ka whakamahi pāpātanga whakaputu o ia rā.
1.2 Te whakamahi tikanga taurangi hei whakaoti rapanga	Te Tau me te Taurangi	<ul style="list-style-type: none"> • Ka whakawhānui i ngā tikanga paheko e pā ana ki te hautau me te tau tōpū. • Ka whakawhānui i ngā tikanga paheko e pā ana ki te tau whakahau, me te whai wāhi mai o ngā tikanga taupū. • Ka hanga, ka whakaoti whārite rārangi, tōrite rārangi hoki, whārite pūrua, whārite taupū māmā, me ngā whārite tukutahi e rua ngā taurangi.
1.3 Te tūhura i ngā hononga o te tūtohi, te whārite me te kauwhata	Te Tau me te Taurangi	<ul style="list-style-type: none"> • Ka whiriwhiri otinga tino whaihua mā te whai i ngā momo tikanga tau. • Ka whakaoti whārite rārangi, tōrite rārangi hoki, whārite pūrua, whārite taupū māmā, me ngā whārite tukutahi e rua ngā taurangi. • Ka tūhono i ngā kauwhata, ngā tūtohi me ngā whārite ki ngā pānga rārangi, pānga pūrua, pānga taupū māmā hoki e kitea mai ana i roto i ngā tauranga tau me ngā tauranga āhuahanga. • Ka tūhono i te pāpātanga o te whiti ki te rōnaki o te kauwhata.

<p>1.4 Te whakamahi tikanga taurangi rārangi hei whakaoti rapanga</p>	<p>Te Tau me te Taurangi</p>	<ul style="list-style-type: none"> • Ka hanga, ka whakaoti whārite rārangi. • Ka whakaoti whārite rārangi, tōrite rārangi hoki, me ngā whārite tukutahi e rua ngā taurangi. • Ka tūhono i ngā kauwhata, ngā tūtohi me ngā whārite ki ngā pānga rārangi. • Ka tūhono i te pāpātanga o te whiti ki te rōnaki o te kauwhata.
<p>1.5 Te whakamahi tikanga ine hei whakaoti rapanga</p>	<p>Te Ine me te Āhuahanga</p>	<ul style="list-style-type: none"> • Ka whakawhitiwhiti i ngā waeine ngahuru, me te whakamahi anō i te tau ā-ira. • Ka whakaputa, ka whakamahi ture tātai hei whiriwhiri i te paenga me te horahanga taparau, me te rōrahi poro. • Ka whiriwhiri i te paenga me te horahanga o te porowhita, me ngā hanga whakahiato āhua, te rōrahi hoki o ngā momo poro me ngā rango. • Ka whakamahi i ngā hononga o ngā waeine ngahuru, ngā hononga o ngā waeine mō ngā āhuatanga rerekē (pērā i te rita me te karamu), me ngā waeine pāpātanga (pērā i te km/h mō te tere). • Ka whakamahi ture tātai hei whiriwhiri i te rōrahi o ngā momo poro, ngā momo koeko, me te poi.
<p>1.6 Te whakamahi whakaaro āhuahanga hei whakaoti rapanga</p>	<p>Te Ine me te Āhuahanga</p>	<ul style="list-style-type: none"> • Ka whakaputa, ka whakamahi hoki i ngā hononga koki ka hua mai i te rārangi pūtahi, te rārangi whakarara me te taparau. • Ka aro ki ngā hanga he ōrite te āhua, ā, ka whakamahi whakaaro pānga riterite hei tātai i tētahi tapa. • Ka whakamahi ōwehenga pākoki me te ture a Pythagoras hei whakaoti rapanga ahuru. • Ka whakaputa, ka whakamahi hoki i ngā hononga koki o te porowhita.
<p>1.7 Te whakamahi tikanga tapatoru hāngai hei whakaoti rapanga ine</p>	<p>Te Ine me te Āhuahanga</p>	<ul style="list-style-type: none"> • Ka whakamahi ōwehenga pākoki me te ture a Pythagoras hei whakaoti rapanga ahu-rua, ahutoru hoki. • Ka aro ki ngā hanga he ōrite te āhua, ā, ka whakamahi whakaaro pānga riterite hei tātai i tētahi tapa. • Ka whiriwhiri, ka whakamahi i ngā waeine mō te roa me te horahanga e hāngai ana ki te horopaki. • Ka whakatutuki inenga, kia hāngai tonu te tōtika o te ine ki te horopaki o te rapanga.
<p>1.8 Te whakamahi whakaahuahanga āhuahanga hei whakaoti</p>	<p>Te Ine me te Āhuahanga</p>	<ul style="list-style-type: none"> • Ka hanga, ka whakamārama huanui māmā. • Ka whakamāori i ngā pūwāhi me ngā rārangi i tētahi papa taunga, me te whai wāhi mai o te āwhata, te ahunga hoki o tētahi mahere.

<p>rapanga</p>		<ul style="list-style-type: none"> • Ka waihanga raumata tōtika mō ngā momo matarau māmā, ā, ka tūhono i ngā āhua ahu-toru me ngā whakaahuhanga ahu-rua. • Ka whakamahi i te papa taunga, te mahere rānei hei whakaatu pūwāhi pātahi me ngā rohe o roto i ētahi huanui e rua, nui ake rānei.
<p>1.9 Te whakamahi āhuahanga panoni hei whakaoti rapanga</p>	<p>Te Ine me te Āhuahanga</p>	<ul style="list-style-type: none"> • Ka tautuhi, ka whakamahi panoni, ā, ka whakamārama i ngā āhuatanga pūmau; • Ka whakatairite, ka whakatutuki panoni matatahi, panoni matatini hoki; • Ka tātari i ngā tauira hangarite me ngā panoni i hua mai ai aua tauira.
<p>1.10 Te whakamahi i ngā tikanga tūhuratanga tauanga hei tūhura i tētahi huinga raraunga matatini</p>	<p>Te Tauanga</p>	<ul style="list-style-type: none"> • Ka whai i ngā tikanga mō te tūhuratanga tauanga hei whakamahere, hei whakatutuki tirohanga tauanga, whakamātau tauanga rānei: <ul style="list-style-type: none"> – Ka whiriwhiri i ngā taurangi e hāngai ana. – Ka āta tiro tiro, ka whakatikatika i ngā raraunga. – Ka whakamahi i ngā momo whakaari raraunga whānui. – Ka whakarōpū anō i ngā raraunga kia kitea ai ngā tauira me ngā taurangitanga o roto i ngā huinga raraunga matatini. – Ka whakatairite i te hanga o ētahi tuari raraunga, me te whakamahi anō i ngā ine wēanga, ngā ine i te hora o ngā raraunga, me ngā ine hautanga o ngā raraunga. – Ka whakaputa pūrongo. • Ka whai i ngā tikanga mō te tūhuratanga tauanga hei whakamahere, hei whakatutuki tūhuratanga: <ul style="list-style-type: none"> – Ka parahau i ngā taurangi i whakamahia ai. – Ka whakamahi i ngā momo whakaari raraunga whānui hei tautohu, hei whakawhiti kōrero mō ngā āhuatanga ka puta i te horopaki o te tūhuratanga (ngā rerekētanga o roto i tētahi tuari raraunga me ngā rerekētanga kei waenganui i ētahi tuari raraunga). – Ka whakaputa hīkaro ōpaki mō te taupori i runga i te āhua o ngā raraunga ka hua ake i tētahi tīpako. – Ka whakamahi i ngā momo whakaari raraunga whānui me ngā tātaitanga tauanga hei parahau i ngā whakakitenga.
<p>1.11 Te whakamahi i ngā tikanga tūhuratanga tauanga hei tūhura raraunga tau matarau</p>	<p>Te Tauanga</p>	<ul style="list-style-type: none"> • Ka whai i ngā tikanga mō te tūhuratanga tauanga hei whakamahere, hei whakatutuki tirohanga tauanga, whakamātau tauanga rānei: <ul style="list-style-type: none"> – Ka whiriwhiri i ngā taurangi me ngā tātaitanga tauanga e hāngai ana. – Ka āta whakaaroaro i te takenga mai o te taurangitanga.

		<ul style="list-style-type: none"> - Ka kohikohi, Ka āta tirotiro, Ka whakatikatika i ngā raraunga. - Ka whakamahi i ngā momo whakaari raraunga whānui. - Ka whakarōpū anō i ngā raraunga, kia kitea ai ngā tauira me ngā hononga o roto i ngā huinga raraunga matarua. - Ka whakaputa pūrongo. • Ka whai i ngā tikanga mō te tūhuratanga tauanga hei whakamahere, hei whakatutuki tūhuratanga: <ul style="list-style-type: none"> - Ka parahau i ngā taurangi me ngā tātaitanga tauanga i whakamahia ai. - Ka whakatau i ngā pūtakenga mai o te taurangitanga, pērā i te whakamahi tīpako matapōkere. - Ka whakamahi i ngā momo whakaari raraunga whānui hei tautohu, hei whakawhiti kōrero i ngā āhuatanga ka puta i te horopaki o te tūhuratanga (te pānga o tētahi taurangi ki tētahi). - Ka whakamahi i ngā momo whakaari raraunga whānui me ngā tātaitanga tauanga hei parahau i ngā whakakitenga.
1.12 Te whakaatu māramatanga ki te tūponotanga me te raraunga	Te Tauanga	<ul style="list-style-type: none"> • Ka arotake i ngā tūhuratanga tauanga me ngā mahi tūponotanga a tētahi atu, me te āta tirotiro i ngā tukanga kohikohi raraunga, ngā tātaitanga tauanga me te tōtika o ngā whakakitenga. • Ka tātai tūponotanga me te whakamahi anō i te hautanga, te ōrau me te ōwehenga. • Ka arotake i ngā pūrongo tauanga ka puta i te ao pāpaho, mā te tūhono i ngā whakaari raraunga, ngā tauanga, ngā tukanga, ngā tūponotanga hoki, ki ngā tāpaetanga kōrero. • Ka tūhura i ngā pūāhua e whai wāhi mai ana tēnei mea te tūponotanga, arā, te tātai tūponotanga i ngā horopaki motuhake.
1.13 Te tūhura pūāhua tūponotanga	Te Tauanga	<ul style="list-style-type: none"> • Ka whakatairite, ka whakamārama i te taurangitanga o te tuari tātai me te tuari whakamātau i tētahi pūāhua tūponotanga. • Ka tūhura i ngā pūāhua tūponotanga: <ul style="list-style-type: none"> - Ka whakatairite tuari tātai motuhake me te tuari whakamātau e hāngai ana, me te aro anō ki te rahi o te tīpako. - Ka tātai tūponotanga i ngā pūāhua motuhake.
1.14 Te whakaoti rangahautanga pāngarau i runga i te tautāwhi a te pouako	Te Whakamahinga o te Pāngarau	<ul style="list-style-type: none"> • Ka mārama te ākonga, ka arohaehae hoki ia i ngā tini whakamahinga o te pāngarau e hāngai ana ki tōna hapori. Me kākahu anō ngā whāinga paetae ki ngā momo horopaki maha o te ao whānui.

<p>1.15 Te whakaatu mōhiotanga ki te reo matatini o te pāngarau</p>	<p>Te Reo Matatini o te Pāngarau</p>	<ul style="list-style-type: none">• Ka whakawhitiwhiti whakaaro, ka āta wānanga te ākonga i āna mahi pāngarau, mā te kupu (ā-waha, ā-tuhi), mā te tohu, me ngā momo whakaahuahanga. He mea nui tēnei hei tautoko i te whakatutukitanga o ngā whāinga paetae pāngarau e pakari anō ai te whakaaro arorau, te whakaaro arohaehae, te whakaaro whitake me te auahatanga o te ākonga e hāngai ana ki tēnei taumata.
---	--------------------------------------	---

He Taura Ngohe Aromatawai mō ngā Paerewa ā-Roto

Kua oti ētahi taura ngohe te tuhi hei aromatawai i te mātauranga me ngā pūkenga e hāngai ana ki ngā Paerewa Paetae ā-roto. He taura noa iho ēnei hei tiro tiro mā te pouako, hei huri māna kia hāngai ki ngā horopaki o te kura e taunga ana te ākongā.

Ko te mea nui o te ngohe aromatawai, kia whai wāhi mai te ākongā ki te whakaatu i tōna mātauranga me ōna pūkenga e hāngai ana ki te Paerewa Paetae. Arā, ko tōna āhe i te whakaoti rapanga, ki te whakaata i te horopaki tūturu o roto i te rapanga ki ngā ture, ki ngā tikanga me ngā taura o te pāngarau. Ko tāna he āta whakaaro i te huarahi hei whakaoti i te rapanga, he tūhonohono i ngā momo mātauranga me ngā pūkenga e hāngai ana, he whakawhitiwhiti kōrero, he whakamārama hoki i āna mahi.

Ina oti i te pouako tētahi ngohe aromatawai te tuhi, e tika ana kia arotakengia e tētahi atu pouako pāngarau tautōhito, e ngā kaitiro tiro rānei o te Mana Tohu Mātauranga o Aotearoa (NZQA). Mā konei e tino rite ai te ngohe ki te mātauranga me ngā pūkenga o roto i te Paerewa Paetae, ā, kāore te ākongā e raru i te kore hāngai o te ngohe.

Kei raro iho nei te rārangitanga mai o ngā paerewa paetae ā-roto me ngā taura ngohe aromatawai. Ko ētahi o ngā taura aromatawai he mea i whakamāori ai i te ngohe Ingarihi e hāngai ana. Ko ētahi kua tuhia i runga i te horopaki e hāngai ana ki te kura reo Māori. Pāwhiria te ngohe aromatawai kia peka atu ki reira.

Te Paerewa Paetae	Taura Ngohe Aromatawai	Momo
1.1 Te whakamahi whakaaro tau whitake hei whakaoti rapanga	Te Tunu Parāoa	hou
	Te Whakarite Hararei	whakamāori
1.4 Te whakamahi tikanga taurangi rārangī hei whakaoti rapanga	He Kaupapa Mahi Moni	hou
	Ngā Utu Tēkehi	whakamāori
1.5 Te whakamahi tikanga ine hei whakaoti rapanga	Te Hanganga Toi	whakamāori
	Te Ipu Waiārani	hou
	Te Whakapau Wai i te Pāmu	hou
1.7 Te whakamahi tikanga tapatoru hāngai hei whakaoti rapanga ine	Ngā Pou Whutupōro	whakamāori
	Te Wharenuī Hou	hou
1.8 Te whakamahi whakaahuahanga āhuahanga hei whakaoti rapanga	Te Awhe Ararau	hou
	Te Hoahoa Wharenuī Hou	hou

1.9 Te whakamahi āhuahanga panoni hei whakaoti rapanga	Te Hoahoa Taura	hou
1.10 Te whakamahi i ngā tikanga tūhuratanga tauanga hei tūhura i tētahi huinga raraunga matatini	Whakataetae Kapa Haka	hou
1.11 Te whakamahi i ngā tikanga tūhuratanga tauanga hei tūhura raraunga tau matarua	Tūhuratanga Raraunga Matarua	hou
1.13 Te tūhura pūāhua tūponotanga	Tūhura Tūponotanga	hou
1.14 Te whakaoti rangahautanga pāngarau i runga i te tautāwhi a te pouako	Te Wharekai	hou
1.15 Te whakaatu mōhiotanga ki te reo matatini o te pāngarau	Te Whakapau Kōhinu	hou

Te Whenu: Te Tau me te Taurangi: He Tauira Akoranga

Te Tūhuratanga

Ka tirohia ngā momo whakaaturanga o te pānga rārangi me te pānga taupū (tūtohi, kauwhata, whārite).

Te Horopaki o te Tūhuratanga

E whakapakari ana a Haimona mō te whakataetae hākinatoru nei, mō te IronMāori, ka whakatūria ki Ahuriri i te marama o Hakihea o ia tau. Kei te tiroiro ia i ngā wā me ngā tawhiti o tana eke paihikara. E 90km te tawhiti o te eke paihikara i te IronMāori. Koia nei te pae ipurangi o [IronMāori](#):

Ngā Whāinga Paetae

Te Tau me te Taurangi

Te Mātauranga Tau me ngā Rautaki Tau

1. Ka whakamahi pānga rārangi hāngai, pānga rārangi kōaro hoki.

Te Pānga me te Tauira

8. Ka tūhono i te kauwhata, te tūtohi me te whārite ki ngā pānga rārangi, pānga pūrua, pānga taupū māmā e kitea mai ana i ngā tauira tau me ngā tauira mokowā.
9. Ka tūhono i te pāpātanga o te whiti ki te rōnaki o tētahi kauwhata.

Ngā Āhuratanga hei Aromatawai

Te mōhio o te ākongā ki:

- te hononga o te tūtohi, te kauwhata me te whārite;
- te tuhi kauwhata rārangi hei whakaatu pānga;
- te whakamāori kauwhata rārangi (te ia, te rōnaki, ngā āhuratanga kōhure);
- te tautuhi i te rōnaki o tētahi kauwhata taupūtanga;
- te hononga o te rōnaki o te kauwhata taupūtanga ki te pāpātanga o te whiti;
- te tūhono i tētahi horopaki tūturu ki te tauira pāngarau, me te āta whakaaro anō i ngā hapa o te tauira pāngarau.

He Kupu Motuhake

mō te pāngarau: tūtohi, kauwhata rārangi, whārite, taupū, rōnaki, ia, āhuratanga kōhure

mō te horopaki: hākinatoru, eke paihikara

Ngā Mahi

E mōhio ana a Haimona, ka oti i a ia tētahi ara paihikara 10km te tawhiti i roto i te 18 meneti. Ka whakamahia tēnei wā hei whiriwhiri i te wā ka oti i a ia ētahi tau tawhititanga i taua ara tonu:

te tawhiti (km)	10	20	30	60	70	90
-----------------	----	----	----	----	----	----

te wā (meneti)	20	40				
----------------	----	----	--	--	--	--

Ko tā te hoa o Haimona he whakamahi i te wā ka oti i a ia te 90km, arā, ngā amiotanga e 9 o te ara, hei whiriwhiri i ngā wā ka oti i ētahi atu tawhititanga:

te tawhiti (km)	10	20	30	60	70	90
te wā (meneti)						240

Hei Ako:

Ko te whakaatu i ēnei whiriwhiringa a Haimona rāua ko tana hoa ki te tūtohi, ki te kauwhata, hei whārite anō hoki.

Ko te tiroiro i te tikanga o te rōnaki o te kauwhata rārangi, me te hononga o tērā ki te horopaki o te rapanga. *(Arā, he pou pou ake te rōnaki mēnā he tere ake te haere.)*

Ko te tūhono i tēnei tauria pāngarau māmā ki te ao tūturu, arā, ko te whakawhiti kōrero mō ngā pōhēhētanga kei roto i ngā whiriwhiringa a te tokorua nei? *(Arā, kāore e noho pūmau te tere o te eke paihikara i te roanga atu o te 90km, nā te ngenge, ka pōturi haere. Mēnā kāore i te tino tawhiti, ka tere ake te paihikara. Mēnā he tawhiti roa, ka pōturi ake.)*

Ko te āhua o te kauwhata hei whakaatu i ngā tawhiti me ngā wā tūturu, me te momo whārite e hāngai ana ki tērā. *(Arā, ko te whārite taupūtanga.)*

Ko te ia o te kauwhata me te kukume i te kauwhata ki waho atu i ngā tawhiti me ngā wā e whakaaturia ana.

Ngā Paerewa Paetae e Hāngai ana

Ko ētahi o ngā āhuatanga o tēnei tauria akoranga e hāngai ana ki ngā paerewa paetae e rua nei:

1.3 (91028) *Te tūhura i ngā hononga o te tūtohi, te whārite me te kauwhata*

1.4 (91029) *Te whakamahi tikanga taurangi rārangi hei whakaoti rapanga*

Te Whenu Tauanga: He Tauira Akoranga

Te Tūhuratanga

Ka tirohia te pānga o ētahi taurangi e rua ka hua mai i tētahi huinga raraunga matarua.

Te Horopaki o te Tūhuratanga

Ko te IronMāori tētahi hākinatoru, ka whakatūria ki Ahuriri i te marama o Hakihea o ia tau. E 2km te tawhiti o te kauhoe, e 90km te eke paihikara, e 21km te omaoma. I tēnei tūhuratanga ka tirohia mēnā he pānga kei waenganui i te pakeke o te tangata me te wā ka oti te hākinatoru nei, te IronMāori.

Koia nei te pae ipurangi o [IronMāori](#)

Ngā Whāinga Paetae

Te Tauanga: Te Tūhuratanga Tauanga

2. Ka whai i ngā tikanga mō te tūhuratanga tauanga ki te whakamahere, ki te whakatutuki tūhuratanga:
 - ka parahau i ngā taurangi me ngā waeine;
 - ka whakatau i ngā pūtakenga o te taurangitanga, pērā i te whakamahi tīpako matapōkere;
 - ka whakamahi whakaari tauanga matatini ki te tautohu, ki te whakawhiti whakaaro mō ngā āhuatanga horopaki, pērā i te ia, ngā hononga taurangi, me ngā taurangitanga o roto, o waenganui hoki i ngā tuari raraunga;
 - ka whakaputa hīkaro ōpaki mō te taupori, ka hua ake i ngā raraunga;
 - ka whakamahi whakaari raraunga me ngā waeine ki te parahau i ngā whakakitenga ka hua ake i te tūhuratanga.

Ngā Āhuatanga hei Aromatawai

Te mōhio o te ākongā ki:

- te tuku matapaenga i runga i te kaupapa o te tūhuratanga;
- te whakaatu i te tuari o tētahi huinga raraunga;
- te tātai i ngā tātaihangā tauanga e hāngai ana, pērā i te toharite, te inenga whānui, te hauwhātanga ...
- te whakatairite i te tuari o ētahi huinga raraunga e rua;
- te whakatairite i ētahi taurangi e rua me te whakaatu anō i ngā āhuatanga, pērā i te ia o te pānga o tētahi taurangi ki tētahi;
- te whiriwhiri i ngā momo whakaaturanga tauanga e hāngai ana ki te kaupapa;
- te whakamahi i ngā tikanga pāngarau hei whakaatu i tētahi horopaki tūturu;
- te whakawhitiwhiti whakaaro mō te tīpako o tētahi tūhuratanga raraunga me te hāngai o tērā ki tōna taupori.

He Kupu Motuhake

mō te pāngarau: taupori, tīpako, raraunga, toharite, hauwhātanga, inenga whānui, kauwhata kauamo, tuari raraunga, kauwhata pouhere, kauwhata marara, taurangi, pānga

mō te horopaki: hākinatoru

Ngā Mahi

Tīkina atu ngā raraunga i te pae ipurangi o IronMāori ka whakamahere ai i tētahi tūhuratanga. Koia nei ētahi tauira pātai hei tūhura:

- Pēhea nei te tuari o ngā raraunga o ia rōpū pakeke;
- He aha ngā ōritenga me ngā rerekētanga o ngā tuari raraunga o ia rōpū pakeke;
- He aha te pānga o te pakeke o te tangata me te wā ka oti te hākinatoru nei, te IronMāori;
- Mehemea ka pērā anō te pānga o te pakeke o te tangata me te wā ka oti tētahi atu hākinatoru.

Hei Ako:

Ko te whakaatu i te tuari o tētahi huinga raraunga ki ngā momo kauwhata pērā i te kauwhata pouhere, te kauwhata rārangi, me te kauwhata kauamo, me te whakawhitiwhiti kōrero anō mō te hāngai o tēnā me tēnā o ngā kauwhata.

Ko te whakamahi pātengi raraunga rorohiko hei pupuri raraunga, hei whakaputa hoki i ngā momo kauwhata e hiahiatia ana.

Ko te tikanga o ngā momo tātaihanga tauanga pērā i te toharite, te tau waenga, ngā hauwhātanga, me te inenga whānui.

Ko te whakaatu i ētahi taurangi e rua ki te kauwhata marara, me te tautuhi anō i te pānga o tētahi taurangi ki tētahi.

Ko te tikanga o tēnei mea te tīpako o tētahi huinga raraunga, me tōna āhei ki te whakaatu tika i tōna taupori.

Ngā Paerewa Paetae e Hāngai ana

Ko ētahi o ngā āhuatanga o tēnei tauira akoranga e hāngai ana ki te paerewa paetae nei:

1.11 (91036) *Te whakamahi i ngā tikanga tūhuratanga tauanga hei tūhura raraunga tau matarua.*

Te Whenu Te Tau me te Taurangi: He Tauira Akoranga

Te Tūhuratanga

Ka tirohia ngā momo whakaaturanga o te pānga pūrua (tūtohi, kauwhata, whārite).

Te Horopaki o te Tūhuratanga

Mutu ana tētahi kēmu, ko te tikanga ka whakarārangi ngā tāngata o ngā tīma ki te rūrū, ki te papaki ringaringa rānei. E toru ngā horopaki hei tūhura i tēnei akoranga. Ka āta tirohohia te maha o ngā rūrū katoa, ngā papaki ringaringa rānei:

1. He ōrite te maha o ngā tāngata o ia tīma. Ka rūrū ia kaitākaro o tētahi tīma ki ia kaitākaro o te tīma tuarua;
2. Kotahi te maha ake o ngā tāngata o tētahi tīma i tētahi. Ka rūrū ia kaitākaro o tētahi tīma ki ia kaitākaro te tīma tuarua;
3. Ka papaki ringaringa ia kaitākaro o tētahi tīma ki ērā atu o ngā kaitākaro o tōna ake tīma.

Ngā Whāinga Paetae

Te Tau me te Taurangi

Te Whārite me te Kīanga

6. Ka tuhi, ka whakaoti whārite rārangi, tōrite rārangi, whārite pūrua, whārite taupū māmā, whārite tukutahi, kia rua ngā taurangi.

Te Pānga me te Taurira

8. Ka tūhono i te kauwhata, te tūtohi me te whārite ki ngā pānga rārangi, pānga pūrua, pānga taupū māmā e kitea mai ana i ngā tauira tau me ngā tauira mokowā.

Ngā Āhuatanga hei Aromatawai

Te mōhio o te ākongi ki:

- te tuhi kauwhata pūrua;
- te āhua o te kauwhata pūrua;
- te hononga o te tūtohi o tētahi pānga pūrua, te kauwhata me te whārite;
- te whakaatu horopaki tūturu o ia rā hei pānga pūrua;
- te whakamāori kauwhata pūrua (te ia, te rōnaki, ngā āhuatanga kōhure);
- te tautuhi i ngā taurangi o tētahi pānga pūrua;
- te tūhono i tētahi horopaki tūturu ki te tauira pāngarau, me te āta whakaaro anō i ngā hapa o te tauira pāngarau.

He Kupu Motuhake

mō te pāngarau: tūtohi tukutuku, kauwhata, whārite, pānga pūrua, ia, rōnaki, āhuatanga kōhure, taurangi,

mō te horopaki: kaitākaro, papaki ringaringa, matapae, rūrū

Ngā Mahi

Whakaaturia ngā horopaki e toru hei tūtohi tukutuku e kitea ai te maha o ngā rūrū.

Hei taurira:

Horopaki 1:					Horopaki 2:				
	1	2	3	4		1	2	3	4
a					a				
e					e				
i					i				
o					o				
					u				
Tokowhā ngā kaitākaro o ia tīma					Tokowhā ngā kaitākaro i tētahi tīma, tokowhā i tētahi				

Mō ia horopaki:

Tuhia he tūtohi hei whakaatu i te maha o ngā rūrū (papaki ringaringa rānei) mō ngā tīma mai i te 1 ki te 10 ngā kaitākaro.

Whakawhitiwhiti kōrero mō ngā taurangi e rua nei, te maha o ngā kaitākaro me te maha o ngā rūrū. He aha te taurira e kitea mai ana i ngā tūtohi? He aha te matapae mō te āhua o te kauwhata hei whakaatu i te hononga o tētahi taurangi ki tētahi?

Tuhia ngā kauwhata e toru ka whakawhitiwhiti korero ai mō te ōrite me te rerekē o tētahi i tētahi.

Whiriwhiria ngā whārite e hāngai ana ki ngā horopaki e toru nei. Arā:

- Horopaki 1: $r = t \times t = t^2$
- Horopaki 2: $r = t \times (t-1) = t^2 - t$
- Horopaki 3: $r = (t-1) \times (t-1) = t^2 - 2t + 1$
(r = te maha o ngā rūrū, t = te tokomaha o ngā tāngata i tētahi tīma)

Hei Ako:

Ko te hononga o te whārite pūrua ki tōna kauwhata.

Ko te tiroiro he aha e **tino** piki ai, e **āta** piki ai rānei tētahi kauwhata pūrua.

Ko te whakaoti whārite pūrua.

Ko te tikanga o te rōnaki o te kauwhata pūrua me tōna tino poupu haere ina tokomaha haere ngā kaitākaro.

Ngā Paerewa Paetae e Hāngai ana

Ko ētahi o ngā āhuetanga o tēnei tauira akoranga e hāngai ana ki ngā paerewa paetae e rua nei:

1.2 (91027) *Te whakamahi tikanga taurangi hei whakaoti rapanga*

1.3 (91028) *Te tūhura i ngā hononga o te tūtohi, te whārite me te kauwhata*

1.4 (91029) *Te whakamahi tikanga taurangi rārangi hei whakaoti rapanga*

Te Whenu Āhuahanga: He Tauira Akoranga

Te Tūhuratanga

Ka tirohia te pūnaha tukutuku hei whakaatu pūwāhi i te mahere, ko te whakamahi anō i ngā tikanga o te tapatoru hāngai hei tātai i ngā tawhiti.

Te Horopaki o te Tūhuratanga

Kei te whakatūria ētahi akomanga hou e toru ki te kura. Ka whakatakotoria ki roto i te whenua he waea hei hono i ngā rorohiko o ēnei akomanga e toru ki te ipurangi. Nā te nui o te utu o te waea me āta whiriwhiri te ara poto rawa atu hei hono i ngā akomanga hou e toru nei.

Ngā Whāinga Paetae

Te Ine me te Āhuahanga

Te Hanga

6. Ka whakamahi ōwehenga pākoki me te ture a Pythagoras, i ngā pūāhua ahu-2, ahu-3 hoki.

Ngā Āhuatanga hei Aromatawai

Te mōhio o te ākongā ki:

- te whakaatu pūwāhi ki te tukutuku;
- te tuhi mahere ki te tukutuku;
- te whakamahi tikanga pāngarau hei whakaatu i tētahi horopaki tūturu;
- te whakamahi i te ture a Pythagoras hei tātai i ngā tapa o te tapatoru hāngai.

He Kupu Motuhake

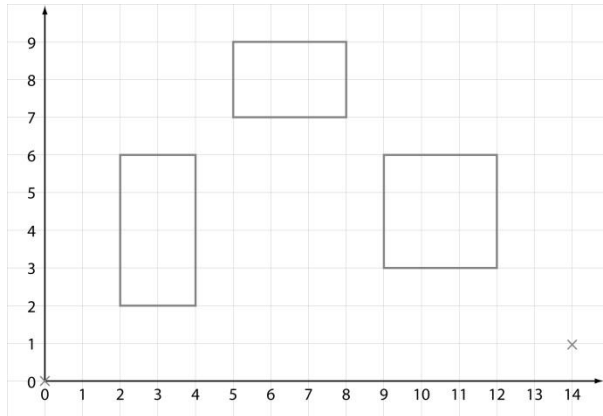
mō te pāngarau: tukutuku, pūwāhi, takirua raupapa, tapatoru hāngai, mahere, kokonga, āwhata

mō te horopaki: ipurangi, waea

Ngā Mahi

Hoatu he tohutohu hei whakaatu mā ngā ākongā i ngā akomanga hou e toru ki tētahi tukutuku. Hei tauira:

- He tapawhā hāngai te āhua o ngā whare e toru.
- Ko te (2,2) te (2,6) me te (4,2) ētahi kokonga e toru o te akomanga 1
- Ko te (5,9) te (8,9) me te (8,7) ētahi kokonga e toru o te akomanga 2
- Ko te (9,3) te (12,6) me te (12,3) ētahi kokonga e toru o te akomanga 3



Ko tā ngā ākongā:

- he whiriwhiri i tētahi āwhata whitake mō te mahere. (Hei tauira, ko ia wehenga o te tukutuku he rite ki te 5m);
- he tuhi i te ara poto rawa atu mō te waea rorohiko, tīmata mai ai i te pūwāhi (0,0), ka haere mā ngā akomanga e toru, ā, ka mutu atu ki te pūwāhi (14,1);
- he tātai i te roa o te waea.

Hei Ako:

Ko te whakaatu i tētahi horopaki tūturu ki ngā whakaahuahanga pāngarau pērā i te mahere tukutuku me te takirua raupapa.

Ko te whakamahi i te ture a Pythagoras hei tātai i ngā tapa o te tapatoru hāngai.

Ngā Paerewa Paetae e Hāngai ana

Ko ētahi o ngā āhuatanga o tēnei tauira akoranga e hāngai ana ki te paerewa paetae nei:

1.7 (91032) *Te whakamahi tikanga tapatoru hāngai hei whakaoti rapanga ine*



Whakamārama:

Ko te whakamahi i ngā raraunga o tētahi tīpako hei whakatakoto whakaaro mō te taupori.
Hei tauira:

Ko ngā ākonga o tētahi kura te tīpako i hua mai ai ngā raraunga nei e pā ana ki te kaupapa ako e tino manakohia ana:

reo	toi	pāngarau	pūtaiao	kori tinana	tikanga ā-iwi	hauora
43	32	39	37	48	31	36

Ina whakawhitia ēnei raraunga ki te taupori o ngā tamariki kura katoa o Aotearoa, ka kīia tērā he hīkaro. Hei tauira, ko te kī atu ko te kori tinana te kaupapa ako e tino manakohia ana e ngā tamariki kura katoa o Aotearoa.

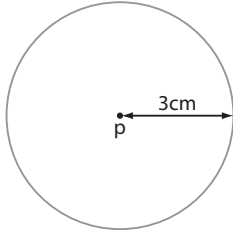
huanui

locus



Whakamārama:

Ko te huinga o ngā pūwāhi e hāngai ana ki tētahi ture. Hei tauira, ko te huanui e 3cm te tawhiti mai i tētahi pūwāhi P, arā, ko te porowhita, ko te P tōna pū, e 3cm tōna pūtoru:





Whakamārama:

Ko ngā momo inenga e hāngai ana ki tētahi huinga raraunga. Hei tauira:

Koia nei ngā omaoma a Hākopa i roto i āna kēmu kirikiti e 20 i tētahi tau:

{3, 35, 104, 89, 78, 103, 140, 32, 7, 13, 98, 104, 88, 45, 0, 78, 124, 104, 29, 69}

Ko ētahi o ngā inenga tauanga o tēnei huinga raraunga:

- ko te toharite = 67.5
- ko te tau waenga = 78
- ko te tau tātui = 104
- ko te ine whānui = 0 ki te 140

otinga tino whaihua

optimal solution



Takenga mai:

otinga – solution; whaihua – beneficial

Whakamārama:

Ko te whiriwhiri i te otinga pai rawa atu o tētahi rapanga, e tino puta ai te hua. Hei taurira:

E rua ngā kamupene tēkehi, koia nei ngā utu:

Tēkehi A: E \$5.00 mō te tonono me te \$3.50 mō ia manomita (km)

Tēkehi E: E \$3.00 mō te tonono me te \$4.00 mō ia manomita (km)

Ko te otinga tino whaihua, ko te tēkehi he māmā ake te utu. Ākene pea he rerekē te otinga whai hua mēnā e 2km, e 5 km rānei te tawhiti o te haere.

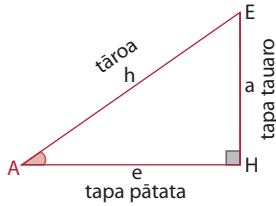
ōwehenga pākoki

trigonometric ratio



Whakamārama:

E hāngai ana te ōwehenga pākoki ki te tapatoru hāngai, arā, he whakaatu i te hononga o tētahi koki o te tapatoru hāngai me ētahi o ngā tapa e rua. Hei tauira, kua waitohua te koki A i tēnei tapatoru hāngai. Ko te tāroa te tapa roa, ko te tapa pātata e hono ana ki te koki A, ko te tapa tauaro e noho tauaro ana ki te koki A:



Koia nei ngā *ōwehenga pākoki* matua:

$$\text{aho } A (\sin A) = \frac{a}{h} = \frac{\text{tapa tauaro}}{\text{tāroa}}$$

$$\text{whenu } A (\cos A) = \frac{e}{h} = \frac{\text{tapa pātata}}{\text{tāroa}}$$

$$\text{pātapa } A (\tan A) = \frac{\text{tapa tauaro}}{\text{tapa pātata}}$$

panoni papa-maha

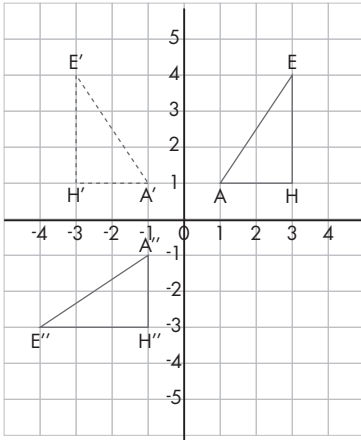
multiple transformation



Whakamārama:

Ko te raupapatanga o ētahi panoni e rua, nui ake rānei, arā, ka whai tētahi panoni i tētahi Hei tauira:

Ko te A''E''H'' te mātātuhi o te tapatoru AEH i muri i te whakaatanga i te tuaka x me te huringa kōaro e 90° i te pokapū o te papa kauwhata.

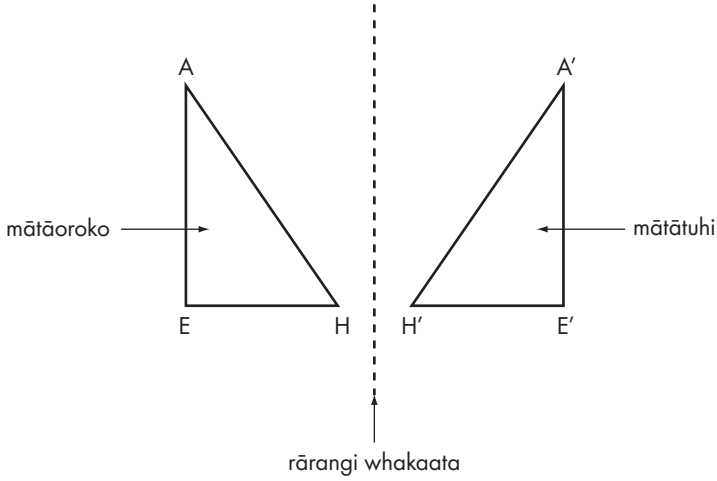


panoni papa-tahi
single transformation



Whakamārama:

Kotahi anake te panoni e hua mai ai te mātātuhi i tōna mātāoroko. Hei tauira, ko te whakaatanga o te tapatoru AEH:



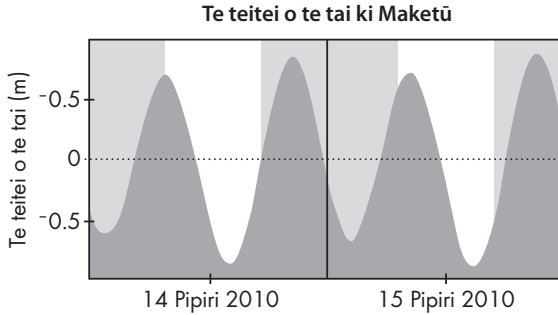
pānga pūrua

quadratic function



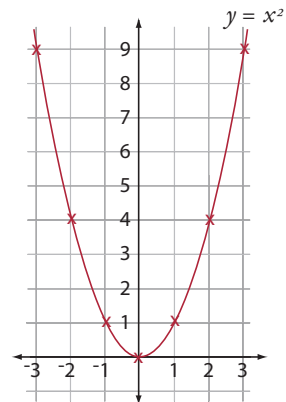
Whakamārama:

He pānga e whai wāhi mai ana te pūruatanga o tētahi o ngā taurangi. He unahi te āhua o te kauwhata hei whakaatu i tētahi pānga pūrua. Hei taurira, ko te pānga kei waenganui i te teitei o te tai i te takanga o te wā:



Ko te $y = x^2$ te whārite pūrua mama. Koia nei te tūtohi me te kauwhata e hāngai ana ki tēnei whārite:

x	-3	-2	-1	0	1	2	3
y	9	4	1	0	1	4	9



Hei taurira o te whakawhānui whārite pūrua:

$$(x + 3)^2 = 0 \rightarrow x^2 + 6x + 9 = 0$$

Hei taurira o te whakatauwehe whārite pūrua:

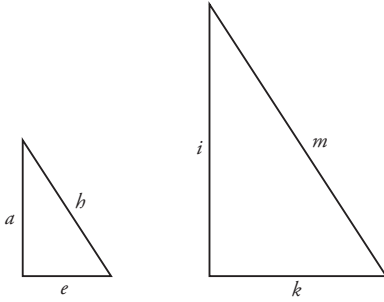
$$x^2 + 4x + 3 = 0 \rightarrow (x + 1)(x + 3)$$

pānga riterite
proportional relationship



Whakamārama:

He pūmau tonu te pānga kei waenganui i ētahi taurangi e rua. Hei tauira, he ōrite te āhua o ēnei tapatoru e rua, nō reira he pānga riterite kei waenganui i ngā tapa (i konei he rearua te rahi ake o tētahi i tētahi):



$$\begin{aligned}i &= 2a & a &= \frac{1}{2}i \\k &= 2e & e &= \frac{1}{2}k \\m &= 2b & b &= \frac{1}{2}m\end{aligned}$$

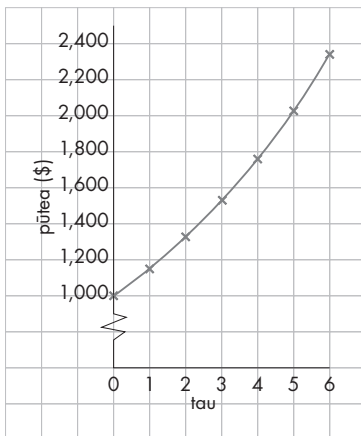
pānga taipū exponential relationship



Whakamārama:

He pānga e whai wāhi mai ana tētahi o ngā taurangi hei taipū. He pūwerewere te āhua o te kauwhata hei whakaatu i tētahi pānga taipū. Hei tauira, ko te piki o te huamoni whakaputu i te takanga o te wā. Ko te 15% te ōrau huamoni whakaputu i konci:

te tau	te pūtea
0	\$1000
1	$\$1000 \times 1.15 = \1150
2	$\$1000 \times 1.15 \times 1.15 = \1322.50
3	$\$1000 \times 1.15 \times 1.15 \times 1.15 = \1520.88
4	$\$1000 \times 1.15 \times 1.15 \times 1.15 \times 1.15 = \1794.01
x	$\$1000 \times 1.15^x$



pānga rārangi linear relationship

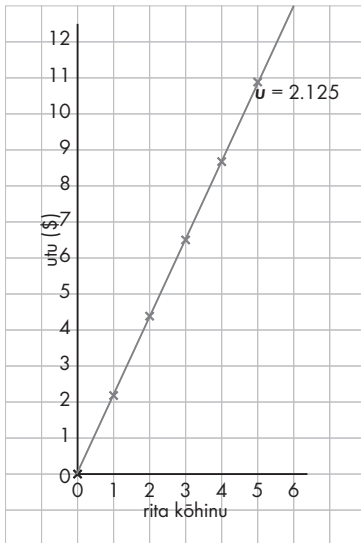


Whakamārama:

E taea ana tēnei momo pānga te whakaatu ki te kauwhata rārangi tōrotika. Arā, ka pūmau tonu te pānga whakarea kei waenganui i ngā taurangi. Hei tauira, ko te utu kōhinu – e pūmau tonu ana te utu mō ia rita, ahakoa te maha o ngā rite ae hokona ana:

ngā rita	1	2	3	4	5	r
te utu	\$2.12	\$4.24	\$6.36	\$8.48	\$10.60	$2.12r$

Ko te whārite rārangi $u = 2.12r$ hei tohu i te pānga rārangi i te kauwhata:



pānga rārangi kōaro

inverse linear relationship



Whakamārama:

Ko te huri kōaro i tētahi pānga rārangi. Hei tauira, ko te $u = 2.12r$ te pānga rārangi kei waenganui i te utu tapeke o te kōhinu (u) me te maha o ngā rita (r) e hokona ana. Ko te pānga rārangi kōaro, ko te $r = u \div 2.12$.

rita kōhinu	1	2	3	4	5
utu (\$)	2.12	4.24	6.36	8.48	10.60

$\times 2.12$ $\div 2.12$

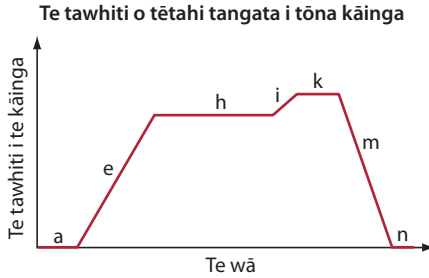
pāpātanga o te whiti

rate of change



Whakamārama:

Ko te tere o te rerekē haere o tētahi āhuatanga i roto i te takanga o te wā. Ko te kauwhata rārangi e tino whakamahia ana hei whakaatu i te pāpātanga o te whiti. Hei tauira, ko te tawhiti o tētahi tangata i tōna kāinga:



Ko te *rōnaki* o te rārangi o te kauwhata hei whakaatu i te pāpātanga o te whiti. Arā:

- Mēnā e tino piki ana te rōnaki, he tino tere te whiti (he tino tere te tawhiti haere o te tangata i tōna kāinga - ko te 'e' i te kauwhata i runga nei).
- Me he māmā te piki o te rōnaki, he pōturi te whiti (kāore e tino tere te tawhiti haere o te tangata i tōna kāinga - ko te 'i' i te kauwhata i runga nei).
- Mēnā he huapae te rārangi, kāore e whiti ana (ka pūmau tonu te tawhiti o te tangata i tōna kāinga - ko te 'a', te 'h', te 'k' me te 'n' i te kauwhata i runga nei).
- Me he māmā te heke o te rārangi, he pōturi te whiti (kāore e tino tere te pātata haere o te tangata ki tōna kāinga).
- Mēnā e tino heke ana te rōnaki, he tino tere te whiti (he tere te pātata haere o te tangata ki tōna kāinga - ko te 'm' i te kauwhata i runga nei).

pāpātanga whakaputu

compounding rates



Takenga mai:

pāpātanga – rate; whakaputu – pile in a heap

Whakamārama:

Ka tāpiria, ka tangohia rānei te pāpātanga whakapiki, te pāpātanga whakaheke rānei i te takanga o te wā. Ko te tauira matua, ko te huamoni whakaputu, arā, ka tāpiria haerehia te huamoni ki te pūtea i ia tau. Hei tauira:

Ko te \$500 te pūtea, ko te 10% te ōrau huamoni whakaputu.

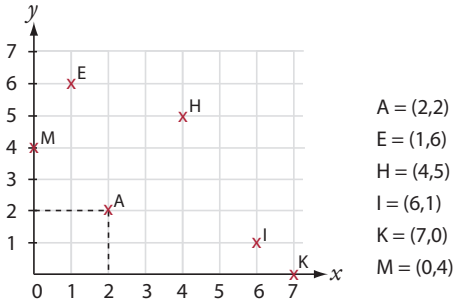
- i te paunga o te tau tuatahi: $P = 500 \times 1.1 \text{ (110\%)} = \550
- i te paunga o te tau tuarua: $P = 550 \times 1.1 \text{ (110\%)} = \605
- i te paunga o te tau tuatoru: $P = 605 \times 1.1 \text{ (110\%)} = \665.50
- i te paunga o te tau- n : $P = 500 \times 1.1^n$

papa taunga
co-ordinate plane



Whakamārama:

He pūnaha tukutuku hei whakaatu i te pūwāhi e noho ana tētahi mea. Ka whakamahia te takirua raupapa hei tohu i tētahi pūwāhi i te papa taunga:





Takenga mai:

parahau – protection, defence

Whakamārama:

Ko te tuku i te kōrero, i te whakamārama, i te tautohenga rānei he aha i tika ai te otinga o tētahi rapanga, ngā hua rānei o tētahi tūhuratanga. He wāhanga nui tēnei i roto i te tūhuratanga tauanga. Hei taurira:

Ko te tāpaetanga kōrero nei te kaupapa o te tūhuratanga tauanga:

I te 20 tau kua pahure nei, he pakari ake te ekenga panuku o te hunga wāhine i te hunga tāne i roto i te hākinakina kaiaka i ngā taumāhekeheke o te ao.

E tika ana kia parahautia ēnei āhuatanga i roto i te tūhuratanga:

- ngā taurangi i whakamahia, pērā i:
 - te tawhiti o te peke roa o te kaiwhiwhi i te mētara kōura
 - te wā o te kaiwhiwhi i te mētara kōura i te omanga 100m
- ngā inenga tauanga ka whakamahia, pērā i te toharite
- ngā momo whakaari raraunga ka whakamahia hei whakaatu i ngā raraunga
- te whakataunga whakamutunga

pūāhua tūponotanga

probability situation



Whakamārama:

He mahi, he kēmu, he āhuatanga rānei e whai wāhi mai ana te tūponotanga. Hei taurira:

- ko te kēmu petipeti o Lotto
- ko te petipeti hākinakina
- ko te pīrori i tētahi mataono tau
- ko te piu i tētahi uka
- ko te hoko hea i te mākete hei whakatipu i tētahi pūtea moni

raraunga motumotu

discrete data



Whakamārama:

Ko ngā momo raraunga e noho motumotu ana, arā, ko ētahi uara noa iho e taea ana. Hei tauira, ko ngā putanga e ono o te pīrori i tētahi mataono tau, ko ēnei noa iho, kāore i tua atu: {1, 2, 3, 4, 5, 6}.

rōnaki

gradient, slope



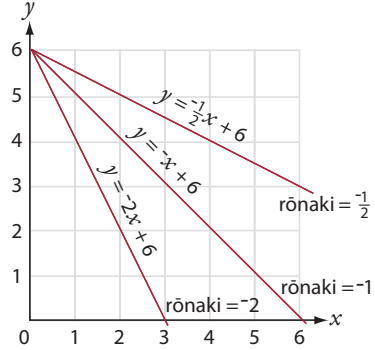
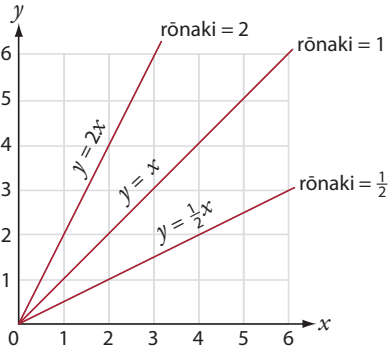
Takenga mai:

rōnaki – sloping, slanting

Whakamārama:

Ko te kaha piki, te kaha heke rānei o tētahi *rārangi* i te *kauwhata*. Mēnā e piki ana te *rārangi*, he *tau tōrunga* hei whakaatu i te rōnaki. Mēnā e heke ana te *rārangi*, he *tau tōraro* te rōnaki.

E whakaaturia ana ētahi rōnaki ki ngā kauwhata nei:



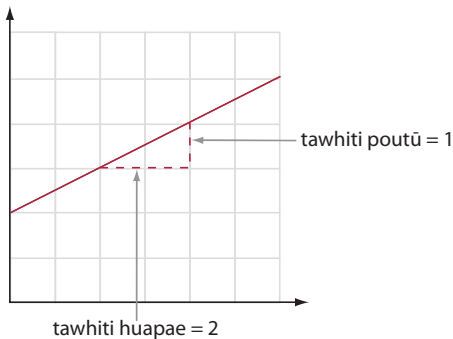
I roto i te *whārite* nei $y = 2x + 1$, ko te 2 te *tau whakarea* o te x . Koirā te rōnaki o te *rārangi*. Anei anō ētahi taurira:

$$y = 5x - 20 \quad \text{rōnaki} = 5$$

$$y = \frac{1}{3}x + 2 \quad \text{rōnaki} = \frac{1}{3}$$

$$y = -2x + 3 \quad \text{rōnaki} = -2$$

E tātaihia ai te rōnaki o tētahi *rārangi*, me whakawehe te *tawhiti poutū* ki te *tawhiti huapae* mai i tētahi pūwāhi o te *rārangi* ki tētahi. Hei taurira:



$$\frac{\text{tawhiti poutū}}{\text{tawhiti huapae}} = \frac{1}{2}$$

Nō reira, ko te rōnaki = $\frac{1}{2}$

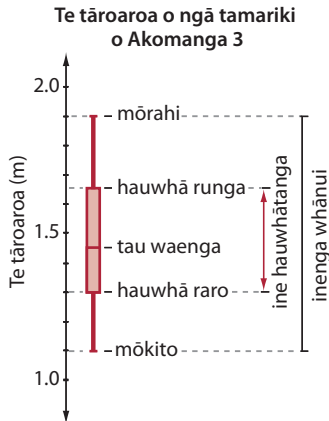
tauanga whakarāpopoto

summary statistics



Whakamārama:

Ko ngā inenga tauanga hei whakaatu i ngā āhuatanga matua o tētahi huinga raraunga. I ētahi wā, ka whakamahia te kauwhata kauamo hei whakaatu i ngā tauanga whakarāpopoto. Hei tauira, ko te tāroaroa o tētahi hunga tamariki o Akomanga 3



I tēnei kauwhata e kitea mai ana ngā tauanga whakarāpopoto nei:

- ko te tau waenga = 1.45m
- ko te ine whānui (mai i te mōrahi ki te mōkito) = 1.1m ki te 1.9m
- ko te hauwhā runga = 1.65m
- ko te hauwhā raro = 1.3m

tauirā mokowā

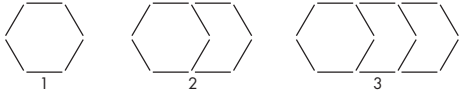
spatial pattern



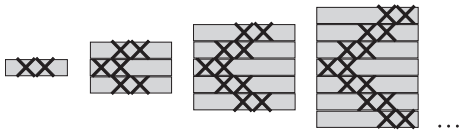
Kupu ke atu: tauira āhuahanga

Whakamārama:

He tauira ka hua mai i tētahi hanga, me te tāruarua, te whakatipu rānei o taua hanga. Koia nei ētahi tauira mokowā:



1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

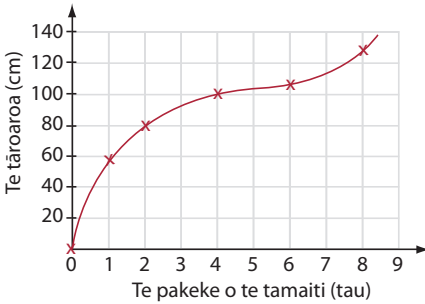




Whakamārama:

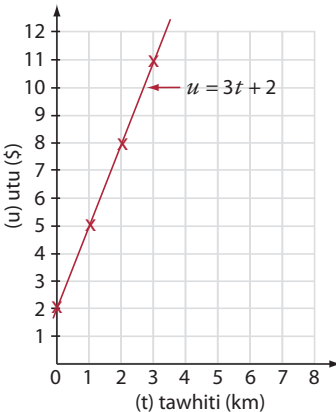
Ko tētahi āhuatanga, tētahi rahinga rānei, kāore e noho pūmau te uara – ka rerekē haere, ka taea rānei te whakarerekē. I ngā tikanga pāngarau, ka whakamahia he pū hei tohu i tētahi taurangi. Hei tauira, ko te tāroaroa o tētahi tamaiti i te takanga o te wā. E rua ngā taurangi i tēnei horopaki – ko te pakeke o te tamaiti me tōna tāroaroa.

Te tāroaroa o tētahi tamaiti me tōna pakeke



I ētahi horopaki e whakawhirinaki ana te uara o tētahi taurangi (ka kīia ko te *taurangi whakamauru*) i taurangi kē atu (ka kīia ko te *taurangi rāwekeweke*). Mēnā ka whakarerekēngia te taurangi rāwekeweke, ka rerekē anō te taurangi whakamauru. Hei tauira, ko te utu waka tono:

Ko te *whārite* hei *tātai* i te utu mō tētahi waka tono: $u = 3t + 2$ ($u =$ utu, $t =$ te tawhiti o te haere)
Ko te utu (u) te taurangi whakamauru (e whakawhirinaki ana ki te tawhiti o te haere), ko te tawhiti (t) te taurangi rāwekeweke. Ka whakaaturia te taurangi rāwekeweke ki te *tuaka pae* o te kauwhata, ko te taurangi whakamauru ki te *tuaka pou*:



I roto i te *kīanga* nei, e toru ngā taurangi rerekē – ko te a , te e , me te h : $5a - 3a + 4h - a + e + 3h$
E taea ana te whakakao mai ngā *taurangi tairite* hei *whakarūnā* i te *kīanga*:

$$\begin{aligned}
 &5a - 3a + 4h - a + e + 3h \\
 &= 5a - 3a - a + 4h + 3h + e \\
 &= a + 7h + e
 \end{aligned}$$

Kāore e tika ana kia honoa ngā taurangi rerekē. Arā: $5a + 3h \neq 8ah$

taurangitanga variation



Takenga mai:

taurangi – variable

Whakamārama:

He āhuatanga ka hua ake i ngā tūhuratanga tauanga me ngā whakamātau tūponotanga. Arā, ka rerekē ngā raraunga ka hua ake i tētahi whakamātau, i ngā tātaitanga i runga anō i te whakaaro arorau, i ngā matapae rānei i runga i te mōhio ki te kaupapa. Hei tauira:

Ko te tātaitanga arorau e mea ana, ina e 24 ngā pīroritanga mataono tau, ka 4 ngā putanga o te 6 (ko te $\frac{1}{6}$ te tūponotanga o ia tau). Engari ia whakamātautanga ka rerekē ngā raraunga ka puta. Koirā te taurangitanga o tēnei mea te tūponotanga.

Hei tauira anō:

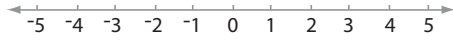
Ina tirohia ngā tūtohi āhuarangi, tērā e kitea ko te marama o Hōngongoi te marama mākū rawa atu i te nuinga o ngā tau 100 kua pahure nei. Engari i ētahi tau ko tētahi marama kē atu. Koirā te taurangitanga o ngā raraunga huarere.

tau tōpū integer



Whakamārama:

Ko te huinga o ngā tauoti tōruna, ngā tauoti tōraro me te kore. Arā: $\{-3, -2, -1, 0, 1, 2, 3 \dots\}$.



He mutunga kore ngā tau tōraro, he mutunga kore hoki ngā tau tōruna.

Mō te tāpiritanga, ka kīia ko te -3 te kōaro o te 3 nā te mea, ko te 0 te otinga ina tāpiria te -3 me te 3 .

tikanga koki o te porowhita

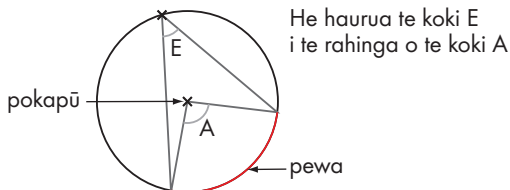
angle properties of a circle



Whakamārama:

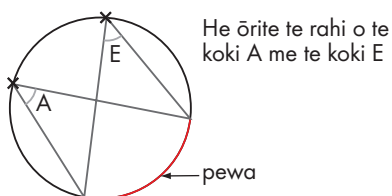
Koia nei ngā tikanga koki o tētahi porowhita:

1. Ina hangaia he koki mā te tūhono i ngā pito o tētahi pewa ki te pokopū, he rearua te rahinga ake o tērā i te koki ka hangaia mā te tūhono i ngā pito o taua pewa ki tētahi pūwāhi i te paenga o te porowhita:



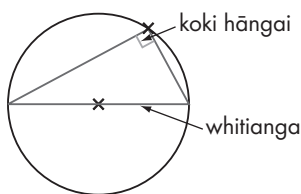
Hei whakapotonga o tēnei tikanga: (koki pokopū = koki paenga × 2)

2. Ina hangaia ētahi koki mā te tūhono i ngā pito o tētahi pewa ki ētahi wāhi i te paenga o te porowhita, he ōrite te rahi o aua koki.



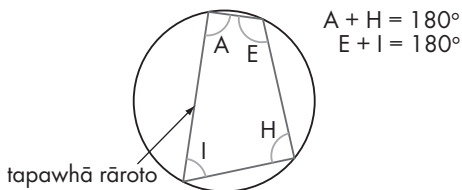
Hei whakapotonga o tēnei tikanga: (ngā koki i te pewa kotahi)

3. Ina honoa ngā pito o te whitianga o tētahi porowhita ki tētahi pūwāhi i te paenga, he tapatoru hāngai ka hua mai.



Hei whakapotonga o tēnei tikanga: (koki porowhita haurua)

4. Ko te 180° te tapeke o ngā koki tauaro o tētahi tapawhā rāroto o tētahi porowhita.



Hei whakapotonga o tēnei tikanga: (koki tauaro, tapawhā rāroto = 180°)



Whakamārama:

Ko ngā tikanga e whāia ana e tētahi rōpū kia pono ai, kia tōtika anō te āhua o ā rātou mahi. Hei tauira, koia nei ētahi o ngā tikanga matatika e hāngai ana ki te hunga rangahau, me ā rātou mahi whakahaere tūhuratanga tauanga:

- te hāngai o te pātai kia kore ai te kaiwhakautu e mamae, e whakaitia rānei
- kia noho matatapu ngā kaiwhakautu pātai mēnā e hāngai ana
- kia mārama te kaiwhakautu pātai, kei a ia tonu te mana, mēnā kāore ia e hiahia ana ki te whakautu pātai
- kia mārama te kaiwhakautu pātai ki te tūhuratanga, te whāinga o te tūhuratanga, me te whakamahinga o ngā raraunga
- kia tika, kia tōkeke te āhua o te whakaatu i ngā raraunga me ngā whakakitenga o te tūhuratanga
- kia kua e haukumea te āhua o ngā pātai

tīpako matapōkere

random sample



Whakamārama:

E whakahaerehia ana tētahi *tūburatanga tauanga*, kia mōhiotia ai he aha ngā kai e tino manakohia ana i te toa kai o tētahi kura. Mēnā 1,500 ngā ākonga o taua kura, he nui rawa tērā *taupori* kia uiuia te katoa. Nō reira, ka *raupapahia* ngā ingoa whānau o ngā ākonga (kia rite ki te waka-pū), ā, ka tīpakohia ia ākonga tuarima kia uiuia. He tīpako matapōkere tēnei.

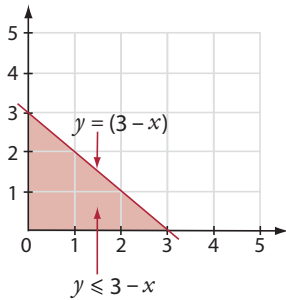
tōrite rārangi

linear inequality



Whakamārama:

He momo kīanga pāngarau e whai wāhi mai ana te tohu nui ake ($<$, \geq) te tohu iti ake rānei ($<$, \leq), hei whakaatu i te pānga rārangi o ētahi taurangi e rua. Ko te $y \leq 3 - x$ hei tauira o tētahi tōrite. Arā, he ōrite, he iti iho rānei te uara o te y i te uara o te $3 - x$. E taea ana te whakaatu ki te kauwhata. Ka kaurukutia te rohe o te kauwhata kei raro iho i te rārangi $y = 3 - x$. Kei roto i taua rohe kauruku ngā uara katoa e tika ai te tōrite $y \leq 3 - x$. Ko ngā pūwāhi $(1,1)$, $(2,0)$ ētahi:





Whakamārama:

Ko te āhua o te hora o tētahi huinga raraunga. Ka whakaaturia te tuari o ngā raraunga ki te kauwhata, ki te tūtohi rānei.

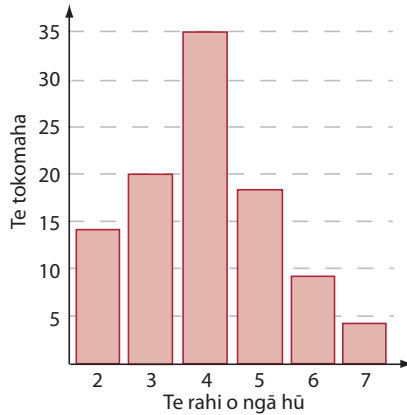
E whakaaturia ana ki te tūtohi nei te tuari o te rahi o ngā hū o ētahi tamariki 100:

Te rahi o ngā hū o ētahi tamariki

Te rahi o ngā hū	Te tokomaha
2	14
3	20
4	35
5	18
6	9
7	4

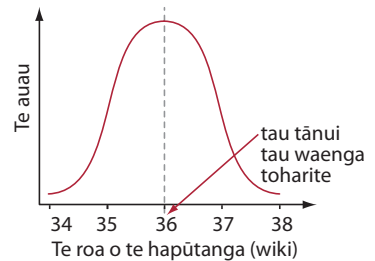
He māmā te kite i te tuari mēnā ka whakaaturia ki te kauwhata. Arā, ko te 4 te tau tānui, he tokoiti te hunga he 6, he 7 rānei te rahi o ngā hū:

Te rahi o ngā hū o ētahi tamariki

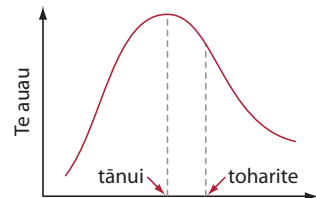


He tuari māori e whakaaturia ana ki te kauwhata nei. Arā, he hangarite te kauwhata. Ko te 36 wiki te tau tānui, te tau waenga me te toharite. He tokoiti ngā wāhine i raro i te 35 wiki te roa o te hapūtanga, he nui ake rānei i te 37 wiki. Ka kīia he ānau māori te rārangi e whakaatu ana i te tuari māori (arā, he hangarite te āhua o te rārangi):

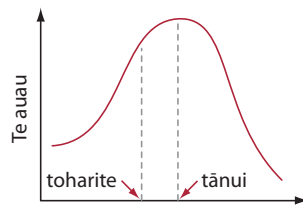
Te roa o te hapūtanga o ētahi wāhine 1,000



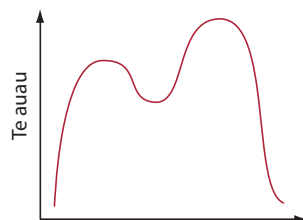
He tuari tītaha tēnei. He tōrunga te tītaha o tēnei kauwhata (tītaha tōrunga). Arā, ko te tīhi kei te taha mauī o te kauwhata – he nui ake te toharite i te tau tānui:



He tītaha hoki tēnei tuari. He *tōraro* te tītaha o tēnei kauwhata (*tītaha tōraro*). Arā, ko te tihi kei te taha matau o te kauwhata – he iti ake te toharite i te tau tānui:



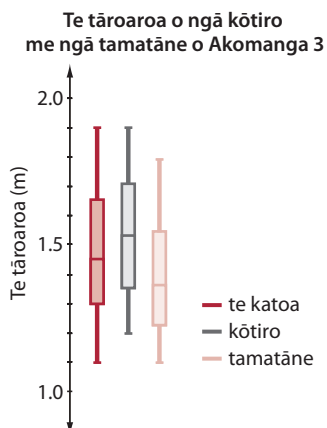
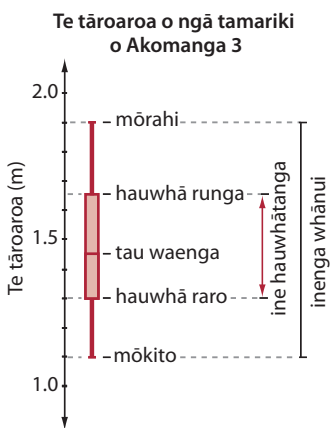
He *tuari tihirua* tēnei. Arā, e rua ngā tihi o te kauwhata, e *rāpoi* ana ngā raraunga ki ētahi tau tānui e rua:



Ka tino whakamahia te kauwhata kauamo hei whakaatu i te tuari o tētahi huinga raraunga, e kitea ai te inenga whānui, te tau waenga, me ngā hauwhātanga. Hei tauira:

E whitu ngā inenga raraunga e whakaaturia ana ki te kauwhata kauamo nei. Arā, ko te *mōkito* me te *mōrahi*, ko te hauwhā runga me te hauwhā raro, ko te tau waenga, ko te inenga whānui me te *ine hauwhātanga*:

E pai ana te kauwhata kauamo hei whakatairite i ngā inenga o ētahi *rōpū raraunga* e rua, nui ake rānei. Hei tauira:



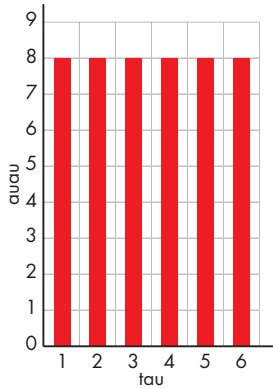
tuari tātai

theoretical distribution



Whakamārama:

Ko te tuari o ngā raraunga o roto i tētahi pūāhua tūponotanga, ka tātaihia i runga i te whakaaro arorau. Hei tauria, koia nei te tuari tātai o ētahi pīroritanga mataono tau e 48. Ka tātaihia i runga i te whakaaro arorau, ko te $\frac{1}{6}$ te tūponotanga o ia putanga (arā, te 1, te 2, te 3, te 4, te 5, te 6 rānei) nō reira ka 8 te maha o ia putanga ($\frac{1}{6}$ o te 48):



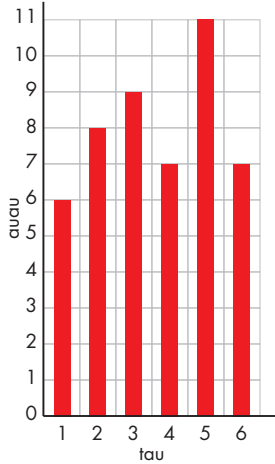
tuari whakamātau

experimental distribution



Whakamārama:

Ko te tuari o ngā raraunga ka hua mai i tētahi whakamātau tūponotanga. Hei tauira, mēnā e 48 ngā pīroritanga mataono tau, koia nei pea te maha o ia putanga (arā, te 1, te 2, te 3, te 4, te 5, te 6 rānei). Ko te tuari whakamātau tēnei:



whaitakenga (o tētahi otinga)

reasonableness (of a solution)



Takenga mai:

whaitake – having purpose, valid

Whakamārama:

Ko te hāngai o te otinga ki te horopaki o te rapanga. Hei tauira:

1. E 44 ngā tamariki hei whakawehe ki ētahi tīma e 7. E 6 ngā tamariki ki ia tīma, e 2 e toe ana. Ākene pea kia 7 ngā tamariki ki ētahi tīma e rua, kia 6 ki ērā atu o ngā tīma. Nō reira i tēnei horopaki, ko te 6 te otinga whaitake ki te whakawehenga $44 \div 7$.
2. E 44 mita te roa o tētahi aho. Ka whakawehea te aho kia 7 ngā wehenga ōrite. I tēnei horopaki, ko te 6.285 te otinga whaitake, nā te mea e taea ana te ine ki te mitamano [mm] e pātata ana.
3. E 44 rita wai hei whakawehe ki ētahi ipu e 7. I tēnei horopaki, ko te 6.3 te otinga whaitake ki tēnei whakawehenga o te 44 ki te 7.

whakaahuahanga representation



Takenga mai:

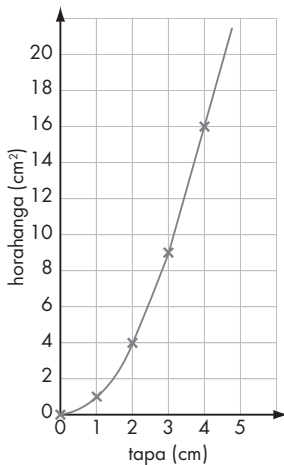
āhua – form, appearance, resemble

Whakamārama:

Ko ngā momo whakaaturanga pāngarau hei kawē i tētahi kaupapa. Hei taurira, ko te tūtohi, ko te whārite me te kauwhata hei whakaatu i te pānga o ētahi taurangi e rua (i konei ko te tapa o tētahi tapawhā rite me tōna horahanga):

tapa (cm)	1	2	3	4	5
horahanga (cm ²)	1	4	9	16	25

$$H = t^2 \text{ (H = horohanga, } t = \text{tapa)}$$



whakaaro whaitake

reasoning



Whakamārama:

Ko te whakamāori, ko te wetewete hoki i ētahi raraunga tau, i ngā tau rānei o roto i tētahi rapanga, ko te whai i tētahi raupapatanga mahi arorau, me te whakamahi i ētahi tikanga pāngarau hei whakaputa otinga. Hei tauira:

- Ko te whakatairite i ngā pāpātanga whakapau kōhinu o ētahi motukā e toru me te whakahāngai anō ki te rahi o ngā pūkaha.
- Ko te kimi i te utu tino whaihua o roto i ētahi umanga tēkehi e toru, me te whakahāngai anō ki te tawhiti o te haerenga.

whārite taupū exponential equation



Whakamārama:

He taupūtanga kei roto i ēnei momo whārite. Hei tauira:

- $y = x^2$
- $y = x^4 - 3x^2 + 2$

whārite tukutahi

simultaneous equation



Whakamārama:

Ko te pānga o tētahi whārite ki tētahi, me te whiriwhiri i ngā uara o ngā taurangi hei whakaoti i ngā whārite e rua. E toru ngā tikanga hei whakaoti whārite tukutahi:

1. Mā te tikanga whakakore taurangi

$$2x + 3y = 8$$

$$3x - y = 1$$

Ka whakareatia te whārite tuatahi ki te 3, ka whakareatia te whārite tuarua ki te 2:

$$6x + 9y = 24$$

$$6x - 2y = 2$$

Ka tangohia tētahi whārite i tētahi:

$$11y = 22$$

$$\text{Nō reira } y = 2$$

Ka whakaurua te $y = 2$ ki te whārite tuarua:

$$3x - 2 = 1$$

$$\text{Nō reira, } x = 1$$

Ko te takirua raupapa (1, 2) hei whakaoti i ēnei whārite e rua.

2. Mā te tikanga whakauru

$$y = 2x + 4$$

$$y = x^2 + 3x - 2$$

Ka whakaurua te $2x + 4$ hei whakakapi i te y i te whārite tuarua. Nō reira, $2x + 4 = x^2 + 3x - 2$

Ka whakaotia tēnei whārite:

$$2x + 4 = x^2 + 3x - 2 \rightarrow x^2 + x - 6 = 0$$

$$\rightarrow (x + 3)(x - 2) = 0$$

$$\rightarrow x = -3, +2 \text{ rānei.}$$

Ka whakaurua ēnei hei uara mō te x i te whārite tuatahi, ka hua mai ngā otinga takirua raupapa nei: (-3, -2) me te (2, 8)

3. Mā te tikanga tuhi kauwhata:

$$y = 2x + 3$$

$$y = 5 - 3x$$

Kei te takiwā o te (0.4, 3.8) te otinga o ngā whārite tukutahi nei.

