

# NI TAKIALA MANUMALO

Fakahulamaiga o  
na Fakamatalaga  
Fakahaienihi

na tuhia e Renata Hopkins  
na fakaliliu e Seiuli Aleta



Ko Grace kua iei tana mihiona: ke ulu ki na fakaalialiga fakahaienihi, ma ke fakaofo na fakamahino, kae ke malo i te togi tupe! Ke taunuku ienei vaega, e tatau ke fatufatu lelei ana hakilikiliga ma ke filifili e ia he auala e hili atu ona fetai ma taoga lelei ke fakaohofia ai te fia matamata ki ei o na tino, vena ke fakaohofia ai na lagona i te tuku atuga o ana fakamaumauga. Kae e filifili vehea nei e na haienitihi na auala e pito hili ona lelei ke “fakaali ma fakamatala” ai te uiga o na fakamaumauga e maua mai i a latou hukehukega?

# Tukufakatahiga o na fakamaumauga

Kua fakaigoa e Grace tana fakaulu ki te "Stop your Tent Blowing Away". Ko tona fakamoemoe ke pupuhi fakatekia na fakamahino.

Ko Grace kua iei ana hakilikiliga e uma te fakatino ke hiaki ai te malolohi o na pine e mafai ke taofi ai te malohi o te falekie. Na fau foki e ia he motele ko ni lakau e nonoa fakatahi – ke **fakafoliga** mai ko he tipī (falekie Initia Amelika). Na tautau e ia he pakete e fakamamafa i ni fatu ki te tipī ke fakamamafa ai ana pine. Na ia faua foki he mea ke fakatuhatuha ai te malohi o te matagi ki na pine. Na fakatakitaki e ia na pine ki ho he koga kekele. Na ia fua te malohi kafai e tutuki katoa te pine ki te kekele vena foki kafai e tutuki oioti na ko he vaega o te pine ki te kekele.

Ko tana hakilikiliga tenei na ia maua ai ni **fakamaumauga mata fōu** e lahi. Ko tana lukitau nei ke fakahula ma fakailoa na fakamaumauga fōu ienei i ni auala manino ma te hako mae ke lahi ai ni fakamatalaga mo tana fakaalialiga fakahaienihi.

Ko te vahega haienihi a Grace nae hukehuke pe vehea ona fakauiga na **vaega e fakahula**. Kua kamata tana galuega i te fetolifakiga o na metotia e ia iloa mo te fakamaumauga, vakilikiliga, ma te kotokotoga o na fakamaumauga. Ko te fekuikuikigiga tenei e fatu mai ai he auala e fakahula ai na fakamaumauga i he ata tuhituhia.



Ko ni a ni ietahi itūkaigā ata e mafau koe e mafai ke fakaaoā e Grace? Ko hea te lelei ai na ata tuhituhi mo te tuku maiga o na fakamatalaga?

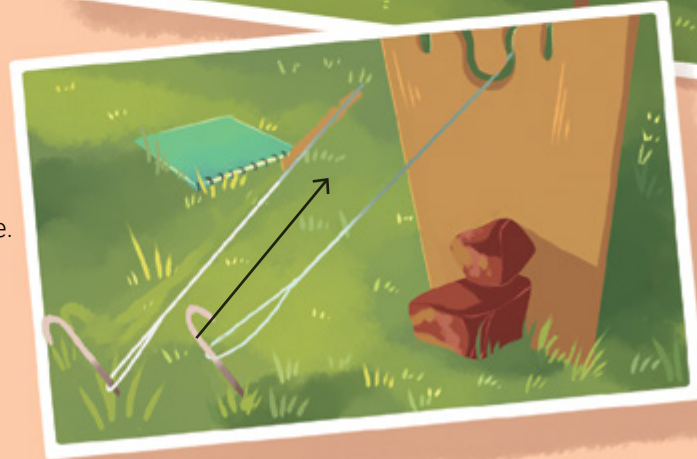
# Ko te ata e ia fakamatala maia ni kupu e afe

Kua mafau fau ia Grace ki na fakaalialiga na fiafia ia ki ei i te tauvaga hukehukega fakahaienihi i te tauhaga kua teka. Na ia mataua ai ko na ata puke e fehoahoani lahi lele ki tana galuega e fakaulu mae ke fakaohofia ai te fia kikila ki ei o na tino, ma e fofou la ke iei ni ana ata puke. Kua lihi na mafuaga e taua ai te iei o ni ata puke mo te tuku maiga o ana fakamaumauga:

- E lelei mo na metotia fakaaliali, ko tona uiga, ke fakaali mai ai pe ni a ta koe na fai ma pe na vehea foki ona fai e koe.
- E maua uma ai na fakamatalaga kae ke he lahi ni au kupu ke taumafai ke fakamatala ai.
- E mafai ke fakahula ai te tulaga o te fakahologa o te fakatinoga o te hakilikiliga.
- E mafai ke fakahula mai ai na vaega e he kitea e na mata, fakatakitakiga, he mea i lalo o te fakaata (microscope) e kitea ai na mea pito hili te taigogole.



Mafau fau ake ki ni ietahi mafuaga e filifili ai na ata ke fakaaliali ai na metotia na fakaaogā? Ko hea na itu e he lelei ai te fakaaogā o na ata puke? Ko ni a ni vaega e he mafai ke hula mai ai?



Ke kite na pine takitahi kae he fakaaogā he falekie, na fai e Grace te pulu fakamalo kae he mafai ai e te uka oi fakatautoho ma te pine.

# Fakatatiaga o na laulau ata

Na fakaaogā e Grace ni itūkaigā pine falekie kehekehe e ono ke kite to latou malohi.

E manakomia ke lihi e ia ni itūkaigā fauhaga kehekehe ma fakamatala pe fau mai i ni a na pine takitahi, kua tago la oi tuhi tana puha.

Ko te laulau ata ko he auala ia e mafai ke fakamaumau ai na fakamaumauga mo na atu takoto (row) ma na atu tutu (column). Ko he filifiliga mahani tenei mo te lekotiga o na fakamaumauga fōu. Ko na atu takoto ma na atu tutu e mafai ke fakaholo totoka ai, ma e fehoahoani mai ai foki ke fakakitea ai na vaega e hokotaga ai na fakamatalaga. E fakaaogā ho e ki tatou na laina laulau i aho takitahi, fakatakitakiga, ko na taimi fakatulaga e malaga ai na pahi, ko na laupapa fakailoilo ai te taimi e malaga mai ai pe lele kehe atu ai foki te vakalele, ma na fakahalalauga o na tala o te tau.

Itūkaigā Pine			
Pine	Ata	Fau mai i te	Fauhaga
1		Ukamea he palatokia	Matau mahini
2		Alamini	Matau mahini
3		Alamini	Foliga ki he V leva ma e iei te matau
4		Volu	E kekena ma foliga ki he T ma e iei he makohi
5		Alamini	Taigole ma foliga ve he V ma e iei he makohi
6		Lakau	Fai i na lima ma e iei he makohi



E ono mafai e Grace oi fakaaopopo ni atu laina tutu ki te puha kae ke ia mafaia ai oi fakamaugia ni ietahi fakamatalaga taua? Na kua fau hau laina laulau mo he poloketi haienihi pe ko te numela? Kafai io, na vehea ona fakaholotonu e koe na fakamaumauga kae ke faigofie oi malamalama?



Ko he laulau ata e fakahula mai ai na fauhaga ma na mea na fau mai ai na pine ienei na fakaaogā i te hukehukega a Grace

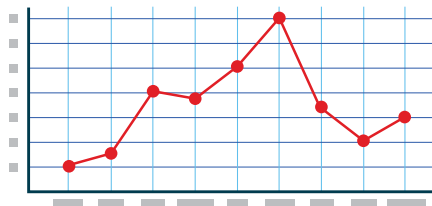
# Fakamaauga fakakalafa

Kafai na haienitihi kua totoka te fakaputuga o na fakamaauga mai a latou hakilikiliga pe ko ni matauga, e manakomia ke fakaholotonu ma fakatu lelei na fakamatalaga kae ke mafai ke vakilikili gofie ai. Ko na kalafa e mahani fakaaogā ke fakahula mai ai he ata kitea o na fakamaauga. Ko na kalafa e mafai ke fehoahoani ke fai ni fakatuhathuga pe kitea ai foki ni pateni ma ni huiga i he taimi vave. Ko he auala lelei tenei ke tuku mai ai na fakamaauga tau numela.

Mo tana hukehukega, nae fofou ia Grace ke kite pe makeke na pine o te falekie kafai kua tutuki katoa ki lalo o te kelekele pe makeke kafai koi kitea he fitu henitimita o te pine koi haha ake ki luga. Na kite e ia ni pine kehekehe e ono ma na fakamaumu na vaega na ia kitea. Kua fai tana tonu ke fakailoa mai na fakamaauga i te fakaaogā o he kalafa poloka. Ko na kalafa poloka e aogā ke fakatuhatuha ai ni mea e lua i ni kulupu kehekehe pe ko ni vaega kehekehe o na fakamaauga.

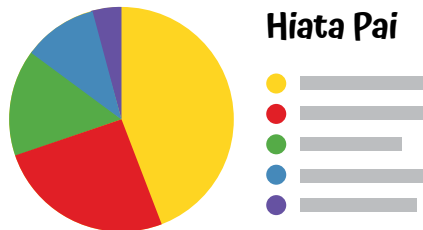
Ko ietahi kalafa e mahani fakaaogā ko na kalafa laina ma na hiata pai:

**Kalafa Laina**



Ko na kalafa laina e aogā ke fakaali mai ai ni fakamaauga e fano ki luga pe fano foki ki lalo i te gahologa o he taimi. E ve ko na kalafa poloka, ko na fakamaauga e tuhi ki luga o ni aehi, e fakaaogā ki ei ni togi ke fakaali ai ni fakamaauga patino. Ko na fakailoga ienei e hohoko e koe i he laina, ma e fehoahoani ke kitea ai ni huiga pe ko ni pateni i loto o na fakamaauga.

**Hiata Pai**



Ko te hiata pai e aogā ke kitea ai ni aofakiga pe ko te pahene o he mea katoa. Ko na hiata pai e he mafai ke kitea ai ni huiga fakavaitaimi.



He kalafa vehea te filifili e koe ke fakakitea mai ai te huiga ki to loa mai te tolu tauhaga kua teka? He kalafa vefea te ono fakaaogā e koe ke fakakitea mai ai na auala kehekehe na omamai ai na tamaiti i tau vahega ki te akoga i te taeao nei? He kalafa vehea te lelei ke fakakitea ai te pahene tamaiti akoga e tafafao i na takaloga kehekehe?



# HUKEHUKEGA 1

Ko te pine e 7 henitimita e heki huhuki katoa ki te kekelele



Ko te kalafa fakamatalaga ko he tahi auala e mafai ke fakaali mai ai na fakamatalaga. Ko na kalafa fakamatalaga e hui fefiloi mai ai na ata fakatuhatuha, na ata ma na kupu. E mafai ke fakafaigofie ai na fakamatalaga ke malamalama ki ei na tino ona kua tuku fakatahi ai na alataki o te kikila ma te tautala ke mafai ai ke faitau gofie ai na tuhituhiga.



**Ukamea he palatokia:**  
matau mahini



Pine 1



Pine 2

**Alamini:**  
matau mahini



Pine 3

**Alamini:** foliga ki he V leva ma e iei te matau



Pine 4

**Volu:** e kekena ma foliga ki he T ma e iei he makohi



Pine 5

**Alamini:** e taigole ma foliga ve he V ma e iei he makohi



Pine 6

**Lakau:** fai i na lima ma e iei he makohi



Oneone

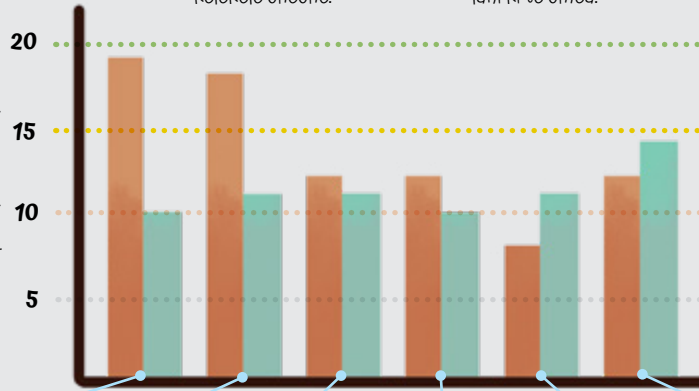
Kafai e manino te vai ma ko te kekelele kua toka ki lalo, ko te lahiga he kekelele oneone.



Omea

Kafai koi lepu ma e kitea he laina kekekelele takamilo i te hioki, ko tau kekelele e lahi ki te omea.

Mamafa katoa e manakomia ke toho akea te pine (kilokalama)



Itōkaiga pine

**20 kilokalama**  
e lahi te malohi e mafai ke toho ai ki fafo

**15 kilokalama**  
e ono mafai ke toho ki fafo

**10 kilokalama**  
e ono toho ki fafo

# Ko te tukuga o au fakamaumauga ki ni kupu

Fakatahi ai ma na ata, na laulau ata, ma na kalafa, na fakaaogā e Grace mo te tauvaga laupapa fakaali ma na tuhituhiga fakahaienihi ke fakamatala ai tana hakilikiliga (investigation). Muamua, nae fofou ke fakamatala ki na fakamahino pe na mafua mai i fea ona manatu ke fakatino ai tana hakilikiliga.

*“I te tahi po, kae koi momoe ki matou i fafo, kae teki lava kua agi malohi te matagi. Ko ietahi falekie i te koga tafafao nae iei ki matou na pakuku ki lalo, auā ko na pine na maunu mai ki fafo. Nae fia ko iloa pe iei ni ietahi pine e hili atu te lelei na i lo i na pine ienei ki te taofiga ke mau o he falekie i na matagi malolohi.”*

Mo he fakatomuaga o te galuega fakaulu a Grace, ko te palakalafa tenei e lahi ni vaega e aogā ai. E fakamatala mai ai he fakafitauli ma tuku mai ai ni fehili ke hakilikiligi ki ei. E fakaohofia ai foki te tino matamata auā ko te galuega fakaulu kua ve e a ia. E kitea e na famahino e iei te mea na tutupu ke fakaohofia ai te fiafia o Grace ki tana hakilikiliga.

## STOP YOUR TENT BLOWING AWAY

“One night, when we were camping, there was a huge wind. Some of the tents in the camping ground fell down because their pegs came out. I wanted to find out if some pegs work better than others to keep a tent up in a high wind.”



### Fakatomuaga

I te haienihi, ko te fakatomuaga e fakamatala ai te kautu mo te fakatinoga o te hakilikiliga ma e fakatatia mai ai te fehili taki o tau hukehukega.

I te umaga o te fakatomuaga o ona manatu, kua fakaaogā e Grace ni vaega tuhituhia ke fakalauaitetele atili ai ona manatu ma toe kikila ai ki te ikuga na ia mauagia. Ko na vaega ienei na mafai ai foki ia ke:

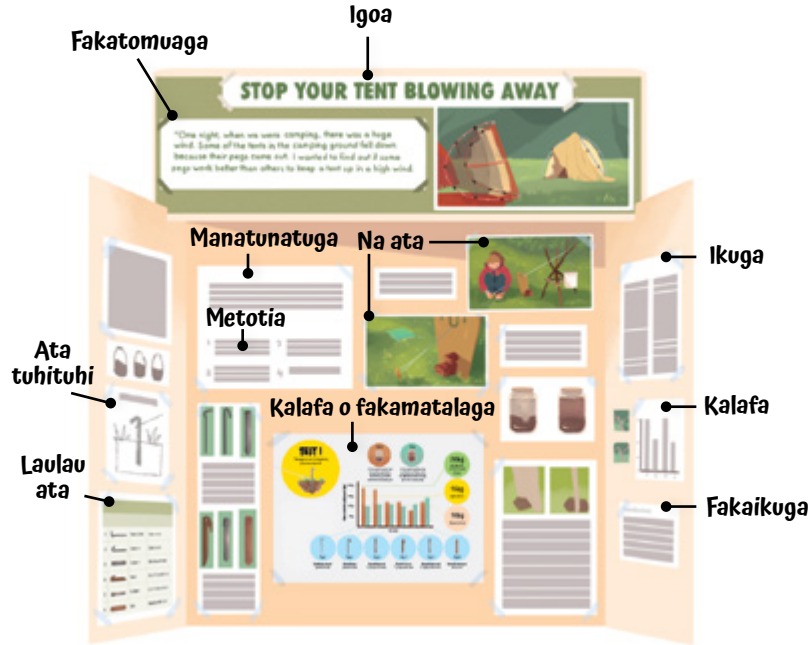
- fakamatala na hukehukega (research) na ia fakatinoa kae ko heki kamata tana hakilikiliga
- fakamalamalama pe na fakatino vehea ana hukehukega
- fakamatea tonu ni fakafitauli na feagai ma ia ma fakamatala ana taumafaiga ke fofo ai
- tuku fakatahi he fakaikuga o ana hakilikiliga.

Ke tuhi na vaega ienei, na aogā ki a Grace te toe tagaki ki tana tuhi fakamaumauga: *“E tali ve he tuhi e fakamaumau ai na vakilikiliga i aho takitahi. Nei kua tuhi taku lipoti fakaiku, e ko kitea te fakahologa katoa mai teia lakahaga ki te tahi lakahaga.”*

# Fakaaogā o he auala mo te tuku maiga o te fekau

Nei kua totoka te fakaholotonuga o na fakamaumauga a Grace, te tuhiga o ana kalafa, ma ana laulau ata, vena ma te filifiliga o na ata, kua ia mafaia oi fakaali mai na fakamatalaga i he laupapa e 1.2 ki te 1.5 mita te lauefa! E laki e malamalama i te taua o te filifili fakalelei o na auala talafeagai ke fakaali mai ai ana fakamaumauga. Ko te ikuga ko he fakaalialiga e fakaohofia ai ia tagata, e hako, ma faigofie ke malamalama ki ei.

Nei kua fai e Grace na filifiliga e lelei mo tana galuega fakaulu ki te fakaalialiga fakahaienihī kua mafai ai loa ke fakafano tona mafaufau ki hetahi mea – pe vehea ona fakaaogā te tupe o te togi manumalo!



# FAKAUIGAGA O NA KUPU

**fakafoliga** – ke fatu he motele pe ko he mea ke hui ai hetahi mea na tutupu kae ke mafai ke fakatino he hakilikiliga

**fakamaumauga mata fōu** – fakamaumauga ko heki vakilikilia (analyse) lelei

**vaega e fakahula** – na ata, motele, pe ko hetahi auala e mafai ke tuku mai ai he manatu, he meatotino, ni fekuikuiakiga, pe ko ni hihitemi



## Fakaamanakiga

Ko te tala tenei e fatu ki luga o he manumalo moni ki galuega fakaulu ki he fakaalialiga fakahaienihī e a Lauren Kendon mai te Northland School i Ueligitone. Ko te togi na tuku ki a Lauren e te Heke o na Akoakoga i te Lunivehite o Victoria i Ueligitone, mo tana fakaalialiga e takua ko te "Don't Let Your Tent Blow Away". E fakafetai lahi ki a Lauren mo te fakatagaga ke fakaaogā tana hakilikiliga tenei na totoka te fatuga, totoka te fakatinoga, ma na totoka te fakamaumauga kua fatu ai ki ei tenei tala.