2

91261M

912615

NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Te Pāngarau me te Tauanga, Kaupae 2, 2013

91261M Te whakahāngai tūāhua taurangi hei whakaoti rapanga

2.00 i te ahiahi Rāhina 18 Whiringa-ā-rangi 2013
Whiwhinga: Whā

Paetae	Paetae Kaiaka	Paetae Kairangi
Te whakahāngai tūāhua taurangi hei whakaoti rapanga.	Te whakahāngai tūāhua taurangi mā te whakaaro whaipānga hei whakaoti rapanga.	Te whakahāngai tūāhua taurangi mā te whakaaro waitara hōhonu hei whakaoti rapanga.

Tirohia mehemea e ōrite ana te Tau Ākonga ā-Motu (NSN) kei tō pepa whakauru ki te tau kei runga ake nei.

Me whakautu e koe ngā pātai KATOA kei roto i te pukapuka nei.

Whakaaturia ngā mahinga KATOA.

Ki te hiahia koe ki ētahi atu wāhi hei tuhituhi whakautu, whakamahia te (ngā) whārangi kei muri i te pukapuka nei, ka āta tohu ai i ngā tau pātai.

Me whakaatu e koe ngā mahinga taurangi i tēnei pepa. Kāore e whakaaturia te whakaaro whaipānga mā te whakamahi i te tikanga o te kimikimi ka tirotiro mēnā kei te tika. Mā te whakamahi i te tikanga o te kimikimi ka tirotiro mēnā kei te tika e here ai te tauira ki te taumata Paetae.

Tirohia mehemea kei roto nei ngā whārangi 2–17 e raupapa tika ana, ā, kāore hoki he whārangi wātea.

HOATU TE PUKAPUKA NEI KI TE KAIWHAKAHAERE HEI TE MUTUNGA O TE WHAKAMĀTAUTAU.

TAPEKE

Kia 60 meneti hei whakautu i ngā pātai o tēnei pukapuka.

PĀTAI TUATAHI

(a) (i) Whakatauwehea $6x^2 - 11x - 10$

(ii) Whakaotihia $6x^2 - 11x - 10 = 0$

(b) Kimihia te uara o m kia kitea kotahi anake te uara o x hei whakaoti i te whārite:

$4x^2 - 8x + m = 0$

You are advised to spend 60 minutes answering the questions in this booklet.

QUESTION ONE

(a) (i) Factorise $6x^2 - 11x - 10$

(ii) Solve $6x^2 - 11x - 10 = 0$

(b) Find the value of m so that only one value of x satisfies the equation:

$4x^2 - 8x + m = 0$

(c) Whakarūnā katoatia $\dfrac{2x^2 - 8}{x^2 - 2x - 8}$

(d) Kotahi anake te otinga tūturu o te whārite $(x+2) - 3\sqrt{(x+2)} - 4 = 0$.

   Kimihia te uara o x.

   (Tīwhiri: Ko $a = \sqrt{(x+2)}$)

(c) Simplify fully $\dfrac{2x^2 - 8}{x^2 - 2x - 8}$

(d) The equation $(x + 2) - 3\sqrt{(x + 2)} - 4 = 0$ has only one real solution.

Find the value of x.

(Hint: Let $a = \sqrt{(x + 2)}$)

(e)　(i)　Kimihia ngā kīanga, e pā ana ki *m* me *n*, mō ngā pūtake o te whārite:

$$\frac{x-m}{x-n} = \frac{2(x+m)}{x+n}$$

(ii)　Homai tētahi tōrite, e pā ana ki *m* me *n*, kia rua ai ngā pūtake wehe kē o te whārite.

(e) (i) Find expressions, in terms of m and n, for the roots of the equation:

$$\frac{x - m}{x - n} = \frac{2(x + m)}{x + n}$$

(ii) Give an inequality, in terms of m and n, so that the equation has two distinct roots.

PĀTAI TUARUA

(a) Whakarūnātia $\dfrac{(4a^2)^3}{(8a^5)^2}$

(b) Whakarūnātia:

(i) $(16x^2)^{\frac{1}{4}}$

(ii) $(16x^2)^{\frac{1}{4}} \times (9x^3)^{\frac{1}{2}}$

(c) I kī a Lara kei te whakaaro ia mō tētahi tau. Ko tāna he:

- pūrua i taua tau,
- ka whakarea i te whakautu ki te 6,
- ka tāpiri kia 12 whakareanga ake o te tau i whakaarohia e ia i te tuatahi,
- ka tango i te 48.

Ko tana whakautu he 0.

He aha ngā tau e whakaaro ana pea ia?

QUESTION TWO

(a)   Simplify $\dfrac{(4a^2)^3}{(8a^5)^2}$

(b)   Simplify:

(i) $(16x^2)^{\frac{1}{4}}$

(ii) $(16x^2)^{\frac{1}{4}} \times (9x^3)^{\frac{1}{2}}$

(c)   Lara says that she is thinking of a number. She:
- squares the number,
- multiplies the answer by 6,
- adds 12 times the number she was first thinking of,
- subtracts 48.

Her answer is 0.

What numbers could she be thinking of?

(d) Hurinahatia te ture $a^x = 5^{(x-1)}$ kia noho ko x te kaupapa.

(e) E rua ngā pūtake tūturu wehe kē o te whārite $3x^2 + 4x - k = 0$.

Mēnā ko 2 te pūtake o tēnei whārite, kimihia te uara o k me te pūtake tuarua.

(d)   Rearrange the formula $a^x = 5^{(x-1)}$ to make x the subject.

(e)   The equation $3x^2 + 4x - k = 0$ has two distinct real roots.

If 2 is a root of this equation, find the value of k and the second root.

PĀTAI TUATORU

(a)   Whakaotihia ngā whārite e whai ake nei.

(i) $\log_x 64 = 3$

(ii) $\dfrac{3 \times 2^{x+1}}{8^x} = 96$

(b)   I te tīmatanga o tana tau tuatahi o ngā akoranga, he \$1 800 te moni ka minoa e Danny mai i ōna mātua.

Ka whakaitihia e ōna mātua te rahi o tana nama ki a rāua mā te 40 ōrau i te mutunga o taua tau, ā, me ia tau hoki o ana akoranga.

He maha ngā tau e ako ana a Danny, ā, kāore ia e utu i ētahi utunga mai i te rahinga tīmatanga i a ia e ako ana.

(i)   Tuhia tētahi kīanga mō te rahi \$A e nama ana a Danny ki ōna mātua mēnā ka ako ia mō te n tau.

(ii)   Whakamahia tō kīanga hei kimi i ngā tau itinga rawa e ako ana a Danny mēnā he iti iho i te \$100 tana nama ki ōna mātua i te mutunga o ana akoranga.

QUESTION THREE

(a) Solve the equations:

(i) $\log_x 64 = 3$

(ii) $\dfrac{3 \times 2^{x+1}}{8^x} = 96$

(b) At the beginning of his first year of study, Danny borrows \$1 800 from his parents.

His parents reduce the amount he owes them by 40% at the end of that year, and each subsequent year he continues his studies.

Danny studies for several years and he does not make any repayments of the initial amount while he is studying.

(i) Write an expression for the amount \$$A$ Danny owes his parents if he studies for n years.
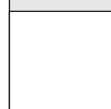
(ii) Use your expression to find the minimum number of years for which Danny studies if he owes his parents less than \$100 when he finishes studying.

(c) Whakamāramahia te take e kore te whārite $(3x + 1)^2 = -7$ e whai otinga tūturu, ā, whakamāramahia ā-kauwhatatia te tikanga o tēnei.

(d) Whakaotihia te whārite $\log x = 2\log(mx)$ mō x e pā ana ki m.

(c) Explain why the equation $(3x + 1)^2 = -7$ does not have any real solutions, and explain what this means graphically.

(d) Solve the equation $\log x = 2 \log (mx)$ for x in terms of m.

He puka anō mēnā ka hiahiatia.
Tuhia te (ngā) tau pātai mēnā e hāngai ana.

QUESTION NUMBER

English translation of the wording on the front cover

Level 2 Mathematics and Statistics, 2013

91261 Apply algebraic methods in solving problems

2.00 pm Monday 18 November 2013
Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Apply algebraic methods in solving problems.	Apply algebraic methods, using relational thinking, in solving problems.	Apply algebraic methods, using extended abstract thinking, in solving problems.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

Show ALL working.

If you need more space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

You are required to show algebraic working in this paper. Guess and check methods do not demonstrate relational thinking. Guess and check methods will limit grades to Achievement.

Check that this booklet has pages 2–17 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.