See back cover for an English translation of this cover

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91261M

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SUPERVISOR'S USE ONLY

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Te Pāngarau me te Tauanga, Kaupae 2, 2012

91261M Te whakahāngai tikanga taurangi hei whakaoti rapanga

2.00 i te ahiahi Rāhina 19 Whiringa-ā-rangi 2012
Whiwhinga: Whā

Paetae	Paetae Kaiaka	Paetae Kairangi
Te whakahāngai tikanga taurangi hei whakaoti rapanga.	Te whakahāngai tikanga taurangi mā te whakaaro whaipānga hei whakaoti rapanga.	Te whakahāngai tikanga 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 me te tirotiro mēnā kei te tika. Mā te whakamahi i te tikanga o te kimikimi me te tirotiro ka here i te ekenga o te ākonga ki te taumata Paetae.

Tirohia mehemea kei roto nei ngā whārangi 2–19 e raupapa tika ana, ā, kāore hoki he whārangi wātea.

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

TAPEKE

MĀ TE KAIMĀKA ANAKE

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

MĀ TE KAIMĀKA ANAKE

PĀTAI TUATAHI

(a) Whakaotihia

(i) $\log x = 3\log 2$

(ii) $\log_5 x = 2$

(b) He $2000 te tuku moni whakangao a te whaea kēkē o Tara mō tōna whānautanga mai.
He 3.5 ōrau te huamoni mō ia tau.
Kāore e rerekē ake tēnei ōrau mēnā ka noho tonu taua moni whakangao.
Ka tāpirihia te huamoni ki te tapeke kua penapenahia e ia i ōna rā huritau i ia tau.
Ka taea te whakatauira te uara o te haumitanga whai muri i ngā tau t mā te whārite

$$A = 2000 \times (1.035)^t$$

ko A te uara o te haumitanga.

(i) Pēhea te roa e eke ai te uara o te haumitanga ki te $2250?

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

ASSESSOR'S USE ONLY

QUESTION ONE

(a) Solve

(i) $\log x = 3\log 2$

(ii) $\log_5 x = 2$

(b) Tara's aunt invests \$2000 for her when she is born.

The interest rate is 3.5% per year.

This rate does not change as long as the money stays invested.

The interest is added to the amount she has invested on her birthday each year.

The value of the investment after t years can be modelled by the equation

$$A = 2000 \times (1.035)^t$$

where the A is the value of the investment.

(i) How long would it take for the value of the investment to be \$2250?

MĀ TE KAIMĀKA ANAKE

(ii) Ka eke a Tara ki tōna rā huritau 18.

Tātaihia te nui o te moni **tāpiri** ka hua i te haumitanga mēnā ka waiho ia i te moni whakangao mō te 3 tau neke atu i tōna rā huritau 18.

(iii) E tātai ana a Tara i te $2000 \times 1.035^m (1.035^n - 1)$

Me kōrero mō te haumitanga, ka whakamārama he aha tā Tara e tātai nei.

(c) Whakaotihia $9^n - (6 \times 3^n) - 27 = 0$ ka whakamāramahia te take he aha i noho ai kia kotahi anake te otinga tūturu.

Tīwhiri: me kī, $3^n = x$

ASSESSOR'S USE ONLY

(ii) Tara reaches her 18th birthday.

Calculate how much **extra** the investment will be worth if she leaves the money invested for another 3 years beyond her 18th birthday.

(iii) Tara is calculating $2000 \times 1.035^m (1.035^n - 1)$

With reference to the investment, explain what Tara is calculating.

(c) Solve $9^n - (6 \times 3^n) - 27 = 0$ and explain why it has only one real solution.

Hint: let $3^n = x$

PĀTAI TUARUA

MĀ TE KAIMĀKA ANAKE

(a) (i) Whakatauwehetia $5x^2 - 9x - 2$

(ii) Whakaotihia $5x^2 - 9x - 2 = 0$

(b) Whakaotihia $\dfrac{x^2 + 5x + 2}{x + 2} = 3$

Whakaaturia ngā mahinga taurangi.

QUESTION TWO

ASSESSOR'S USE ONLY

(a) (i) Factorise $5x^2 - 9x - 2$

(ii) Solve $5x^2 - 9x - 2 = 0$

(b) Solve $\dfrac{x^2 + 5x + 2}{x + 2} = 3$

Show algebraic working.

MĀ TE KAIMĀKA ANAKE

(c) I whakaotihia e Mark te whārite $\dfrac{x^2-5x+6}{x^2+x-6}=4$

E whakaatuhia ana āna mahinga i raro nei.

$x^2 - 5x + 6 = 4x^2 + 4x - 24$

$3x^2 + 9x - 30 = 0$

$3(x^2 + 3x - 10) = 0$

$3(x + 6)(x - 2) = 0$

$x = -6$, $x = 2$ rānei

Kei te tika te whakautu a Mark?

Parahau whānuitia tō whakautu.

(d) Tātaihia te uara o c mēnā $\dfrac{x^2+x-6}{6x^2+4x+c}=\dfrac{x+3}{2(3x+8)}$

ASSESSOR'S USE ONLY

(c) Mark solves the equation $\dfrac{x^2 - 5x + 6}{x^2 + x - 6} = 4$

His working is shown below.

$x^2 - 5x + 6 = 4x^2 + 4x - 24$

$3x^2 + 9x - 30 = 0$

$3(x^2 + 3x - 10) = 0$

$3(x + 6)(x - 2) = 0$

$x = -6$ or $x = 2$

Is Mark's answer correct?

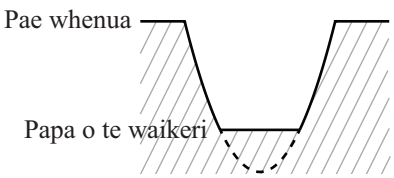
Fully justify your answer.

(d) Find the value of c if $\dfrac{x^2 + x - 6}{6x^2 + 4x + c} = \dfrac{x + 3}{2(3x + 8)}$

(e) Ko te whānui o te waikeri i te pae whenua he 16 mita.

Ka taea te whakatauira ngā **taha** o te waikeri mā tētahi kīanga pūrua e hua ake ai ko te hōhonutanga mōrahi o te 16 mita.

Engari, he **papatahi** te papa o tēnei waikeri, ā, he 12 mita te whānui.



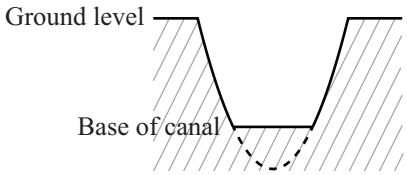
He aha te hōhonu tūturu o te waikeri?

MĀ TE KAIMĀKA ANAKE

(e) The width of a canal at ground level is 16 m.

The **sides** of the canal can be modelled by a quadratic expression that would give a maximum depth of 16 m.

However, the base of the canal is **flat** and has a width of 12 m.



What is the actual depth of the canal?

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PĀTAI TUATORU

MĀ TE KAIMĀKA ANAKE

(a) Whakarūnātia:

(i) $(x^5)^2(2x)^3$

(ii) $\left(8x^{\frac{1}{2}}\right)^{\frac{2}{3}}$

(iii) $\sqrt{\dfrac{\left(8x^{\frac{1}{2}}\right)^{\frac{2}{3}}}{x^{\frac{-1}{2}}}}$

QUESTION THREE

ASSESSOR'S USE ONLY

(a) Simplify

(i) $(x^5)^2(2x)^3$

(ii) $\left(8x^{\frac{1}{2}}\right)^{\frac{2}{3}}$

(iii) $\sqrt{\dfrac{\left(8x^{\frac{1}{2}}\right)^{\frac{2}{3}}}{x^{\frac{-1}{2}}}}$

MĀ TE KAIMĀKA ANAKE

(b) (i) E whakaoti ana a Mark i te $(2x - 3)(x + 4) = 13$ mā te whakamahi i te tātai pūrua

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Homai ngā uara mō a, b me c hei whakaoti i te rapanga.

(ii) Ki tā te whārite $(2x - 3)(x + 4) = k$ kotahi anake te otinga tūturu.

Tātaihia te uara o k.

ASSESSOR'S USE ONLY

(b) (i) Mark is solving $(2x - 3)(x + 4) = 13$ by using the quadratic formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Give the values of a, b and c and hence solve the equation.

(ii) The equation $(2x - 3)(x + 4) = k$ has only one real solution.

Find the value of k.

(c) Tātaihia ngā uara ka taea mō d mēnā he otinga tūturu tō $x^2 + 5x - 1 - d(x^2 + 1) = 0$.

MĀ TE KAIMĀKA ANAKE

(c) Find the possible values of d if real solutions exist for $x^2 + 5x - 1 - d(x^2 + 1) = 0$.

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

TAU PĀTAI

MĀ TE KAIMĀKA ANAKE

Extra paper if required.
Write the question number(s) if applicable.

QUESTION NUMBER

ASSESSOR'S USE ONLY

English translation of the wording on the front cover

Level 2 Mathematics and Statistics, 2012

91261 Apply algebraic methods in solving problems

2.00 pm Monday 19 November 2012
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.

91261M

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 2–19 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.