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91261M

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NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

QUALIFY FOR THE FUTURE WORLD
KIA NOHO TAKATŪ KI TŌ ĀMUA AO!

Te Pāngarau me te Tauanga, Kaupae 2, 2015

91261M Te whakahāngai tūāhua taurangi hei whakaoti rapanga

2.00 i te ahiahi Rātū 10 Whiringa-ā-rangi 2015
Whiwhinga: Whā

Paetae	Kaiaka	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 mēnā e rite ana te Tau Ākonga ā-Motu (NSN) kei runga i tō puka whakauru ki te tau kei runga i tēnei whārangi.

Me whakamātau koe i ngā tūmahi KATOA kei roto i tēnei pukapuka.

Tirohia mēnā kei a koe te Rau Rauemi L2–MATHF.

Whakaaturia ngā mahinga KATOA.

Mēna ka hiahia whārangi atu anō mō ō tuhinga, whakamahia ngā whārangi wātea kei muri o tēnei pukapuka, ka āta tohu ai i ngā tau tūmahi.

Me whakaatu e koe ngā mahinga taurangi i tēnei pepa. Mā te whakamahi anake i ngā tikanga o te kimikimi ka tirotiro me te whakatika ka herea te ākonga ki te taumata Paetae.

Tirohia mēnā e tika ana te raupapatanga o ngā whārangi 2–19 kei roto i tēnei pukapuka, ka mutu, kāore tētahi o aua whārangi i te takoto kau.

ME HOATU RAWA KOE I TĒNEI PUKAPUKA KI TE KAIWHAKAHAERE Ā TE MUTUNGA O TE WHAKAMĀTAUTAU.

TAPEKE

MĀ TE KAIMĀKA ANAKE

MĀ TE KAIMĀKA ANAKE

TŪMAHI TUATAHI

(a) (i) Kimihia te uara o $\log_2 1024$.

(ii) Whakaotihia te whārite $\log_4(3w + 1) = 2$.

(iii) E kī ana a Luke kotahi anake te otinga mō te whārite $\log_x(4x + 12) = 2$.

He tika rānei tāna?

Kimihia te (ngā) otinga, parahautia tō tuhinga.

(b) Me whakarite ko x te kaupapa o te whārite $a^{2x} = b^{x+1}$.

QUESTION ONE

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(a) (i) Find the value of $\log_2 1024$.

(ii) Solve the equation $\log_4(3w + 1) = 2$.

(iii) Luka says that the equation $\log_x(4x + 12) = 2$ has only one solution.

Is he correct?

Find the solution(s), justifying your answer.

(b) Make x the subject of the equation $a^{2x} = b^{x+1}$.

(c) E piki haere ana te uara mākete o te whare o Sue ki te pāpātanga taupū aumou o te 3% i te tau mai i te wā i hokona mai e ia i ngā tau 16 ki mua i te tīmatanga o te tau 1999. I te tīmatanga o te tau 2015 he $350 000 te uara.

(i) Mehemea ko te tipu taupū he $y = A\,r^t$, he aha te uara o te whare i te tīmatanga o te tau 1999 i te wā i hokona mai e Sue?

(ii) I hokona mai anō e tētahi hoa he whare i te tīmatanga o te tau 1999 ki te utu o te $200 000.

E piki haere ana tōna uara mākete, ēngari he āhua nui ake te pāpātatanga taupū o te 3.5%.

Ko tōna uara, $\$y$, e t tau i muri mai i te tīmatanga o te tau 1999, ka tohua mā te pānga

$$y = 200\,000 \times (1.035)^t$$

Ki te piki haere tonu te uara o ngā whare ki aua pāpātanga anō, ko tēhea te tau ka ōrite te uara o ngā whare e rua?

MĀ TE KAIMĀKA ANAKE

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(c) The market value of Sue's house has been increasing at a constant exponential rate of 3% per annum since she bought it sixteen years ago at the start of 1999. At the start of 2015 it was worth \$350 000.

(i) Assuming the exponential growth is of the form $y = A\,r^t$, what was the value of the house at the start of 1999 when she bought it?

(ii) A friend also bought a house at the start of 1999 that cost \$200 000.

Its market value also has been steadily increasing, but at a slightly higher exponential rate of 3.5%.

Its value, \$$y$, t years after the start of 1999, is given by the function

$$y = 200\,000 \times (1.035)^t$$

If the houses continue to keep increasing in value at the original rates, in which year will the two houses be worth the same amount?

TŪMAHI TUARUA

MĀ TE KAIMĀKA ANAKE

(a) Whakarūnāhia $\dfrac{2x^2+7x-4}{2x^2-32}$

(b) Mēnā $a = y^{\frac{3}{4}}$, kimihia tētahi kīanga mō a^7 e ai ki y.

(c) Whakaotihia te whārite $2u^{\frac{2}{3}} + 7u^{\frac{1}{3}} = 4$

QUESTION TWO

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(a) Simplify $\dfrac{2x^2+7x-4}{2x^2-32}$

(b) If $a = y^{\frac{3}{4}}$, find an expression for a^7 in terms of y.

(c) Solve the equation $2u^{\frac{2}{3}} + 7u^{\frac{1}{3}} = 4$

(d) I whakamahia e Talia he papa hei whakatū i ngā taha waho o tana māra tapawhā hāngai. He x mita te roa o te māra, ā, ko te horahanga he 50 m^2.

(i) Whakaaturia mai te paenga o te māra ko te $2x+\frac{100}{x}$

(ii) Ki te whakamahia kia 33 m ngā papa hei hanga i ngā taha, kimihia te rahinga o te māra.

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(d) Talia used timber to form the exterior sides of her rectangular garden. The length of the garden is x metres, and its area is 50 m^2.

(i) Show that the perimeter of the garden is given by $2x + \frac{100}{x}$

(ii) If she uses 33 m of timber to build the sides, find the dimensions of the garden.

(e) Kei te whakatatae a David rāua ko Sione i roto i tētahi whakataetae pahikara 150 km.

He 4 km te tere toharite ake i te hāora o Sione i a David mō te eke pahikara, ā, he haurua hāora tana mutu i mua i a David.

Kimihia te tere toharite o David.

ME MĀTUA whakamahi i ngā tikanga taurangi hei whakaoti i tēnei rapanga.

(Āwhina: tere toharite= $\frac{\textit{tawhiti}}{\textit{wā}}$ *)*

MĀ TE KAIMĀKA ANAKE

(e) David and Sione are competing in a cycle race of 150 km.

Sione cycles on average 4 km per hour faster than David, and finishes half an hour earlier than David.

Find David's average speed.

You MUST use algebra to solve this problem. (Hint: average speed = $\frac{distance}{time}$*)*

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MĀ TE KAIMĀKA ANAKE

TŪMAHI TUATORU

(a) Whakarūnāhia, ka tuhi ai i te otinga kia tōrunga ngā taupū:

(i) $\left(\dfrac{a^{10}}{4a^5}\right)^{-2}$

(ii) $\sqrt[5]{\left(\dfrac{32}{x^5}\right)^3}$

(b) Whakaotihia te whārite e whai nei mō t:

$$\frac{1}{t(t-1)}-\frac{1}{t}=\frac{3}{t-1}$$

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QUESTION THREE

(a) Simplify, giving your answer with positive exponents:

(i) $\left(\dfrac{a^{10}}{4a^5}\right)^{-2}$

(ii) $\sqrt[5]{\left(\dfrac{32}{x^5}\right)^3}$

(b) Solve the following equation for t:

$$\frac{1}{t(t-1)} - \frac{1}{t} = \frac{3}{t-1}$$

(c) Mō (t)ēhea uara o k kāore e pā te kauwhata o te pānga pūrua

$$y = x^2 + (3k - 1)x + (2k + 10)$$

ki te tuaka-x?

MĀ TE KAIMĀKA ANAKE

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(c) For what value(s) of k does the graph of the quadratic function

$$y = x^2 + (3k - 1)x + (2k + 10)$$

never touch the x-axis?

(d) E rua ngā pūtake tūturu tōrunga o te whārite pūrua

$$mx^2 - (m + 2)x + 2 = 0$$

Kimihia te (ngā) uara o m ka taea, me ngā pūtake o te whārite.

MĀ TE KAIMĀKA ANAKE

(d) The quadratic equation

$$mx^2 - (m + 2)x + 2 = 0$$

has two positive real roots.

Find the possible value(s) of m, and the roots of the equation.

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He whārangi anō ki te hiahiatia.
Tuhia te (ngā) tau tūmahi mēnā e tika ana.

TAU TŪMAHI

MĀ TE KAIMĀKA ANAKE

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

QUESTION NUMBER

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English translation of the wording on the front cover

Level 2 Mathematics and Statistics, 2015

91261 Apply algebraic methods in solving problems

2.00 p.m. Tuesday 10 November 2015
Credits: Four

91261M

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.

Make sure that you have Resource Sheet L2–MATHF.

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 and correct answer(s) only will generally 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.