91261M

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NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Te Pāngarau me te Tauanga, Kaupae 2, 2014

91261M Te whakahāngai tūāhua taurangi hei whakaoti rapanga

2.00 i te ahiahi Rāapa 19 Whiringa-ā-rangi 2014
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.

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

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. Mā te whakamahi i te tikanga o te kimikimi me te tirotiro mēnā kei te tika, ā, me te whakautu tika noa iho, ko te tikanga ka herea te ākonga ki te taumata Paetae anake.

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

MĀ TE KAIMĀKA ANAKE

MĀ TE KAIMĀKA ANAKE

PĀTAI TUATAHI

(a) Whakarūnāhia:

(i) $\left(\frac{5}{a^4}\right)^{-3}$

(ii) $\left(0.25x^3\right)^{\frac{1}{2}}$

(iii) $\frac{\left(8x^6\right)^{\frac{1}{3}}}{3\left(x^{-2}\right)^4}$

(b) E toru whakareatanga ake tētahi pūtake o te whārite $x^2 + mx + 12 = 0$ i tētahi atu.

Whiriwhiria ngā uara o m.

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QUESTION ONE

(a) Simplify:

(i) $\left(\frac{5}{a^4}\right)^{-3}$

(ii) $\left(0.25x^3\right)^{\frac{1}{2}}$

(iii) $\frac{\left(8x^6\right)^{\frac{1}{3}}}{3\left(x^{-2}\right)^4}$

(b) One root of the equation $x^2 + mx + 12 = 0$ is three times the other.

Find the values of m.

(c) E rua ngā pūtake wehe kē o te whārite $3x^2 - nx + 5 = 0$.

Whiriwhiria ngā uara o n.

(d) Whakaotihia $10x^4 - 13x^2 + 4 = 0$

Whakaaturia ō mahinga taurangi.

MĀ TE KAIMĀKA ANAKE

(c) The equation $3x^2 - nx + 5 = 0$ has two distinct roots.

Find the values of n.

(d) Solve $10x^4 - 13x^2 + 4 = 0$

You must show algebraic working.

ASSESSOR'S USE ONLY

MĀ TE KAIMĀKA ANAKE

PĀTAI TUARUA

(a) Whakatauwehea ka whakaoti i te $12a^2 - 11a - 15 = 0$

(b) (i) Me tuhi hei hautau kotahi $\frac{3}{x-2} - \frac{4x}{x+1}$

(ii) Whakaotihia te whārite $\frac{x^2 + 2x - 8}{x^2 - x - 2} = 3$

Whakaaturia ō mahinga taurangi.

ASSESSOR'S USE ONLY

QUESTION TWO

(a) Factorise and solve $12a^2 - 11a - 15 = 0$

(b) (i) Write as a single fraction $\frac{3}{x-2} - \frac{4x}{x+1}$

(ii) Solve the equation $\frac{x^2 + 2x - 8}{x^2 - x - 2} = 3$

You must show algebraic working.

MĀ TE KAIMĀKA ANAKE

(c) (i) E whakatauiratia ana te teitei h ā-mita o tētahi kauhanga mā tētahi pānga o te āhua

$$h = rx^2 - tx$$

ina ko r me t he aumou.

Me whakarite ko x, te tawhiti ā-mita mai i te taha mauī o te kauhanga, te kaupapa o te whārite.

(ii) Ka whakatauiratia pea te āhua o te kauhanga mā tētahi unahi.

Ko te teitei mōrahi o te kauhanga he 6 m, ā, i te papa whenua he 12 m te whānui.

Homai te whārite o te unahi.

ASSESSOR'S USE ONLY

(c) (i) The height h metres of a tunnel is modelled by a function of the form

$$h = rx^2 - tx$$

where r and t are constants.

Make x, the distance in metres from the left side of the tunnel, the subject of the equation.

(ii) The shape of the tunnel can be modelled by a parabola.

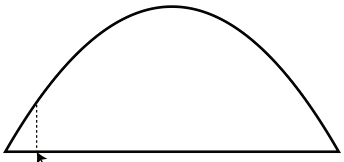
The maximum height of the tunnel is 6 m, and at ground level its width is 12 m.

Find the equation of the parabola.

(iii) E rua ngā ara e ōrite ana te whānui i roto i te kauhanga.

Kua mākahia te taitapa o waho o ia ara ki te rārangi kia taea ai e tētahi waka 1.8 m te teitei te whai wāteatanga mōkito poutū o te 0.1 m mai i runga rawa o te waka ki te tuanui o te kauhanga.

(Kaua e aro atu ki te whānui o te rārangi.)



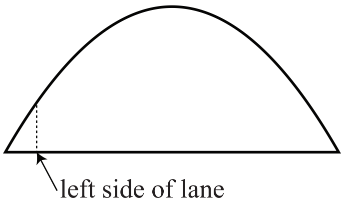
Kimihia te whānui o ia ara.

MĀ TE KAIMĀKA ANAKE

(iii) There are two lanes of equal width through the tunnel.

The outside edge of each lane is marked by a line so that a car of height 1.8 m would have a minimum clearance of 0.1 m vertically from the top of the car to the tunnel roof.

(Ignore the width of the line.)



Find the width of each lane.

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MĀ TE KAIMĀKA ANAKE

PĀTAI TUATORU

(a) (i) Whiriwhirihia te uara o x mēnā ko $x = \log_3 81$

(ii) Whakaotihia te whārite $\log_x 343 = 3$

(b) Whakaotihia mō x: $5^x \times 2^{-2x} = 15$

QUESTION THREE

ASSESSOR'S USE ONLY

(a) (i) Find the value of x if $x = \log_3 81$

(ii) Solve the equation $\log_x 343 = 3$

(b) Solve for x: $5^x \times 2^{-2x} = 15$

(c) Toru tekau meneti i muri i te whāngaitanga o te rongoā tuatahi ki te tūroro, ka eke te rahinga o te rongoā i roto i tōna ia toto ki te 224 mg.

Ka heke haere tonu te rahinga o te rongoā i roto i te ia toto mā te 20% i ia hāora.

Ka taea te whakatauira te rahinga o te rongoā M mg i roto i te toto o te tūroro mā te pānga

$$M = 224 \times 0.8^{t-0.5}$$

ina ko t te wā ā-hāora mai i te whāngaitanga o te rongoā.

(i) Whakamāramahia he aha te 0.8 i roto i tēnei pānga.

(ii) Kimihia te rahinga o te rongoā i whāngaihia i te tuatahi.

(iii) Ka taea te whāngai rongoā anō i muri mai, ā, ka taea anō te whakatauira i te rahinga o te rongoā kei roto i te toto o te tūroro mai i te whāngaitanga tuarua o te rongoā mā te pānga ōrite ki te tuatahi.

Kaua rawa te rahinga katoa o te rongoā kei roto i te toto e neke atu i te 300 mg.

E hia te roa mai i te whāngaitanga o te rongoā tuatahi ka taea te whāngai te whāngaitanga rongoā tuarua?

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(c) Thirty minutes after a patient is administered his first dose of a medication, the amount of medication in his blood stream reaches 224 mg.

The amount of the medication in the blood stream decreases continuously by 20% each hour.

The amount of the medication M mg in the patient's blood stream after it is administered can be modelled by the function

$$M = 224 \times 0.8^{t-0.5}$$

where t is the time in hours since the drug was administered.

(i) Explain what the 0.8 represents in this function.

(ii) Find the amount of medication administered initially.

(iii) A second dose of the medication can be administered some time later, and again the amount of the medication in the patient's bloodstream from the second dose can be modelled by the same function as that for the first.

The total amount of the drug in the blood stream must never exceed 300 mg.

How long after administering the first dose can the second dose be administered?

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

TAU PĀTAI

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, 2014

91261 Apply algebraic methods in solving problems

2.00 pm Wednesday 19 November 2014
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.

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 only will generally 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.