SUPERVISOR'S USE ONLY

Tirohia te uhi o muri e kitea ai te whakapākehātanga o tēnei uhi

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91261M

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Tuhia he (☒) ki te pouaka mēnā kāore koe i tuhi kōrero ki tēnei puka

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NZQA

Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Te Pāngarau me te Tauanga, Kaupae 2, 2025

91261M Te whakamahi tikanga taurangi i te whakaoti rapanga

Ngā whiwhinga: E whā

Paetae	Kaiaka	Kairangi
Te whakamahi tikanga taurangi i te whakaoti rapanga.	Te whakamahi tikanga taurangi i te whakaoti rapanga, mā te whai i te whakaaro ā-pānga.	Te whakamahi tikanga taurangi i te whakaoti rapanga, mā te whai i te whakaaro waitara e whānui ana.

Tirohia kia kitea ai 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.

Whakaaturia ngā whiriwhiringa KATOA.

Tirohia kia kitea ai kei a koe te Puka Ture Tātai L2–MATHMF.

Ki te hiahia wāhi atu anō koe mō ō tuhinga, whakamahia ngā whārangi kei muri o tēnei pukapuka.

Tirohia kia kitea ai e tika ana te raupapa o ngā whārangi 2–23, ka mutu, kāore tētahi o aua whārangi i te takoto kau.

Kaua e tuhi ki ngā paenga (⁄ ⁄ ⁄). Ka poroa aua wāhanga ka mākahia ana te pukapuka.

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

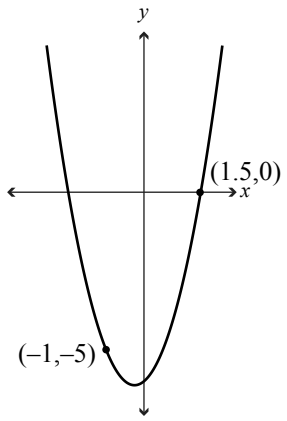
TE TŪMAHI TUATAHI

(a) Whakarūnāhia te $5y \times \sqrt{\frac{y^6}{64}}$.

(b) Rawekehia te kīanga $2y = \sqrt[3]{7x - 5}$ kia noho ai ko x hei tumu.

(c) Whakaarotia te kauwhata $y = 2x^2 + ax + b$, e noho nei a a me b hei tau pūmau. Ko tētahi o ngā pūwāhi e whakawhiti ai te kauwhata i te tuaka-x, ko te (1.5,0). E takoto ana hoki te pūwāhi (–1,–5) i te kauwhata.

Whiriwhiria ngā uara o a me b.



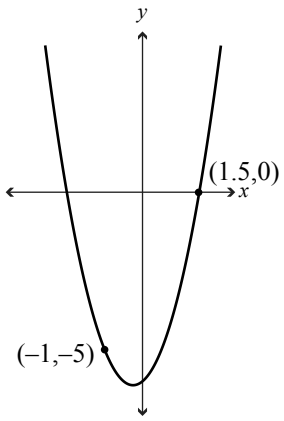
QUESTION ONE

(a) Simplify $5y \times \sqrt{\frac{y^6}{64}}$.

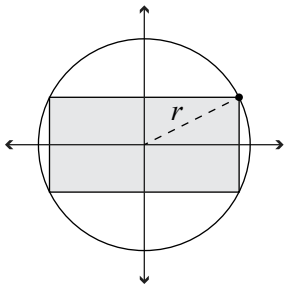
(b) Rearrange the expression $2y = \sqrt[3]{7x - 5}$ to make x the subject.

(c) Consider the graph of $y = 2x^2 + ax + b$, where a and b are constants.
One of the points where the graph crosses the x-axis is at (1.5,0).
The point (–1,–5) also lies on the graph.

Find the values of a and b.



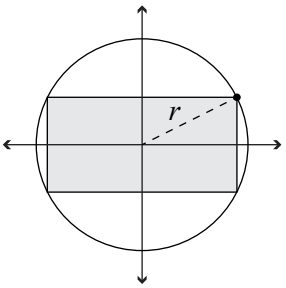
(d) E noho rāroto ana tētahi tapawhā hāngai i tētahi porohita me te pūroto r, e whakaaturia nei i te hoahoa. E huarua ana te roa o te tapawhā hāngai, i tōna whānui.



Whiriwhiria tētahi kīanga kua whakarūnāhia katoatia mō te horahanga o te tapawhā hāngai, ka mutu, me whai wāhi te r.

Te ture a Pythagoras: $a^2 + b^2 = c^2$

(d) A rectangle is inscribed in a circle with radius r, as shown in the diagram. The length of the rectangle is twice its width.



Find a fully simplified expression for the area of the rectangle in terms of r.

Pythagoras' Theorem: $a^2 + b^2 = c^2$

(e) Whakaotia te $5^{2x+1} - 120 = 5^{x+2}$

(He tīwhiri: Me pēnei, $n = 5^x$)

(e) Solve $5^{2x+1} - 120 = 5^{x+2}$

(Hint: Let $n = 5^x$)

TE TŪMAHI TUARUA

(a) Ko te aha te uara o k e tuhia ai te $9x^2 - 30x + k$ hei tapawhā paruhi?

(b) Whakarūnātia katoatia te $\dfrac{6x^3 + 26x^2 - 20x}{5x^2 + 23x - 10}$.

(c) Ka taea te tuhi te otinga o te whārite $\dfrac{10}{(3x-1)^2} = 2$ kia pēnei kē te āhua: $\dfrac{1+\sqrt{a}}{b}$ kia pēnei hoki: $\dfrac{1-\sqrt{a}}{b}$.

Whiriwhiria ngā uara o a me b.

QUESTION TWO

(a) What is the value of k needed to write $9x^2 - 30x + k$ as a perfect square?

(b) Simplify fully $\dfrac{6x^3 + 26x^2 - 20x}{5x^2 + 23x - 10}$.

(c) The solutions to the equation $\dfrac{10}{(3x-1)^2} = 2$ can be written in the form $\dfrac{1+\sqrt{a}}{b}$ and $\dfrac{1-\sqrt{a}}{b}$.

Find the values of a and b.

(d) Whakaotia te whārite $2\log_5(x+6) - \log_5 x - 2 = 0$.

(d) Solve the equation $2\log_5(x+6) - \log_5 x - 2 = 0$.

(e) Ka ea i ngā uara o x me y ngā whārite tukutahi

$y - 2x = 13$

$x^2 + 2ky = 6k$

arā, ko k tētahi tau pūmau kāore e rite ana tōna uara ki te kore.

I te mea kotahi anake te otinga o ngā whārite, whiriwhiria te uara o k.

Whiriwhiria te otinga o ēnei whārite tukutahi.

(e) The values of x and y satisfy the simultaneous equations

$$y - 2x = 13$$
$$x^2 + 2ky = 6k$$

where k is a non-zero constant.

Given that there is only one solution to the equations, find the value of k.

Find the solution to these simultaneous equations.

TE TŪMAHI TUATORU

(a) Whakaotia te $\log_{\sqrt{x}} 8 = 6$.

(b) Ko ngā otinga o te whārite pūrua, $ax^2 + bx + c = 0$, ko te $\frac{1}{5}$ me te $\frac{-2}{3}$.

Whiriwhiria ngā uara o ngā tautōpū, o a, o b, me c.

(c) Mēnā e pēnei ana: $p = \log_a 3$, ā, e pēnei ana hoki: $q = \log_a 5$, tuhia te $\log_a 75$, ka mutu, me whai wāhi te p me te q.

QUESTION THREE

(a) Solve $\log_{\sqrt{x}} 8 = 6$.

(b) A quadratic equation, $ax^2 + bx + c = 0$, has solutions of $\frac{1}{5}$ and $\frac{-2}{3}$.

Find the values of the integers a, b, and c.

(c) If $p = \log_a 3$ and $q = \log_a 5$, write $\log_a 75$ in terms of p and q.

(d) Ka taea tētahi kīanga te tuhi mō te tapeke o ngā tapawhā rite e rua kia pēnei te āhua:
$a^2 + b^2 = (a + b)^2 - 2ab$.

Mēnā ko a me b ngā otinga o te whārite $x^2 - mx + n = 0$, whiriwhiria tētahi kīanga mō $a^2 + b^2$, ka mutu, me whai wāhi te m me te n.

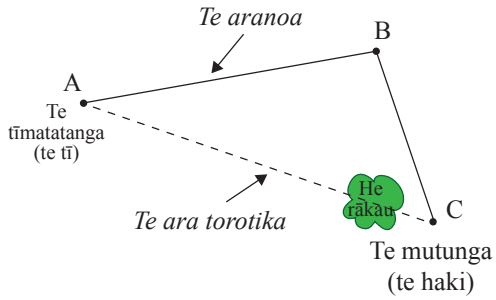
Ka rere tonu te Tūmahi Tuatoru i te whārangi e whai ake nei.

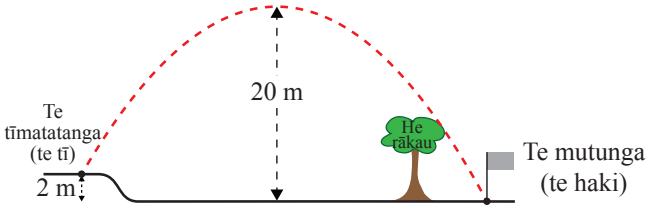
(d) An expression for the sum of two squares can be written as $a^2 + b^2 = (a + b)^2 - 2ab$.

If a and b are solutions of the equation $x^2 - mx + n = 0$, find an expression for $a^2 + b^2$ in terms of m and n.

Question Three continues on the next page.

(e) Kua tata a Shiloh ki te tākaro ki tētahi roherohe hahaupōro. Ka tīmata ia i (te tī) ki te pūwāhi A, e whakaaturia nei i te hoahoa. I te nuinga o te wā, ka haere ngā kaitākaro hahaupōro mā te ara ABC e tae ai rātou ki te mutunga o te roherohe, ki (te haki). Ka whakatau ia kia māia ahakoa ngā tūraru, ka haere tōtika ai i te tīmatatanga (te tī) ki te mutunga (te haki). Heoi, e whakapōrearea ana tētahi rākau i te ara me tohipa rawa e tana pōro.





E 2 m te teitei ake o te tīmatatanga (te tī) i te pae whenua (arā, ko te haki).

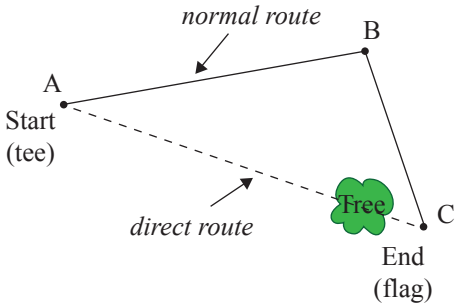
Ka eke te pōro ki tōna taumata teitei katoa, ki te 20 m, ka 110 m ana tana tawhiti atu i te tīmatatanga.

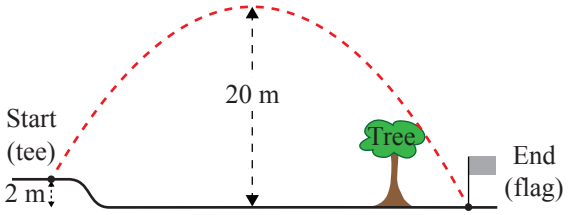
E 7.5 m te teitei o te rākau, ā, e 200 m tana tawhiti atu i te tīmatatanga.

Me kī, ka taea te rerenga o te pōro te whakatauira mā tētahi whārite pūrua.

Ka eke rānei te pōro ki tētahi taumata teitei e tohipa ai te pōro i te rākau?

(e) Shiloh is about to play a golf hole. She starts (tee) at point A, as shown in the diagram. Normally golfers take the route ABC to get to the end of the hole (flag). She decides to take a risk and go direct from the start (tee) to the end (flag). However, there is a tree in the way that she will need to clear.





The start (tee) is 2 m above ground level (i.e the flag).

The ball reaches its maximum height of 20 m when it is 110 m from the start.

The tree is 7.5 m high, and is 200 m away from the start.

Assume the flight of the ball can be modelled by a quadratic equation.

Will the golf ball be high enough to clear the tree?

He whārangi anō ki te hiahiatia.
Tuhia te tau tūmahi mēnā e hāngai ana.

TE TAU TŪMAHI

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

QUESTION NUMBER

He whārangi anō ki te hiahiatia.
Tuhia te tau tūmahi mēnā e hāngai ana.

TE TAU TŪMAHI

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

QUESTION NUMBER

English translation of the wording on the front cover

Level 2 Mathematics and Statistics 2025

91261M Apply algebraic methods in solving problems

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.

Show ALL working.

Make sure that you have the Formulae Sheet L2–MATHMF.

If you need more room for any answer, use the extra space provided at the back of this booklet.

Check that this booklet has pages 2–23 in the correct order and that none of these pages is blank.

Do not write in the margins (⁝⁝⁝). This area will be cut off when the booklet is marked.

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