



SUPERVISOR'S USE ONLY

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translation of this cover

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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, 2023

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 Pepa 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 2–19, ka mutu, kāore tētahi o aua whārangi i te takoto kau.

Kaua e tuhi ki tētahi wāhi e kitea ai te kauruku whakahāngai (A E Rūhū Te Kōwhiriwhiri). Ka poroa taua wāhanga ka mākahia ana te pukapuka.

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

TE TŪMAHI TUATAHI

(a) Whakarūnāhia ia kīanga, kia noho ai ngā pū tōrunga i tō tuhinga.

(i) $\sqrt[5]{\frac{4(2n)^3}{n^8}}$

(ii) $\left(\frac{n^3}{16n^6}\right)^{-0.5}$

(b) Ka taea te tuhi te whārite $\frac{20x^2 - 22x + 6}{5x^2 - 3x}$ kia pēnei kē te āhua $A + \frac{B}{x}$, arā, he tau tōpū a A me B .

Whiriwhiria ngā uara o A me B .

QUESTION ONE

(a) Simplify each expression, leaving your answer with positive indices.

(i)
$$\sqrt[5]{\frac{4(2n)^3}{n^8}}$$

(ii)
$$\left(\frac{n^3}{16n^6}\right)^{-0.5}$$

(b) $\frac{20x^2 - 22x + 6}{5x^2 - 3x}$ can be written in the form $A + \frac{B}{x}$, where A and B are integers.

Find the values of A and B .

- (c) The value, V , in dollars (\$), of a laptop can be modelled by $V = 40 + ke^{-0.5t}$, $t \geq 0$, where t is the time in years since the laptop was purchased. The original price of the laptop was \$900.

How long does it take for the laptop's value to be reduced to 50% of the original value?

- (d) $2y = 2x + 29$ is a tangent to the quadratic $x^2 - 2ky + 32k = 0$, where k is a non-zero constant.

Find the value of k and determine where the quadratic crosses the y -axis.

TE TŪMAHI TUARUA

- (a) (i) Whiriwhiria te m mēnā e pēnei ana: $\log_2(3m + 1) = 4$.

- (ii) Whakaotia te whārite e whai ake nei:

$$3 \log_x(64) = 6.$$

- (b) Whiriwhiria he kīanga mō p e ai ki a x mēnā e pēnei ana: $\frac{5^{7x+6}}{25^{-x}} = 125^p$.

- (c) Whiriwhiria te uara o $6 + \log_b\left(\frac{1}{b^3}\right) + \log_b(\sqrt{b})$.

QUESTION TWO

- (a) (i) Find m if $\log_2(3m + 1) = 4$.

- (ii) Solve the following equation:

$$3 \log_x(64) = 6.$$

- (b) Find an expression for p in terms of x if $\frac{5^{7x+6}}{25^{-x}} = 125^p$.

- (c) Find the value of $6 + \log_b\left(\frac{1}{b^3}\right) + \log_b(\sqrt{b})$.

TE TŪMAHI TUATORU

- (a) (i) Whakaotia te whārite e whai ake nei:

$$5x^2 + 13x = 6$$

- (ii) Whakarūnātia:

$$\frac{3x^2 - 10x + 8}{9x^2 - 16}$$

- (b) Whiriwhiria te whānuitanga o ngā uara o p e kore ai te kauwhata o $f(x) = 2x^2 + 8x + p$ e whakawhiti i te tuaka- x .

- (c) $\frac{x^2 + 2x + k}{x^2 + 7x + 10} = \frac{x - 3}{x + 2}$ arā, he tau pūmau a k .

Whiriwhiria te uara o k .

QUESTION THREE

- (a) (i) Solve the following equation:

$$5x^2 + 13x = 6$$

- (ii) Simplify:

$$\frac{3x^2 - 10x + 8}{9x^2 - 16}$$

- (b) Find the range of values of p for which the graph $f(x) = 2x^2 + 8x + p$ does not cross the x -axis.

- (c) $\frac{x^2 + 2x + k}{x^2 + 7x + 10} = \frac{x - 3}{x + 2}$ where k is a constant.

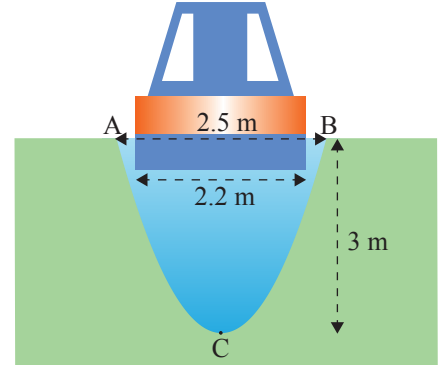
Work out the value of k .

(d) E whakaaturia ana i te hoahoa o raro nei te topenga o tētahi kōawa me tētahi poti whāiti e mānu ana i te kōawa.

- E 2.5m te whānui o te kārewa o te wai (i waenga i a A me B).
- E 3 m te hōhonu o te kōawa, i te pūwāhi hōhonu katoa o C.
- Ka taea te whakatauiria te topenga o te kōawa hei ānau pūrua, arā, ko ACB.
- Ka taea te whakatauiria te topenga o tētahi poti whāiti i te kōawa hei tapawhā roa, e 2.2 m tōna whānui.
- Me 1 m te tau o te poti whāiti ki raro i te wai e mānu ai.



Te mātāpuna: www.pxfuel.com/en/free-photo-xerdyj



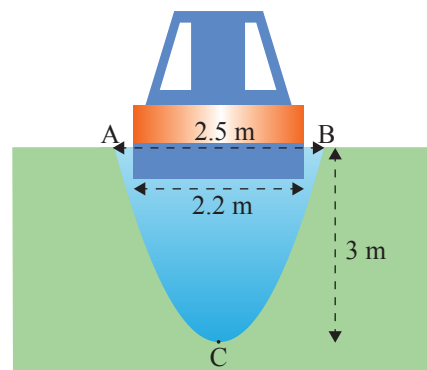
Ka mānu rānei te poti whāiti i tēnei kōawa?

(d) The diagram below shows the cross-section of a canal and narrowboat floating in the canal.

- The surface of the water (between points A and B) measures 2.5 m across.
- The canal is 3 m deep, at the deepest point C.
- The cross-section of the canal can be modelled as a quadratic curve ACB.
- The cross-section of a narrowboat on the canal can be modelled as a rectangle with a width of 2.2 m.
- The narrowboat must maintain a constant depth below the water of 1 m in order to float.

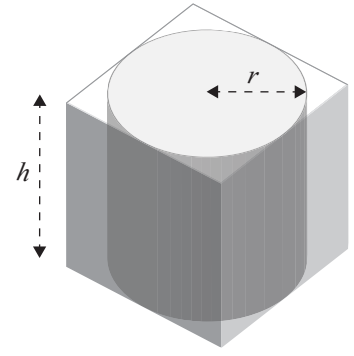


Source: www.pxfuel.com/en/free-photo-xerdj



Will the narrowboat be able to float in this canal?

- (e) Kua hoahoatia tētahi pouaka tuwhera (arā, kua whai pūtake, engari kāore he taupoki) e ngita ai te \bar{o} o tētahi kārara rango. Ko te horahanga mata o ngā mata e rima o te pouaka e rite ana ki te tapeke o te horahanga mata o te kārara.

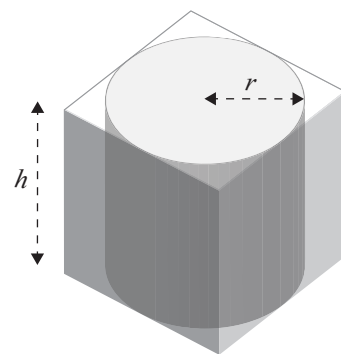


Tuhia he kīanga mō te teitei, mō h , e ai ki te pūtoro, ki a r , me π .
 (Te horahanga mata o tētahi rango = $2\pi r^2 + 2\pi r h$.)

- (e) An open box (i.e. with a base but no lid) has been designed to tightly fit a cylindrical candle. The surface area of the five surfaces of the box is equal to the total surface area of the candle.

Write an expression for the height, h , in terms of the radius, r , and π .

(Surface area of a cylinder = $2\pi r^2 + 2\pi rh$.)



English translation of the wording on the front cover

Level 2 Mathematics and Statistics 2023

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 2–19 in the correct order and that none of these pages is blank.

Do not write in any cross-hatched area (DO NOT WRITE). 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.