

91261



NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

2

SUPERVISOR'S USE ONLY

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.

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 2–10 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.

TOTAL

ASSESSOR'S USE ONLY

QUESTION ONE

(a) Simplify:

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

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

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

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

Find the values of m .

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The examination continues on the following page.**

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.

- (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.

QUESTION THREEASSESSOR'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) 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?

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