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NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

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SUPERVISOR'S USE ONLY

Level 2 Mathematics and Statistics, 2013

91261 Apply algebraic methods in solving problems

2.00 pm Monday 18 November 2013
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.

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 do not demonstrate relational thinking. Guess and check methods will 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

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You are advised to spend 60 minutes answering the questions in this booklet.

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QUESTION ONE

(a) (i) Factorise $6x^2 - 11x - 10$

(ii) Solve $6x^2 - 11x - 10 = 0$

(b) Find the value of m so that only one value of x satisfies the equation:

$4x^2 - 8x + m = 0$

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(c) Simplify fully $\dfrac{2x^2-8}{x^2-2x-8}$

(d) The equation $(x+2)-3\sqrt{(x+2)}-4=0$ has only one real solution.

Find the value of x.

(Hint: Let $a=\sqrt{(x+2)}$)

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(e) (i) Find expressions, in terms of m and n, for the roots of the equation:

$$\frac{x-m}{x-n} = \frac{2(x+m)}{x+n}$$

(ii) Give an inequality, in terms of m and n, so that the equation has two distinct roots.

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The examination continues on the following page.

QUESTION TWO

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(a) Simplify $\dfrac{(4a^2)^3}{(8a^5)^2}$

(b) Simplify:

(i) $(16x^2)^{\frac{1}{4}}$

(ii) $(16x^2)^{\frac{1}{4}} \times (9x^3)^{\frac{1}{2}}$

(c) Lara says that she is thinking of a number. She:

- squares the number,
- multiplies the answer by 6,
- adds 12 times the number she was first thinking of,
- subtracts 48.

Her answer is 0.

What numbers could she be thinking of?

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(d) Rearrange the formula $a^x = 5^{(x-1)}$ to make x the subject.

(e) The equation $3x^2 + 4x - k = 0$ has two distinct real roots.

If 2 is a root of this equation, find the value of k and the second root.

QUESTION THREE

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(a) Solve the equations:

(i) $\log_x 64 = 3$

(ii) $\dfrac{3\times 2^{x+1}}{8^x} = 96$

(b) At the beginning of his first year of study, Danny borrows $1 800 from his parents.

His parents reduce the amount he owes them by 40% at the end of that year, and each subsequent year he continues his studies.

Danny studies for several years and he does not make any repayments of the initial amount while he is studying.

(i) Write an expression for the amount $\$A$ Danny owes his parents if he studies for n years.

(ii) Use your expression to find the minimum number of years for which Danny studies if he owes his parents less than $100 when he finishes studying.

(c) Explain why the equation $(3x + 1)^2 = -7$ does not have any real solutions, and explain what this means graphically.

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(d) Solve the equation $\log x = 2\log(mx)$ for x in terms of m.

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

QUESTION NUMBER

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