

SUPERVISOR'S USE ONLY

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91261



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Mana Tohu Mātauranga o Aotearoa  
New Zealand Qualifications Authority

## Level 2 Mathematics and Statistics 2023

### 91261 Apply algebraic methods in solving problems

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.

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

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 2–11 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.**

## QUESTION ONE

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

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

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

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(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  $B$ .

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## QUESTION TWO

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

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- (ii) Solve the following equation:

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

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

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

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### QUESTION THREE

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

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

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- (ii) Simplify:

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

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

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- (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  $k$ .

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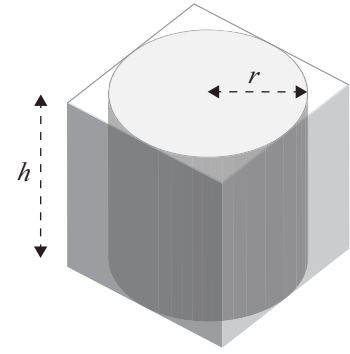
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- (e) An open box (i.e. with a base but no lid) has been designed to tightly fit a cylindrical candle. The surface area of the five surfaces of the box is equal to the total surface area of the candle.

Write an expression for the height,  $h$ , in terms of the radius,  $r$ , and  $\pi$ .

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




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