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90284

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

National Certificate of Educational Achievement
TAUMATA MĀTAURANGA Ā-MOTU KUA TAEA

Level 2 Mathematics, 2003

90284 Manipulate algebraic expressions and solve equations

Credits: Four
9.30 am Wednesday 19 November 2003

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 answer ALL the questions in this booklet.

Show ALL working.

If you need more space for any answer, use the page provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–8 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.

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Achievement Criteria		
Achievement	**Achievement with Merit**	**Achievement with Excellence**
Manipulate algebraic expressions ☐		
Solve equations. ☐	Solve problems involving equations. ☐	Choose algebraic techniques and strategies to solve problems. ☐
Overall Level of Performance (all criteria within a column are met) ☐		

You are advised to spend 35 minutes answering the questions in this booklet.

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TARA'S ALGEBRA

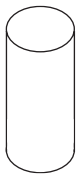
Show **ALL** working.

QUESTION ONE

Expand and simplify:

$(5\boldsymbol{x} - 4)(\boldsymbol{x} + 1)(\boldsymbol{x} + 2)$

QUESTION TWO



The volume of a cylinder is $\boldsymbol{V} = \pi \boldsymbol{r}^2 \boldsymbol{h}$

Rearrange the formula to make $\boldsymbol{r}$ the subject.

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QUESTION THREE

Write as the log of a single number:

$\log 3 + 3 \log 2$

QUESTION FOUR

Solve the following equations:

(a) $(x^2 - 64)(3x - 4) = 0$

(b) $\log_x 8 = 3$

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QUESTION FIVE

Tara buys 8 cakes for her family.
5 of the cakes are cream and 3 are plain.
She spends $16.25 altogether.
A cream cake costs 45 cents more than a plain cake.

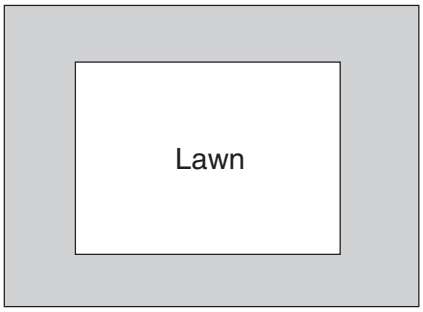
Calculate the price of ONE cream cake.

QUESTION SIX

Find the x-coordinates of the points of intersection of:

$$y = 2x - 1$$
$$x^2 + y^2 - 4x - 5 = 0$$

QUESTION SEVEN



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Tara has a rectangular lawn that is 11 m long and 8 m wide.
The lawn is to be surrounded by a path.
The width of the path on each side of the lawn is the same.
The path has an area of 100 m^2.

Calculate the width of the path.

QUESTION EIGHT

One morning, Tara takes 250 mg of a medical drug.
At the end of each hour, the level of the drug in her bloodstream is 55% of what it was at the end of the previous hour.
Tara knows that it is not safe to drive until the level of the drug in her bloodstream is less than 50 mg.

By solving the equation $250(0.55)^{n} = 50$, calculate how long after taking the drug it will be safe for Tara to drive.

QUESTION NINE

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Tara wants to calculate the distance from the top of a well to the surface of the water.

She can do this by dropping a stone from the top and timing how long it takes until the sound of the splash is heard.

If air resistance is ignored, the relationship between the distance the stone has fallen and the time taken is given by

$$d = 4.9t_1^2$$

where d is the distance the stone has fallen, in metres, from the top of the well
and t_1 is the time, in seconds, as the stone is falling.

Let t_2 be the time, in seconds, of the sound of the splash going back up the well.

Sound travels at approximately 335 m/s, so $d = 335t_2$.

It takes 1.9 seconds between the time the stone is released and the time the sound of the splash is heard.

Calculate the **distance** from the top of a well to the surface of the water.

Show all working.

Assessor's use only

Extra paper for continuation of answers if required.
Clearly number the question.

Assessor's use only

Question Number