To be completed by Candidate and School:	
Name:	
NSN No:	
School Code:	

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SUPERVISOR'S USE ONLY

DAY 1
TUESDAY

NZQA
NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Level 1 Mathematics and Statistics CAT, 2014

91027 Apply algebraic procedures in solving problems

Tuesday 16 September 2014
Credits: Four

You should attempt ALL the questions in this booklet.

Calculators may NOT be used.

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 2–8 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.

ASSESSOR'S USE ONLY	Achievement Criteria	
Achievement	**Achievement with Merit**	**Achievement with Excellence**
Apply algebraic procedures in solving problems.	Apply algebraic procedures, using relational thinking, in solving problems.	Apply algebraic procedures, using extended abstract thinking, in solving problems.
		Overall level of performance

QUESTION ONE

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(a) Simplify $5m^2n \times m^3n^2$

(b) Solve $4a^3 = 32$

$a =$ _____

(c) Solve $8 = \dfrac{5x - 4}{2}$

$x =$ _____

(d) Factorise $3a^2b + a^3b^2 - 5a^2b$, giving your answer in the simplest form.

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(e) Mark had worked twice as many hours as James.
If James had worked another 48 hours, he would have worked twice as long as Mark.

Write an equation, and use this to find how many more hours Mark worked than James.

(f) Solve $\frac{4x-6}{3} > 2x+1$

(g) Simplify $\frac{r^2-1}{r^2+r}$

QUESTION TWO

ASSESSOR'S USE ONLY

(a) Factorise $x^2 - 3x - 40$

(b) Sam is paid to work at a chemist shop after school.

He receives an extra $2 for each delivery he makes.

One day he makes 5 deliveries and is paid a total of $25.

If d = the number of deliveries:

(i) Give the formula for the wages, P, that he receives each day.

(ii) Make d the subject of the formula you wrote in part (i).

(c) Emma says that her height is at least as much as her younger sister's plus a quarter as much again.

(i) Write an inequation to express Emma's height E, in terms of the height of her sister, S.

(ii) Emma's sister's height is 96 cm.

Find Emma's height.

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(iii) Use your answer from (c)(ii) to describe, in words, how Emma's height compares with her sister's height.

(d) An n-sided polygon has D diagonals, where $D = \frac{n}{2}(n-3)$.

Use the formula to find how many sides the polygon has, if there are 20 diagonals.

QUESTION THREE

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(a) Simplify $\frac{3x}{7}+\frac{2x}{5}$

(b) Simplify $(2x^2)^3$

(c) Solve $3 \times 2^{a-1} = 96$

$a =$ _____

(d) Sam is investigating sequences of numbers.

One of the sequences is listed below:

Number, n	Sequence, T	Prime Number?
1	23	yes
2	25	no = 5 × 5
3	29	yes
4	35	no = 5 × 7
5	43	yes

The formula for the nth term of this sequence is $T = n^2 - n + 23$.

(i) What is the value of T for the 12th term in the sequence?

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Some of the numbers in the sequence are prime numbers.

(A prime number is one that can only be divided by 1 and itself. 1 is not a prime number.)

(ii) For the sequence of numbers where $T = n^2 - n + a$,
show that for any value of n, if $n = a$, then T will never be a prime number.

Assume $n > 1$.

(iii) If $T = n^2 - n + 5$ and $R = (5n - 4)(n + 1) - 2n(2n + 3) + 4(n + 1) - 3$,
write an equation for R in terms of T.

(iv) Using the formula $T = n^2 - n + 1$, find the value of n when $T = 91$.

(v) Explain why $T = n^2 - n - 6$ will never give a prime number value for T.

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

QUESTION NUMBER

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91027A