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

1

SUPERVISOR'S USE ONLY

DAY 2
THURSDAY

NZQA
NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

QUALIFY FOR THE FUTURE WORLD
KIA NOHO TAKATŪ KI TŌ ĀMUA AO!

Level 1 Mathematics and Statistics CAT, 2018

91027 Apply algebraic procedures in solving problems

Thursday 20 September 2018
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' and 'correct answer only' methods do not demonstrate relational thinking and will limit the grade for that part of the question to a maximum of Achievement. Guess and check and correct answer only may only be used a maximum of one time in the paper and will not be used as evidence of solving a problem.

A candidate cannot gain Achievement in this standard without solving at least one problem.

Answers must be given in their simplest algebraic form.

Where a question is given in words you will be expected to write an equation.

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

ASSESSOR'S USE ONLY

(a) $A = \frac{25}{9}r^2$

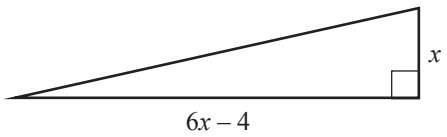
Give the equation for r in terms of A.

(b) Find the value of x if $2^{x-1} = 64$.

(c) Write $\frac{3}{x-4} + \frac{5}{x+1}$ as a single fraction.

ASSESSOR'S USE ONLY

(d) The area of the right-angled triangle is 65 cm^2.



What is the value of x?

Remember you must use algebra and justify your answer.

(e) Samantha and James are organising 28 people in two groups to go to a concert.

The tickets cost \$20 for students and \$25 for adults.

Half of James's group are adults.

One quarter of Samantha's group are adults.

The total cost of the tickets for the 28 people is \$600.

How many adults are in James's group?

You must show the use of algebra in solving the problem.

QUESTION TWO

ASSESSOR'S USE ONLY

(a) The area of a deck on a house is given by:

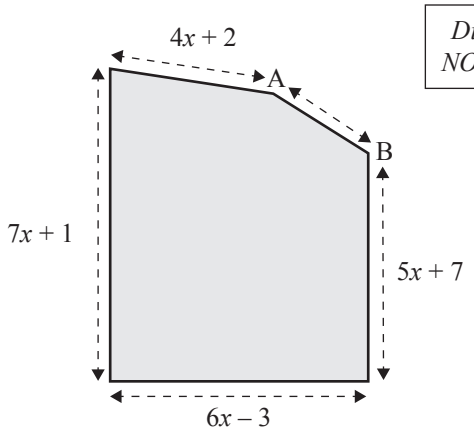
$$A = 3(2x^2y - 2x)$$

If $x = 3$, and $y = 5$ give the area of the deck.

(b) A model of the top of a swimming pool is shown in the diagram.

The perimeter of the model is $25x - 2$.

What is the length of the side labelled AB?



(c) Simplify $\dfrac{3x^2 + 15x}{x^2 - 25}$

ASSESSOR'S USE ONLY

(d) For what values of x will $7 \times 7^{(1-x)} = 7^{3x^2}$?

(e) Raj and Ranee do some work for their hockey coach to raise funds for their team trip.

Their coach is also their maths teacher.

She tells them that she has kept a record of how many hours each of them has worked.

She said she will pay both of them, but they have to solve a maths problem before she gives them the money.

Ranee thinks she has worked for **more** hours than Raj.

They are told that the number of hours each of them has worked relates to the number "n".

For Raj, his teacher says the number of hours he has worked is this number, n, cubed plus eight times the number, which can be written as $n^3 + 8n = n(n^2 + 8)$.

For Ranee the number of hours she has worked is this number, n, squared, plus ten times the number n.

If Ranee has worked for more hours than Raj, find the possible value(s) of n.

Show your use of algebra in solving the problem, and justify your answer.

QUESTION THREE

ASSESSOR'S USE ONLY

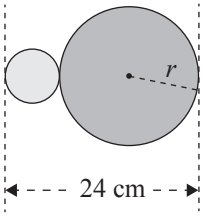
(a) The sides of a rectangle are $3x - 2$ and $x + 2$.

Give an expression for the area of the rectangle written in the form $ax^2 + bx + c$.

(b) Solve $3x^2 + 13x - 10 = 0$.

(c) Sara is designing a new logo for her sports club, made up of two circles.

She draws one circle alongside the other, as shown in the diagram.



The **total** width of the two circles is always 24 cm.

(i) Sara is exploring what happens to the total circumference of the two circles when the radius of one circle increases and the other decreases.

Show that the total of the two circumferences of the circles is 24π cm.

Remember $C = 2\pi r$.

ASSESSOR'S USE ONLY

(ii) Give the equation for the difference in the **areas** of the two circles.
Give your answer in the simplest form.
Remember $A = \pi r^2$.

(d) Solve $9 \times 3^{x-4} < 30$.

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

QUESTION NUMBER

ASSESSOR'S USE ONLY

91027B