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

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

Tuesday 18 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

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

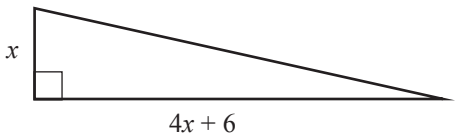
Give an expression for the area of the rectangle in the form $ax^2 + bx + c$.

(b) Find the value of x if $3^{x+1} = 81$.

(c) Solve $3x^2 + 2x - 8 = 0$.

ASSESSOR'S USE ONLY

(d) The area of the right-angled triangle shown is 35 cm^2.



What is the value of x?

Remember you must use algebra, and justify your answer.

(e) Sophia and Tama's grandmother is a maths teacher.

She bought both of them some fidget spinners but they have to solve a maths problem before she will give the fidget spinners to them.

Tama thinks that because he is older he should get **more** fidget spinners than Sophia.

They are told that the number of fidget spinners they each will get relates to the number "n".

Their grandmother says the number of fidget spinners that Sophia will get is this number, n, cubed plus three times this number, which can be written as $n^3 + 3n = n(n^2 + 3)$.

Tama will get the number n, squared, times two, plus six times the number n.

What value(s) could n have so that Tama gets more fidget spinners than Sophia?

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

QUESTION TWO

ASSESSOR'S USE ONLY

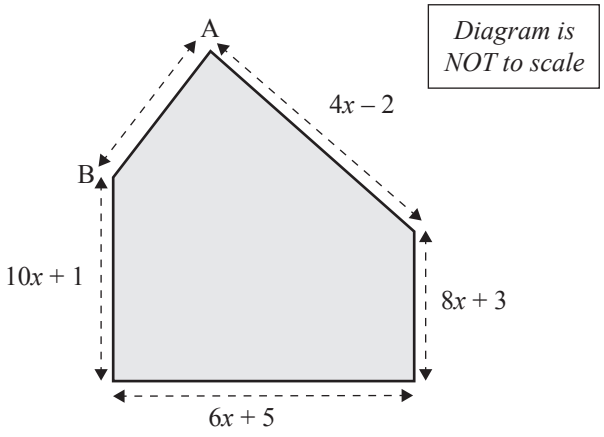
(a) $A = \frac{9}{4}r^2$

Give the equation for r in terms of A.

(b) A house shaped model is shown in the diagram.

The perimeter of the model is $32x - 7$.

What is the length of the side labelled AB?



(c) Write $\frac{2}{x+1} + \frac{3}{x-2}$ as a single fraction.

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(d) Solve $8 \times 2^{x-4} < 20$.

(e) George and Leo are organising 27 people in two groups to go to a sports game.
The tickets cost $20 for students and $30 for adults.
Half of George's group are students.
Two-thirds of Leo's group are students.
The cost of the tickets for the 27 people is $650.

How many students are in Leo's group?
You must show the use of algebra in solving the problem.

QUESTION THREE

ASSESSOR'S USE ONLY

(a) The area of a garden is given by

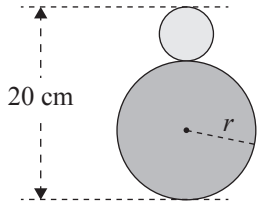
$$A = 2(x + 3xy^2)$$

If $x = 5$, and $y = 2$, give the area of the garden.

(b) Simplify $\dfrac{3x^2 + 12x}{x^2 - 16}$

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

She draws one circle on top of another, as shown in the diagram.



The **total** height of the two circles is always 20 cm.

(i) Georgia 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 20π cm.

Remember $C = 2\pi r$.

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(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) For what values of x will $5 \times 5^{3x} = 5^{-2x^2}$?

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

QUESTION NUMBER

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91027A