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

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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, 2015

91027 Apply algebraic procedures in solving problems

Thursday 17 September 2015
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 an Achievement grade. 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 2–11 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

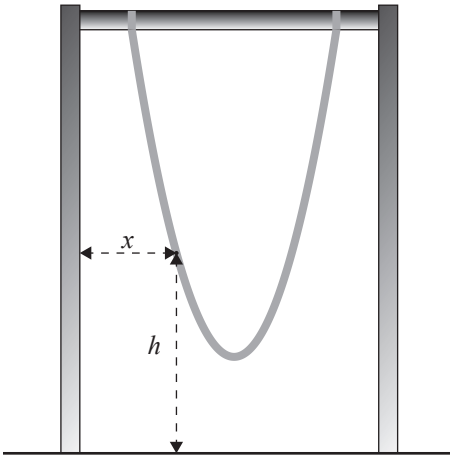
ASSESSOR'S USE ONLY

(a) Factorise $2x^2 - 15x + 18$.

(b) A swing is made by attaching two ends of a rope to two different points on a steel frame.

The height h metres of the rope above the ground at a distance x metres from the left-hand side of the frame is modelled by $h = x(x - 1) + 2$

What is the height of the swing when x is 2?



(c) If $y = x^2 + 4x - 12$, for what values of x will y be negative?

(d) Tane is training for a triathlon.

His coach tells him that he should build up his training gradually

The first week he runs a total distance of 7 km.

Each week he doubles the distance that he runs.

The distance, D, that he runs each week can be modelled by the equation $D = 7 \times 2^{n-1}$, where n is the number of weeks.

How many weeks will it take him to be running 112 km per week.

ASSESSOR'S USE ONLY

(e) Shari is asked to solve the equation $\frac{x^2-1}{x^2+2x+1}=\frac{3}{4}$

Shari's solution is given below

$4(x^2 - 1) = 3(x^2 + 2x + 1)$

$4x^2 - 4 = 3x^2 - 6x + 3$

$x^2 + 6x - 7 = 0$

$(x + 7)(x - 1) = 0$

$x = -7$ or $x = 1$

Shari's teacher tells her she is wrong, as it has only 1 valid solution.

Explain Shari's mistake.

(f) 21 adults go to a movie.
The cost is $14 for people under age 65, and $10 for people aged 65 or over.
The cost for the group is $258

How many of the adults in the group are aged 65 or over?

QUESTION TWO

ASSESSOR'S USE ONLY

(a) Expand $(3x + 7)(x - 2)$

(b) Where would the graph of $y = x(x + 9)$ cut the x-axis?

(c) Manu is paid \$38 to look after her cousin for 2 hours.
She is then paid \$13 per hour after that.
She was paid \$77 altogether.

How many hours was she paid for?

(d) Simplify $\dfrac{5xy^2 - 2x^3y + xy^2}{4xy^2}$

ASSESSOR'S USE ONLY

(e) Uenuku and Tom live 15 km from each other.
Uenuku skateboards 12 km in the same time as Tom rides his bike 18 km.

If they both leave home at the same time and travel towards each other, how far from Uenuku's home will they meet.

You must show the use of algebra.

(f) Marnie is trying to find a value for b so that $x^2 + bx + 16 = 0$ has only one solution.

Use algebra to find the value for b, and the solution to the equation.

QUESTION THREE

ASSESSOR'S USE ONLY

(a) Aroha says that if she takes her favourite number, adds 7, and then divides the answer by 4, she gets an answer of 5.

Use algebra to find Aroha's favourite number.

(b) Jono wants to make a vegetable garden that is a rectangle a metres long.
Its width is 3 metres shorter than its length.

Find the area of the garden in terms of a.

(c) A weed is growing on a lake at the rate of r m^2 each week.
6 m^2 of the lake was covered when the area was first measured.
At the end of 4 weeks after the area was first measured, the area covered by the weed was 486 m^2.
This can be modelled by $486 = 6r^4$

Use algebra to find the rate r at which the weed is spreading.

ASSESSOR'S USE ONLY

(d) Talia and Kaziah are both wanting to get the position of Goal Shoot in their netball team.

Talia claims she does more goal shooting practice than Kaziah.

Kaziah says she does 100 shots on each of four days of the week.

Talia says she does three quarters the amount Kaziah does during the week, and at least a further 80 shots on the weekend.

Is Talia's claim always correct?

Explain your solution.

(e) Marina and Wiremu have a job painting their Uncle's fence.
He pays Marina $20 an hour.
Wiremu is paid $2 less per hour than Marina.
Marina works three times as long as Wiremu.
Together they earn a total of $156.

How much does Wiremu earn?

Question Three continues on the following page.

ASSESSOR'S USE ONLY

(f) The volume of a cylinder is given by $V = \pi r^2 h$ and that of a cone is given by $V = \frac{\pi}{3} r^2 h$.

A cylinder has the same height as a cone.

If the volume of the cylinder is 4 times that of the cone, give an expression for ratio of the radius of the cylinder to the radius of the cone.

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

QUESTION NUMBER

ASSESSOR'S USE ONLY

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

QUESTION NUMBER

ASSESSOR'S USE ONLY

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