Mā te Kaiwhakauru me te Kura e whakaoti:	
Ingoa:	
Tau NSN:	
Waehere Kura:	

1

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RĀ 1
RĀTŪ

NZQA
NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

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

Te Pāngarau me te Tauanga CAT, Kaupae 1, 2018

91027M Te whakahāngai tūāhua taurangi hei whakaoti rapanga

Rātū 18 Mahuru 2018
Whiwhinga: Whā

Me whakamātau koe i ngā tūmahi KATOA kei roto i tēnei pukapuka.

KĀORE e whakaaetia ngā tātaitai.

Whakaaturia ngā mahinga KATOA.

Mēnā ka hiahia whārangi atu anō koe mō ō tuhinga, whakamahia te (ngā) whārangi wātea kei muri o tēnei pukapuka, ka āta tohu ai i te tau tūmahi.

Me whakaatu e koe ngā mahinga taurangi i tēnei pepa. Kāore e whakaaturia te whakaaro whaipānga mā te whakamahi anake i ngā tikanga o te kimikimi ka tirotiro me te whakatika, ā, ka herea te taumata mō tērā wāhanga o te tūmahi ki te taumata Paetae. Ka taea anake te whakamahi ngā tikanga o te kimikimi ka tirotiro me te whakatika mō te wā kotahi noa iho i roto i tēnei pepa, ā, kāore e whakamahia tēnei hei taunakitanga o te whakaoti rapanga.

Me mātua whakaoti i te ākonga tētahi rapanga i te iti rawa kia taea ai te taumata Paetae i tēnei paerewa.

Me tuhi ngā otinga ki te āhua taurangi rūnā rawa.

Ina tuhia tētahi tūmahi ki te rerenga kupu me whakamahi koe i tētahi whārite.

Tirohia mēnā e tika ana te raupapatanga o ngā whārangi 2–15 kei roto i tēnei pukapuka, ka mutu, kāore tētahi o aua whārangi i te takoto kau.

ME HOATU RAWA KOE I TĒNEI PUKAPUKA KI TE KAIWHAKAHAERE Ā TE MUTUNGA O TE WHAKAMĀTAUTAU.

MĀ TE KAIMĀKA ANAKE	Paearu Paetae	
Paetae	**Kaiaka**	**Kairangi**
Te whakahāngai tūāhua taurangi hei whakaoti rapanga.	Te whakahāngai tūāhua taurangi mā te whakaaro whaipānga hei whakaoti rapanga.	Te whakahāngai tūāhua taurangi mā te whakaaro waitara hōhonu hei whakaoti rapanga.
		Whakakaotanga o te tairanga mahinga

TŪMAHI TUATAHI

MĀ TE KAIMĀKA ANAKE

(a) Ko ngā taha o tētahi tapawhā hāngai he $2x + 3$ me te $x - 2$.

Tuhia he kīanga mō te horahanga o te tapawhā hāngai ki te āhua $ax^2 + bx + c$.

(b) Whiriwhirihia te uara o x mēnā $3^{x+1} = 81$.

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

QUESTION ONE

ASSESSOR'S USE ONLY

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

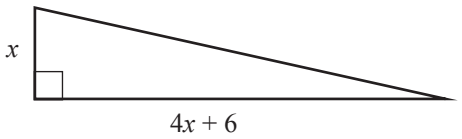
Give an expression for the area of the rectangle in the form $ax^2 + bx + c$.

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

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

MĀ TE KAIMĀKA ANAKE

(d) Ko te horahanga o te tapatoru hāngai e whakaaturia ana he 35 cm^2.



He aha te uara o x?

Me whakamahi i ngā tikanga taurangi, ka parahau i tō tuhinga.

(e) He kaiako pāngarau te kuia o Sophia rāua ko Tama.

I hokona mai e ia he tāwhirowhiro mā rāua engari me whakaoti e rāua tētahi panga pāngarau kia whakawhiwhia rāua ki ngā tāwhirowhiro.

Ko te whakaaro o Tama me **nui atu** āna tāwhirowhiro ka whiwhi ia i a Sophie i te mea he pakeke ake ia.

Kua kōrerohia rāua e hāngai ana te maha o ngā tāwhirowhiro ka whiwhi i a rāua ki te tau "n".

Ka kī atu tō rāua kuia ki a rāua ko te maha o ngā tāwhirowhiro ka whiwhi i a Sophie ko tēnei tau, n, kua pūtorutia me te whakarea i tēnei tau ki te toru, ā, ka taea te tuhi hei $n^3 + 3n = n(n^2 + 3)$.

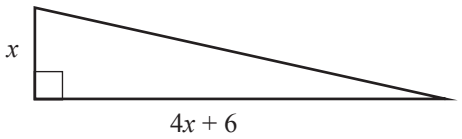
Ka whiwhi a Tama i te tau n kua pūruatia, whakarea ki te rua, me te tāpiri i te whakarea i te tau n ki te ono.

He aha te(ngā) uara pea o n e nui atu ai te whiwhi tāwhirowhiro a Tama i a Sophie?

Me whakaatu e koe tō whakamahi i ngā tikanga taurangi hei whakaoti i te rapanga, ā, ka parahau i tō tuhinga.

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.

TŪMAHI TUARUA

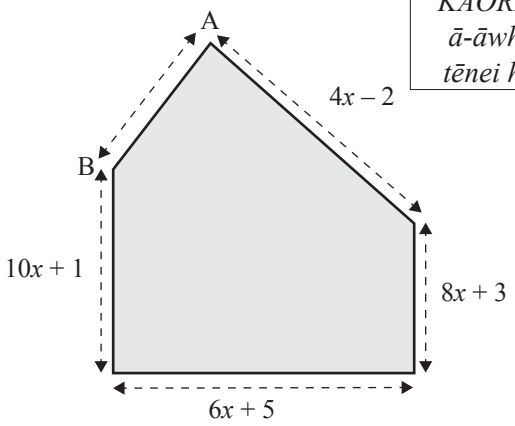
MĀ TE KAIMĀKA ANAKE

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

Tuhia te whārite mō r e pā ana ki A.

(b) E whakaaturia ana he tauira whare i roto i te hoahoa.

KĀORE i tuhi ā-āwhatatia tēnei hoahoa



Ko te paenga o te tauira he $32x - 7$.

He aha te roa o te taha AB?

(c) Me tuhi $\frac{2}{x+1} + \frac{3}{x-2}$ hei hautau kotahi.

QUESTION TWO

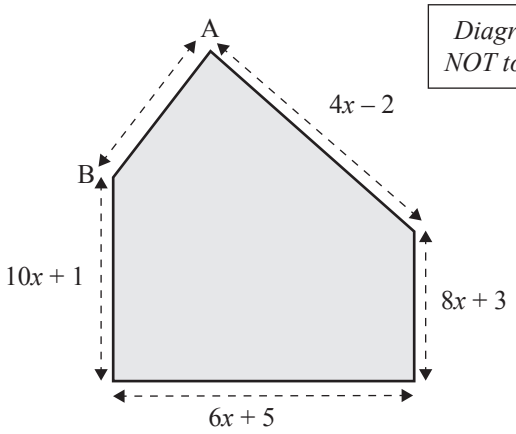
ASSESSOR'S USE ONLY

(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.

Diagram is NOT to scale



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.

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

MĀ TE KAIMĀKA ANAKE

(e) Kei te wehewehe a George rāua ko Leo i ngā tāngata e 27 ki ngā rōpū e rua mō tētahi tākaro hākinakina.

He $20 te utu mō ngā ākonga, ā, he $30 mō ngā pakeke.

Ko te haurua o te rōpū o George he ākonga.

Ko te rua hautoru o te rōpū o Leo he ākonga.

Ko te utu o ngā tīkiti mō ngā tāngata e 27 he $650.

E hia ngā ākonga kei roto i te rōpū o Leo?

Me mātua whakaatu koe kei te whakamahia ngā tikanga taurangi hei whakaoti i te rapanga.

ASSESSOR'S USE ONLY

(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.

TŪMAHI TUATORU

MĀ TE KAIMĀKA ANAKE

(a) Ko te horahanga o tētahi māra ko te

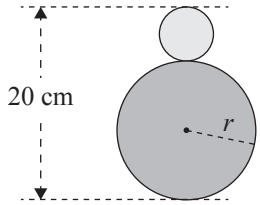
$A = 2(x + 3xy^2)$

Mēnā $x = 5$, ā, $y = 2$, tuhia te horahanga o te māra.

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

(c) Kei te hoahoa a Georgia i tētahi moko hou mō tōna karapu hākinakina, mai i ngā porohita e rua.

Ka tuhia e ia tētahi porohita i runga ake i tētahi, e ai ki te hoahoa.



Ko te teitei **tapeke** o ngā porohita e rua i ngā wā katoa he 20 cm.

(i) E hōpara ana a Georgia ka ahatia te paenga tapeke o ngā porohita e rua ina nui ake te pūtoro o tētahi porohita, ā, ka iti haere ake tētahi.

Whakaaturia ko te tapeke o ngā paenga e rua o ngā porohita he 20π cm.

Kia maumahara ko $C = 2\pi r$.

MĀ TE KAIMĀKA ANAKE

(ii) Homai te whārite mō te rerekētanga o ngā **horahanga** o ngā porohita e rua.
Homai tō tuhinga rūnā rawa.
Kia maumahara $A = \pi r^2$.

(d) Mō ēhea uara o x he $5 \times 5^{3x} = 5^{-2x^2}$?

QUESTION THREE

ASSESSOR'S USE ONLY

(a) The area of a garden is given by

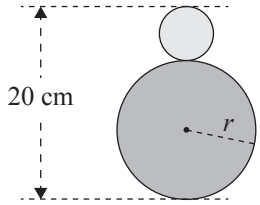
$$A = 2(x + 3xy^2)$$

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 $C = 2\pi r$.

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

He whārangi anō ki te hiahiatia.
Tuhia te (ngā) tau tūmahi mēnā e tika ana.

TAU TŪMAHI

MĀ TE KAIMĀKA ANAKE

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

QUESTION NUMBER

ASSESSOR'S USE ONLY

English translation of the wording on the front cover

Level 1 Mathematics and Statistics CAT, 2018

91027 Apply algebraic procedures in solving problems

Tuesday 18 September 2018
Credits: Four

91027MA

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 2–15 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.