1

**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, 2016

91027M Te whakahāngai tūāhua taurangi hei whakaoti rapanga

Rātū 13 Mahuru 2016
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 tāea 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 te ākonga i tētahi rapanga i te iti rawa kia tāea 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 2−18 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

(a) (i) Ko te horahanga o tētahi tapawhā hāngai ko $x^2 - x - 2$.

Mēnā he $x + 1$ mita te roa o tētahi taha, homai te taha tuarua e ai ki x, ina ko x he tau tōrunga.

(ii) He aha ō mōhio ki te uara o x mō tēnei tapawhā hāngai?

Whakamāramatia tō whakautu.

QUESTION ONE

(a) (i) The area of a rectangle is $x^2 - x - 2$.

If one side has length $x + 1$ metres, give the second side in terms of x, where x is a positive number.

(ii) What do you know about the value of x for this rectangle?

Explain your answer.

(b) He nui ake te moni a Ranee i tā Hone.

Mēnā i hoatu a Ranee i te $20 ki a Hone, he ōrite te nui ki a rāua.

Mēnā i hoatu kē a Hone i te $22 ki a Ranee, e rua whakareanga ake te nui o tā Ranee moni i tā Hone.

E hia te moni a tēnā, a tēna?

(c) $A = 3(n^2 - 4n + 2) + n$

ā, $B = (2n + 1)(n - 6) + n^2 + 3$

Kimihia tētahi kīanga mō A e pā ana ki B.

(d) Mō tēhea uara o x ko te $4 \times 2^x = 2^{6x + 3}$?

(b)   Ranee has more money than Hone.

If Ranee gave Hone $20, they would have the same amount.

If instead Hone gave Ranee $22, Ranee would then have twice as much as Hone.

How much money does each person actually have?

(c) $A = 3(n^2 - 4n + 2) + n$

and $B = (2n + 1)(n - 6) + n^2 + 3$

Give an expression for A in terms of B.

(d)   For what value of x will $4 \times 2^x = 2^{6x + 3}$?

TŪMAHI TUARUA

(a)   Ko te whārite o tētahi unahi ko $y = 3x^2 - 2x + 5$.

He aha te uara mō y ina $x = 4$?

(b)   Mō ēhea uara o x ko te $(x - 2)(x + 2) > (x - 2)(x + 3)$?

(c)   Mēnā ko n he tauoti, mō ēhea uara o te n ko te $6 \times 2^{n+1} > 123$?

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

QUESTION TWO

(a)   A parabola has the equation $y = 3x^2 - 2x + 5$.

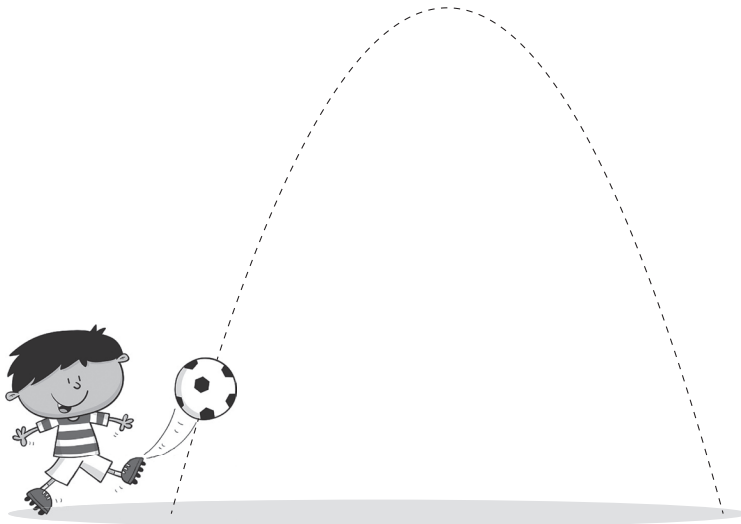What is the value of y when $x = 4$?

(b)   For what values of x is $(x - 2)(x + 2) > (x - 2)(x + 3)$?

(c)   If n is a whole number, for what values of n is $6 \times 2^{n+1} > 123$?

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

(e) Whakaotihia te $\dfrac{x^2 + 2x - 8}{(x + 2)(x - 2)} = \dfrac{x}{2}$.

(f) Ka whanaia e Raj tētahi pōro. Ka tāea te whakatauira te ara rere o te pōro mā $y = -(x^2 - 4x)$ ina inea ā-mita a x me y.
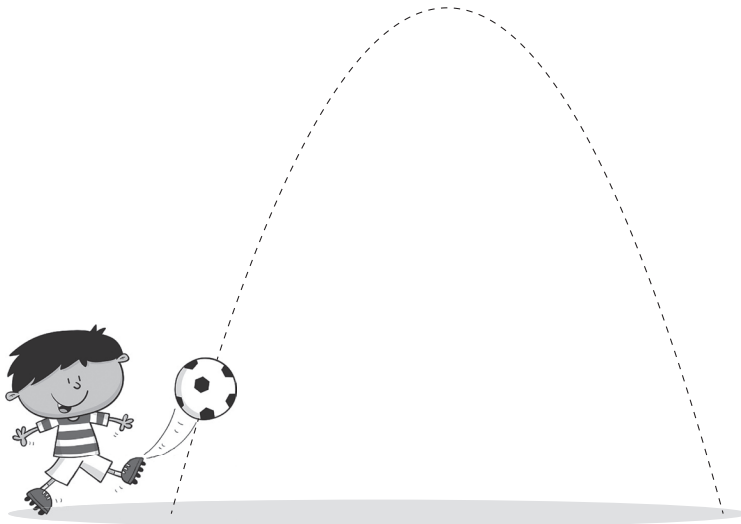

(i) Kei te ine te x i te aha?

(ii) Mō tēhea ōrautanga o te tawhiti huapae e rere ana te pōro he toru mita neke atu rānei tōna teitei i runga ake i te whenua?

(e) Solve $\dfrac{x^2 + 2x - 8}{(x+2)(x-2)} = \dfrac{x}{2}$.

(f) Raj kicks a ball. The flight path of the ball can be modelled by $y = -(x^2 - 4x)$ where x and y are measured in metres.

(i) What does x measure?

(ii) For what percentage of the horizontal distance that the ball travels will it be 3 metres or more above the ground?

TŪMAHI TUATORU

(a)   Ko te horahanga o tētahi tapawhā hāngai ko $x^2 + 4x - 12$.
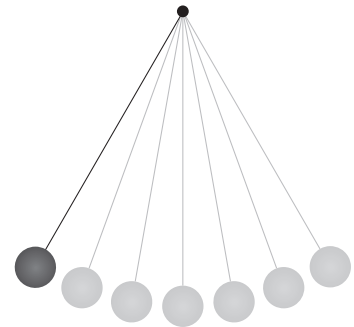
　　(i)   He aha ngā roanga o ngā taha e ai ki x?

　　(ii)   Mēnā e 128 cm^2 te horahanga o te tapawhā hāngai, he aha te (ngā) uara o x?

(b)   Ka mōhio a Brook ko te roa o te wā ka pau mō te tārere a tētahi tautau i tētahi taha ki tētahi ka tukuna mā te tātai:

$$T = 2\pi\sqrt{\frac{L}{9.8}}$$

ina ko L te roa o te taura.

Tuhia he tātai ka tāea e ia te whamamahi ki te whiriwhiri i te roa o te taura e ai ki te wā, T, i pau mō te tārere kotahi.

(c)   Whakaaturia he ōrite te $\dfrac{2}{x} + \dfrac{3+x}{5}$ ki te $\dfrac{x^2 + 3x + 10}{5x}$.

QUESTION THREE

(a) A rectangle has an area of $x^2 + 4x - 12$.

   (i) What are the lengths of the sides in terms of x?

   (ii) If the area of the rectangle is 128 cm^2, what is the value(s) of x?

(b) Brook knows that the time it takes for a pendulum to swing from one side to the other and back is given by the formula:

$$T = 2\pi\sqrt{\frac{L}{9.8}}$$

where L is the length of the string.

Write a formula that she could use to find the length of the string in terms of the time, T, taken for one swing.
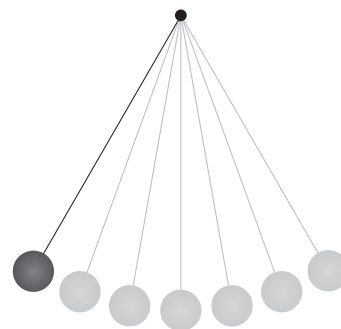
(c) Show that $\dfrac{2}{x} + \dfrac{3+x}{5}$ is the same as $\dfrac{x^2 + 3x + 10}{5x}$.

(d) Ka tuhi a Jason i ētahi tau e whā: 1, 3, 5, me te 7.

Ka tāpiri ia i ngā takirua tau kia puta mai ai he tapatoru, pēnei e whakaaturia nei i raro.

Ka mutu ia ina tae ki te tau kotahi i raro iho i te tapawhā.

Rārangi 1   **1**   **3**   **5**   **7**

Rārangi 2 $1 + 3 = \mathbf{4}$ $3 + 5 = \mathbf{8}$ $5 + 7 = \mathbf{12}$

Rārangi 3 $4 + 8 = \mathbf{12}$ $8 + 12 = \mathbf{20}$

Rarangi 4 $12 + 20 = \mathbf{32}$

(i) Tūhura ka tūpono te aha ina hurihia e Jason te raupapa o ngā tau i te Rārangi 1.

Ka whiwhi ia i te otinga ōrite i te Rārangi 4?

(ii) Kimihia, mā te taurangi, te pānga o ngā tau i te rārangi tuatahi ki ngā tau i te rārangi tuawhā ina hurihia e ia te raupapa o ngā tau i te Rārangi 1.

Whakamāramatia tō tuhinga.

(iii) Mēnā ka tuhituhi a Jason i ngā tau piritata e whā kia raupapa, he aha ō mōhio ki aua tau mēnā ka tāea te wehe pū te tau kei raro iho o te tapatoru ki te toru?

Whakamāramatia tō tuhinga.

(d) Jason writes down 4 numbers: 1, 3, 5, and 7.

He adds the pairs of numbers to form a triangle, as shown below.

He stops when he gets to a single number at the bottom of the triangle.

Line 1   **1**   **3**   **5**   **7**

Line 2 $1 + 3 = \mathbf{4}$ $3 + 5 = \mathbf{8}$ $5 + 7 = \mathbf{12}$

Line 3 $4 + 8 = \mathbf{12}$ $8 + 12 = \mathbf{20}$

Line 4 $12 + 20 = \mathbf{32}$

(i) Investigate what happens when Jason changes the order of the numbers in Line 1.

Does he get the same answer in Line 4?

(ii) Find, using algebra, the relationship of the numbers in the first line to the numbers in the fourth line when he changes the order of the numbers in Line 1.

Explain your answer.

(iii) If Jason writes 4 consecutive numbers in order, what do you know about the numbers if the number at the bottom of the triangle is divisible by 3?

Explain your answer.

TAU TŪMAHI

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

TAU TŪMAHI

QUESTION
NUMBER

English translation of the wording on the front cover

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 2–18 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.