Linguistics Problem: Old Māori Numerals

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Problem

The following relations describe numerals in an old version of Māori. All numbers are ≤ 100.

$$\begin{aligned} kotahi \times kaono &= kaono \\ kadowa^2 - 4kadowa + 4 &= 0 \\ kadowa \cdot kawa + kotahi &= kaiwa \\ kawitou \times 5 &= katekau\ katodou\ madoua \\ 23 + katekau &= katekau\ katodou\ matahi \\ kaiwa \times 3 &= katekau\ kadowa\ madima \\ kagnaoodu^2 - kotahi &= katekau\ kaiwa \\ kaono \times (katekau\ kadima) &= katekau\ kawadu\ maouadu \end{aligned}$$

(a) Write the equations using digits.

(b) Express the following numbers in words: 57, 110, 17, 43.

(c) Write these numbers with digits: *katekau kawitou maouitou*, *katekau kaono magnaoodu*, *karaou*, knowing that *karaou* is a 3-digit perfect square.

Note. This problem is inspired by the 129th edition of *The Journal of the Polynesian Society*, which analyzes a document by Adelbert von Chamisso (1825) about Māori numerals. Māori is an Eastern Polynesian language spoken by the Māori people of Aotearoa/New Zealand and is one of the official languages of New Zealand.