

Numerals (Les chiffres)

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The Egyptians wrote numbers using hieroglyphics: $I = 1$, $\cap = 10$, $\text{ㄩ} = 100$, and $\text{𐦎} = 1000$, according to the following rules:

- i.* Divide the number by 1000 and write that many 𐦎 s. Divide the remainder by 100 and write that many ㄩ s. Continue, using next \cap , and then I , until the remainder is 0.
 - ii.* A string of hieroglyphs represents the *sum* of the numbers the hieroglyphs represent, *e.g.*, $\text{ㄩㄩㄩ}\cap\text{IIII} = 100 + 100 + 100 + 10 + 1 + 1 + 1 + 1 = 314$.
1. Write each of these numbers using Egyptian hieroglyphics: 8, 42, 999, 2018, 3141.

2. What is the largest number you can write with Egyptian hieroglyphics, according to the rules above, without using more than three 𐦎 s?

3. How long is the string of Egyptian hieroglyphics representing each of these numbers? 1, 2, 3, 4, 8, 33, 3413.

The Romans wrote numbers using letters as numerals (the symbols for numbers): $I = 1$, $V = 5$, $X = 10$, $L = 50$, $C = 100$, $D = 500$, and $M = 1000$, according to the following rules:

- i.* Divide the number by 1000 and write that many Ms. Divide the remainder by 500 and write that many Ds. Continue, using in order C, L, X, V, and then I, until the remainder is 0.
 - ii.* If there are four Is, Xs, Cs, or Ms, erase the last three and replace with the next larger numeral, *e.g.*, $XXXX \rightarrow XL$.
 - iii.* If there are two Vs, or Ls, or Ds, erase the first one, and replace the second with the next larger numeral, *e.g.*, $LXL \rightarrow XC$.
 - iv.* A string of letters represents the *sum* of the numbers the letters represented, except when a smaller numeral comes before a larger one, in which case it is subtracted, *e.g.*, $CCCXIV = 100 + 100 + 100 + 10 - 1 + 5 = 314$.
4. Which of these strings is allowed by the rules, and what numbers do they represent? XIX, MMC, DXXIII, MCM, VIV, IX, XD, CDXC.
5. Write each of these numbers using Roman numerals: 8, 42, 999, 2018, 3141.
6. What is the largest number you can write with Roman numerals, according to the rules above?
7. How long is the string of Roman numerals representing each of these numbers? 1, 2, 3, 4, 8, 33, 3413.



Traditional Chinese numbers are written using the characters: 一 = 1, 二 = 2, 三 = 3, 四 = 4, 五 = 5, 六 = 6, 七 = 7, 八 = 8, 九 = 9, 十 = 10, 百 = 100, and 千 = 1000, according to the following rules:

- i.* Divide the number by 1000 and write the quotient followed by 千. Divide the remainder by 100 and write the quotient followed by 百. Divide the remainder by 10 and write the quotient followed by 十. Finally, write the remainder.
 - ii.* A string of characters represents the *sum* of products, *e.g.*, 三百一十四 = $3 \times 100 + 1 \times 10 + 4 = 314$.
8. Write each of these numbers using Chinese characters: 8, 42, 999, 2018, 3141.
9. What is the largest number you can write with Chinese characters, according to the rules above?
10. How long is the string of Chinese characters representing each of these numbers? 1, 2, 3, 4, 8, 33, 3413.



11. On this graph paper, for each number 1 to 100, plot how many Egyptian hieroglyphs are used. Then plot, in a different color, how many Roman letters are used. Then plot, in a third color, how many Chinese characters are used. Finally plot, in a fourth color, how many numerals we use.

