# CHANAKYA'S MIND GAMES

**#1**

## "Don't know much about history …

Don't know much biology …" But I do love Hindu-Arabic numerals. Everyone knows about them even though many have probably not heard the words "Hindu-Arabic numerals". The ten digits 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9 that everyone in the world use to count are the Hindu-Arabic numerals. Symbols for digits 1 to 9 have their origins in the Brahmi system of writing in India dating back at least to the rule of King Ashoka (ca. 268 to 232 BCE). In the 7th century CE the Indians began using symbols for digits 1 to 9 and 0 in the familiar base 10 positional system we use now. This system was adopted in Arabic mathematics by the 9th century CE and later spread to Europe.

But around 3000 BCE the Egyptians used a base ten non positional system with a symbol for each non negative integer power of 10. Their symbols, called Hieroglyphic numerals now, were the following:

| stroke | heelbone | coiled rope | lotus flower | pointed finger | tadpole | scribe |
|--------|----------|-------------|--------------|----------------|---------|--------|
| 1 | 10 | 100 | 1000 | 10 000 | 100 000 | 1 000 000 |

Whole numbers were represented by appropriate repetitions of the symbols. E.g., to represent 459,623 the Egyptians would write:



The usual practice was to put the symbols with smaller values on the left. Here is an example of addition in this system:



So we have to add 4 strokes, 3 heelbones and 2 coiled ropes to 3 strokes, 2 heelbones, 1 coiled rope and 4 lotus flowers. The answer is 7 strokes, 5 heelbones, 3 coiled ropes and 4 lotus flowers. If we add 9 strokes, 8 heelbones and 9 coiled ropes to 3 strokes, 2 heelbones, 1 coiled rope and 4 lotus flowers, then the answer is 2 strokes, 1 heelbone, 1 coiled rope and 5 lotus flowers.

### Mind Game # 1

If different non negative integer powers of 10 from 1 to 10, 000 are assigned to stroke, heelbone, coiled rope, lotus flower and tadpole and the following addition is correct, then what is the maximum value of the sum in Hindu-Arabic numerals? (Note: The usual practice of putting the symbols with smaller values on the left is not followed.)

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