

In base b is there a largest number without repeated digits? If so, what is it?

A number system of base b has b unique digits. For example, a base 2 number system has only unique digits 1 and 0 (1 and 0 are only representative symbols of the digit and can be represented by any symbol). Therefore we can assume that the largest value of any number system of base b without repeating digits is a value which contains all the unique digits of that number system, ordered in descending order of value starting from $b-1$ down to the lowest value digit(0).

E.g.

- Base 10 = 9 8 7 6 5 4 3 2 1 0

- Base 5 = 4 3 2 1 0

- Base 15 = '14' '13' '12' '11' '10' 9 8 7 6 5 4 3 2 1 0.

In the case of base 15 there are no repeating digits because in such a number system, $b-1(14)$ would have its own unique digit representing its value therefore 14 and 4 are not repetitions.