

BASIC implementation of k-parasitic/k-transposable number generator.

A novel number generator is defined by a series of steps within a cycle which generates a set of digits that may be continued indefinitely by repeating the cycle:

$$X_{i+1} = ((aX_i \text{ MOD } m) + c_i) \text{ MOD } m$$

$$c_n = 0$$

$$c_n = (aX_i \text{ MOD } m + c_i - (aX_i - aX_i) \text{ MOD } m) / m \text{ IFF } (aX_i \text{ MOD } m) + c_i \geq m$$

$$c_{i+1} = (aX_i - aX_i \text{ MOD } m) / m + c_n$$

Initial conditions are imposed by selection of a modulus value m , a seed value, X_0 , and a multiplier a . A carry c_i and a secondary carry c_n are set to zero for programming purposes.

$$0 < X \leq 9$$

$$0 < a \leq 99$$

$$c_i = c_n = 0$$

An implementation in BASIC:

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FOR M=scale TO scale           :scale is input; modulus M
  FOR f=factor TO factor       :factor is input; multiply by factor
    FOR k = seed TO seed       :seed is input; initial value
      ex=k                       :test value to quit DO loop
      d=k                         :value used in calculation loop
      N=0                         :digit count
      txtnum$=""                 :empty the digit string
      cn=0                        :loop step internal carry set to zero
      c=0                         :loop carry set to zero
      DO
        y=(d*f)MOD M             :DO.....UNTIL generates numbers by
        n=(y+c)MOD M             :synthetic multiplication
        IF y+c>=M THEN cn=(y+c-n)/M ELSE cn=0 :keeps track of carries
        c=(d*f-y)/M + cn
        d=n
        INC(N)                   :track digit count
        cn=0
        txtnum$ = RIGHT$(STR$(d),1) + txtnum$ :load digit string
      UNTIL (d=ex AND c=0)        :initial conditions recur
    NEXT k
    PRINT txtnum$;" base ";M;" has ";N;" digits" :edit for other outputs
  NEXT f
NEXT M

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FOR...NEXT var TO var results in a single pass through the loop; to produce multiple answers, allowing e.g., FOR...NEXT var TO var+C gives all answers that meet the criteria for var, var+1, var+2...var+C.

A092697 - scale=10, factor=2-9, seed=1.

A094676 - scale=10, factor=seed=2-9.

A159774 - scale=3-10, factor=2, seed=1.

A159863 - scale=4-10, factor=3, seed=1 to scale-1.

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