Graphs of mod 100 on powers of 2 to 9

- Exponents = {0,1,2... 101 }
- Objects = { 2, 3, 4, 5, 6, 7, 8, 9, }
- Object_Power_Sets = { $\{x^{exp}\}$ | x ∈ Objects ; exp ∈ Exponents }
- Cycle_Sets = { {o mod 100 } | o ∈ O ; O ∈ Object_Power_Sets }

Elements of Cycle_Sets

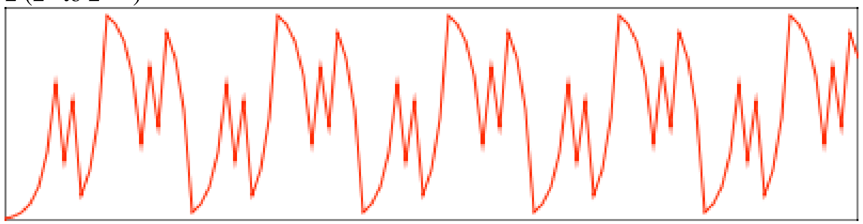
These sets form a Group under the operation $\otimes_{100}(x,y) = (x * y) \bmod 100$. For identity element derivation see below.

- $Cycle\_Set_2$ = {4,8,16,32,64,28,56,12,24,48,96,92,84,68,36,72,44,88,76,52} [count=20] (show table)
- $Cycle\_Set_3$ = {1,3,9,27,81,43,29,87,61,83,49,47,41,23,69,7,21,63,89,67} [count=20] (show table)
- $Cycle\_Set_4$ = {4,16,64,56,24,96,84,36,44,76} [count=10] (show table)
- $Cycle\_Set_5$ = {25} [count=1] (show table)
- $Cycle\_Set_6$ = {36,16,96,76,56} [count=5] (show table)
- $Cycle\_Set_7$ = {1,7,49,43} [count=4] (show table)
- $Cycle\_Set_8$ = {8,64,12,96,68,44,52,16,28,24,92,36,88,4,32,56,48,84,72,76} [count=20] (show table)
- $Cycle\_Set_9$ = {1,9,81,29,61,49,41,69,21,89} [count=10] (show table)

Horizontal View (back to top)

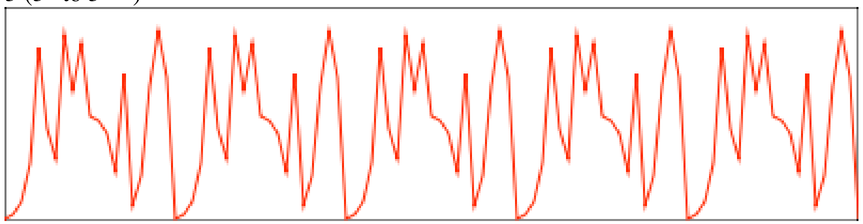
Last 2 digit(s) for powers of

2 (2^0 to 2^{101})

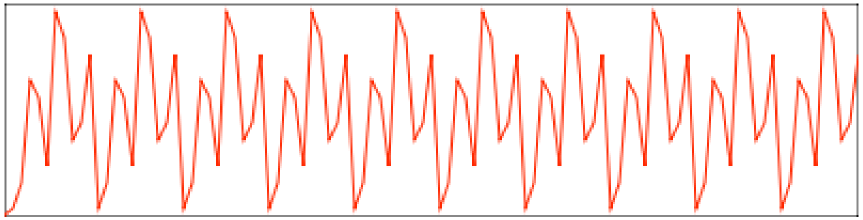


4 (4^0 to 4^{101})

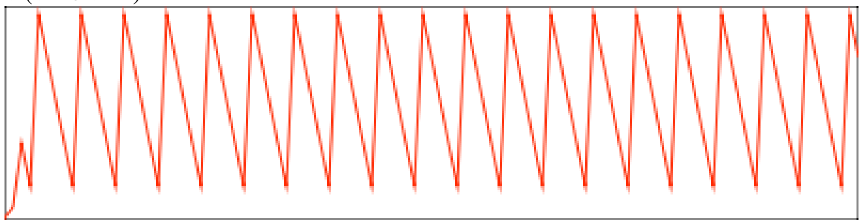
3 (3^0 to 3^{101})



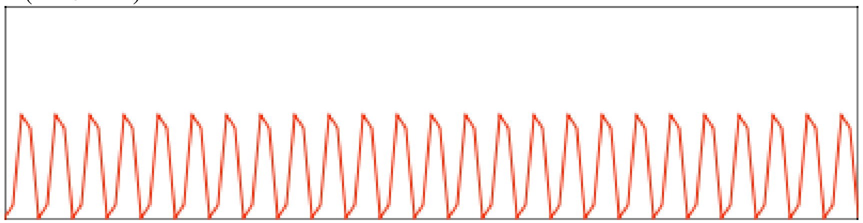
5 (5^0 to 5^{101})



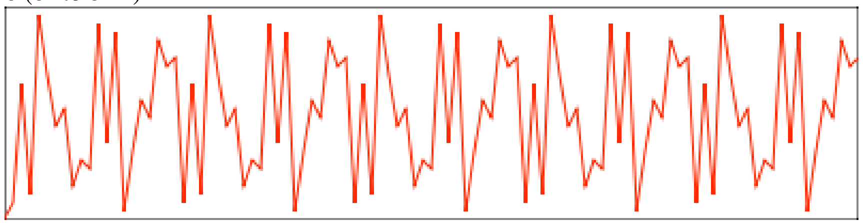
6 (6^0 to 6^{101})



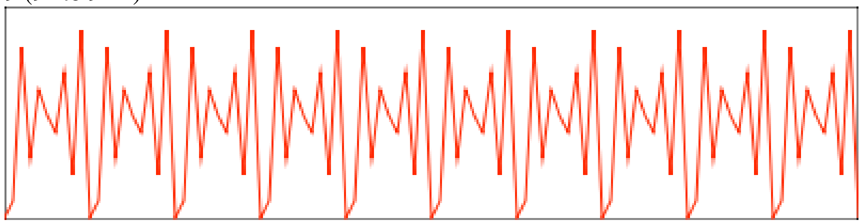
7 (7^0 to 7^{101})



8 (8^0 to 8^{101})



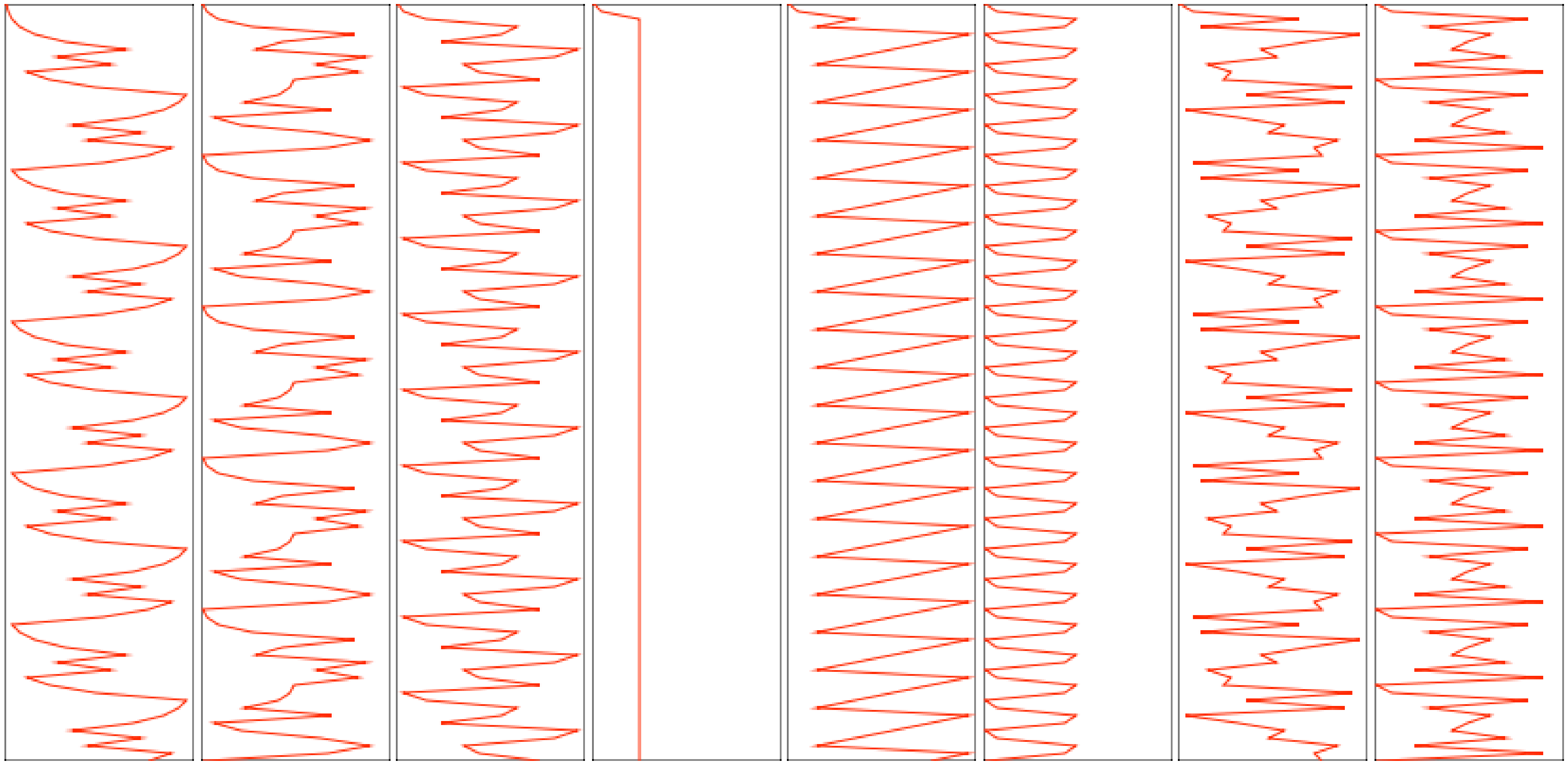
9 (9^0 to 9^{101})



Vertical View (back to top)

<u>Last 2 digit(s) for powers of</u>

2 (2^0 to 2^{101}) 3 (3^0 to 3^{101}) 4 (4^0 to 4^{101}) 5 (5^0 to 5^{101}) 6 (6^0 to 6^{101}) 7 (7^0 to 7^{101}) 8 (8^0 to 8^{101}) 9 (9^0 to 9^{101})



Identity element

The members in the cycle set (say x, y, z) will be a subset of Numbers= {0,1,2,3,...98, 99, 100}.
With the operator $\otimes_{100}$ (x,y) = (x * y) mod 100, the search for identity element proceeds as follows:

- Let x be the identity element of a cycle set, then for any y from the cycle set, (x * y) mod 100 = y. This is possible with x=1+u (u ∈ Numbers). Then (x*y) mod 100
  = (y+ u*y) mod 100
  = y mod 100 + (u*y) mod 100
  = y + (u*y) mod 100
  need to find smallest u such that u*y to be a multiple of 100, then (u*y) mod 100 = 0
  - An element y from $Cycle\_Set_2$ or $Cycle\_Set_4$ or $Cycle\_Set_6$ or $Cycle\_Set_8$ is a multiple of 4,
    then (x*y) mod 100
    = (y+ 4*u*z) mod 100

= y mod 100 + (4*u *y) mod 100
= y + (4*u*y) mod 100
need 4*u*y to be multiple of 100, irrespective of y (member of cycle set)
that is possible with u= 25 (x=26) or u=50 (x=51) or u=75 (x=76),of this x=76 (u=75) is a member of the cycle sets
∴ ***75*** is the identity element for the cycle sets mentioned above

- For $Cycle\_Set_3$ or $Cycle\_Set_7$ or $Cycle\_Set_9$,
  then (x*y) mod 100
  = (y+ u*y) mod 100
  = y mod 100 + (u*y) mod
  = y + (u*y) mod 100
  need u*y to be multiple of 100, irrespective of y (member of cycle set)
  that is possible with u= 0 (x=1) or u=99 (x=100), but x=100 (u=99) is not a member of these sets
  ∴ ***1*** is the identity element for the cycle sets mentioned above

- $Cycle\_Set_5$ has just 25, it should be the identity.
  then (x*y) mod 100
  = (y+ u*y) mod 100
  = y mod 100 + (u*y) mod
  = y + (u*y) mod 100
  need u*y to be multiple of 100, irrespective of y (member of cycle set)
  that is possible with u=4 (x=5) or u= 4 (x=5) or u=8 (x=9) or u=12 (x=13) or u=16 (x=17) or u=20 (x=21) or u=24 (x=25), of all this x=25 is the only possible member
  ∴ ***25*** is the identity element for the $Cycle\_Set_5$