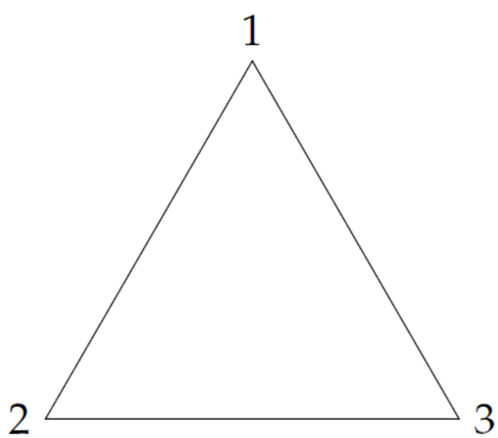
Day 11 (July 17, 2012)

Symmetries of an equilateral triangle



Permutation	Transformation on the triangle
()	Do nothing
(1 2 3)	Rotation 120° c.c.w.
(1 3 2)	
(1 2)	
(1 3)	Reflection
(2 3)	

"then"	()	(1 2 3)	(1 3 2)	(1 2)	(1 3)	(2 3)
()						
(1 2 3)				then	(1 2)	
(1 3 2)						
(1 2)						
(1 3)		(2 3)				
(2 3)						

Start with 1 2 3

(1 3) means switch 1st & 3rd ⇒ 321

then (123) means 1st → 2nd → 3rd ⇒ 132

Notes:

acts on

"123" (13)(123) becomes "321" (123) then ...

these refer to positions of the numbers you're working with.

... "321" (123) becomes "1 3 2"

$1^{st} \to 2^{nd} \to 3^{rd}$

this says write the number in the 1^{st} position in the 2^{nd} position, the number that was in the 2^{nd} position in the 3^{rd} position, then the number in the 3^{rd} position in the 1^{st} position.

Problem #1:

acts on

"0 1 2 3 4 5 6 7" (124)(365) becomes "04132567" (365)

These numbers refer to positions of the numbers we're working with. Notice there is a "0" now.

(124) means the 1 moves to where the 2 is now, the 2 moves to where the 4 is now, the 4 moves to where the 1 is now.

... "04132567" (365) becomes "04152637"

acts on

$0\,4\,{}_1\,5\,{}_2\,6\,{}_3\,7$

Problem #8:

n	# of units in mod n	Cycle length of 2^k in mod n	Cycle length of 10^k in mod n
3	2	2	1
7	6	3	6
9	6	6	1
11	10	10	2
13	12	12	6
17	16	8	16
19	18	18	18
21	12	6	6
23	[illegible]	11	22
[illegible]	[illegible]	[illegible]	[illegible]

n	# of units in mod n	Cycle length of 2^k in mod n	Cycle length of 10^k in mod n
93	60	10	15
97	96	48	96
99	60	30	2
101	100	100	4
103	102	51	34
107	106	1, 2, 53, 106 ?	?
109	108	36	108
111	72	36	3
[illegible]	112	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

What are some possibilities for these missing #s?
(Without doing a huge amount of work.)

The cycle length in mod *n* ~~gazinda~~ divides the # of units in mod *n*.