

Series generated by

Color	Y	R	B	G
Code	0, 10	5, 14	6, 14	4, 13

#1 #2

GnB

RnB - { ..., -58, 14, 86, 156, 230, ... } k is +/- INTEGER

{ ..., -50, 22, 94, 166, 238, ... }
 $22 + 72k$

$14 + 72k$

NOTES:
 *1) GnB Under
 $d = 94 - 22 = 72$
 $T_n = 22 + 72k$

*2) RnB
 $d = 86 - 14 = 72$
 $T_n = 14 + 72k$

same method applies to all other series

-100	-99	-98	-97	-96	-95	-94	-93	-92	-91
-90	-89	-88	-87	-86	-85	-84	-83	-82	-81
-80	-79	-78	-77	-76	-75	-74	-73	-72	-71
-70	-69	-68	-67	-66	-65	-64	-63	-62	-61
-60	-59	-58	-57	-56	-55	-54	-53	-52	-51
-50	-49	-48	-47	-46	-45	-44	-43	-42	-41
-40	-39	-38	-37	-36	-35	-34	-33	-32	-31
-30	-29	-28	-27	-26	-25	-24	-23	-22	-21
-20	-19	-18	-17	-16	-15	-14	-13	-12	-11
-10	-9	-8	-7	-6	-5	-4	-3	-2	-1
0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99
100	101	102	103	104	105	106	107	108	109
110	111	112	113	114	115	116	117	118	119
120	121	122	123	124	125	126	127	128	129
130	131	132	133	134	135	136	137	138	139
140	141	142	143	144	145	146	147	148	149
150	151	152	153	154	155	156	157	158	159
160	161	162	163	164	165	166	167	168	169
170	171	172	173	174	175	176	177	178	179
180	181	182	183	184	185	186	187	188	189
190	191	192	193	194	195	196	197	198	199
200	201	202	203	204	205	206	207	208	209
210	211	212	213	214	215	216	217	218	219
220	221	222	223	224	225	226	227	228	229
230	231	232	233	234	235	236	237	238	239
240	241	242	243	244	245	246	247	248	249

*3a) $310 + 360k$

Blue is an even series ($8n+6$)

Green alternates between odd & even

Red alternates between odd & even

$9n+5$

Both Green & Red are parallel

$G \cap R = \{ \}$ null set
 so neither can be on at the same time. therefore, in this case, four lights are impossible

GnY $40 + 90k$

RnY $50 + 90k$

BnY $30 + 40k$

B $8n+6$

*3b) $230 + 360k$

$Y = 10n + 0$

$RnBnY$

+230

Note *3a, 3b

How to get and

(310 + 360k) where k is a real number

1) Start with the sequence 22 + 70k

2) Increase the value of k until a yellow turns on (as well as the .)

3) Write down the number and set k to zero

4) Reduce k until turns on. (as well)

Take first number (310) and second number (-50)

and use this equation:

$$310 - (-50) = 360$$

first - second = difference

$$\text{ (230 + 360k)}$$

Repeat process, but instead of using

use

*4 A series generated by ~~T~~ $T_n + S$ where n is an integer

and S is the 'shift'

$T_n + S, T_{(n+1)} + S, T_{(n+2)} + S, \dots$

$$T_{(n+1)} + S - (T_n + S)$$

= S proved.

green is ~~4, 13, 22, 31, \dots~~

$$T = 13 - 4 \quad S = 4$$

$$= 9 \quad \text{green is } 9_{n+4}$$

*5 Three and four digit positive and negative numbers that turn on each light

1) 10 THE FORMULAS,

Some random numbers obtained with the calculations

	Positive 3 digit	Positive Four digit	Negative three digit	Negative Four digit
<input type="checkbox"/> $10n + 0$	130	1300	-130	-1300
<input type="checkbox"/> $9n + 5$	905	9005	-895	-8995
<input type="checkbox"/> $8n + 6$	246	8066	-106	-8502
<input type="checkbox"/> $9n + 4$	904	9004	-86	-8996
<input type="checkbox"/> $40 + 90k$	220	9130	-140	-8960
<input type="checkbox"/> $50 + 90k$	230	9230	-130	-8950
<input type="checkbox"/> $22 + 70k$	454	7202	-698	-7178
<input type="checkbox"/> $14 + 70k$	158	7214	-706	-7186
<input type="checkbox"/> $30 + 40k$	430	4030	-370	-3070
<input type="checkbox"/> $810 + 360k$	310	1030	-410	-1130
<input type="checkbox"/> $230 + 360k$	230	1670	-490	-1210

This question can also be solved by using modular arithmetic: \mathbb{Z}_9

Green: $9n + 4$

is equivalent to $x \equiv 4 \pmod{9}$

Red: $9n + 5$

$x \equiv 5 \pmod{9}$

$10n + 9$
 $9n + 4$

$$\begin{cases} x \equiv 0 \pmod{10} \\ x \equiv 4 \pmod{9} \end{cases}$$

$$\text{GCD}(10, 9) = 1$$

as $x = a$ number $+ 9 \times 10 \times k$

Modulo equations can be solved by chinese remainder theorem

k is any integer