

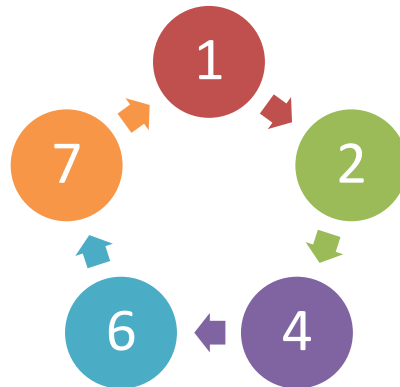
## THEORY OF CYCLES

**Summary-** This paper speaks about the Theory of Cycles and how to use it. It also contains solved examples regarding the same.

This article is authored by V. Abhay Rangan studying in 10<sup>th</sup> standard, in Poorna Prajna Education Centre, Indiranagar, Bangalore, India. The following is his Theory of Cycles-

The Theory of Cycles states says that any n (3 and above) digit number with its digits in ascending order, when cycled, will give numbers which are cycles too, when the numbers so formed are subtracted from each other.

Ex- 12467



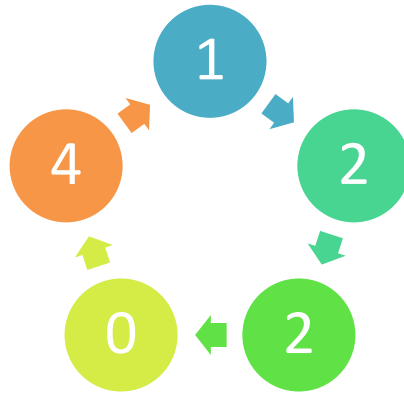
When 12467 is cycled, we get

12467  
24671  
46712  
67124  
71246

When we subtract these numbers from each other, we get-

24671-12467=12204  
46712-24671=22041  
67124-46712=20412  
71246-67124=04122

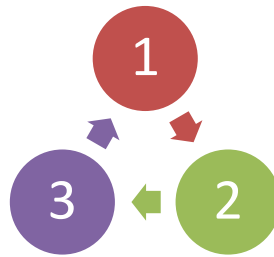
12204, 22041, 20412, 04122 are cyclic



This holds true for all numbers falling under the given conditions. Here are some solved examples-

Ex-124

When 124 is cycled, we get

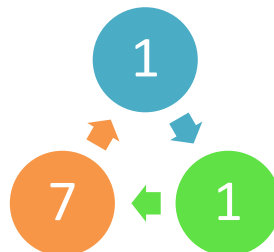


124  
241  
412

When we subtract these numbers from each other, we get-

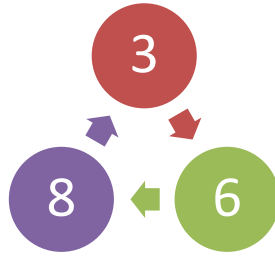
$241 - 124 = 117$   
 $412 - 241 = 171$

117 and 171 are cyclic



Ex-368

When 368 is cycled, we get

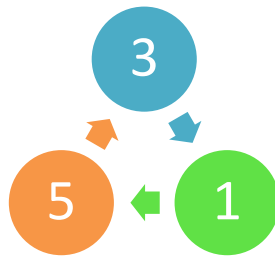


368  
683  
836

When we subtract these numbers from each other, we get-

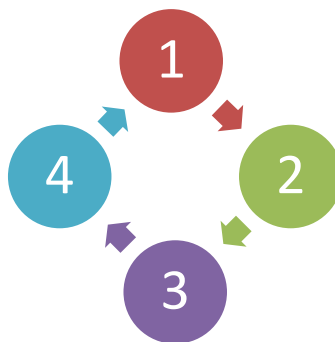
$$683 - 368 = 315$$
$$836 - 683 = 153$$

315 and 153 are cyclic



Ex-1234

When 1234 is cycled, we get



1234  
2341  
3412  
4123

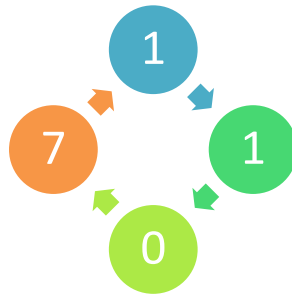
When we subtract these numbers from each other, we get-

$$2341-1234=1107$$

$$3412-2341=1071$$

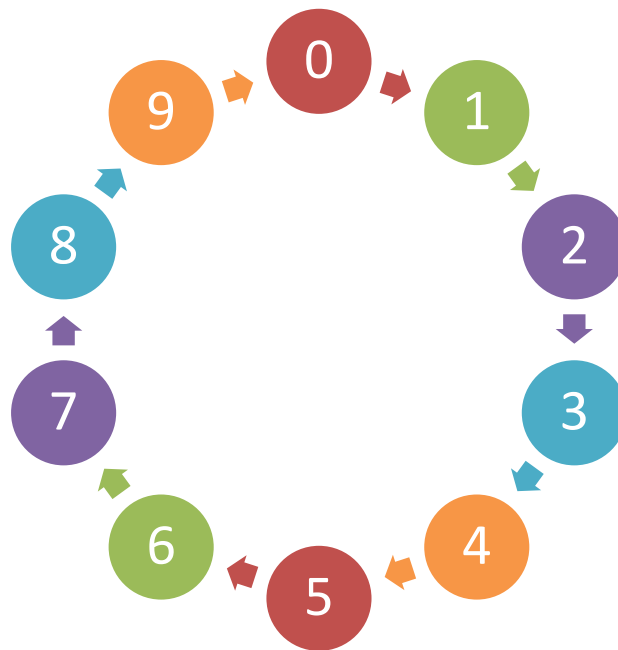
$$4123-3412=0711$$

1107, 1071 and 0711 are cyclic



Ex-0123456789

When 0123456789 is cycled, we get

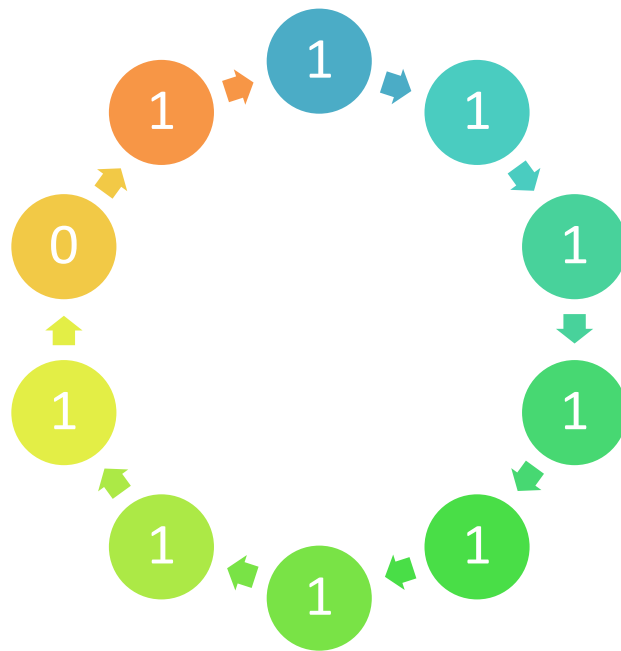


0123456789  
1234567890  
2345678901  
3456789012  
4567890123  
5678901234  
6789012345  
7890123456  
8901234567  
9012345678

When we subtract these numbers from each other, we get-

1234567890-0123456789=1111111101  
 2345678901-1234567890=1111111011  
 3456789012-2345678901=1111110111  
 4567890123-3456789012=1111101111  
 5678901234-4567890123=1111011111  
 6789012345-5678901234=1110111111  
 7890123456-6789012345=1101111111  
 8901234567-7890123456=1011111111  
 9012345678-8901234567=0111111111

1111111101, 1111111011, 1111110111, 1111011111, 1110111111, 1101111111, 1101111111,  
 1011111111, 0111111111 are cyclic



Ex-1346789

When 1346789 is cycled, we get

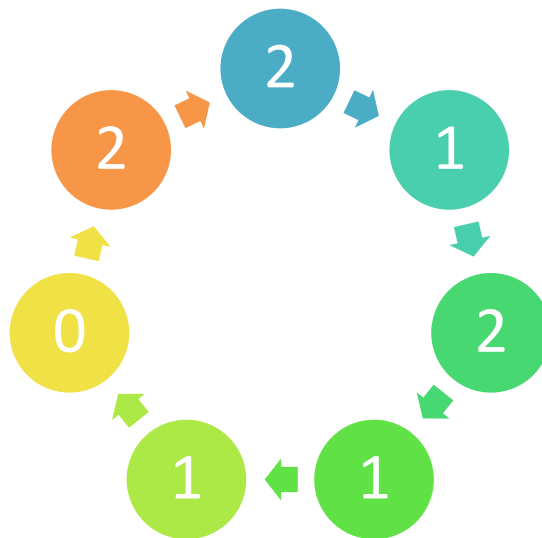


1346789  
 3467891  
 4678913  
 6789134  
 7891346  
 8913467  
 9134678

When we subtract these numbers from each other, we get-

3467891-1346789=2121102  
 4678913-3467891=1211022  
 6789134-4678913=2110221  
 7891346-6789134=1102212  
 8913467-7891346=1022121  
 9134678-8913467=0221211

2121102, 1211022, 2110221, 1102212, 1022121 and 0221211 are cyclic



In general, if abc [Note:  $a < b < c$ ] is a cyclic number, then bca and cab will be the possible cyclic numbers. Then, if we subtract bca from cab, we get-

$$\begin{array}{r} cab \\ -bca \\ \hline (c-1-b)(a+10-c)(b-a) \end{array}$$

$(c-1-b)(a+10-c)(b-a)$  is the number which we get. If we subtract abc from bca, we get

$$\begin{array}{r} bca \\ -abc \\ \hline (b-a)(c-1-b)(a+10-c) \end{array}$$

$(c-1-b)(a+10-c)(b-a)$  and  $(b-a)(c-1-b)(a+10-c)$  are cyclic numbers

**Thank you**