

Gap Test  
 → It is used to count the no of digits betn two successive occurrence of the same digits.

Steps:

S1: Define Hypothesis

$H_0: R_i \sim$  independently

$H_1: R_i \not\sim$  independently.

S2: Determine the gap  $G$  length of each gap associated with each digit (0, 1, 2, 3, 4, 5, 6, 7, 8, 9)

S3: Select the interval width based on no of gaps & generate the frequency distribution table for samples of gaps & apply KS Test

Gap len	Freq	Rel. Freq	Acc. Rel Freq	CDF	$ F(n) - S(x) $
			$S_N(n)$	$F(n)_{n+1}$	
				$1 - (0.9)^{n+1}$	

Where  $n$  is max<sup>m</sup> value for each interval.

S4: Compute  $D_{calc} = \max |F_n - S(x)|$

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S<sub>6</sub> :- Find  $D_{\text{tab}} = \text{box}$

S<sub>7</sub> :- If  $D_{\text{curr}} < D_{\text{tab}}$  accept Ho  
else reject Ho

\* Note Total no of gaps = Total no in  
Sequence - Total no of distinct digit

Cg :- For sequence 1 1 2 2 1  
length of

For digit 1 gaps = 0, 2  
length of

For digit 2 gaps = 0

Total no of gaps = 2 + 1 = 3

or, Total no of gaps = 5 - 2 = 3

For sequence 1 3 2 1 2 2 3  
length of

For digit 1 gaps = 2

For digit 2 length of gaps = 1, 0

For digit 3 length of gaps = 4

Total no of gaps = 4

or 7 - 3 = 4



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↑ # Numerical Consider the following sequence of 120 digits (0-9)

2 3 6 5 6 0 0 1 3 4 5 6 7 9 4 9 3 1 8 3  
 1 3 7 4 8 6 2 5 1 6 4 9 3 3 4 2 1 5 8 7  
 0 8 8 2 6 7 8 1 3 5 3 8 4 0 9 0 3 0 9 2  
 4 6 9 9 8 5 6 0 1 7 6 7 0 3 1 0 2 4 2 0  
 1 1 2 6 7 6 3 7 5 9 3 6 6 7 8 2 3 5 9 6  
 6 4 0 3 9 3 6 8 1 5 0 7 6 2 6 0 5 7 8 0

Test whether these digits can be assumed to be independent based on frequency which with which gap occurs at  $\lambda = 0.05$

S<sub>1</sub>: Define Hypothesis

S<sub>2</sub>: No. of digits = 120  
 unique digits = 10

Total no. of gaps =  $120 - 10 = 110$

Digit	length of each gap	No. of gaps
0	0, 33, 12, 1, 1, 9, 4, 2, 3, 22, 7, 4, 3	13
1	9, 2, 7, 10, 20, 5, 5, 0, 2, 6	10

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2	25, 8, 7, 15, 16, 1, 3, 12, 17	9
3	6, 7, 2, 1, 10, 0, 14, 1, 15, 16, 12, 3, 5, 6, 1	15
4	4, 8, 6, 0, 2, 17, 7, 16, 23	9
5	6, 16, 9, 11, 15, 22, 8, 11, 6	9
6	1, 6, 13, 3, 14, 16, 4, 3, 12, 1, 3, 6, 6, 0, 5, 15, 1	17
7	9, 16, 3, 23, 1, 12, 2, 5, 17, 5	10
8	5, 13, 2, 0, 3, 4, 12, 24, 12, 10	16
9	1, 38, 3, 3, 0, 25, 8, 5	4



Date . . .

Group len	Freq	Rel Freq	Acc Rel Freq $S_N(n)$	$F(n)$ $1 - (0.9)^{n+1}$	$ F(n) - S_N(n) $
0-3	34	.309	0.309	.3434	0.0344
4-7	30	.27	.58	.5895	.01
8-11	13	.1181	.7	.7175	.0175
12-15					
16-19					
20-23					
24-27					
28-31					
32-35					
36-39					

$S_4 =$

$$D = \max_{\text{cell}} (F(n) - S_N(n))$$

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$$S_5 = D_{\text{tab}} = D_x = \frac{136}{\sqrt{N}} = \frac{136}{\sqrt{110}} \quad 0.129$$

S6 Compute -