Int. J. Math. And Appl., 6(1–B)(2018), 243–247
ISSN: 2347-1557
Available Online: http://ijmaa.in/

International Journal of *Mathematics And its Applications*

Digits in Units Place of 2-Prime Factors Numbers Till 1 Trillion

Neeraj Anant Pande[1,*]

1 Department of Mathematics & Statistics, Yeshwant Mahavidyalaya (College), Nanded, Maharashtra, India.

Abstract: The first non-trivial type of k-Prime Factors numbers are 2-Prime Factors numbers. In this work, digits occurring in 2-Prime Factors numbers in units place are analyzed in thorough range of 1 trillion as well as within increasing ranges till 1 trillion for different block-sizes.

MSC: 11A51, 11N05, 11N80.

Keywords: Prime number, k-Prime Factors number, 2 Prime Factors number, Digits in units place.

1. Introduction

The usual primes $2, 3, 5, 7, 11, 13, 17, \ldots$ are generalized by author to k-Prime Factors numbers [6].

Definition 1.1. *For any integer $k \geq 0$, a positive integer having k number of prime factors, which need not be necessarily distinct, is called as k-Prime Factors number.*

The case of $k = 2$, i.e., 2-Prime Factors numbers have been recently analyzed in deep for their maximum [7] and minimum counts [6] as well as maximum [9] and minimum [8] spacings between successive such numbers. Lack of systematic pattern for primes [1] forces such studies for primes themselves [3] and their special types [4]. Analysis in high ranges has been made possible by use of efficient algorithms for generating primes [2] and sophisticatedly evolved programming languages like Java [5] running on every type of electronic computer.

2. Digits in Units Place of 2-Prime Factors Numbers

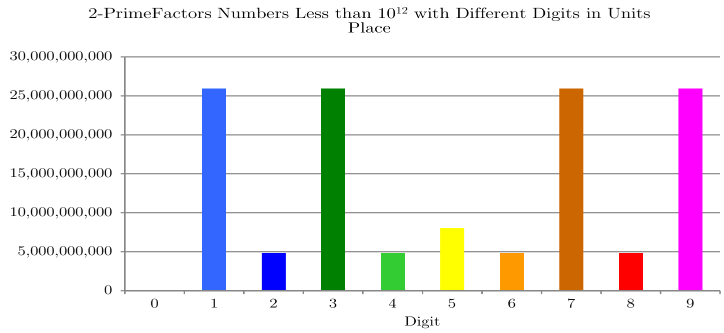
We stick up to usual decimal system wherein there are 10 digits. For all 2-Prime Factors numbers till 1 trillion, we have rigorously determined the digits in their units place.

Sr. No.	The Digit in Units Place	Number of 2-Prime Factors Numbers Less than 10^{12} with that Digit in Units Place
1	0	1
2	1	25,952,743,455
3	2	4,827,024,466
4	3	25,952,691,212
5	4	4,827,042,005
6	5	8,007,105,058

* *E-mail: napande@gmail.com*

Sr. No.	The Digit in Units Place	Number of 2-Prime Factors Numbers Less than 10^{12} with that Digit in Units Place
7	6	4,827,045,470
8	7	25,952,641,863
9	8	4,827,024,200
10	9	25,952,699,448

These quantities are graphically compared below.



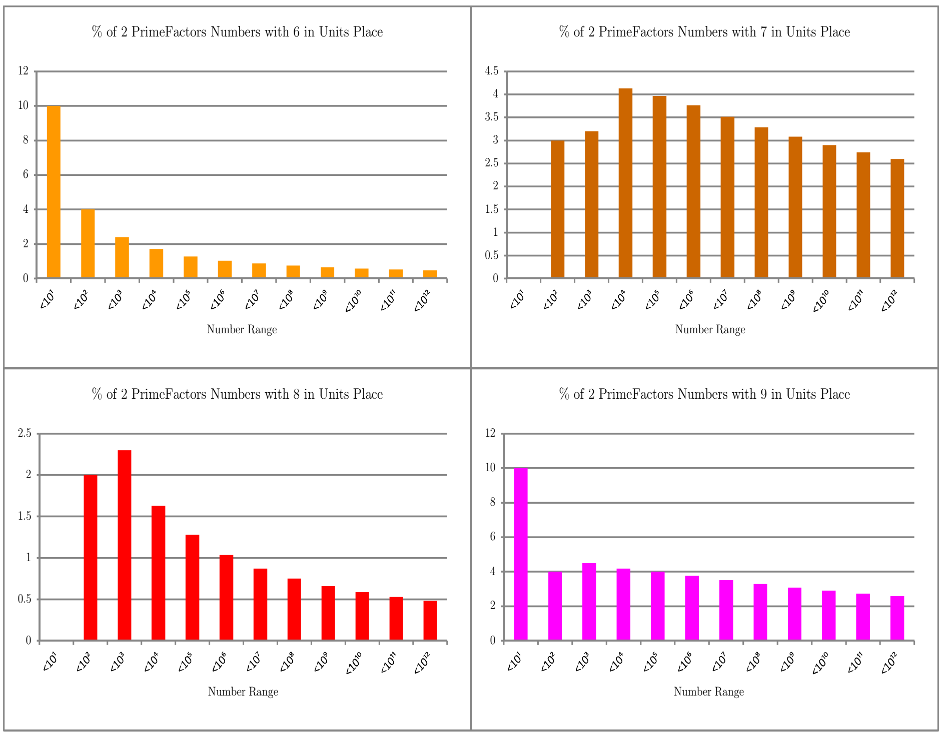
3. Range-wise Digits in Units Place of 2-Prime Factors Numbers

In earlier section, we saw in one go the number of different digits in units place of 2-Prime Factors numbers till 1 trillion. Here we give their appearance in increasing ranges.

Sr.No.	Range	Number of 2-Prime Factors Numbers with Digit in Units Place				
		0	1	2	3	4
1	$< 10^1$	0	0	0	0	0
2	$< 10^2$	1	3	3	2	5
3	$< 10^3$	1	42	22	40	25
4	$< 10^4$	1	415	163	408	170
5	$< 10^5$	1	4,017	1,274	3,981	1,289
6	$< 10^6$	1	37,643	10,386	37,535	10,404
7	$< 10^7$	1	351,794	87,062	351,570	87,179
8	$< 10^8$	1	3,289,191	750,340	3,288,456	750,395
9	$< 10^9$	1	30,839,442	6,588,414	30,836,960	6,589,260
10	$< 10^{10}$	1	290,154,400	58,737,871	290,142,625	58,739,669
11	$< 10^{11}$	1	2,739,524,581	529,908,515	2,739,544,509	529,916,098
12	$< 10^{12}$	1	25,952,743,455	4,827,024,466	25,952,691,212	4,827,042,005

Sr.No.	Range	Number of 2-Prime Factors Numbers with Digit in Units Place				
		5	6	7	8	9
1	$< 10^1$	0	1	0	0	1
2	$< 10^2$	7	4	3	2	4
3	$< 10^3$	45	24	32	23	45
4	$< 10^4$	302	172	413	163	418
5	$< 10^5$	2,261	1,290	3,970	1,279	4,016
6	$< 10^6$	17,983	10,382	37,635	10,365	37,701
7	$< 10^7$	148,932	87,216	351,525	87,055	351,990
8	$< 10^8$	1,270,606	750,395	3,288,504	750,003	3,289,367
9	$< 10^9$	11,078,936	6,589,746	30,837,521	6,588,446	30,839,810
10	$< 10^{10}$	98,222,286	58,739,173	290,147,857	58,737,509	290,155,052
11	$< 10^{11}$	882,206,715	529,915,470	2,739,519,349	529,914,494	2,739,540,610
12	$< 10^{12}$	8,007,105,058	4,827,045,470	25,952,641,863	4,827,024,200	25,952,699,448

The percentages of 2-Prime Factors numbers with different digits in units place are plotted in following graphs.



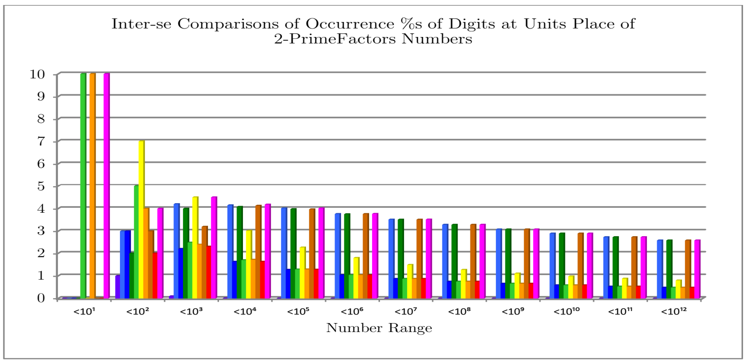
The digits 1, 3, 7, and 9 are seen appearing dominantly in units place of 2-Prime Factors numbers. Interestingly, there all are only appearing digits in units place of 1-Prime Factors numbers, i.e., usual primes (excepting the unique cases of occurrence solitude of 2 and 5). The even digits 2, 4, 6 and 8 are more or less running parallel in competition to each other and 5 is almost double in appearance than these. Also 10 is the unique 2-PrimeFactor number with 0 in units place. Product of 2 primes is 2-Prime Factors number. Primes have 1, 3, 7 and 9 in units place. Their all product combinations give again 1, 3, 7, 9 in units place.

Units place Digit in First Number	Units place Digit in Second Number	Units place Digit in Product
1	1	1
	3	3
	7	7
	9	9
3	1	3
	3	9
	7	1
	9	7
7	1	7
	3	1
	7	9
	9	3
9	1	9
	3	7
	7	3
	9	1

So, there is dominance of these digits in units place of 2-Prime Factors numbers. Now two special primes are 2 and 5 which are unique primes with these digits in units place. When they multiply other primes the results for units place digits are as follows :

Units place Digit in First Number	Units place Digit in Second Number	Units place Digit in Product
2	1	2
	3	6
	7	4
	9	8
5	1	5
	3	5
	7	5
	9	5

And the second row block is the reason why 5 is found to be more in units place of 2-Prime Factors than 2, 4, 6, 8. The following trends till 1 trillion are predicted to continue in all higher ranges due to the reasons made clear in above tables.



Acknowledgements

The author duly mentions extensive use of all computers in Laboratory of the Department of Mathematics & Statistics of Yeshwant Mahavidyalaya, Nanded. Software like Java programming language, NetBeans IDE and Microsoft Excel are employed for getting all analysis done and their development teams also deserve applause. The author is thankful to the anonymous referee(s) of this paper.

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