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Sieve of Prime Numbers Using Algorithms

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Abstract

This study suggests grouping of numbers that do not divide the number 3 and/or 5 in eight columns. Allocation results obtained from multiplication of numbers is based on column belonging to him. If in the Sieve of Eratosthenes the majority of multiplication of prime numbers result in a results devoid of practical benefit (numbers divisible by 2, 3 and/or 5), in the sieve of prime numbers using algorithms, each multiplication of prime number gives a result in a number not divisible to 2, 3 and/or 5.

Keywords: Column; Factor; Position; Sieve; Termination

Introduction

Sieve of prime numbers using algorithms

This paper deals with the study of odd numbers that cannot be divided with 3 and/or 5 by grouping them in eight columns, as follows:

The multiplication versions are in number of 36, their results being allocated according to columns, explained in Table 1.

Position Calculus

From the result of multiplying two numbers subtract the number assigned at position zero of the column namely one of the numbers i(p0): 7-11-13-17-19-23-29-31, the result is divided by 30. Integer obtained indicates the position of that number considering its column origin [1,2].

Formulas for determining the position

Position occupied by the result of the multiplication between numbers i(p0), i(p1), i(p2),..., i(pn), with all the numbers in Table 2. Position occupied p1 as a result of multiplication of numbers i (p1) and all the numbers in Table 3;

Positions of p1 are used to calculate p2, p3, p4,...., pn multiplying i(p0), positions occupied p2 as a result of multiplication of numbers i(p2) and all the numbers in Table 4;

Calculation algorithm

- Fill in Table 1 with all the numbers to be tested if they are prime number;
- Write all numbers under test, in order of their increasing in column 9,as shown in Table 5;
- Fill p0 formulas in Table 5;

Col.1=Col.	1x8	2x4	3x5			6x7		
Col.2=Col.	1x6	2x8	3x4		5x7			
Col.3=Col.	1x5	2x6	3x8	4x7				
Col.4=Col.	1x2		3x7	4x8	5x6			
Col.5=Col.	1x1	2x7	3x3	4x4	5x8	6x6		
Col.6=Col.	1x7	2x3		4x5		6x8		
Col.7=Col.	1x4	2x5	3x6				7x8	
Col.8=Col.	1x3	2x2		4x6	5x5		7x7	8x8

Table 1: Multiplication versions are in number of 36.

Position	1	2	3	4	5	6	7	8
0	7	11	13	17	19	23	29	31
1	37	41	43	47	49	53	59	61
2	67	71	73	77	79	83	89	91
3	97	101	103	107	109	113	119	121

Table 2: Odd numbers that cannot be divided with 3 and/or 5.

7+31	5+23	4+19	2+11	1+7	6+29	3+17	2 +13	+37n
6+17	11+31	8+23	2+7	10+29	4+13	6+19	3+11	+41n
8+19	7+17	13+31	12+29	5+13	4+11	9+23	2+ 7	+43n
6+11	7+13	16+29	17+31	9+17	10+19	3+ 7	12+23	+47n
8+13	**18+29**	**4+ 7**	**14+23**	**19+31**	**10+17**	**6+11**	**11+19**	**+49n**
22+29	5+ 7	8+11	14+19	17+23	23+31	9+13	12+17	+53n
22+23	18+19	16+17	12+13	10+11	6+ 7	29+31	27+29	+59n
7+7	11+11	13+13	17+17	19+19	23+23	29+29	31+31	+61n

Table 3: Position occupied p1 as a result of multiplication of numbers i.

7+31x2	5+23x2	4+19x2	2+11x2	1+7x2	6+29x2	3+17x2	2+13x2	+67n
6+17x2	11+31x2	8+23x2	2+7x2	10+29x2	4+13x2	6+19x2	3+11x2	+71n
8+19x2	7+17x2	13+31x2	12+29x2	5+13x2	4+11x2	9+23x2	2+7x2	+73n
6+11x2	**7+13x2**	**16+29x2**	**17+31x2**	**9+17x2**	**10+19x2**	**3+7x2**	**12+23x2**	**+77n**
8+13x2	18+29x2	4+7x2	14+23x2	19+31x2	10+17x2	6+11x2	11+19x2	+79n
22+29x2	5+7x2	8+11x2	14+19x2	17+23x2	23+31x2	9+13x2	12+17x2	+83n
22+23x2	18+19x2	16+17x2	12+13x2	10+11x2	6+7x2	29+31x2	27+29x2	+89n
7+7x2	**11+11x2**	**13+13x2**	**17+17x2**	**19+19x2**	**23+23x2**	**29+29x2**	**31+31x2**	**+91n**

Table 4: Positions of p1 are used to calculate p2, p3, p4.

1	2	3	4	5	6	7	8	9
7	5	4	2	1	6	3	2	+7n
6	11	8	2	10	4	6	3	+11n
8	7	13	12	5	4	9	2	+13n
6	7	16	17	9	10	3	12	+17n
8	18	4	14	19	10	6	11	+19n
22	5	8	14	17	23	9	12	+23n
22	18	16	12	10	6	29	27	+29n
7	11	13	17	19	23	29	31	+31n

Table 5: Position occupied p0 as a result of multiplication of numbers i (p0) and all the numbers.

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- Mark all numbers divisible in Table 1 by the formulas of p0;
- Eliminates all the numbers in column 9 Table 2 that were marked in Table 1 according to the formulas of p0;
- Fill formulas of p1 Table 2; number 49 was removed according to Table 1 no longer consider;
- Repeat the operations made in step 4 and 5 according to the formulas p1;
- Fill formulas of p2 Table 2 and repeat the operations in step 4 and 5. Numbers not eliminated in column 9 Table 2 are prime numbers.

In column 9 we register numbers under test up to P (max). Maxim position calculation is the integer number of the maximum number being tested radical divided by 30 [2-4].

Formulas belonging composite numbers are omitted. The algorithm uses formulas primes numbers squared correlating n=0,1,2,3,.... With Pn.

Using the tables respecting the above algorithm complexity is much smaller, any multiple of prime number (which represents the number of position) has corresponding number is compound odd number and not divisible by 3 and/or 5.

Example: Determination of prime numbers up to N=1001.

In parentheses are the numbers corresponding to position past according to column.

Divisibility by 7:

Col.1: 7+7n=7(217) – 14(427) – 21(637) – 28(847)

Col.2: 5+7n=5(161) – 12(371) – 19(581) – 26(791) – 33(1001)

Col.3: 4+7n=4(133) – 11(343) – 18(553) – 25(763) – 32(973)

Col.4: 2+7n=2(77) – 9(287) – 16(497) – 23(707) – 30(917)

Col.5: 1+7n=1(49) – 8(259) – 15(469) – 22(679) – 29(889)

Col.6: 6+7n=6(203) – 13(413) – 20(623) – 27(833)

Col.7=3+7n=3(119) – 10(329) – 17(539) – 24(749) – 31(959)

Col.8=2+7n=2(91) – 9(301) – 16(511) – 23(321) – 30(931)

Divisibility by 11:

Col.1=6+11n=6(187) – 17(517) – 28(847)

Col.2=11+11n=11(341) – 22(671) – 33(1001)

Col.3=8+11n=8(253) – 19(583) – 30(913)

Col.4=2+11n=2(77) – 13(407) – 24(737)

Col.5=10+11n=10(319) – 21(649) – 32(979)

Col.6=4+11n=4(143) – 15(473) – 26(803)

Col.7=6+11n=6(209) – 17(539) – 28(869)

Col.8=3+11n=3(121) – 14(451) – 25(781)

Divisibility by 13:
Divisibility by 17:

Col.1=8+13n=8(247) – 21(637)
Col.1=6+17n=6(187) – 23(697)

Col.2=7+13n=7(221) – 20(611) – 33(1001)
Col.2=7+17n=7(221) – 24(731)

Col.3=13+13n=13(403) – 26(793)
Col.3=16+17n=16(493)

Col.4=12+13n=12(377) – 25(767)
Col.4=17+17n=17(527)

Col.5=5+13n=5(169) – 18(559) – 31(949)
Col.5=9+17n=9(289) – 26(799)

Col.6=4+13n=4(143) – 17(533) – 30(923)
Col.6=10+17n=10(323) – 27(833)

Col.7=9+13n=9(299) – 22(689)
Col.7=3+17n=3(119) – 20(629)

Col.8=2+13n=2(91) – 15(481) – 28(871)
Col.8=12+17n=12(391) – 29(901)

Divisibility by 19:
Divisibility by 23:

Col.1=8+19n=8(247) – 27(817)
Col.1=22+23n=22(667)

Col.2=18+19n=18(551)
Col.2=5+23n=5(161) – 28(851)

Col.3=4+19n=4(133) – 23(703)
Col.3=8+23n=8(253) – 31(943)

Col.4=14+19n=14(437)
Col.4=14+23n=14(437)

Col.5=19+19n=19(589)
Col.5=17+23n=17(529)

Col.6=10+19n=10(323) – 29(893)
Col.6=23+23n=23(713)

Col.7=6+19n=6(209) – 25(779)
Col.7=9+23n=9(299) – 32(789)

Col.8=11+19n=11(361) – 30(961)
Col.8=12+23n=12(391)

Divisibility By 29:
Divisibility by 31:

Col.1=22+29n=22(667)
Col.1=7+31=7(217)

Col.2=18+29n=18(551)
Col.2=11+31=11(341)

Col.3=16+29n=16(493)
Col.3=13+31n=13(403)

Col.4=12+29n=12(377)
Col.4=17+31n=17(527)

Col.5=10+29n=10(319)
Col.5=19=31n=19(589)

Col.6=6+29n=6(203)
Col.6=23+31n=23(713)

Col.7=29+29n=29(899)
Col.7=29+31n=29(899)

Col.8=27+29n=27(841)
Col.8=31+31n=31(961)

Numbers not eliminated are prime numbers

Application: The Factorial Multiplying or the Method of Determining if a Number is Prime up to a Given Number

The method of grouping odd numbers according to Table 1, allows checking whether a number is prime according to the last two or five digits of position the number.

For termination two digits

The calculation algorithm is:

Step 1: Determine the position number and column it belongs;

Step 2: Last two digits of the calculated number indicates the termination position of tested number;

Step 3: Determine factors for termination and column number tested. I have illustrated the calculation of factors termination 10, column 1. Once calculated these factors can be used to determine of any prime numbers that belongs to the column 1, termination 10.

Step 4: It performs testing divisibility of a number with multiples of 3 000 plus pairs of numbers factorial group to which it belongs termination corresponding column number tested.

We assign factorial group for multiplying operation positions from 0-99, as in Table 1, numbers between 7-3.001 grouped in columns. The position occupied by the result of the multiplication between any two numbers in the factorial group is a maximum six digit number. The last two digits of the number shows the termination, the rest of maximum four digits is the factor and which the position will be calculated for those termination belonging to specific column [5,6].

I1 and I2 are two numbers higher than the numbers belonging to factorial group.

Position obtained by multiplying the numbers is determined by formula:

P=n2 × i1 (f)+n1 × i2+F, followed by T

Or, =n1 × i2 (f)+n2 × i1+F, followed by T

Where:

n1, n2: represents multiples of 3000 corresponding of i1(f), respectively i2(f);

i1 (f), i2 (f): represents the corresponding numbers of i1 and i2 in factorial group;

F – Factor

T – Termination

Be: 32 999 × 32 693=1 078 836 307

P=(1 078 836 307 – 7): 30=35 961 210 col.1 T=10 p(without T)=359 612

Factor calculation and termination:

2 999 × 2 693=(8 076 307 – 7): 30=269 210; F=2 692 T=10

P=10 × 2 999+10 × 32 693+F, followed by T

=10 × 2 693+10 × 32 999+F, followed by T

We calculate all the factors column 1, termination 10. The four types of multiplication corresponding col. 1 between numbers belonging to factor group, generates 400 factors with T.10, as follows:

7 × 901=2 37 × 1 711=21 67 × 721=16

307 × 3 001=307 337 × 811=91 367 × 2 821=345

607 × 2 101=425 637 × 2 911=618 667 × 1 921=427

2 707 × 1 801=1 625 2 737 × 2 611=2 382 2 767 × 1 621=1 495

97 × 931=30 127 × 2 341=99 157 × 1 951=102

397 × 31=4 427 × 1 441=205 457 × 1 051=160

697 × 2 131=495 727 × 541=131 757 × 151=38

2 797 × 1 831=1 707 2 827 × 241=227 2 857 × 2 851=2 715

187 × 2 761=172 217 × 1 771=128 247 × 1 981=163

487 × 1 861=302 517 × 871=150 547 × 1 081=197

787 × 961=252 817 × 2 971=809 847 × 181=51

2 887 × 661=636 2 917 × 2 671=2 597 2 947 × 2 881=2 830

277 × 391=36

577 × 2 491=476

877 × 1 591=465

2 977 × 1 291=1 281

Or,

11 × 1 937=7 41 × 227=3 71 × 2 117=50

311 × 2 837=294 341 × 1 127=128 371 × 17=2

611 × 737=150 641 × 2 027=433 671 × 917=205

2 711 × 1 037=937 2 741 × 2 327=2 126 2 771 × 1 217=1 124

101 × 1 607=54 131 × 1 697=74 161 × 2 387=128

401 × 2 507=335 431 × 2 597=374 461 × 287=44

701 × 407=95 731 × 497=121 761 × 1 187=3 011

2 801 × 707=660 2 831 × 797=752 2 861 × 1 487=1 418

191 × 677=43 221 × 2 567=189 251 × 2 057=172

491 × 1 577=258 521 × 467=81 551 × 2 957=543

791 × 2 477=653 821 × 1 367=374 851 × 857=243

2 891 × 2 777=2 676 2 921 × 1 667=1 623 2 951 × 1 157=1 138

281 × 2 147=201

581 × 47=9

881 × 947=278

2 981 × 1 247=1 239

Or,

19 × 1 753=11 49 × 1 843=30 79 × 1 333=35

319 × 2 653=282 349 × 2 743=319 379 × 2 233=282

619 × 553=114 649 × 643=139 679 × 133=30

2 719 × 853=773 2 749 × 943=864 2 779 × 433=401

109 × 223=8 139 × 1 513=70 169 × 2 203=124

409 × 1 123=153 439 × 2 413=353 469 × 103=16

709 × 2 023=478 739 × 313=7 769 × 1 003=257

2 809 × 2 323=2 175 2 839 × 613=580 2 869 × 1 303=1 246

199 × 2 293=152 229 × 1 783=136 259 × 673=58

499 × 193=32 529 × 2 683=473 559 × 1 573=293

799 × 1 093=291 829 × 583=161 859 × 2 473=708

2 899 × 1 393=1 346 2 929 × 883=862 2 959 × 2 773=2 735

289 × 1 963=189

589 × 2 863=562

889 × 763=226

2 989 × 1 063=1 059

Or,

29 × 2 183=21 59 × 1 073=21 89 × 2 363=70

329 × 83=9 359 × 1 973=236 389 × 263=34

629 × 983=206 659 × 2 873=631 689 × 1 163=267

2 729 × 1 283=1 167 2 759 × 173=159 2 789 × 1 463=1 360

119 × 53=2 149 × 143=7 179 × 2 633=157

419 × 953=133 449 × 1 043=156 479 × 533=85

719 × 1 853=444 749 × 1 943=485 779 × 1 433=372

2 819 × 2 153=2 023 2 849 × 2 243=2 130 2 879 × 1 733=1 663

209 × 1 523=106 239 × 2 813=224 269 × 503=45

509 × 2 423=411 539 × 713=128 569 × 1 403=266

809 × 323=87 839 × 1 613=451 869 × 2 303=667

2 909 × 623=604 2 939 × 1 913=1 874 2 969 × 2 603=2 576

299 × 593=59

599 × 1 493=298

899 × 2 393=717

2 999 × 2 693=2 692

Grouping numbers from left of multiplying operation according to the above model, in this case numbers on the right have a constant growth rate, which allows for relatively simple determination of them. Perform tests to see if number N is prime or not, using position calculation formulas, as follows:

Divisibility by:

(3 000 × n+7) × (3 000 × n+901) F=2

7 × n; 901 × n; 901+3 007xn; 901x2+6 007xn; 901x3+9 007xn;.....................

7xn correspond to: 7 × (3 000 × n+901); 901xn correspond to: 901 × (3 000 × n+7);

901+3 007xn correspond to: 3 007 × (3 000 × n+901);

901x2+6 007xn correspond to: 6 007 × (3 000 × n+901);

901x3+9 007xn correspond to: 9 007 × (3 000 × n+901);

If not results indicate position of N decreased by the factor F=2, the number studied does not divide with multiples of 3000 plus pair of numbers 7-901

(3 000 × n+307) × (3 000 × n+3001) F=307

307 × n; 3 001 × n; 3 001+3 307xn; 3 001x2+6 307xn; 3 001x3+9 307xn;....................

307 × n correspond to: 307 × (3 000 × n+3 001); 3 001 × n correspond to: 3 001 × (3 000 × n+307);

3 001+3 307 × n correspond to: 3 307 × (3 000 × n+3 001);

3 001x2+6 307xn correspond to: 6 307 × (3 000 × n+3 001);

3 001x3+9 307xn correspond to: 9 307 × (3 000 × n+3 001);...

Extract factor F=307 out of the position number of N than check calculation above.

(3 000 × n+607) × (3 000 × n+2 101) F=425

607 × n; 2 101 × n; 2 101+3 607xn; 2 101x2+6 607xn; 2 101x3+9 607xn;

Or,

(3 000 × n+2 707) × (3 000 × n+1 801) F=1 625

2 707 × n; 1 801 × n; 1 801+5 707xn; 1 801x2+8 707xn; 1 801x3+11 707xn;

If none of the operations related to 400 factors do not give as results the position of studied number, this number is prime.

For this example (p=359 612) we check these calculations:

Divisibility by:

(3 000 × n+7) × (3 000 × n+901) F=2 P – F=359 610

7 × 51 372=359 604 not divisible by 7 × (3 000 × n+901)

901 × 399=359 499 not divisible by 901 × (3 000 × n+7)

901+3 007x119=358 734 -//- 3 007 × (3 000 × n+901)

901x2+6 007x59=356 215 -//- 6 007 × (3 000 × n+901

901x3+9 007x39=353 976 -//- 9 007 × (3 000 × n+901)

901x4+12 007x29=351 807 -//- 12 007 × (3 000 × n+901)

901x5+15 007x23=349 666 -//- 15 007 × (3 000 × n+901)

901x6+18 007x20=365 546 -//- 18 007 × (3 000 × n+901)

901x7+21 007x16=342 419 -//- 21 007 × (3 000 × n+901)

901x8+24 007x14=343 306 -//- 24 007 × (3 000 × n+901)

901x9+27 007x13=359 200 -//- 27 007 × (3 000 × n+901)

901x10+30 007x11=339 087 -//- 30 007 × (3 000 × n+901)

901x20+60 007x5=318 055 -//- 60 007 × (3 000 × n+901)

901x30+90 007x3=297 054 -//- 90 007 × (3 000 × n+901)

901x40+120 007x2=276 054 -//- 120 007 × (3 000 × n+901)

901x50+150 007x2=345 064 -//- 150 007 × (3 000 × n+901)

901x60+180 007x1=234 067 -//- 180 007 × (3 000 × n+901)

901x92+276 007=358 899 -//- 276 007 × (3 000 × n+901)

Last calculation can be performed.

Testing for number N continues with:

Divisibility by:

(3 000 × n+37) × (3 000 × n+1 711) F=21 P – F=359 591

(3 000 × n+67) × (3 000 × n+721) F=16 P – F=359 596

Divisibility by:

(3 000 × n+2999) × (3 000 × n+2693) F=2 692 P – F=356 920

2 999 × 119=356 881 -//- 2 999 × (3 000 × n+2 693)

2 693 × 132=355 476 -//- 2 693 × (3 000 × n+2 999)

2 693+5 999x59=356 634 -//- 5 999 × (3 000 × n+2 693)

2 693x2+8 999x39=356 347 -//- 8 999 × (3 000 × n+2 693)

2 693x10+32 999x10=356 920**,** number identical to P – F,

So N is divisible by 32 999.

For termination five digits

The calculation algorithm is:

Pas.1: Determine the position number and column it belongs;

Pas.2: Last five digits of the calculated number indicates the termination position of tested number;

Pas 3: Determine factors for termination and column number tested. I have illustrated the calculation of factors termination 001 10, column 1;

Pas.4: We divisibility test the formulas for calculating factorial.

Positions calculated results do not contain termination 001 10

For pair of numbers 31 – 397

31 × (3 000 000xn+1 161 397) p=12+31 × n; divisibility by 31

3 031 × (3 000 000xn+1 800 397) p=1 819+3 031 × n -//- 3 031

6 031 × (3 000 000xn+2 439 397) p=1 819+3 085+6 031 × n -//- 6 031

9 031 × (3 000 000xn+3 078 397) p=1 819+3 085 × 2+1 278+9 031 × n -//- 9 031

12 031 × (3 000 000xn+3 717 397) p=1 819+3 085 × 3+1 278 × (2)!+12 031 × n -//- 12 031

15 031 × (3 000 000xn+4 356 379) p=1 819+3 085 × 4+1 278 × (3)!+15 031 × n -//- 15 031

18 031 × (3 000 000xn+4 995 379) p=1 819+3 085 × 5+1 278 × (4)!+18 031 × n -//- 18 031

2 997 031 × (3 000 000xn+639 522 379) p=1 819+3 085 × 998+1 278 × (997)!+2 997 031 × n divisibility by 2 997 031

3 000 031 × (3 000 000xn+640 161 379) p=1 819+3 085 × 999+1 278 × (998)!+3 000 031 × n divisibility by 3 000 031

3 003 031 × (3 000 000xn+640 800 379) p=1 819+3 085 × 1 000+1 278 × (999)!+3 003 031 × n divisibility by 3 003 031

And,

397 × (3 000 000xn+2 403 031) p=318+397 × n divisibility by 397

3 397 × (3 000 000xn+234 031) p=265+3 397 × n -//- 3 397

6 397 × (3 000 000xn+1 065 031) p=265+2 006+6 397 × n -//- 6 397

9 397 × (3 000 000xn+1 896 031) p=265+2006 × 2+1 662+9 397 × n -//- 9 397

12 397 × (3 000 000xn+2 727 031) p=265+2006 × 3+1 662 × (2)!+12 397 × n -//- 12 397

15 397 × (3 000 000xn+3 558 031) p=265+2 006 × 4+1 662 × (3)!+15 397 × n -//- 15 397

18 397 × (3 000 000xn+4 389 031) p=265+2 006 × 5+1 662 × (4)!+18 397 × n -//- 18 397

2 997 397 × (3 000 000xn+829 572 031) p=265+2 006 × 998+1 662 × (997)!+2 997 397 × n divisibility by 2 997 397

3 000 397 × (3 000 000xn+830 403 031) p=265+2 006 × 999+1 662 × (998)!+3 000 397 × n divisibility by 3 000 397

3 003 397 × (3 000 000xn+831 234 031) p=265+2 006 × 1 000+1 662 × (999)!+3 003 397 × n divisibility by 3 003 397

Or, pair of numbers 331 – 1 297

331 × (3 000 000xn+2 755 297) p=304+331 × n divisibility by 331

3 331 × (3 000 000xn+994 297) p=1 104+3 331 × n -//- 3 331

6 331 × (3 000 000xn+2 233 297) p=1 104+3 609+6 331 × n -//- 6 331

9 331 × (3 000 000xn+3 472 297) p=1 104+3 609 × 2+2 478+9 331 × n -//- 9 331

12 331 × (3 000 000xn+4 711 297) p=1 104+3 609 × 3+2 478 × (2)!+12 331 × n -//- 12 331

15 331 × (3 000 000xn+5 950 297) p=1 104+3 609 × 4+2 478 × (3)!+15 331 × n -//- 15 331

18 331 × (3 000 000xn+7 189 297) p=1 104+3 609 × 5+2 478 × (4)!+18 331 × n -//- 18 331

And,

1 297 × (3 000 000xn+342 331) p=148+1 297 × n divisibility by 1 297

4 297 × (3 000 000xn+1 773 331) p=2 540+4 297 × n -//- 4 297

7 297 × (3 000 000xn+3 204 331) p=2 540+5 254+7 297 × n -//- 7 297

10 297 × (3 000 000xn+4 635 331) p=2 540+5 254 × 2+2 862+10 297 × n -//- 10 297

13 297 × (3 000 000xn+6 066 331) p=2 540+5 254 × 3+2 862 × (2)!+13 297 × n -//- 13 297

16 297 × (3 000 000xn+7 497 331) p=2 540+5 254 × 4+2 862 × (3)!+16 297 × n -//- 16 297

19 297 × (3 000 000xn+8 928 331) p=2 540+5 254 × 5+2 862 × (4)!+19 297 × n -//- 19 297

Conclusion

Number testing is done with all the 400 pairs of numbers in the group factorial. Factorial multiplication process has as principle of calculation pairs of numbers that belong to the factorial group unique to each termination and column.

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