



Centrum voor Wiskunde en Informatica

**REPORTRAPPORT**

Factorizations of Cunningham numbers with bases 13 to 99:  
millennium edition

R.P. Brent, P.L. Montgomery, H.J.J. te Riele

Modelling, Analysis and Simulation (MAS)

**MAS-R0107 July 31, 2001**

Report MAS-R0107  
ISSN 1386-3703

CWI  
P.O. Box 94079  
1090 GB Amsterdam  
The Netherlands

CWI is the National Research Institute for Mathematics and Computer Science. CWI is part of the Stichting Mathematisch Centrum (SMC), the Dutch foundation for promotion of mathematics and computer science and their applications.

SMC is sponsored by the Netherlands Organization for Scientific Research (NWO). CWI is a member of ERCIM, the European Research Consortium for Informatics and Mathematics.

Copyright © Stichting Mathematisch Centrum  
P.O. Box 94079, 1090 GB Amsterdam (NL)  
Kruislaan 413, 1098 SJ Amsterdam (NL)  
Telephone +31 20 592 9333  
Telefax +31 20 592 4199

# Factorizations of Cunningham Numbers with Bases 13 to 99: Millennium Edition\*

Richard P. Brent

*Oxford University Computing Laboratory, Wolfson Building, Parks Road, Oxford OX1 3QD, UK*  
*rpb@comlab.ox.ac.uk*

Peter L. Montgomery

*780 Las Colindas Road, San Rafael, CA 94903-2346, USA*  
*Microsoft Research and CWI*  
*pmontgom@cwil.nl*

Herman J. J. te Riele

*CWI, P.O. Box 94079, 1090 GB Amsterdam, The Netherlands*  
*herman@cwil.nl*

with the assistance of

Henk Boender, Stephania Cavallar, Conrad Curry,  
Bruce Dodson, Jens Franke, Joseph Leherbauer,  
George Sassoon, and Robert Silverman

## ABSTRACT

This Report updates the tables of factorizations of  $a^n \pm 1$  for  $13 \leq a < 100$ , previously published as CWI Report NM-R9212 (June 1992) and updated in CWI Report NM-R9419 (Update 1, September 1994) and CWI Report NM-9609 (Update 2, March 1996). A total of 951 new entries in the tables are given here. The factorizations are now complete for  $n < 76$ , and there are no composite cofactors smaller than  $10^{102}$ .

This "Millennium edition" gives internet pointers to electronic versions of the complete tables incorporating all updates. A file containing only the new updates, a file containing factorizations for an extended table range, and a file of factors, are also available on the internet.

*2000 Mathematics Subject Classification:* Primary 11Y05. Secondary 11-04.

*1998 ACM Computing Classification System:* F.2.1.

*Keywords and Phrases:* Factor tables, ECM, NFS, GNFS, MPQS, PMPQS, PMPMPQS, SNFS.

*Note:* This report has also appeared as Technical Report TR-14-00 of the Computing Laboratory of Oxford University, December 2000 (see <http://web.comlab.ox.ac.uk/oucl/publications/tr/index.html>). The research of Cavallar, Montgomery, and Te Riele was carried out under project MAS2.2 "Computational number theory and data security".

---

\* Incorporating *Factorizations of  $a^n \pm 1$ ,  $13 \leq a < 100$ : Update 3*  
Copyright © 2000, the authors.

## 1. INTRODUCTION

For many years there has been an interest in the prime factors of numbers of the form  $a^n \pm 1$ , where  $a$  is a small integer (the *base*) and  $n$  is a positive exponent. Such numbers often arise. For example, if  $a$  is prime then there is a finite field  $F$  with  $a^n$  elements, and the multiplicative group of  $F$  has  $a^n - 1$  elements. Also, for prime  $a$  the sum of divisors of  $a^n$  is  $\sigma(a^n) = (a^{n+1} - 1)/(a - 1)$ . Numbers of the form  $a^n + 1$  arise as factors of  $a^{2n} - 1$  and in other ways.

An extensive table of factors of  $a^n \pm 1$  for  $a \leq 12$  has been published by Brillhart *et al* [11]. The computation of these tables is referred to as the *Cunningham Project* in recognition of the pioneering computations of Cunningham and Woodall [12]. For a history, see the Introduction in [11].

The tables [11] are limited to  $a \leq 12$ , but many applications require larger bases. In June 1992 tables covering the range  $13 \leq a < 100$  were published [8]. The exponents  $n$  satisfied  $a^n < 10^{255}$  if  $a < 30$ , and  $n \leq 100$  if  $a \geq 30$ . An update [9] containing 780 new factorizations (with the same limits for  $a$  and  $n$ ) was published in September 1994, and a second update [10] containing 760 new factorizations was published in March 1996. These factorizations are now incorporated in the *Magma* package [3].

Since the second update [10], many new factors have been found. The factorizations are now complete for  $n \leq 75$ , and there are no composite cofactors with fewer than 103 digits<sup>1</sup>. This report includes all the new (complete or partial) factorizations found from the publication of [10] to 31 December 2000. Altogether, 951 new (complete or partial) factorizations are listed, involving 1098 new factors<sup>2</sup>. Table 1 summarizes progress since the publication of the original tables [8]. “Update 3” refers to this Report.

Table 1: Statistics regarding the Tables and Updates

Tables	Date	Smallest composite	Complete to exponent	Total entries
Original	June 1992	81 digits	46	13882
Update 1	Sept. 1994	87 digits	58	780
Update 2	March 1996	95 digits	66	760
Update 3	Dec. 2000	103 digits	75	951

Table 2 shows the number of prime factors of different sizes found for Updates 1–3 (excluding large factors obtained by division). The median sizes are 26 digits for Update 1, 29–30 digits for Update 2, and 33 digits for Update 3. The *smallest* new factor is 20 digits for Update 3 (compare 14 digits for Update 2). We would be surprised if many factors of less than 25 digits are still to be found. The *largest* new penultimate factor is 60 digits for Update 3 (compare 56 digits for Update 2).

## 2. FORMAT OF THE TABLES

The format of the Tables is the same as in [8]. For each base  $a$ , not a perfect power, in the range  $13 \leq a < 100$ , we give two separate tables –

<sup>1</sup>“digits” always means “decimal digits”.

<sup>2</sup>Here and elsewhere we do not count large factors which are obtained by division by other factors.

Table 2: Distribution of Factors

Digits	Update 1	Update 2	Update 3
10–14	0	1	0
15–19	17	23	0
20–24	333	144	24
25–29	329	273	242
30–34	154	197	322
35–39	72	99	181
40–44	44	89	134
45–49	9	39	107
50–54	0	14	63
55–59	1	3	15
60–64	0	0	10
Total	959	882	1098

*Table a-*: factorizations of  $a^n - 1$ ,  $n$  odd.

*Table a+*: factorizations of  $a^n + 1$ .

The exponent ranges are as in [8] –

$13 \leq a < 30$ , exponents  $n$  such that  $a^n < 10^{255}$ .

$30 \leq a < 100$ , exponents  $n \leq 100$ .

The entries are similar in format to those of the “short” tables in [11]. All known factors, including algebraic and Aurifeuillian [4] factors, are listed. Factors which are given as decimal numbers are primes. Exponents are indicated by a hat (^), for example “2^3” means  $2^3$ . Multiplication is indicated by a period (.), for example  $3^3 + 1 = 2^{27}$  is written as “2^2.7”. A period at the end of a line implies that the factorization is continued on the next line. An underscore (\_) at the end of a line means that a (large) factor is continued on the next line (see, for example, the entry for  $19^{177} - 1$ ).

The largest factor of  $a^n \pm 1$  may be found by division by the smaller factors. Thus, such factors are abbreviated. The notation  $p_{xy}$  or “p $xy$ ” means a prime factor of  $xy$  digits. For example, the prime 1238926361552897 might be abbreviated as p16. Similarly, the notation  $c_{xy}$  or “c $xy$ ” means a composite number of  $xy$  digits.

### 3. AVAILABILITY OF TABLES, UPDATES AND FACTORS

The changes since Update 2 are available by anonymous ftp from `ftp://ftp.comlab.ox.ac.uk/pub/Documents/techpapers/Richard.Brent/rpb134u3.txt.gz` (a compressed text file). This file includes comments on the person and method responsible for finding each factor (if there is no attribution, the factor was found by one of the authors).

For technical reasons, in this CWI Report we only give the complete Tables 13–, 13+, 99–, and 99+ for the original table range. The complete tables for  $13 \leq a < 100$  incorporating Updates 1–3, and a list of factors, are available online: see <http://www.comlab.ox.ac.uk/oucl/work/richard.brent/factors.html>. See also: <http://www.cwi.nl/ftp/herman/>

`Cunn2tot.txt.Z`. The restriction  $n \leq 100$  for bases  $a \geq 30$  has been relaxed in the Oxford tables; there it is only required that  $a^n < 10^{255}$ . For this extended table range, the smallest composite has 102 digits.

#### 4. FACTORIZATION METHODS

Since Update 2 we have attempted to factor the remaining composite numbers in the tables by using the *elliptic curve method* (ECM). Sometimes ECM is successful in finding one or more factors. If the factorization can not be completed by ECM, but the remaining composite part is sufficiently small, we use the *multiple polynomial quadratic sieve* (MPQS) method to complete the factorization. In some cases we prefer to use the *number field sieve* (NFS) if it is predicted to be faster than MPQS<sup>3</sup>.

We do not describe ECM, MPQS or NFS here. The reader should refer to [16, 17, 19] for a general description of ECM, to [2, 23] for MPQS, and to [15, 13, 21] for NFS. A recent survey is [7]. The particular implementations of ECM by Brent and Montgomery are described in [6, 18].

Table 3 shows the number of factors found by several methods in the preparation of Updates 1–3. For ECM and MPQS these only include penultimate factors of at least 30 digits. An increase in the use of SNFS and decline in the use of Pollard’s  $p \pm 1$  methods [22] is evident. There is also a marked increase in the number of large (at least 30-digit) factors found by ECM. Most of the new factors found by MPQS and SNFS are large because these methods are only used after ECM has been tried. In fact, since Update 2, MPQS and SNFS did not find any factor with less than thirty digits, because such factors had already been found by ECM. The largest factor found by ECM was a 52-digit factor of  $96^{98} + 1$  (see [5]).

Table 3: Factors Found by Different Methods

	Pollard $p - 1$	Pollard $p + 1$	ECM (30D+)	MPQS (30D+)	NFS
Update 1	38	16	69	157	37
Update 2	0	3	151	155	136
Update 3	0	3	423	129	279

#### 5. FIRST HOLES

A “first hole” is the first composite number occurring in a table. Thus, each table of factorizations is complete up to, but not including, its first hole. Table 4 lists the exponents of the current first holes for  $2 \leq a < 100$  (the range  $2 \leq a \leq 12$  is included for the sake of comparison). For example, the first holes in the tables for  $a = 17$  occur for exponents 137 and 118. In fact, first holes such as  $17^{118} + 1 = 2 \cdot 5 \cdot 29 \cdot 7789 \cdot c_{139}$  are good candidates for factorization by SNFS.

---

<sup>3</sup>The choice depends upon the size of the known non-algebraic factors of the number  $a^n \pm 1$ . We normally use the *special* number field sieve (SNFS), but in at least one case ( $17^{186} + 1$ ) the *general* number field sieve (GNFS) was used (a contribution by Couveignes, Granboulan, Hoogvorst and Nguyen).

Table 4: Exponents of First Holes for  $2 \leq a \leq 99$ 

$a$	-	+	$a$	-	+	$a$	-	+	$a$	-	+
2	641	617	3	379	382	5	307	283	6	251	232
7	227	214	10	197	223	11	191	181	12	173	172
13	161	151	14	149	134	15	127	122	17	137	118
18	131	121	19	155	113	20	149	106	21	125	128
22	103	116	23	101	101	24	101	107	26	107	103
28	103	106	29	101	112	30	103	103	31	97	113
33	103	89	34	103	101	35	97	103	37	89	97
38	101	86	39	89	89	40	97	97	41	101	89
42	115	86	43	101	89	44	103	94	45	83	92
46	101	82	47	89	86	48	107	94	50	89	97
51	97	83	52	83	82	53	89	88	54	107	79
55	107	86	56	83	79	57	83	79	58	83	76
59	97	79	60	79	86	61	79	94	62	79	82
63	83	83	65	79	79	66	97	86	67	83	82
68	79	76	69	83	83	70	83	89	71	89	76
72	79	83	73	79	83	74	89	82	75	79	79
76	103	79	77	89	86	78	79	79	79	97	83
80	83	82	82	83	79	83	79	82	84	79	76
85	83	76	86	79	79	87	97	83	88	79	92
89	83	83	90	83	79	91	83	92	92	83	82
93	79	82	94	79	76	95	79	79	96	83	79
97	83	82	98	95	79	99	89	88			

## 6. PROBABLE PRIMES

Numbers listed as prime have not in all cases been rigorously proved to be prime; they may merely have passed a probabilistic primality test [14]. There is a positive but extremely small probability that a composite number will pass such a test and be mistaken for a prime. In applications where it is essential for primality to be proven rigorously, one should apply an algorithm such as Morain's elliptic curve primality test [1, 20], which can easily prove or disprove the primality of numbers of the size considered here.

## ACKNOWLEDGEMENTS

We thank the people mentioned on the title page for their assistance since Update 2. In particular, Robert Silverman helped eliminate many first holes.

Thanks to Franz-Dieter Berger, Anders Bjorn, Henk Boender, Arjen Bots, Lars Brunjes, John Cannon, Stephania Cavallar, Graeme Cohen, Conrad Curry, Thomas Denny, Bruce Dodson, Harvey Dubner, Robert Dubner, Will Edgington, Jens Franke, Torbjorn Granlund, Uwe Hollerbach, Marije Huizing, Wilfrid Keller, Yuji Kida, Hidenori Kuwakado, Samuli Larvala, Joseph Leherbauer, Arjen Lenstra, Paul Leyland, Walter Lioen, Hisanori Mishima, Peter Moore, Mitsuo Morimoto, Andreas Müller, Henrik Olsen, John Pollard, Hans Riesel, David Rusin, George Sassoon (Mullfac), Robert Silverman, Thomas Sosnowski, Allan Steel,

Andrew Steward, Samuel Wagstaff, Georg Wambach, Damian Weber, Michael Wiener, Hugh Williams, Aiichi Yamasaki, Paul Zimmermann, and anyone inadvertently omitted from this list, for sending us factors or assisting in other ways.

The Australian National University Supercomputer Facility provided computer time to run the first author's ECM programs on a Fujitsu VP 2200/10 vector processor and an SGI Power Challenge. The ANU-Fujitsu CAP Research Project provided time on a Fujitsu AP 1000.

The Oxford Supercomputing Centre provided time to run the first author's ECM programs on *Oscar*, an SGI Origin 2000.

The Dutch National Computing Facilities Foundation provided computer time to run the programs of Boender, Elkenbracht-Huizing, Montgomery, and te Riele.

Many runs with ECM, MPQS and SNFS were carried out on workstations at CWI and Leiden University. We are grateful to the workstation "owners" at CWI and Leiden University for letting us use their idle cycles for this project.



## References

1. A. O. L. Atkin and F. Morain, *Elliptic curves and primality proving*, Math. Comp. **61** (1993), 29–68.
2. H. Boender and H. J. J. te Riele, Factoring integers with large prime variations of the quadratic sieve, *Experimental Mathematics* 5 (1996), 257–273.
3. W. Bosma and J. Cannon, *Handbook of Magma Functions*, School of Mathematical Sciences, Univ. of Sydney, January 1996. See also the *Magma home page*: <http://www.maths.usyd.edu.au/comp/magma/Overview.html> .
4. R. P. Brent, *On computing factors of cyclotomic polynomials*, Math. Comp. **61** (1993), 131–149.
5. R. P. Brent, *Large factors found by ECM*, Computer Sciences Laboratory, Australian National Univ., Canberra, December 1995. Revision available from <ftp://ftp.comlab.ox.ac.uk/pub/Documents/techpapers/Richard.Brent/champs.txt>
6. R. P. Brent, Factorization of the tenth Fermat number, *Mathematics of Computation*, 68 (1999), 429–451.
7. R. P. Brent, Recent progress and prospects for integer factorisation algorithms, *Computing and Combinatorics: Proc. Sixth Annual International Computing and Combinatorics Conference* (Sydney, July 26–28, 2000), edited by D.-Z. Du, P. Eades, V. Estivill-Castro, X. Lin and A. Sharma, *Lecture Notes in Computer Science*, Vol. 1858, Springer-Verlag, Berlin, 2000, 3–22. Preliminary version available at <ftp://ftp.comlab.ox.ac.uk/pub/Documents/techpapers/Richard.Brent/rpb196tr.ps.gz>
8. R. P. Brent and H. J. J. te Riele, *Factorizations of  $a^n \pm 1$ ,  $13 \leq a < 100$* , Report NM-R9212, Department of Numerical Mathematics, Centrum voor Wiskunde en Informatica, Amsterdam, June 1992, v+363pp. [ftp://ftp.comlab.ox.ac.uk/pub/Documents/techpapers/Richard.Brent/rpb134\\*.gz](ftp://ftp.comlab.ox.ac.uk/pub/Documents/techpapers/Richard.Brent/rpb134*.gz)
9. R. P. Brent, P. L. Montgomery and H. J. J. te Riele, *Update 1 to: Factorizations of  $a^n \pm 1$ ,  $13 \leq a < 100$* , Report NM-R9419, Centrum voor Wiskunde en Infor-

- matica, Amsterdam, September 1994, iv+42pp. [ftp://ftp.comlab.ox.ac.uk/pub/Documents/techpapers/Richard.Brent/rpb134u1.\\*.gz](ftp://ftp.comlab.ox.ac.uk/pub/Documents/techpapers/Richard.Brent/rpb134u1.*.gz) and <ftp://ftp.cwi.nl/pub/CWIreports/NW/NM-R9419.ps.Z>
10. R. P. Brent, P. L. Montgomery and H. J. J. te Riele, *Factorizations of  $a^n \pm 1$ ,  $13 \leq a < 100$ : Update 2*, Report NM-R9609, CWI, Amsterdam, March 1996, viii+42pp. [ftp://ftp.comlab.ox.ac.uk/pub/Documents/techpapers/Richard.Brent/rpb134u2.\\*.gz](ftp://ftp.comlab.ox.ac.uk/pub/Documents/techpapers/Richard.Brent/rpb134u2.*.gz) and <ftp://ftp.cwi.nl/pub/CWIreports/NW/NM-R9609.ps.Z>
  11. J. Brillhart, D. H. Lehmer, J. L. Selfridge, B. Tuckerman, and S. S. Wagstaff, Jr., *Factorizations of  $b^n \pm 1$ ,  $b = 2, 3, 5, 6, 7, 10, 11, 12$  up to high powers*, 2nd ed., Amer. Math. Soc., Providence, RI, 1988. Also various updates: see <http://www.cerias.purdue.edu/homes/ssw/cun/>.
  12. A. J. C. Cunningham and H. J. Woodall, *Factorisation of  $y^n \mp 1$ ,  $y = 2, 3, 5, 6, 7, 10, 11, 12$  up to high powers ( $n$ )*, Hodgson, London, 1925.
  13. R. M. Huizing, An implementation of the number field sieve, *Experimental Mathematics* **5** (1996), 231–253.
  14. D. E. Knuth, *The art of computer programming, Volume 2: Seminumerical algorithms* (third edition), Addison-Wesley, Menlo Park, CA, 1998.
  15. A. K. Lenstra and H. W. Lenstra, Jr. (editors), *The development of the number field sieve*, Lecture Notes in Mathematics **1554**, Springer-Verlag, Berlin, 1993.
  16. H. W. Lenstra, Jr., *Factoring integers with elliptic curves*, *Annals of Mathematics* (2) **126** (1987), 649–673.
  17. P. L. Montgomery, *Speeding the Pollard and elliptic curve methods of factorization*, *Math. Comp.* **48** (1987), 243–264.
  18. P. L. Montgomery, *An FFT extension of the elliptic curve method of factorization*, Ph. D. dissertation, Mathematics, University of California at Los Angeles, 1992.
  19. P. L. Montgomery, *A survey of modern integer factorization algorithms*, *CWI Quarterly* **7** (1994), 337–366.
  20. F. Morain, *Courbes elliptiques et tests de primalité*, Ph. D. thesis, Université Claude Bernard – Lyon I, France, 1990.
  21. B. Murphy, *Polynomial selection for the number field sieve integer factorisation algorithm*, Ph. D. thesis, Australian National University, Canberra, 1999.
  22. H. Riesel, *Prime numbers and computer methods for factorization*, 2nd edition, Birkhäuser, Boston, 1994.
  23. R. D. Silverman, *The multiple polynomial quadratic sieve*, *Math. Comp.* **48** (1987), 329–339.

## THE TABLES

For technical reasons, in this CWI Report we only give the example Tables 13<sup>-</sup>, 13<sup>+</sup>, 99<sup>-</sup>, and 99<sup>+</sup>. For pointers to online versions of the Tables 13<sup>-</sup>, 13<sup>+</sup>, 14<sup>-</sup>, . . . , 98<sup>+</sup>, 99<sup>-</sup>, 99<sup>+</sup>, see §3.

Table 13-

13	1-	2 <sup>2.3</sup>
13	3-	2 <sup>2.3</sup> <sup>2.61</sup>
13	5-	2 <sup>2.3</sup> .p5
13	7-	2 <sup>2.3</sup> .p7
13	9-	2 <sup>2.3</sup> <sup>3.61</sup> .p7
13	11-	2 <sup>2.3</sup> .23.419.859.p5
13	13-	2 <sup>2.3</sup> .53.264031.p7
13	15-	2 <sup>2.3</sup> <sup>2.61</sup> .4651.30941.p6
13	17-	2 <sup>2.3</sup> .103.443.p14
13	19-	2 <sup>2.3</sup> .12865927.p13
13	21-	2 <sup>2.3</sup> <sup>2.43</sup> .61.337.547.2714377.p7
13	23-	2 <sup>2.3</sup> .1381.p22
13	25-	2 <sup>2.3</sup> .701.9851.30941.p16
13	27-	2 <sup>2.3</sup> <sup>4.61</sup> .650971.1609669.p14
13	29-	2 <sup>2.3</sup> .1973.2843.3539.p21
13	31-	2 <sup>2.3</sup> .311.1117.p28
13	33-	2 <sup>2.3</sup> <sup>2.23</sup> .61.419.859.18041.p23
13	35-	2 <sup>2.3</sup> .211.30941.5229043.3357897971.p15
13	37-	2 <sup>2.3</sup> .1481.67495678093.4287755796749.p14
13	39-	2 <sup>2.3</sup> <sup>2.53</sup> .61.79.1093.4603.21841.264031.1803647.p14
13	41-	2 <sup>2.3</sup> .6740847065723.p32
13	43-	2 <sup>2.3</sup> .119627.p42
13	45-	2 <sup>2.3</sup> <sup>3.61</sup> .181.4651.30941.161971.1609669.p25
13	47-	2 <sup>2.3</sup> .183959.19216136497.p36
13	49-	2 <sup>2.3</sup> .1667.5229043.28082195177.p34
13	51-	2 <sup>2.3</sup> <sup>2.61</sup> .103.443.763879.15798461357509.p30
13	53-	2 <sup>2.3</sup> .107.194723.189541180943969.8403659652641423.p21
13	55-	2 <sup>2.3</sup> .23.419.859.2861.18041.30941.13545148572117361.p25
13	57-	2 <sup>2.3</sup> <sup>2.61</sup> .12865927.796956375829.9468940004449.p29
13	59-	2 <sup>2.3</sup> .273997.5311771.p53
13	61-	2 <sup>2.3</sup> .4027.4759.7687.27817.92110001.4672993939. 48401662036451.p20
13	63-	2 <sup>2.3</sup> <sup>3.43</sup> .61.127.337.547.6301.825679.1609669.2714377. 5229043.7327657.997294663.p13
13	65-	2 <sup>2.3</sup> .53.131.1171.30941.156131.264031.1803647. 71442881968439190301.p24
13	67-	2 <sup>2.3</sup> .586079017.1093561021297.1195860242597359.p38
13	69-	2 <sup>2.3</sup> <sup>2.61</sup> .139.1381.10903.282244620282733. 2519545342349331183143.p29
13	71-	2 <sup>2.3</sup> .6959.12923.201499.p65
13	73-	2 <sup>2.3</sup> .145009586102490829218552548223336637.p46
13	75-	2 <sup>2.3</sup> <sup>2.61</sup> .701.1951.4651.9851.30941.161971. 2752135920929651.p42
13	77-	2 <sup>2.3</sup> .23.419.859.18041.5229043.624958606550654822293.p47
13	79-	2 <sup>2.3</sup> .3793.16433.6709792556882923.p64
13	81-	2 <sup>2.3</sup> <sup>5.61</sup> .650971.1609669.57583418699431. 1102123844336048491.p42
13	83-	2 <sup>2.3</sup> .12451.1383113.p82
13	85-	2 <sup>2.3</sup> .103.443.30941.28152511.15798461357509.

- 11435433293542010176161611 . p39
- 13 87-  $2^2.3^2.61.1973.2843.3539.8527.846041103974872866961.808648601294417626878199. p35$
- 13 89-  $2^2.3.179.9257.716164560927079240026189379811. p62$
- 13 91-  $2^2.3.53.10193.34763.264031.1326781.1803647.5229043.72019220497491955875703699. p40$
- 13 93-  $2^2.3^2.61.311.1117.1303.6377362657.109711631401199502223.8170509011431363408568150369. p34$
- 13 95-  $2^2.3.191.27361.30941.4986361.12865927.9468940004449. p67$
- 13 97-  $2^2.3.389.971.93964390627. p91$
- 13 99-  $2^2.3^3.23.61.199.419.859.3169.18041.1609669.17551032119981679046729.2192746830056885246381227. p37$
- 13 101-  $2^2.3.1213. p109$
- 13 103-  $2^2.3.5563.9577825183.299872566772439874463.1493185475735966076741431. p56$
- 13 105-  $2^2.3^2.43.61.211.337.547.4651.30941.161971.2714377.5229043.3357897971.995277238201.707179356161321. p42$
- 13 107-  $2^2.3.2141.3286126349184953. p100$
- 13 109-  $2^2.3.1091.2617.794018567.7730096009. p96$
- 13 111-  $2^2.3^2.61.1481.67495678093.4287755796749.31964044249933.5897148699869174859194378551. p53$
- 13 113-  $2^2.3.1583.5651.114025363. p110$
- 13 115-  $2^2.3.1381.30941.3344431.1309485451.2519545342349331183143. p83$
- 13 117-  $2^2.3^3.53.61.79.1093.4603.21841.259507.264031.1519831.1609669.1803647.19440694027.57745124662681.462116939124761758477693. p35$
- 13 119-  $2^2.3.103.443.5229043.13883731.15798461357509.1251321793446942324872434004484031. p67$
- 13 121-  $2^2.3.23.419.859.18041.4911149.4161245903.1368405847627633. p92$
- 13 123-  $2^2.3^2.61.1340947.6740847065723.1374332707191583.763604898951326591407.34241383511160276465403.2500231913819762291766481. p32$
- 13 125-  $2^2.3.251.701.9851.30941.350101751.801560380001.2752135920929651. p89$
- 13 127-  $2^2.3.5912867.190421635185941.115806724907473978817. p100$
- 13 129-  $2^2.3^2.61.6451.119627.7180925126477041.43466212635494347.552781743698966779174737704265497702530829. p58$
- 13 131-  $2^2.3.263.135979.400852141. p129$
- 13 133-  $2^2.3.2129.5229043.12865927.9468940004449. p117$
- 13 135-  $2^2.3^4.61.181.2161.4651.30941.161971.203311.650971.1609669.57583418699431.2997534286720771645924621. p72$
- 13 137-  $2^2.3. p152$
- 13 139-  $2^2.3.62895574665131573770495625630815229. p119$
- 13 141-  $2^2.3^2.61.283.1693.183959.1924651.19216136497.455036140638637.534280344481909234853671069326391741. p76$
- 13 143-  $2^2.3.23.53.419.859.18041.264031.1803647.133419712999.140748861026489.34436567931553789.39826785573214737241.422385642452919347685571782874181. p40$
- 13 145-  $2^2.3.1973.2843.3539.30941.846041103974872866961.3331836160337746180840402301.573409492728603405512028102226141331. p62$

- 13 147-  $2^2.3^2.43.61.337.547.1667.2714377.5229043.28082195177.1303929619014323295195519453212113.p94$
- 13 149-  $2^2.3.2242046914771.p153$
- 13 151-  $2^2.3.2118633909226902785023835895222977.p134$
- 13 153-  $2^2.3^3.61.103.443.919.554167.763879.1609669.326881441.1814824801.15798461357509.1981729131748453.535301324317729848039542278039.p66$
- 13 155-  $2^2.3.311.1117.30941.100860853831.46458503064581.100889415553845820735921.8170509011431363408568150369.p86$
- 13 157-  $2^2.3.80071.27323390907418173038175977.p144$
- 13 159-  $2^2.3^2.61.107.19081.194723.189541180943969.8403659652641423.274690322498001718403.p112$
- 13 161-  $2^2.3.1381.3221.5229043.2519545342349331183143.c144$
- 13 163-  $2^2.3.8693117.1279033291.57483449583854824247.p145$
- 13 165-  $2^2.3^2.23.61.419.859.2861.4651.18041.30941.161971.13545148572117361.17551032119981679046729.8603427927040724342317061.3386047926964307416018724773840321.p56$
- 13 167-  $2^2.3.74016071.199494205465879.863628686858502013448191.c139$
- 13 169-  $2^2.3.53.677.264031.1803647.3221968439.200764162484293733261.586814952741629335333029441607.9678439913990009887548497710458137.p78$
- 13 171-  $2^2.3^3.61.1609669.10692289.12865927.796956375829.9468940004449.1707914176047127.11579626908585447176195979823.14654187650846568795703728901.p70$
- 13 173-  $2^2.3.347.113489.481633.p179$
- 13 175-  $2^2.3.211.701.9851.30941.667801.5229043.3357897971.6960114001.707179356161321.2752135920929651.15320444013418579351.97940332989443462362601.1534984704054820657287614317690451.p43$
- 13 177-  $2^2.3^2.61.1063.273997.5311771.274985077.210439555242381217.39514351240970968031506068648339967.30233706222041559662776806806113588758534692993333729.p66$
- 13 179-  $2^2.3.68014208993.p188$
- 13 181-  $2^2.3.5431.23531.30047.423541.32598463.1244504930700295881445351.c151$
- 13 183-  $2^2.3^2.61^2.367.4027.4759.7687.27817.92110001.4672993939.6274983367069.48401662036451.71639002544177046079.87103671046409436847.417324063726420174777931.715867003033745576109669960047077.p41$
- 13 185-  $2^2.3.1481.30941.30594191.67495678093.355505024671.4287755796749.6934871644321.26101416485231.31964044249933.p116$
- 13 187-  $2^2.3.23.103.419.443.859.18041.28123679.15798461357509.445536601753454704112226421.p145$
- 13 189-  $2^2.3^4.43.61.127.337.547.757.6301.650971.825679.1609669.2714377.5229043.7327657.997294663.203865063949.2617880963923.57583418699431.91323298699395463.56199108572218966663.p70$
- 13 191-  $2^2.3.3674491999.34115367574721.84897381032489674968541203989617.p157$

- 13 193-  $2^2.3.27281323.223486667.1468937560453708434469.c177$
- 13 195-  $2^2.3^2.53.61.79.131.1093.1171.4603.4651.21841.30941.156131.161971.264031.1302991.1803647.8078071.56253601.743408641.57745124662681.5234176303106791.71442881968439190301.158943831041162255277151.2794855972087224486028011777601.p32$
- 13 197-  $2^2.3.81559.c214$
- 13 199-  $2^2.3.797.5573.94327.1562947.21460559.60144579533.2822026772941.704550879887947.c158$
- 13 201-  $2^2.3^2.61.1609.586079017.1093561021297.1195860242597359.14137511716656949.46832111174371450604616850217838043873.c128$
- 13 203-  $2^2.3.1973.2843.3539.82013.1050323.5229043.11878648531.615557670589.846041103974872866961.p155$
- 13 205-  $2^2.3.1231.3691.30941.6740847065723.143207110374732650171977021.58047259977349384372529747126587.p146$
- 13 207-  $2^2.3^3.61.139.1381.10903.1609669.39674449.1598219928127.282244620282733.2519545342349331183143.22271867346104672186904295489.p128$
- 13 209-  $2^2.3.23.419.859.18041.12865927.50792017.864962803.50273133791.9468940004449.c174$
- 13 211-  $2^2.3.318872063.453216197376414128940399015272903.c193$
- 13 213-  $2^2.3^2.61.6959.12923.201499.8227339.39355159.5990431171.24385215615829.34078015035971503.504649541791910254264659793435883391598383106891.1016705137474747135476535700217615993757244294651630647.p65$
- 13 215-  $2^2.3.30941.119627.1395397213914606731.552781743698966779174737704265497702530829.c169$
- 13 217-  $2^2.3.311.1117.16493.5229043.436265047.506813917.8170509011431363408568150369.c179$
- 13 219-  $2^2.3^2.61.439.1024921.1762236499.145009586102490829218552548223336637.1194776740722409996051132396456283691052300333.c143$
- 13 221-  $2^2.3.53.103.443.77351.264031.1803647.710581301.3890188303.15798461357509.7720293918867096427863843822346904850820471837355601107472627048_71450490130127391654067619897.p98$
- 13 223-  $2^2.3.6691.883973.609240789000934129655613721.c211$
- 13 225-  $2^2.3^3.61.181.701.1951.4651.9851.30941.161971.1609669.1711042515451.2752135920929651.2997534286720771645924621.185129510660424877123166434146327362331151.c122$
- 13 227-  $2^2.3.362293.433117.c241$

Table 13+

13	1+	2.7
13	2+	2.5.17
13	3+	2.7.157
13	4+	2.p5
13	5+	2.7.11.2411
13	6+	2.5.17.p5
13	7+	2.7 <sup>2</sup> .29.p5
13	8+	2.p9
13	9+	2.7.19.157.271.937
13	10+	2.5 <sup>2</sup> .17.421.601.641
13	11+	2.7.p12
13	12+	2.14281.p9
13	13+	2.7.13417.20333.p5
13	14+	2.5.17.p14
13	15+	2.7.11.31.157.2411.p8
13	16+	2.2657.441281.p9
13	17+	2.7.p18
13	18+	2.5.17.37.28393.428041.p7
13	19+	2.7.p21
13	20+	2.41.14281.29881.p12
13	21+	2.7 <sup>2</sup> .29.157.463.22079.p11
13	22+	2.5.17.5281.p19
13	23+	2.7.47.277.1151.2347.p14
13	24+	2.1009.407865361.p15
13	25+	2.7.11.101.2411.57751.p16
13	26+	2.5.17.380329.p22
13	27+	2.7.19.157.163.271.937.904663.p12
13	28+	2.113.14281.p25
13	29+	2.7.59.1741.8546789918171.p14
13	30+	2.5 <sup>2</sup> .17.421.601.641.28393.460655521.p10
13	31+	2.7.373.2729.145831193.p20
13	32+	2.193.1601.10433.p26
13	33+	2.7.67.157.331.1123.6997.122167.960961.p12
13	34+	2.5.17 <sup>2</sup> .1021.897329.61165661.75094577.p10
13	35+	2.7 <sup>2</sup> .11.29.71.2411.22079.654221.759641.p14
13	36+	2.73.4177.14281.181297.815702161.p16
13	37+	2.7.223.21017.152219.1548921490187.p17
13	38+	2.5.17.229.94621.p33
13	39+	2.7.157.13417.20333.79301.p27
13	40+	2.407865361.p36
13	41+	2.7.83.638453.140299545168523469.p20
13	42+	2.5.17.673.2857.4621.28393.23161037562937.p17
13	43+	2.7.173.12566837.8001003293.346982008721.p16
13	44+	2.89.6073.14281.p39
13	45+	2.7.11.19.31.157.271.937.2251.2411.12601.28325071.p20
13	46+	2.5.17.461.160081.159686609.1445443990517.p21
13	47+	2.7.498851139881.p40
13	48+	2.97.2657.88993.441281.283763713.127028743393.p18
13	49+	2.7 <sup>3</sup> .29.22079.435709.22896329.54461639.p26



- 13 50+ 2.5<sup>3</sup>.17.421.601.641.1253653901.26771688828701.p22
- 13 51+ 2.7.157.617886851384381281.p36
- 13 52+ 2.14281.86113.2176307537.224277684782113.p25
- 13 53+ 2.7.3499.7504072417.202326783229.37379721025854083.p17
- 13 54+ 2.5.17.37.109.28393.428041.1471069.16764949.4220430741361.p19
- 13 55+ 2.7.11<sup>2</sup>.2411.53681.128011456717.4122652482568228291.p21
- 13 56+ 2.407865361.17254637799169.p41
- 13 57+ 2.7.157.845083.2657518772948983.6061387217546931661.p21
- 13 58+ 2.5.17.233.20970714732554798304809.p38
- 13 59+ 2.7.5783.p61
- 13 60+ 2.41.4441.8161.14281.29881.217561.815702161.543124566401.p23
- 13 61+ 2.7.6024266671.298681203493.1535617756259.p34
- 13 62+ 2.5.17.1861.1178621.48534593.111109852618983753193.p30
- 13 63+ 2.7<sup>2</sup>.19.29.157.271.463.937.22079.11032183.704972647.  
54165939703.p25
- 13 64+ 2.257.3230593.36713826768408543617.p43
- 13 65+ 2.7.11.2411.13417.16381.20333.79301.3808876542352598861.p31
- 13 66+ 2.5.17.5281.28393.37869877.23057835113017.  
3577574298489429481.p24
- 13 67+ 2.7.269.4021.138959.28376556792667.p49
- 13 68+ 2.137.409.14281.63104137.p59
- 13 69+ 2.7.47.157.277.1151.2347.7039.84801400975699.p46
- 13 70+ 2.5<sup>2</sup>.17.421.601.641.23161037562937.p54
- 13 71+ 2.7.532615479720542238328159944384931.p46
- 13 72+ 2.1009.3889.680401.407865361.29975087953.659481276875569.  
6654909974864689.p18
- 13 73+ 2.7.45553.64803179963.p65
- 13 74+ 2.5.17.149.1738568407946597.p63
- 13 75+ 2.7.11.31.101.151.157.2411.11551.57751.2113801.28325071.  
966623849742301.3258254426373251.p18
- 13 76+ 2.761.2281.14281.692513.62300665486585624081.p49
- 13 77+ 2.7<sup>2</sup>.29.22079.78947177.128011456717.p59
- 13 78+ 2.5.17.313.1873.28393.380329.2874105113569.  
1418792215861230619657.p36
- 13 79+ 2.7.25202746699639.p74
- 13 80+ 2.2657.441281.444641.4335041.283763713.1116130730334721.  
1266394281048641.p29
- 13 81+ 2.7.19.157.163.271.937.30133.73387.904663.1094473.  
259640317.770321341.762615992953.p28
- 13 82+ 2.5.17.1089083758501.1508425553233.p65
- 13 83+ 2.7.167.499.p87
- 13 84+ 2.113.14281.815702161.213867479113.2341071239305009.  
4803378460849459680406337.p27
- 13 85+ 2.7.11.1361.2411.617886851384381281.p69
- 13 86+ 2.5.17.2753.748717.3605871444392247654973.  
14704313671678643430446722121.p35
- 13 87+ 2.7.59.157.1741.45353101.8546789918171.16397414286709.  
388719701504541540919.p35
- 13 88+ 2.4049.407865361.479397861182521358407441.  
1358999792679530608571000081.p35
- 13 89+ 2.7.21001153.2197020880176009487.

- 410771620528283009753757952793.p43
- 13 90+ 2.5<sup>2</sup>.17.37.421.601.641.28393.428041.1471069.460655521.  
1453046401.14513462249341141.p38
- 13 91+ 2.7<sup>2</sup>.29.4733.13417.20333.22079.79301.6176383648709.  
244409090738941856729.p44
- 13 92+ 2.1657.14281.10093085551851597657003882281641.  
13083857523758118007762301611817.p33
- 13 93+ 2.7.157.373.2729.23623.145831193.16389023943543602257.p63
- 13 94+ 2.5.17.36097.75389.99886248944632632917.p74
- 13 95+ 2.7.11.2411.19755615371.3657554614741.5810151294071.  
104422877883960436477.p45
- 13 96+ 2.193.1153.1601.10433.68675120456139881482562689.  
11352931040252580224415980746369.p38
- 13 97+ 2.7.404094629.p99
- 13 98+ 2.5.17.197.2710681.4478993.49517833.139310921.  
4980348180221.23161037562937.p50
- 13 99+ 2.7.19.67.157.271.331.937.1123.6997.122167.960961.  
262119133.626133421.128011456717.p50
- 13 100+ 2.41.7001.14281.29881.128245657201.543124566401.  
38245779934601.538823041855601.52008826491976715201.p27
- 13 101+ 2.7.3327037444864439.7425107270430419.  
9320615531279027221853.14560861044113847497319380951.p30
- 13 102+ 2.5.17<sup>2</sup>.1021.28393.897329.1886389.61165661.75094577.  
718862341.6152936617.229090993311472339969.p36
- 13 103+ 2.7.619.89611.1450447.89433871.592045971390131.  
147258804290600290058437.p54
- 13 104+ 2.3329.407865361.161343579388091039418006351540289.p72
- 13 105+ 2.7<sup>2</sup>.11.29.31.71.157.463.2411.22079.654221.759641.1759171.  
28325071.54165939703.16566575194331.30152259698778631.p31
- 13 106+ 2.5.17.1061.2034766409871541.55315179851718646236650521.  
1331344930977110852021126518627097.p39
- 13 107+ 2.7.6053633.116077045829.791958624719.p89
- 13 108+ 2.73.433.1297.4177.14281.181297.14799457.815702161.  
9818892432332713.3156176124992605532414981091253561.p34
- 13 109+ 2.7.29867.965087.36081138446572828651824827033.p82
- 13 110+ 2.5<sup>2</sup>.17.421.601.641.661.5281.4439770467824561.  
3577574298489429481.202254724516962030101.p51
- 13 111+ 2.7.157.223.21017.152219.1548921490187.10626791079749447.  
3832014914233819776114475402917811351.p44
- 13 112+ 2.2657.441281.283763713.p107
- 13 113+ 2.7.227.9719.1267183.2158975289.4427870101287797057.  
852333015613949705733446242454881.p52
- 13 114+ 2.5.17.229.28393.94621.452660103574249.  
30746232270870161677690909.  
580196961910046805312944783240761.p41
- 13 115+ 2.7.11.47.277.1151.2347.2411.84801400975699.p99
- 13 116+ 2.14281.52201.1142833.9705011473.11779246681.3201194517593.p82
- 13 117+ 2.7.19.157.271.937.13417.20333.79301.5621617.5786353.  
162837793.584288727345658049575114801.p59
- 13 118+ 2.5.17.709.3541.115877.118137589.3172190933.p101
- 13 119+ 2.7<sup>2</sup>.29.239.22079.172597045223.2534279978077.

- 2810860561573.617886851384381281.p69
- 13 120+ 2.241.1009.407865361.1030309681.2643964801.659481276875569.  
442779263234039928595359287744639041.p51
- 13 121+ 2.7.8713.131891.1801207.2644917463.128011456717.  
236537675815901485856148017522791.p66
- 13 122+ 2.5.17.8626498609074269149060403255784440097670457.p91
- 13 123+ 2.7.83.157.739.638453.247072069.140299545168523469.  
45111380897407574171.915180098788603185080359.p54
- 13 124+ 2.14281.111072257.189616769827415561.304200083494791049.p91
- 13 125+ 2.7.11.101.2411.8501.57751.873251.4831140001.  
3258254426373251.1047326688430383001.p74
- 13 126+ 2.5.17.37.673.2857.4621.15373.28393.428041.1471069.  
23161037562937.61452748127532301.  
1149869468581335216529112593.p49
- 13 127+ 2.7.  
6873040591530484446826717330003603147955905895870249645702015964\_  
37.  
p75
- 13 128+ 2.96769.2940673.p131
- 13 129+ 2.7.157.173.12566837.7825170961.8001003293.346982008721.  
9391016904700369.4048619615131328239.p66
- 13 130+ 2.5^2.17.421.521.601.641.380329.5218721.6691361.  
1418792215861230619657.72395677076468070119906108281513841.p56
- 13 131+ 2.7.1049.138599.p137
- 13 132+ 2.89.6073.7129.14281.815702161.134799670920553.  
668229430151772307653060812800711311233.p72
- 13 133+ 2.7^2.29.22079.579016463719.104422877883960436477.  
7983601174254569126173.p87
- 13 134+ 2.5.17.117628061579381.597891861167008906854329.  
208987627610561976973469464852117.p77
- 13 135+ 2.7.11.19.31.157.163.271.937.2251.2411.9181.12601.904663.  
28325071.762615992953.4971111387529339441.  
19145097390154976011.p58
- 13 136+ 2.407865361.2101969584130840266612144288141743329.  
17915834850330581667260806159243454369619165933658481.p55
- 13 137+ 2.7.1714667341.22221138052054464059847263.  
252135148303109236253632457534648757143.  
315763309485400584429158395865631317867.p40
- 13 138+ 2.5.17.461.28393.160081.159686609.1445443990517.  
6533247341521.602053110178724749481.  
54836637716450236990971812089.p57
- 13 139+ 2.7.245753.18466388799146717978191.p127
- 13 140+ 2.41.113.281.14281.29881.175362601.960991081.543124566401.  
18603406827218262281.4803378460849459680406337.p68
- 13 141+ 2.7.157.498851139881.590202369266263393.  
3245178229485124818467952891417691434077.p85
- 13 142+ 2.5.17.569.853.8237.869893.1863893.9598349.  
1187807331749399825071347132433.p98
- 13 143+ 2.7.8009.13417.20333.79301.120121.64050562577.128011456717.  
26955750986564813756380111933.p86
- 13 144+ 2.97.2017.2657.47521.54721.88993.441281.1590049.283763713.

- 127028743393.403791981344275297.  
8299042833797200969471889569.p61
- 13 145+ 2.7.11.59.1741.2411.7634343961.8546789918171.  
16397414286709.943112272332884711.117977510451276076784741.p74
- 13 146+ 2.5.17.293.466462905277.  
301557549694923141366115643799231359796226965278135642569.p90
- 13 147+ 2.7<sup>3</sup>.29.157.463.22079.435709.22896329.54461639.1314082687.  
17712284017.54165939703.14790290915806570339477.  
16049801116294358590175881.p53
- 13 148+ 2.3257.14281.12716161.560678027993.p139
- 13 149+ 2.7.2683.2178083.p156
- 13 150+ 2.5<sup>3</sup>.17.421.601.641.28393.460655521.1253653901.1453046401.  
20858983540201.26771688828701.2152338940237584453701.p76
- 13 151+ 2.7.49529.3457568707.2462954753131.c141
- 13 152+ 2.407865361.p161
- 13 153+ 2.7.19.157.271.307.937.1872876367.8122054267.936052510699.  
15840010226107.617886851384381281.  
476622264829847630603684799705499201.p61
- 13 154+ 2.5.17.5281.7393.1702933.150324329.23161037562937.  
718377597171850001.3577574298489429481.  
4209006442599882158485591696242263069.p61
- 13 155+ 2.7.11.373.2411.2729.24181.11268811.145831193.42277560371.  
151091386477111.13496217990809681.16389023943543602257.  
44630257194378716844161.p59
- 13 156+ 2.14281.86113.815702161.2176307537.224277684782113.  
7009558351001043033313937.  
14269421767320773422797054675027409.p73
- 13 157+ 2.7.1571.9421.1579421.1302884463846205672630741.  
5321704544480702707255714477.42086256219133569812191465703.p80
- 13 158+ 2.5.17.317.p172
- 13 159+ 2.7.157.3499.76003.7504072417.202326783229.1462139329561.  
37379721025854083.39349502420618381.  
197795581824045269616226824820047463.p64
- 13 160+ 2.193.1601.10433.96001.68675120456139881482562689.c138
- 13 161+ 2.7<sup>2</sup>.29.47.277.1151.2347.22079.84801400975699.  
105533603618353.c134
- 13 162+ 2.5.17.37.109.28393.428041.1471069.16764949.303474601.  
29320472989.4220430741361.1639740678532467913.p102
- 13 163+ 2.7.653.7499.231461.15018169.2756901479.  
2551939308888735197.3645787857397596049.  
346453308677790002393.p95
- 13 164+ 2.14281.c179
- 13 165+ 2.7.11<sup>2</sup>.31.67.157.331.1123.2411.6997.53681.58411.82171.  
122167.960961.28325071.128011456717.396089529902881.  
4122652482568228291.159781905331924011841.p65
- 13 166+ 2.5.17.1993.417489312958537.712503393203262887688109.c141
- 13 167+ 2.7.c185
- 13 168+ 2.1009.407865361.16425059281.17254637799169.  
659481276875569.17075564227260177641438981577201118063969.p97
- 13 169+ 2.7.4057.13417.20333.79301.p171
- 13 170+ 2.5<sup>2</sup>.17<sup>2</sup>.421.601.641.1021.48281.897329.3553001.61165661.

- 75094577.4246832221.6152936617.4618988261621.  
130262335782633067441.p89
- 13 171+ 2.7.19<sup>2</sup>.157.271.937.845083.3300771062593.2657518772948983.  
110463092370899893.170627672083045501.6061387217546931661.  
104422877883960436477.p73
- 13 172+ 2.14281.17923777.866662249.149170984032147278296821073.c145
- 13 173+ 2.7.100512721293404023.33244834894845209424542011.c150
- 13 174+ 2.5.17.233.349.2437.28393.1321357.14114031000998557.  
20970714732554798304809.18178782258903260081683549.  
4560345610457374306086188377621.  
48898592536658682820603047728758723297.p41
- 13 175+ 2.7<sup>2</sup>.11.29.71.101.2411.16451.22079.57751.654221.759641.  
16566575194331.3258254426373251.  
132535660270668350675597927401.  
302595407569313485796560805198699713897070701.p56
- 13 176+ 2.353.2657.441281.15020897.21068609.283763713.  
19395547354657.29919435299224417.161812513752466240577.c112
- 13 177+ 2.7.157.4957.5783.8378827.  
6521936381117722253551175198473042077230030832125770878689819.  
p119
- 13 178+ 2.5.17.6053.929585777.c184
- 13 179+ 2.7.359.1433.39062813.p185
- 13 180+ 2.41.73.4177.4441.8161.14281.29881.181297.217561.815702161.  
543124566401.9818892432332713.56156144390197362704881.p107
- 13 181+ 2.7.47324623.c193
- 13 182+ 2.5.17.337793.380329.23161037562937.1418792215861230619657.c155
- 13 183+ 2.7.157.6024266671.298681203493.1535617756259.  
5880679831907887.51880092713072077.  
2306860055683352406587860779838313.p102
- 13 184+ 2.407865361.7911246015404132480993.c175
- 13 185+ 2.7.11.223.2411.21017.152219.888577614401.1548921490187.  
1614630622391.10626791079749447.c137
- 13 186+ 2.5.17.1861.28393.1178621.48534593.111109852618983753193.  
576918426137514613314253213249.p134
- 13 187+ 2.7.10847.421211143.21903343661.128011456717.  
367934980978027.617886851384381281.p141
- 13 188+ 2.14281.41737.553784729353.188172028979257.  
398225319299696783138113.7663511503164270157006126605793.c120
- 13 189+ 2.7<sup>2</sup>.19.29.157.163.271.379.463.937.22079.904663.11032183.  
704972647.54165939703.762615992953.5588363607297409.  
1626764139744163077191689.4948493178819470211350281226827.p72
- 13 190+ 2.5<sup>2</sup>.17.229.421.601.641.94621.  
22000710008560364143650941501.  
580196961910046805312944783240761.p133
- 13 191+ 2.7.383.c210
- 13 192+ 2.257.3230593.36713826768408543617.  
3215877717636198473712500018174097551256193.p143
- 13 193+ 2.7.146540934096087353.c197
- 13 194+ 2.5.17.289837.1180346441.2249753895467636981.p181
- 13 195+ 2.7.11.31.157.2411.13417.16381.20333.70981.79301.28325071.  
3808876542352598861.584288727345658049575114801.

- 5085423411603888410443263272201.p103
- 13 196+ 2.113.14281.115249.11096942977.375644987843497.  
42780848865255089.39174253999996064489.  
4803378460849459680406337.c122
- 13 197+ 2.7.21277.611873120423.c203
- 13 198+ 2.5.17.37.397.5281.28393.341749.428041.1471069.37869877.  
23057835113017.3577574298489429481.  
416086662911383416679189.p126
- 13 199+ 2.7.2634761.36130441.602884829.250480083153607.c184
- 13 200+ 2.401.1201.407865361.45604314401.10381913540858401.  
689249499714233698770401.  
442779263234039928595359287744639041.p123
- 13 201+ 2.7.157.269.4021.138959.556942300417.3215553577393.  
28376556792667.  
7213463499437577647267326183042302804613669934521.p123
- 13 202+ 2.5.17.809.20201.4778818919489153480993.  
20307225713395144899769.p172
- 13 203+ 2.7<sup>2</sup>.29<sup>2</sup>.2.59.1741.22079.11367371513.29216756731.  
8546789918171.16397414286709.14913858445348196461.c147
- 13 204+ 2.137.409.14281.63104137.815702161.4681059934921.  
55444393239496164406865681531894115168657269299195964355161.  
p130
- 13 205+ 2.7.11.83.2411.638453.1114694881.8325373081.33639770611.  
19643811777631.140299545168523469.45111380897407574171.p136
- 13 206+ 2.5.17.1237.2473.169156125029.c210
- 13 207+ 2.7.19.47.157.271.277.829.937.1151.2347.7039.20287.  
84801400975699.  
1577551654677578101258914545922231304801732231.p140
- 13 208+ 2.2657.145601.441281.283763713.p209
- 13 209+ 2.7.128011456717.104422877883960436477.p201
- 13 210+ 2.5<sup>2</sup>.17.421.601.641.673.2857.4621.28393.460655521.  
1453046401.23161037562937.61452748127532301.  
296376064934132422053161022580730249078367228427198561.p107
- 13 211+ 2.7.330963403934881.179988350604280470445878376547.c191
- 13 212+ 2.14281.92009.18464777.84863647489.  
296102253960054265850194729.4000741506474775723055096281.c155
- 13 213+ 2.7.157.149191250053.36136869058233840897019.  
3635675840331161742297981783031.  
96292821127287236064998822696599.  
532615479720542238328159944384931.  
1649818592952900908784269998191033146612006407.p60
- 13 214+ 2.5.17.857.21401.18470838679921.2458739964418553.c201
- 13 215+ 2.7.11.173.431.2411.14621.12566837.1888302431.8001003293.  
346982008721.9391016904700369.370696297879940727105731.p148
- 13 216+ 2.1009.3889.53569.680401.52883713.407865361.29975087953.  
659481276875569.923563008624961.6654909974864689.  
558181416418089697.p133
- 13 217+ 2.7<sup>2</sup>.29.373.2729.11719.22079.145831193.  
16389023943543602257.27340842173064358257699651251.  
9265063882320201898324947759713.p138
- 13 218+ 2.5.17.p241

- 13 219+ 2.7.157.45553.64803179963.110628894631.  
5030641640221783826510884729079173775636718045309795338674775249\_  
9.  
p150
- 13 220+ 2.41.89.881.6073.14281.29881.39161.4476745241.543124566401.  
668229430151772307653060812800711311233.c162
- 13 221+ 2.7.13417.20333.23869.79301.741677.1566449.194388949.  
617886851384381281.1590964049817874064437613134993537.c156
- 13 222+ 2.5.17.149.6217.14653.28393.201091153.1738568407946597.  
596131104371449237.72899319864895280400157.  
120687541344843078804469.  
1438734846120969865240176038964493.  
186121273917021854408917552512305587532503574509.p63
- 13 223+ 2.7.13381.13163260466767.c231
- 13 224+ 2.193.449.1601.10433.83777.114689.58317286721.  
10199228225275634431937.10759970447698109015939009.  
68675120456139881482562689.p144
- 13 225+ 2.7.11.19.31.101.151.157.271.937.2251.2411.11551.12601.  
57751.2113801.28325071.966623849742301.3258254426373251.  
101348453341211701.19145097390154976011.c134
- 13 226+ 2.5.17.3617.16273.23957.2245321301.c229
- 13 227+ 2.7.41050444705991995903280091731.c224
- 13 228+ 2.457.761.2281.14281.20521.692513.815702161.  
62300665486585624081.  
2135382121254983685021572341095722302254446826817.c154

For pointers to the Tables 14−, 14+, . . . , 98−, 98+, see §3.



Table 99-

99	1-	2.7 <sup>2</sup>
99	3-	2.7 <sup>2</sup> .9901
99	5-	2.7 <sup>2</sup> .p8
99	7-	2.7 <sup>3</sup> .12979.p8
99	9-	2.7 <sup>2</sup> .19 <sup>2</sup> .127.9901.p8
99	11-	2.7 <sup>2</sup> .397.p18
99	13-	2.7 <sup>2</sup> .53.131.157.p18
99	15-	2.7 <sup>2</sup> .9901.97039801.p16
99	17-	2.7 <sup>2</sup> .320417.4653343.p20
99	19-	2.7 <sup>2</sup> .571.39740734591141.p20
99	21-	2.7 <sup>3</sup> .43.9901.12979.10468417.p23
99	23-	2.7 <sup>2</sup> .30466170347.222628529119.p23
99	25-	2.7 <sup>2</sup> .97039801.5595086438943451.p25
99	27-	2.7 <sup>2</sup> .19 <sup>2</sup> .127.811.919.9901.20535283.30622807.p23
99	29-	2.7 <sup>2</sup> .523.162517.702787.175281266965559.p28
99	31-	2.7 <sup>2</sup> .39371.p56
99	33-	2.7 <sup>2</sup> .397.661.9901.1083721.230128580234081233.p32
99	35-	2.7 <sup>3</sup> .9241.12979.10468417.97039801.1516445266992375820241.p23
99	37-	2.7 <sup>2</sup> .p72
99	39-	2.7 <sup>2</sup> .53.79.131.157.9901.63495043.821456624786426851.p39
99	41-	2.7 <sup>2</sup> .83 <sup>2</sup> .76261.3036275993.p62
99	43-	2.7 <sup>2</sup> .1549.348207551.p73
99	45-	2.7 <sup>2</sup> .19 <sup>2</sup> .127.9901.20535283.97039801.3551863449061. 716359512559681.9134249824299601.p21
99	47-	2.7 <sup>2</sup> .p92
99	49-	2.7 <sup>4</sup> .12979.843781.6088153.10468417.10867907.p64
99	51-	2.7 <sup>2</sup> .9901.320417.4653343.57688814829868263071.p64
99	53-	2.7 <sup>2</sup> .107.118566886147247.p88
99	55-	2.7 <sup>2</sup> .397.42901.204601.97039801.230128580234081233. 327414198153783782669101.p47
99	57-	2.7 <sup>2</sup> .571.9901.1676029.39740734591141.37151009801325375691.p66
99	59-	2.7 <sup>2</sup> .1063.148537384959989.4631579044347830647.p80
99	61-	2.7 <sup>2</sup> .8663.27817.105653.238877.49036900943. 10527303441917105235878602048817.p60
99	63-	2.7 <sup>3</sup> .19 <sup>2</sup> .43.127.4789.9901.10333.12979.2729413.10468417. 20535283.193620897667.296323515978335648713. 20405404499169396293707.p26
99	65-	2.7 <sup>2</sup> .53.131.157.97039801.1734834401.821456624786426851. 550780160268332441039460497501.p57
99	67-	2.7 <sup>2</sup> .269.51134669.416950783.12756973500253. 3780574316663829815529867056872778269.p64
99	69-	2.7 <sup>2</sup> .139.9901.15878419.30466170347.222628529119. 536561938621.28820089845571.242460345918040491433. 11939460883273302109457.p33
99	71-	2.7 <sup>2</sup> .14627.158047.15490781.482044561.17179549507. 6787613924430123425819.2123069070360192515833718179.p56
99	73-	2.7 <sup>2</sup> .36793.3278172880914712338521191295531.p109
99	75-	2.7 <sup>2</sup> .151.9901.34784401.97039801.5595086438943451. 9134249824299601.1461830744902104296233051.p71

- 99 77-  $2.7^3.397.12979.5526137.10468417.113089684775453.$   
 $32982101201754013.230128580234081233.$   
 $8698520189091630442361145439816553.p49$
- 99 79-  $2.7^2.3319.6637.428023.853429417.$   
 $274512778508464216268280437477.$   
 $27100756722615202899087603064941702173.p67$
- 99 81-  $2.7^2.19^2.127.811.919.1621.9901.20535283.30622807.$   
 $36563868632477911923127.p105$
- 99 83-  $2.7^2.167.12119.106777977100687331.p141$
- 99 85-  $2.7^2.2551.3061.320417.4653343.97039801.410043401.$   
 $57688814829868263071.p113$
- 99 87-  $2.7^2.523.9901.57073.69427.162517.702787.175281266965559.$   
 $7281734814760575782986405667.p103$
- 99 89-  $2.7^2.1462102202783.983575267881704300649386383.c137$
- 99 91-  $2.7^3.53.131.157.1093.12979.721267.10468417.41256851819.$   
 $821456624786426851.p125$
- 99 93-  $2.7^2.9901.39371.876619.902007055801.229328611909843.$   
 $138083340352064818681.$   
 $18979663619975067593590717641897091789568243789952868031.p68$
- 99 95-  $2.7^2.571.3041.97039801.2334201491.25872120641.$   
 $39740734591141.37151009801325375691.207055472356835604911.p101$
- 99 97-  $2.7^2.30136543.222376963.89974471973.c165$
- 99 99-  $2.7^2.19^2.127.397.661.9901.251857.1083721.20535283.$   
 $47803141.230128580234081233.$   
 $11302545709649271048356758313821.p107$

Table 99+

99	1+	$2^2.5^2$
99	2+	$2.13^2.29$
99	3+	$2^2.5^2.31.313$
99	4+	$2.2617.p5$
99	5+	$2^2.5^3.p8$
99	6+	$2.13^2.29.p8$
99	7+	$2^2.5^2.p12$
99	8+	$2.17.1553.250993.p6$
99	9+	$2^2.5^2.31.37.313.39097.p6$
99	10+	$2.13^2.29.61.821.p12$
99	11+	$2^2.5^2.23.52757.250031.p9$
99	12+	$2.2617.18353.p16$
99	13+	$2^2.5^2.521.p22$
99	14+	$2.13^2.29.113.1429.11472833.p12$
99	15+	$2^2.5^3.31.181.313.6271.33751.243301.p8$
99	16+	$2.449.p29$
99	17+	$2^2.5^2.137.p30$
99	18+	$2.13^2.29.30637.96049801.2198833093.p11$
99	19+	$2^2.5^2.647.p34$
99	20+	$2.41.601.2617.18353.688201.99013241.p14$
99	21+	$2^2.5^2.31.313.189253.932065347907.p19$
99	22+	$2.13^2.29.89.p38$
99	23+	$2^2.5^2.47.5122331.2294665013.p27$
99	24+	$2.17.97.1553.6337.250993.696257.418258071409.p15$
99	25+	$2^2.5^4.3301.947651.19019801.p30$
99	26+	$2.13^3.29.65071241.p39$
99	27+	$2^2.5^2.31.37.163.313.2377.39097.650827.p31$
99	28+	$2.281.2617.18353.12625714428146384294689.p24$
99	29+	$2^2.5^2.59.929.180174217.p43$
99	30+	$2.13^2.29.61.821.6121.1118041.96049801.184231655921.p23$
99	31+	$2^2.5^2.387253.1330147009.140028543787291.941091948776813.p17$
99	32+	$2.193.3137.105481090085456435565163841.p32$
99	33+	$2^2.5^2.23.31.67.313.22639.52757.250031.295110971.5615902187993659.p18$
99	34+	$2.13^2.29.549320729.p56$
99	35+	$2^2.5^3.71.2311.19019801.932065347907.23622410172131.p30$
99	36+	$2.73.433.1873.2017.2617.8209.18353.24697.837802513.9227446848219601.p20$
99	37+	$2^2.5^2.p72$
99	38+	$2.13^2.29.9324916217.9879998861.350580803333.144453687390242609.p24$
99	39+	$2^2.5^2.31.313.521.82911940969819963.1684301387713950072653.p31$
99	40+	$2.17.1553.250993.624241.696257.225617921.p50$
99	41+	$2^2.5^2.p80$
99	42+	$2.13^2.29.113.1429.21169.11472833.96049801.478406070661.p44$
99	43+	$2^2.5^2.1646946417182137.p69$
99	44+	$2.2617.18353.3796673.34280401.180921137.p58$
99	45+	$2^2.5^3.31.37.181.313.2161.6271.33751.39097.46171.243301.$

- 650827.19019801.28556470441.p30
- 99 46+ 2.13<sup>2</sup>.29.271861.12993609334073.47686397099278076441.p50
- 99 47+ 2<sup>2</sup>.5<sup>2</sup>.13260878740517132985360700296254354341931.p52
- 99 48+ 2.449.577.1366841761.10969399148351641537.  
94817123729941607978286682849.p33
- 99 49+ 2<sup>2</sup>.5<sup>2</sup>.932065347907.2812671807464335279.p66
- 99 50+ 2.13<sup>2</sup>.29.61.101.401.701.821.184231655921.  
46259978873311450015201.p50
- 99 51+ 2<sup>2</sup>.5<sup>2</sup>.31.103.137.313.38573137.10138830384564590312437.  
615287002470019622809170998441.p33
- 99 52+ 2.2617.17681.18353.493505039561.65797600936601.  
19540659040448772411597569.p41
- 99 53+ 2<sup>2</sup>.5<sup>2</sup>.4571887.285543362926494449131396642507.  
1543189276339384293014267210278307.p35
- 99 54+ 2.13<sup>2</sup>.29.109.4861.30637.96049801.2198833093.13157816761.  
11391348056437.p54
- 99 55+ 2<sup>2</sup>.5<sup>3</sup>.23.52757.250031.19019801.295110971.656450787631.  
13474326747311.437636575693447830130625591.p29
- 99 56+ 2.17.1553.250993.696257.563330705804744753.  
231300436355859337805633.p55
- 99 57+ 2<sup>2</sup>.5<sup>2</sup>.31.229.313.647.775530570242561500537.  
52429510976475024649447.75547683516783970023754171.p34
- 99 58+ 2.13<sup>2</sup>.29<sup>2</sup>.25870321.90829662977.6512934106283413.  
272497433337357937.9891422277444155989.p40
- 99 59+ 2<sup>2</sup>.5<sup>2</sup>.709.937060303.49112638873.21271793245780759751.p74
- 99 60+ 2.41.601.1801.2617.18353.688201.99013241.69519309001.  
50710302877921.234346431711121.309640814187841.  
9227446848219601.p21
- 99 61+ 2<sup>2</sup>.5<sup>2</sup>.53681.31515054111561916184539981.  
191276595207610837936720800784327951668355733.p46
- 99 62+ 2.13<sup>2</sup>.29.1117.7069.  
13170039176332415793505633509346733932901899557017.p64
- 99 63+ 2<sup>2</sup>.5<sup>2</sup>.31.37.313.39097.189253.650827.99387080101.  
932065347907.27157471213321.4730901658176955717.  
19387094798099329057.p29
- 99 64+ 2.257.p126
- 99 65+ 2<sup>2</sup>.5<sup>3</sup>.521.2861.19019801.1684301387713950072653.  
10171089960370790140312481.p68
- 99 66+ 2.13<sup>2</sup>.29.89.16568641.59656081.96049801.288211003609.  
91890280307280327628448173521054393809.p54
- 99 67+ 2<sup>2</sup>.5<sup>2</sup>.232105698061110266693.  
3573158451809722384773911428213917603303718223938549.p60
- 99 68+ 2.2617.18353.4535080073.322776284081.15032031798473.  
2535079759092683496503704337645334999366189769.p48
- 99 69+ 2<sup>2</sup>.5<sup>2</sup>.31.47.313.466717.5122331.54783793.2294665013.  
143656302824624706066557003.  
586907165505528868524312142405797409.p39
- 99 70+ 2.13<sup>2</sup>.29.61.113.821.1429.42701.11472833.184231655921.  
478406070661.17343565384878349476721.p69
- 99 71+ 2<sup>2</sup>.5<sup>2</sup>.p140
- 99 72+ 2.17.97.1553.6337.250993.696257.2462155057.418258071409.

- 331179420272401.p87
- 99 73+  $2^2 \cdot 5^2$ .  
5111666489901648108628693542786747692556509973159521.p92
- 99 74+  $2 \cdot 13^2 \cdot 29 \cdot 149$ .p142
- 99 75+  $2^2 \cdot 5^4 \cdot 31 \cdot 181 \cdot 313 \cdot 3301 \cdot 6271 \cdot 33751 \cdot 243301 \cdot 947651 \cdot 19019801$ .  
522925641694384403628501230551.  
822376316434098201618519225502403515651.p41
- 99 76+  $2 \cdot 2617 \cdot 18353 \cdot 26033801 \cdot 677502728081 \cdot 8836328970557326091297$ .  
13702449083684826241681.6746614141668833614416629016683329.p47
- 99 77+  $2^2 \cdot 5^2 \cdot 23 \cdot 463 \cdot 617 \cdot 2003 \cdot 45893 \cdot 52757 \cdot 250031 \cdot 797567$ .  
295110971.474233535161.793780546021.932065347907.  
1915297233227947343691533.p53
- 99 78+  $2 \cdot 13^3 \cdot 29 \cdot 43615261 \cdot 65071241 \cdot 96049801 \cdot 706989037$ .  
92868390664377312052526770616800728397.p80
- 99 79+  $2^2 \cdot 5^2 \cdot 317 \cdot 19218236092543 \cdot 1580213510534581459$ .  
3216718449115059964790839.29449924662383503171479975953.p69
- 99 80+  $2 \cdot 449 \cdot 38561 \cdot 40801 \cdot 2923676968095965670797487361$ .  
94817123729941607978286682849.  
1420151726163558749262184230715351478252824321.p46
- 99 81+  $2^2 \cdot 5^2 \cdot 31 \cdot 37 \cdot 163 \cdot 313 \cdot 487 \cdot 2377 \cdot 7129 \cdot 39097 \cdot 650827 \cdot 675541$ .  
15008913889363.2153856259114281840807124972453.p83
- 99 82+  $2 \cdot 13^2 \cdot 29 \cdot 342761 \cdot 83608712544984558637$ .  
14744319896460010618619177.p110
- 99 83+  $2^2 \cdot 5^2 \cdot 38300351 \cdot 2978746923617$ .  
3786459333397349071548308272559.p114
- 99 84+  $2 \cdot 281 \cdot 2617 \cdot 18353 \cdot 127849 \cdot 2460783697 \cdot 9227446848219601$ .  
12625714428146384294689.221453415989744487722489.p82
- 99 85+  $2^2 \cdot 5^3 \cdot 137 \cdot 34511 \cdot 19019801 \cdot 332067621806931431$ .  
208427571406849335028261.615287002470019622809170998441.p83
- 99 86+  $2 \cdot 13^2 \cdot 29 \cdot 173 \cdot 7205509277257$ .p153
- 99 87+  $2^2 \cdot 5^2 \cdot 31 \cdot 59 \cdot 313 \cdot 929 \cdot 180174217$ .  
60281824723934126056156112991395338513.  
7565894381225637658169837392669593442248967.p74
- 99 88+  $2 \cdot 17 \cdot 353 \cdot 1553 \cdot 250993 \cdot 696257$ .c158
- 99 89+  $2^2 \cdot 5^2 \cdot 179 \cdot 2671 \cdot 1626434687544660758783209$ .  
100604426185616516203010213.p120
- 99 90+  $2 \cdot 13^2 \cdot 29 \cdot 61 \cdot 821 \cdot 6121 \cdot 30637 \cdot 1118041 \cdot 96049801 \cdot 2198833093$ .  
13157816761.184231655921.12443063374584118503841.  
4300136572481927613100909589221.p66
- 99 91+  $2^2 \cdot 5^2 \cdot 521 \cdot 6007 \cdot 932065347907 \cdot 1684301387713950072653$ .  
5697585119133460028477.6961703058707154579277.p97
- 99 92+  $2 \cdot 2617 \cdot 5153 \cdot 18353 \cdot 7788353 \cdot 38116889 \cdot 59142569 \cdot 95281273$ .  
2719699869569.p130
- 99 93+  $2^2 \cdot 5^2 \cdot 31^2 \cdot 313 \cdot 387253 \cdot 267099163 \cdot 1330147009$ .  
140028543787291.941091948776813.10788174659897441.  
10455951761612031460842831751.p82
- 99 94+  $2 \cdot 13^2 \cdot 29 \cdot 2633 \cdot 82721 \cdot 567949 \cdot 1512775203058949909$ .  
1294516385768596839151769.p128
- 99 95+  $2^2 \cdot 5^3 \cdot 191 \cdot 647 \cdot 5264521 \cdot 19019801$ .  
1276922138849438544469733908707377.p135
- 99 96+  $2 \cdot 193 \cdot 3137 \cdot 105481090085456435565163841$ .

56760968148061651986424823729921.c128  
99 97+  $2^{2.5^2.389.971}$ .c186  
99 98+ 2.13<sup>2</sup>.29.113.197.1429.11472833.478406070661.  
7194528282706940118374545661.73760695060600884076941716993.p109  
99 99+  $2^{2.5^2.23.31.37.67.199.313.4159.16831.22639.39097.52757}$ .  
250031.650827.295110971.27588586848769.5615902187993659.  
9644462945525827.969877026919518103.9999524292645728809.  
2672298663383581485486692581.p34  
99 100+ 2.41.601.2617.18353.688201.99013241.50710302877921.  
6356741265252657280201.c138