9 January 2022

GENERALIZED CANNONBALL PROBLEM

J.W.L. (JAN) EERLAND

Abstract. The cannonball problem asks which numbers are both square and square pyramidal. In this paper I consider the cannonball problem for other r-regular polygons. I carried out a computer search and found a total of 858 solutions for polygons $3 \leq r \leq 10^5$. By using elliptic curves I also found that there are no solutions for $r = 5$ (pentagon), $r = 7$ (heptagon), and $r = 9$ (enneagon).

1. Introduction

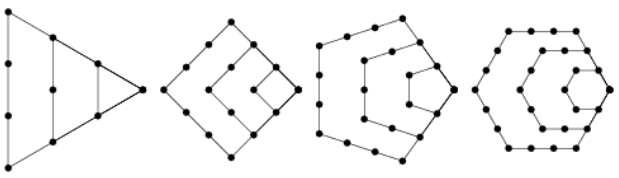
The general cannonball problem asks which r-regular polygons exist that are also an r-regular pyramidal (i.e. pyramids with an r-regular base). The case for a square and a square pyramidal was solved a long time ago: as early as 1918, G.N. Watson [1, 2] proved in the most elementary way that 1 and 4900 are the only solutions to the cannonball problem for a square.

In order to prove the above-mentioned result, this paper uses elliptic curves. The method to do this will be described later. The cannonball problem for a square looks for integer solutions to the following Diophantine equation: $a\left(a+1\right)\left(2a+1\right)/6 = b^2$. By means of a simple substitution $x = 12a$ and $y = 72b$, I obtain the following elliptic curve: $y^2 = x^3 + 18x^2 + 72x$. With SageMath, all the integer solutions of this elliptic curve can be found. Now, I see that integer solutions to x and y imply integer solutions to a and b. Filtering the solutions for situations when a and b are positive integers only gives the following: $(a, b) \in \{(1, 1), (24, 70)\}$. So, the only solutions that exist are when $b = 1$ and $b = 70$, which gives cannonball numbers of 1 and 4900, respectively.

The search for the solutions to the general cannonball problem started after Numberphile posted a video entitled: '90,525,801,730 Cannon Balls' [3, 4].

2. Methodology

Using MathWorld [5], I derived the formula for a polygonal number. A polygonal number is a type of figurate number that is a generalization of triangular, square, et cetera, to a b-gon for b, an arbitrary positive integer. The diagram [6] below graphically illustrates the process in which the polygonal numbers are built up.



Starting with the bth triangular number T_b, then

$$b + T_{b-1} = \mathrm{T}_b \tag{1}$$

Now, note that

$$b + 2T_{b-1} = b^2 \tag{2}$$

gives the bth square number,

$$b + 3T_{b-1} = \frac{b\,(3b-1)}{2} \tag{3}$$

gives the bth pentagonal number, and so on. The general polygonal number can be written in the following form:

$$p_b^r = \frac{b\,(b\,(r-2)+4-r)}{2} \tag{4}$$

where p_b^r is the bth r-gonal number. For example, taking $r = 3$ gives a triangular number, et cetera.

To get the pyramidal numbers from the polygonal numbers, the polygonal numbers need to be summed from 1 to a. This is logical because the pyramidal numbers are made from stacking polygonal numbers on top of each other. This relation is shown in Equation (5).

$$\frac{a\,(a+1)\,(a\,(r-2)+5-r)}{6} = \sum_{b=1}^{a} \frac{b\,(b\,(r-2)+4-r)}{2} \tag{5}$$

So, the general cannonball problem looks for integer solutions to the following Diophantine equation:

$$\# \coloneqq \frac{a\,(a+1)\,(a\,(r-2)+5-r)}{6} = \frac{b\,(b\,(r-2)+4-r)}{2} \tag{6}$$

A computer search was conducted to find solutions between $3 \leq r \leq 10^5$. In order to solve individual cases, I made use of a free open-source mathematics software package called SageMath. However, to use that software with the aim to find the integer points [7] of elliptic curves, our Equation (6) had to be transformed into a Weierstrass equation for an elliptic curve [8, 9].

An elliptic curve over a field K is a projective nonsingular curve E defined over K of genus 1 together with a point $O \in E$ defined over K. Let K be an arbitrary field. A Weierstrass equation for an elliptic curve E/K is an equation of the following form [8, 9]:

$$b^2 + \beta_1 ab + \beta_3 b = a^3 + \beta_2 a^2 + \beta_4 a + \beta_6 \tag{7}$$

where $\beta_1, \beta_2, \beta_3, \beta_4, \beta_6$ are constants in K. The coefficients can be written as Weierstrass coefficients [8]:

$$[\beta_1, \beta_2, \beta_3, \beta_4, \beta_6] \tag{8}$$

When both the right-hand side and the left-hand side of Equation (6) are multiplied by 6, this equation turns into an elliptic curve. This elliptic curve has the following form:

$$(3r-6)\,b^2 + (12-3r)\,b = (r-2)\,a^3 + 3a^2 + (5-r)\,a \tag{9}$$

Let $x \coloneqq (3r-6)\,(r-2)\,a$ and $y \coloneqq (3r-6)^2\,(r-2)\,b$. With these substitutions, Equation (6) is written in the Weierstrass form as follows:

$$y^2 + (3r-6)\,(r-2)\,(12-3r)\,y = x^3 + 3\,(3r-6)\,x^2 + (3r-6)^2\,(r-2)\,(5-r)\,x \tag{10}$$

Notice that the substitutions that are done imply that integer solutions to x and y imply integer solutions to a and b. The coefficients from Equation (10) can now be written as the Weierstrass coefficients:

$$\left[0, 9\,(r-2), 9\,(4-r)\,(r-2)^2, 9\,(5-r)\,(r-2)^3, 0\right] \tag{11}$$

3. Results

With the help of a computer search, I looked for integer solutions to Equation (6), from $r = 3$ to $r = 10^5$. I found 858 solutions. Using C# I looked for solutions to Equation (6) by first solving this equation for b:

$$b = \frac{1}{r-2} \cdot \left\{ \frac{r}{2} + \frac{1}{6} \cdot \sqrt{3\left(3\left(r-4\right)^2 + 4a\left(r-2\right)\left(5+3a-r+a^2\left(r-2\right)\right)\right)} - 2 \right\} \tag{12}$$

and then I used a brute force method to check when:

$$3\left(3\left(r-4\right)^2 + 4a\left(r-2\right)\left(5+3a-r+a^2\left(r-2\right)\right)\right) \tag{13}$$

is a perfect square, so that the square and the square root cancel each other. Due to the nature of the used C#-code it is likely that not all solutions can be found that exist between the bounds.

Here, I present a brief selection of the results I found; a complete overview of all our results is presented below, following the reference section of this paper. For $r = 3$, I investigated if a triangle base pyramid (tetrahedron) would be equal to a triangle number. In this case, I found four non-trivial solutions, namely $(3, 4)$, $(8, 15)$, $(20, 55)$, and $(34, 119)$. For $r = 6$, I found one non-trivial solution: $(11, 22)$. Finally, for $r = 8$ I found four non-trivial solutions, namely $(10, 19)$, $(18, 45)$, $(49785, 6413415)$, and $(91839, 16068720)$.

However, for $3 \leq r \leq 10$ our search found no solutions for $r = 5$, $r = 7$, and $r = 9$. I will now prove that no solutions exist for $r = 5$, $r = 7$, and $r = 9$.

3.1. **Pentagon.** With $r = 5$, I obtain the following elliptic curve: $3b^2 - b = a^3 + a^2$. Using the substitutions $x = 27a$ and $y = 243b$, the elliptic curve is written in the following Weierstrass form: $y^2 - 81y = x^3 + 27x^2$. This means that I only need to consider integer solutions to x and y. I used SageMath to find the integer solutions to this elliptic curve. Transforming the solutions I found back to (a, b), I saw that the only integer solutions that exist are given by:

$$(a, b) \in \{(-1, 0), (0, 0), (1, 1), (4, -5), (6, -9)\} \tag{14}$$

This means that there is one positive trivial solution $(1, 1)$ and no non-trivial solutions. It shows that for a pentagon there are no solutions to the cannonball problem. □

3.2. **Heptagon.** With $r = 7$, I obtain the following elliptic curve: $15\mathrm{b}^2 - 9\mathrm{b} = 5\mathrm{a}^3 + 3\mathrm{a}^2 - 2\mathrm{a}$. Using the substitutions $x = 75a$ and $y = 1125b$, the elliptic curve is written in the following Weierstrass form: $y^2 - 675y = x^3 + 45x^2 - 2250x$. This means that I only need to consider integer solutions to x and y. I used SageMath to find the integer solutions to this elliptic curve. Transforming the solutions I found back to (a, b), I saw that the only integer solutions that exist are given by:

$$(a, b) \in \{(-1, 0), (0, 0), (1, 1)\} \tag{15}$$

This means that there is one positive trivial solution $(1, 1)$ and no non-trivial solutions. It shows that for a heptagon there are no solutions to the cannonball problem. □

3.3. **Enneagon.** With $r = 9$, I obtain the following elliptic curve: $21\mathrm{b}^2 - 15\mathrm{b} = 7\mathrm{a}^3 + 3\mathrm{a}^2 - 4\mathrm{a}$. Using the substitutions $x = 147a$ and $y = 3087b$, the elliptic curve is written in the following Weierstrass form: $y^2 - 2205y = x^3 + 63x^2 - 12348x$. This means that I only need to consider integer solutions to x and y. I used SageMath to find the integer solutions to this elliptic curve. Transforming the solutions I found back to (a, b), I saw that the only integer solutions that exist are given by:

$$(a, b) \in \{(-1, 0), (0, 0), (1, 1), (8, -13)\} \tag{16}$$

This means that there is one positive trivial solution $(1, 1)$ and no non-trivial solutions. It shows that for an enneagon there are no solutions to the cannonball problem. □

4. Conclusion

To conclude, the cannonball problem can be generalized to r-regular polygons. Using elliptic curves I showed that no solution exists for $r = 5$, $r = 7$, and $r = 9$. With the help of a computer search I found a total of 858 solutions, with $3 \leq r \leq 10^5$.

Acknowledgements

I would like to thank R. (Richard) Brink BSc, for writing and implementing the code. In addition, I thank Dr. J. (James) Grime and S.T.M. (Sten) van der Sluijs MSc for the revision of this paper and for thinking along with me while I was writing it. Besides the people who worked on this paper, I would like to thank Brady Haran (Numberphile) and Matt Parker for inspiring me to investigate this problem.

References.

[1] Wolfram MathWorld. *Wolfram MathWorld: Cannonball Problem.* URL: `https://mathworld.wolfram.com/CannonballProblem.html`. (accessed: 13.05.2020).
[2] G.N. Watson. *The Problem of the Square Pyramid.* Messenger. Math. 48. Cambridge, 1918, pp. 1–22.
[3] Numberphile. *Numberphile: 90,525,801,730 Cannon Balls.* URL: `https://www.youtube.com/watch?v=q6L06pyt9CA`. (accessed: 13.05.2020).
[4] Numberphile. *Numberphile: Cannon Ball Numbers.* URL: `https://www.numberphile.com/cannon-ball-numbers`. (accessed: 13.05.2020).
[5] Wolfram MathWorld. *Wolfram MathWorld: Polygonal Number.* URL: `https://mathworld.wolfram.com/PolygonalNumber.html`. (accessed: 13.05.2020).
[6] Wolfram MathWorld. *Wolfram MathWorld: Cannonball Problem diagram.* URL: `https://mathworld.wolfram.com/images/eps-gif/PolygonalNumber_1100.gif`. (accessed: 13.05.2020).
[7] SageMath. *SageMath: Compute all integral points (up to sign) on this elliptic curve.* URL: `https://bit.ly/2XVgmj6`. (accessed: 13.05.2020).
[8] Joseph H. Silverman. *The Arithmetic of Elliptic Curves.* Graduate Texts in Mathematics. Springer, 2016, p. 42. ISBN: 978-0-387-09494-6.
[9] alozano. *alozano: Weierstrass equation of an elliptic curve.* URL: `https://planetmath.org/weierstrassequationofanellipticcurve`. (accessed: 13.05.2020).

Email address: jan.eerland1@gmail.com
Den Helder, The Netherlands

$r = 3$	$a = 3$	$b = 4$	$\# = 10$
$r = 3$	$a = 8$	$b = 15$	$\# = 120$
$r = 3$	$a = 20$	$b = 55$	$\# = 1540$
$r = 3$	$a = 34$	$b = 119$	$\# = 7140$
$r = 4$	$a = 24$	$b = 70$	$\# = 4900$
$r = 6$	$a = 11$	$b = 22$	$\# = 946$
$r = 8$	$a = 10$	$b = 19$	$\# = 1045$
$r = 8$	$a = 18$	$b = 45$	$\# = 5985$
$r = 8$	$a = 49785$	$b = 6413415$	$\# = 123395663059845$
$r = 8$	$a = 91839$	$b = 16068720$	$\# = 774611255177760$
$r = 10$	$a = 5$	$b = 7$	$\# = 175$
$r = 10$	$a = 6511$	$b = 303336$	$\# = 368050005576$
$r = 11$	$a = 25$	$b = 73$	$\# = 23725$
$r = 11$	$a = 10044$	$b = 581175$	$\# = 1519937678700$
$r = 11$	$a = 16906$	$b = 1269127$	$\# = 7248070597636$
$r = 14$	$a = 6$	$b = 9$	$\# = 441$
$r = 14$	$a = 46$	$b = 181$	$\# = 195661$
$r = 17$	$a = 73$	$b = 361$	$\# = 975061$
$r = 17$	$a = 8583$	$b = 459096$	$\# = 1580765544996$
$r = 20$	$a = 106$	$b = 631$	$\# = 3578401$
$r = 23$	$a = 145$	$b = 1009$	$\# = 10680265$
$r = 26$	$a = 190$	$b = 1513$	$\# = 27453385$
$r = 29$	$a = 241$	$b = 2161$	$\# = 63016921$
$r = 30$	$a = 17$	$b = 41$	$\# = 23001$
$r = 32$	$a = 298$	$b = 2971$	$\# = 132361021$
$r = 35$	$a = 361$	$b = 3961$	$\# = 258815701$
$r = 38$	$a = 430$	$b = 5149$	$\# = 477132085$
$r = 41$	$a = 204$	$b = 1683$	$\# = 55202400$
$r = 41$	$a = 505$	$b = 6553$	$\# = 837244045$
$r = 43$	$a = 33$	$b = 110$	$\# = 245905$
$r = 44$	$a = 586$	$b = 8191$	$\# = 1408778281$
$r = 47$	$a = 673$	$b = 10081$	$\# = 2286380881$
$r = 50$	$a = 34$	$b = 115$	$\# = 314755$
$r = 50$	$a = 766$	$b = 12241$	$\# = 3595928401$
$r = 53$	$a = 865$	$b = 14689$	$\# = 5501691505$
$r = 56$	$a = 970$	$b = 17443$	$\# = 8214519205$
$r = 59$	$a = 1081$	$b = 20521$	$\# = 12001111741$
$r = 60$	$a = 5695$	$b = 248132$	$\# = 1785508245600$
$r = 62$	$a = 1198$	$b = 23941$	$\# = 17194450141$
$r = 65$	$a = 1321$	$b = 27721$	$\# = 24205450501$
$r = 68$	$a = 1450$	$b = 31879$	$\# = 33535911025$
$r = 71$	$a = 1585$	$b = 36433$	$\# = 45792819865$
$r = 74$	$a = 1726$	$b = 41401$	$\# = 61704091801$
$r = 77$	$a = 1873$	$b = 46801$	$\# = 82135801801$

$r = 80$	$a = 2026$	$b = 52651$	$\# = 108110983501$
$r = 83$	$a = 2185$	$b = 58969$	$\# = 140830060645$
$r = 86$	$a = 2350$	$b = 65773$	$\# = 181692979525$
$r = 88$	$a = 15$	$b = 34$	$\# = 48280$
$r = 89$	$a = 2521$	$b = 73081$	$\# = 232323110461$
$r = 92$	$a = 2698$	$b = 80911$	$\# = 294592986361$
$r = 95$	$a = 2881$	$b = 89281$	$\# = 370651946401$
$r = 98$	$a = 3070$	$b = 98209$	$\# = 462955752865$
$r = 101$	$a = 3265$	$b = 107713$	$\# = 574298249185$
$r = 104$	$a = 3466$	$b = 117811$	$\# = 707845127221$
$r = 107$	$a = 3673$	$b = 128521$	$\# = 867169871821$
$r = 110$	$a = 3886$	$b = 139861$	$\# = 1056291950701$
$r = 113$	$a = 4105$	$b = 151849$	$\# = 1279717317685$
$r = 116$	$a = 4330$	$b = 164503$	$\# = 1542481297345$
$r = 119$	$a = 4561$	$b = 177841$	$\# = 1850193919081$
$r = 122$	$a = 4798$	$b = 191881$	$\# = 2209087768681$
$r = 125$	$a = 5041$	$b = 206641$	$\# = 2626068425401$
$r = 128$	$a = 5290$	$b = 222139$	$\# = 3108767552605$
$r = 131$	$a = 5545$	$b = 238393$	$\# = 3665598710005$
$r = 134$	$a = 5806$	$b = 255421$	$\# = 4305815955541$
$r = 140$	$a = 6346$	$b = 291871$	$\# = 5877999117001$
$r = 143$	$a = 6625$	$b = 311329$	$\# = 6833243472625$
$r = 145$	$a = 162$	$b = 1191$	$\# = 101337426$
$r = 146$	$a = 6910$	$b = 331633$	$\# = 7918568615665$
$r = 149$	$a = 7201$	$b = 352801$	$\# = 9148412523601$
$r = 152$	$a = 7498$	$b = 374851$	$\# = 10538467676101$
$r = 155$	$a = 7801$	$b = 397801$	$\# = 12105761089501$
$r = 161$	$a = 8425$	$b = 446473$	$\# = 15847347060325$
$r = 164$	$a = 8746$	$b = 472231$	$\# = 18063133727761$
$r = 167$	$a = 9073$	$b = 498961$	$\# = 20539330895161$
$r = 170$	$a = 9406$	$b = 526681$	$\# = 23300957849401$
$r = 173$	$a = 9745$	$b = 555409$	$\# = 26374921015465$
$r = 176$	$a = 10090$	$b = 585163$	$\# = 29790118757485$
$r = 179$	$a = 10441$	$b = 615961$	$\# = 33577549990021$
$r = 182$	$a = 10798$	$b = 647821$	$\# = 37770426667621$
$r = 185$	$a = 11161$	$b = 680761$	$\# = 42404290220701$
$r = 188$	$a = 11530$	$b = 714799$	$\# = 47517132005785$
$r = 191$	$a = 11905$	$b = 749953$	$\# = 53149517838145$
$r = 194$	$a = 12286$	$b = 786241$	$\# = 59344716674881$
$r = 200$	$a = 13066$	$b = 862291$	$\# = 73610946594901$
$r = 203$	$a = 13465$	$b = 902089$	$\# = 81783248916205$
$r = 206$	$a = 13870$	$b = 943093$	$\# = 90721194225805$
$r = 209$	$a = 14281$	$b = 985321$	$\# = 100483647464341$
$r = 212$	$a = 14698$	$b = 1028791$	$\# = 111133039782241$

$r = 215$	$a = 15121$	$b = 1073521$	$\# = 122735528181001$
$r = 218$	$a = 15550$	$b = 1119529$	$\# = 135361159849225$
$r = 221$	$a = 15985$	$b = 1166833$	$\# = 149084041261465$
$r = 227$	$a = 16873$	$b = 1265401$	$\# = 180139324122901$
$r = 230$	$a = 17326$	$b = 1316701$	$\# = 197641824880501$
$r = 233$	$a = 17785$	$b = 1369369$	$\# = 216582146624845$
$r = 236$	$a = 18250$	$b = 1423423$	$\# = 237057400203625$
$r = 239$	$a = 18721$	$b = 1478881$	$\# = 259169874172561$
$r = 242$	$a = 19198$	$b = 1535761$	$\# = 283027239138961$
$r = 245$	$a = 19681$	$b = 1594081$	$\# = 308742757412401$
$r = 248$	$a = 20170$	$b = 1653859$	$\# = 336435498030565$
$r = 251$	$a = 20665$	$b = 1715113$	$\# = 366230557228285$
$r = 254$	$a = 21166$	$b = 1777861$	$\# = 398259284417821$
$r = 257$	$a = 21673$	$b = 1842121$	$\# = 432659513748421$
$r = 260$	$a = 22186$	$b = 1907911$	$\# = 469575801313201$
$r = 263$	$a = 22705$	$b = 1975249$	$\# = 509159668071385$
$r = 266$	$a = 23230$	$b = 2044153$	$\# = 551569848553945$
$r = 269$	$a = 23761$	$b = 2114641$	$\# = 596972545420681$
$r = 272$	$a = 24298$	$b = 2186731$	$\# = 645541689936781$
$r = 275$	$a = 24841$	$b = 2260441$	$\# = 697459208436901$
$r = 276$	$a = 26$	$b = 77$	$\# = 801801$
$r = 281$	$a = 25945$	$b = 2412793$	$\# = 812108689316605$
$r = 284$	$a = 26506$	$b = 2491471$	$\# = 875246963075641$
$r = 287$	$a = 27073$	$b = 2571841$	$\# = 942546809507041$
$r = 290$	$a = 27646$	$b = 2653921$	$\# = 1014234341580001$
$r = 293$	$a = 28225$	$b = 2737729$	$\# = 1090545395665825$
$r = 296$	$a = 28810$	$b = 2823283$	$\# = 1171725841819765$
$r = 299$	$a = 29401$	$b = 2910601$	$\# = 1258031900594701$
$r = 302$	$a = 29998$	$b = 2999701$	$\# = 1349730466454701$
$r = 305$	$a = 30601$	$b = 3090601$	$\# = 1447099437856501$
$r = 308$	$a = 31210$	$b = 3183319$	$\# = 1550428054066945$
$r = 311$	$a = 31825$	$b = 3277873$	$\# = 1660017238784425$
$r = 314$	$a = 32446$	$b = 3374281$	$\# = 1776179950632361$
$r = 317$	$a = 33073$	$b = 3472561$	$\# = 1899241540592761$
$r = 320$	$a = 33706$	$b = 3572731$	$\# = 2029540116447901$
$r = 322$	$a = 28$	$b = 86$	$\# = 1169686$
$r = 323$	$a = 34345$	$b = 3674809$	$\# = 2167426914298165$
$r = 326$	$a = 34990$	$b = 3778813$	$\# = 2313266677224085$
$r = 329$	$a = 35641$	$b = 3884761$	$\# = 2467438041160621$
$r = 335$	$a = 36961$	$b = 4102561$	$\# = 2802361946353201$
$r = 338$	$a = 37630$	$b = 4214449$	$\# = 2983944798951985$
$r = 341$	$a = 38305$	$b = 4328353$	$\# = 3175520698569745$
$r = 344$	$a = 38986$	$b = 4444291$	$\# = 3377543790718981$
$r = 347$	$a = 39673$	$b = 4562281$	$\# = 3590484584279581$

$r = 350$	$a = 40366$	$b = 4682341$	$\# = 3814830389763901$
$r = 353$	$a = 41065$	$b = 4804489$	$\# = 4051085765338405$
$r = 356$	$a = 41770$	$b = 4928743$	$\# = 4299772970669905$
$r = 359$	$a = 42481$	$b = 5055121$	$\# = 4561432428664441$
$r = 362$	$a = 43198$	$b = 5183641$	$\# = 4836623195166841$
$r = 365$	$a = 43921$	$b = 5314321$	$\# = 5125923436689001$
$r = 368$	$a = 44650$	$b = 5447179$	$\# = 5429930916234925$
$r = 371$	$a = 45385$	$b = 5582233$	$\# = 5749263487290565$
$r = 374$	$a = 624$	$b = 9000$	$\# = 15064335000$
$r = 374$	$a = 46126$	$b = 5719501$	$\# = 6084559596046501$
$r = 377$	$a = 46873$	$b = 5859001$	$\# = 6436478791921501$
$r = 383$	$a = 48385$	$b = 6144769$	$\# = 7192933280636545$
$r = 386$	$a = 49150$	$b = 6291073$	$\# = 7598897900740225$
$r = 392$	$a = 50698$	$b = 6590611$	$\# = 8470048625319061$
$r = 395$	$a = 51481$	$b = 6743881$	$\# = 8936805111705901$
$r = 398$	$a = 52270$	$b = 6899509$	$\# = 9425437080130765$
$r = 401$	$a = 53065$	$b = 7057513$	$\# = 9936792303244885$
$r = 404$	$a = 53866$	$b = 7217911$	$\# = 10471744636405921$
$r = 407$	$a = 54673$	$b = 7380721$	$\# = 11031194614952521$
$r = 410$	$a = 55486$	$b = 7545961$	$\# = 11616070060528201$
$r = 413$	$a = 56305$	$b = 7713649$	$\# = 12227326696522585$
$r = 416$	$a = 57130$	$b = 7883803$	$\# = 12865948772698045$
$r = 419$	$a = 57961$	$b = 8056441$	$\# = 13532949699069781$
$r = 422$	$a = 58798$	$b = 8231581$	$\# = 14229372689107381$
$r = 425$	$a = 59641$	$b = 8409241$	$\# = 14956291412325901$
$r = 428$	$a = 60490$	$b = 8589439$	$\# = 15714810656334505$
$r = 431$	$a = 61345$	$b = 8772193$	$\# = 16506066998410705$
$r = 434$	$a = 62206$	$b = 8957521$	$\# = 17331229486668241$
$r = 440$	$a = 63946$	$b = 9335971$	$\# = 19088115603070501$
$r = 443$	$a = 64825$	$b = 9529129$	$\# = 20022345947806525$
$r = 446$	$a = 65710$	$b = 9724933$	$\# = 20995497302486365$
$r = 449$	$a = 66601$	$b = 9923401$	$\# = 22008911627463301$
$r = 452$	$a = 67498$	$b = 10124551$	$\# = 23063967646210801$
$r = 455$	$a = 68401$	$b = 10328401$	$\# = 24162081595551001$
$r = 458$	$a = 69310$	$b = 10534969$	$\# = 25304707986021145$
$r = 461$	$a = 70225$	$b = 10744273$	$\# = 26493340372446025$
$r = 464$	$a = 71146$	$b = 10956331$	$\# = 27729512134784461$
$r = 467$	$a = 72073$	$b = 11171161$	$\# = 29014797269317861$
$r = 470$	$a = 73006$	$b = 11388781$	$\# = 30350811190248901$
$r = 473$	$a = 73945$	$b = 11609209$	$\# = 31739211541778365$
$r = 479$	$a = 75841$	$b = 12058561$	$\# = 34680018209778721$
$r = 482$	$a = 76798$	$b = 12287521$	$\# = 36235958421388321$
$r = 485$	$a = 77761$	$b = 12519361$	$\# = 37851354552463201$
$r = 488$	$a = 78730$	$b = 12754099$	$\# = 39528087949845685$

$r = 491$	$a = 79705$	$b = 12991753$	$\# = 41268087286688845$
$r = 494$	$a = 80686$	$b = 13232341$	$\# = 43073329449785581$
$r = 497$	$a = 81673$	$b = 13475881$	$\# = 44945840437920181$
$r = 500$	$a = 82666$	$b = 13722391$	$\# = 46887696271310401$
$r = 503$	$a = 83665$	$b = 13971889$	$\# = 48901023912208105$
$r = 506$	$a = 84670$	$b = 14224393$	$\# = 50988002196726505$
$r = 509$	$a = 85681$	$b = 14479921$	$\# = 53150862777962041$
$r = 512$	$a = 86698$	$b = 14738491$	$\# = 55391891080478941$
$r = 515$	$a = 87721$	$b = 15000121$	$\# = 57713427266224501$
$r = 518$	$a = 88750$	$b = 15264829$	$\# = 60117867211943125$
$r = 521$	$a = 89785$	$b = 15532633$	$\# = 62607663498157165$
$r = 524$	$a = 90826$	$b = 15803551$	$\# = 65185326409782601$
$r = 527$	$a = 91873$	$b = 16077601$	$\# = 67853424948447601$
$r = 530$	$a = 92926$	$b = 16354801$	$\# = 70614587856582001$
$r = 533$	$a = 93985$	$b = 16635169$	$\# = 73471504653345745$
$r = 536$	$a = 95050$	$b = 16918723$	$\# = 76426926682464325$
$r = 539$	$a = 96121$	$b = 17205481$	$\# = 79483668172039261$
$r = 542$	$a = 97198$	$b = 17495461$	$\# = 82644607306401661$
$r = 545$	$a = 98281$	$b = 17788681$	$\# = 85912687310076901$
$r = 548$	$a = 99370$	$b = 18085159$	$\# = 89290917543928465$
$r = 551$	$a = 100465$	$b = 18384913$	$\# = 92782374613548985$
$r = 554$	$a = 101566$	$b = 18687961$	$\# = 96390203489966521$
$r = 557$	$a = 102673$	$b = 18994321$	$\# = 100117618642734121$
$r = 560$	$a = 103786$	$b = 19304011$	$\# = 103967905185470701$
$r = 563$	$a = 104905$	$b = 19617049$	$\# = 107944420033921285$
$r = 566$	$a = 106030$	$b = 19933453$	$\# = 112050593076604645$
$r = 569$	$a = 107161$	$b = 20253241$	$\# = 116289928358116381$
$r = 572$	$a = 108298$	$b = 20576431$	$\# = 120666005275155481$
$r = 575$	$a = 109441$	$b = 20903041$	$\# = 125182479785342401$
$r = 578$	$a = 110590$	$b = 21233089$	$\# = 129843085628896705$
$r = 581$	$a = 111745$	$b = 21566593$	$\# = 134651635563242305$
$r = 584$	$a = 112906$	$b = 21903571$	$\# = 139612022610608341$
$r = 587$	$a = 114073$	$b = 22244041$	$\# = 144728221318693741$
$r = 590$	$a = 115246$	$b = 22588021$	$\# = 150004289034463501$
$r = 593$	$a = 116425$	$b = 22935529$	$\# = 155444367191144725$
$r = 596$	$a = 117610$	$b = 23286583$	$\# = 161052682608490465$
$r = 599$	$a = 118801$	$b = 23641201$	$\# = 166833548806379401$
$r = 602$	$a = 119998$	$b = 23999401$	$\# = 172791367331819401$
$r = 605$	$a = 121201$	$b = 24361201$	$\# = 178930629099423001$
$r = 614$	$a = 124846$	$b = 25468381$	$\# = 198483352045059061$
$r = 617$	$a = 126073$	$b = 25844761$	$\# = 205395130956320461$
$r = 620$	$a = 127306$	$b = 26224831$	$\# = 212512196065127401$
$r = 626$	$a = 129790$	$b = 26996113$	$\# = 227382508142144785$
$r = 629$	$a = 131041$	$b = 27387361$	$\# = 235146166029094321$

$r = 632$	$a = 132298$	$b = 27782371$	$\# = 243135934866552421$
$r = 635$	$a = 133561$	$b = 28181161$	$\# = 251357275983800701$
$r = 638$	$a = 134830$	$b = 28583749$	$\# = 259815755731561885$
$r = 641$	$a = 136105$	$b = 28990153$	$\# = 268517046989445445$
$r = 644$	$a = 137386$	$b = 29400391$	$\# = 277466930687749681$
$r = 647$	$a = 138673$	$b = 29814481$	$\# = 286671297343688281$
$r = 650$	$a = 139966$	$b = 30232441$	$\# = 296136148612109401$
$r = 662$	$a = 145198$	$b = 31943341$	$\# = 336724410790593541$
$r = 665$	$a = 146521$	$b = 32380921$	$\# = 347585710152037501$
$r = 668$	$a = 147850$	$b = 32822479$	$\# = 358745926628848825$
$r = 671$	$a = 149185$	$b = 33268033$	$\# = 370211884491111265$
$r = 674$	$a = 150526$	$b = 33717601$	$\# = 381990532082191201$
$r = 677$	$a = 151873$	$b = 34171201$	$\# = 394088943502951201$
$r = 680$	$a = 153226$	$b = 34628851$	$\# = 406514320311136501$
$r = 683$	$a = 154585$	$b = 35090569$	$\# = 419273993236002445$
$r = 686$	$a = 155950$	$b = 35556373$	$\# = 432375423908250925$
$r = 689$	$a = 157321$	$b = 36026281$	$\# = 445826206605343861$
$r = 692$	$a = 158698$	$b = 36500311$	$\# = 459634070012261761$
$r = 695$	$a = 160081$	$b = 36978481$	$\# = 473806878997775401$
$r = 698$	$a = 161470$	$b = 37460809$	$\# = 488352636406298665$
$r = 701$	$a = 162865$	$b = 37947313$	$\# = 503279484865390585$
$r = 704$	$a = 164266$	$b = 38438011$	$\# = 518595708608974621$
$r = 707$	$a = 165673$	$b = 38932921$	$\# = 534309735316343221$
$r = 710$	$a = 167086$	$b = 39432061$	$\# = 550430137967015701$
$r = 713$	$a = 168505$	$b = 39935449$	$\# = 566965636711517485$
$r = 716$	$a = 169930$	$b = 40443103$	$\# = 583925100758148745$
$r = 719$	$a = 171361$	$b = 40955041$	$\# = 601317550275810481$
$r = 722$	$a = 172798$	$b = 41471281$	$\# = 619152158312956081$
$r = 725$	$a = 174241$	$b = 41991841$	$\# = 637438252732736401$
$r = 728$	$a = 175690$	$b = 42516739$	$\# = 656185318164406405$
$r = 731$	$a = 177145$	$b = 43045993$	$\# = 675402997971061405$
$r = 734$	$a = 178606$	$b = 43579621$	$\# = 695101096233770941$
$r = 740$	$a = 181546$	$b = 44660071$	$\# = 735978580061634001$
$r = 743$	$a = 183025$	$b = 45206929$	$\# = 757178395466930425$
$r = 746$	$a = 184510$	$b = 45758233$	$\# = 778899493092707065$
$r = 749$	$a = 186001$	$b = 46314001$	$\# = 801152510950593001$
$r = 752$	$a = 187498$	$b = 46874251$	$\# = 823948260023155501$
$r = 755$	$a = 189001$	$b = 47439001$	$\# = 847297726364722501$
$r = 761$	$a = 192025$	$b = 48582073$	$\# = 895702643154581725$
$r = 764$	$a = 193546$	$b = 49160431$	$\# = 920780960215331161$
$r = 767$	$a = 195073$	$b = 49743361$	$\# = 946458732090850561$
$r = 770$	$a = 196606$	$b = 50330881$	$\# = 972747852301958401$
$r = 773$	$a = 198145$	$b = 50923009$	$\# = 999660402404331265$
$r = 776$	$a = 199690$	$b = 51519763$	$\# = 1027208654209348885$

$r = 779$	$a = 201241$	$b = 52121161$	$\# = 1055405072022357421$
$r = 782$	$a = 202798$	$b = 52727221$	$\# = 1084262314898419021$
$r = 785$	$a = 204361$	$b = 53337961$	$\# = 1113793238915615701$
$r = 788$	$a = 205930$	$b = 53953399$	$\# = 1144010899465975585$
$r = 794$	$a = 209086$	$b = 55198441$	$\# = 1206559662173486281$
$r = 797$	$a = 210673$	$b = 55828081$	$\# = 1238917892550833881$
$r = 803$	$a = 213865$	$b = 57101689$	$\# = 1305871433292290005$
$r = 806$	$a = 215470$	$b = 57745693$	$\# = 1340495130984177205$
$r = 809$	$a = 217081$	$b = 58394521$	$\# = 1375902729913849741$
$r = 812$	$a = 218698$	$b = 59048191$	$\# = 1412108964595385641$
$r = 815$	$a = 220321$	$b = 59706721$	$\# = 1449128790279378001$
$r = 818$	$a = 221950$	$b = 60370129$	$\# = 1486977385423827025$
$r = 821$	$a = 223585$	$b = 61038433$	$\# = 1525670154183402865$
$r = 823$	$a = 113$	$b = 694$	$\# = 197427385$
$r = 824$	$a = 225226$	$b = 61711651$	$\# = 1565222728917147301$
$r = 827$	$a = 226873$	$b = 62389801$	$\# = 1605650972714682301$
$r = 830$	$a = 228526$	$b = 63072901$	$\# = 1646970981940993501$
$r = 833$	$a = 230185$	$b = 63760969$	$\# = 1689199088799856645$
$r = 836$	$a = 231850$	$b = 64454023$	$\# = 1732351863915975025$
$r = 839$	$a = 233521$	$b = 65152081$	$\# = 1776446118935895961$
$r = 842$	$a = 235198$	$b = 65855161$	$\# = 1821498909147774361$
$r = 845$	$a = 236881$	$b = 66563281$	$\# = 1867527536120051401$
$r = 848$	$a = 238570$	$b = 67276459$	$\# = 1914549550359116365$
$r = 854$	$a = 241966$	$b = 68718061$	$\# = 2011645203432305221$
$r = 860$	$a = 245386$	$b = 70180111$	$\# = 2112931353371038201$
$r = 863$	$a = 247105$	$b = 70918849$	$\# = 2165192462810561185$
$r = 866$	$a = 248830$	$b = 71662753$	$\# = 2218557641490205345$
$r = 869$	$a = 250561$	$b = 72411841$	$\# = 2273046258505402081$
$r = 872$	$a = 252298$	$b = 73166131$	$\# = 2328677953842384181$
$r = 878$	$a = 255790$	$b = 74690389$	$\# = 2443450510889738605$
$r = 884$	$a = 259306$	$b = 76235671$	$\# = 2563037958430031041$
$r = 887$	$a = 261073$	$b = 77016241$	$\# = 2624689325660590441$
$r = 890$	$a = 262846$	$b = 77802121$	$\# = 2687607459785457001$
$r = 893$	$a = 264625$	$b = 78593329$	$\# = 2751813977416413625$
$r = 896$	$a = 266410$	$b = 79389883$	$\# = 2817330789263011165$
$r = 899$	$a = 268201$	$b = 80191801$	$\# = 2884180103123354101$
$r = 902$	$a = 269998$	$b = 80999101$	$\# = 2952384426895094101$
$r = 908$	$a = 273610$	$b = 82629919$	$\# = 3092949654469068745$
$r = 911$	$a = 275425$	$b = 83453473$	$\# = 3165357101947555825$
$r = 914$	$a = 277246$	$b = 84282481$	$\# = 3239212652854475761$
$r = 920$	$a = 280906$	$b = 85956931$	$\# = 3391364600636616901$
$r = 923$	$a = 282745$	$b = 86802409$	$\# = 3469710064991903965$
$r = 926$	$a = 284590$	$b = 87653413$	$\# = 3549601774065215485$
$r = 932$	$a = 288298$	$b = 89372071$	$\# = 3714125648326863121$

$r = 935$	$a = 290161$	$b = 90239761$	$\# = 3798809506073158201$
$r = 938$	$a = 292030$	$b = 91113049$	$\# = 3885143000149961785$
$r = 941$	$a = 293905$	$b = 91991953$	$\# = 3973152823067871145$
$r = 947$	$a = 297673$	$b = 93766681$	$\# = 4154309950858606981$
$r = 950$	$a = 299566$	$b = 94662541$	$\# = 4247512376129964901$
$r = 953$	$a = 301465$	$b = 95564089$	$\# = 4342501377748002205$
$r = 956$	$a = 303370$	$b = 96471343$	$\# = 4439305403726321305$
$r = 959$	$a = 305281$	$b = 97384321$	$\# = 4537953263316939841$
$r = 962$	$a = 307198$	$b = 98303041$	$\# = 4638474130439730241$
$r = 965$	$a = 309121$	$b = 99227521$	$\# = 4740897547133496001$
$r = 968$	$a = 311050$	$b = 100157779$	$\# = 4845253427028752725$
$r = 971$	$a = 312985$	$b = 101093833$	$\# = 4951572058842281965$
$r = 974$	$a = 314926$	$b = 102035701$	$\# = 5059884109893525901$
$r = 977$	$a = 316873$	$b = 102983401$	$\# = 5170220629642890901$
$r = 980$	$a = 318826$	$b = 103936951$	$\# = 5282613053252028001$
$r = 983$	$a = 320785$	$b = 104896369$	$\# = 5397093205166158345$
$r = 986$	$a = 322750$	$b = 105861673$	$\# = 5513693302718511625$
$r = 989$	$a = 324721$	$b = 106832881$	$\# = 5632445959756945561$
$r = 992$	$a = 326698$	$b = 107810011$	$\# = 5753384190292814461$
$r = 995$	$a = 328681$	$b = 108793081$	$\# = 5876541412172154901$
$r = 998$	$a = 330670$	$b = 109782109$	$\# = 6001951450769256565$
$r = 1001$	$a = 332665$	$b = 110777113$	$\# = 6129648542702686285$
$r = 1004$	$a = 334666$	$b = 111778111$	$\# = 6259667339573833321$
$r = 1007$	$a = 336673$	$b = 112785121$	$\# = 6392042911728043921$
$r = 1010$	$a = 338686$	$b = 113798161$	$\# = 6526810752038413201$
$r = 1013$	$a = 340705$	$b = 114817249$	$\# = 6664006779712302385$
$r = 1016$	$a = 342730$	$b = 115842403$	$\# = 6803667344120649445$
$r = 1019$	$a = 344761$	$b = 116873641$	$\# = 6945829228650141181$
$r = 1022$	$a = 346798$	$b = 117910981$	$\# = 7090529654578314781$
$r = 1025$	$a = 348841$	$b = 118954441$	$\# = 7237806284971656901$
$r = 1028$	$a = 350890$	$b = 120004039$	$\# = 7387697228606768305$
$r = 1031$	$a = 352945$	$b = 121059793$	$\# = 7540241043914662105$
$r = 1034$	$a = 355006$	$b = 122121721$	$\# = 7695476742948263641$
$r = 1037$	$a = 357073$	$b = 123189841$	$\# = 7853443795373180041$
$r = 1040$	$a = 359146$	$b = 124264171$	$\# = 8014182132481807501$
$r = 1043$	$a = 361225$	$b = 125344729$	$\# = 8177732151230844325$
$r = 1046$	$a = 363310$	$b = 126431533$	$\# = 8344134718302277765$
$r = 1058$	$a = 371710$	$b = 130841569$	$\# = 9039104473232062945$
$r = 1061$	$a = 373825$	$b = 131959873$	$\# = 9220399509771467425$
$r = 1064$	$a = 375946$	$b = 133084531$	$\# = 9404802389346367861$
$r = 1067$	$a = 378073$	$b = 134215561$	$\# = 9592357382409493261$
$r = 1070$	$a = 380206$	$b = 135352981$	$\# = 9783109262479977901$
$r = 1073$	$a = 382345$	$b = 136496809$	$\# = 9977103310418674165$
$r = 1076$	$a = 384490$	$b = 137647063$	$\# = 10174385318727619585$

$r = 1079$	$a = 386641$	$b = 138803761$	$\# = 10375001595873726121$
$r = 1082$	$a = 388798$	$b = 139966921$	$\# = 10578998970636759721$
$r = 1085$	$a = 390961$	$b = 141136561$	$\# = 10786424796481678201$
$r = 1088$	$a = 393130$	$b = 142312699$	$\# = 10997326955955395485$
$r = 1091$	$a = 395305$	$b = 143495353$	$\# = 11211753865108040245$
$r = 1094$	$a = 397486$	$b = 144684541$	$\# = 11429754477938776981$
$r = 1106$	$a = 406270$	$b = 149506993$	$\# = 12338492125279577905$
$r = 1109$	$a = 408481$	$b = 150729121$	$\# = 12575114709021127441$
$r = 1112$	$a = 410698$	$b = 151957891$	$\# = 12815616269443502341$
$r = 1115$	$a = 412921$	$b = 153193321$	$\# = 13060049652749641501$
$r = 1118$	$a = 415150$	$b = 154435429$	$\# = 13308468279550500925$
$r = 1121$	$a = 417385$	$b = 155684233$	$\# = 13560926149534998565$
$r = 1127$	$a = 421873$	$b = 158202001$	$\# = 14078178541396827001$
$r = 1130$	$a = 424126$	$b = 159471001$	$\# = 14343084000425115001$
$r = 1133$	$a = 426385$	$b = 160746769$	$\# = 14612250586456157545$
$r = 1136$	$a = 428650$	$b = 162029323$	$\# = 14885735265503735725$
$r = 1139$	$a = 430921$	$b = 163318681$	$\# = 15163595611211742661$
$r = 1142$	$a = 433198$	$b = 164614861$	$\# = 15445889809702257061$
$r = 1145$	$a = 435481$	$b = 165917881$	$\# = 15732676664449335901$
$r = 1148$	$a = 437770$	$b = 167227759$	$\# = 16024015601178594265$
$r = 1151$	$a = 440065$	$b = 168544513$	$\# = 16319966672792640385$
$r = 1152$	$a = 9215$	$b = 510720$	$\# = 149979784926720$
$r = 1154$	$a = 442366$	$b = 169868161$	$\# = 16620590564322433921$
$r = 1157$	$a = 444673$	$b = 171198721$	$\# = 16925948597904635521$
$r = 1160$	$a = 446986$	$b = 172536211$	$\# = 17236102737785015701$
$r = 1163$	$a = 449305$	$b = 173880649$	$\# = 17551115595347991085$
$r = 1166$	$a = 451630$	$b = 175232053$	$\# = 17871050434172356045$
$r = 1169$	$a = 453961$	$b = 176590441$	$\# = 18195971175113277781$
$r = 1172$	$a = 456298$	$b = 177955831$	$\# = 18525942401410622881$
$r = 1175$	$a = 458641$	$b = 179328241$	$\# = 18861029363823683401$
$r = 1178$	$a = 460990$	$b = 180707689$	$\# = 19201297985792370505$
$r = 1181$	$a = 463345$	$b = 182094193$	$\# = 19546814868624943705$
$r = 1184$	$a = 465706$	$b = 183487771$	$\# = 19897647296712343741$
$r = 1187$	$a = 468073$	$b = 184888441$	$\# = 20253863242769197141$
$r = 1190$	$a = 470446$	$b = 186296221$	$\# = 20615531373101560501$
$r = 1196$	$a = 475210$	$b = 189133183$	$\# = 21355502351568381865$
$r = 1199$	$a = 477601$	$b = 190562401$	$\# = 21733946048057518801$
$r = 1202$	$a = 479998$	$b = 191998801$	$\# = 22118123636255278801$
$r = 1205$	$a = 482401$	$b = 193442401$	$\# = 22508107330381686001$
$r = 1208$	$a = 484810$	$b = 194893219$	$\# = 22903970070420004645$
$r = 1211$	$a = 487225$	$b = 196351273$	$\# = 23305785527573566525$
$r = 1214$	$a = 489646$	$b = 197816581$	$\# = 23713628109749882461$
$r = 1217$	$a = 492073$	$b = 199289161$	$\# = 24127572967072105861$
$r = 1223$	$a = 496945$	$b = 202256209$	$\# = 24974073851985891865$

$r = 1226$	$a = 499390$	$b = 203750713$	$\# = 25406783940889436185$
$r = 1229$	$a = 501841$	$b = 205252561$	$\# = 25845904438778331721$
$r = 1232$	$a = 504298$	$b = 206761771$	$\# = 26291514290487983821$
$r = 1235$	$a = 506761$	$b = 208278361$	$\# = 26743693216716425701$
$r = 1241$	$a = 511705$	$b = 211333753$	$\# = 27668081089091846845$
$r = 1247$	$a = 516673$	$b = 214418881$	$\# = 28619721556223035681$
$r = 1250$	$a = 519166$	$b = 215972641$	$\# = 29105969221610330401$
$r = 1253$	$a = 521665$	$b = 217533889$	$\# = 29599280900247019105$
$r = 1256$	$a = 524170$	$b = 219102643$	$\# = 30099741905171822005$
$r = 1262$	$a = 529198$	$b = 222262741$	$\# = 31122457263401576941$
$r = 1265$	$a = 531721$	$b = 223854121$	$\# = 31644886377963064501$
$r = 1268$	$a = 534250$	$b = 225453079$	$\# = 32174814353270946625$
$r = 1271$	$a = 536785$	$b = 227059633$	$\# = 32712330673378802665$
$r = 1274$	$a = 539326$	$b = 228673801$	$\# = 33257525674561050601$
$r = 1277$	$a = 541873$	$b = 230295601$	$\# = 33810490551385740601$
$r = 1280$	$a = 544426$	$b = 231925051$	$\# = 34371317362816129501$
$r = 1283$	$a = 546985$	$b = 233562169$	$\# = 34940099038341104245$
$r = 1286$	$a = 549550$	$b = 235206973$	$\# = 35516929384134522325$
$r = 1289$	$a = 552121$	$b = 236859481$	$\# = 36101903089243537261$
$r = 1292$	$a = 554698$	$b = 238519711$	$\# = 36695115731805977161$
$r = 1295$	$a = 557281$	$b = 240187681$	$\# = 37296663785296844401$
$r = 1298$	$a = 559870$	$b = 241863409$	$\# = 37906644624804004465$
$r = 1301$	$a = 562465$	$b = 243546913$	$\# = 38525156533333131985$
$r = 1304$	$a = 565066$	$b = 245238211$	$\# = 39152298708141982021$
$r = 1307$	$a = 567673$	$b = 246937321$	$\# = 39788171267104054621$
$r = 1310$	$a = 570286$	$b = 248644261$	$\# = 40432875255101720701$
$r = 1313$	$a = 572905$	$b = 250359049$	$\# = 41086512650448877285$
$r = 1319$	$a = 578161$	$b = 253812241$	$\# = 42421000282348061881$
$r = 1322$	$a = 580798$	$b = 255550681$	$\# = 43102059200904183481$
$r = 1325$	$a = 583441$	$b = 257297041$	$\# = 43792468903871087401$
$r = 1328$	$a = 586090$	$b = 259051339$	$\# = 44492336134098420205$
$r = 1331$	$a = 588745$	$b = 260813593$	$\# = 45201768607027212805$
$r = 1337$	$a = 594073$	$b = 264362041$	$\# = 46649765045527891741$
$r = 1340$	$a = 596746$	$b = 266148271$	$\# = 47388549364770591001$
$r = 1346$	$a = 602110$	$b = 269744833$	$\# = 48896248572094198465$
$r = 1349$	$a = 604801$	$b = 271555201$	$\# = 49665389829945422401$
$r = 1352$	$a = 607498$	$b = 273373651$	$\# = 50444878131968274901$
$r = 1355$	$a = 610201$	$b = 275200201$	$\# = 51234829215595195501$
$r = 1358$	$a = 612910$	$b = 277034869$	$\# = 52035359851619768845$
$r = 1361$	$a = 615625$	$b = 278877673$	$\# = 52846587851101103125$
$r = 1364$	$a = 618346$	$b = 280728631$	$\# = 53668632072298894561$
$r = 1367$	$a = 621073$	$b = 282587761$	$\# = 54501612427639245961$
$r = 1370$	$a = 623806$	$b = 284455081$	$\# = 55345649890711307401$
$r = 1373$	$a = 626545$	$b = 286330609$	$\# = 56200866503294807065$

$r = 1376$	$a = 629290$	$b = 288214363$	$\# = 57067385382418540285$
$r = 1379$	$a = 632041$	$b = 290106361$	$\# = 57945330727449884821$
$r = 1382$	$a = 634798$	$b = 292006621$	$\# = 58834827827215410421$
$r = 1385$	$a = 637561$	$b = 293915161$	$\# = 59736003067152650701$
$r = 1388$	$a = 640330$	$b = 295831999$	$\# = 60648983936493105385$
$r = 1391$	$a = 643105$	$b = 297757153$	$\# = 61573899035476540945$
$r = 1394$	$a = 645886$	$b = 299690641$	$\# = 62510878082596657681$
$r = 1397$	$a = 648673$	$b = 301632481$	$\# = 63460051921878191281$
$r = 1400$	$a = 651466$	$b = 303582691$	$\# = 64421552530185516901$
$r = 1403$	$a = 654265$	$b = 305541289$	$\# = 65395513024562823805$
$r = 1406$	$a = 657070$	$b = 307508293$	$\# = 66382067669605928605$
$r = 1409$	$a = 659881$	$b = 309483721$	$\# = 67381351884865795141$
$r = 1412$	$a = 662698$	$b = 311467591$	$\# = 68393502252283829041$
$r = 1415$	$a = 665521$	$b = 313459921$	$\# = 69418656523659015001$
$r = 1418$	$a = 668350$	$b = 315460729$	$\# = 70456953628146964825$
$r = 1421$	$a = 671185$	$b = 317470033$	$\# = 71508533679790944265$
$r = 1424$	$a = 674026$	$b = 319487851$	$\# = 72573537985084946701$
$r = 1427$	$a = 676873$	$b = 321514201$	$\# = 73652109050568881701$
$r = 1430$	$a = 679726$	$b = 323549101$	$\# = 74744390590455946501$
$r = 1436$	$a = 685450$	$b = 327644623$	$\# = 76970666034648746425$
$r = 1439$	$a = 688321$	$b = 329705281$	$\# = 78104953474845579361$
$r = 1442$	$a = 691198$	$b = 331774561$	$\# = 79253538476708849761$
$r = 1445$	$a = 694081$	$b = 333852481$	$\# = 80416570908359930401$
$r = 1454$	$a = 702766$	$b = 340138261$	$\# = 83993870322171352621$
$r = 1457$	$a = 705673$	$b = 342250921$	$\# = 85216216354545551221$
$r = 1460$	$a = 708586$	$b = 344372311$	$\# = 86453778126654403201$
$r = 1463$	$a = 711505$	$b = 346502449$	$\# = 87706713149796210985$
$r = 1466$	$a = 714430$	$b = 348641353$	$\# = 88975180237006056745$
$r = 1469$	$a = 717361$	$b = 350789041$	$\# = 90259339511107743481$
$r = 1472$	$a = 720298$	$b = 352945531$	$\# = 91559352412798871581$
$r = 1475$	$a = 723241$	$b = 355110841$	$\# = 92875381708769118901$
$r = 1481$	$a = 729145$	$b = 359467993$	$\# = 95556147229208719405$
$r = 1484$	$a = 732106$	$b = 361659871$	$\# = 96921215690548546441$
$r = 1487$	$a = 735073$	$b = 363860641$	$\# = 98302965036378513841$
$r = 1490$	$a = 738046$	$b = 366070321$	$\# = 99701564786289774001$
$r = 1493$	$a = 741025$	$b = 368288929$	$\# = 101117185835276321425$
$r = 1496$	$a = 744010$	$b = 370516483$	$\# = 102550000462087602565$
$r = 1499$	$a = 747001$	$b = 372753001$	$\# = 104000182337614873501$
$r = 1502$	$a = 749998$	$b = 374998501$	$\# = 105467906533311373501$
$r = 1505$	$a = 753001$	$b = 377253001$	$\# = 106953349529646382501$
$r = 1511$	$a = 759025$	$b = 381789073$	$\# = 109978104942151327225$
$r = 1514$	$a = 762046$	$b = 384070681$	$\# = 111517777440902279161$
$r = 1517$	$a = 765073$	$b = 386361361$	$\# = 113075888922600163561$
$r = 1523$	$a = 771145$	$b = 390970009$	$\# = 116248164909496669765$

$r = 1526$	$a = 774190$	$b = 393288013$	$\# = 117862701111857806885$
$r = 1529$	$a = 777241$	$b = 395615161$	$\# = 119496419708911635421$
$r = 1532$	$a = 780298$	$b = 397951471$	$\# = 121149510248328914521$
$r = 1535$	$a = 783361$	$b = 400296961$	$\# = 122822163773215603201$
$r = 1538$	$a = 786430$	$b = 402651649$	$\# = 124514572830944131585$
$r = 1541$	$a = 789505$	$b = 405015553$	$\# = 126226931482019372545$
$r = 1547$	$a = 795673$	$b = 409771081$	$\# = 129712281425330974381$
$r = 1550$	$a = 798766$	$b = 412162741$	$\# = 131485668484520205901$
$r = 1553$	$a = 801865$	$b = 414563689$	$\# = 133279796688937826005$
$r = 1556$	$a = 804970$	$b = 416973943$	$\# = 135094867798959772705$
$r = 1559$	$a = 808081$	$b = 419393521$	$\# = 136931085142022775241$
$r = 1562$	$a = 811198$	$b = 421822441$	$\# = 138788653621735133641$
$r = 1565$	$a = 814321$	$b = 424260721$	$\# = 140667779727022743001$
$r = 1571$	$a = 820585$	$b = 429165433$	$\# = 144491538751738673365$
$r = 1577$	$a = 826873$	$b = 434107801$	$\# = 148404046183705500301$
$r = 1586$	$a = 836350$	$b = 441592273$	$\# = 154442958224759283025$
$r = 1589$	$a = 839521$	$b = 444106081$	$\# = 156502172220311118961$
$r = 1592$	$a = 842698$	$b = 446629411$	$\# = 158584875107690749861$
$r = 1595$	$a = 845881$	$b = 449162281$	$\# = 160691289739833843901$
$r = 1598$	$a = 849070$	$b = 451704709$	$\# = 162821640657945542365$
$r = 1607$	$a = 858673$	$b = 459389521$	$\# = 169358582065498375321$
$r = 1610$	$a = 861886$	$b = 461970361$	$\# = 171586957640783938201$
$r = 1613$	$a = 865105$	$b = 464560849$	$\# = 173840417868471242185$
$r = 1616$	$a = 868330$	$b = 467161003$	$\# = 176119197621708800845$
$r = 1619$	$a = 871561$	$b = 469770841$	$\# = 178423533529695572581$
$r = 1622$	$a = 874798$	$b = 472390381$	$\# = 180753663987509562181$
$r = 1625$	$a = 878041$	$b = 475019641$	$\# = 183109829165973027901$
$r = 1628$	$a = 881290$	$b = 477658639$	$\# = 185492271021554362105$
$r = 1631$	$a = 884545$	$b = 480307393$	$\# = 187901233306306713505$
$r = 1634$	$a = 887806$	$b = 482965921$	$\# = 190336961577843419041$
$r = 1637$	$a = 891073$	$b = 485634241$	$\# = 192799703209350313441$
$r = 1640$	$a = 894346$	$b = 488312371$	$\# = 195289707399634984501$
$r = 1643$	$a = 897625$	$b = 491000329$	$\# = 197807225183213042125$
$r = 1646$	$a = 900910$	$b = 493698133$	$\# = 200352509440431469165$
$r = 1649$	$a = 904201$	$b = 496405801$	$\# = 202925814907629122101$
$r = 1652$	$a = 907498$	$b = 499123351$	$\# = 205527398187334449601$
$r = 1655$	$a = 910801$	$b = 501850801$	$\# = 208157517758500497001$
$r = 1658$	$a = 914110$	$b = 504588169$	$\# = 210816433986777264745$
$r = 1661$	$a = 917425$	$b = 507335473$	$\# = 213504409134821488825$
$r = 1664$	$a = 920746$	$b = 510092731$	$\# = 216221707372643911261$
$r = 1667$	$a = 924073$	$b = 512859961$	$\# = 218968594787994108661$
$r = 1670$	$a = 927406$	$b = 515637181$	$\# = 221745339396782946901$
$r = 1673$	$a = 930745$	$b = 518424409$	$\# = 224552211153542729965$
$r = 1676$	$a = 934090$	$b = 521221663$	$\# = 227389481961925110985$

$r = 1679$	$a = 937441$	$b = 524028961$	$\# = 230257425685236833521$
$r = 1682$	$a = 940798$	$b = 526846321$	$\# = 233156318157013371121$
$r = 1685$	$a = 944161$	$b = 529673761$	$\# = 236086437191630533201$
$r = 1688$	$a = 947530$	$b = 532511299$	$\# = 239048062594954105285$
$r = 1691$	$a = 950905$	$b = 535358953$	$\# = 242041476175027591645$
$r = 1694$	$a = 954286$	$b = 538216741$	$\# = 245066961752798128381$
$r = 1697$	$a = 957673$	$b = 541084681$	$\# = 248124805172880634981$
$r = 1700$	$a = 961066$	$b = 543962791$	$\# = 251215294314360272401$
$r = 1703$	$a = 964465$	$b = 546851089$	$\# = 254338719101633275705$
$r = 1706$	$a = 967870$	$b = 549749593$	$\# = 257495371515286229305$
$r = 1709$	$a = 971281$	$b = 552658321$	$\# = 260685545603013852841$
$r = 1712$	$a = 974698$	$b = 555577291$	$\# = 263909537490575365741$
$r = 1715$	$a = 978121$	$b = 558506521$	$\# = 267167645392789498501$
$r = 1718$	$a = 981550$	$b = 561446029$	$\# = 270460169624568218725$
$r = 1721$	$a = 984985$	$b = 564395833$	$\# = 273787412611989239965$
$r = 1724$	$a = 988426$	$b = 567355951$	$\# = 277149678903407381401$
$r = 1727$	$a = 991873$	$b = 570326401$	$\# = 280547275180604846401$
$r = 1730$	$a = 995326$	$b = 573307201$	$\# = 283980510269980488001$
$r = 1733$	$a = 998785$	$b = 576298369$	$\# = 287449695153778129345$
$r = 1736$	$a = 1002250$	$b = 579299923$	$\# = 290955142981354007125$
$r = 1739$	$a = 1005721$	$b = 582311881$	$\# = 294497169080483406061$
$r = 1742$	$a = 1009198$	$b = 585334261$	$\# = 298076090968706552461$
$r = 1745$	$a = 1012681$	$b = 588367081$	$\# = 301692228364713834901$
$r = 1748$	$a = 1016170$	$b = 591410359$	$\# = 305345903199770420065$
$r = 1751$	$a = 1019665$	$b = 594464113$	$\# = 309037439629180331785$
$r = 1754$	$a = 1023166$	$b = 597528361$	$\# = 312767164043790061321$
$r = 1757$	$a = 1026673$	$b = 600603121$	$\# = 316535405081531776921$
$r = 1760$	$a = 1030186$	$b = 603688411$	$\# = 320342493639006200701$
$r = 1763$	$a = 1033705$	$b = 606784249$	$\# = 324188762883105220885$
$r = 1766$	$a = 1037230$	$b = 609890653$	$\# = 328074548262674307445$
$r = 1769$	$a = 1040761$	$b = 613007641$	$\# = 332000187520214799181$
$r = 1772$	$a = 1044298$	$b = 616135231$	$\# = 335966020703626130281$
$r = 1775$	$a = 1047841$	$b = 619273441$	$\# = 339972390177988064401$
$r = 1778$	$a = 1051390$	$b = 622422289$	$\# = 344019640637383004305$
$r = 1781$	$a = 1054945$	$b = 625581793$	$\# = 348108119116758445105$
$r = 1784$	$a = 1058506$	$b = 628751971$	$\# = 352238175003829639141$
$r = 1787$	$a = 1062073$	$b = 631932841$	$\# = 356410160051022540541$
$r = 1790$	$a = 1065646$	$b = 635124421$	$\# = 360624428387457097501$
$r = 1793$	$a = 1069225$	$b = 638326729$	$\# = 364881336530970960325$
$r = 1796$	$a = 1072810$	$b = 641539783$	$\# = 369181243400183673265$
$r = 1802$	$a = 1079998$	$b = 647998201$	$\# = 377911501066762378201$
$r = 1805$	$a = 1083601$	$b = 651243601$	$\# = 382342581814422789001$
$r = 1808$	$a = 1087210$	$b = 654499819$	$\# = 386818121212783746445$
$r = 1811$	$a = 1090825$	$b = 657766873$	$\# = 391338490366758837925$

$r = 1814$	$a = 1094446$	$b = 661044781$	$\# = 395904062855282665861$
$r = 1817$	$a = 1098073$	$b = 664333561$	$\# = 400515214743660331261$
$r = 1820$	$a = 1101706$	$b = 667633231$	$\# = 405172324595957945401$
$r = 1823$	$a = 1105345$	$b = 670943809$	$\# = 409875773487434237665$
$r = 1826$	$a = 1108990$	$b = 674265313$	$\# = 414625945017013327585$
$r = 1829$	$a = 1112641$	$b = 677597761$	$\# = 419423225319798729121$
$r = 1832$	$a = 1116298$	$b = 680941171$	$\# = 424268003079628655221$
$r = 1835$	$a = 1119961$	$b = 684295561$	$\# = 429160669541672690701$
$r = 1838$	$a = 1123630$	$b = 687660949$	$\# = 434101618525069901485$
$r = 1844$	$a = 1130986$	$b = 694424791$	$\# = 444129952278446772481$
$r = 1847$	$a = 1134673$	$b = 697823281$	$\# = 449218137670876423081$
$r = 1850$	$a = 1138366$	$b = 701232841$	$\# = 454356206855126591401$
$r = 1856$	$a = 1145770$	$b = 708085243$	$\# = 464783626769813173405$
$r = 1859$	$a = 1149481$	$b = 711528121$	$\# = 470073799225222277941$
$r = 1865$	$a = 1156921$	$b = 718447321$	$\# = 480809143499494531501$
$r = 1868$	$a = 1160650$	$b = 721923679$	$\# = 486255153141902204425$
$r = 1874$	$a = 1168126$	$b = 728910001$	$\# = 497305962344588670001$
$r = 1877$	$a = 1171873$	$b = 732420001$	$\# = 502911616062376170001$
$r = 1883$	$a = 1179385$	$b = 739473769$	$\# = 514285577769505366045$
$r = 1886$	$a = 1183150$	$b = 743017573$	$\# = 520054756487995793725$
$r = 1889$	$a = 1186921$	$b = 746572681$	$\# = 525879318919005690661$
$r = 1895$	$a = 1194481$	$b = 753716881$	$\# = 537696367178045153401$
$r = 1898$	$a = 1198270$	$b = 757306009$	$\# = 543689746204428870265$
$r = 1901$	$a = 1202065$	$b = 760906513$	$\# = 549740295367045473385$
$r = 1907$	$a = 1209673$	$b = 768141721$	$\# = 562014721891765006021$
$r = 1910$	$a = 1213486$	$b = 771776461$	$\# = 568239515353512065701$
$r = 1913$	$a = 1217305$	$b = 775422649$	$\# = 574523311178129397085$
$r = 1916$	$a = 1221130$	$b = 779080303$	$\# = 580866574681300451545$
$r = 1919$	$a = 1224961$	$b = 782749441$	$\# = 587269774109818673281$
$r = 1922$	$a = 1228798$	$b = 786430081$	$\# = 593733380655413450881$
$r = 1925$	$a = 1232641$	$b = 790122241$	$\# = 600257868468619478401$
$r = 1928$	$a = 1236490$	$b = 793825939$	$\# = 606843714672689594005$
$r = 1931$	$a = 1240345$	$b = 797541193$	$\# = 613491399377551164205$
$r = 1934$	$a = 1244206$	$b = 801268021$	$\# = 620201405693806081741$
$r = 1937$	$a = 1248073$	$b = 805006441$	$\# = 626974219746774445141$
$r = 1940$	$a = 1251946$	$b = 808756471$	$\# = 633810330690581988001$
$r = 1943$	$a = 1255825$	$b = 812518129$	$\# = 640710230722291326025$
$r = 1946$	$a = 1259710$	$b = 816291433$	$\# = 647674415096077089865$
$r = 1949$	$a = 1263601$	$b = 820076401$	$\# = 654703382137445011801$
$r = 1952$	$a = 1267498$	$b = 823873051$	$\# = 661797633257495034301$
$r = 1955$	$a = 1271401$	$b = 827681401$	$\# = 668957672967228508501$
$r = 1958$	$a = 1275310$	$b = 831501469$	$\# = 676184008891899550645$
$r = 1961$	$a = 1279225$	$b = 835333273$	$\# = 683477151785410624525$
$r = 1964$	$a = 1283146$	$b = 839176831$	$\# = 690837615544752417961$

$r = 1967$	$a = 1287073$	$b = 843032161$	$\# = 698265917224488081361$
$r = 1970$	$a = 1291006$	$b = 846899281$	$\# = 705762577051281896401$
$r = 1973$	$a = 1294945$	$b = 850778209$	$\# = 713328118438472442865$
$r = 1976$	$a = 1298890$	$b = 854668963$	$\# = 720963068000690331685$
$r = 1979$	$a = 1302841$	$b = 858571561$	$\# = 728667955568520572221$
$r = 1982$	$a = 1306798$	$b = 862486021$	$\# = 736443314203209641821$
$r = 1985$	$a = 1310761$	$b = 866412361$	$\# = 744289680211417325701$
$r = 1988$	$a = 1314730$	$b = 870350599$	$\# = 752207593160013395185$
$r = 1991$	$a = 1318705$	$b = 874300753$	$\# = 760197595890919192345$
$r = 1994$	$a = 1322686$	$b = 878262841$	$\# = 768260234535994189081$
$r = 1997$	$a = 1326673$	$b = 882236881$	$\# = 776396058531967588681$
$r = 2000$	$a = 1330666$	$b = 886222891$	$\# = 784605620635415037901$
$r = 2003$	$a = 1334665$	$b = 890220889$	$\# = 792889476937780517605$
$r = 2006$	$a = 1338670$	$b = 894230893$	$\# = 801248186880443480005$
$r = 2009$	$a = 1342681$	$b = 898252921$	$\# = 809682313269831300541$
$r = 2012$	$a = 1346698$	$b = 902286991$	$\# = 818192422292577112441$
$r = 2015$	$a = 1350721$	$b = 906333121$	$\# = 826779083530723092001$
$r = 2018$	$a = 1354750$	$b = 910391329$	$\# = 835442869976969262625$
$r = 2021$	$a = 1358785$	$b = 914461633$	$\# = 844184358049967885665$
$r = 2024$	$a = 1362826$	$b = 918544051$	$\# = 853004127609663506101$
$r = 2027$	$a = 1366873$	$b = 922638601$	$\# = 861902761972678721101$
$r = 2030$	$a = 1370926$	$b = 926745301$	$\# = 870880847927745739501$
$r = 2033$	$a = 1374985$	$b = 930864169$	$\# = 879938975751183800245$
$r = 2036$	$a = 1379050$	$b = 934995223$	$\# = 889077739222422517825$
$r = 2039$	$a = 1383121$	$b = 939138481$	$\# = 898297735639571222761$
$r = 2042$	$a = 1387198$	$b = 943293961$	$\# = 907599565835034365161$
$r = 2045$	$a = 1391281$	$b = 947461681$	$\# = 916983834191173049401$
$r = 2048$	$a = 1395370$	$b = 951641659$	$\# = 926451148656012767965$
$r = 2051$	$a = 1399465$	$b = 955833913$	$\# = 936002120758997402485$
$r = 2054$	$a = 1403566$	$b = 960038461$	$\# = 945637365626789560021$
$r = 2057$	$a = 1407673$	$b = 964255321$	$\# = 955357501999117312621$
$r = 2060$	$a = 1411786$	$b = 968484511$	$\# = 965163152244667408201$
$r = 2063$	$a = 1415905$	$b = 972726049$	$\# = 975054942377025020785$
$r = 2066$	$a = 1420030$	$b = 976979953$	$\# = 985033502070660108145$
$r = 2069$	$a = 1424161$	$b = 981246241$	$\# = 995099464676960444881$
$r = 2072$	$a = 1428298$	$b = 985524931$	$\# = 1005253467240311398981$
$r = 2075$	$a = 1432441$	$b = 989816041$	$\# = 1015496150514222519901$
$r = 2081$	$a = 1440745$	$b = 998435593$	$\# = 1036250140850472120805$
$r = 2084$	$a = 1444906$	$b = 1002764071$	$\# = 1046762748111246621841$
$r = 2087$	$a = 1449073$	$b = 1007105041$	$\# = 1057366636512035277241$
$r = 2093$	$a = 1457425$	$b = 1015824529$	$\# = 1078850898711215389225$
$r = 2096$	$a = 1461610$	$b = 1020203083$	$\# = 1089732603032019593965$
$r = 2099$	$a = 1465801$	$b = 1024594201$	$\# = 1100708249570623152901$
$r = 2102$	$a = 1469998$	$b = 1028997901$	$\# = 1111778513196107292901$

$r = 2105$ $a = 1474201$ $b = 1033414201$ $\# = 1122944072650532905501$
$r = 2108$ $a = 1478410$ $b = 1037843119$ $\# = 1134205610565586552345$
$r = 2111$ $a = 1482625$ $b = 1042284673$ $\# = 1145563813479274098625$
$r = 2114$ $a = 1486846$ $b = 1046738881$ $\# = 1157019371852662042561$
$r = 2117$ $a = 1491073$ $b = 1051205761$ $\# = 1168572980086666608961$
$r = 2120$ $a = 1495306$ $b = 1055685331$ $\# = 1180225336538890674901$
$r = 2123$ $a = 1499545$ $b = 1060177609$ $\# = 1191977143540508595565$
$r = 2126$ $a = 1503790$ $b = 1064682613$ $\# = 1203829107413198998285$
$r = 2132$ $a = 1512298$ $b = 1073730871$ $\# = 1227836351112966205921$
$r = 2135$ $a = 1516561$ $b = 1078274161$ $\# = 1239993063688989688201$
$r = 2141$ $a = 1525105$ $b = 1087399153$ $\# = 1264616282580417073945$
$r = 2147$ $a = 1533673$ $b = 1096575481$ $\# = 1289657423806353381781$
$r = 2150$ $a = 1537966$ $b = 1101182941$ $\# = 1302336554714496486901$
$r = 2153$ $a = 1542265$ $b = 1105803289$ $\# = 1315122381779254809805$
$r = 2159$ $a = 1550881$ $b = 1115082721$ $\# = 1341017117233074170641$
$r = 2162$ $a = 1555198$ $b = 1119741841$ $\# = 1354127532516753377041$
$r = 2165$ $a = 1559521$ $b = 1124413921$ $\# = 1367347657781360430001$
$r = 2168$ $a = 1563850$ $b = 1129098979$ $\# = 1380678257020601268325$
$r = 2171$ $a = 1568185$ $b = 1133797033$ $\# = 1394120098478480464765$
$r = 2174$ $a = 1572526$ $b = 1138508101$ $\# = 1407673954667010764701$
$r = 2177$ $a = 1576873$ $b = 1143232201$ $\# = 1421340602383971749701$
$r = 2180$ $a = 1581226$ $b = 1147969351$ $\# = 1435120822730717694001$
$r = 2183$ $a = 1585585$ $b = 1152719569$ $\# = 1449015401130034681945$
$r = 2186$ $a = 1589950$ $b = 1157482873$ $\# = 1463025127344047054425$
$r = 2189$ $a = 1594321$ $b = 1162259281$ $\# = 1477150795492173252361$
$r = 2192$ $a = 1598698$ $b = 1167048811$ $\# = 1491393204069131125261$
$r = 2195$ $a = 1603081$ $b = 1171851481$ $\# = 1505753155962992772901$
$r = 2198$ $a = 1607470$ $b = 1176667309$ $\# = 1520231458473288988165$
$r = 2201$ $a = 1611865$ $b = 1181496313$ $\# = 1534828923329163369085$
$r = 2204$ $a = 1616266$ $b = 1186338511$ $\# = 1549546366707576168121$
$r = 2210$ $a = 1625086$ $b = 1196062561$ $\# = 1579344476088513103201$
$r = 2213$ $a = 1629505$ $b = 1200944449$ $\# = 1594426796848573341985$
$r = 2216$ $a = 1633930$ $b = 1205839603$ $\# = 1609632405683001152245$
$r = 2219$ $a = 1638361$ $b = 1210748041$ $\# = 1624962141282643363981$
$r = 2222$ $a = 1642798$ $b = 1215669781$ $\# = 1640416846896434849581$
$r = 2225$ $a = 1647241$ $b = 1220604841$ $\# = 1655997370349952438901$
$r = 2228$ $a = 1651690$ $b = 1225553239$ $\# = 1671704564064019115905$
$r = 2231$ $a = 1656145$ $b = 1230514993$ $\# = 1687539285073358564905$
$r = 2234$ $a = 1660606$ $b = 1235490121$ $\# = 1703502395045300134441$
$r = 2243$ $a = 1674025$ $b = 1250495929$ $\# = 1752170745293334399925$
$r = 2249$ $a = 1683001$ $b = 1260567001$ $\# = 1785274264350399091501$
$r = 2252$ $a = 1687498$ $b = 1265622751$ $\# = 1802026064907349029001$
$r = 2255$ $a = 1692001$ $b = 1270692001$ $\# = 1818912417393001230001$
$r = 2258$ $a = 1696510$ $b = 1275774769$ $\# = 1835934221214981626545$

$r = 2261$ $a = 1701025$ $b = 1280871073$ $\# = 1853092380584146510225$
$r = 2267$ $a = 1710073$ $b = 1291104361$ $\# = 1887821406938935164061$
$r = 2273$ $a = 1719145$ $b = 1301392009$ $\# = 1923106826940193945765$
$r = 2276$ $a = 1723690$ $b = 1306556263$ $\# = 1940960496668957202385$
$r = 2279$ $a = 1728241$ $b = 1311734161$ $\# = 1958956049157387100921$
$r = 2282$ $a = 1732798$ $b = 1316925721$ $\# = 1977094422779783222521$
$r = 2285$ $a = 1737361$ $b = 1322130961$ $\# = 1995376560868815028201$
$r = 2288$ $a = 1741930$ $b = 1327349899$ $\# = 2013803411735145975085$
$r = 2291$ $a = 1746505$ $b = 1332582553$ $\# = 2032375928687109343045$
$r = 2294$ $a = 1751086$ $b = 1337828941$ $\# = 2051095070050435839781$
$r = 2297$ $a = 1755673$ $b = 1343089081$ $\# = 2069961799188033052381$
$r = 2300$ $a = 1760266$ $b = 1348362991$ $\# = 2088977084519816813401$
$r = 2303$ $a = 1764865$ $b = 1353650689$ $\# = 2108141899542594549505$
$r = 2306$ $a = 1769470$ $b = 1358952193$ $\# = 2127457222850000680705$
$r = 2312$ $a = 1778698$ $b = 1369596691$ $\# = 216654333429734806914 1$
$r = 2315$ $a = 1783321$ $b = 1374939721$ $\# = 218631610528884179550 1$
$r = 2318$ $a = 1787950$ $b = 1380296629$ $\# = 2206243350308305096525$
$r = 2321$ $a = 1792585$ $b = 1385667433$ $\# = 2226326073734364881365$
$r = 2324$ $a = 1797226$ $b = 1391052151$ $\# = 2246565285163184320801$
$r = 2327$ $a = 1801873$ $b = 1396450801$ $\# = 2266961999428764505801$
$r = 2330$ $a = 1806526$ $b = 1401863401$ $\# = 2287517236623298701001$
$r = 2333$ $a = 1811185$ $b = 1407289969$ $\# = 2308232022117579261145$
$r = 2336$ $a = 1815850$ $b = 1412730523$ $\# = 2329107386581457278525$
$r = 2339$ $a = 1820521$ $b = 1418185081$ $\# = 2350144366004355029461$
$r = 2342$ $a = 1825198$ $b = 1423653661$ $\# = 2371344001715831287861$
$r = 2345$ $a = 1829881$ $b = 1429136281$ $\# = 2392707340406199573901$
$r = 2348$ $a = 1834570$ $b = 1434632959$ $\# = 2414235434147199405865$
$r = 2351$ $a = 1839265$ $b = 1440143713$ $\# = 2435929340412720623185$
$r = 2354$ $a = 1843966$ $b = 1445668561$ $\# = 2457790122099580848721$
$r = 2357$ $a = 1848673$ $b = 1451207521$ $\# = 2479818847548356158321$
$r = 2360$ $a = 1853386$ $b = 1456760611$ $\# = 2502016590564265025701$
$r = 2363$ $a = 1858105$ $b = 1462327849$ $\# = 2524384430438105610685$
$r = 2366$ $a = 1862830$ $b = 1467909253$ $\# = 2546923451967246458845$
$r = 2369$ $a = 1867561$ $b = 1473504841$ $\# = 2569634745476670680581$
$r = 2372$ $a = 1872298$ $b = 1479114631$ $\# = 2592519406840073677681$
$r = 2375$ $a = 1877041$ $b = 1484738641$ $\# = 2615578537501014485401$
$r = 2378$ $a = 103$ $b = 604$ $\# = 432684460$
$r = 2378$ $a = 1881790$ $b = 1490376889$ $\# = 2638813244494120798105$
$r = 2381$ $a = 1886545$ $b = 1496029393$ $\# = 2662224640466347746505$
$r = 2384$ $a = 1891306$ $b = 1501696171$ $\# = 2685813843698290494541$
$r = 2386$ $a = 420$ $b = 4970$ $\# = 29437553530$
$r = 2387$ $a = 1896073$ $b = 1507377241$ $\# = 2709581978125550723941$
$r = 2390$ $a = 1900846$ $b = 1513072621$ $\# = 2733530173360157074501$
$r = 2393$ $a = 1905625$ $b = 1518782329$ $\# = 2757659564712039608125$

$r = 2396$ $a = 1910410$ $b = 1524506383$ $\# = 2781971293210558364665$
$r = 2399$ $a = 1915201$ $b = 1530244801$ $\# = 2806466505626086077601$
$r = 2402$ $a = 1919998$ $b = 1535997601$ $\# = 2831146354491645117601$
$r = 2405$ $a = 1924801$ $b = 1541764801$ $\# = 2856011998124598732001$
$r = 2408$ $a = 1929610$ $b = 1547546419$ $\# = 2881064600648396648245$
$r = 2411$ $a = 1934425$ $b = 1553342473$ $\# = 2906305332014375109325$
$r = 2414$ $a = 1939246$ $b = 1559152981$ $\# = 2931735368023611409261$
$r = 2417$ $a = 1944073$ $b = 1564977961$ $\# = 2957355890348832996661$
$r = 2420$ $a = 1948906$ $b = 1570817431$ $\# = 2983168086556381214401$
$r = 2426$ $a = 1958590$ $b = 1582539913$ $\# = 3035372280484057818985$
$r = 2429$ $a = 1963441$ $b = 1588422961$ $\# = 3061766683003378286521$
$r = 2435$ $a = 1973161$ $b = 1600232761$ $\# = 3115146155982868595701$
$r = 2438$ $a = 1978030$ $b = 1606159549$ $\# = 3142133667201153811285$
$r = 2441$ $a = 1982905$ $b = 1612100953$ $\# = 3169321332143803249645$
$r = 2444$ $a = 1987786$ $b = 1618056991$ $\# = 3196710386323342823881$
$r = 2447$ $a = 1992673$ $b = 1624027681$ $\# = 3224302071346055850481$
$r = 2450$ $a = 1997566$ $b = 1630013041$ $\# = 3252097634934496892401$
$r = 2453$ $a = 2002465$ $b = 1636013089$ $\# = 3280098330950060986705$
$r = 2456$ $a = 2007370$ $b = 1642027843$ $\# = 3308305419415608324805$
$r = 2459$ $a = 2012281$ $b = 1648057321$ $\# = 3336720166538144453341$
$r = 2462$ $a = 2017198$ $b = 1654101541$ $\# = 3365343844731556063741$
$r = 2465$ $a = 2022121$ $b = 1660160521$ $\# = 3394177732639402438501$
$r = 2468$ $a = 2027050$ $b = 1666234279$ $\# = 342322311515776262225$
$r = 2471$ $a = 2031985$ $b = 1672322833$ $\# = 345248128345813838546 5$
$r = 2474$ $a = 2036926$ $b = 1678426201$ $\# = 348195353501041304940 1$
$r = 2477$ $a = 2041873$ $b = 1684544401$ $\# = 351164117360586623940 1$
$r = 2480$ $a = 2046826$ $b = 1690677451$ $\# = 354154550938024463550 1$
$r = 2483$ $a = 2051785$ $b = 1696825369$ $\# = 357166785883688778457$
$r = 2486$ $a = 2056750$ $b = 1702988173$ $\# = 360200954486991606512 5$
$r = 2489$ $a = 2061721$ $b = 1709165881$ $\# = 363257189678745980406 1$
$r = 2492$ $a = 2066698$ $b = 1715358511$ $\# = 366335625033496472796 1$
$r = 2498$ $a = 2076670$ $b = 1727788609$ $\# = 372559633762836089606 5$
$r = 2501$ $a = 2081665$ $b = 1734026113$ $\# = 375705477526214641478 5$
$r = 2504$ $a = 2086666$ $b = 1740278611$ $\# = 378874062234866747682 1$
$r = 2507$ $a = 2091673$ $b = 1746546121$ $\# = 382065524717133119742 1$
$r = 2510$ $a = 2096686$ $b = 1752828661$ $\# = 385280002459181405070 1$
$r = 2513$ $a = 2101705$ $b = 1759126249$ $\# = 388517633607375307688 5$
$r = 2516$ $a = 2106730$ $b = 1765438903$ $\# = 391778556970649390294 5$
$r = 2522$ $a = 2116798$ $b = 1778109481$ $\# = 398370838905319275828 1$
$r = 2528$ $a = 2126890$ $b = 1790840539$ $\# = 405057972076685792780 5$
$r = 2531$ $a = 2131945$ $b = 1797228793$ $\# = 408437462006312691560 5$
$r = 2534$ $a = 2137006$ $b = 1803632221$ $\# = 411841091052321657714 1$
$r = 2540$ $a = 2147146$ $b = 1816484671$ $\# = 418721341230875182500 1$
$r = 2543$ $a = 2152225$ $b = 1822933729$ $\# = 422198251438977226382 5$

$r = 2546$	$a = 2157310$	$b = 1829398033$	$\# = 4256998789194345381265$
$r = 2549$	$a = 2162401$	$b = 1835877601$	$\# = 4292263699278297361201$
$r = 2552$	$a = 2167498$	$b = 1842372451$	$\# = 4327778714112595433701$
$r = 2555$	$a = 2172601$	$b = 1848882601$	$\# = 4363545310107840661501$
$r = 2558$	$a = 2177710$	$b = 1855408069$	$\# = 4399564970638818492445$
$r = 2561$	$a = 2182825$	$b = 1861948873$	$\# = 4435839186069107145925$
$r = 2564$	$a = 2187946$	$b = 1868505031$	$\# = 4472369453775743901361$
$r = 2567$	$a = 2193073$	$b = 1875076561$	$\# = 4509157278173949356761$
$r = 2570$	$a = 2198206$	$b = 1881663481$	$\# = 4546204170741909725401$
$r = 2573$	$a = 2203345$	$b = 1888265809$	$\# = 4583511650045617238665$
$r = 2576$	$a = 2208490$	$b = 1894883563$	$\# = 4621081241763768723085$
$r = 2579$	$a = 2213641$	$b = 1901516761$	$\# = 4658914478712722419621$
$r = 2582$	$a = 2218798$	$b = 1908165421$	$\# = 4697012900871513113221$
$r = 2585$	$a = 2223961$	$b = 1914829561$	$\# = 4735378055406925640701$
$r = 2591$	$a = 2234305$	$b = 1928204353$	$\# = 4812914786364356043745$
$r = 2594$	$a = 2239486$	$b = 1934915041$	$\# = 4852089493285174080481$
$r = 2597$	$a = 2244673$	$b = 1941641281$	$\# = 4891537193630771026081$
$r = 2603$	$a = 2255065$	$b = 1955140489$	$\# = 4971257915870465371405$
$r = 2612$	$a = 2270698$	$b = 1975506391$	$\# = 5092926276074747235841$
$r = 2615$	$a = 2275921$	$b = 1982326321$	$\# = 5134045447899327609001$
$r = 2618$	$a = 2281150$	$b = 1989161929$	$\# = 5175448852556330720425$
$r = 2624$	$a = 2291626$	$b = 2002880251$	$\# = 5259114909474100825501$
$r = 2630$	$a = 2302126$	$b = 2016661501$	$\# = 5343937620386986372501$
$r = 2633$	$a = 2307385$	$b = 2023575769$	$\# = 5386786870928834512045$
$r = 2636$	$a = 2312650$	$b = 2030505823$	$\# = 5429930279988861289225$
$r = 2642$	$a = 2323198$	$b = 2044413361$	$\# = 5517106304942036320561$
$r = 2645$	$a = 2328481$	$b = 2051390881$	$\# = 5561142305689055408401$
$r = 2648$	$a = 2333770$	$b = 2058384259$	$\# = 5605479234714565333765$
$r = 2651$	$a = 2339065$	$b = 2065393513$	$\# = 5650118803778467993885$
$r = 2654$	$a = 2344366$	$b = 2072418661$	$\# = 5695062732421374927421$
$r = 2660$	$a = 2354986$	$b = 2086516711$	$\# = 5785870585669226053201$
$r = 2666$	$a = 2365630$	$b = 2100678553$	$\# = 5877916707405516359545$
$r = 2669$	$a = 2370961$	$b = 2107783441$	$\# = 5924408501235471506281$
$r = 2672$	$a = 2376298$	$b = 2114904331$	$\# = 5971215136770931966381$
$r = 2675$	$a = 2381641$	$b = 2122041241$	$\# = 6018338388762705960901$
$r = 2681$	$a = 2392345$	$b = 2136363193$	$\# = 6113541881117183322205$
$r = 2684$	$a = 2397706$	$b = 2143548271$	$\# = 6161625711061252257241$
$r = 2687$	$a = 2403073$	$b = 2150749441$	$\# = 6210033336678502880641$
$r = 2690$	$a = 2408446$	$b = 2157966721$	$\# = 6258766572961903728001$
$r = 3500$	$a = 4078666$	$b = 4755723391$	$\# = 39556966787198234015401$
$r = 3503$	$a = 4085665$	$b = 4767969889$	$\# = 39795056269308318577105$
$r = 3506$	$a = 4092670$	$b = 4780237393$	$\# = 40034373014208688983505$
$r = 3509$	$a = 4099681$	$b = 4792525921$	$\# = 40274922289112769389041$
$r = 5351$	$a = 9537265$	$b = 17004941713$	$\# = 773379930055466751080185$

$r = 5354$	$a = 9547966$	$b = 17033569561$	$\# = 776421308518138462185721$
$r = 5357$	$a = 9558673$	$b = 17062229521$	$\# = 779472933052885556665321$
$r = 4980$	$a = 30810$	$b = 3122317$	$\# = 24264913354964425$
$r = 7373$	$a = 18110545$	$b = 44497606609$	$\# = 72974263409625591933650 65$
$r = 7376$	$a = 18125290$	$b = 44551960363$	$\# = 73182421336867547134542 85$
$r = 7379$	$a = 18140041$	$b = 44606358361$	$\# = 73391088000147016189588 21$
$r = 7382$	$a = 18154798$	$b = 44660800621$	$\# = 73600264435164009135244 21$
$r = 9325$	$a = 12691$	$b = 825436$	$\# = 3176083959788026$
$r = 9525$	$a = 2169$	$b = 58322$	$\# = 16195753597485$
$r = 16420$	$a = 6936$	$b = 333506$	$\# = 913053565546276$
$r = 17324$	$a = 100017226$	$b = 577499457151$	$\# = 28884922008820078268048058 01$
$r = 17327$	$a = 100051873$	$b = 577799560801$	$\# = 28919958299455847336389908 01$
$r = 17330$	$a = 100086526$	$b = 578099768401$	$\# = 28955031010349030789770260 01$
$r = 17333$	$a = 100121185$	$b = 578400079969$	$\# = 28990140173043241063345561 45$
$r = 17336$	$a = 100155850$	$b = 578700495523$	$\# = 29025285819103942764640635 25$
$r = 17339$	$a = 100190521$	$b = 579001015081$	$\# = 29060467980118464025326144 61$
$r = 17342$	$a = 100225198$	$b = 579301638661$	$\# = 29095686687696007856926728 61$
$r = 17345$	$a = 100259881$	$b = 579602366281$	$\# = 29130941973467663510460489 01$
$r = 19605$	$a = 1191$	$b = 23731$	$\# = 5519583702676$
$r = 31265$	$a = 259$	$b = 2407$	$\# = 90525801730$
$r = 31368$	$a = 14858$	$b = 1045635$	$\# = 17147031694579605$
$r = 83135$	$a = 1310$	$b = 27375$	$\# = 31148407558500$