The arithmetic of binary representations of even positive integer 2n and its application to the solution of the Goldbach's binary problem

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Abstract

One of causes why Goldbach's binary problem was unsolved over a long period is that binary representations of even integer 2n (BR2n) in the view of a sum of two odd primes(VSTOP) are considered separately from other BR2n. By purpose of this work is research of connections between different types of BR2n. For realization of this purpose by author was developed the "Arithmetic of binary representations of even positive integer 2n" (ABR2n). In ABR2n are defined four types BR2n. As shown in ABR2n all types BR2n are connected with each other by relations which represent distribution of prime and composite positive integers less than 2n between them. On the basis of this relations (axioms ABR2n) are deduced formulas for computation of the number of BR2n (NBR2n) for each types. In ABR2n also is defined and computed Average value of the number of binary sums are formed from odd prime and composite positive integers $< 2n$ (AVNBS). Separately AVNBS for prime and AVNBS for composite positive integers. We also deduced formulas for computation of deviation NBR2n from AVNBS. It was shown that if n go to infinity then NBR2n go to AVNBS that permit to apply formulas for AVNBS to computation of NBR2n. At the end is produced the proof of the Goldbach's binary problem with help of ABR2n. For it apply method of a proof by contradiction in which we make an assumption that for any 2n not exist BR2n in the VSTOP then make computations at this conditions then we come to contradiction. Hence our assumption is false and forall $2n > 2$ exist BR2n in the VSTOP.

1 Introduction

On 7 June, 1742,the Prussian mathematician Christian Goldbach wrote a letter to Leonhard Euler in which he proposed the following conjecture: Every integer greater than 2 can be written as the sum of three primes. He considered 1 to be a prime number. In mathematics, a prime number is a natural number that has exactly two natural number divisors, which are 1 and the prime... , a convention subsequently abandoned. A modern version of Goldbach's original conjecture is: Every integer greater than 5 can be written as the sum of three primes. Euler, becoming interested in the problem, replied by noting that this conjecture is equivalent with another version: Every even integer greater than 2 can be written as the sum of two primes. Euler's version is the form in which the conjecture is usually expressed today. It is also known as the strong,even, or binary Goldbach's conjecture.

2 The arithmetic of binary representations of even positive integer 2n

2.1 General conception

Definition 2.1 *The binary representations of even positive integer 2n in ABR2n are defined as bijective mappings :*

$$f : X \to Y \tag{1}$$

$$y = 2n - x \tag{2}$$

Where:

$$X\{x|x \in N, 1 \leq x < n\} \tag{3}$$

$$Y\{y|y \in N, n < y < 2n\} \tag{4}$$

n- positive integer .

$$|X| = |Y| \tag{5}$$

Definition 2.2 *The set of binary representations of even positive integer 2n (SBR2n) are defined as follows :*
SBR2n$\{1 + (2n - 1) = 2n$ *;*
$2 + (2n - 2) = 2n$ *;*
...

$n - 1 + (2n - (n - 1)) = 2n\}$
The last is got by represent (2)
in the view of $x + y = 2n$.

Definition 2.3 *The set XUY consist of: even positive integers , odd positive integers inclusive odd composite positive integers and noncomposite positive integers (pimes and "1").*

Remark 2.1 *Since n is not mapped into Y and it is mapped into itself (automorphism) therefore mapping* $n \to n$ *and corresponding binary representation* $n + n = 2n$ *do not enter into SBR2n which is formed only from bijective mappings .By this reason n do not enter into XUY. But it is not denoted that as a result of the exception of binary representations:* $2+2 = 4$ *and* $3+3 = 6$ *from SBR2n,* 4 *and* 6 *have not binary representations in the view of a sum of two noncomposite positive integers. But it is not the case.In SBR2n is in existence the binary representations* $1+3 = 4$ *and* $1 + 5 = 6$. *It is significant "1" with primes are related in ABR2n to noncomposite positive integers. At that special status of "1" in N is ignored in ABR2n.*

Definition 2.4 s_e *- the number of even composite positive integers into SBR2n* $< 2n$.
s_e *- positive integer* $> 0 \ \forall\ 2n > 6$ $s_e = 0 \ \ \forall\ 2 < 2n < 8$.

Definition 2.5 s_o *- the number of odd composite positive integers into SBR2n* $< 2n$.
s_o *- positive integer* $> 0 \ \forall\ 2n > 8$ $s_o = 0 \ \ \forall\ 2 < 2n < 10$.

Definition 2.6 *p- the number of odd noncomposite integers (primes and "1") into SBR2n* $< 2n$.
$p - positive\ integer\ > \ 0 \ \forall\ 2n \ > \ 2$.

Corollary 2.1 *By reason of exclusion n from the set XUY if n is even then n or* s_e *are decremented by two (since it is excluded* $n + n = 2n$*):*
$n* = n - 2; s_e* = s_e - 2$.

Corollary 2.2 *By reason of exclusion n from the set X U Y If n is odd then n or* s_o *are decremented by two:*
$n* = n - 2; s_o* = s_o - 2$.

Corollary 2.3 *By reason of exclusion n from the set X U Y If n is odd prime then n or p are decremented by two:*
$n* = n - 2; p* = p - 2$.

Remark 2.2 *It needs to say that corollaries 2.1 , 2.2 , 2.3 are took into account automatically at forming SBR2n since it makes until appearance of representation in the view of* $n + n = 2n$ *which throw-off . Thus if* n *is odd or odd prime then* n, s_o *automatically are decremented by two at the direct computation them into SBR2n. if* n *is even then* n, s_o, p *are not decremented since* $|Q|.|L|, |H|, s_o, p$ *by definitions concem to odd composite and noncomposite integers.*

Remark 2.3 *In the equations which include* n *is even* n, s_o, p *are not decremented (see rem 2.2).*
At the computations which concem to s_e n *is decremented by two.*

Remark 2.4 *In the equations which include* n *is odd or odd prime then it is decremented by one since* n *enters in the equation with value which is required the correction.*

Proposition 2.1 $\forall\ n > 1$ *always is fulfilled the condition* $|X| = |Y|$.

Proof 2.1 *Taking into account that* $2n$ *do not enter into the set* XUY *and* n *is excluded from the set* XUY *(see remark 2.1)*
then we have :

$$|XUY| = 2n - 2 = 2(n - 1) \tag{6}$$

Hence $|XUY|$ *is even for any* n *and thus* $\forall\ n > 1$ *always is fulfilled the condition* $|X| = |Y|$ *.* □

2.2 The types of binary representations even positive integer 2n

In depend of that are x,y in the view of $x + y = 2n$ prime or composite it can be four types binary representations of even positive integer $2n$:

Definition 2.7 *There is Type "H" if x-odd prime positive integer or"1" and y- odd prime positive integer.*
$|H|$*- the number of binary representations of Type "H".*
$|H|$*- positive integer* $> 0\ \forall\ 2n > 2$ *see Theorem (10.1).*

Definition 2.8 *There is Type "Q" if x-odd composite positive integer; and y-odd composite positive integer .*
$|Q|$*- the number of binary representations of Type "Q".*
$|Q|$*- positive integer* $> 0\ \forall\ 2n > 22$ *see corollary (9.1)*
exepting $2n = 26; 28; 32; 38;$ *in which* $|Q| = 0$
(see numerical solution $|Q| = 0$ *subsection (12.2) .*
$|Q| = 0\ \ \forall\ 2 < 2n < 24.$

Definition 2.9 *There is Type "L" if x- odd prime positive integer or"1" and y-odd composite positive integer or x-odd composite positive integer and y- odd prime positive integer.*
$|L|$ *- the number of binary representations of Type "L".*
$|L|$*- positive integer* $> 0\ \forall\ 2n > 8$.
$|L| = 0\ \forall\ 2\ <\ 2n\ <\ 10$.

Definition 2.10 *There is Type "E" if x-even positive integer and y-even positive integer .*
$|E|$*- the number of binary representations of Type"E".*
$|E|$*- positive integer* $> 0\ \forall\ 2n > 4$.

2.3 The axioms of ABR2n

Axiom 2.1 *The number of the binary representations type "H" (NBRH) is connected with The number of the binary representations type"L"(NBRL) as follows:*

$$2|H| + |L| = p \tag{7}$$

$\forall\ 2n > 2$.
The equation (7) asserts that odd noncomposite positive integers less than $2n$ *are allotted to types "H"," L" in compliance with balance (7).*

Remark 2.5 *From equations (7 and 8) it follows :*
$|H| = (p - |L|)/2;\ |Q| = (s_0 - |L|)/2$.
In these equations is devision by '2'. From this it can conclude that equations are correct only for n is even. But it is not the case. Below we show that in ABR2n all equations where is devision by '2' It always is possibility for any n's and p's parity.

Proposition 2.2 *The equation (7) is true for any n's and p's parity.*

Proof 2.2 ***Case 2.1*** *For n is even p is even*
By equation (7) we get: $|H| = (p - |L|)/2$.
By equation (26) $|L| = n - p - 2|Q|$ *and* $|L|$ *is even for n and p is even then* $(p - |L|)$ *is even .*
Hence the devision by"2" is possibility then $|H|$ *is integer for n and p is even .*
Thus equation (7) is true for n is even p is even.

Case 2.2 *For n is even ; p is odd*
By equation (7) we get: $|H| = (p - |L|)/2$ *.*
By equation (26) $|L| = n - p - 2|Q|$ *and* $|L|$ *is odd*
for n is even and p is odd then $(p - |L|)$ *is even .*
Hence the devision by"2" is possibility then $|H|$
is integer for n is even and p is odd .
Thus equation (7) is true for n is even p is odd.

Case 2.3 *For n is odd or odd prime; p is even*
By equation (7) we get: $|H| = (p - |L|)/2$ *.*
By equation (27) $|L| = n - p - 1 - 2|Q|$ *and* $|L|$ *is even*
for n is odd or odd prime and p is even then $(p - |L|)$*is even .*
Hence the devision by"2" is possibility then $|H|$
is integer for n is odd or odd prime and p is even .
Thus equation (7) is true for n is odd or odd prime; p is even.

Case 2.4 *For n is odd or odd prime ; p is odd*
By equation (7) we get: $|H| = (p - |L|)/2$ *.*
Dy equation (27) $|L| = n - p - 1 - 2|Q|$ *and* $|L|$ *is odd*
for n is odd or odd prime and p is odd then $(p - |L|)$*is even .*
Hence the devision by"2" is possibility then $|H|$
is integer for n is odd or odd prime and p is odd .
Thus equation (7) is true for n is odd or odd prime; p is odd.

Finally equation (7) is true for any n's and p's parity. □

Axiom 2.2 *The number of the binary representations Type Q (NBRQ) is connected with the number of the binary representations Type "L" (NBRL) as follows:*

$$2|Q| + |L| = s_0 \tag{8}$$

$\forall\ 2n > 2$.
The expression(8) asserts that odd composite positive integers less than $2n$ *are allotted to types "Q","L" in compliance with balance (8).*

Proposition 2.3 *The equation (8) is true for any n's and p's parity.*

Proof 2.3 ***Case 2.5*** *For n is even ; p is even*
By equation (8) we get: $|Q| = (s_0 - |L|)/2$ *.*
By equation (7) $|L| = p - 2|H|$ *and* $|L|$ *is even*
for n is even and p is even .
By equation (17) $s_o = n - p$ *is even then* $(s_0 - |L|)$ *is even .*

Hence the devision by"2" is possibility then $|Q|$
is integer for n is even and p is even.
Thus equation (8) is true for n is even ; p is even.

Case 2.6 *For n is even p is odd*
By equation (8) we get: $|Q| = (s_0 - |L|)/2$ *.*
By equation (7) $|L| = p - 2|H|$ *and*$|L|$ *is odd*
for n is even ; p is odd .
By equation (17) $s_0 = n - p$ *is odd then* $(s_0 - |L|)$ *is even .*
Hence the devision by"2" is possibility then $|Q|$
is integer for n is even and p is odd
Thus equation (8) is true for n is even p is odd

Case 2.7 *For n is odd or odd prime , p is even*
By equation (8) we get: $|Q| = (s_0 - |L|)/2$ *.*
By equation (7) $|L| = p - 2|H|$ *and* $|L|$ *is even*
for n is odd or odd prime p is even .
By equation (18) $s_0 = n - p - 1$ *is even then* $(s_0 - |L|)$ *is even .*
Hence the devision by"2" is possibility then $|Q|$
is integer for n is odd or odd prime and p is evern .
Thus equation (8) is true for n is odd or odd prime ; p is even.

Case 2.8 *For n is odd or odd prime p is odd*
By equation (8) we get: $|Q| = (s_0 - |L|)/2$ *.*
By equation (7) $|L| = p - 2|Q|$ *and* $|L|$ *is odd*
for n is odd or odd prime p is odd .
By equation (18) $s_0 = n - p - 1$ *is odd then* $(s_0 - |L|)$ *is even .*
Hence the devision by"2" is possibility then $|Q|$
is integer for n is odd or odd prime and p is odd.
Thus equation (8) is true for n is odd or odd prime p is odd.

Finally equation (8) is true for any n's and p's parity. □

Definition 2.11 *G- the general number of binary representations in* $SBR2n$*.*
$G-$ *positive integer* $\forall\ 2n > 2$ *.*

Axiom 2.3

$$|Q| + |L| + |H| + |E| = G \tag{9}$$

Definition 2.12 *F-the general number of binary representations with odd positive integers .*
$F -$ positive integer $\forall\ 2n\ > 2$.

Axiom 2.4

$$|Q| + |L| + |H| = F \tag{10}$$

2.4 The computation of $G, F, S_o, p, |Q|, |L|, |H|, |E|$

2.4.1 The computation of G

Proposition 2.4

$$G = n - 1 \tag{11}$$

$\forall\ n\ >\ 1$

Proof 2.4 *The general number of elements in the set XUY by equation (6) equals $2(n-1)$. Taking into account that in forming of each binary representation participate with two elements from the set XUY then we have: $G = 1/2(2(n-1) = n-1$. $\forall\ n\ >\ 1$.* □

2.4.2 The computation of $|E|$

Proposition 2.5

$$|E| = [(n-1)/2] \tag{12}$$

$\forall\ n\ >\ 1$

Proof 2.5 *By definition (2.1) by elements of the set XUY*
are numbers of the natural scale. Half of them are even integers.
Then the number of even integers in the set XUY equals:
$1/2|XUY| = 1/2(2(n-1)) = n-1$ *.*
Taking into account that in forming of each binary representation
participate by two elements from the set XUY we have: $|E| = (n-1)/2$.
Taking into account that for n - even $|E|$ is not integer
that breaks the status of $|E|$ (see definition (2.10)
then $|E| = [(n-1)/2]$ is aliquot of $(n-1)/2$
then we get : $|E| = [(n-1)/2]\ \forall\ n\ >\ 1$ □

Proposition 2.6

$$E = n/2 - 1 \tag{13}$$

for n is even ; $n\ >\ 1$

Proof 2.6 *For* $n = 2i$ *where* $i \in N$ *by equation (12) we get:* $E = [(2i - 1)/2] = [i - 1/2] = [(i - 1) + 1/2] = i - 1$ *;*
returning to n finally we get: $E = n/2 - 1 \quad n > 1$ *.* □

Proposition 2.7

$$E = (n - 1)/2 \tag{14}$$

$for\ n\ is\ odd\ or\ odd\ prime;\ n > 2$

Proof 2.7 *For n = 2i + 1 where* $i \in N$ *by equation (12) we get: E = [(2i + 1 - 1)/2] = [i] = i ;*
returning to n finally we get: $E = (n - 1)/2$ $n > 2$*.* □

2.4.3 The computation of F

Proposition 2.8

$$F = n/2 \tag{15}$$

$for\ n\ is\ even\ n > 1$

Proof 2.8 *Subtracting equation (10) from equation (9) we get:* $|E| = G - F$ *whence* $F = G - |E|$ *. Taking into account equations (11), (12) we get:*
$F = (n - 1) - [(n - 1)/2]$ *for* $n = 2i$ *we get:*
$F = 2i - 1 - [(2i - 1)/2] = 2i - 1 - [i - 1/2] =$
$= 2i - 1 - [i - 1 + 1/2] = 2i - 1 - (i - 1) = i$
returning to n finally we get: $F = n/2$ $n > 1$

Remark 2.6 *Since n is even then the devision by"2"*
is possibility. Thus F is integer and equation (15) is true for n is even.
□

Proposition 2.9

$$F = (n - 1)/2 \tag{16}$$

$for\ n\ is\ odd\ or\ odd\ prime\ n > 2$

Proof 2.9 *Subtracting equation (10) from equation (9) we get:* $|E| = G - F$ *whence* $F = G - |E|$ *. Taking into account equations (11), (12) we get:*
$F = (n - 1) - [(n - 1)/2]$ *for n = 2i + 1 we get:*
F = 2i - i = i ; returning to n finally we get: F = (n - 1)/2 $n > 2$*.* □

Remark 2.7 *Since n is odd or odd prime then (n - 1) is even . Hence the devision by"2"*
is possibility.Thus F is integer and equation (16) is true for n is odd or odd prime.

2.4.4 The computation of s_o

Proposition 2.10

$$s_o = n - p \tag{17}$$

$for\ n\ is\ even,\ n\ >\ 1$.

Proof 2.10 *By definition (2.3) for computation s_o it needs to subtract from $|XUY|$ the number of even composite positive integers $(n-2)$ here(-2) takes into account corollary 2.1 : $n* = n-2$ and also subtract the number of odd noncomposite positive integers p then we get:*
$s_o = 2(n-1) - (n-2) - p = n - p\ for\ n\ is\ even\ n\ >\ 1$. □

Proposition 2.11

$$s_o = n - p - 1 \tag{18}$$

$for\ n\ is\ odd\ or\ odd\ prime\ n > 1$.

Proof 2.11 *Making the change equation (17) by rem 2.4 we get: $s_o = n - p - 1\ for\ n\ is\ odd\ n\ >\ 1$.* □

2.4.5 The computation of p

Definition 2.13 $p_1 - the\ first\ approximation\ of\ p.$
$p_2 - the\ second\ approximation\ of\ p.$
$p_3 - the\ third\ approximation\ of\ p.$

Proposition 2.12

$$p_1 = round(2n/ln2n) \tag{19}$$

$$p_2 = round(2n/ln2n + 2n/(ln2n)^2) \tag{20}$$

$$p_3 = round(2n/ln2n + 2n/(ln2n)^2 + 4n/(ln2n)^3) \tag{21}$$

Proof 2.12 *As everybody knows [1] that the number of the primes less than 2n is expressed as follows:*
$\pi(2n) = (2n/ln2n)\int_0^1 (1 - (lny/ln2n) + (ln^2y/ln^2 2n) + \ldots)dy$
We are limited to three of the first terms of the series.
Integrating in parts then we get:
$\pi(2n) = (2n/ln2n)(1 + 1/ln2n + 2/ln^2 2n)$
Whence taking into account definition (4.1) that p is (primes + 1) then we get :
$p = round(2n/ln2n + 2n/ln^2 2n + 4n/ln^3 2n + 1)$
But taking into account that "2" is not odd prime and

that by def. 4.1 p is the number of odd prime < 2n then
$p = round(2n/ln2n + 2n/ln^2 2n + 4n/ln^3 2n + 1 - 1)$ *Finally we get:* $p = round(2n/ln2n + 2n/ln^2 2n + 4n/ln^3 2n)$ *Whence we get:*
$p_1 = round(2n/ln2n)$;
$p_2 = round(2n/ln2n + 2n/ln^2 2n)$;
$p_3 = round(2n/ln2 + 2n/ln^2 2n + 4n/ln^3 2n)$; $\square$

2.4.6 The computation of $|Q|$

Proposition 2.13

$$|Q| = (n - p - |L|)/2 \tag{22}$$

for n is even $n > 1$.

Proof 2.13 *By equation (8) we get:* $|Q| = (s_o - |L|)/2$. *Taking into account equation (17) we get for n is even*
$|Q| = (n - p - |L|)/2$. *Now we show that for n is even* $(n - p - |L|) = (n - (p + |L|))$ *is even:*
By equation (28) $|L| = p - 2|H|$ *whence* $|L|$ *has parity of p hance* $(p + |L|)$ *is even*
for any p's and $|L|'s$ *parity and if n is even then* $(n - p - |L|)$ *is even then the devision by"2" is possibility*
thus $|Q|$ *is integer and equation (22) is true for n is even* $n > 1$. $\square$

Proposition 2.14

$$|Q| = (n - p - 1 - |L|)/2 \tag{23}$$

for n is odd or odd prime $n > 1$.

Proof 2.14 *Changing equation (22) by rem (2.4) we get:* $|Q| = (n - p - 1 - |L|)/2 = (n - 1 - (p + |L|))$ *for n is odd or odd prime* $n > 1$.
Now we show that for n is odd or odd prime $(n - p - 1 - |L|)$ *is even:*
By equation (28) $|L| = p - 2|H|$; *whence* $|L|$ *has parity of p hance* $(p + |L|)$ *is even for any p's and* $|L|'s$ *parity*
and if n is odd or odd prime then $(n - p - 1 - |L|)$ *is even then the devision by"2" is possibility thus* $|Q|$ *is integer and equation (23) is true for n is odd or odd prime* $n > 1$. $\square$

Proposition 2.15

$$|Q| = (n - 2p + 2|H|)/2 \tag{24}$$

for n is even $n > 1$.

Proof 2.15 *subtracting equation (7) from equation (8) we get:* $2|Q| - 2|H| = s_0 - p$ *Whence we get:* $|Q| = (2|H| + s_0 - p)/2$. *Taking into account equation (17)*
$|Q| = (2|H| + n - p - p)/2 = (n - 2p + 2|H|)/2$. *and for n is even* $(n - 2p + 2|H|)$ *is even then the devision by"2"*
is possibility thus $|Q|$ *is integer and equation (24) is true for n is even* $n > 1$. □

Proposition 2.16

$$|Q| = (n - 2p + 2|H| - 1)/2 \tag{25}$$

for n is odd or n is odd prime $n > 1$.

Proof 2.16 *Changing equation (24) by rem (2.4) we get:* $|Q| = (n-2p+2|H| - 1)/2$ *for n is odd or odd prime* $n > 1$.
For n is odd or odd prime $(n - 2p + 2|H| - 1)$ *is even then the devision by"2" is possibility thus* $|Q|$ *is integer and equation (25) is true for n is odd or odd prime* $n > 1$. □

2.4.7 The computation of $|L|$

Proposition 2.17

$$|L| = n - p - 2|Q| \tag{26}$$

for n is even $n > 1$

Proof 2.17 *By equation (8) we get:* $|L| = (s_o - 2|Q|)$ *Taking into account (17) we get for n is even*
$|L| = (n - p - 2|Q|)$ *For n is even* $n > 1$. □

Proposition 2.18

$$|L| = n - p - 1 - 2|Q| \tag{27}$$

for n is odd or odd prime $n > 1$

Proof 2.18 *Changing equation (26) by rem (2,4) we get:* $|L| = (n - p - 1 - 2|Q|)/2$ *for n is odd or odd prime* $n > 1$. □

Proposition 2.19

$$|L| = p - 2|H| \tag{28}$$

$\forall\ n\ >\ 1$

Proof 2.19 *By equation (7) and rem (2.3) we get:* $|L| = p - 2|H|$
$for\ n\ is\ even,\ n\ >\ 1$
For n is odd or odd prime by rem (2.4) we also get:$|L| = p - 2|H|\ n\ >\ 1$
Thus $|L| = p - 2|H|\ \forall\ n\ >\ 1$. □

2.4.8 The computation of $|H|$

Proposition 2.20

$$|H| = (p - |L|)/2 \tag{29}$$

$\forall\ n\ >\ 1$

Proof 2.20 *By equation(7) and rem (2.3) we get:* $|H| = (p - |L|)/2$ *for n is even ,* $n\ >\ 1$.
For n is odd or odd prime by rem (2.4) we also get: $|H| = (p - |L|)/2\ n\ >\ 1$.
Now we show that $\forall\ n\ (p - |L|)$ *is even*
By equation (26) $|L| = n - p - 2|Q|$ *whence* $|L| + p$ *is even if n is even .*
It is possibility if $|L|$ *and p have equal parity then* $(p - |L|)$ *is also even for n is even . By equation (27)* $|L| = n - p - 1 - 2|Q|$ *whence* $|L| + p$ *is even if n is odd or odd prime.*
It is possibility if $|L|$ *and p have equal parity then* $(p - |L|)$ *is also even for n is odd or odd prime.*
Thus $(p - |L|)$ *is even* $\forall\ n$.
Hence the devision by"2" is possibility then $|H|$ *is integer and equation (29) is true* $\forall\ n\ >\ 1$. □

Proposition 2.21

$$|H| = (2p + 2|Q| - n)/2 \tag{30}$$

for n is even $n\ >\ 1$

Proof 2.21 *subtracting equation (7) from equation (8) we get:*
$2|Q| - 2|H| = s_0 - p$ *Whence we get:* $|H| = (2|Q| - s_0 + p)/2$. *Taking into account equation (17) we have for n is even:*
$|H| = (2|Q| - (n - p) + p)/2 = (2p + 2|Q| - n)/2$. *Now we show that for n is even* $((2p + 2|Q| - n)$ *is even*
then the devision by"2" is possibility thus $|H|$ *is integer and equation (30) is true for n is even* $n > 1$ □

Proposition 2.22

$$|H| = (2p + 2|Q| - n + 1)/2 \tag{31}$$

for n is odd or odd prime $n > 1$

Proof 2.22 *subtracting equation (7) from equation (8) we get:*
$2|Q| - 2|H| = s_o - p$ *Whence we get:* $|H| = (2|Q| - s_0 + p)/2$. *Taking into account (18) we have for n is odd or odd prime:*
$|H| = (2|Q| - (n - p - 1) + p)/2 = (2p + 2|Q| - n + 1)/2$. *Now we show that for n is odd or odd prime*
$(2p + 2|Q| - n + 1)$ *is even then the devision by"2" is possibility thus* $|H|$ *is integer and equation (31) is true*
for n is odd or odd prime $n > 1$. □

Definition 2.14 $|Q| - |H|$ *- lower limit of possible range of* $|Q| - |H|$.
$|Q| - |H|$*- positive integer* $> 0 \quad \forall\ 2n > 120$.
$|Q| - |H|$ *- negative integer* $< 0 \quad \forall\ 2 < 2n < 120$.
excepting $2n = 94; 96; 100; 106; 118;$ *for which* $|Q| - |H| = 0$.

Proposition 2.23

$$|Q| - |H| = (n - 2p)/2 \tag{32}$$

for n is even, $n > 1$

Proof 2.23 *subtracting equation (7) from equation (8) we get:* $2|Q| - 2|H| = s_0 - p$ *Whence we get:* $|Q| - |H| = (s_0 - p)/2 =$. *Taking into account equation (17) we have for n is even:*
$|Q| - |H| = (n - p - p)/2 = (n - 2p)/2$. *Since for n is even* $(n - 2p)$ *is even then the devision by"2"*
is possibility thus $|Q| - |H|$ *is integer and equation (32) is true for n is even,* $n > 1$ □

Proposition 2.24

$$|Q| - |H| = (n - 2p - 1)/2 \tag{33}$$

for n is odd or odd prime, $n > 1$

Proof 2.24 *subtracting equation (7) from equation (8) we get:*
$2|Q| - 2|H| = s_0 - p$ *Whence we get:* $|Q| - |H| = (s_0 - p)/2 =$. *Taking into account equation (18)*
we have for n is odd or odd prime :
$|Q| - |H| = (n - 1 - p - p)/2 = (n - 2p - 1)/2$. *Since for n is odd or odd prime* $(n - 2p - 1)$ *is even then*
the devision by"2" is possibility thus $|Q| - |H|$ *is integer*
and equation (33) is true for n is odd or odd prime $n > 1$. □

3 The control of ABR2n

Remark 3.1 *It needs to take ito account that:* $p, s_o, |Q|, |L|, |H|, |Q|_b, |Q|-|H|$, *are defined for values* $< 2n$.
i.e. the direct computations of them are made forall values of $< 2n$, *but the computations by equations*
are made for $n = 2n/2$.

Exemple 3.1 *The computation of* $|Q|,\ |L|,\ |H|,\ s_o,\ G\ ,\ F$ *for* $2n = 4$
Construction SBR2n:
$2n = 4\ ;\ n = 2$
$\oslash$ - *odd noncomposite;* $\oplus$ - *odd composite ;* $\otimes$ - *even composite .*
$\oslash 1 + 3\oslash = 4(H)$
Data of direct computations for even $n = 2$, *at that it is took into account remark (2.2)*
$p = 2;\ s_o = 0;\ |Q| = 0;\ |L| = 0;\ |H| = 1;\ G = 1;\ F = 1$
The computations of parameters of binary representations of the positive integer $2n = 4$ *with help of arithmetic stated above*
at that $p, s_o, |Q|, |L|, |H|$, *are took from the data of direct computations.*
$n = 4/2 = 2$;
$G = n - 1 = 2 - 1 = 1$; *by equation (11)*
$|E| = n/2 - 1 = 1 - 1 = 0$; *by equation (13)*
$F = n/2 = 2/2 = 1$; *by equation (15)*
$s_o = n - p = 2 - 2 = 0$; *by equation (17)*
$|L| = n - p - 2|Q| = 2 - 2 - 0 = 0$; *by equation (26)*
$|L| = p - 2|H| = 2 - 2 = 0$; *by equation (28)*
$|H| = (2|Q| + 2p - n)/2 = (0 + 4 - 2)/2 = 1$; *by equation (30)*
$|H| = (p - |L|)/2 = (2 - 0)/2 = 1$; *by equation (29)*
$|Q| = (n - p - |L|)/2 = (2 - 2 - 0)/2 = 01$; *by equation (22)*
$|Q| = (n - 2p + 2|H|)/2 = (2 - 4 + 2)/2 = 0$; *by equation (24)*
$|Q| - |H| = 0 - 1 = -1$;
$|Q| - |H| = (n - 2p)/2 = (2 - 4)/2 = -1$; *by equation (32)*
$p = 2|H| + |L| = 2 + 0 = 2$; *by equation (7)*
$s_o = 2|Q| + |L| = 0 + 0 = 0$; *by equation (8)*
$F = |Q| + |L| + |H| = 0 + 0 + 1 = 1$; *by equation (10)*
The compare of data of direct computations with computed values shows full coincidence of results.

Exemple 3.2 *The computation of* $|Q|,\ |L|,\ |H|,\ s_o,\ G,\ F$ *for* $2n = 6$
.

$\oslash$ *- odd noncomposite;* $\oplus$ *- odd composite ;* $\otimes$ *- even composite .*

Construction SBR2n:
$2n = 6$; $n = 3$
$\oslash 1 + 5 \oslash = 6(H)$
$\otimes 2 + 4 \otimes = 6(E)$
Data of direct computations for odd n = 3 , at that it is took into account remark (2.2)
$p* = 2;\ s_o = 0;\ |Q| = 0;\ |L| = 0;\ |H| = 1; G = 2; F = 1$
The computations of parameters of binary representations of the positive integer $2n = 6$ *with help of arithmetic stated above*
at that $p, s_o, |Q|, |L|, |H|,$ *are took from the data of direct computations.*
$n = 6/2 = 3;$
$G = n - 1 = 3 - 1 = 2;$ *by equation (11)*
$|E| = (n - 1)/2 = 1;$ *by equation (12)*
$F = (n - 1)/2 = (3 - 1)/2 = 1;$ *by equation (16)*
$s_o = n - p - 1 = 3 - 2 - 1 = 0;$ *by equation (18)*
$|L| = n - p - 2|Q| - 1 = 3 - 2 - 0 - 1 = 0;$ *by equation (27)*
$|L| = p - 2|H| = 2 - 2 = 0;$ *by equation (28)*
$|H| = (2|Q| + 2p - n + 1)/2 = (0 + 4 - 3 + 1)/2 = 1;$ *by equation (31)*
$|H| = (p - |L|)/2 = (2 - 0)/2 = 1;$ *by equation (29)*
$|Q| = (n - p - |L| - 1)/2 = (3 - 2 - 0 - 1)/2 = 0;$ *by equation (23)*
$|Q| = (n - 2p + 2|H| - 1)/2 = (3 - 4 + 2 - 1)/2 = 0;$ *by equation (25)*
$|Q| - |H| = 0 - 1 = -1;\ |Q| - |H| = (n - 2p - 1)/2 = (3 - 4 - 1)/2 = -1;$ *by equation (33)*
$p = 2|H| + |L| = 2 + 0 = 2;$ *by equation (7)*
$s_o = 2|Q| + |L| = 0 + 0 = 0;$ *by equation (8)*
$F = |Q| + |L| + |H| = 0 + 0 + 1 = 1;$ *by equation (10)*
The compare of data of direct computations with computed values shows full coincidence of results.

Exemple 3.3 *The computation of* $|Q|,\ |L|,\ |H|,\ s_o,\ G\ ,\ F$ *for* $2n = 12$
Construction SBR2n:
$2n = 12$; $n = 6$
$\oslash$ *- odd noncomposite;* $\oplus$ *- odd composite ;* $\otimes$ *- even composite .*
$\oslash 1 + 11 \oslash = 12(H)$
$\otimes 2 + 10 \otimes = 12(E)$
$\oslash 3 + 9 \oplus = 12(L)$
$\otimes 4 + 8 \otimes = 12(E)$
$\oslash 5 + 7 \oslash = 12(H)$

Data of direct computations for even $n = 2$, at that it is took into account remark (2.2)

$p = 5;\ s_o = 1;\ |Q| = 0;\ |L| = 1;\ |H|\ =\ 2;\ G = 5;\ F = 3$

The computations of parameters of binary representations of the positive integer $2n = 12$ with help of arithmetic stated above

$n = 12/2 = 6$;

$G = n - 1 = 6 - 1 = 5$; *by equation (11)*

$|E| = n/2 - 1 = 3 - 1 = 2$; *by equation (13)*

$F = n/2 = 6/2 = 3$; *by equation (15)*

$s_o = n - p = 6 - 5 = 1$; *by equation (17)*

$|L| = n - p - 2|Q| = 6 - 5 - 0 = 1$; *by equation (26)*

$|L| = p - 2|H| = 5 - 4 = 1$; *by equation (28)*

$|H| = (2|Q| + 2p - n)/2 = (0 + 10 - 6)/2 = 2$; *by equation (30)*

$|H| = (p - |L|)/2 = (5 - 1)/2 = 2$; *by equation (29)*

$|Q| = (n - p - |L|)/2 = (6 - 5 - 1)/2 = 01$; *by equation (22)*

$|Q| = (n - 2p + 2|H|)/2 = (6 - 10 + 4)/2 = 0$; *by equation (24)*

$|Q| - |H| = 0 - 2 = -2$;

$|Q| - |H| = (n - 2p)/2 = (6 - 10)/2 = -2$; *by equation (32)*

$p = 2|H| + |L| = 4 + 1 = 5$; *by equation (7)*

$s_o = 2|Q| + |L| = 0 + 1 = 1$; *by equation (8)*

$F = |Q| + |L| + |H| = 0 + 1 + 2 = 3$; *by equation (10)*

The compare of data of direct computations with computed values shows full coincidence of results.

Exemple 3.4 *The computation of* $|Q|,\ |L|,\ |H|,\ s_o,\ G,\ F\ for\ 2n\ =\ 14$.

$\oslash$ *- odd noncomposite;* $\oplus$ *- odd composite ;* $\otimes$ *- even composite .*

Construction SBR2n:

$2n\ =\ 14\ ;\ n\ =\ 7$

$\oslash 1 + 13 \oslash = 14(H)$

$\otimes 2 + 12 \otimes = 14(E)$

$\oslash 3 + 11 \oslash = 14(H)$

$\otimes 4 + 10 \otimes = 14(E)$

$\oslash 5 + 9 \oplus = 14(L)$

$\otimes 6 + 8 \otimes = 14(E)$

Data of direct computations for odd $n = 7$, at that it is took into account remark (2.2).

$p* = 5;\ s_o = 1;\ |Q| = 0;\ |L| = 1;\ |H| = 2; G = 6; F = 3$

The computations of parameters of binary representations of the positive

integer $2n = 14$ *with help of arithmetic stated above*
$n = 14/2 = 7$;
$G = n - 1 = 7 - 1 = 6$; *by equation (11)*
$|E| = (n - 1)/2 = 3$; *by equation (12)*
$F = (n - 1)/2 = (7 - 1)/2 = 3$; *by equation (16)*
$s_o = n - p - 1 = 7 - 5 - 1 = 1$; *by equation (18)*
$|L| = n - p - 2|Q| - 1 = 7 - 5 - 0 - 1 = 1$; *by equation (27)*
$|L| = p - 2|H| = 5 - 4 = 1$; *by equation (28)*
$|H| = (2|Q| + 2p - n + 1)/2 = (0 + 10 - 7 + 1)/2 = 2$; *by equation (31)*
$|H| = (p - |L|)/2 = (5 - 1)/2 = 2$; *by equation (29)*
$|Q| = (n - p - |L| - 1)/2 = (7 - 5 - 1 - 1)/2 = 0$; *by equation (23)*
$|Q| = (n - 2p + 2|H| - 1)/2 = (7 - 10 + 4 - 1)/2 = 0$; *by equation (25)*
$|Q| - |H| = 0 - 2 = -2$; $|Q| - |H| = (n - 2p - 1)/2 = (7 - 10 - 1)/2 = -2$; *by equation (33)*
$p = 2|H| + |L| = 4 + 1 = 5$; *by equation (7)*
$s_o = 2|Q| + |L| = 0 + 1 = 1$; *by equation (8)*
$F = |Q| + |L| + |H| = 0 + 1 + 2 = 3$; *by equation (10)*
The compare of data of direct computations with computed values shows full coincidence of results.

Exemple 3.5 *The computation of* $|Q|$, $|L|$, $|H|$, s_o, G , F *for* $2n = 132$

Remark 3.2 *The representations with x is even; y is even are excluded since*
$|Q|$. $|L|$, $|H|$, s_o, p, *by definitions concem to odd composite and noncomposite integers.*
$\oslash$ *- odd noncomposite;* $\oplus$ *- odd composite ;*

Construction SBR2n:
$2n = 132$; $n = 66$
$\oslash 1 + 131 \oslash = 132(H)$
$\oslash 3 + 129 \oplus = 132(L)$
$\oslash 5 + 127 \oslash = 132(H)$
$\oslash 7 + 125 \oplus = 132(L)$
$\oplus 9 + 123 \oplus = 132$ *(Q)*
$\oslash 11 + 121 \oplus = 132$ *(L)*
$\oslash 13 + 119 \oplus = 132$ *(L)*
$\oplus 15 + 117 \oplus = 132$ *(Q)*
$\oslash 17 + 115 \oplus = 132$ *(L)*

$\oslash 19 + 113\oslash = 132$ *(H)*
$\oplus 21 + 111\oplus = 132$ *(Q)*
$\oslash 23 + 109\oslash = 132$ *(H)*
$\oplus 25 + 107\oslash = 132$ *(L)*
$\oplus 27 + 105\oplus = 132$ *(Q)*
$\oslash 29 + 103\oslash = 132$ *(H)*
$\oslash 31 + 101\oslash = 132$ *(H)*
$\oplus 33 + 99\oplus = 132$ *(Q)*
$\oplus 35 + 97\oslash = 132$ *(L)*
$\oslash 37 + 95\oplus = 132$ *(L)*
$\oplus 39 + 93\oplus = 132$ *(Q)*
$\oslash 41 + 91\oplus = 132$ *(L)*
$\oslash 43 + 89\oslash = 132$ *(H)*
$\oplus 45 + 87\oplus = 132$ *(Q)*
$\oslash 47 + 85\oplus = 132$ *(L)*
$\oplus 49 + 83\oslash = 132$ *(L)*
$\oplus 51 + 81\oplus = 132$ *(Q)*
$\oslash 3 + 79\oslash = 132$ *(H)*
$\oplus 55 + 77\oplus = 132$ *(Q)*
$\oplus 57 + 75\oplus = 132$ *(Q)*
$\oslash 59 + 73\oslash = 132$ *(H)*
$\oslash 61 + 71\oslash = 132$ *(H)*
$\oplus 63 + 69\oplus = 132$ *(Q)*
$\oplus 65 + 67\oslash = 132$ *(L)*
Data of direct computations for even n = 66 ,at the compare it is took into account remark (2.2).
$p = 32;\ s_o = 34;\ |Q| = 11;\ |L| = 12;\ |H| = 10; F = 33$
The computations of parameters of binary representations of the positive integer 2n = 132 with help of arithmetic stated above
at that $p, s_o, |Q|, |L|, |H|,$ *are took from the data of direct computations.*
n = 132/2 = 66 ;
$G = n - 1 = 66 - 1 = 65;$ *by equation (11)*
$|E| = n/2 - 1 = 66/2 - 1 = 32;$ *by equation (13)*
$F = n/2 = 66/2 = 33;$ *by equation (15)*
$s_o = n - p = 66 - 32 = 34;$ *by equation (17)*
$|L| = n - p - 2|Q| = 66 - 32 - 22 = 12;$ *by equation (26)*
$|L| = p - 2|H| = 32 - 20 = 12;$ *by equation (28)*
$|H| = (2|Q| + 2p - n)/2 = (22 + 64 - 66)/2 = 10;$ *by equation (30)*
$|H| = (p - |L|)/2 = (32 - 12)/2 = 10;$ *by equation (29)*
$|Q| = (n - p - |L|)/2 = (66 - 32 - 12)/2 = 11;$ *by equation (22)*
$|Q| = (n - 2p + 2|H|)/2 = (66 - 64 + 20)/2 = 11;$ *by equation (24)*

$|Q| - |H| = 11 - 10 = 1;$ *by equation ()*
$|Q| - |H| = (n - 2p)/2 = (66 - 64)/2 = 1;$ *by equation (32)*
$p = 2|H| + |L| = 20 + 12 = 32;$ *by equation (7)*
$s_o = 2|Q| + |L| = 22 + 12 = 34;$ *by equation (8)*
$F = |Q| + |L| + |H| = 11 + 12 + 10 = 33;$ *by equation (10)*
The compare of data of direct computations with computed values shows full coincidence of results.

Exemple 3.6 *The computation of* $|Q|,\ |L|,\ |H|,\ s_o,\ G,\ F\ for\ 2n = 138$.

Remark 3.3 *The representations with x is even; y is even are excluded since*
$|Q|.|L|, |H|, s_o, p,$ *by definitions concem to odd composite and prime integers.*
$\oslash$ *- odd noncomposite;* $\oplus$ *- odd composite ;*

Construction SBR2n:
$2n = 138$; $n = 69$
$\oslash 1 + 137 \oslash = 138(H)$
$\oslash 3 + 135 \oplus = 138(L)$
$\oslash 5 + 133 \oplus = 138(L)$
$\oslash 7 + 131 \oslash = 138(H)$
$\oplus 9 + 129 \oplus = 138(Q)$
$\oslash 11 + 127 \oslash = 138(H)$
$\oslash 13 + 125 \oplus = 138(L)$
$\oplus 15 + 123 \oplus = 138(Q)$
$\oslash 17 + 121 \oplus = 138(L)$
$\oslash 19 + 119 \oplus = 138(L)$
$\oplus 21 + 117 \oplus = 138(Q)$
$\oslash 23 + 115 \oplus = 138(L)$
$\oplus 25 + 113 \oslash = 138(L)$
$\oplus 27 + 111 \oplus = 138(Q)$
$\oslash 29 + 109 \oslash = 138(H)$
$\oslash 31 + 107 \oslash = 138(H)$
$\oplus 33 + 105 \oplus = 138(Q)$
$\oplus 35 + 103 \oslash = 138(L)$
$\oslash 37 + 101 \oslash = 138(H)$
$\oplus 39 + 99 \oplus = 138(Q)$

$\oslash 41 + 97 \oslash = 138(H)$
$\oslash 43 + 95 \oplus = 138(L)$
$\oplus 45 + 93 \oplus = 138(Q)$
$\oslash 47 + 91 \oplus = 138(L)$
$\oplus 49 + 89 \oslash = 138(L)$
$\oplus 51 + 87 \oplus = 138(Q)$
$\oslash 53 + 85 \oplus = 138(L)$
$\oplus 55 + 83 \oslash = 138(L)$
$\oplus 57 + 81 \oplus = 138(Q)$
$\oslash 59 + 79 \oslash = 138(H)$
$\oslash 61 + 77 \oplus = 138(L)$
$\oplus 63 + 75 \oplus = 138(Q)$
$\oplus 65 + 73 \oslash = 138(L)$
$\oslash 67 + 71 \oslash = 138(H)$
Data of direct computations for odd n = 69 , at that it is took into account remark (2.2) .
$p = 33;\ \ s{*}_o = 35;\ \ |Q| = 10;\ \ |L| = 15;\ \ |H| = 9; F = 34$
The computations of parameters of binary representations of the positive integer $2n = 132$ *with help of arithmetic stated above*
at that $p, s_o, |Q|, |L|, |H|,$ *are took from the data of direct computations.*
$n = 138/2 = 69;$
$G = n - 1 = 69 - 1 = 68;$ *by equation (11)*
$|E| = (n - 1)/2 = 34;$ *by equation (12)*
$F = (n - 1)/2 = (69 - 1)/2 = 34;$ *by equation (16)*
$s_o = n - p - 1 = 69 - 33 - 1 = 35;$ *by equation (18)*
$|L| = n - p - 2|Q| - 1 = 69 - 33 - 20 - 1 = 15;$ *by equation (27)*
$|L| = p - 2|H| = 33 - 18 = 15;$ *by equation (28)*
$|H| = (2|Q| + 2p - n + 1)/2 = (20 + 66 - 69 + 1)/2 = 9;$ *by equation (31)*
$|H| = (p - |L|)/2 = (33 - 15)/2 = 9;$ *by equation (29)*
$|Q| = (n - p - |L| - 1)/2 = (69 - 33 - 15 - 1)/2 = 10;$ *by equation (23)*
$|Q| = (n - 2p + 2|H| - 1)/2 = (69 - 66 + 18 - 1)/2 = 10;$ *by equation (25)*
$|Q| - |H| = 10 - 9 = 1;$ $|Q| - |H| = (n - 2p - 1)/2 = (69 - 66 - 1)/2 = 1;$ *by equation (33)*
$p = 2|H| + |L| = 18 + 15 = 33;$ *by equation (7)*
$s_o = 2|Q| + |L| = 20 + 15 = 35;$ *by equation (8)*
$F = |Q| + |L| + |H| = 10 + 15 + 9 = 34;$ *by equation (10)*
The compare of data of direct computations with computed values shows full coincidence of results.

Exemple 3.7 *The computation of* $|Q|, |L|, |H|, s_o, G, F$ *for 2n = 134*

Remark 3.4 *The representations with x is even; y is even are excluded*

since
$|Q|.|L|, |H|, s_o, p,$ *by definitions concem to odd composite and prime integers.*
$\oslash$ *- odd noncomposite;* $\oplus$ *- odd composite ;*

Construction SBR2n::
$2n\ =\ 134\ \ n\ =\ 67$
$\oslash 1 + 133 \oplus = 134(L)$
$\oslash 3 + 131 \oslash = 134(H)$
$\oslash 5 + 129 \oplus = 134(L)$
$\oslash 7 + 127 \oslash = 134(H)$
$\oplus 9 + 125 \oplus = 134(Q)$
$\oslash 11 + 123 \oplus = 134(L)$
$\oslash 13 + 121 \oplus = 134(L)$
$\oplus 15 + 119 \oplus = 134(Q)$
$\oslash 17 + 117 \oplus = 134(L)$
$\oslash 19 + 115 \oplus = 134(L)$
$\oplus 21 + 113 \oslash = 134(L)$
$\oslash 23 + 111 \oplus = 134(L)$
$\oplus 25 + 109 \oslash = 134(L)$
$\oplus 27 + 107 \oslash = 134(L)$
$\oslash 29 + 105 \oplus = 134(L)$
$\oslash 31 + 103 \oslash = 134(H)$
$\oplus 33 + 101 \oslash = 134(L)$
$\oplus 35 + 99 \oplus = 134(Q)$
$\oslash 37 + 97 \oslash = 134(H)$
$\oplus 39 + 95 \oplus = 134(Q)$
$\oslash 41 + 93 \oplus = 134(L)$
$\oslash 43 + 91 \oplus = 134(L)$
$\oplus 45 + 89 \oplus = 134(Q)$
$\oslash 47 + 87 \oplus = 134(L)$
$\oplus 49 + 85 \oplus = 134(Q)$
$\oplus 51 + 83 \oslash = 134(L)$
$\oslash 53 + 81 \oplus = 134(L)$
$\oplus 55 + 79 \oslash = 134(L)$
$\oplus 57 + 77 \oplus = 134(Q)$
$\oslash 59 + 75 \oplus = 134(L)$
$\oslash 61 + 73 \oplus = 134(H)$
$\oplus 63 + 71 \oslash = 134(L)$
$\oplus 65 + 69 \oslash = 134(Q)$
Data of direct computations for odd prime n = 67 , at that it is took into

account remark (2.2)
$p* = 30;\ s_o = 36;\ |Q| = 8;\ |L| = 20;\ |H| = 5; F = 33$
The computations of parameters of binary representations of the positive integer $2n = 134$
with help of arithmetic stated above
at that $p, s_o, |Q|, |L|, |H|$, *are took from the data of direct computations.*
$n = 134/2 = 67;$
$G = n - 1 = 67 - 1 = 66;$ *by equation (11)*
$|E| = (n - 1)/2 = 33;$ *by equation (12)*
$F = (n - 1)/2 = (67 - 1)/2 = 33;$ *by equation (16)*
$s_o = n - p - 1 = 67 - 30 - 1 = 36;$ *by equation (18)*
$|L| = n - p - 2|Q| - 1 = 67 - 30 - 16 - 1 = 20;$ *by equation (27)*
$|L| = p - 2|H| = 30 - 10 = 20;$ *by equation (28)*
$|H| = (2|Q| + 2p - n + 1)/2 = (16 + 60 - 67 + 1)/2 = 5;$ *by equation (31)*
$|H| = (p - |L|)/2 = (30 - 20)/2 = 5;$ *by equation (29)* $|Q| = (n - p - |L| - 1)/2 = (67 - 30 - 20 - 1)/2 = 8;$ *by equation (23)*
$|Q| = (n - 2p + 2|H| - 1)/2 = (67 - 60 + 10 - 1)/2 = 8;$ *by equation (25)*
$|Q| - |H| = 8 - 5 = 3;$
$|Q| - |H| = (n - 2p - 1)/2 = (67 - 60 - 1)/2 = 3;$ *by equation (33)*
$p = 2|H| + |L| = 10 + 20 = 30;$ *by equation (7)*
$s_o = 2|Q| + |L| = 16 + 20 = 36;$ *by equation (8)*
$F = |Q| + |L| + |H| = 8 + 20 + 5 = 33;$ *by equation (10)*
The compare of data of direct computations with computed values shows full coincidence of results.

4 The limited values of possible range of $|Q|, |L|, |H|$

Definition 4.1 $|H|_b$ *-lower limit of possible range of* $|H|$.

Axiom 4.1

$$|H|_b = 0 \tag{34}$$

Definition 4.2 *p(n) is the number of odd noncomposite integers (primes and "1")* $< n$
p(n) is positive integer $> 0 \ \forall\ n > 1$

Definition 4.3 $p - p(n)$ *- the number of odd noncomposite integers in* Y *.*

Definition 4.4 $|H|_c$*-upper limit of possible range of* $|H|$.

Proposition 4.1

$$|H|_c = p - p(n) \qquad (35)$$

Proof 4.1 *By Low of distribution of primes the number of odd noncomposite integers in* X *is greater than the number of odd noncomposite integers in* Y *:* $p(n) > p - p(n)$ *.*
Since the number of primes decreases with increase of n. Hence maximal number of pair of odd noncomposite integers in the set XUY equals the number of odd noncomposite integers in Y : p - p(n)
then $|H|_c = p - p(n)$ *.* □

Corollary 4.1 *The number of unpaired odd noncomposite positive integers in X equals :* $2p(n) - p$ *and are allotted to type "L". Then* $|L| > 0 \ \forall 2n > 8$

Proof 4.2 *The number of unpaired odd noncomposite positive integers in X by definitions 8.4, 8.5 equals :*
(p(n) - (p - p(n)) = 2p(n) - p
and are allotted to type "L". □

Definition 4.5 $|L|_b$ *- lower limit of possible range of* $|L|$*.*

Proposition 4.2

$$|L|_b = 2p(n) - p \qquad (36)$$

Proof 4.3 *Substituting upper limit of* $|H|$ *by (35) to (7) then we get: lower limit for* $|L|$ *:* $|L|_b = 2p(n) - p$ □

Definition 4.6 $|L|_c$ *-upper limit of possible range of* $|L|$*.*

Proposition 4.3

$$|L|_c = p \qquad (37)$$

Proof 4.4 *Substituting lower limit of* $|H|$ *by (34) to (7) then we get upper limit for* $|L|$ *:* $|L|_c = p$ □

Definition 4.7 $|Q|_b$ *- lower limit of possible range of* $|Q|$*.*
$|Q|_b$*- positive integer* $> 0 \ \ \forall \ 2n > 120$ *see proposition (9.2).*
$|Q|_b$ *- negative integer* $< 0 \ \ \forall \ 2 < 2n < 120$ *see proposition (9.1).*
excepting $2n = 94; 96; 100; 106; 118;$ *for which* $|Q|b = 0$ *see subsection (12.1). At that* $2n = 120; (|Q|_b = 0)$ *is border point.*

Proposition 4.4

$$|Q|_b = (n - 2p)/2 \tag{38}$$

n is even; $n > 1$

Proof 4.5 *Substituting upper limit of* $|L|$ *by equation (37) to equation (8) then we get*
lower limit for $|Q|$*:* $|Q|_b = (S_o - p)/2$.
Substituting S_0 *by equation (17), then we get:*
$|Q|_b = (n - 2p)/2 \; n > 1$. □

Proposition 4.5

$$|Q|_b = (n - 2p - 1)/2 \tag{39}$$

n is odd or odd prime ; $n > 1$

Proof 4.6 *Substituting upper limit of* $|L|$ *by equation (37) to equation (8) then we get*
lower limit for $|Q|$*:* $|Q|_b = (S_0 - p)/2$.
Substituting S_0 *by equation (18), finally we get:* $|Q|_b = (n - 2p - 1)/2$;
$for\ n\ is\ odd\ or\ odd\ prime; n > 1$. □

Definition 4.8 $|Q|_c$ *- upper limit of possible range of* $|Q|$.

Proposition 4.6

$$|Q|_c = (n - 2p(n))/2 \tag{40}$$

$for;$

Proof 4.7 *Substituting lower limit of* $|L|$ *by equation (36) to equation (8) then we get*
upper limit for $|Q|$*:* $|Q|_c = (S_0 - (2p(n) - p))/2$.
Substituting S_0 *by equation (17) finally we get:* $|Q|_c = (n - 2p(n))/2$;
for n is even or n is odd prime; □

Proposition 4.7

$$|Q|_c = (n - 2p(n) - 1)/2 \tag{41}$$

for n is odd or odd prime;

Proof 4.8 *Substituting lower limit of* $|L|$ *by equation (36) to equation (8) then we get*
upper limit for $|Q|$*:* $|Q|_c = (S_0 - (2p(n) - p))/2$
Substituting S_0 *by equation (18) finally we get:* $|Q|_c = (n - 2p(n) - 1)/2$;
for n is odd or odd prime; □

Proposition 4.8

$$|Q| - |H| = |Q|_b \tag{42}$$

$\forall n > 1$

Proof 4.9 *By equation (32) we have:* $|Q|-|H| = (n-2p)/2$*for n is even ; By equation (33) we have:* $|Q| - |H| = (n - 2p - 1)/2$ *for n is odd or odd prime.*
By equation (38) we have: $|Q|_b = (n - 2p)/2$ *for n is even. By equation (39) we have:* $|Q|_b = (n - 2p - 1)/2$ *; for n is odd or odd prime.*
Whence we get: $|Q| - |H| = |Q|_b \ \forall \ n \ > 1$. □

5 Average value of the number of binary sums are formed from odd composite positive integers $< 2n$

.

Definition 5.1 $S -$ *ordered set of odd composite positive integers* $< 2n$
$s -$ *element of* S
$|S|_0 -$ *power of* S
$s_i -$ *vary over all* s
$s_j -$ *vary over all* s

Definition 5.2 $V\ \{v_k | v_k \in N, v_k = s_i + s_j\}$
is a set by elements of which are every possible binary sums of odd composite integers $< 2n$. *(each with all the rest)*
Since $s_i < 2n; s_j < 2n$ *then max* $v_k < 4n$.
$|V|$ *- the power of set V.*

Definition 5.3 $W\{w | w \in N, w = 2k, 1 \leq k \leq 2n\}$
is a set of even composite positive integers $< 4n + 2$
$(inf\ W = 2; sup\ W = 4n)$.
$|W| -$ *the power of set* $W; |W| = 2n$.

Definition 5.4 $|Q|_m$ - *mean quantity of binary sums* $v_k = s_i + s_j$ *which can be formed of odd composite positive integers* $< 2n$ *and which are mapped into* W *by surjective mapping :*
$f : V \Rightarrow W$

$$|Q|_m = |V|/|W| \tag{43}$$

i.e. uniform mapping regardless of real.
$|Q|_m$ *– positive rational number* $> 0 \ \forall \ 2n > 4$.

Proposition 5.1

$$|V| = s_0^2 \tag{44}$$

Proof 5.1 *The number of every possible binary sums in the view of* $v_k = s_i + s_j$ *are formed of odd composite positive integers* $< 2n$ *is equal the power of Cartesian product: S X S . Then :*
$|V| = s_0 \cdot s_0 = s_0^2$ □

Proposition 5.2

$$|Q|_m = s_0^2/2n \tag{45}$$

Proof 5.2 *By equations (43 and 44) we have :* $|Q|_m = |V|/|W| = s_0^2/2n$
□

Proposition 5.3

$$|Q|_m = (n - p)^2/2n \tag{46}$$

$For n is even; n > 1$

Proof 5.3 *Substituting* s_0 *by equation (17) to equation (45) then we get :* $|Q|_m = (n - p)^2/2n;$
For n is even ;$n > 1$ □

Proposition 5.4

$$|Q|_m = (n - p - 1)^2/2n \tag{47}$$

For n is odd or odd prime; $n > 1$

Proof 5.4 *Substituting* s_0 *by equation (18) to equation (45) then we get :*
$|Q|_m = (n - p - 1)^2/2n;$
For n is odd or odd prime ; $n > 1$ □

6 Average value of the number of binary sums are formed from odd noncomposite positive integers $< 2n$

Definition 6.1 *P - ordered set of odd noncomposite positive integers* $< 2n$;
p - elements of P ;
$|P| = p$ *- power of P ;*
p_i*- vary over all p ;*
p_j *- vary over all p ;*

Definition 6.2 $T\{t_k | t_k \in N, t_k = p_i + p_j\}$;
is a set by elements of which are every possible binary sums of odd noncomposite integers $< 2n$. *(each with all the rest)*
Since $p_i < 2n; p_j < 2n$ *then max* $t_k < 4n$.
$|T|$ *- the power of set T.*

Definition 6.3 $|H|_m$ *is mean quantity of binary sums* $p_i + p_j = 2k$ *which can be formed of odd noncomposite positive integers* $< 2n$ *and which are mapped into W by surjective mapping :*
$f:\ T \Rightarrow\ W$

$$|H|_m = |T|/|W| \tag{48}$$

i.e. uniform mapping regardless of real.
$|H|_m$*-positive rational number* $> 0\ \ \forall 2n > 4$.

Proposition 6.1

$$|T| = p^2 \tag{49}$$

Proof 6.1 *The number of every possible binary sums are formed of odd noncomposite positive integers* $<\ 2n$ *in the view of* $p_i + p_j = 2k$ *is equal the power of Cartesian product P X P .*
Then $|T| = p \cdot p = p^2\ \ \square$

Proposition 6.2

$$|H|_m = p^2/2n \tag{50}$$

$\forall\ n > 1$

Proof 6.2 *By equations (48 and 49) we have :* $|H|_m = p^2/2n \ \forall \ n > 1$
$\square$

7 The deviation of $|Q|, |H| \ from \ |Q|_m, |H|_m$

Definition 7.1 *The deviation of* $|Q| \ from \ |Q|_m$ *is:*
$\Delta|Q| \ = \ |Q|_m - \ |Q|$
$\Delta|Q| \ > \ 0 \ if \ |Q|_m \ > \ |Q|$
$\Delta|Q| \ < \ 0 \ if \ |Q|_m \ < \ |Q|$

Definition 7.2 *The deviation of* $|H| \ from \ |H|_m$ *is:*
$\Delta|H| \ = \ |H|_m - \ |H|$
$\Delta|H| \ > \ 0 \ if \ |H|_m > \ |H|$ *;*
$\Delta|H| \ < \ 0 \ if \ |H|_m < \ |H|$

7.1 Relationship between the deviations $\Delta|Q| \ and \ \Delta|H|$

Proposition 7.1

$$\Delta Q = \Delta H + |Q|_m - |H|_m - |Q|_b \tag{51}$$

$\forall \ n \ > \ 1$

Proof 7.1 *By equation (42)* $|Q| - |H| = |Q|_b$;
By definition (7.1) $\Delta|Q| = |Q|_m - |Q|$ *;*
By definition (7.2) $\Delta|H| = |H|_m - |H|$ *;*
Whence : $|Q| = |Q|_m - \Delta|Q|$;
$|H| = |H|_m - \Delta|H|$;
Then:
$(|Q|_m - \Delta|Q|) - (|H|_m - \Delta|H|) = |Q|_b$ *;*
$|Q|_m - \Delta|Q| - |H|_m + \Delta|H| = |Q|_b$;
Whence:
$\Delta|Q| = \Delta|H| + |Q|_m - |H|_m - |Q|_b$. $\square$

7.2 The control of equation for $\Delta|Q|$

Exemple 7.1 ***Exemple 7.2*** *The computation* $\Delta|Q|$ *for n is even:* $n = 2, \ 2n = 4$ *.*
Data of direct computations we take from exmp 3.1

$p = 2;\ s_o = 0;\ |Q| = 0;\ |L| = 0;\ |H| = 1;\ G = 1;\ F = 1$
$|Q|_m = ((n-p)^2/2n) = ((2-2)^2/4) = 0.$ *by equation (46)*
$|H|_m = (p^2)/2n = (2^2)/4 = 1;$ *by equation (50)*
$\Delta|Q| = |Q|_m - |Q| = 0 - 0 = 0;$ *by definition (7.1)*
$\Delta|H| = |H|_m - |H| = 1 - 1 = 0;$ *by definition (7.2)*
$|Q|_b = (n-2p)/2 = (2-4)/2 = -1$ *; by equation (38)*
The computation of Delta|Q| by equation (51) .
$\Delta|Q| = |Q|_m - |H|_m - |Q|_b + \Delta|H| = 0 - 1 + 1 - 0 = 0$.
The compare of $\Delta|Q|$ computed by data of direct computations with computed value
by equation (51) shows full coincidence of results.

The computation $\Delta|Q|$ for n is odd prime: $n = 3; 2n = 6$.
Data of direct computations for odd prime n = 3 we take from exmp 3.2
$p* = 2;\ s_o = 0;\ |Q| = 0;\ |L| = 0;\ |H| = 1; G = 2; F = 1$
$|Q|_b = |Q| - |H| = 0 - 1 = -1$. *by equation (42)*
$|Q|_m = ((n-p-1)^2)/2n = ((3-2-1)^2/134) = 0.$ *by equation (47)*
$|H|_m = (p^2)/2n = (2^2)/6 = 2/3;$ *by equation (50)*
$\Delta|Q| = |Q|_m - |Q| = 0 - 8 = 0;$ *by definition (7.1)*
$\Delta|H| = |H|_m - |H| = 2/3 - 1 = -1/3;$ *by definition (7.2)*
$|Q|_b = (n-2p-1)/2 = (3-4-1)/2 = -1$ *; by equation (39)*
The computation of $\Delta|Q|$ by equation (51) .
$\Delta|Q| = |Q|_m - |H|_m - |Q|)b + \Delta|H| = 0 - 2/3 + 1 - 1/3 = 0$.
The compare of $\Delta|Q|$ computed by data of direct computations with computed value
by equation (51) shows full coincidence of results.

Exemple 7.3 *The computation $\Delta|Q|$ for n is even: n = 6, 2n = 12 .*
Data of direct computations we take from exmp 3.3
$p = 5;\ s_o = 1;\ |Q| = 0;\ |L| = 1;\ |H| = 2;\ G = 5;\ F = 3$
$|Q|_m = ((n-p)^2/2n) = ((6-5)^2/12) = 1/12.$ *by equation (46)*
$|H|_m = (p^2)/2n = (5^2)/12 = 25/12;$ *by equation (50)*
$\Delta|Q| = |Q|_m - |Q| = 1/12 - 0 = 1/12;$ *by definition (7.1)*
$\Delta|H| = |H|_m - |H| = 25/12 - 2 = 1/12;$ *by definition (7.2)*
$|Q|_b = (n-2p)/2 = (6-10)/2 = -2$ *; by equation (38)*
The computation of Delta|Q| by equation (51) .
$\Delta|Q| = |Q|_m - |H|_m - |Q|_b + \Delta|H| = 1/12 - 25/12 + 2 + 1/12 = 1/12$.
The compare of $\Delta|Q|$ computed by data of direct computations with computed value
by equation (51) shows full coincidence of results.

Exemple 7.4 *The computation $\Delta|Q|$ for n is odd prime: $n = 7; 2n = 14$*
.

Data of direct computations for odd prime n = 67 we take from exmp 3.4
$p* = 5;\ s_o = 1;\ |Q| = 0;\ |L| = 1;\ |H| = 2; G = 6; F = 3$
$|Q|_b = |Q| - |H| = 0 - 2 = -2$. *by equation (42)*
$|Q|_m = ((n-p-1)^2)/2n = ((7-5-1)^2/14) = 1/14.$ *by equation (47)*
$|H|_m = (p^2)/2n = (5^2)/14 = 25/14;$ *by equation (50)*
$\Delta|Q| = |Q|_m - |Q| = 1/14 - 0 = 1/14;$ *by definition(7.1)*
$\Delta|H| = |H|_m - |H| = 25/14 - 2 = -3/14;$ *by definition (7.2)*
$|Q|_b = (n-2p-1)/2 = (7-10-1)/2 = -2$ *; by equation (39)*
The computation of $\Delta|Q|$ *by equation (51) .*
$\Delta|Q| = |Q|_m - |H|_m - |Q|)b + \Delta|H| = 1/14 - 25/14 + 2 - 3/14 = 1/14$.
The compare of $\Delta|Q|$ *computed by data of direct computations with computed value*
by equation (51) shows full coincidence of results.

Exemple 7.5 *The computation* $\Delta|Q|$ *for n is even: n = 66, 2n = 132 .*
Data of direct computations we take from exmp 3.5
$p = 32;\ s_o = 34;\ |Q| = 11;\ |L| = 12;\ |H| = 10; F = 33$
$|Q|_m = ((n-p)^2/2n) = ((66-32)^2/132) = 8,7575757.$ *by equation (46)*
$|H|_m = (p^2)/2n = (32^2)/132 = 7,7575757;$ *by equation (50)*
$\Delta|Q| = |Q|_m - |Q| = 8,7575757 - 11 = -2,2424243;$ *by definition (7.1)*
$\Delta|H| = |H|_m - |H| = 7,7575757 - 10 = -2,2424243;$ *by definition (7.2)*
$|Q|_b = (n-2p)/2 = (66-64)/2 = 1$ *; by equation (38)*
The computation of Delta|Q| by equation (51) .
$\Delta|Q| = |Q|_m - |H|_m - |Q|_b + \Delta|H| = 8,7575757 - 7,7575757 - 1 - 2,2424243 = -2,2424243$.
The compare of $\Delta|Q|$ *computed by data of direct computations with computed value*
by equation (51) shows full coincidence of results.

Exemple 7.6 *The computation* $\Delta|Q|$ *for n is odd :* $n = 69; 2n = 138$.
Data of direct computations we take from exmp 3.6
$p = 33;\ s_o = 35;\ |Q| = 10;\ |L| = 15;\ |H| = 9;$
$|Q|_m = ((n-p-1)^2/2n) = ((69-33-1)^2/138) = 8,8768115.$ *by equation (47)*
$|H|_m = (p^2)/2n = (33^2)/138 = 7,8913043;$ *by equation (50)*
$\Delta|Q| = |Q|_m - |Q| = 8,8768115 - 10 = -1,123189;$ *by definition (7.1)*
$\Delta|H| = |H|_m - |H| = 7,8913043 - 9 = -1,1086957;$ *by definition (7.2)*
$|Q|_b = (n-2p-1)/2 = (69-66-1)/2 = 1$ *; by equation (39)*
The computation of $\Delta|Q|$ *by equation (51) .*
$\Delta|Q| = |Q|_m - |H|_m - |Q|)b + \Delta|H| = 8,8768115 - 7,8913043 - 1 - 1,1086957 = -1,123189$.

The compare of $\Delta|Q|$ *computed by data of direct computations with computed value*
by equation (51) shows full coincidence of results.

Exemple 7.7 *The computation* $\Delta|Q|$ *for* n *is odd prime:* $n = 67; 2n = 134$ *.*
Data of direct computations for odd prime n = 67 we take from exmp 3.7
$p = 30;\ s_o = 36;\ |Q| = 8;\ |L| = 20;\ |H| = 5;$
$|Q|_b = |Q| - |H| = 8 - 5 = 3$ *. by equation (42)*
$|Q|_m = ((n-p-1)^2)/2n = ((67-30-1)^2/134) = 9,6716417.$ *by equation (47)*
$|H|_m = (p^2)/2n = (30^2)/134 = 6,7164179;$ *by equation (50)*
$\Delta|Q| = |Q|_m - |Q| = 9,6716417 - 8 = 1,6716417;$ *by definition (7.1)*
$\Delta|H| = |H|_m - |H| = 6,7164179 - 5 = 1.7164179;$ *by definition (7.2)*
$|Q|_b = (n - 2p - 1)/2 = (67 - 60 - 1)/2 = 3$ *; by equation (39)*
The computation of $\Delta|Q|$ *by equation (51) .*
$\Delta|Q| = |Q|_m - |H|_m - |Q|)b + \Delta|H| = 2,9552238 - 3 + 1,7164179 = 1,6716417$ *.*
The compare of $\Delta|Q|$ *computed by data of direct computations with computed value*
by equation (51) shows full coincidence of results.

Hence equation (51) is true $\forall n > 1$ *.*

8 The relationship between n and p

8.1 The relationship between n and p for $n < 60$

Proposition 8.1

$$2p > n \tag{52}$$

$for\ n\ is\ even\ n\ <\ 60$

Proof 8.1 *From the numerical solution (see.sabsection 12.1)*
it follows that:
$2p > n\ for\ n\ is\ even\ n\ <\ 60$ □

Proposition 8.2

$$2p + 1 > n \tag{53}$$

$for\ n\ is\ odd\ or\ odd\ prime\ n\ <\ 59$

Proof 8.2 *From the numerical solution (see.sabsection 12.1) it follows that:*
$2p + 1 > n$ *for n is odd or odd prime*
$n < 59$. □

8.2 The relationship between n and p for $n > 60$

Proposition 8.3

$$n > 2p \tag{54}$$

for n is even $n > 60$

Proposition 8.4

$$n > 2p + 1 \tag{55}$$

for n is odd or odd prime $n > 59$.

Proof 8.3 *We need to prove that:* $n > 2p$ *for n is even,* $n > 60$.
$n > 2p + 1$ *for n is odd or odd prime,* $n > 59$.
For it we must find a dependence of differences :
$f_1 = n - 2p;$ *and* $f_2 = n - (2p + 1);$ *from n*
Substituting for p its the second order approximation by equation (20) we get:
$f_1 = n - 2(2n/ln2n + 2n/ln^2 2n) f_2 = n - (2(2n/ln2n + 2n/ln^2 2n) + 1)$.
$f_1 = n - 4n/ln2n - 4n/ln^2 2n f_2 = n - 4n/ln2n - 2n/ln^2 2n) - 1$.
Next we computation the derivatives :
$(f_1)' = (ln^4 2n - 4ln^3 2n + 8ln2n)/ln^4 2n$.
$(f_2)' = (ln^4 2n - 4ln^3 2n + 8ln2n)/ln^4 2n$.
Whence $(f_1)' > 0$; $(f_2)' > 0$; $\forall\ 2n > 2$.
Then f_1, f_2 *increase* $\forall\ 2n > 2$.
Next we compute the points of intersection of f_1, f_2 *with abscissa axis.*
For it we need to test of fulfillment of conditions:
$(f_1(2n) = 0$; $f_1(2n + 2) > 0)$ *and* $(f_2(2n) = 0; f_2(2n + 4) > 0)$.
As follows from numerical solution (see subsubsection 12.1).
The points of intersection are:
2n = 120 for n is even; and 2n = 118 for n is odd or odd prime
Since conditions are fulfilled only for them.
Hence $f_1 > 0$ *forn is even,* $n > 60$.
And $f_2 > 0$ *for n is odd or odd prime* $n > 59$
Thus $n > 2p;$ *for n is even ,* $n > 60$.
And $n > 2p + 1$; *for n is odd or odd prime,* $n > 59$. □

8.2.1 The control of relationship $n > 2p$; $n > 2p + 1$

Exemple 8.1 ***Remark 8.1*** *$p*$ is decremental value of p by corollary 2.3*

From data direct computations exmp 3.5; examp 3.6 ; examp 3.7 we have :

n = 66 , p = 32 ; n = 67, p = 30 ; n = 69, p = 33 ;*

By proposition (8.3) 66 > 64; .

By proposition (8.4) 67 > 60 + 1 ; 69 > 66 + 1 . *Hence propositions (8.3 and 8.4) are correct for n stated above.*

8.3 The relationship between n and p ∀ n

Definition 8.1 *The correspondence p to finite set of 2n it is when for several 2n it takes at the same p at computations by equations ABR2n.*

Proposition 8.5 *For each p correspond to finite set of 2n included between neighboring values of p .*

Proof 8.4 *Let for any $2n_1$ exists $p < 2n_1$ and for $2n_k$ exists $p + 1 < 2n_k$ then p correspond to set of 2n*
$2n_1 ... 2n_k$ This set is restrictedly. Hence For each p correspond to finite set
of 2n included between neighboring values of p. □

8.3.1 The examples of the set of n included between neighboring values of p.

Exemple 8.2 *Let we have the set XUY 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15, U 17,18,19,20,21,22,23,24,25,26,27,28,29,30,31*

n=16 is excluded by rem (2.1). Corollaries (2.1 and 2.2 and 2.3)change following way: $s_e = s_e - 1; s_o* = s_o - 1 : p* = p - 1$*

since in this case is excluded one n.

We can see that :

p = 2 correspond 2n = 4

p = 3 correspond 2n = 6

p = 4 correspond 2n = 8,10

p = 5 correspond 2n = 12

p = 6 correspond 2n = 14,16

p = 7 correspond 2n = 18

p = 8 correspond 2n = 20,22

p = 9 correspond 2n = 24,26,28

p = 10 correspond 2n = 30

We control the following correspondences: p = 4 correspond 2n = 8,10 subsets: XUY 1,2,3U5,6,7 n =4 is excluded by rem.(2.1);
XUY 1,2,3,4U6,7,8,9 n =5 is excluded.
p = 6 correspond 2n = 14,16 subsets:XUY 1,2,3,4,5,6U8,9,10,11,12,13 n =7 is excluded ;
XUY 1,2,3,4,5,6,7U9,10,11,12,13,14,15 n =8 is excluded
p = 8 correspond 2n = 20,22 subsets:XUY 1,2,3,4,5,6,7,8,9U11,12,13,14,15,16,17,18,19 n =10 is excluded ;
XUY 1,2,3,4,5,6,7,9,10,U12,13,14,15,16,17,18,19,20,21 n =11 is excluded
p = 9 correspond 2n = 24,26,28 subsets:XUY 1,2,3,4,5,6,7,8,9,10,11U13,14,15,16,17,18,19,20,2
n =12 is excluded ;
XUY 1,2,3,4,5,6,7,9,10,11,12U14,15,16,17,18,19,20,21,22,23,24,25 n =13 is excluded
XUY 1,2,3,4,5,6,7,9,10,11,12,13U15,16,17,18,19,20,21,22,23,24,25,26,27 n =14 is excluded
By equation (17) we get :
for 2n - 8; n = 4 ; p = 4 .
$s_o = n - p = 4 - 4 = 0$. *By direct computation for* $2n = 8,\ s_o = 0$.
for 2n - 10; n = 5 ; p = 3 (corrolary (2.3) with real changes).*
By equation (18) we get :
$s_o = n-p-1 = 5-3-1 = 1$ *By direct computation for* $2n = 10,\ s_o = 1$.
for 2n - 14; n = 7 ; p = 5 (corrolary (2.3) with real changes) .*
By equation (18) we get :
$s_o = n-p-1 = 7-5-1 = 1$ *By direct computation for* $2n = 14,\ s_o = 1$.
for 2n - 16; n = 8 ; p = 6 .
By equation (17) we get :
$s_o = n - p = 8 - 6 = 2$ *By direct computation for* $2n = 16,\ s_o = 2$.
for 2n - 20; n = 10 ; p = 8 .
By equation (17) we get :
$s_o = n - p = 10 - 8 = 2$ *By direct computation for* $2n = 20,\ s_o = 2$.
for 2n - 22; n = 11; p = 7 (corrolary (2.3) with real changes) .*
By equation (18) we get :
$s_o = n-p-1 = 11-7-1 = 3$ *By direct computation for* $2n = 22,\ s_o = 3$.
for 2n - 24; n = 12 ; p = 9 .
By equation (17) we get :
$s_o = n - p = 12 - 9 = 3$ *By direct computation for* $2n = 24,\ s_o = 3$.
for 2n - 26; n = 13; p = 8 (corrolary (2.3) with real changes) .*
By equation (18) we get :
$s_o = n-p-1 = 13-8-1 = 4$ *By direct computation for* $2n = 26,\ s_o = 4$.
for 2n - 28; n = 14 ; p = 9 .
By equation (17) we get :

$s_o = n - p = 14 - 9 = 5$ *By direct computation for* $2n = 28,\ s_o = 5$.
Thus for several 2n it takes at the same p at computations by equations ABR2n and these computations are correct.
Hence for each p correspond to finite set of 2n included between neighboring values of p

9 The properties of $|Q|_b$

Proposition 9.1 *In the range of* $2 < 2n < 120$ $|Q|_b$ *is negative integer excepting* $2n = 94,\ 96,\ 100,\ 118$.

Proof 9.1 *By proof (4.5)* $|Q|_b$ *is integer for n is even .*
By proof (4.6) $|Q|_b$ *is integer for n is odd or odd prime .*
Then $|Q|_b$ *is integer* $\forall\ n > 1$ *.*
Since by propositions (8.1 and 8.2) $2p > n$ *and* $2p + 1 > n$
then by equation (38) $|Q|_b < 0$ *for n is even* < 60 *.*
And by equation (39) $|Q|_b < 0$ *for n is odd or odd prime* $<$ *60.*
By direct computation with help of numerical solution of $|Q|_b$ *(see subsection 12.1)*
we find 2n for which $|Q|_b = 0$.
Thus In the range of $2 < 2n < 120$ $|Q|_b$ *is negative integer excepting* $2n = 94,\ 96,\ 100,\ 118$. □

Proposition 9.2 $|Q|_b$ *is positive integer* $\forall 2n > 120$

Proof 9.2 *By proof (4.5)* $|Q|_b$ *is integer for n is even .*
By proof (4.6) $|Q|_b$ *is integer for n is odd or odd prime .*
Then $|Q|_b$ *is integer* $\forall\ n > 1$ *.*
Since by propositions (8.3 and 8.4) $2p < n$ *and* $2p + 1 < n$
then by equation (38) $|Q|_b > 0$ *for n is even* > 60 *.*
And by equation (39) $|Q|_b > 0$ *for n is odd or odd prime* $>$ *60.*
Thus $|Q|_b$ *is positive integer* $\forall 2n > 120$ □

Corollary 9.1 *There is no less than* $|Q|_b$ *of representations of the type "Q"* $\forall\ 2n > 120$ *.*

Remark 9.1 *The following proposition explains the cause by which* $|Q| = 0$ *in the range of* $2 < 2n < 120$ *.*

Proposition 9.3 *In the range of* $2 < 2n < 120$ *if fulfilled the condition* $|H| = ||Q|_b|$ *then* $|Q| = 0$ *.*

Proof 9.3 *By equation (42) and proposition (9.1— we have for* $2 < 2n < 120$
$|H| = |Q| + ||Q|_b|$.
Let $|Q| = 0$; *then* $|H| = ||Q|_b|$.
Thus if it is fulfilled the condition $|H| = ||Q|_b|$ *then* $|Q| = 0$
In the range of $2 < 2n < 120$. □

10 The solution of the Goldbach's binary problem

Lemma 10.1 $\forall\ 2 < 2n < 120$ *exists at least one representation of type "H".*

Proof 10.1 *Taking into account equation (42) we get:* $|H| = |Q| - |Q|_b$. *Since in the range of* $2 < 2n < 120$ *by proposition*(9.1) $|Q|_b < 0$ *then* $|H| = |Q| + ||Q|_b|$
Whence $|H| > 0$ *excepting* $2n = 94; 96; 100; 106; 118;$ *in which* $|Q|_b = 0$ *(see subsection 12.1).*
For this $2n$ *the truth of lemma follows from that for* $2n$ *in which* $|Q|_b = 0$ *then* $|Q| > 0$ *in this points since the points of exclusion for* $|Q|$ *2n = 26, 28,32,38 (see subsection 12.2) don't coincidence with points of exclusion* $|Q|_b$ *2n = 94,96, 100,106,118 (see subsection 12.1) .*
Thus $|H| > 0\ \forall\ 2 < 2n < 120$ □

Theorem 10.1 $\forall\ 2n > 2$ *exists at least one representation of even positive integer* $2n$ *in the view of a sum of two odd prime positive integers or "1" and odd prime positive integer.*

Proof 10.2 *Earlier by Lemma we proved that* $|H| > 0\ \forall\ 2 < 2n < 120$.
For the full proof of the theorem we need to prove that
$|H| > 0\ \forall\ 2n > 120$
Let $|H| = 0$ *for some value* $n > 60$ *then by definition (7.2) we get:*

$$\Delta|H| = |H|m \tag{56}$$

Also from definition (7.1) we get:

$$|Q| = |Q|m - \Delta|Q| \tag{57}$$

Taking into account that at $|H| = 0$ *from equation (42) it follows that:*

$$|Q| = |Q|_b \tag{58}$$

we get:

$$|Q|_b = |Q|m - \Delta|Q| \tag{59}$$

Taking into account proposition (7.1) and equation (56) we get:

$$|Q|_b = |Q|m - (|Q|_m - |H|_m - |Q|_b + |H|_m) \tag{60}$$

Whence $|Q|_b = |Q|_b$
Taking into account equation (38) we get identity for n *is even,* $n > 1$ *:*

$$(n - 2p)/2 = (n - 2p)/2 \tag{61}$$

Taking into account equation (39) we get identity for n *is odd or odd prime,* $n > 1$ *:*

$$(n - 2p - 1)/2 = (n - 2p - 1)/2 \tag{62}$$

Thus in the result of assumption that $|H| = 0$ *for some value* $n > 60$
we come to identities: (61 and 62) from them we transite to other identities which are correct too:
$2n(n - 2p) = 2n(n - 2p); 2n^2 - 4pn = 2n^2 - 4pn;$ *whence* $:$ $4pn = 4pn;$ *or* $2np = 2np$.
$2n(n-2p-1) = 2n(n-2p-1); 2n^2-4pn-2n = 2n^2-4pn-2n;$ *whence* $:$ $4pn = 4pn;$ *or* :

$$2np = 2np \tag{63}$$

We fix value of p *and will be substitute values of infinite series 2n to(63) and identity (63) is correct for all values of 2n*
then it is determine following relationship between n *and* p *: each* p *correspond to infinite set of 2n .*
That contradict by proposition (8.5) which assert that each p *correspond to finite set of 2n included between neighboring values of* p*.*
Hence our assumption that $|H| = 0$ *for some value* $n > 60$ *is false and it is true that* $|H| > 0 \ \forall \ 2n > 120$*. Thus we proved that* $|H| > 0 \ \forall \ 2n > 2$ *.*
Hence $\forall \ 2n > 2$ *exists at least one representation of even positive integer 2n in the view of a sum of two odd prime positive integers or "1" and odd prime positive integer.* □

Corollary 10.1

$$|Q| > |Q|_b; \ \forall \ n > 1 \tag{64}$$

Proof 10.3 *From equation (42) we get:*

$$|Q| = |Q|_b + |H|$$

Then for $|H| > 0$ *we get:*
$|Q| \ > \ |Q|_b \ \forall \ n \ > \ 1$. □

Corollary 10.2

$$|L| < p; \ \forall \ n > 1 \tag{65}$$

Proof 10.4 *From equation (2.7) we get:*

$$|L| = p - 2|H|$$

Then for $|H| > 0$ *we get:*
$|L| < p; \forall n > 1.$ □

11 The computation of the real values of $|Q|, |H|$

11.1 The relative accuracy of computation of $|Q|, |H|$

Definition 11.1 *The relative accuracy of computation of* $|Q|$ *as follows below :*

$$\delta_Q = (\Delta|Q|/|Q|_m)100\% \tag{66}$$

Definition 11.2 *The relative accuracy of computation of* $|H|$ *as follows below:*

$$\delta_H = (\Delta|H|/|H|_m)100\% \tag{67}$$

11.1.1 The estimation of δ_Q

Proposition 11.1

$$100(p^2)/(n-p)^2 \ > \ \delta_Q \tag{68}$$

$for \ n \ is \ even \ , \ n \ > \ 2;$

Proof 11.1 *By definition (7.1) we have* $|Q| = |Q|_m - \Delta|Q|$. *By definition. (11.1) we have:*
$\Delta|Q| = (\delta_Q|Q|_m)/100$ *then we get :* $|Q| = |Q|_m - (\delta_Q|Q|_m)/100$.
By corollary (10.9) $|Q|_m - (\delta_Q|Q|_m)/100 > |Q|_b$.
Whence it follows that $100((|Q|_m - |Q|_b)/|Q|_m) > \delta_Q$.
Taking into account equations (46 and 38). Then we get: $100((n-p)^2)/2n - (n-2p)/2)/((n-p)^2)/2n > \delta_Q$.
Hence $100(p^2)/(n-p)^2 \ > \ \delta_Q$ *for n is even ,* $n \ > \ 2$; □

Proposition 11.2

$$100(p^2 + 2p - n + 1)/(n - p - 1)^2 \ > \ \delta_Q \tag{69}$$

for n is odd or oddprime, $n \ > \ 4$

Proof 11.2 *By definition (7.1) we have* $|Q| = |Q|_m - \Delta|Q|$. *By definition. (11.1) we have:*
$\Delta|Q| = (\delta_Q|Q|_m)/100$ *then we get :* $|Q| = |Q|_m - (\delta_Q|Q|_m)/100$.
By corollary (10.9) $|Q|_m - (\delta_Q|Q|_m)/100 > |Q|_b$.
Whence it follows that $100((|Q|_m - |Q|_b)/|Q|_m) > \delta_Q$.
Taking into account equations (47 and 39) then we get:
Then we get: $100((n-p-1)^2)/2n-(n-2p-1)/2)/((n-p-1)^2)/2n > \delta_Q$.
Hence $100(p^2+2p-n+1)/(n-p-1)^2 \ > \ \delta_Q$. *for n is odd or odd prime,* $n \ > 4$. □

11.1.2 The dependence of $\delta_Q(2n)$

Theorem 11.1 *For n is even* $> \ 2$ *If* $n \ \to \ \infty$ *then* $\delta_Q \ \to \ 0$.

Proof 11.3 *We equate* δ_Q *with its estimation by equation(68)*
then for n is even we have:$\delta_Q = 100(p^2)/(n-p)^2$.
We replace p with its first order approximation by equation (19) we get:
$\delta_Q = (100 \cdot 4n^2/ln^2 2n)/(n^2 ln^2 2n - 4n^2 ln 2n + 4n^2) ln^2 2n = 400/ln^2 2n(1 - 4/ln 2n + 4/ln^2 2n)$
Whence follows that if $n \ \to \ \infty$ *then* $\delta_Q \ \to \ 0$.
for n is even, $n \ > \ 2$;

□

Theorem 11.2 *For n is odd or odd*$\prime$ $> \ 4$ *If* $n \ \to \ \infty$ *then* $\delta_Q \ \to \ 0$.

Proof 11.4 *We equate* δ_Q *with its estimation by equation (69)*
then for n is odd or odd prime we have:$\delta_Q = 100(p^2{+}2p{-}n{+}1)/(n{-}p{-}1)^2$.
We replace p with its first order approximation by equation (19) we get:
$\delta_Q = (4n^2{+}4nln2n{-}nln^2 2n{+}ln^2 2n)/(n^2 ln^2 2n{-}4n^2 ln2n{+}4n^2{-}2nln^2 2n{+}4nln2n + ln^2 2n)$ *;*
$\delta_Q = 4n^2 ln^2 2n(1/ln^2 2n{+}1/nln2n{-}1/4n{+}1/4n^2)/4n^2 ln^2 2n(1/4{-}1/ln2n{+}1/ln^2 2n - 1/2n + 1/nln2n + 1/4n^2)$
$(1/ln^2 2n + 1/nln2n - 1/4n + 1/4n^2)/(1/4 - 1/ln2n + 1/ln^2 2n - 1/2n + 1/nln2n + 1/4n^2)$
Whence follows that if $n \to \infty$ *then* $\delta_Q \to 0$.
$for\ n\ is\ odd\ or\ odd\ prime,\ n\ >\ 4$*;*
Thus we proved that if $n\ \to\ \infty$ *then* $\delta_Q\ \to\ 0\ \forall\ n\ >\ 4$

□

11.2 The character of dependence of $|Q|(2n)$

Theorem 11.3 *If* $n \to \infty$ *then* $|Q|\ \to\ |Q|_m$.

Proof 11.5 *By Theorems (11.1 and 11.2)* $\delta_Q \to 0$ *if* $n \to \infty$
then by Defenition 11.1 $\Delta|Q|\ \to 0$ *since* $\delta_Q\ \to 0$.
Whence by Definition 7.1 we have:
If $n \to \infty$*then* $|Q|\ \to\ |Q|_m$. □

11.3 The formulas for computation of the real values of $|Q|, |H|$

$$|Q| = round((n-p)^2)/2n \tag{70}$$

$for\ n\ is\ even,\ n\ >\ 16$

$$|Q| = round((n-p-1)^2)/2n \tag{71}$$

$for\ n\ is\ odd\ or\ odd\ prime,\ n\ >\ 17$
Where: $p = round(2n/ln2n + 2n\ln^2 2n)$. *By (20)*
The computed value of $|Q|$ *it can be used for*
computation of $|H|$ *by equations(30 and 31):*
$|H| = (2|Q| + 2p - n)/2\ for\ n\ is\ even,\ n\ >\ 16$
$|H| = (2|Q| + 2p - n - 1)/2\ for\ n\ isodd\ or\ odd\ prime,\ n\ >\ 17$

12 Appendices

12.1 The numerical solution of $|Q|_b = 0$ *in the range* $2 < 2n < 138$

Remark 12.1 *If* n *is prime then value of* p *is decremented by one .* $p* = p - 1$ *by corollary 2.3 .*

$2n = 4; n = 2; p = 2; |Q|_b = -1$ *by (38).*
$2n = 6; n = 3; p* = 2; |Q|_b = -1$ *by (39).*
$2n = 8; n = 4; p = 4; |Q|_b = -2$ *by (38).*
$2n = 10; n = 5; p* = 3; |Q|_b = -1$ *by (39).*
$2n = 12; n = 6; p = 5; |Q|_b = -2$ *by (38).*
$2n = 14; n = 7; p* = 5; |Q|_b = -2$ *by (39).*
$2n = 16; n = 8; p = 6; |Q|_b = -2$ *by (38).*
$2n = 18; n = 9; p = 7; |Q|_b = -3$ *by (39).*
$2n = 20; n = 10; p = 8; |Q|_b = -3$ *by (38).*
$2n = 22; n = 11; p* = 7; |Q|_b = -2$ *by (39).*
$2n = 24; n = 12; p = 9; |Q|_b = -3$ *by (38).*
$2n = 26; n = 13; p* = 8; |Q|_b = -2$ *by (39).*
$2n = 28; n = 14; p = 9; |Q|_b = -2$ *by (38).*
$2n = 30; n = 15; p = 10|Q|_b = -3$ *by (39).*
$2n = 32; n = 16; p = 11; |Q|_b = -3$ *by (38).*
$2n = 34; n = 17; p* = 10; |Q|_b = -2$ *by (39)*
$2n = 36; n = 18; p = 11; |Q|_b = -2$ *by (38).*
$2n = 38; n = 19; p* = 11; |Q|_b = -2$ *by (39).*
$2n = 40; n = 20; p = 12; |Q|_b = -2$ *by (38).*
$2n = 42; n = 21; p = 13; |Q|_b = -3$ *by (39).*
$2n = 44; n = 22; p = 14; |Q|_b = -3$ *by (38).*
$2n = 46; n = 23; p* = 13; |Q|_b = -2$ *by (39).*
$2n = 48; n = 24; p = 15; |Q|_b = -3$ *by (38).*
$2n = 50; n = 25; p = 15; |Q|_b = -3$ *by (39).*
$2n = 52; n = 26; p = 15; |Q|_b = -2$ *by (38)*
. $2n = 54; n = 27; p = 16; |Q|_b = -3$ *by (39).*
$2n = 56; n = 28; p = 16; |Q|_b = -2$ *by (38).*
$2n = 58; n = 29; p* = 15; |Q|_b = -1$ *by (39).*
$2n = 60; n = 30; p = 17; |Q|_b = -2$ *by (38).*
$2n = 62; n = 31; p* = 17; |Q|_b = -2$ *by (39).*
$2n = 64; n = 32; p = 18; |Q|_b = -2$ *by (38).*
$2n = 66; n = 33; p = 18; |Q|_b = -2$ *by (39).*
$2n = 68; n = 34; p = 19; |Q|_b = -2$ *by (38).*

$2n = 70; n = 35; p = 19; |Q|_b = -2$ *by (39).*
$2n = 72; n = 36; p = 20; |Q|_b = -2$ *by (38).*
$2n = 74; n = 37; p* = 20; |Q|_b = -2$ *by (39).*
$2n = 76; n = 38; p = 21; |Q|_b = -2$ *by (38).*
$2n = 78; n = 39; p = 21; |Q|_b = -2$ *by (39).*
$2n = 80; n = 40; p = 22; |Q|_b = -2$ *by (38).*
$2n = 82; n = 41; p* = 21; |Q|_b = -1$ *by (39).*
$2n = 84; n = 42; p = 23; |Q|_b = -2$ *by (38).*
$2n = 86; n = 43; p* = 22; |Q|_b = -1$ *by (39).*
$2n = 88; n = 44; p = 23; |Q|_b = -1$ *by (38).*
$2n = 90; n = 45; p = 24; |Q|_b = -2$ *by (39).*
$2n = 92; n = 46; p = 24; |Q|_b = -1$ *by (38).*
$2n = 94; n = 47; p* = 23; |Q|_b = 0$ *by (39).*
$2n = 96; n = 48; p = 24; |Q|_b = 0$ *by (38).*
$2n = 98; n = 49; p = 25; |Q|_b = -1$ *by (39).*
$2n = 100; n = 50; p = 25; |Q|_b = 0$ *by (38).*
$2n = 102; n = 51; p = 26; |Q|_b = -1$ *by (39).*
$2n = 104; n = 52; p = 27; |Q|_b = -1$ *by (38).*
$2n = 106; n = 53; p* = 26; |Q|_b = 0$ *by (39).*
$2n = 108; n = 54; p = 28; |Q|_b = -1$ *by (38).*
$2n = 110; n = 55; p = 29; |Q|_b = -2$ *by (39).*
$2n = 112; n = 56; p = 29; |Q|_b = -1$ *by (38).*
$2n = 114; n = 57; p = 30; |Q|_b = -2$ *by (39).*
$2n = 116; n = 58; p = 30; |Q|_b = -1$ *by (38).*
$2n = 118; n = 59; p = 29; |Q|_b = 0$ *by (39).*
$2n = 120; n = 60; p = 30; |Q|_b = 0$ *by (38).*
$2n = 122; n = 61; p = 29; |Q|_b = 1$ *by (39).*
$2n = 124; n = 62; p = 30; |Q|_b = 1$ *by (38).*
$2n = 126; n = 63; p = 30; |Q|_b = 1$ *by (39).*
$2n = 128; n = 64; p = 31; |Q|_b = 1$ *by (38).*
$2n = 130; n = 65; p = 31; |Q|_b = 1$ *by (39).*
$2n = 132; n = 66; p = 32; |Q|_b = 1$ *by (38).*
$2n = 134; n = 67; p = 31; |Q|_b = 2$ *by (39).*
$2n = 136; n = 68; p = 32; |Q|_b = 2$ *by (38).*
$2n = 138; n = 69; p = 33; |Q|_b = 1$ *by (39).*

12.2 The numerical solution of $|Q| = 0$ in the range $8 < 2n < 134$

$2n = 10; |Q| = 0; (10 - 9 = 1)$.
$2n = 12; |Q| = 0; (12 - 9 = 3)$.
$2n = 14; |Q| = 0; (14 - 9 = 5)$.
$2n = 16; |Q| = 0; (16 - 9 = 7)$.
$2n = 18; |Q| = 0; (18 - 9 = 9)$.
$2n = 20; |Q| = 0; (20 - 9 = 11)$.
$2n = 22; |Q| = 0; (22 - 9 = 13)$.
$2n = 24; |Q| > 0; (24 - 9 = 15)$.
$2n = 26; |Q| = 0; (26 - 9 = 17)$.
$2n = 28; |Q| = 0; (28 - 9 = 19)$.
$2n = 30; |Q| > 0; (30 - 9 = 21)$.
$2n = 32; |Q| = 0; (32 - 9 = 23)$.
$2n = 34; |Q| > 0; (34 - 9 = 25)$.
$2n = 36; |Q| > 0; (30 - 9 = 21)$.
$2n = 38; |Q| = 0; (38 - 9 = 29)$.
$2n = 40; |Q| > 0; (40 - 15 = 25)$.
$2n = 42; |Q| > 0; (42 - 9 = 33)$.
$2n = 44; |Q| > 0; (44 - 9 = 35)$.
$2n = 46; |Q| > 0; (46 - 21 = 25)$.
$2n = 48; |Q| > 0; (48 - 9 = 39)$.
$2n = 50; |Q| > 0; (50 - 15 = 35)$.
$2n = 52; |Q| > 0; (52 - 25 = 27)$.
$2n = 54; |Q| > 0; (54 - 9 = 45)$.
$2n = 56; |Q| > 0; (56 - 21 = 35)$.
$2n = 58; |Q| > 0; (58 - 9 = 49)$.
$2n = 60; |Q| > 0; (60 - 9 = 51)$.
$2n = 62; |Q| > 0; (62 - 9 = 21)$.
$2n = 64; |Q| > 0; (64 - 9 = 55)$.
$2n = 66; |Q| > 0; (66 - 9 = 57)$.
$2n = 68; |Q| > 0; (68 - 33 = 35)$.
$2n = 70; |Q| > 0; (70 - 15 = 55)$.
$2n = 72; |Q| > 0; (72 - 9 = 63)$.
$2n = 74; |Q| > 0; (74 - 9 = 21)$.
$2n = 76; |Q| > 0; (76 - 21 = 55)$.
$2n = 78; |Q| > 0; (78 - 9 = 69)$.
$2n = 80; |Q| > 0; (80 - 15 = 65)$.
$2n = 82; |Q| > 0; (82 - 25 = 57)$.
$2n = 84; |Q| > 0; (84 - 9 = 75)$.

$2n = 86; |Q| > 0; (86 - 9 = 77)$.
$2n = 88; |Q| > 0; (88 - 25 = 63)$.
$2n = 90; |Q| > 0; (90 - 9 = 81)$.
$2n = 92; |Q| > 0; (92 - 15 = 77)$.
$2n = 94; |Q| > 0; (94 - 9 = 85)$.
$2n = 96; |Q| > 0; (96 - 9 = 87)$.
$2n = 98; |Q| > 0; (98 - 21 = 77)$.
$2n = 100; |Q| > 0; (100 - 15 = 85)$.
$2n = 102; |Q| > 0; (102 - 9 = 93)$.
$2n = 104; |Q| > 0; (104 - 9 = 95)$.
$2n = 106; |Q| > 0; (106 - 15 = 91)$.
$2n = 108; |Q| > 0; (108 - 9 = 99)$.
$2n = 110; |Q| > 0; (110 - 15 = 95)$.
$2n = 112; |Q| > 0; (112 - 21 = 91)$.
$2n = 114; |Q| > 0; (114 - 9 = 105)$.
$2n = 116; |Q| > 0; (116 - 21 = 95)$.
$2n = 118; |Q| > 0; (118 - 25 = 93)$.
$2n = 120; |Q| > 0; (120 - 9 = 111)$.
$2n = 122; |Q| > 0; (122 - 35 = 87)$.
$2n = 124; |Q| > 0; (124 - 9 = 115)$.
$2n = 126; |Q| > 0; (126 - 9 = 117)$.
$2n = 128; |Q| > 0; (128 - 9 = 119)$.
$2n = 130; |Q| > 0; (130 - 9 = 121)$.
$2n = 132; |Q| > 0; (132 - 9 = 123)$.

13 RESUME

With help of the "Arithmetic of binary representations of even integer 2n"(ABR2n) it is got one of possible solutions of the Goldbach's binary problem.
With help of the ABR2n it can also be solved other arithmetical problems. In ABR2n are given formulas for computation of the number of binary representations even integer 2n for basic types of BR2n. Particularly for values inaccessible for computer programs.

14 References

References

[1] *J.B.Zeldovich , A.D.Myshkis:* The elements of applied mathematics, *pgs: 562-567, publishers "Nauka",Moscow (1965)*