Theorem on the distribution of prime pairs

\[ A_n = a_1 n + a_2 \]
\[ B_n = b_1 n + b_2 \]

\((A_n, B_n)\) are not obviously composite,
\(a_1, a_2, b_1, b_2\) are integer, except like \(A_n = n, B_n = n + 1\) that one of it is even)

At most 2 \(A_n B_n\) of 3 divided by 3.
for example
\[ A_n = n + 2 \]
\[ B_n = n \]

\[ A_1 B_1 = 3 \cdot 1 = 3(30) \]
\[ A_2 B_2 = 4 \cdot 2 = 8(3\times) \]
\[ A_3 B_3 = 5 \cdot 3 = 15(30) \]
\[ A_4 B_4 = 6 \cdot 4 = 24(30) \]
\[ A_5 B_5 = 7 \cdot 5 = 35(3\times) \]

\(n = 3, 4, 2A_n B_n\) divided by.

2 of \(p - A_n B_n\) divided by \(p\).

\(<\text{Theorem1}>\)

one of \(3^4 \ln^4 3 - A_n B_n\) doesn't divided by \(P\) or less
prime. and when every $A_n B_n < P^2$, they are prime at once.

<proof of Theorem 1>
1 of $2 - A_n B_n$ divided by 2.
2 of $3 - A_n B_n$ divided by 3.

and let's see how long $A_n B_n$ must contains doesn't divided by $P$ or less prime.

in other word, when we overlap
$2 \triangle 2 \triangle 2 \triangle 2 \triangle 2 \triangle 2 \triangle 2 \triangle$
$33 \triangle 33 \triangle 33 \triangle 33 \triangle 33 \triangle 33 \triangle 33 \triangle$
$55 \triangle \triangle 55 \triangle \triangle 55 \triangle \triangle \triangle$
\vdots
$PP \triangle \triangle \triangle \triangle \triangle \triangle \triangle \triangle \triangle \triangle \triangle$

How long $P$ or less primes are consecutive.
For example, overlap
$2 \triangle 2 \triangle 2 \triangle 2 \triangle 2 \triangle 2 \triangle 2 \triangle$
$33 \triangle 33 \triangle 33 \triangle 33 \triangle 33 \triangle 33 \triangle 33 \triangle$ makes
$23232 \triangle 23232 \triangle 23232 \triangle$
$3 \quad 3 \quad 3 \quad 3 \quad 3 \quad 3 \quad 3$

means 6-consecutive $A_n B_n$ contains doesn't divided by 3 or less prime.
when overlap

\[ 2 \bigtriangleup 2 \bigtriangleup 2 \bigtriangleup 2 \bigtriangleup 2 \bigtriangleup 2 \bigtriangleup 2 \bigtriangleup \]
\[ 3 \bigtriangleup 3 \bigtriangleup 3 \bigtriangleup 3 \bigtriangleup 3 \bigtriangleup 3 \bigtriangleup 3 \bigtriangleup \]
\[ 5 \bigtriangleup \bigtriangleup 5 \bigtriangleup \bigtriangleup 5 \bigtriangleup \bigtriangleup 5 \bigtriangleup \bigtriangleup \bigtriangleup \]

\[ \vdots \]
\[ PP \bigtriangleup \bigtriangleup \bigtriangleup \bigtriangleup \bigtriangleup \bigtriangleup \bigtriangleup \bigtriangleup \bigtriangleup \bigtriangleup \bigtriangleup \bigtriangleup \bigtriangleup \bigtriangleup \]

if vacant

\[ \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \]

7 circles on

\[ \bigtriangledown \bigtriangledown \cdots \bigtriangledown \bigtriangledown \cdots \bigtriangledown \bigtriangledown \cdots \bigtriangledown \bigtriangledown \cdots \]

makes

\[ \bigtriangledown \bigtriangledown \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigtriangledown \bigcirc \cdots \bigtriangledown \bigtriangledown \cdots \bigtriangledown \bigtriangledown \cdots \]

not longer than \( 7 \cdot \frac{5+2}{5-2} \)

it means consecutive \( 7 \cdot \frac{5+2}{5-2} \) contains 7 vacant circle.

it means

\[ \bigtriangledown \bigtriangledown \bigcirc \bigcirc \bigcirc \bigcirc \bigtriangledown \bigtriangledown \bigtriangledown \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigtriangledown \bigcirc \bigtriangledown \bigtriangledown \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigtriangledown \bigcirc \]

when

\[ \bigtriangledown \bigtriangledown \bigcirc \bigcirc \bigcirc \bigcirc \bigtriangledown \bigtriangledown \text{ overlap with } \]
\[ \bigtriangleup \bigtriangleup \cdots \bigtriangleup \bigtriangleup \cdots \bigtriangleup \bigtriangleup \cdots \bigtriangleup \bigtriangleup \cdots \bigtriangleup \bigtriangleup \cdots \]
\[ \Delta \Delta \nabla \nabla \Delta \Delta \nabla \nabla \circ \Delta \Delta \circ \circ \Delta \Delta \cdots \Delta \Delta \cdots \Delta \Delta \cdots \]

it’s not longer than
\[ \nabla \nabla \circ \circ \circ \circ \nabla \nabla \text{ fills} \]
\[ \Delta \Delta \cdots \Delta \Delta \cdots \Delta \Delta \cdots \Delta \Delta \cdots \Delta \Delta \cdots \Delta \Delta \cdots \]

that makes \[ \frac{4+2}{4-2} \text{-times - case of overlap } \Delta, \nabla. \]

\[ 7 \cdot \frac{5+2}{5-2} \cdot \frac{4+2}{4-2} \text{-consecutive } A_nB_n \text{ contains } 7 \text{-not divided by 4 or 5.} \]

overlapping
\[ \circ \circ \circ \circ \cdots \circ \circ \circ \bigcirc \text{(P circles)} \]
\[ 2 \Delta 2 \Delta 2 \Delta 2 \Delta 2 \Delta 2 \Delta 2 \Delta \]
\[ 33 \Delta 33 \Delta 33 \Delta 33 \Delta 33 \Delta 33 \Delta 33 \Delta \]
\[ 55 \Delta \Delta 55 \Delta \Delta 55 \Delta \Delta 55 \Delta \Delta \]
\[ \vdots \]
\[ PP \Delta \Delta \Delta \Delta \Delta \cdots \Delta \Delta \Delta PP \]

\[ P \cdot \left( \frac{2+1}{2-1} \right) \cdot \left( \frac{3+2}{3-2} \right) \cdot \left( \frac{5+2}{5-2} \right) \cdot \cdots \cdot \left( \frac{P+2}{P-2} \right) \text{-consecutive} \]
\[ A_nB_n \text{ contains } P \text{-unit - not divided by } P \text{ or less prime.} \]
\[ P \cdot \left( \frac{2+1}{2-1} \right) \cdot \left( \frac{3+2}{3-2} \right) \cdot \left( \frac{5+2}{5-2} \right) \cdots \cdot \left( \frac{P+2}{P-2} \right) < P \cdot \left( \frac{2}{2-1} \right)^4 \cdot \left( \frac{3}{3-1} \right)^4 \cdot \left( \frac{5}{5-1} \right)^4 \cdots \cdot \left( \frac{P}{P-1} \right)^4 \]

from that
\[
\left( \frac{2}{2-1} \right) \cdot \left( \frac{3}{3-1} \right) \cdot \left( \frac{5}{5-1} \right) \cdots \cdot \left( \frac{P}{P-1} \right) < 3 \ln P
\]

\[ P \cdot \left( \frac{2}{2-1} \right)^4 \cdot \left( \frac{3}{3-1} \right)^4 \cdot \left( \frac{5}{5-1} \right)^4 \cdots \cdot \left( \frac{P}{P-1} \right)^4 < 3^4 P \ln^4 P \]

Hence

\[ 3^4 P \ln^4 P \text{-consecutive } A_n, B_n \text{ contains both are not divided by } P \text{ or less prime, when } A_n, B_n < P^2, \text{ both are prime.} \]

\[ \langle \text{Theorem2} \rangle \]

\[ A_n = a_1 n + a_2 \]

\[ B_n = b_1 n + b_2 \]

\[ C_n = c_1 n + c_2 \]

\[ \vdots \text{ (kth)} \]

for \( A_n B_n C_n \cdots < P^2 \)

\[ 3^{2k} P \ln^{2k} P \text{-consecutive } A_n B_n C_n \cdots \text{contains every } A_n, B_n, C_n, \cdots \text{are prime at once.} \]

And we know
1. Goldbach’s conjecture
   \[ A_n = n \]
   \[ B_n = -n + 2N \]
   \[ 3^4 \sqrt{2N \ln^4 \sqrt{2N}} \text{-consecutive } (A_n, B_n) \text{ contains } A_n, B_n \text{ both are prime at once.} \]

2. Twin prime conjecture
   \[ A_n = n \]
   \[ B_n = n - 2 \]
   between \( N \text{th} \) and \( N - 3^4 \sqrt{N \ln^4 \sqrt{N}} \text{th}(A_n, B_n) \)
   there is \( A_n, B_n \text{ both are prime at once,} \)

3. \( k = 1 \)

   both \( N \) and \( N + 3^4 \sqrt{N \ln^4 \sqrt{N}} \) always exist prime.

4. and

   Polignac’s conjecture, green-tao theorem, so on.

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