

## An interesting pattern of primes

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If you observe below there is a correlation between  $x$  and  $y$ .  $x$  will always be a positive even number and  $y$  will always be a positive odd number and its subtraction will give 7 until a certain prime number and there after it will be a different correlation where the result is 8 and after a while it will be 9 and so on. Later i will repost its new correlation, for now it is enough to see that this pattern holds until the 1062 nd prime.

mathematica

( Defining the ordered pairs )

```
pairs = {{8, 1}, {10, 3}, {12, 5}, {14, 7}, {16, 9}, {18, 11}, {20, 13}, {22, 15}, {24, 17}, {26, 19}, {28, 21}, {30, 23}};
```

( Function to verify if a is prime )

```
isPrimeZ[x_, y_] := Module[{z},  
  z = 7000 + 914 + y;  
  z == 7907 + x && PrimeQ[z]  
];
```

( Filttering the pairs that satisfy the condition )

```
results = Select[pairs, isPrimeZ[#[[1]], #[[2]]] &];
```

( Exhibiting the results )

```
results
```

```
{{12,5}, {20,13}, {26,19}, {30,23}}
```

mathematica

( Defining the ordered pairs )

```
pairs =  
{{10,2},{12,4},{14,6},{16,8},{18,10},{20,12},{22,14},{24,16},{26,18},{28,20},{30,22},  
{32,24},{34,26},{36,28},{38,30},{40,32},{42,34},{44,36},{46,38},{48,40},{50,42},{  
52,44},{54,46},{56,48},{58,50},{60,52},{62,54},{64,56},{66,58},{68,60},{70,62},{72,64},  
{74,66},{76,68},{78,70},{80,72},{82,74},{84,76},{86,78},{88,80},{90,82}};
```

( Function to verify if a is prime )

```
isPrimeZ[x_, y_] := Module[{z},  
  z = 16000 + 1395 + y;  
  z == 17387 + x && PrimeQ[z]  
];
```

( Filttering the pairs that satisfy the condition )

```
results = Select[pairs, isPrimeZ[#[[1]], #[[2]]] &];
```

( Exhibiting the results)  
Results

### RULE 1

$\{\{14,6\},\{30,22\},\{32,24\},\{44,36\},\{56,48\},\{62,54\},\{80,72\},\{84,76\},\{90,82\}\}$

mathematica

```
AS=Cases[Tuples[Range[190],2],{p_,i_}/;EvenQ@p && OddQ@i && p-i==7]
```

( Defining the ordered pairs )

```
pairs = AS;
```

( Function to verify if a is prime )

```
isPrimeZ[x_, y_] := Module[{z},
```

```
z = 7000 + 914 + y;
```

```
z == 7907 + x && PrimeQ[z]
```

```
];
```

( Filtering the pairs that satisfy the condition )

```
results = Select[pairs, isPrimeZ#[[1]], #[[2]] &];
```

( Exhibiting the results )

results

```
po = results[[All, 1]]
```

```
Differences[%]
```

```
pp=results[[All, 2]]
```

```
pc=pairs[[All,1]]
```

```
ListLinePlot[results]
```

```
a=ListLinePlot[po,PlotStyle->Red]
```

```
b=ListLinePlot[pp,PlotStyle->Green]
```

```
d=ListLinePlot[pc,PlotStyle->Blue]
```

```
c=Show[a,b,d]
```

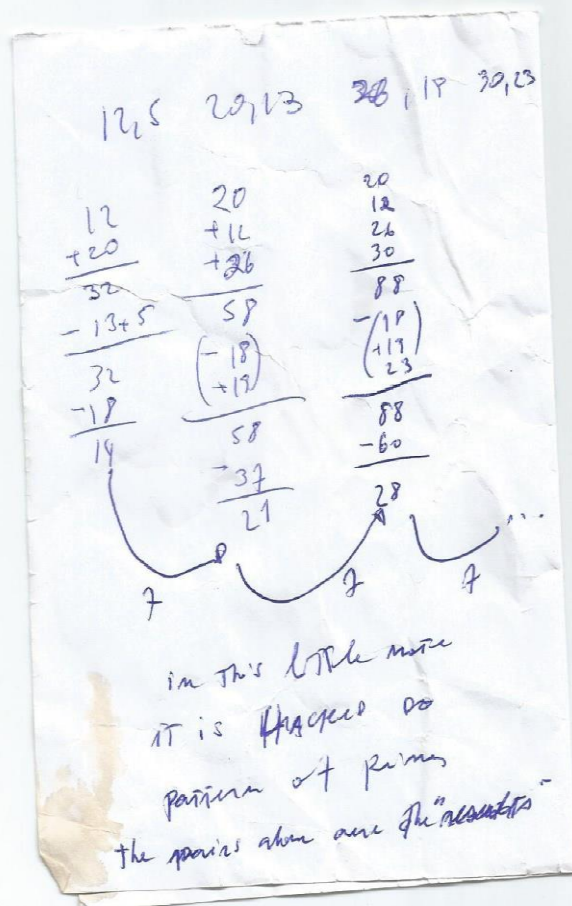
$\{\{12,5\},\{20,13\},\{26,19\},\{30,23\},\{42,35\},\{44,37\},\{56,49\},\{86,79\},\{102,95\},\{104,97\},$   
 $\{110,103\},\{132,125\},\{146,139\},\{152,145\},\{162,155\},\{174,167\},\{180,173\},\{182,175\},\{186,179\}\}$

$\{12,20,26,30,42,44,56,86,102,104,110,132,146,152,162,174,180,182,186\}$   
 $\{8,6,4,12,2,12,30,16,2,6,22,14,6,10,12,6,2,4\}$  THE DISTANCE BETWEEN  
EVERY ORDERED PAIR THAT GIVES A PRIME GIVES BY SUM THE NEXT  
ODD NUMBER IN THE PAIRS  
 $\{5,13,19,23,35,37,49,79,95,97,103,125,139,145,155,167,173,175,179\}$

$8+5=13$  ,  $13+6=19$ ,  $19+4=23$ ,  $23+12=35$  AND SO ON

AND FINALLY WRITTEN IN PORTUGUESE AND FOR THE SAKE OF  
IDENTITY THE CONJECTURE THAT SEEMS TO HOLD TRUE :

$\{\{12,5\},\{20,13\},\{26,19\},\{30,23\},\{42,35\},\{44,37\},\{56,49\},\{86,79\},\{102,95\},\{104,97\},$   
 $\{110,103\},\{132,125\},\{146,139\},\{152,145\},\{162,155\},\{174,167\},\{180,173\},\{182,17$   
 $5\},\{186,179\}\}$  a Soma consecutiva dos pares dos pares ordenados menos a  
soma consecutiva dos impares progressivamente dá múltiplos consecutivos de  
7....



pairs={12,5},{20,13},{26,19},{30,23},{42,35},{44,37},{56,49},{86,79},{102,95},{104,97},{110,103},  
 {132,125},{146,139},{152,145},{162,155},{174,167},{180,173},{182,175},{186,179},{194,187},{

```
204,197},{210,203},{216,209},{240,233},{254,247},{260,253},{264,257},{272,265},{284,277},{30
2,295},{312,305},{314,307},{324,317},{326,319},{330,323},{336,329},{356,349},{362,355},{366,
359},{380,373},{384,377},{386,379},{390,383},{404,397},{410,403},{422,415},{446,439},{456,44
9},{462,455},{470,463},{480,473},{482,475}}
```

```
list = pairs[[All, 1]]
```

```
list2=pairs[[All,2]]
```

```
list3=Drop[list2,2]
```

```
pairs = Table[{list[[i]], list[[i + 2]]}, {i, 1, Length[list] - 2}];
```

```
sums = Map[Total, pairs];
```

```
sums
```

```
division=sums/2
```

```
list3-division
```

```
PrimeQ[list2]
```

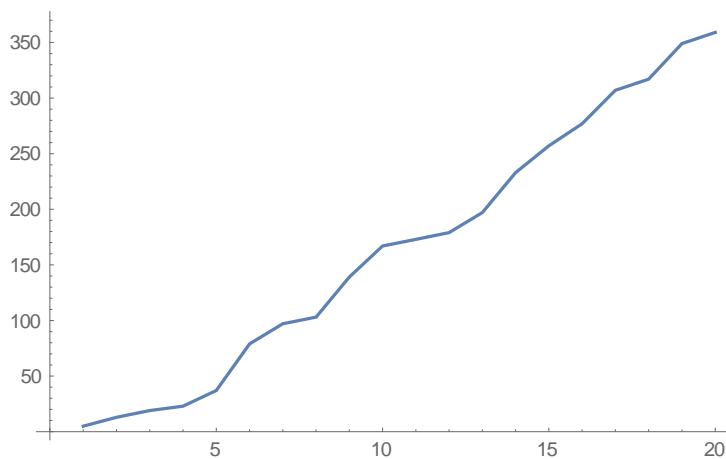
```
a=Select[list2,PrimeQ,(20)]
```

```
ListLinePlot[a]
```

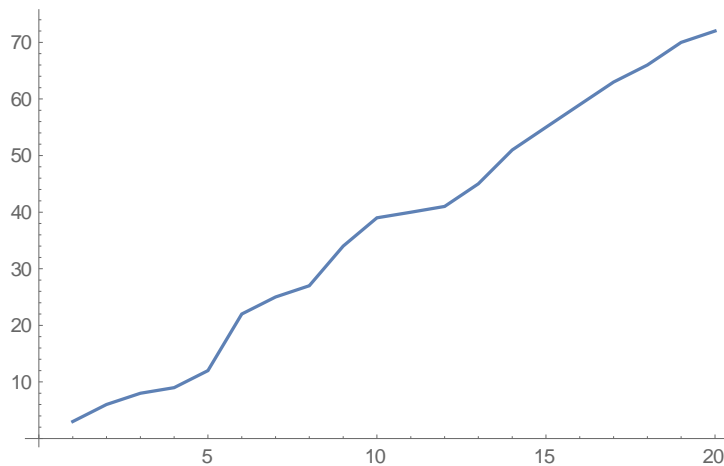
```
PrimePi[a]
```

```
ListLinePlot[%]
```

```
{5,13,19,23,37,79,97,103,139,167,173,179,197,233,257,277,307,317,349,359}
```



```
{3,6,8,9,12,22,25,27,34,39,40,41,45,51,55,59,63,66,70,72}
```



```
pairs={{12,5},{20,13},{26,19},{30,23},{42,35},{44,37},{56,49},{86,79},{102,95},{104,97},{110,103},
{132,125},{146,139},{152,145},{162,155},{174,167},{180,173},{182,175},{186,179},{194,187},{
204,197},{210,203},{216,209},{240,233},{254,247},{260,253},{264,257},{272,265},{284,277},{30
2,295},{312,305},{314,307},{324,317},{326,319},{330,323},{336,329},{356,349},{362,355},{366,
359},{380,373},{384,377},{386,379},{390,383},{404,397},{410,403},{422,415},{446,439},{456,44
9},{462,455},{470,463},{480,473},{482,475},{512,505},{516,509},{522,515},{524,517},{536,529},
{540,533},{554,547},{560,553},{594,587}}
```

```
list = pairs[[All, 1]]
```

```
list2=pairs[[All,2]]
```

```
list3=Drop[list2,2]
```

```
pairs = Table[{list[[i]], list[[i + 2]]}, {i, 1, Length[list] - 2}];
```

```
sums = Map[Total, pairs];
```

```
sums
```

```
division=sums/2
```

```
list3-division
```

```
PrimeQ[list2]
```

```
a=Select[list2,PrimeQ,(60)]
```

```
ListLinePlot[a] 1)
```

```
PrimePi[a]
```

```
ListLinePlot[%] 2)
```

```
series =
```

```
{3,6,8,9,12,22,25,27,34,39,40,41,45,51,55,59,63,66,70,72,74,75,76,78,85,87,90,97,101,107}
```

```
pairs = Table[series[[i]] + series[[Length[series] - i + 1]], {i, 1, Floor[Length[series]/2]]
```

```
ListLinePlot[pairs]
```

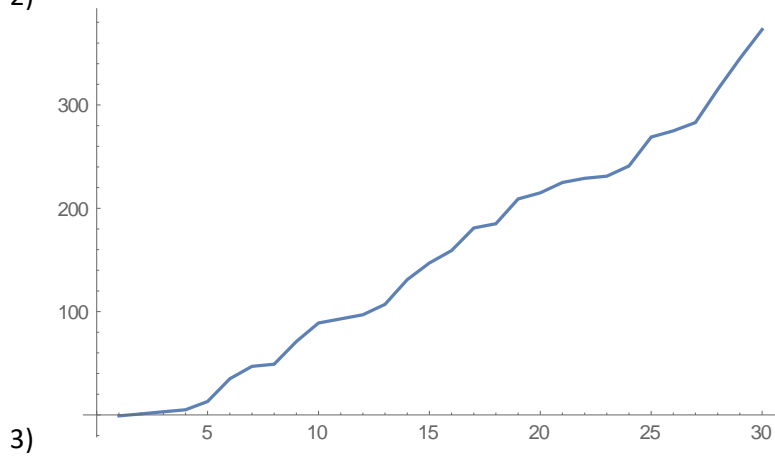
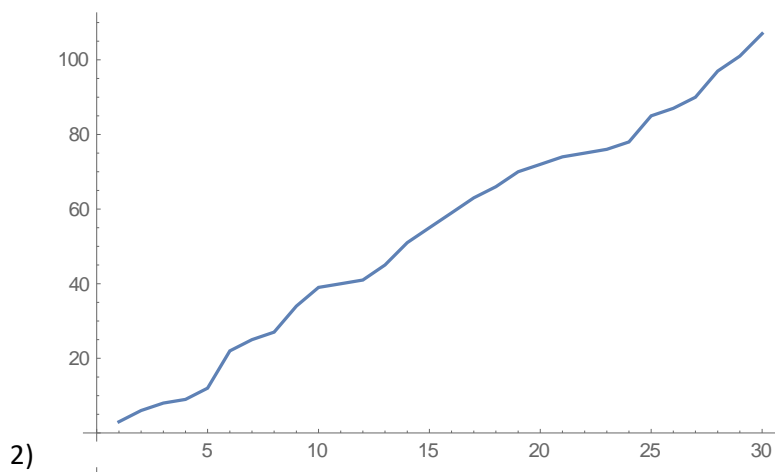
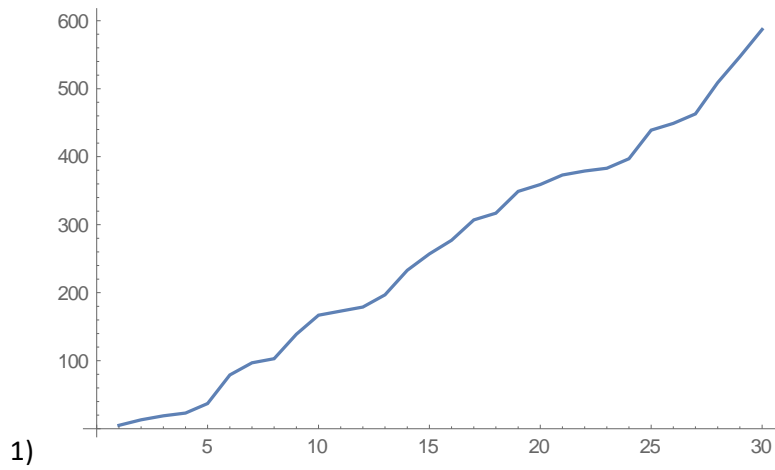
```
po = Table[pairs[[i]] + pairs[[Length[pairs] - i + 1]], {i, 1, Floor[Length[pairs]/2]]
```

```
ListLinePlot[pairs]
```

```
de=a-(series*2)
```

```
PrimeQ[de]
```

```
ListLinePlot[de] 3)
```



The following program algorithm checks if there is other forms of pairs that satisfy a certain pattern: Please use a translator to convert the texts in to english as it was originally formulated in portuguese.

```
(* Definindo os pares ordenados *)
```

```
pairs = {{12, 5}, {20, 13}, {26, 19}, {30, 23}, {42, 35}, {44, 37}, {56, 49}, {86, 79}, {102, 95}, {104, 97}};
```

```
(* Função para verificar a propriedade *)verificarPropriedade[pairs_List] := Module[{n, i, par1, impar1, par2, impar2, soma1, soma2, resultado}, n = Length[pairs];
```

```
resultado = True; For[i = 1, i <= Floor[n/2], i++, par1 = pairs[[i, 1]]; impar1 = pairs[[i, 2]]; par2 = pairs[[n - i + 1, 1]];
```

```
impar2 = pairs[[n - i + 1, 2]];
```

```
soma1 = par1 + impar2;
```

```
soma2 = impar1 + par2;
```

```
If[soma1 != soma2, resultado = False; Break[ ]; ]; resultado]
```

```
(* Verificando a propriedade *)verificarPropriedade[pairs]
```

```
True
```

## PROGRAM 2

```
pairs = {{12, 5}, {20, 13}, {26, 19}, {30, 23}, {42, 35}, {44, 37}, {56, 49}, {86, 79}, {102, 95}, {104, 97}};
```

```
(* Função para verificar a propriedade *)verificarPropriedade[pairs_List] := Module[{n, i, par1, impar1, par2, impar2, soma1, soma2, resultado}, n = Length[pairs];
```

```
resultado = True;
```

```
For[i = 1, i <= Floor[n/2], i++, par1 = pairs[[i, 1]]; impar1 = pairs[[i, 2]]; par2 = pairs[[n - i + 1, 1]];
```

```
impar2 = pairs[[n - i + 1, 2]];
```

```
soma1 = par1 + impar2;
```

```
soma2 = impar1 + par2;
```

```
If[soma1 != soma2, resultado = False; Break[ ]; ]; resultado]
```

```
(* Verificando a propriedade *)verificarPropriedade[pairs]
```



```
(* Modificando os pares para garantir somas únicas *)modificarPares[pairs_List] := Module[{n,
i, novoPar}, n = Length[pairs]; Table[ novoPar = {pairs[[i, 1]], pairs[[i, 2]]};
While[MemberQ[Table[pairs[[j, 1]] + pairs[[n - j + 1, 2]], {j, 1, Floor[n/2]}], novoPar[[1]] +
novoPar[[2]]], novoPar = {novoPar[[1]] + 2, novoPar[[2]] + 2}; ]; novoPar, {i, 1, n} ]]
```

```
(* Modificando os pares *)paresModificados = modificarPares[pairs];
```

```
(* Verificando a propriedade nos pares modificados *)
```

```
verificarPropriedade(paresModificados)
```

```
(* Exibindo os pares modificados *)paresModificados
```

```
True
```

```
{{12 verificarPropriedade,5 verificarPropriedade},{20 verificarPropriedade,13
verificarPropriedade},{26 verificarPropriedade,19 verificarPropriedade},{30
verificarPropriedade,23 verificarPropriedade},{42 verificarPropriedade,35
verificarPropriedade},{44 verificarPropriedade,37 verificarPropriedade},{60
verificarPropriedade,53 verificarPropriedade},{86 verificarPropriedade,79
verificarPropriedade},{102 verificarPropriedade,95 verificarPropriedade},{104
verificarPropriedade,97 verificarPropriedade}}

{{12,5},{20,13},{26,19},{30,23},{42,35},{44,37},{60,53},{86,79},{102,95},{104,97}}
```

```
nn = Range[1, 10000000];n = Select[nn, PrimeQ, {1000}];
```

```
k = (n^2) - 1 + n + (2 - 4 n);d = n^4 - 1 + n^2;c = n^3 + 2;e = Mod[c, 3];
```

```
f = Mod[d, 3];
```

```
g = Mod[k, 3];
```

```
h = Mod[c, 7];
```

```
i = Mod[d, 7];
```

```
j = Mod[k, 7];
```

```
l = Mod[c, 4];
```

```
m = Mod[d, 4];
```

```
o = Mod[k, 4];
```

```
r = Mod[c, 5];
```

```
s = Mod[d, 5];
```

```
t = Mod[k, 5];
```

```
QQ = Transpose[{e, f, g, h, i, j, l, m, o, r, s, t}];
```

```
validNumbers = Select[Range[7963, 8050], Module[{n2 = #, k1, d1, c1, e1, f1, g1, h1, i1, j1, l1,
m1, o1, r1, s1, t1, pp1}, k1 = (n2^2) - 1 + n2 + (2 - 4 n2);
```

```
d1 = n2^4 - 1 + n2^2;
```

```

c1 = n2^3 + 2;
e1 = Mod[c1, 3];
f1 = Mod[d1, 3];
g1 = Mod[k1, 3];
h1 = Mod[c1, 7];
i1 = Mod[d1, 7];
j1 = Mod[k1, 7];
l1 = Mod[c1, 4];
m1 = Mod[d1, 4];
o1 = Mod[k1, 4];
r1 = Mod[c1, 5];
s1 = Mod[d1, 5];
t1 = Mod[k1, 5];
pp1 = {e1, f1, g1, h1, i1, j1, l1, m1, o1, r1, s1, t1};
MemberQ[QQ, pp1] ] &];
validNumbers

```

```

oddNumbers = Select[validNumbers, OddQ];
validNumbers = Select[oddNumbers, Mod[2^#, #] == 2 &];

```

```

validNumbers

```

```

{7963,7967,7969,7979,7981,7982,7983,7985,7987,7991,7993,7997,7999,8003,8009,8011,801
7,8021,8023,8027,8033,8039,8041,8047}
{7963,7993,8009,8011,8017,8039}

```

```

nn = Range[1, 10000000];ng=Select[nn,OddQ,(5000)];n = Select[ng, CompositeQ, (1000)];
k = (n^2) - 1 + n + (2 - 4 n);d = n^4 - 1 + n^2;c = n^3 + 2;e = Mod[c, 3];
f = Mod[d, 3];
g = Mod[k, 3];

```

```

h = Mod[c, 7];
i = Mod[d, 7];
j = Mod[k, 7];
l = Mod[c, 4];
m = Mod[d, 4];
o = Mod[k, 4];
r = Mod[c, 5];
s = Mod[d, 5];
t = Mod[k, 5];

QQ = Transpose[{e, f, g, h, i, j, l, m, o, r, s, t}];

validNumbers = Select[Range[7963, 8050], Module[{n2 = #, k1, d1, c1, e1, f1, g1, h1, i1, j1, l1,
m1, o1, r1, s1, t1, pp1}, k1 = (n2^2) - 1 + n2 + (2 - 4 n2);

d1 = n2^4 - 1 + n2^2;
c1 = n2^3 + 2;
e1 = Mod[c1, 3];
f1 = Mod[d1, 3];
g1 = Mod[k1, 3];
h1 = Mod[c1, 7];
i1 = Mod[d1, 7];
j1 = Mod[k1, 7];
l1 = Mod[c1, 4];
m1 = Mod[d1, 4];
o1 = Mod[k1, 4];
r1 = Mod[c1, 5];
s1 = Mod[d1, 5];
t1 = Mod[k1, 5];
pp1 = {e1, f1, g1, h1, i1, j1, l1, m1, o1, r1, s1, t1};
MemberQ[QQ, pp1] ] &];

validNumbers

oddNumbers1 = Select[validNumbers, OddQ];

```

```
validNumbers = Select[oddNumbers1, Mod[2^#, #] == 2 &];
```

```
validNumbers
```

```
nn = Range[1, 10000000]; n = Select[nn, PrimeQ, {1000}];
```

```
k = (n^2) - 1 + n + (2 - 4 n); d = n^4 - 1 + n^2; c = n^3 + 2; e = Mod[c, 3];
```

```
f = Mod[d, 3];
```

```
g = Mod[k, 3];
```

```
h = Mod[c, 7];
```

```
i = Mod[d, 7];
```

```
j = Mod[k, 7];
```

```
l = Mod[c, 4];
```

```
m = Mod[d, 4];
```

```
o = Mod[k, 4];
```

```
r = Mod[c, 5];
```

```
s = Mod[d, 5];
```

```
t = Mod[k, 5];
```

```
QQ = Transpose[{e, f, g, h, i, j, l, m, o, r, s, t}];
```

```
validNumbers = Select[Range[7963, 8050], Module[{n2 = #, k1, d1, c1, e1, f1, g1, h1, i1, j1, l1, m1, o1, r1, s1, t1, pp1}, k1 = (n2^2) - 1 + n2 + (2 - 4 n2);
```

```
d1 = n2^4 - 1 + n2^2;
```

```
c1 = n2^3 + 2;
```

```
e1 = Mod[c1, 3];
```

```
f1 = Mod[d1, 3];
```

```
g1 = Mod[k1, 3];
```

```
h1 = Mod[c1, 7];
```

```
i1 = Mod[d1, 7];
```

```
j1 = Mod[k1, 7];
```

```
l1 = Mod[c1, 4];
```

```
m1 = Mod[d1, 4];
```

```
o1 = Mod[k1, 4];
```

```
r1 = Mod[c1, 5];
```

```

s1 = Mod[d1, 5];
t1 = Mod[k1, 5];
pp1 = {e1, f1, g1, h1, i1, j1, l1, m1, o1, r1, s1, t1};
MemberQ[QQ, pp1] ] &];
validNumbers

```

```

oddNumbers = Select[validNumbers, OddQ];
validNumbers = Select[oddNumbers, Mod[2^#, #] == 2 &];

```

```

validNumbers
validNumbers2=Intersection[oddNumbers,oddNumbers1]
validNumbers = Select[validNumbers2, Mod[2^#, #] == 2 &]
validNumbers

```

```

{7963,7965,7967,7969,7971,7973,7975,7977,7979,7981,7983,7985,7987,7989,7991,7993,799
5,7997,7999,8001,8003,8005,8007,8009,8011,8013,8015,8017,8019,8021,8023,8025,8027,80
29,8031,8033,8035,8037,8039,8041,8043,8045,8047,8049}

```

```

{7963,7993,8009,8011,8017,8039}

```

```

{7963,7967,7969,7979,7981,7982,7983,7985,7987,7991,7993,7997,7999,8003,8009,8011,801
7,8021,8023,8027,8033,8039,8041,8047}

```

```

{7963,7993,8009,8011,8017,8039}

```

```

{7963,7967,7969,7979,7981,7983,7985,7987,7991,7993,7997,7999,8003,8009,8011,8017,802
1,8023,8027,8033,8039,8041,8047}

```

```

{7963,7993,8009,8011,8017,8039}

```

Now observe the following sequence of pairs that satisfy the rule established in **RULE 1**

```

pairs = {{12, 5}, {20, 13}, {26, 19}, {30, 23}, {42, 35}, {44, 37}, {56, 49}, {86, 79}, {102, 95}, {104,
97}, {110, 103}, {132, 125}, {146, 139}, {152, 145}, {162, 155}, {174, 167}, {180, 173}, {182, 175},
{186, 179}, {194, 187}, {204, 197}, {210, 203}, {216, 209}, {240, 233}, {254, 247}, {260, 253},
{264, 257}, {272, 265}, {284, 277}, {302, 295}, {312, 305}, {314, 307}, {324, 317}, {326, 319},
{330, 323}, {336, 329}, {356, 349}, {362, 355}, {366, 359}, {380, 373}, {384, 377}, {386, 379},
{390, 383}, {404, 397}, {410, 403}, {422, 415}, {446, 439}, {456, 449}, {462, 455}, {470, 463},
{480, 473}, {482, 475}, {512, 505}, {516, 509}, {522, 515}, {524, 517}, {536, 529}, {540, 533},
{554, 547}, {560, 553}, {594, 587}};

```

```

result = FoldList[#2 - 12 &, Last[pairs][[1]], Reverse[Most[pairs]]][[All, 1]]

a=Differences[result]

b=a*-1

c=Reverse[b]

numbers = c

result = FoldList[Plus, 12, numbers]

```

and then check for the results...

```
{594,548,542,528,524,512,510,504,500,470,468,458,450,444,434,410,398,392,378,374,372,368,354,350,344,324,318,314,312,302,300,290,272,260,252,248,242,228,204,198,192,182,174,170,168,162,150,140,134,120,98,92,90,74,44,32,30,18,14,8,0}
```

```
{-46,-6,-14,-4,-12,-2,-6,-4,-30,-2,-10,-8,-6,-10,-24,-12,-6,-14,-4,-2,-4,-14,-4,-6,-20,-6,-4,-2,-10,-2,-10,-18,-12,-8,-4,-6,-14,-24,-6,-6,-10,-8,-4,-2,-6,-12,-10,-6,-14,-22,-6,-2,-16,-30,-12,-2,-12,-4,-6,-8}
```

```
{46,6,14,4,12,2,6,4,30,2,10,8,6,10,24,12,6,14,4,2,4,14,4,6,20,6,4,2,10,2,10,18,12,8,4,6,14,24,6,6,10,8,4,2,6,12,10,6,14,22,6,2,16,30,12,2,12,4,6,8}
```

```
{8,6,4,12,2,12,30,16,2,6,22,14,6,10,12,6,2,4,8,10,6,6,24,14,6,4,8,12,18,10,2,10,2,4,6,20,6,4,14,4,2,4,14,6,12,24,10,6,8,10,2,30,4,6,2,12,4,14,6,46}
```

```
{8,6,4,12,2,12,30,16,2,6,22,14,6,10,12,6,2,4,8,10,6,6,24,14,6,4,8,12,18,10,2,10,2,4,6,20,6,4,14,4,2,4,14,6,12,24,10,6,8,10,2,30,4,6,2,12,4,14,6,46}
```

```
{12,20,26,30,42,44,56,86,102,104,110,132,146,152,162,174,180,182,186,194,204,210,216,240,254,260,264,272,284,302,312,314,324,326,330,336,356,362,366,380,384,386,390,404,410,422,446,456,462,470,480,482,512,516,522,524,536,540,554,560,606}
```

these are the even parts of the pairs that satisfy RULE 1. Subtract 7 from the even numbers and you get the odd parts of the ordered pairs.

Now just to clarify the number 914 used in the equation of z in RULE 1 comes from subtracting the 999th prime number from the multiplication of 7\*999, which is 7907-(7\*999)=914

```
pairs = {{12, 5}, {20, 13}, {26, 19}, {30, 23}, {42, 35}, {44, 37}, {56, 49}, {86, 79}, {102, 95}, {104, 97}, {110, 103}, {132, 125}, {146, 139}, {152, 145}, {162, 155}, {174, 167}, {180, 173}, {182, 175}, {186, 179}, {194, 187}, {204, 197}, {210, 203}, {216, 209}, {240, 233}, {254, 247}, {260, 253}, {264, 257}, {272, 265}, {284, 277}, {302, 295}, {312, 305}, {314, 307}, {324, 317}, {326, 319}, {330, 323}, {336, 329}, {356, 349}, {362, 355}, {366, 359}, {380, 373}, {384, 377}};
```

```
subtractFromEvens[pairs_List] :=
```

```
Flatten[If[EvenQ[#], # - 12, Nothing] & /@ pairs]
```

```
newList = subtractFromEvens[First /@ pairs];
```

( Output the new list of modified even numbers )

newList

```
a=Differences[newList]
```

**b=a**

```
c=Reverse[b]
```

```
numbers = b
```

```
result = FoldList[Plus, 12, numbers]
```

```
as=result+7907
```

PrimeQ[as]

```
rir=FoldList[Plus, 12, c]
```

ok=rir+7907

PrimeQ[ok]

 $\text{Mod}[2^{\text{ok}}, \text{ok}]$ 

{0,8,14,18,30,32,44,74,90,92,98,120,134,140,150,162,168,170,174,182,192,198,204,228,242,248,252,260,272,290,300,302,312,314,318,324,344,350,354,368,372}

$\{8, 6, 4, 12, 2, 12, 30, 16, 2, 6, 22, 14, 6, 10, 12, 6, 2, 4, 8, 10, 6, 6, 24, 14, 6, 4, 8, 12, 18, 10, 2, 10, 2, 4, 6, 20, 6, 4, 14, 4\}$

$\{8, 6, 4, 12, 2, 12, 30, 16, 2, 6, 22, 14, 6, 10, 12, 6, 2, 4, 8, 10, 6, 6, 24, 14, 6, 4, 8, 12, 18, 10, 2, 10, 2, 4, 6, 20, 6, 4, 14, 4\}$

$\{4, 14, 4, 6, 20, 6, 4, 2, 10, 2, 10, 18, 12, 8, 4, 6, 14, 24, 6, 6, 10, 8, 4, 2, 6, 12, 10, 6, 14, 22, 6, 2, 16, 30, 12, 2, 12, 4, 6, 8\}$

$\{8, 6, 4, 12, 2, 12, 30, 16, 2, 6, 22, 14, 6, 10, 12, 6, 2, 4, 8, 10, 6, 6, 24, 14, 6, 4, 8, 12, 18, 10, 2, 10, 2, 4, 6, 20, 6, 4, 14, 4\}$

{12,20,26,30,42,44,56,86,102,104,110,132,146,152,162,174,180,182,186,194,204,210,216,240,254,260,264,272,284,302,312,314,324,326,330,336,356,362,366,380,384}

{7919,7927,7933,7937,7949,7951,7963,7993,8009,8011,8017,8039,8053,8059,8069,8081,8087,8089,8093,8101,8111,8117,8123,8147,8161,8167,8171,8179,8191,8209,8219,8221,8231,8233,8237,8243,8263,8269,8273,8287,8291}

[illegible]

```
{12,16,30,34,40,60,66,70,72,82,84,94,112,124,132,136,142,156,180,186,192,202,210,214,216,222,234,244,250,264,286,292,294,310,340,352,354,366,370,376,384}
```

```
{7919,7923,7937,7941,7947,7967,7973,7977,7979,7989,7991,8001,8019,8031,8039,8043,8049,8063,8087,8093,8099,8109,8117,8121,8123,8129,8141,8151,8157,8171,8193,8199,8201,8217,8247,8259,8261,8273,8277,8283,8291}
```

```
{True,False,True,False,False,False,False,False,False,False,False,False,False,False,True,False,False,False,True,True,False,False,True,False,True,False,False,False,False,False,False,False,True,False,False,True}
```

```
{2,6734,2,8,512,6297,6339,8,6708,8,2841,890,4373,8,2,5972,8,4980,2,2,6416,3041,2,8,2,3526,2454,6833,8,2,8,512,5947,2339,8,8,2048,2,6173,8027,2}
```

( Define the ordered pairs )

```
orderedPairs = {{12, 5}, {20, 13}, {26, 19}, {30, 23}, {42, 35}, {44, 37}, {56, 49}, {86, 79}, {102, 95}, {104, 97}, {110, 103}, {132, 125}, {146, 139}, {152, 145}, {162, 155}, {174, 167}, {180, 173}, {182, 175}, {186, 179}};
```

( Extract the first and second elements of the pairs )

```
firstElements = orderedPairs[[All, 1]];
```

```
secondElements = orderedPairs[[All, 2]];
```

( Calculate the differences and check for primes )

```
differences = firstElements + secondElements;
```

```
isPrime = PrimeQ /@ differences;
```

( Generate the next odd numbers based on the second elements )

```
nextOddNumbers = secondElements + 2 Range[Length[secondElements]]
```

( Check the sums and find the primes )

```
primeSums = Select[Differences, PrimeQ];
```

( Conjecture: Consecutive sums of ordered pairs minus consecutive sums of odd numbers gives multiples of 7 )

```
consecutiveSums = Accumulate[firstElements] - Accumulate[nextOddNumbers];
```

```
multiplesOf7 = Mod[consecutiveSums, 7] == 0
```



( Output results )

```
Print["Ordered Pairs: ", orderedPairs];
```

```
Print["Differences: ", differences];
```

```
Print["Are Differences Prime? ", isPrime];
```

```
Print["Next Odd Numbers: ", nextOddNumbers];
```

```
Print["Prime Sums: ", primeSums];
```

```
Print["Conjecture Results (Multiples of 7): ", multiplesOf7];
```

Finally a pattern : Conjecture:7 consecutive Consecutive gives minus multiples numbers odd of<sup>3</sup> ordered pairs sums<sup>2</sup>

$\{5,1,2,1,5,0,0,5,1,2,1,5,0,0,5,1,2,1,5\}==0$

$a=\{5,8,9,8,5,0,-7,-16,-27,-40,-55,-72,-91,-112,-135,-160,-187,-216,-247\}$   
 $\text{Mod}[a,7]=\{5,1,2,1,5,0,0,5,1,2,1,5,0,0,5,1,2,1,5\}==0$

Given Results

Out[23]= Define ordered pairs the

Out[25]= and elements Extract first of pairs second the<sup>2</sup>

Out[28]= {17 and Calculate check for primes the,33 and Calculate check for primes the,45 and Calculate check for primes the,53 and Calculate check for primes the,77 and Calculate check for primes the,81 and Calculate check for primes the,105 and Calculate check for primes the,165 and Calculate check for primes the,197 and Calculate check for primes the,201 and Calculate check for primes the,213 and Calculate check for primes the,257 and Calculate check for primes the,285 and Calculate check for primes the,297 and Calculate check for primes the,317 and Calculate check for primes the,341 and Calculate check for primes the,353 and Calculate check for primes the,357 and Calculate check for primes the,365 and Calculate check for primes the}

Out[31]= based elements Generate next numbers odd on second the<sup>2</sup>

Out[32]= {7,17,25,31,45,49,63,95,113,117,125,149,165,173,185,199,207,211,217}

Out[33]= and Check find primes sums the<sup>2</sup>

During evaluation of In[23]:= Select::normal: Nonatomic expression expected at position 1 in Select[Differences,PrimeQ].

Out[35]= Conjecture:7 consecutive Consecutive gives minus multiples numbers odd of<sup>3</sup> ordered pairs sums<sup>2</sup>

Out[36]= {5,8,9,8,5,0,-7,-16,-27,-40,-55,-72,-91,-112,-135,-160,-187,-216,-247}

Out[37]= {5,1,2,1,5,0,0,5,1,2,1,5,0,0,5,1,2,1,5}==0

Out[38]= Output results

During evaluation of In[23]:= Ordered Pairs:

{{12,5},{20,13},{26,19},{30,23},{42,35},{44,37},{56,49},{86,79},{102,95},{104,97},{110,103},{132,125},{146,139},{152,145},{162,155},{174,167},{180,173},{182,175},{186,179}}

During evaluation of In[23]:= Differences:

{17,33,45,53,77,81,105,165,197,201,213,257,285,297,317,341,353,357,365}

During evaluation of In[23]:= Are Differences Prime?

{True,False,False,True,False,False,False,False,True,False,False,True,False,False,True,False,True,False,False}

During evaluation of In[23]:= Next Odd Numbers:

{7,17,25,31,45,49,63,95,113,117,125,149,165,173,185,199,207,211,217}

During evaluation of In[23]:= Prime Sums: Select[Differences,PrimeQ]

During evaluation of In[23]:= Conjecture Results (Multiples of 7):

{5,1,2,1,5,0,0,5,1,2,1,5,0,0,5,1,2,1,5}==0

A expressão `nextOddNumbers = secondElements + 2`

`Range[Length[secondElements]]` no contexto fornecido está gerando uma lista de números ímpares subsequentes com base nos elementos da lista `secondElements`.

Aqui está uma explicação detalhada:

1. `secondElements`: Esta é uma lista que contém o segundo elemento de cada par ordenado. Por exemplo, se `orderedPairs` é `{{12, 5}, {20, 13}, {26, 19}, ...}`, então `secondElements` será `{5, 13, 19, ...}`.
2. `Range[Length[secondElements]]`: Esta função gera uma lista de inteiros de 1 até o comprimento de `secondElements`. Se `secondElements` tem 3 elementos, `Range[3]` será `{1, 2, 3}`.
3. `2 Range[Length[secondElements]]`: Multiplica cada elemento da lista gerada por `Range` por 2. Então, se `Range[3]` é `{1, 2, 3}`, `2 Range[3]` será `{2, 4, 6}`.
4. `secondElements + 2 Range[Length[secondElements]]`: Adiciona cada elemento da lista `secondElements` ao correspondente elemento da lista `2 Range[Length[secondElements]]`. Por exemplo, se `secondElements` é `{5, 13, 19}` e `2 Range[3]` é `{2, 4, 6}`, então `nextOddNumbers` será `{5+2, 13+4, 19+6}`, resultando em `{7, 17, 25}`.

Portanto, `nextOddNumbers` é uma lista de números ímpares subsequentes gerados a partir dos elementos de `secondElements`.

I just asked AI copilot of Microsoft if it could continue the pattern of Out[36]= {5,8,9,8,5,0,-7,-16,-27,-40,-55,-72,-91,-112,-135,-160,-187,-216,-247}

For more 20 numbers and the answer was

10:41

4G

← ≡ **Padrão de Decréscimo de 2** ...

-1015 \ -1015 - 65 &= -1080 \ -1080 - 67 &= -1147 \  
-1147 - 69 &= -1216 \ -1216 - 71 &= -1287 \  
\end{align\*}]

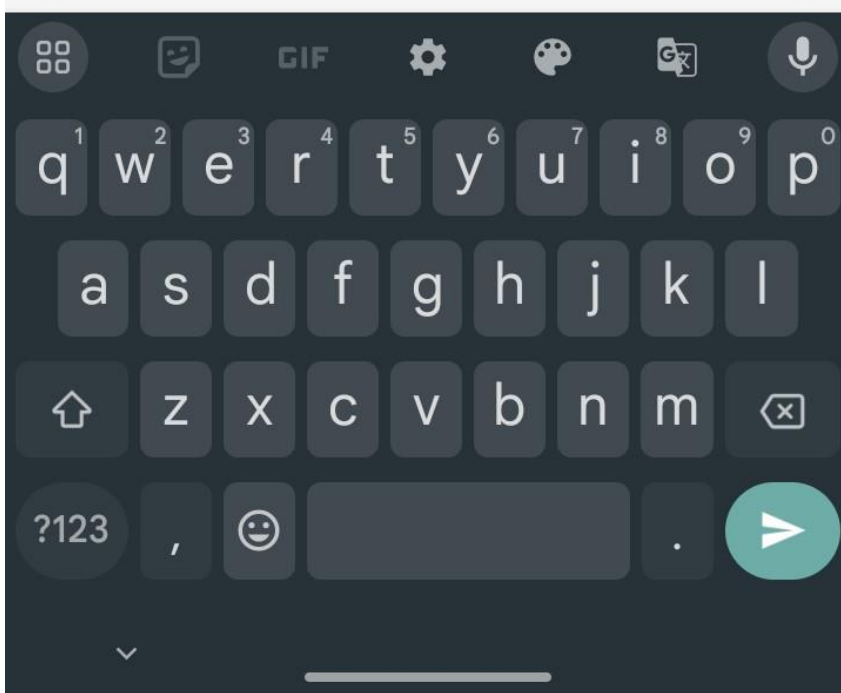
Portanto, a sequência completa com os próximos 20 números é:

[ {5, 8, 9, 8, 5, 0, -7, -16, -27, -40, -55, -72, -91, -112,  
-135, -160, -187, -216, -247, -280, -315, -352, -391,  
-432, -475, -520, -567, -616, -667, -720, -775, -832,  
-891, -952, -1015, -1080, -1147, -1216, -1287} ]

Se precisar de mais alguma coisa, estou aqui para ajudar!

👍 🗑️ 📄 ➦ 🔊 2 de 30

Pergunte-me qualquer coisa...



Now running the program for more ordered pairs that gives primes the result is :

```
orderedPairs = {{12, 5}, {20, 13}, {26, 19}, {30, 23}, {42, 35}, {44, 37}, {56, 49}, {86, 79}, {102, 95}, {104, 97}, {110, 103}, {132, 125}, {146, 139}, {152, 145}, {162, 155}, {174, 167}, {180, 173}, {182, 175}, {186, 179}, {194, 187}, {204, 197}, {210, 203}, {216, 209}, {240, 233}, {254, 247}, {260, 253}, {264, 257}, {272, 265}, {284, 277}, {302, 295}, {312, 305}, {314, 307}, {324, 317}, {326, 319}, {330, 323}, {336, 329}, {356, 349}, {362, 355}, {366, 359}, {380, 373}, {384, 377}};
```

( Extract the first and second elements of the pairs )

```
firstElements = orderedPairs[[All, 1]];
```

```
secondElements = orderedPairs[[All, 2]];
```

( Calculate the differences and check for primes )

```
differences = firstElements + secondElements;
```

```
isPrime = PrimeQ /@ differences;
```

( Generate the next odd numbers based on the second elements )

```
nextOddNumbers = secondElements + 2 Range[Length[secondElements]]
```

( Check the sums and find the primes )

```
primeSums = Select[Differences, PrimeQ]
```

( Conjecture: Consecutive sums of ordered pairs minus consecutive sums of odd numbers gives multiples of 7 )

```
consecutiveSums = Accumulate[firstElements] - Accumulate[nextOddNumbers]
```

```
{5,8,9,8,5,0,-7,-16,-27,-40,-55,-72,-91,-112,-135,-160,-187,-216,-247,-280,-315,-352,-391,-432,-475,-520,-567,-616,-667,-720,-775,-832,-891,-952,-1015,-1080,-1147,-1216,-1287,-1360,-1435}
```

A perfect match so that means PRIME NUMBERS DO HAVE A PATTERN !!!

BUT IT IS NOT EXCLUSIVE HERE IS WHY:

```
orderedPairs =
```

```
{{12,5},{20,13},{26,19},{30,23},{42,35},{44,37},{56,49},{86,79},{102,95},{104,97},{110,103},{112,105},{114,107},{116,109},{118,111},{120,113},{122,115},{124,117},{126,119},{128,121},{130,123}};
```

A COMPLETE NON SENSE SEQUENCE THAT OBEYS ALL THE RULES BUT AT THE END ARE NOT CORRESPONDED TO PRIMES

( Extract the first and second elements of the pairs )

```
firstElements = orderedPairs[[All, 1]];
```

```
secondElements = orderedPairs[[All, 2]];
```

```
( Calculate the differences and check for primes )
```

```
differences = firstElements + secondElements;
```

```
isPrime = PrimeQ /@ differences;
```

```
( Generate the next odd numbers based on the second elements )
```

```
nextOddNumbers = secondElements + 2 Range[Length[secondElements]]
```

```
( Check the sums and find the primes )
```

```
primeSums = Select[Differences, PrimeQ]
```

```
( Conjecture: Consecutive sums of ordered pairs minus consecutive sums of odd numbers gives  
multiples of 7 )
```

```
consecutiveSums = Accumulate[firstElements] - Accumulate[nextOddNumbers]
```

```
consecutiveSums={5,8,9,8,5,0,-7,-16,-27,-40,-55,-72,-91,-112,-135,-160,-187,-216,-247,-280,-  
315,-352,-391,-432,-475,-520,-567,-616,-667,-720,-775,-832,-891,-952,-1015,-1080,-1147,-  
1216,-1287,-1360,-1435}
```

```
{5, 8, 9, 8, 5, 0, -7, -16, -27, -40, -55, -72, -91, -112, -135, \
```

```
-160, -187, -216, -247, -280, -315}
```