

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]
```

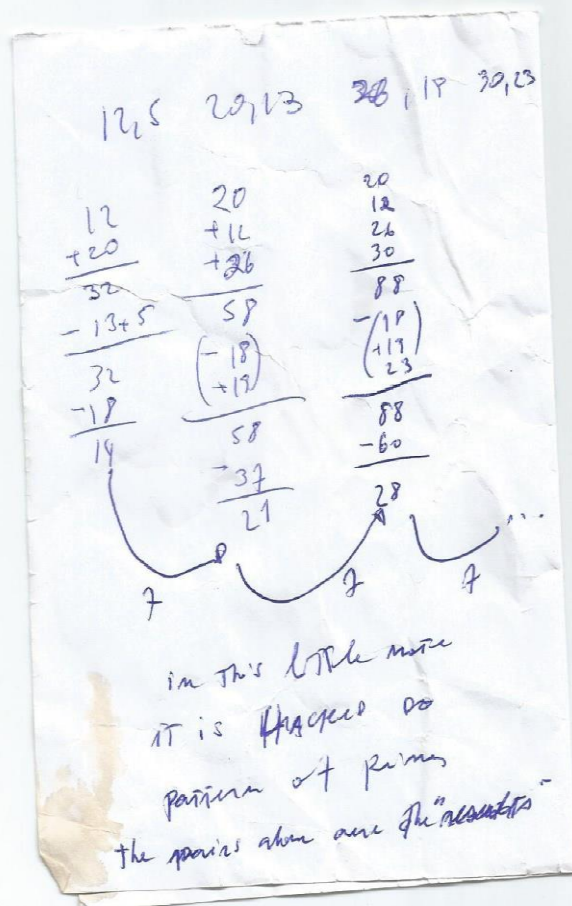
$\{\{12,5\},\{20,13\},\{26,19\},\{30,23\},\{42,35\},\{44,37\},\{56,49\},\{86,79\},\{102,95\},\{104,97\},$
 $\{110,103\},\{132,125\},\{146,139\},\{152,145\},\{162,155\},\{174,167\},\{180,173\},\{182,175\},\{186,179\}\}$

$\{12,20,26,30,42,44,56,86,102,104,110,132,146,152,162,174,180,182,186\}$
 $\{8,6,4,12,2,12,30,16,2,6,22,14,6,10,12,6,2,4\}$ 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]
```

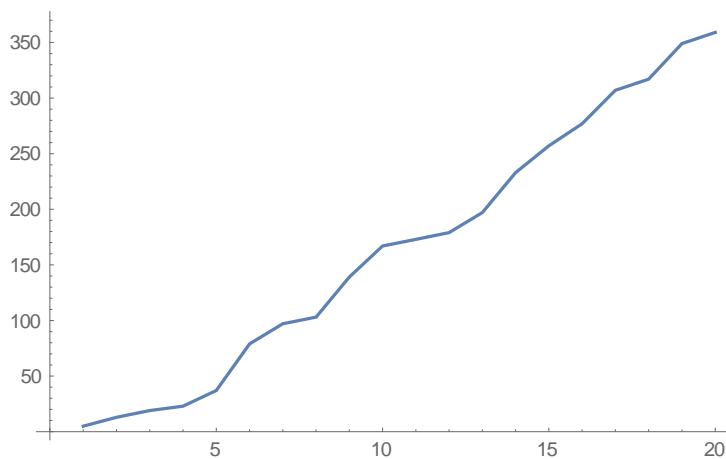
```
a=Select[list2,PrimeQ,(20)]
```

```
ListLinePlot[a]
```

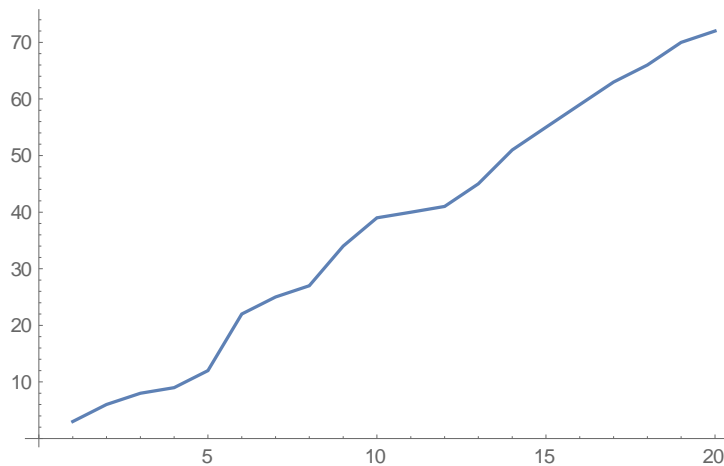
```
PrimePi[a]
```

```
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]
```

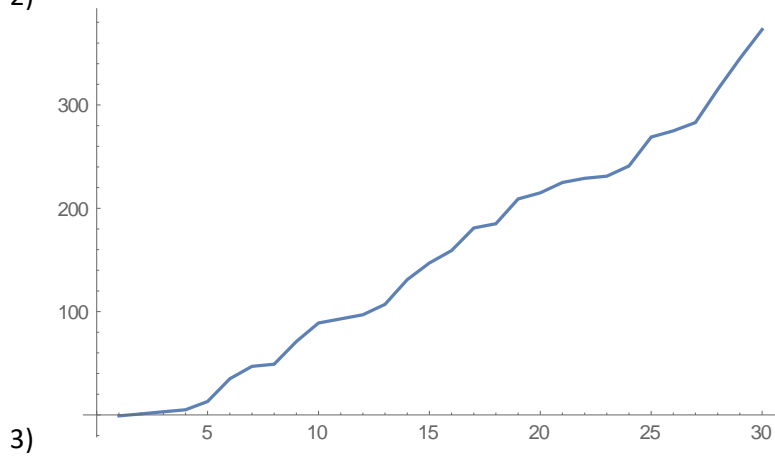
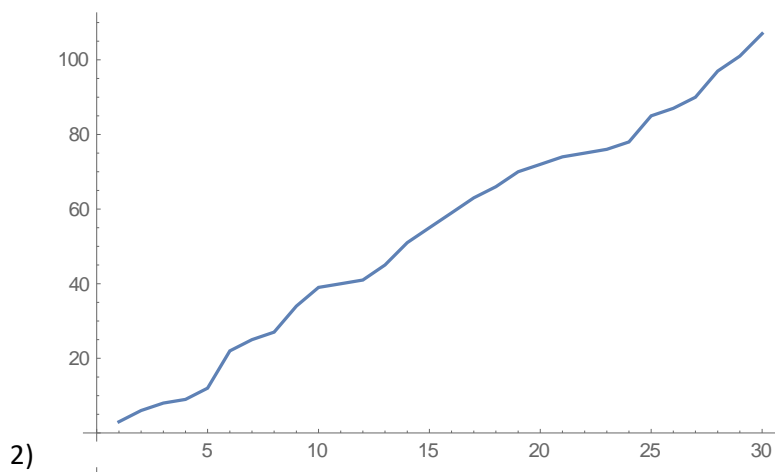
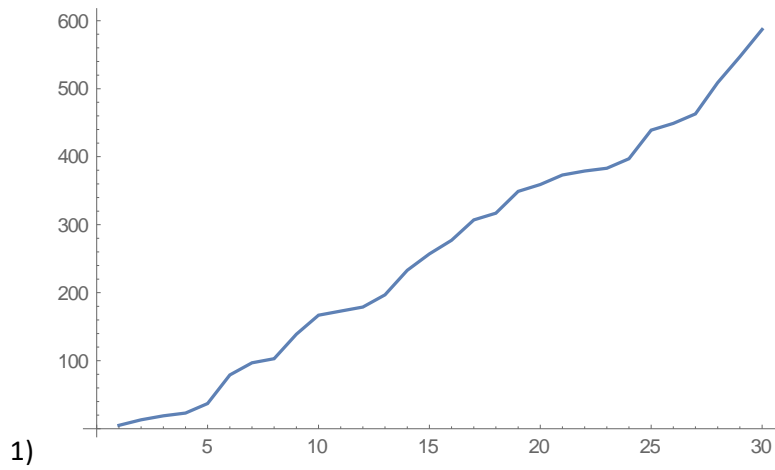
```
po = Table[pairs[[i]] + pairs[[Length[pairs] - i + 1]], {i, 1, Floor[Length[pairs]/2]]
```

```
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]
```

(Apply the function to the first element of each pair)

```
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 of³ ordered pairs sums²

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

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

Given Results

Out[23]= Define ordered pairs the

Out[25]= and elements Extract first of pairs second the²

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 the²

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 the²

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 of³ ordered pairs sums²

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