

Padrão prime sublists within lists ( a definite prime pattern thorough a polynomial counting mod)

Seq1 is the list of the positions of the primes that share the same mod sequence and seq2 is the result of the  $\text{Mod}\{1693,420\}+420n$  until 40. Now observe the result of FindInstance for seq1 and 2 and look that they are the same result ...

```
(* Defina as sequências *)
```

```
seq1 = {32, 164, 280, 488, 541, 640, 689, 738, 785, 976, 1020, 1113, 1159, 1208, 1253, 1297, 1383, 1564, 1689, 1738, 1829, 1873, 1953, 1995, 2084, 2162};
```

```
seq2 = {131, 551, 971, 1391, 1811, 2231, 2651, 3071, 3491, 3911, 4331, 4751, 5171, 5591, 6011, 6431, 6851, 7271, 7691, 8111, 8531, 8951, 9371, 9791, 10211, 10631}
```

```
(* Calcular Mod[X, 131] para cada sequência *)
```

```
modSeq1 = Mod[#, 131] & /@ seq1;
```

```
modSeq2 = Mod[#, 131] & /@ seq2;
```

```
(* Mostrar os resultados *)
```

```
{modSeq1, modSeq2}
```

```
b=seq2-seq1
```

```
Differences[b]
```

```
c=Mod[seq2,seq1]
```

```
d=Mod[b,seq1]
```

```
{131,551,971,1391,1811,2231,2651,3071,3491,3911,4331,4751,5171,5591,6011,6431,6851,7271,7691,8111,8531,8951,9371,9791,10211,10631}
```

```
{{32,33,18,95,17,116,34,83,130,59,103,65,111,29,74,118,73,123,117,35,126,39,119,30,119,66},  
{0,27,54,81,108,4,31,58,85,112,8,35,62,89,116,12,39,66,93,120,16,43,70,97,124,20}}
```

```
{99,387,691,903,1270,1591,1962,2333,2706,2935,3311,3638,4012,4383,4758,5134,5468,5707,  
,6002,6373,6702,7078,7418,7796,8127,8469}
```

```
{288,304,212,367,321,371,371,373,229,376,327,374,371,375,376,334,239,295,371,329,376,340,378,331,342}
```

```
{3,59,131,415,188,311,584,119,351,7,251,299,535,759,999,1243,1319,1015,935,1159,1215,1459,1559,1811,1875,1983}
```

{3,59,131,415,188,311,584,119,351,7,251,299,535,759,999,1243,1319,1015,935,1159,1215,1459,1559,1811,1875,1983}

(\* Defina a sequência seq2 \*)

seq2 = {131, 551, 971, 1391, 1811, 2231, 2651, 3071, 3491, 3911, 4331, 4751, 5171, 5591, 6011, 6431, 6851, 7271, 7691, 8111, 8531, 8951, 9371, 9791, 10211, 10631}

(\* Defina seq1 como uma variável simbólica \*)

Clear[x];

seq1 = Array[x, Length[seq2]];

(\* Calcular a diferença entre seq2 e seq1 \*)

b = seq2 - seq1;

(\* Calcular Mod[seq2, seq1] \*)

c = Mod[seq2, seq1];

(\* Calcular Mod[b, seq1] \*)

d = Mod[b, seq1];

(\* Resolver a equação c == d para encontrar os valores de seq1 \*)

sol = FindInstance[c == d, seq1];

(\* Mostrar os resultados \*)

Sol

{131,551,971,1391,1811,2231,2651,3071,3491,3911,4331,4751,5171,5591,6011,6431,6851,7271,7691,8111,8531,8951,9371,9791,10211,10631}

{x[1]->171/10-(103 I)/5,x[2]->64/5+I/10,x[3]->92/5+(89 I)/5,x[4]->69/5-I/5,x[5]->17/2+(23 I)/10,x[6]->-(181/10)+(114 I)/5,x[7]->7/2+(43 I)/5,x[8]->19/2-(63 I)/10,x[9]->-(157/10)+(207 I)/10,x[10]->16/5-(217 I)/10,x[11]->-(4/5)+(79 I)/5,x[12]->18/5+10 I,x[13]->-(35/2)-(23 I)/10,x[14]->213/10-(49 I)/5,x[15]->-(102/5)+(89 I)/10,x[16]->-(29/2)-(5 I)/2,x[17]->-(43/10)+(77 I)/5,x[18]->161/10-(41 I)/5,x[19]->-18+(39 I)/2,x[20]->-10+(79 I)/10,x[21]->58/5-

```
(23 I)/10,x[22]->-(17/5)-6 I,x[23]->-(83/5)-(74 I)/5,x[24]->-(8/5)+(7 I)/2,x[25]->39/10+(247 I)/10,x[26]->11/2+23 I}}
```

```
(* Defina a sequência seq2 *)
```

```
seq1 = {32, 164, 280, 488, 541, 640, 689, 738, 785, 976, 1020, 1113, 1159, 1208, 1253, 1297, 1383, 1564, 1689, 1738, 1829, 1873, 1953, 1995, 2084, 2162};
```

```
(* Defina seq1 como uma variável simbólica *)
```

```
Clear[x];
```

```
seq1 = Array[x, Length[seq2]];
```

```
(* Calcular a diferença entre seq2 e seq1 *)
```

```
b = seq2 - seq1;
```

```
(* Calcular Mod[seq2, seq1] *)
```

```
c = Mod[seq2, seq1];
```

```
(* Calcular Mod[b, seq1] *)
```

```
d = Mod[b, seq1];
```

```
(* Resolver a equação c == d para encontrar os valores de seq1 *)
```

```
sol = FindInstance[c == d, seq1];
```

```
(* Mostrar os resultados *)
```

```
Sol
```

```
{{x[1]->171/10-(103 I)/5,x[2]->64/5+I/10,x[3]->92/5+(89 I)/5,x[4]->69/5-I/5,x[5]->17/2+(23 I)/10,x[6]->-(181/10)+(114 I)/5,x[7]->7/2+(43 I)/5,x[8]->19/2-(63 I)/10,x[9]->-(157/10)+(207 I)/10,x[10]->16/5-(217 I)/10,x[11]->-(4/5)+(79 I)/5,x[12]->18/5+10 I,x[13]->-(35/2)-(23 I)/10,x[14]->213/10-(49 I)/5,x[15]->-(102/5)+(89 I)/10,x[16]->-(29/2)-(5 I)/2,x[17]->-(43/10)+(77 I)/5,x[18]->161/10-(41 I)/5,x[19]->-18+(39 I)/2,x[20]->-10+(79 I)/10,x[21]->58/5-(23 I)/10,x[22]->-(17/5)-6 I,x[23]->-(83/5)-(74 I)/5,x[24]->-(8/5)+(7 I)/2,x[25]->39/10+(247 I)/10,x[26]->11/2+23 I}}
```

```
(* Defina as duas sequências seq2 *)
```

```
seq2a = {131, 551, 971, 1391, 1811, 2231, 2651, 3071, 3491, 3911, 4331, 4751, 5171, 5591,  
6011, 6431, 6851, 7271, 7691, 8111, 8531, 8951, 9371, 9791, 10211, 10631};
```

```
seq2b = {32, 164, 280, 488, 541, 640, 689, 738, 785, 976, 1020, 1113, 1159, 1208, 1253, 1297,  
1383, 1564, 1689, 1738, 1829, 1873, 1953, 1995, 2084, 2162};
```

```
(* Defina seq1 como uma variável simbólica *)
```

```
Clear[x];
```

```
seq1 = Array[x, Length[seq2a]];
```

```
(* Calcular a diferença entre seq2a e seq1 *)
```

```
b = seq2a - seq1;
```

```
(* Calcular Mod[seq2a, seq1] *)
```

```
c = Mod[seq2a, seq1];
```

```
(* Calcular Mod[b, seq1] *)
```

```
d = Mod[b, seq1];
```

```
(* Resolver a equação c == d para encontrar os valores de seq1 *)
```

```
sol = FindInstance[c == d, seq1];
```

```
(* Mostrar os resultados *)
```

```
sol
```

```
(* Comparar seq2a com seq2b e encontrar correspondências *)
```

```
matches = Table[seq2a[[i]] -> seq2b[[i]], {i, Length[seq2a]}]
```

```
(* Mostrar as correspondências *)
```

```
Matches
```

```
{{x[1]->171/10-(103 l)/5,x[2]->64/5+l/10,x[3]->92/5+(89 l)/5,x[4]->69/5-l/5,x[5]->17/2+(23 l)/10,x[6]->-(181/10)+(114 l)/5,x[7]->7/2+(43 l)/5,x[8]->19/2-(63 l)/10,x[9]->-(157/10)+(207 l)/10,x[10]->16/5-(217 l)/10,x[11]->-(4/5)+(79 l)/5,x[12]->18/5+10 l,x[13]->-(35/2)-(23 l)/10,x[14]->213/10-(49 l)/5,x[15]->-(102/5)+(89 l)/10,x[16]->-(29/2)-(5 l)/2,x[17]->-(43/10)+(77 l)/5,x[18]->161/10-(41 l)/5,x[19]->-18+(39 l)/2,x[20]->-10+(79 l)/10,x[21]->58/5-(23 l)/10,x[22]->-(17/5)-6 l,x[23]->-(83/5)-(74 l)/5,x[24]->-(8/5)+(7 l)/2,x[25]->39/10+(247 l)/10,x[26]->11/2+23 l}}
```

```
{131->32,551->164,971->280,1391->488,1811->541,2231->640,2651->689,3071->738,3491->785,3911->976,4331->1020,4751->1113,5171->1159,5591->1208,6011->1253,6431->1297,6851->1383,7271->1564,7691->1689,8111->1738,8531->1829,8951->1873,9371->1953,9791->1995,10211->2084,10631->2162}
```

```
{131->32,551->164,971->280,1391->488,1811->541,2231->640,2651->689,3071->738,3491->785,3911->976,4331->1020,4751->1113,5171->1159,5591->1208,6011->1253,6431->1297,6851->1383,7271->1564,7691->1689,8111->1738,8531->1829,8951->1873,9371->1953,9791->1995,10211->2084,10631->2162}
```

(\* Suponha que conhecemos seq2 \*)

```
seq1 = {32, 164, 280, 488, 541, 640, 689, 738, 785, 976, 1020, 1113, 1159, 1208, 1253, 1297, 1383, 1564, 1689, 1738, 1829, 1873, 1953, 1995, 2084, 2162};
```

```
seq2 = {131, 551, 971, 1391, 1811, 2231, 2651, 3071, 3491, 3911, 4331, 4751, 5171, 5591, 6011, 6431, 6851, 7271, 7691, 8111, 8531, 8951, 9371, 9791, 10211, 10631}
```

(\* Supor um padrão para seq1 \*)

(\* Exemplo de cálculo da diferença entre elementos consecutivos \*)

```
diffs = Differences[seq2];
```

(\* Assumindo que seq1 pode ser encontrada por uma diferença constante \*)

```
constantDifference = Mean[diffs];
```

(\* Calcular seq1 a partir de seq2 e a diferença constante \*)

```
seq1Guess = Table[seq2[[1]] - i*constantDifference, {i, 0, Length[seq2] - 1}];
```

(\* Mostrar o resultado da suposição \*)

```
bn=seq1Guess-232
```

```
vb=Mod[bn,seq1]
```

```
vc=Mod[seq2,seq1]
```

mn=vb+vc

mn-30

{131,551,971,1391,1811,2231,2651,3071,3491,3911,4331,4751,5171,5591,6011,6431,6851,7271,7691,8111,8531,8951,9371,9791,10211,10631}

{-101,-521,-941,-1361,-1781,-2201,-2621,-3041,-3461,-3881,-4301,-4721,-5141,-5561,-5981,-6401,-6821,-7241,-7661,-8081,-8501,-8921,-9341,-9761,-10181,-10601}

{27,135,179,103,383,359,135,649,464,23,799,844,654,479,284,84,94,579,784,609,644,444,424,214,239,209}

{3,59,131,415,188,311,584,119,351,7,251,299,535,759,999,1243,1319,1015,935,1159,1215,1459,1559,1811,1875,1983}

{30,194,310,518,571,670,719,768,815,30,1050,1143,1189,1238,1283,1327,1413,1594,1719,1768,1859,1903,1983,2025,2114,2192}

{0,164,280,488,541,640,689,738,785,0,1020,1113,1159,1208,1253,1297,1383,1564,1689,1738,1829,1873,1953,1995,2084,2162}

(\* Suponha que conhecemos seq2 \*)

seq1={{35},{104},{223},{442},{545},{594},{691},{786},{837},{884},{1115},{1341},{1385},{1427},{1473},{

1653},{1782},{1914},{2041},{2208},{2249},{2377},{2421},{2508},{2633},{2719},{2796},{2879},{3000},{3081},{3165},{3283},{3321},{3404},{3441},{3526},{3568},{3613},{3694},{3849},{3973},{4128},{4364},{4451},{4494},{4604},{4793},{4833},{4868},{4908},{4949},{4983},{5026},{5148},{5185},{5219},{5413},{5639},{5685},{5808},{5843},{5884},{6001},{6077},{6182},{6332},{6599},{6631},{6709},{6858},{6966},{7004},{7042},{7086},{7347},{7422},{7651},{7870},{7908},{7983},{8060},{8099},{8350},{8385},{8493},{8638},{9051},{9089},{9128},{9279},{9313},{9350},{9419},{9452},{9487},{9564},{9600},{9747},{9857},{9921},{9961},{10000}}

seq1=Flatten[%]

seq2={149,569,989,1409,1829,2249,2669,3089,3509,3929,4349,4769,5189,5609,6029,6449,6869,7289,7709,8129,8549,8969,9389,9809,10229,10649,11069,11489,11909,12329,12749,13169,13589,14009,14429,14849,15269,15689,16109,16529,16949,17369,17789,18209,18629,19049,19469,19889,20309,20729,21149,21569,21989,22409,22829,23249,23669,24089,24509,24929,25349,25769,26189,26609,27029,27449,27869,28289,28709,29129,29549,29969,30389,30809,31229,31649,32069,32489,32909,33329,33749,34169,34589,35009,35429,35849,36269,36689,37109,37529,37949,38369,38789,39209,39629,40049,40469,40889,41309,41729,42149,42569}

(\* Exemplo de cálculo da diferença entre elementos consecutivos \*)

```
diffs = Differences[seq2];
```

```
(* Assumindo que seq1 pode ser encontrada por uma diferença constante *)
```

```
constantDifference = Mean[diffs];
```

```
(* Calcular seq1 a partir de seq2 e a diferença constante *)
```

```
seq1Guess = Table[seq2[[1]] - i*constantDifference, {i, 0, Length[seq2] - 1}];
```

```
(* Mostrar o resultado da suposição *)
```

```
bn=seq1Guess-232
```

```
vb=Mod[bn,seq1]
```

```
vc=Mod[seq2,seq1]
```

```
mn=vb+vc
```

```
mn-30
```

```
Out[11]=
```

```
{{35},{104},{223},{442},{545},{594},{691},{786},{837},{884},{1115},{1341},{1385},{1427},{1473},{1653},{1782},{1914},{2041},{2208},{2249},{2377},{2421},{2508},{2633},{2719},{2796},{2879},{0},{3081},{3165},{3283},{3321},{3404},{3441},{3526},{3568},{3613},{3694},{3849},{3973},{1148},{4364},{4451},{4494},{4604},{4793},{4833},{4868},{4908},{4949},{4983},{5026},{5148},{2590},{5219},{5413},{5639},{5685},{5808},{5843},{5884},{6001},{6077},{6182},{6332},{6599},{6631},{6709},{6858},{6966},{7004},{7042},{7086},{7347},{7422},{7651},{7870},{7908},{7983},{8060},{8099},{8350},{8385},{8493},{8638},{9051},{9089},{9128},{9279},{9313},{9350},{9419},{9452},{4383},{9564},{9600},{9747},{9857},{9921},{9961},{10000}}
```

```
Out[12]=
```

```
{35,104,223,442,545,594,691,786,837,884,1115,1341,1385,1427,1473,1653,1782,1914,2041,2208,2249,2377,2421,2508,2633,2719,2796,2879,0,3081,3165,3283,3321,3404,3441,3526,3568,3613,3694,3849,3973,1148,4364,4451,4494,4604,4793,4833,4868,4908,4949,4983,5026,5148,2590,5219,5413,5639,5685,5808,5843,5884,6001,6077,6182,6332,6599,6631,6709,6858,6966,7004,7042,7086,7347,7422,7651,7870,7908,7983,8060,8099,8350,8385,8493,8638,9051,9089,9128,9279,9313,9350,9419,9452,4383,9564,9600,9747,9857,9921,9961,10000}
```

```
Out[13]=
```

```
{149,569,989,1409,1829,2249,2669,3089,3509,3929,4349,4769,5189,5609,6029,6449,6869,7289,7709,8129,8549,8969,9389,9809,10229,10649,11069,11489,11909,12329,12749,13169,13589,14009,14429,14849,15269,15689,16109,16529,16949,17369,17789,18209,18629,19049,19469,19889,20309,20729,21149,21569,21989,22409,22829,23249,23669,24089,24509,24929,25349,25769,26189,26609,27029,27449,27869,28289,28709,29129,29549,29969,30389,30809,31229,31649,32069,32489,32909,33329,33749,34169,34589,35009,35429,35849,36269,36689,37109,37529,37949,38369,38789,39209,39629,40049,40469,40889,41309,41729,42149,42569}
```

Out[17]= {-83,-503,-923,-1343,-1763,-2183,-2603,-3023,-3443,-3863,-4283,-4703,-5123,-5543,-5963,-6383,-6803,-7223,-7643,-8063,-8483,-8903,-9323,-9743,-10163,-10583,-11003,-11423,-11843,-12263,-12683,-13103,-13523,-13943,-14363,-14783,-15203,-15623,-16043,-16463,-16883,-17303,-17723,-18143,-18563,-18983,-19403,-19823,-20243,-20663,-21083,-21503,-21923,-22343,-22763,-23183,-23603,-24023,-24443,-24863,-25283,-25703,-26123,-26543,-26963,-27383,-27803,-28223,-28643,-29063,-29483,-29903,-30323,-30743,-31163,-31583,-32003,-32423,-32843,-33263,-33683,-34103,-34523,-34943,-35363,-35783,-36203,-36623,-37043,-37463,-37883,-38303,-38723,-39143,-39563,-39983,-40403,-40823,-41243,-41663,-42083,-42503}

During evaluation of In[11]:= Mod::indet: Indeterminate expression Mod[-11843,0] encountered.

Out[18]=  
{22,17,192,425,417,193,161,121,742,557,177,661,417,165,1402,229,325,433,521,769,513,605,361,289,369,293,181,93,Indeterminate,61,3142,29,3082,3077,2842,2847,2637,2442,2427,2782,2982,1065,4097,4112,3907,4037,4562,4342,4097,3877,3662,3412,3207,3397,547,2912,3462,4172,3982,4177,3932,3717,3882,3842,3947,4277,5192,4932,4902,5227,5347,5117,4887,4687,5572,5527,6252,6927,6697,6652,6617,6392,7227,6982,7102,7407,1,8822,8597,8932,8682,8447,8372,8117,4267,7837,7597,7912,8042,7942,7722,7497}

During evaluation of In[11]:= Mod::indet: Indeterminate expression Mod[11909,0] encountered.

Out[19]=  
{9,49,97,83,194,467,596,731,161,393,1004,746,1034,1328,137,1490,1523,1547,1586,1505,1802,1838,2126,2285,2330,2492,2681,2852,Indeterminate,5,89,37,305,393,665,745,997,1237,1333,1133,1057,149,333,405,653,633,297,557,837,1097,1353,1637,1885,1817,2109,2373,2017,1533,1769,1697,1977,2233,2185,2301,2301,2121,1473,1765,1873,1697,1685,1953,2221,2465,1841,1961,1465,1009,1277,1397,1509,1773,1189,1469,1457,1297,65,333,597,413,697,969,1113,1401,182,1793,2069,1901,1881,2045,2305,2569}

Out[20]=  
{31,66,289,508,611,660,757,852,903,950,1181,1407,1451,1493,1539,1719,1848,1980,2107,2274,2315,2443,2487,2574,2699,2785,2862,2945,Indeterminate,66,3231,66,3387,3470,3507,3592,3634,3679,3760,3915,4039,1214,4430,4517,4560,4670,4859,4899,4934,4974,5015,5049,5092,5214,2656,5285,5479,5705,5751,5874,5909,5950,6067,6143,6248,6398,6665,6697,6775,6924,7032,7070,7108,7152,7413,7488,7717,7936,7974,8049,8126,8165,8416,8451,8559,8704,66,9155,9194,9345,9379,9416,9485,9518,4449,9630,9666,9813,9923,9987,10027,10066}

Out[21]=  
{1,36,259,478,581,630,727,822,873,920,1151,1377,1421,1463,1509,1689,1818,1950,2077,2244,2285,2413,2457,2544,2669,2755,2832,2915,Indeterminate,36,3201,36,3357,3440,3477,3562,3604,3649,3730,3885,4009,1184,4400,4487,4530,4640,4829,4869,4904,4944,4985,5019,5062,5184,2626,5255,5449,5675,5721,5844,5879,5920,6037,6113,6218,6368,6635,6667,6745,6894,7002,7040,7078,7122,7383,7458,7687,7906,7944,8019,8096,8135,8386,8421,8529,8674,36,9125,9164,9315,9349,9386,9455,9488,4419,9600,9636,9783,9893,9957,9997,10036}