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AS178

David Singmaster  
letter

2 pages

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Neil Sloane  
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Dear Neil Sloane,

I've just worked out some sequences that may interest you.

It is well known that the number of ways of packing a  $2 \times n$  board with dominoes is  $F_n$  where the  $F_n$  are the Fibonacci numbers.

with  $F_0 = 0$ . I believe the following are well known though I don't.

rectangle with dominoes satisfies  $f(n) = 4f(n-1) - f(n-2)$  with  $f(0) = 1$ ,  
 $f(1) = 3$ ,  $f(2) = 11$ . This sequence is in the Handbook, but you do not  
give a reference to its occurrence in this context (though I haven't  
checked the Euler reference, but it seems unlikely that he did this).  
The number of ways of packing a  $4 \times n$  rectangle with dominoes satisfies

15 16 17 18 19 20 21 22 23 24 25

28

35 32  
page 2

960, 268435436, 720, 1073741824, 840, 9216, 196608, 5184, 1260, ...

I can't remember where I got this from. Possibly by looking in Glaisher's Number-Divisor Tables.

Let  $a_1 = 1$ ,  $b_1 = 2$ ,  $a_{n+1} = a_n + b_n$ ,  $b_{n+1} = \text{least integer} > b_n$  and which is not an  $a_i$ . The sequences go:

$a_n$  1 3 7 12 18 26 35 45 56 69 83 98 114 131 151 172 194 217  
 $b_n$  2 4 5 6 8 9 10 11 13 14 15 16 17 19 20 21 22 23

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A friend gave this sequence to me, but he didn't say where it came from.

It is very close to your sequence 1042 and 355. It seems like it should

be related to Beatty and/or Wythoff, but I haven't really tried to find such a relation.

At one time I wrote down the following sequences.

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Smallest prime factor of  $n$ : 2, 3, 2, 5, 2, 7, 2, 3, 2, 11, 2, 13, 2, 3, 2, ...

These would be the first factors which cancel the corresponding number in carrying out the Sieve of Erasthenes.

Largest prime factor of  $n$ : 2, 3, 2, 5, 3, 7, 2, 3, 5, 11, 3, 13, 7, 5, 2, 17, ..

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Regards,

David Singmaster