Take Our Children To Work (2003)

Demonstration of On-Line Encyclopedia of Integer Sequences
(www.research.att.com/~njas/sequences/)

Find the next term: (see the web site if you give up!)

1. $1, 4, 9, 16, 25, 36, 49, \ldots$ [A000290] **2.** $0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, \ldots$ [A000045]

3. $4, 6, 7, 9, 10, 11, 12, 14, 15, 16, 17, 18, \ldots$ [A001690] **4.** $1, 2, 5, 12, 29, 70, 169, 408, \ldots$ [A000129]

5. $1, 2, 4, 8, 16, 22, 26, 38, 62, 74, 102, 104, 108, 116, 122, \ldots$ [A063108]

6. $1, 2, 3, 7, 43, 1807, 3263443, \ldots$ [A000058] **7.** $1, 1, 3, 1, 5, 3, 7, 1, 9, 5, 11, 3, 13, 7, \ldots$ [A000265]

8. $2, 12, 1112, 3112, 132112, 1113122112, 311311222112, \ldots$ [A006751]

9. From the *New York Times* a while back: $2, 3, 3, 5, 10, 13, 39, 43, 172, 177, \ldots$ [A019460]

10. *Chess Life* said this one defeated the world chess champion (except I bet he was not given 10 terms): $7, 9, 40, 74, 1526, 5436, 2323240, 29548570, 5397414549030, 873117986721660, \ldots$ [A007449]

11. $1, 3, 7, 12, 18, 26, 35, 45, 56, 69, 83, 98, \ldots$ [A005228]

12. $0, 1, 1, 0, 1, 0, 0, 1, 1, 0, 0, 1, 0, 1, 1, 0, 1, 0, 0, 1, 0, 1, 1, 0, 0, 1, 1, 0, \ldots$ [A010060] Find a formula!

13. $1, 2, 2, 3, 3, 4, 4, 4, 5, 5, 5, 6, 6, 6, 6, 7, 7, 7, 7, 8, 8, 8, 8, 9, \ldots$ [A001462]

14. $1, 3, 4, 6, 8, 9, 11, 12, 14, 16, 17, 19, 21, 22, 24, 25, 27, \ldots$ [A000201]

For pleasure, contemplate the following: (see the web site for more information)

15. $0, 1, 3, 4, 7, 9, 12, 13, 16, 19, 21, 25, 27, 28, 31, 36, \ldots$ [A003136]

Numbers of the form $a^2 + ab + b^2$ (distances from base station to centers of cells in hexagonal grid of cell phones, squared). Which numbers are not in the sequence?

16. $2, 4, 6, 3, 9, 12, 8, 10, 5, 15, 18, 14, 7, 21, 24, 16, 20, \ldots$ [A064413]

Start with 2. Next term is smallest number not yet seen which has a common factor with current term. After 9, next term is smallest number with a common factor with 9, so 3, 6, 9, 12, ..., and we have already seen 3, 6 and 9, so it must be 12. Show every number ≥ 2 will eventually appear!

17. $2, 3, 211, 5, 23, 7, 3331113965338635107, 311, 773, 11, 223, 13, 13367, \ldots$ [A037274]

Explanation: start with n, construct new number by writing its prime factors in order, repeat until reach a prime! For example: $4 \to 2 \times 2 = 22 \to 2 \times 11 = 211$, prime, so fourth term is 211. Do you always stop? No one knows!

Neil Sloane, AT&T Shannon Labs, Florham Park, njas@research.att.com