OTHER SMARANDACHE TYPE FUNCTIONS

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1) Let f: N ---> N be a strictly increasing function and x an element in N. Then:

a) Inferior Smarandache f-Part of x,

ISf(x) is the smallest k such that f(k) <= x < f(k+1).

b) Superior Smarandache f-Part of x,

SSf(x) is the smallest k such that f(k) < x <= f(k+1).

Particular Cases:

a) Inferior Smarandache Prime Part:
For any positive real number n one defines ISp(n) as the largest prime number less than or equal to n.
The first values of this function are (Smarandache[6] and Sloane[5]):
2,3,3,5,5,7,7,7,7,11,11,13,13,13,13,17,17,19,19,19,19,23,23.

b) Superior Smarandache Prime Part:
For any positive real number n one defines SSp(n) as the smallest prime number greater than or equal to n.
The first values of this function are (Smarandache[6] and Sloane[5]):
2,2,2,3,5,5,7,7,11,11,11,11,13,13,17,17,17,17,19,19,23,23,23.

c) Inferior Smarandache Square Part:
For any positive real number n one defines ISs(n) as the largest square less than or equal to n.
The first values of this function are (Smarandache[6] and Sloane[5]):
0,1,1,1,4,4,4,4,4,9,9,9,9,9,9,9,16,16,16,16,16,16,16,16,16,25,25.

b) Superior Smarandache Square Part:
For any positive real number n one defines SSs(n) as the smallest square greater than or equal to n.
The first values of this function are (Smarandache[6] and Sloane[5]):

0,1,4,4,4,9,9,9,9,9,16,16,16,16,16,16,16,25,25,25,25,25,25,25,25,25,36.

d) Inferior Smarandache Cubic Part:
For any positive real number n one defines ISc(n) as the largest cube less than or equal to n.
The first values of this function are (Smarandache[6] and Sloane[5]):
0,1,1,1,1,1,1,1,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,8,27,27,27,27.

e) Superior Smarandache Cube Part:
For any positive real number n one defines SSs(n) as the smallest cube greater than or equal to n.
The first values of this function are (Smarandache[6] and Sloane[5]):

0,1,8,8,8,8,8,8,8,27,27,27,27,27,27,27,27,27,27,27,27,27,27,27,27,27.

f) Inferior Smarandache Factorial Part:
For any positive real number n one defines ISf(n) as the largest factorial less than or equal to n.
The first values of this function are (Smarandache[6] and Sloane[5]):

1,2,2,2,2,6,6,6,6,6,6,6,6,6,6,6,6,6,6,6,6,6,24,24,24,24,24,24,24.

g) Superior Smarandache Factorial Part:
For any positive real number n one defines SSf(n) as the smallest factorial greater than or equal to n.
The first values of this function are (Smarandache[6] and Sloane[5]):

1,2,6,6,6,6,24,24,24,24,24,24,24,24,24,24,24,24,24,24,24,24,24,24,120.

This is a generalization of the inferior/superior integer part.

2) Let g: A ---> A be a strictly increasing function, and let "~" be a given internal law on A. Then we say that f: A ---> A is <u>smarandachely complementary with respect to the function g and the internal law "~"</u> if:
f(x) is the smallest k such that there exists a z in A so that x~k = g(z).

Particular Cases:

a) Smarandache Square Complementary Function:
f: N ---> N, f(x) = the smallest k such that xk is a perfect square.
The first values of this function are (Smarandache[6] and Sloane[5]):
1,2,3,1,5,6,7,2,1,10,11,3,14,15,1,17,2,19,5,21,22,23,6,1,26,3,7.

b) Smarandache Cubic Complementary Function:
f: N ---> N, f(x) = the smallest k such that xk is a perfect cube.
The first values of this function are (Smarandache[6] and Sloane[5]):
1,4,9,2,25,36,49,1,3,100,121,18,169,196,225,4,289,12,361,50.

More generally:

c) Smarandache m-power Complementary Function:
f: N ---> N, f(x) = the smallest k such that xk is a perfect m-power.

d) Smarandache Prime Complementary Function:
f: N ---> N, f(x) = the smallest k such that x+k is a prime.
The first values of this function are (Smarandache[6] and Sloane[5]):
1,0,0,1,0,1,0,3,2,1,0,1,0,3,2,1,0,1,0,3,2,1,0,5,4,3,2,1,0,1,0,5.

References:

[1] Castillo, Jose, "Other Smarandache Type Functions", http://www.gallup.unm.edu/~smarandache/funct2.txt
[2] Dumitrescu, C., Seleacu, V., "Some Notions and Questions in Number THeory", Xiquan Publ. Hse., Phoenix-Chicago, 1994.
[3] Popescu, Marcela, Nicolescu, Mariana, "About the Smarandache Complementary Cubic Function", <Smarandache Notions Journal>, Vol. 7, no. 1-2-3, 54-62, 1996.
[4] Popescu, Marcela, Seleacu, Vasile, "About the Smarandache Complementary Prime Function", <Smarandache Notions Journal>, Vol. 7, no. 1-2-3, 12-22, 1996.
[5] Sloane, N.J.A.S, Plouffe, S., "The Encyclopedia of Integer Sequences", online, email: superseeker@research.att.com (SUPERSEEKER by N. J. A. Sloane, S. Plouffe, B. Salvy, ATT Bell Labs, Murray Hill, NJ 07974, USA).
[6] Smarandache, Florentin, "Only Problems, not Solutions!", Xiquan Publishing House, Phoenix-Chicago, 1990, 1991, 1993; ISBN: 1-879585-00-6. (reviewed in <Zentralblatt fur Mathematik> by P. Kiss: 11002, 744, 1992; and in <The American Mathematical Monthly>, Aug.-Sept. 1991);
[7] "The Florentin Smarandache papers" Special Collection, Arizona State University, Hayden Library, Tempe, Box 871006, AZ 85287-1006, USA; (Carol Moore & Marilyn Wurzburger: librarians).