SMARANDACHE MAXIMUM RECIPROCAL REPRESENTATION FUNCTION

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ABSTRACT: Smarandache Maximum Reciprocal Representation (SMRR) Function $f_{SMRR}(n)$ is defined as follows

$f_{SMRR}(n) = t$ if

$$\sum_{r=1}^{t} 1/r \leq n \leq \sum_{r=1}^{t+1} 1/r$$

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SMRRS is defined as $T_n = f_{SMRR}(n)$

$f_{SMRR}(1) = 1$

$f_{SMRR}(2) = 3$, $(1 + 1/2 + 1/3 < 2 < 1 + 1/2 + 1/3 + 1/4)$

$f_{SMRR}(3) = 10$

$$\sum_{r=1}^{10} 1/r \leq 3 \leq \sum_{r=1}^{11} 1/r$$

SMRRS is

1, 3, 10, . . .

A note on The SMRR Function:

The harmonic series $\sum 1/n$ satisfies the following inequality

$$\log(n+1) < \sum 1/n < \log n + 1 \quad \text{-------(1)}$$

This inequality can be derived as follows
We have $e^x > 1 + x >$, $x > 0$

and $(1 + 1/n)^{(1 + 1/n)} > 1$, $n > 0$

which gives

$1/(r+1) < \log(1 + 1/r) < 1/r$

summing up for $r = 1$ to $n+1$ and with some algebraic jugallary we get (1). With the help of (1) we get the following result on the **SMRR function.**

If SMRR(n) = m then [log(m)] ≈ n - 1

Where [log(m)] stands for the integer value of log(m).

SOME CONJECTURES:

(1.1). Every positive integer can be expressed as the sum of the reciprocal of a finite number of distinct natural numbers. (in infinitely many ways.).

Let us define a function $R_m(n)$ as the minimum number of natural numbers required for such an expression.

(1.2). Every natural number can be expressed as the sum of the reciprocals of a set of natural numbers which are in Arithmetic Progression.

(1.3). Let

$\sum 1/r \leq n \leq \sum 1/(r+1)$

where $\sum 1/r$ stands for the sum of the reciprocals of first r natural numbers and let $S_1 = \sum 1/r$

let $S_2 = S_1 + 1/(r+k_1)$ such that $S_2 + 1/(r+k_1+1) > n \geq S_2$

let $S_3 = S_2 + 1/(r+k_2)$ such that $S_3 + 1/(r+k_2+1) > n \geq S_3$

and so on , then there exists a finite m such that

$$S_{m+1} + 1/(r+k_m) = n$$

Remarks : The veracity of conjecture (1.1) is deducible from conjecture (1.3) .

(1.4). (a) There are infinitely many disjoint sets of natural numbers sum of whose reciprocals is unity.

(b) Among the sets mentioned in (a) , there are sets which can be organised in an order such that the largest element of any set is smaller than the smallest element of the next set.

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