

# The ThreeKPlusOne Package

Version 42

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You can do with this package what you want.

Really.

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# Chapter 1

## The $3k + 1$ Problem

### 1.1 Theory

Let  $k \in \mathbb{N}$  be a natural number. We consider the sequence  $n(i, k), i \in \mathbb{N}$ , with  $n(1, k) = k$  and else  $n(i + 1, k) = n(i, k)/2$  if  $n(i, k)$  is even and  $n(i + 1, k) = 3n(i, k) + 1$  if  $n(i, k)$  is odd.

It is not known whether for any natural number  $k \in \mathbb{N}$  there is an  $m \in \mathbb{N}$  with  $n(m, k) = 1$ .

ThreeKPlusOne provides the function `ThreeKPlusOneSequence` (1.2.1) to explore this for given  $n$ . If you really want to know something about this problem, see [Wir98] or <http://www.ku.de/mgf/mathematik/lehrstuhlstatistik/team/dr-guenther-wirsching/> for more details (and forget this package).

### 1.2 Program

In this section we describe the main function of this package.

#### 1.2.1 ThreeKPlusOneSequence

▷ `ThreeKPlusOneSequence(k[, max])` (function)

This function computes for a natural number  $k$  the beginning of the sequence  $n(i, k)$  defined in section 1.1. The sequence stops at the first 1 or at  $n(max, k)$ , if  $max$  is given.

Example

```
gap> ThreeKPlusOneSequence(101);  
"Sorry, not yet implemented. Wait for Version 84 of the package"
```

# References

- [Wir98] Günther J. Wirsching. *The dynamical system generated by the  $3n + 1$  function*, volume 1681 of *Lecture Notes in Mathematics*. Springer-Verlag, Berlin, 1998. [4](#)

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