

# Introduction to automatic sequences

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In this minicourse we define automatic sequences, and discuss their properties, characterisations and applications.

We first define and develop the basic theory of  $k$ -automatic sequences. We give several examples of sequences which are automatic, and also describe techniques that can be used to show when a sequence is not automatic. We discuss frequencies and logarithmic frequencies of letters in automatic sequences. We describe Cobham's characterisation of automatic sequences as codings of fixed points of length- $k$  substitutions, and Eilenberg's characterisation of automatic sequences as those whose  $k$ -kernel is finite. We also discuss Cobham's theorem.

Next we specialise to the case when the sequence  $(a_k)_{k \geq 0}$  is  $p$ -automatic,  $p$  prime, and we study the characterisations of  $p$ -automatic sequences by Christol and Furstenberg. We emphasize the constructive nature of results in this area. Time permitting, we discuss applications to number theory, algebra and dynamics.

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