

## Rna motivation

RNA is made up of strands of four different bases that encode genomic information in specific ways. The bases are elements of the set  $B = \{\text{A}, \text{C}, \text{U}, \text{G}\}$ . Strands are ordered nonempty finite sequences of bases. Formally, to define the set of all RNA strands, we need more than roster method or set builder descriptions.

## Recursive sets definition

**New! Recursive Definitions of Sets:** The set  $S$  (pick a name) is defined by:

- Basis Step: Specify finitely many elements of  $S$
- Recursive Step: Give rule(s) for creating a new element of  $S$  from known values existing in  $S$ , and potentially other values.

The set  $S$  then consists of all and only elements that are put in  $S$  by finitely many (a nonnegative integer number) of applications of the recursive step after the basis step.

# Set recursive examples

**Definition** The set of nonnegative integers  $\mathbb{N}$  is defined (recursively) by:

Basis Step:

Recursive Step:

Examples:

**Definition** The set of all integers  $\mathbb{Z}$  is defined (recursively) by:

Basis Step:

Recursive Step:

Examples:

**Definition** The set of RNA strands  $S$  is defined (recursively) by:

Basis Step:  $\mathbf{A} \in S, \mathbf{C} \in S, \mathbf{U} \in S, \mathbf{G} \in S$

Recursive Step: If  $s \in S$  and  $b \in B$ , then  $sb \in S$

where  $sb$  is string concatenation.

Examples:

**Definition** The set of bitstrings (strings of 0s and 1s) is defined (recursively) by:

Basis Step:

Recursive Step:

*Notation:* We call the set of bitstrings  $\{0, 1\}^*$  and we say this is the set of all strings over  $\{0, 1\}$ .

Examples: