

# Week 9 Discussion Worksheet

## RQ 6.5

The functions *rnalen* and *basecount* from class are defined recursively and are related to RNA strands and bases.

Select all and only true statements. These statements involve more complicated quantifier nesting and logical structure.

- $\forall s \in S \exists b \in B \forall c \in B$   
 $(\text{basecount}(s, b) \geq \text{basecount}(s, c))$
- $\exists s \in S \forall b \in B \exists t \in S$
- $(\text{rnalen}(t) = \text{basecount}(s, b))$   
 $\wedge \text{basecount}(t, b) = \text{rnalen}(s)$
- $\forall s \in S \exists b \in B \forall c \in B$   
 $(\text{basecount}(s, b) \geq \text{basecount}(s, c))$
- $\forall s_1 \in S \forall s_2 \in S$
- $(\forall b \in B (\text{basecount}(s_1, b) = \text{basecount}(s_2, b))$   
 $\rightarrow s_1 = s_2)$
- $\forall s \in S$
- $(\exists b \in B (\text{rnalen}(s) = \text{basecount}(s, b))$   
 $\wedge \forall c \in B (\text{rnalen}(s) > \text{basecount}(s, c)))$
- $\exists s \in S$
- $(\forall b \in B (\text{rnalen}(s) > \text{basecount}(s, b))$   
 $\wedge \exists c \in B (\text{rnalen}(s) = \text{basecount}(s, c)))$

**Bonus: write down the negation of this statement. How does it compare with the next/final statement? Can you use this statement to evaluate the next statement?**

## RQ 8.4

Consider the function  $f : \mathbb{N} \rightarrow \mathbb{Z}$  given by

$$f(n) = \begin{cases} n \operatorname{div} 4 & \text{if } n \text{ is even} \\ -((n+1) \operatorname{div} 4) & \text{if } n \text{ is odd} \end{cases}$$

Select all and only the true statements below.

- There is an onto function with domain  $\mathbb{N}$  and codomain  $\mathbb{Z}$
- $f$  witnesses that  $|\mathbb{N}| \geq |\mathbb{Z}|$
- There is a bijection with domain  $\mathbb{N}$  and codomain  $\mathbb{Z}$
- $|\mathbb{N}| \geq |\mathbb{Z}|$
- For every pair of distinct natural numbers  $n_1 \neq n_2$ , we have  $f(n_1) \neq f(n_2)$

Select all possible options that apply.