Foundations of Computer Science (COMP109)

Tutorial VI (bring solutions between 06.11.2017 – 10.11.2017)

VI.1. Let f be the function from $\{a, b, c\}$ to $\{1, 2, 3\}$ such that $f(a) = 2$, $f(b) = 3$, and $f(c) = 1$. Is f a bijection, and if it is, what is its inverse?

VI.2. Consider the function $f : \mathbb{R} \to \mathbb{R}$ given by $f(x) = 3x$ and the function $g : \mathbb{R} \to \mathbb{R}$ given by $g(x) = x + 9$. Calculate $g \circ f$, $f \circ g$, $f \circ f$ and $g \circ g$.

VI.3. Use the pigeonhole principle to give solutions to the following problems:

(a) How many times must a single die be rolled to guarantee that some number is obtained at least twice?

(b) How many times must two dice be rolled to guarantee that the same total score is obtained at least twice?

(c) How many times must two dice be rolled to guarantee that the same total score is obtained at least three times?

VI.4. A drawer contains a dozen brown socks and a dozen black socks, all unmatched. A man takes socks out at random in the dark.

(a) How many socks must he take out to be sure that he has at least two socks of the same colour?

(b) How many socks must he take out to be sure that he has at least two black socks?