COMP 182: Algorithmic Thinking
14 January 2014

1 Sets, subsets, and permutations

1. Consider the set $A = \{1, 2, 3, 4\}$.
   (a) How many subsets of A of size 2 are there?
   (b) How many subsets of A are there?
   (c) How many permutations of the elements of A are there?
2. Now, assume the set A has n elements.
   (a) How many subsets of A of size k (where $0 \leq k \leq n$) are there?
   (b) How many subsets of A are there?
   (c) How many permutations of the elements of A are there?

2 What is the value of k?

What value does Algorithm **PrintK** print upon termination?

Algorithm 1: PrintK

Input: Integers $n_1, n_2, \ldots, n_m$ each of which is ≥ 1.
Output: None.
$k \leftarrow 0$;
for $i_1 \leftarrow 1$ **to** n_1 **do**
  for $i_2 \leftarrow 1$ **to** n_2 **do**
    .
    .
    .
    for $i_m \leftarrow 1$ **to** n_m **do**
      $k \leftarrow k + 1$;
Print k;

3 Hello World!... a gazillion times

Consider the set $A = \{1, 2, 3, \ldots, n\}$. How many times does Algorithm **HelloWorld!** print `Hello World!`?

Algorithm 2: HelloWorld!

Input: Set $A = \{1, 2, 3, \ldots, n\}$ for some integer $n \geq 1$.
Output: None.
$k \leftarrow 0$;
while $k \leq |A|$ **do**
  foreach *subset B of A of size k* **do**
    foreach *permutation of the elements of B* **do**
      Print `Hello World!`;
  $k \leftarrow k + 1$;