

# Algorithms, Summer 2019 at CIS

## Homework 2

Due: 7/22/19 before class

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1. Suppose we randomly order the numbers  $\{1, 2, \dots, n\}$ , producing a list  $a_1, a_2, \dots, a_n$ . We say that  $a_i$  is *good* if  $a_i = \text{median}(a_1, a_2, a_3, \dots, a_i)$ . What is the expected total number of good items  $a_i$ ? You can express your answer as a summation if you like.
2. True or False: given a list  $a_1, \dots, a_n$ , one can output a sorted list of the smallest  $n^{1/3}$  items in  $O(n)$  time.
3. What is an algorithm with the smallest number of comparisons you can find for outputting both the maximum and the minimum of  $n$  numbers?