Analysis of Algorithms: Solutions 1

The histogram shows the distribution of grades, from 0 to 10.

Problem 1
Write an algorithm that finds the most frequent element in an integer array $A[1..n]$; that is, your algorithm must identify the element that occurs the greatest number of times.

```
MOST-FREQUENT(A, n)
max ← 0
cost times
for i ← 1 to n
do B[i] ← TRUE
for i ← 1 to n
do if B[i]
then B[i] ← FALSE
   count ← 1
   for j ← i + 1 to n
         then B[j] ← FALSE
            count ← count + 1
   if count > max
      then max ← count
         freq ← i
   return A[freq ]
```

```
Problem 2
Estimate the worst-case running time of your algorithm.

\[
T(n) \leq c_1 + c_2(n + 1) + c_3n + c_4(n + 1) + c_5n + c_6n + c_7n + c_8 \frac{n(n + 1)}{2} + c_9 \frac{n(n - 1)}{2} + c_{10} \frac{n(n - 1)}{2} + c_{11} \frac{n(n - 1)}{2} + c_{12}n + c_{13}n + c_{14}n + c_{15} \\
= \left( \frac{c_8}{2} + \frac{c_9}{2} + \frac{c_{10}}{2} + \frac{c_{11}}{2} \right) n^2 \\
+ \left( c_2 + c_3 + c_4 + c_5 + c_6 + c_7 + \frac{c_8}{2} - \frac{c_9}{2} - \frac{c_{10}}{2} - \frac{c_{11}}{2} + c_{12} + c_{13} + c_{14} \right) n \\
+ \left( c_1 + c_2 + c_4 + c_{15} \right) \\
= \Theta(n^2)
\]