

Comments Q1. Algorithm design and performance. Most students did very well on this question and the average was c70%, with quite a few almost perfect answers.

Most tried to devise algorithms more efficient than those based on standard linear searching, some using hash methods (hash sets, hash counting, etc) or sorting. Others came up with sophisticated solutions, including the double pass Boyer-Moore algorithm for majority elements. Complexities again were mainly handled well. Marks were lost in (a) not explaining the algorithms and their correctness, (b) not showing the calculation for the complexity, (c) presenting inefficient algorithms.

Q2. Performance on this question was generally disappointing, with far too many students obtaining almost no marks.

a) Most candidates answered this well, though a few insisted on confusing merge and merge-sort---a great way of throwing away all their marks.

b) Quite a few candidates got the basic idea, but to get full marks, candidates had to indicate clearly all the key points in the argument. Few did.

c) Most got this right.

d) There were many heroic attempts to show this by induction (almost impossible, actually). Only a few brave souls pointed at that $n!$ is the product of n numbers, at least half of which are at least $n/2$.

e) Many candidates just did not get this at all. But a reasonable number did describe the tree of possible runs and make all the key points: $n!$ leaves, height $\log(n!)$, and the rest from the lower bound on $n!$

Q3. Performance on this question was far above my expectations, with many candidates gaining first-class marks. The concepts of complexity bounds and (more impressively) the sizes of numerical inputs were evidently generally well understood.

a) Many candidates had learned the exact definition. A few got the quantifiers muddled.

b) The question simply asked candidates to formulate clearly a certain relationship between an algorithm (which has many inputs of various sizes) and a set of functions of the form $O(f)$. Not so easy, as it turned out.

c) Many candidates answered this correctly.

d) Many candidates remembered this.
