Q1) This was generally well done. High marks were attained by most who attempted it.

Q2) It was only when I came to mark this question that I realised that the solution provided in the marking scheme was incorrect and that the real answer had some rather unpleasant fractions. It did not therefore have the simple fraction formulation my initial attempt had presented.

I should point out that there _is_ a feasible solution, and that the general simplex method _does_ give that answer. However, because most students did not expect such an odd answer, I decided to award marks to those students who’s first pivot operation demonstrated that they knew how to solve this sort of problem.

Mostly this half of the course was well done, and most students scored adequately on this part.

Section B
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Q3. Performance on this question seemed to be bimodal: about half the candidates gave generally sensible answers, and the rest collapsed, apparently having little idea what was expected. Even many candidates who made reasonable attempts experienced difficulty giving clear and mathematically precise formulations, especially when it came to matters such as order of quantification and direction of implication.

A) Most candidates correctly defined NP, and clearly had the correct idea. I was rather forgiving when it came to interpreting phrases such as “the algorithm decides/solves/computes P”.

B) Most candidates realized that this was a simple question with a simple answer. A few just said “SAT is in NP because …”, inserting their definition in part a) for the “…”; they got no marks for that.

C) Generally well done.

D) Also generally well done.

E) Many candidates correctly remembered the essential trick of the reduction: replace pairs of literals with a new proposition letter and add a ‘defining clause’ containing three literals. Many of those candidates gave a spirited attempt at showing the correctness of the reduction, though few gave a correct argument for both directions of the required bi-conditional.

F) A reasonable number of students gave the essentially correct solution, though quite a few made some minor slips of execution. I expected this to be a hard part of the question, as it tests candidates’ understanding of the fundamental principles, rather than recall.

Q4 Apart from one candidate, who aced it with a straight 20/20, this question was generally not well done. There were definitely some reasonable attempts, but many others were just not serious.

A) Most candidates could do this. A few people just said “Co-P is the complement class of P”: we were looking for a fuller explanation.

B) This is a question where you have to think before regurgitating. Many students blundered straight into the algorithm of Savitch’s theorem; a few others gave the depth-first-search algorithm, which is slightly closer to what is needed, but still not right.

C) This was a massacre. Very few students could see how reachability in a directed graph could be coded using propositional implications, even though it was shown in class and is clearly described in the prescribed textbooks.

D) Oddly enough, this was done slightly better. Quite a few students remembered the Immerman-Szelepcsenyi theorem. We did not expect a fully rigorous account, and were essentially just looking for the inference co-P is NL-complete, NL = NL-complete, so P is NL-complete.