

Grading Guide and Comments

Section 4.6

10. (5 marks)
1 mark for part (b), 2 marks each for the parts (d) and (e).
For every part, half of the total credit is given to answers which had “off-by-one” errors, such as $C(42,36)$ for part (b) and $C(22,16)$ for part (e). In general, all answers which demonstrated understanding of the subject matter but were only slightly incorrect were given half of the total credit.
For part (d), answers which only considered one case (2 broccoli croissants) and neglected the other 2 cases (0 and 1 broccoli croissant) were given only half a mark. Similarly, answers which considered 2 cases, but neglected 1 were given only 1 mark.
Many students understood that this was a “stars-and-bars” question, but applied the formula somewhat incorrectly; it should be highlighted that the correct formula for choosing n objects from r categories, assuming at least n objects in each category, is $C(n+r-1, n)$, *not* $C(n+r, n)$ or $C(n+r-1, r)$.
28. (5 marks)
Full credit given to any correct answer, evaluated or not ($6! / 2$ and 360 are both equally acceptable answers)
3 marks (out of 5) were given for answers which did not consider the 2 “R” alphabets.
2 marks (out of 5) were given for answers which ignored the rule that the 3 “A” alphabets must be in consecutive order.
36. (5 marks)
Full credit given to any correct answer, evaluated or not
1 mark deducted for each dimensional step not considered. (4, 3, 5, 4)
40. (5 marks)
2 marks for part (a), 3 marks for part (b)
Half of the total credit is given to answers which had “off-by-one” errors, such as $C(16,12)$ for part (a) or $16! / 3!$ for part (b).
No marks taken off for incorrect answers in part (b) due to propagation of errors from part (a). For example, if the answer in part (a) was wrong, but the answer in part (b) was obtained by multiplying the incorrect answer in part (a) with $12!$ (correct step), only marks were taken off from part (a).
No credit was given for any conceptually incorrect errors, such as 4^{12} for part (b). The question specifically states that the *ordering* of books in *each of the shelves* matters, so it would be wrong to assume that each of the twelve books has only 4 fixed choices corresponding to the 4 different shelves.

Grading guide sections 5.1

A TOTAL OF 20 points possible

#8

Max: 6 points.

2 points for each of a) b) c)

Either it was correct or it was not.

There were cases where an initial mistake caused each answer to be wrong. For instance the 1.3 % were interpreted as 0.0013 or 1.3 instead of 0.013. In this case one point was deducted from the entire problem rather than from each of a), b) and c)

#24

Max: 6 points

a,b,c were given a maximum of 2 points each.

Getting a) correctly was crucial to getting the rest correct. If there was some reasonable argument in a) 1 point was given. The initial conditions depended on the answer in a) and if they were consistent with the analysis in part a) they received at least one point. For c) again, a solution consistent with a formula in a) received at least 1 point. 2 points if the end result was correct. Thus 3 points were given for a noble attempt. 6 points for a correct solution.

#44

Max: 4 points

1 point was given to solutions that simply stating a formula (but incorrectly)

2 were given if there was a reasonable attempt to guess the formula but the result was not correct.

3 if the solution was right, but in terms of more than one variable. (The hint indicated to look at n as 2^{m+k} and so formulas that used m and k instead of just n , while not entirely wrong, were of the wrong format). Also if the attempt was made to convert it to an expression just in terms of n but there was a minor flaw (like ceiling instead of floor was for the log, or a minus sign was replaced by a mod operation) 3 points were given

4 were given for a correct solution

#46

Max: 4 points.

2 were possible at most if the answer to 44 was wrong.

There would be no way they could get 46 right. But if there was a clear attempt

to consider all cases in the proof, 2 points were given.
Otherwise,
Base case: 1 pt.
even and odd case in the inductive proof were worth 1.5 each.

Grading guide sections 5.5, 5.6

5.5 - 6. 6 pts total, 2 pts each part. Minor computation errors –1 pt. Otherwise all or nothing.

5.5 – 24. 4 pts total. Having something with the right form but wrong answer gets 2 pts. Having something with the right form and intermediate results are mostly right gets 3 pts.

5.6 – 6. 5 pts total. Having the right form gets 2 pts. Having the right form but significant counting errors gets 3 pts. Having the right form with minor calculation errors gets 4 pts.

5.6 – 26. 5 pts total. Up to 4 pts if result is wrong but work is heading in the right direction.