COT 3100 Exam 2 – Graders' General Feedback

Page 1 (Robinson Vasquez) (Class Average = 83.4% for the page)
The most common mistakes were the following:

Question 1:

1) Students would get 40 as their answer since they would just consider the number of days it took but not what day it started.

2) Even though it was not a mistake in this problem some students would say that the amount of particles is 4^20(1-r)^(d-1), where r is the rate but if r wasn't 1/2 that wouldn't work.

3) there was a student that did half-life but used -1/2 as the k

4) there was a student that multiplied 4 20 times and made a line in the middle to get 4^10, thinking that was cutting in half.

5) Also some students tried to get the answer by just going though each step and see the pattern which is not bad but it's better to set up the formal equation as shown in the solution.

6) Some students didn't do enough work to justify their answer.

Question 2:

1) Some people tried to do induction but just proving when the difference between m and n is since they would so like base case m=2 and n=1 then assume for some m=k and n=j and then try to prove it for m=k+1 and j=k+1.

2) There was a student that got that c/b is (m^2 + n^2)/ 2mn and tried to equate the nominators and the denominators.

3) There we some students that tried to prove only that m has to be greater than n.

Page 2 (Sahar Hooshmand) (Class Average: 81/5%)
Most of the answers were correct and many students did a good job for this question. However, I list some common mistakes:

1. Some students had lots of mistake in algebra of the extended algorithm. So their whole calculation became wrong and they missed some points
2. Some students used the numbers 170 and 386 .
3. While using the offsets some of them just flipped the order.
4. There are a few students who did not apply the Euclidean Algorithm. They just solve x in term of y and solved y in term of x. I made a comment for them and explained that they should use Euclidean Algorithm.

Page 3 (John Stoner) (Class Average: 77.9%)
Overall, the students did well on this question.

Part a:
Most students answered this part correctly, and the errors seemed to be mostly due to inattention like writing down the wrong number. Some took the prime factorization of 6,131,520, even after writing down that the number was 6^13 * 5^20, strangely enough. There were a few who did not factor the 6 and 15 into the primes 2, 3, and 5.

Part b:
Nearly every student who answered part a correctly answered this part correctly. There were very few off-by-1 errors, and those who did not answer part (a) correctly had an incorrect answer for part (b).

Part c:
Many students answered this part correctly, making some reference to the fact that the powers of the prime divisors must be even either symbolically or in words. There were many more off-by-1 errors in this part, as students tried a variety of division approaches on the previously found powers. Common errors of this type were taking the floor of each exponent divided by 2 which yields 6 x 16 x 10, and taking the ceiling which yields 7 x 17 x 10.

The next most common error was students only counting possible powers not if they were even, but only if they were powers of 2 or perfect squares themselves. This caused them to reach much smaller answers.

Some students also broke their answer to part b (14 x 34 x 21) into (2^2 * 7^2 * 3 * 17), and they took that to mean n only had two square divisors.

Page 4 (Alec Kerrigan) (Class Average: 90.3%)

As for problem 5, there really isn't much to say. Well over 85% of students got full credit. The ones that didn't did one of two things

a: Didn't do induction hypo/induction step and just went straight to algebra, indicating they didn't really understand induction.

b: Just straight from the induction hypothesis to the final answer, indicating they didn't know the process and wanted to get as much partial credit as possible. (which is fine!)

There were some people in the b set who did break up the sum correctly and substituted in induction hypothesis, but then just jumped to the answer as well.

Page 5 (Arup Guha) (Class Average: 69.1%)

The most common errors were as follows:

1) Some students used n = 2 as the base case instead of n = 1. n = 1 must be used because the prompt asks the user to prove the claim for all positive integers. Students who used n=2 erroneously looked at the definition of the Fibonacci numbers (the recurrence is valid for integers n>1) which has nothing to do with which set of numbers we are supposed to prove the claim.

2) Some students didn't fully specify the inductive hypothesis or omitted words. Something like the following should be written:

"Assume for an arbitrarily chosen positive integer k that, $\begin{bmatrix}1 & 1\\ 1 & 2\end{bmatrix}^k = \begin{bmatrix}F(2k-1) & F(2k)\\ F(2k) & F(2k+1)\end{bmatrix}$"

Some students skipped the words, which they shouldn't have and others just wrote, "Assume the statement is true for n = k", or something of that nature. Either way, this is a step that can't be written in short-hand.

3) Some students didn't fully specify the inductive step. You must FULLY write out what needs to be proved without attempting to start the proof. You must write:

"We must prove for n = k+1 that $\begin{bmatrix}1 & 1\\ 1 & 2\end{bmatrix}^{(k+1)} = \begin{bmatrix}F(2k+1) & F(2k+2)\\ F(2k+2) & F(2k+3)\end{bmatrix}$"

It makes sense if students had an extra step to get to the final RHS here.

4) Students skipped too much algebra in the last step. They went from F(2k-1)+2F(2k) directly to F(2k+2), and also went directly from F(2k)+2F(2k+1) directly to F(2k+3). At a minimum one intermediary step must be shown here. There's too much algebra to move directly between the two. Students automatically lost three points if they did this, no matter what."

Page 6 (Justin Rehg) (Class Average: 83.0% for the page)

Feedback for Problem 7: Almost every student got this one right. The only error I saw was someone dividing by 5.

Feedback for Problem 8: Most students got this right. The most common error I saw was only having 8!

Feedback for Problem 9: For this problem I saw many students attempt this incorrectly one of two ways. The more common error I saw was getting most of the way through the problem, but missing the ordering of the vowels. So they would be missing a * 3.

I also saw a lot of incorrect simplification, but if they had the original set up right (with ncr and factorials) I didn't take points off.

The other common error I saw was them finding one or 2 components, for example finding the number of ordering the consonants and only subtracting that from the answer to number 8. This usually led to a lot of answers sitting around 9000 range.

There were a lot of students who also did not show work on these problems, I figured as long as they got the numbers right I could still award credit but it was harder to award partial credit when there was less work.

Page 7 (Patrick Caughy) (Class Average: 56.3% for the page, 44.2% for Question 10)

1. Some students looked at the problem as 11 or 10 separate choices, sometimes binary choices, sometimes counting how many options each choice had. This doesn't work because the choices are dependent on previous ones, not independent.
2. Many students must have read the question wrong because they assumed that it had to be in alternating order, or couldn't be in alternating order. It's possible the word "merge" was too confusing.
3. Some students tried to use combinations or permutations with repetition, but didn't account for the number of students in each line.
4. Some students used just 11! or 5!6! or either of those divided or multiplied by 2.

General Feedback

The class average for the exam was 78.4%, which is much, much higher than it would have been had the exam been given in class under normal circumstances. Invariably, this semester, there will be some natural grade inflation in all classes. I do think that the extra time and resources probably helped some students learn more while taking this exam than they would have learned otherwise.

In this sort of system, it's really up to students to police themselves in terms of learning. There's some opportunity to learn even more than what one would have learned under normal circumstances and there's also opportunity to skate by with good grades without learning much. In time, greater effort put forth now will pay dividends later.

The two lowest question by question averages (and this was expected) were the matrix question which required some algebra with Fibonacci numbers and the last counting question, which required students to view the problem in a different way than the multiplication principle, which many student gravitate towards without realizing its flaw. Remember to write things out fully, especially in this format where you have plenty of time and copy paste available. Also, remember to double check that you're turning in the right thing to the right turn in.