Comments on Exam 1, Spring 2009

Below are some comments on common mistakes that were made on some of the problems.

Problem 2: Some people confused sets and their cardinalities in their writing. It is important to be careful when writing mathematics for several reasons:

"sloppy writing" often leads to mathematical mistakes;

using incorrect notation makes your work harder for someone else to read and understand.

Problem 5: This problem asks for the numbers of certain kinds of sequences of tosses, not for probabilities. Please read the questions carefully and answer the question which is being asked.

Problem 6: Several people said that $P(E \cap F) = P(E)\,P(F)$, but E and F are not independent. This multiplication formula only holds for independent events; in fact, it is the definition of independence.

Problem 7: Several people confused "independent events" with "mutually exclusive events." Please make sure that you understand the difference.

Problem 8 (and others): You should delay rounding results as long as possible – to the end if possible. If you must round intermediate results, keep as much accuracy as possible, preferably as much as your calculator displays. Every time you round you are introducing error in your answer, and if you then sum or multiply these rounded numbers, the errors grow, both in magnitude and, especially after multiplication, as a percentage of the correct answer; this is known as ***Propagation of Error***. One student rounded probabilities to two decimal places and, as a result, was off by 15% in $E(Y)$. Such errors would be disastrous in practice (such as when calculating insurance policy premiums).

Problem 9: Two serious errors were made by some people. Some said that $E(Y^2) = [E(Y)]^2$ (the expectation of the square of Y is the square of its expectation) and others said that $E(Y^2) = V(Y)$. Both are false (except coincidentally or in special cases). You need to calculate $E(Y^2)$ either directly using the summation definition (which will be an integration definition for continuous random variables) or by using the computing formula for the variance (unless you have some additional information in a particular problem).