

**Problem Set 10      Foundations      Due 4/29/2011**

Each problem is worth 5 points. Clear and complete justification is required for full credit. You are welcome to discuss these problems with anyone and everyone, but must write up your own final submission without reference to any sources other than the textbook and instructor. Submissions must be on clean paper with no ragged edges.

1. A standard die is tossed twice. What is the probability that the second roll is higher than the first?
2. A coin is tossed 3 times. What is the probability of all three tosses being heads if you know that at least one of the tosses came up heads?
3.  $\forall y \in N, 0 + y = y + 0.$
4.  $\forall x, y \in N, x + y = y + x \Rightarrow x' + y = y + x'.$
5.  $\forall x, y \in N, x + y = y + x.$
6. Using the definition of  $S(A)$  from section 5.4, write  $S(\emptyset)$ ,  $S(S(\emptyset))$ ,  $S(S(S(\emptyset)))$ , and  $S(S(S(S(\emptyset))))$  explicitly. How many elements are in each of these sets?
7. With the understanding that  $0' = 1$  and  $1' = 2$ , where these are elements of a Peano system, show that  $2 + 2 = 4.$

