Assignment 1

Due Wednesday, September 12

Exercises: (P = Problems, TE = Theoretical Exercises)

Chapter 1: P 1, 8(d), 10*, 12, 19*, 26, 27, 28*, 31*, 33

TE 2, 8, 10*, 18, 20, 22*

*Problems marked with an asterisk will be collected and graded.

Writing up solutions: In all these problems—and in problems on future assignments—you must *explain your reasoning clearly.* In a typical simple counting problem you make a series of choices; your answer should tell me what those choices were and what factor each contributed to the solution. Don't be excessively wordy, but say enough so that I can see that you know where each part of your answer came from. You might say something like this:

> First choose five footballs in $\binom{7}{5}$ ways, then choose five helmets in $\binom{11}{5}$ ways, and then pair up helmets with footballs in 5! ways, leading to
>
> $$\binom{7}{5}\binom{11}{5}5! = \frac{7!\,11!}{2!\,6!\,5!}$$
>
> total possible pairings.

By the way, it is OK to leave your answer in the first, unsimplified, form above, although if there are some simplifiyng cancellations, it is nice to show them, as we did in the second form above. But it is not OK *only* to give the final total number.

Hints:

P 28, 31: Blackboards are indistinguishable; teachers are not (at least, so we teachers like to believe). If you have trouble getting started in problems like these, it may help to think first about smaller numbers—say, 3 teachers among 2 schools—where you can look at the cases explicitly.

TE 10. The answers are given, of course. What you must supply is *clear* explnations of where they come from.

TE 18. Try to do this both from the formula (page 11) for the multinomial coefficient and by counting ways of dividing n objects into r groups of size $n_1, \ldots, n_r$; for the latter approach, understand the right hand side by first deciding into which group to put object number 1.

TE 21. Count out a few simple cases by hand to get a feel for what is going on—e.g., $n = 2$, $r = 3$ and $n = 3$, $r = 2$. Remeber that in calculating mixed partial derivatives the order of differentiation does not matter!