CHAPTER 1

We thank Professor Junro Sato of Kochi University for pointing out an error in Definition 1.1(i).

Definition 1.1 (i) A function $f$ is said to be one-one if $x, y \in X$ satisfies $f(x) = f(y)$ then $x = y$.

Example 1.27 The argument - and hence the diagram (Figure 1.3) - are wrong. We are grateful to Professor Dave Bayer of Barnard College, Columbia University for pointing this out. The problem is that: $(\binom{r}{k}(r-k)!$ does count the permutations with $k$ fixed points, but with replications. His ingenious solution is that there are: $(\binom{r}{k}(r-k)!$ permutations with $k$ marked fixed points, and possibly other, unmarked fixed points. In using the inclusion and exclusion principle the unmarked fixed points are also sieved out.

Another argument is as follows: there are $r!$ permutations of $r$ objects. Let $\alpha_k$ be the set of permutations that leave the $k$th object fixed. Then $\sum_i \#(\alpha_i)$ is made up of terms in which 1 element is fixed and those remaining may be permuted: $\sum_i \#(\alpha_i) = (r-1)! + (r-1)! + \cdots + (r-1)! = (\binom{r}{1}(r-1)!.$

Similarly, $\sum_{i \neq j} \#(\alpha_i\alpha_j)$ is made up of terms in which 2 elements are fixed and those remaining are permuted: $\sum_{i \neq j} \#(\alpha_i\alpha_j) = (r-2)! + (r-2)! + \cdots + (r-2)! = (\binom{r}{2}(r-2)!$ and so on. Then by the principle of inclusion and exclusion, the number of permutations with no fixed points is $d_r = r! - (\binom{r}{1}(r-1)! + (\binom{r}{2}(r-2)! - \cdots = \sum_{k=0}^{r} (-1)^k \binom{r}{k}(r-k)!$. (1.1) This is the required explicit expression for derangements.

Chapter 2

Example 2.2 In part (ii) the + sign on the left should be - so the solution starts: $(2 - 3z)^{-7} = 2^{-7}(1 - \frac{3z}{2})^{-7} = \cdots$.
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