

## Math 205 — Homework 1 Solutions

**23.** Each way of shooting the target in the specified way corresponds to a string consisting of 4 (indistinguishable) Rs, 3 Ws, 2 Gs, and 3 Bs. Let

- $T_I$  be the task of arranging a collection of 4 indistinguishable Rs, 3 Ws, etc.,
- $T_D$  be the task of arranging a collection of 12 distinguishable letters,
- $T_R$  be the task of arranging a collection of 4 distinguishable Rs,
- $T_W$  be the task of arranging a collection of 3 distinguishable Ws,
- $T_G$  be the task of arranging a collection of 2 distinguishable Gs, and
- $T_B$  be the task of arranging a collection of 3 distinguishable Bs.

Then  $T_D = T_I \& T_R \& T_W \& T_G \& T_B$ . Furthermore, we know that there are

- $12!$  ways to perform  $T_D$ ,
- $4!$  ways to perform  $T_R$ ,
- $3!$  ways to perform  $T_W$ ,
- $2!$  ways to perform  $T_G$ , and
- $3!$  ways to perform  $T_B$ ,

and so  $12! = N_I 4! 3! 2! 3!$ , where  $N_I$  is the number of ways to perform task  $T_I$ . Therefore  $N_I = \frac{12!}{4! 3! 2! 3!}$ .