

# Exercise to Submit Week 2

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## 1

We search for all the ways to build a word containing two a's, one b and one c.

It is clearly given by  $\frac{4!}{2!} = 12$ .

This clearly determines the coefficient of  $a^2bc$ .

## 2

We first calculate the probability that all the boys have a different number, then we calculate the probability that at least two girls have the same number and finally we can multiply these probabilities. There are  $80 \cdot \dots \cdot 70$  ways for the boys to choose 10 different numbers for [80] and there are  $80^{10}$  for them to choose different numbers. Hence the probability for this event is

$$P(\text{All boys have different numbers}) = \frac{80 \cdot \dots \cdot 70}{80^{10}}$$

To calculate the probability that at least two girls have the same number we first calculate the probability that all girls have different numbers.

This probability is given by

$$P(\text{All girls have different numbers}) = \frac{80 \cdot \dots \cdot 65}{80^{15}}$$

Now, the probability that at least two girls have the same number is given by

$$P(\text{At least two girls have the same number}) = 1 - P(\text{All girls have different numbers})$$

We can now calculate the probability demanded in the exercise which gives

$$\begin{aligned} P(\text{Both events}) &= P(\text{At least two girls have the same number}) \cdot P(\text{All boys have different numbers}) \\ &= \frac{80 \cdot \dots \cdot 70}{80^{10}} \cdot \left(1 - \frac{80 \cdot \dots \cdot 65}{80^{15}}\right) \end{aligned}$$