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 the 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 $80 \cdot \ldots \cdot 70$ 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

$$P(\text{ All boys have different numbers }) = \frac{80 \cdot \ldots \cdot 71}{80^{10}}$$

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

$$P(\text{ All girls have different numbers }) = \frac{80 \cdot \ldots \cdot 66}{80^{15}}$$

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

$$\begin{aligned} P(\text{ Both events }) &= P(\text{ At least two girls have the same number }) \cdot P(\text{ All boys have different numbers }) \\ &= \frac{80 \cdot \ldots \cdot 71}{80^{10}} \cdot \left(1 - \frac{80 \cdot \ldots \cdot 66}{80^{15}}\right) \simeq 0.419 \end{aligned}$$