

Mathematics 2602

Quiz 4

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1. You have twenty-four different books written in English, French, Dutch, and Yiddish. You have five English books, three French books, six Dutch books, and ten Yiddish books. In how many ways can you select ~~ten~~^{nine} books from your shelf if you must select at least two from each language?

Pick 2 from each language, then pick a ninth from the remaining 16.

Then divide by 3 from overcounting

ie. you want $E_1 E_2 F F D D Y Y E_3$

to be the same as: $E_1 E_3 F F D D Y Y E_2$

and $E_2 E_3 F F D D Y Y E_1$

$$\text{So total} = \frac{\binom{5}{2} \binom{3}{2} \binom{6}{2} \binom{10}{2} \cdot 16}{3} = 108000$$

Alternatively: break it up into 4 cases:

case 1: 3 English books: $\binom{5}{3} \binom{3}{2} \binom{6}{2} \binom{10}{2}$

case 2: 3 French books: $\binom{5}{2} \binom{3}{3} \binom{6}{2} \binom{10}{2}$

case 3: 3 Dutch books: $\binom{5}{2} \binom{3}{2} \binom{6}{3} \binom{10}{2}$

case 4: 3 Yiddish books: $\binom{5}{2} \binom{3}{2} \binom{6}{2} \binom{10}{3}$

$$\text{total} = \text{case 1} + \text{case 2} + \text{case 3} + \text{case 4} = 108000$$