

Archie Math - S6C

Exercises in Combinatorics - v0.5

Exercises 1 and 2 from “Exercises in Combinatorics v0.5”.

You can find the document on Archie, under Resources.

Try to explain your reasoning and your answers to the best of your ability.

For your convenience, I am including exercises 1 and 2 here, too.

1. We have 10 numbered white books $1-10$, $(W_1, W_2, \dots, W_{10})$ and ten numbered black books $(B_1, B_2, \dots, B_{10})$. In how many ways can we place them on a shelf:
 - (i) with no restrictions?
 - (ii) if the 10 first books have to be white?
 - (iii) if books of the same color cannot be adjacent?
 - (iv) if the books W_1, W_2 and W_3 have to be adjacent?
 - (v) if all the even-numbered books have to be before the odd-numbered books?

2. Abel is creating a 4-digit pin code for his phone. How many different such codes can he create:
 - (i) with no restrictions?
 - (ii) if no digit is repeated?
 - (iii) if no digit is repeated and the 2nd digit of the code is ‘0’?
 - (iv) if no digit is repeated and the digits appear in decreasing order?
 - (v) if no digit is repeated and the code has to have the digits ‘3’ and ‘9’?