Data Science in Aerospace

Combinatorial Analysis

Latest Update: *23rd February, 2026, 22:10*

1 Flight Scheduling

Consider a fleet of 23 different aircraft models, $A = \{a, b, c, \ldots, v, x, z\}$.

- How many unique 5-aircraft flight schedules can be formed such that the first and last aircraft in the schedule are distinct jet models (vowels: $\{a, e, i, o, u\}$), and the remaining three aircraft are distinct propeller models (consonants)?

$$5 \times 18 \times 17 \times 16 \times 4 = 97920$$

$$P(5, 2) \times P(18, 3) = 97920$$

2 Pilot Scheduling

An airline has 8 types of aircraft and 7 types of flight routes. Each pilot is assigned a schedule that includes 3 different aircraft and 2 different routes.

- How many distinct schedules can be created?

$$C(8, 3) \times C(7, 2) = 1176$$

3 Flight Number Assignment

- How many unique flight numbers, which are even and have no repeated digits, can be assigned to flights departing from an airport, if the flight numbers must be between 20000 and 70000?

$$1 \times 8 \times 7 \times 6 \times 4$$
$$+1 \times 8 \times 7 \times 6 \times 5$$
$$+1 \times 8 \times 7 \times 6 \times 4$$
$$+1 \times 8 \times 7 \times 6 \times 5$$
$$+1 \times 8 \times 7 \times 6 \times 4 = 7392$$

4   Committee Selection

A group of 11 individuals consists of 4 pilots and 7 flight attendants. How many committees of 5 members can be formed under the following conditions:

- There are no restrictions on the selection of members.

$$C(11,5) = 462$$

- The committee must include exactly 2 pilots.

$$C(4,2) \times C(7,3) = 210$$

- The committee must include at least 3 flight attendants.

$$C(7,3) \times C(4,2) + C(7,4) \times C(4,1) + C(7,5) \times C(4,0) = 371$$

- A specific pilot and a specific flight attendant cannot serve on the committee simultaneously.

$$C(11,5) - (C(2,2) \times C(9,3)) = 378$$

5   Aviation Seating Problem

Ten seats are aligned in a row on an airplane.

- In how many ways can seven passengers be seated in seven of these seats such that no two empty seats are adjacent?

$$C(10,3) - (6 \times 7 + 7 + 7 + 8) = 56$$

$$56 \times 7!$$

6   Task Distribution

- Find the number of ways to assign 10 tasks to a group of pilots such that 2 tasks are assigned to Pilot A, 3 tasks are assigned to Pilot B, and 5 tasks are assigned to Pilot C.

$$C(10,2) \times C(8,3) \times C(5,5) = 2520$$