

Tarea 7:

In this notebook we will proof that at least 3 people will have the same amount of hair.

Assumptions:

- There are 900,000 individuals
- Every individual has a hair count between 50,000 and 200,000

This is easy an easy proof (pigeon hole principle):

There are more objects (actual number of individuals) than "containers" (Amount of hair they can have)

$$900,000 > 2 * (200,000 - 50,000 + 1)$$

$$\Leftrightarrow 900,000 > 2 * 150,001 \Leftrightarrow 900,000 > 300,002$$

Let's run a short simulation to test this.

```
def find_three_with_same_count(num_people=900000, min_hair=50000,
                               max_hair=200000):
    import random
    from collections import Counter

    # 1. Generate random hair counts
    possible_counts = range(min_hair, max_hair + 1)
    assigned_counts = [random.choice(possible_counts) for _ in
                        range(num_people)]

    # 2. Count occurrences of each hair-count
    counter = Counter(assigned_counts)

    # 3. Check if any hair count appears at least three times
    for hair_count, c in counter.items():
        if c >= 3:
            # We found at least one hair-count shared by three or more
            # people
            print(f"Hair count {hair_count} is held by {c} people. We
                  only needed 3 to prove the point!")
            return

    print("No hair count had 3 or more people (which should be
          extremely unlikely).")

if __name__ == "__main__":
    find_three_with_same_count()
```

Hair count 159210 is held by 9 people. We only needed 3 to prove the point!

