To calculate the **Simple Matching Coefficient (SMC)** and **Jaccard Coefficient** between two binary variables $P$ and $Q$, let's first define how these metrics work.

## 1. Simple Matching Coefficient (SMC)

The **Simple Matching Coefficient** measures the proportion of matches (both 1s and 0s) between two binary variables.

**Formula:**

$$\text{SMC} = \frac{(a + d)}{(a + b + c + d)}$$

# Where:

- $a$: The number of times both $P$ and $Q$ are 1 (True Positive)
- $d$: The number of times both $P$ and $Q$ are 0 (True Negative)
- $b$: The number of times $P$ is 1 and $Q$ is 0 (False Negative)
- $c$: The number of times $P$ is 0 and $Q$ is 1 (False Positive)

### 2. Jaccard Coefficient

The **Jaccard Coefficient** measures the similarity between two sets, focusing only on the 1s.

**Formula:**

$$\text{Jaccard} = \frac{a}{(a + b + c)}$$

# Where:

- $a$: The number of times both $P$ and $Q$ are 1 (True Positive)
- $b$: The number of times $P$ is 1 and $Q$ is 0 (False Negative)
- $c$: The number of times $P$ is 0 and $Q$ is 1 (False Positive)

## Values from $P = (1, 1, 1, 1, 0, 1)$ and $Q = (1, 0, 0, 1, 1, 0)$:

| $P$ | $Q$ | Matches (1-1 and 0-0) |
|-----|-----|-----------------------|
| 1 | 1 | $a = 1$ |
| 1 | 0 | $b = 1$ |
| 1 | 0 | $b = 1$ |
| 1 | 1 | $a = 1$ |
| 0 | 1 | $c = 1$ |
| 1 | 0 | $b = 1$ |

**Counts:**

- $a = 2$ (both P and Q are 1)
- $b = 3$ (P is 1, Q is 0)
- $c = 1$ (P is 0, Q is 1)
- $d = 0$ (both P and Q are 0)

## Simple Matching Coefficient (SMC):

$$\text{SMC} = \frac{(a+d)}{(a+b+c+d)} = \frac{(2+0)}{(2+3+1+0)} = \frac{2}{6} = 0.333$$

## Jaccard Coefficient:

$$\text{Jaccard} = \frac{a}{(a+b+c)} = \frac{2}{(2+3+1)} = \frac{2}{6} = 0.333$$

## Conclusion:

- **Simple Matching Coefficient (SMC)** = 0.333
- **Jaccard Coefficient** = 0.333

Both coefficients result in the same value in this case because there are no cases where both $P$ and $Q$ are 0, thus no true negatives.