How high is the probability that in a group of 4 people EXACTLY 2 of them have their birthday on the same day?

We consider a variation problem and number them from 1 to 4.

☑ Use product rule for the following 3 substeps:

substep1: How many possibilities exist to place the pair (with the same weekday)?

→ Combination w/o-rep. We choose 2 positions out of the set of positions $\{1, 2, 3, 4\}$.

So, $\binom{4}{2} = 6$

substep2: fill the pair-position with one of the $\underline{7}$ weekdays.

substep3: fill the rest of the positions with the other weekdays. Two positions are left. So, $6 * 5 = 30$

In total: $6 * 7 * 30 = 1260$ desired events

$7^4 = 2401$ all events

Laplace: $P(\text{„Exactly one pair"}) = \frac{\text{desired events}}{\text{all events}} = \frac{1260}{2401}$

$= 52,478\%$