Finding your Birthmate:

How many strangers do you need to ask to have a 50-50 chance to find someone with the same birthday as yours?

\[ E = \bigcap_{i=1}^{n} E_i \text{ where } E_i = "i^{th} \text{ stranger is your Birthmate"} \]

- \( E_i \) are independent,
- \( P(E_i) = \frac{1}{d} \), where \( d = 365 \).

\[
P(E^c) = P\left( \bigcap_{i=1}^{n} E_i^c \right) \text{ (de Morgan)}
\]

\[
= \prod_{i=1}^{n} P(E_i^c) = \left(1 - \frac{1}{d}\right)^n \quad \text{(stability of independence \( \Rightarrow \))}
\]

\[
= (1 - \frac{1}{d})^n = \left(1 - \frac{1}{d}\right)^{\frac{n}{d}}
\]

\[
\approx e^{-\frac{n}{d}} = \frac{1}{2} \quad \text{(50-50 chance)}
\]

Solve for \( n \Rightarrow \)

\[
n = d \ln 2 \approx 253 \quad \text{Answer.}
\]

Remark: The approximation is very accurate; \( n = 253 \) gives

\[ 0.5005 - 0.4995 \text{ chance.} \]