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## Quiz 2

1. A die is rolled 4 times. What is the probability that 6 comes up at least once?

$$1 - \left(\frac{5}{6}\right)^4 = 1 - \frac{625}{1296} = \frac{671}{1296}$$

2. If there are 12 people in a room, what is the probability that no two of them celebrate their birthday in the same month?

$$\frac{12!}{12^{12}}$$

3. Prove that  $P(E \cap F^c) = P(E) - P(E \cap F)$ .

$$\begin{aligned} P(E) &= P(E \cap S) \\ &= P(E \cap (F \cup F^c)) \\ &= P((E \cap F) \cup (E \cap F^c)) \\ &= P(E \cap F) + P(E \cap F^c) \end{aligned}$$

↖ then subtract this over

4. What is the probability that at least one of a pair of fair dice lands on 6, given that the sum of the dice is 7?

$$E = \text{at least one die is 6}$$

$$F = i + j = 7$$

$$P(E|F) = \frac{P(E \cap F)}{P(F)} = \frac{2/36}{6/36} = \boxed{\frac{1}{3}}$$