

When you roll two dice, we define our sample space as the result of the first die roll and the sum of both dice.

$$\Omega = \{(\text{first die roll}, \text{sum of dice})\}$$

Define event A as:

$$A = \{\text{first die roll is 2, sum of dice is 7}\}$$

Let X_1 and X_2 be random variables representing the outcomes of the first and second dice, respectively. The sum is represented as $X_1 + X_2$.

We are interested in computing the conditional probability,

$$P(A) = P(X = 2 \mid X_1 + X_2 = 7)$$

Using the definition of conditional probability,

$$P(X = 2 \mid X_1 + X_2 = 7) = \frac{P(X = 2 \cap X_1 + X_2 = 7)}{P(X_1 + X_2 = 7)}$$

We first find all outcomes such that $X_1 + X_2 = 7$:

$$\{(1, 6), (2, 5), (3, 4), (4, 3), (5, 2), (6, 1)\}$$

Of these six outcomes, only one has $X_1 = 2$, namely $(2, 5)$.

So:

$$P(X = 2 \mid X_1 + X_2 = 7) = \frac{1}{6}$$