

Homework 4.5: Independence

1. Two dice, one red and one green, are rolled. Define the events

A : the red die lands on a 3, 4, or 5

B : the sum of the two dice is 9

- Compute $P(A | B)$.
- Compute $P(B | A)$.
- Are A and B independent events? Justify your answer.

2. Recall that three events A , B , and C are *independent* if

$$\begin{aligned} P(A \cap B) &= P(A) \cdot P(B) \\ P(B \cap C) &= P(B) \cdot P(C) \\ P(A \cap C) &= P(A) \cdot P(C) \end{aligned} \tag{1}$$

and

$$P(A \cap B \cap C) = P(A) \cdot P(B) \cdot P(C) \tag{2}$$

- Two dice, one red and one green, are rolled. Define the events

A : the red die lands on a 1, 2, or 3

B : the red die lands on a 3, 4, or 5

C : the sum of the two dice is 9

Do these three events satisfy (1)? Do they satisfy (2)?

- A roulette wheel has thirty-six numbers colored red or black according to the pattern indicated below:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
R	R	R	R	R	B	B	B	B	R	R	R	R	B	B	B	B	B
36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19

Define the events

A : red number appears

B : even number appears

C : number is less than or equal to 18

Do these three events satisfy (1)? Do they satisfy (2)?