

What properties should a probability measure have?

Lessons from a frequentist's view of chance

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Sum of face values of a pair of dice: 50 throws

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Sum of face values of a pair of dice: 50 throws

7	5	4	6	3	7	9	7	6	2	8	8	6	6	10	11	2	8	6	8	2	8	7	6	9	8	6	12	7	7	9	8	11	3	10	4	10	4	4	7	5	10	3	6	9	8	5	10	9	6
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Lessons from a frequentist's view of chance

Sum of face values of a pair of dice: 50 throws

7 | 5 | 4 | 6 | 3 | 7 | 9 | 7 | 6 | 2 | 8 | 8 | 6 | 6 | 10 | 11 | 2 | 8 | 6 | 8 | 2 | 8 | 7 | 6 | 9 | 8 | 6 | 12 | 7 | 7 | 9 | 8 | 11 | 3 | 10 | 4 | 10 | 4 | 4 | 7 | 5 | 10 | 3 | 6 | 9 | 8 | 5 | 10 | 9 | 6

Sample space: $\Omega = \{2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$

Win: $A = \{7, 11\}$

Lose: $B = \{2, 3, 12\}$

Win or lose: $A \cup B = \{2, 3, 7, 11, 12\}$

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Sum of face values of a pair of dice: 50 throws



Frequency of occurrence: $\nu(\cdot)$

Sample space: $\Omega = \{2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$

$$\nu(\Omega) = \frac{50}{50} = 1$$

Win: $A = \{7, 11\}$

$$\nu(A) = \frac{9}{50}$$

Lose: $B = \{2, 3, 12\}$

$$\nu(B) = \frac{7}{50}$$

Win or lose: $A \cup B = \{2, 3, 7, 11, 12\}$

$$\nu(A \cup B) = \frac{16}{50} = \frac{9}{50} + \frac{7}{50} = \nu(A) + \nu(B)$$

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Sum of face values of a pair of dice: 50 throws



Frequency of occurrence: $\nu(\cdot)$

Sample space: $\Omega = \{2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$

$$\nu(\Omega) = \frac{50}{50} = 1$$

Normalisation: The certain event

Win: $A = \{7, 11\}$

$$\nu(A) = \frac{9}{50}$$

Positivity

Lose: $B = \{2, 3, 12\}$

$$\nu(B) = \frac{7}{50}$$

Win or lose: $A \cup B = \{2, 3, 7, 11, 12\}$

$$\nu(A \cup B) = \frac{16}{50} = \frac{9}{50} + \frac{7}{50} = \nu(A) + \nu(B)$$

Additivity: A and B are disjoint, $A \cap B = \emptyset$