

Computing probabilities

Example: For the process of summing the values on a pair of fair dice, the sample space is $S = \{2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$. We have worked out the following probability distribution for this process:

2	3	4	5	6	7	8	9	10	11	12
1/36	2/36	3/36	4/36	5/36	6/36	5/36	4/36	3/36	2/36	1/36

1. What is the probability of getting 10 or more on one roll?

Event: $A = \{10, 11, 12\}$

Probability: $P(A) =$

2. What is the probability of getting less than 10 on one roll? Compute this probability directly from the probability distribution.

Event: $B = \{2, 3, 4, 5, 6, 7, 8, 9\}$

Probability: $P(B) =$

3. How is event B related to the sample space S and event A ?

4. How is the probability $P(B)$ related to the probabilities $P(S)$ and $P(A)$?

5. Use the idea from (4) and your result from (1) to compute the probability of getting less than 10 on one roll. Compare with your result from (2).

Example: For the process of a fair coin, the sample space is $S = \{H, T\}$. We assume the following probability distribution for this process:

H	T
1/2	1/2

- (a) What is the probability of getting heads on one flip of a fair coin?

- (b) What is the probability of getting heads on a second flip of a fair coin?

- (c) What is the probability of getting heads on both of two successive flips of a fair coin? You can think of this as the event “heads on the first flip AND heads on the second flip”.

- (d) Let A be the event “heads on the first flip”. Let B be the event “heads on the second flip”. How is $P(A \text{ and } B)$ related to $P(A)$ and $P(B)$? Write this as a formula.

- (e) What is the probability of getting 5 heads every time on 5 successive flips of a coin?

- (f) If you look at 96 different instances of 5 successive flips of a coin, how many times would you expect to get all heads? Would it surprise you to not get 5 heads in a row in 96 tries?