

AI1110: Assignment 3

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Outline

Question

a) In the coin experiment, the space S consists of the outcomes h and t :

$$S = \{h, t\}$$

and it's events are the four sets $\{\emptyset\}$, $\{t\}$, $\{h\}$, S .

$P\{h\} = p$ and $P\{t\} = q$. Show that $p + q = 1$

b) We consider now the experiment of the toss of a coin three times. What is the probability of getting two heads in the first two tosses?

Solution (a)

The given coin is fair.

We get either heads or tails for one toss.

Number of possible outcomes = 2

Probability of getting heads is $P\{h\} = p$

Probability of getting tails is $P\{t\} = q$

Both events are exhaustive, mutually exclusive and equally probable.

$$\implies P\{h\} = P\{t\} = \frac{1}{2} \quad (1)$$

$$\implies p = q = \frac{1}{2} \quad (2)$$

$$\therefore p + q = \frac{1}{2} + \frac{1}{2} \quad (3)$$

$$= 1 \quad (4)$$

Solution (b)

Let $P(E)$ be the required probability

The possible outcomes/events of this experiment(tossing the coin thrice) are:

$hhh, hht, hth, htt, thh, tth, ttt$

In this case, the probability of each elementary event equals $\frac{1}{8}$.

Thus the probability $P\{hhh\}$ that we get three heads equals $\frac{1}{8}$. The event

$$\{E\} = \{hhh, hht\} \quad (5)$$

consists of the two outcomes hhh and hht .

Hence the required probability is

$$P(E) = P\{hhh\} + P\{hht\} \quad (6)$$

$$= \frac{1}{8} + \frac{1}{8} \quad (7)$$

$$= \frac{2}{8} \quad (8)$$