AI1110 Assignment-5

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***Abstract*—This document contains the solution for Assignment 5 (NCERT Class 11 Probability Exercise 16.2 Question 4)**

EXERCISE 16.2.4 : Three coins are tossed once. Let A denote the event "three heads show", B denote the event "two heads and one tail show", C denote the event "three tails show", D denote the event "a head shows on the first coin". Which events are

(i) Mutually exclusive?
(ii) Simple?
(iii) Compound?

Solution:

Three coins are tossed at once we can represent outcome of each coin in random variables as $X_i \in \{0,1\}, i = 1,2,3$ where $X_i = 0$ denotes occurrence of tail and $X_i = 1$ denotes occurrence of head.

Event	Description
A	3 Heads
B	2 Heads 1 Tail
C	3 Tails
D	Head on first coin

TABLE I
EVENTS

Every outcome in the sample space is denoted in the form (X_1, X_2, X_3).

The outcomes of events in table (I) are,

$$A = \{(1,1,1)\} \tag{1}$$
$$B = \{(1,1,0) \cup (1,0,1) \cup (0,1,1)\} \tag{2}$$
$$C = \{(0,0,0)\} \tag{3}$$
$$D = \{(1,1,1) \cup (1,1,0) \cup (1,0,1) \cup (1,0,0)\} \tag{4}$$

(i) Now we observe that,

$$A \cap B = \phi \tag{5}$$
$$A \cap C = \phi \tag{6}$$
$$A \cap D = \{(1,1,1)\} \neq \phi \tag{7}$$
$$B \cap C = \phi \tag{8}$$
$$B \cap D = \{(1,1,0) \cup (1,0,1)\} \neq \phi \tag{9}$$
$$C \cap D = \phi \tag{10}$$

Therefore from above we can say,
Event A and B; Event A and C; Event B and C; and Event C and D are all Mutually exclusive.

(ii) If an event has only one sample point of a sample space, it is called a **Simple event**.
Thus, A and C are simple events.

(iii) If an event has more than one sample point of a sample space, it is called a **Compound event**.
Thus, B and D are compound events.