Assignment 1
Ncert Exampler

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I. Question-11.16.3.43

Match the following:

(a) if E_1 and E_2 are the two mutually exclusive events	(i) $E_1 \cap E_2 = E_1$
(b) if E_1 and E_2 are the mutually exclusive and exhaustive events	(ii) $(E_1 - E_2) \cup (E_1 \cap E_2) = E_1$
(c) if E_1 and E_2 have common outcomes, then	(iii) $E_1 \cap E_2 = \phi, E_1 \cup E_2 = S$
(d) if E_1 and E_2 are two events such that $E_1 \subset E_2$	(iv) $E_1 \cap E_2 = \phi$

TABLE 0

Solution:
(a) If E_1 and E_2 are mutually exclusive events, then $E_1E_2 = \phi$.
(b) If E_1 and E_2 are mutually exclusive and exhaustive events, then $E_1E_2 = \phi$ and $E_1 + E_2 = S$
(c) If E_1 and E_2 have common outcomes, this means:

$$E_1E_2 \neq 0 \tag{1}$$

Let E_a be the outcomes that are present in E_1 and not in E_2. So,

$$E_a = E_1 - E_2 \tag{2}$$

Let E_b be the outcomes common between E_1 and E_2. So,

$$E_b = E_1E_2 \tag{3}$$

So, we can say that

$$E_1 = E_a + E_b \tag{4}$$

Refering to equation (2) and (3):

$$E_1 = (E_1 - E_2) + (E_1E_2) \tag{5}$$

(d) If E_1 and E_2 are two events such that $E_1 \subset E_2$, then let E be subset of E_2 containing elements other than E_1. So,

$$E_1 + E = E_2 \text{ and } E_1E = E_2 \tag{6}$$

Refering to equation (6):

$$E_1E_2 = E_1(E_1 + E) \tag{7}$$
$$= (E_1E_1) + (E_1E) \tag{8}$$
$$= E_1 \tag{9}$$

Hence,
$(a) \leftrightarrow (iv), (b) \leftrightarrow (iii), (c) \leftrightarrow (ii), (d) \leftrightarrow (i)$