

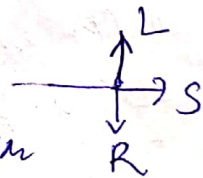
2.1

Q. (2) Suppose that vehicles taking a particular freeway exit can turn right (R), turn left (L), or go straight (S). Consider observing the direction for each of three successive vehicles.

- List all outcomes in the event A that all three vehicles go in the same direction.
- List all outcomes in the event C that exactly two of the three vehicles turn right.
- List all outcomes in the event B that all three vehicles ~~go in the same~~ take different directions.
- List all outcomes in the event D that exactly two vehicles go in the same direction.
- List all outcomes in D' , $C \cup D$ and $C \cap D$.

Ans:

- $A = \text{three vehicles go in the same direction}$
 $= \{RRR, SSS, LLL\}$
- $B = \{RSL, RLS, SLR, SRL, LRS, LSR\}$
- $C = \{RRL, RRS, LRR, SRR, RSR, RLR\}$
- $D = \{$



- $\{$

As, exactly 2 in R = $\{RRL, RRS, LRR, SRR, RSR, RLR\}$
 2 in L = $\{LLR, LLS, RLL, SLL, LRL, LSL\}$
 2 in S = $\{SSL, SSR, LSS, RSS, SRS, SLS\}$

$$\begin{aligned}
 (c) D' &= (\text{exactly 2 vehicles go in the same direction})' \\
 &= \text{all 3 vehicles go in the same direction} \\
 &\quad \text{or they go in different direction} \\
 &= \{ RRR, LLL, SSS, RLS, RSL, SRL, SLR, LRS, LSR \} \\
 &= \overline{A \cap B} = A \cup B
 \end{aligned}$$

$$\begin{aligned}
 \text{Also } C \cup D &= D \quad (\because C \subseteq D) \\
 C \cap D &= C \quad (\because C \subseteq D)
 \end{aligned}$$

2.1 Q16

A college library has five copies of a certain text on reserve. Two copies (1 and 2) are first printings, and the other three (3, 4, and 5) are second printings. A student examines these books in random order, stopping only when a second printing has been selected. One possible outcome is 5, and another is 213.

- List all outcomes in S .
- Let A denote the event that exactly one book must be examined. What outcomes are in A ?
- Let B be the event that book 5 is the one selected. What outcomes are in B ?
- Let C be the event that book 1 is not examined. What outcomes are in C ?

Ans (6)

1st printing copies $\rightarrow 1, 2$
2nd printing books $\rightarrow 3, 4, 5$

A student stops to examine books when he selects a second printing book i.e. 3, 4, 5.

$$(a) S = \{ 3, 4, 5, 13, 14, 15, 23, 24, 25, 123, 124, 125, 213, 214, 215 \}$$

(b) A = the event that exactly one book must be examined.

So, the book we select must from 2nd printing in order to stop the selection immediately.

$$\therefore A = \{ 3, 4, 5 \}$$

(c) B = the event that book 5 is the one selected.

$$= \{ 5, 15, 25, 125, 215 \}$$

(d) C = the event that book 1 is not examined.

$$= \{ 3, 4, 5, 23, 24, 25 \}$$

2.1

Q. (4) Each of a sample of four mortgages is classified as fixed rate (F) or variable rate (V).

- What are the 16 outcomes in S ?
- Which outcomes are in the event that exactly three of the selected mortgages are fixed rate?
- Which outcomes are in the event that all four mortgages are of the same type?
- Which outcomes are in the event that at most one of the four is a variable-rate mortgage?
- What is the event union of the events in parts (c) and (d), and what is the intersection of these two events?
- What are the union and intersection of the two events in parts (b) and (c)?

Ans:

(a) $S = \left\{ \begin{array}{ll} FFFF, & VVVV, \\ FFFV, & VVV F, \\ FFVF, & VV FV, \\ FFVV, & VV FF, \\ FVFF, & VFVV, \\ FVVF, & VFFV, \\ FV FV, & VFVF, \\ FVVV, & VFFF \end{array} \right\}$

(b) A = exactly 3 of the selected mortgages are fixed rate
 $= \{ FFFV, FFVF, FVFE, VFFF \}$

(c) B = all 4 mortgages are of the same type
 $= \{ FFFF, VVVV \}$

(d) C = ^{at most one of the} ~~at least~~ four mortgages ~~are~~ is a variable rate mortgage?
 $= \{ FFFF, FFFV, FFVF, FVFE, VFFF \}$

(e) B \cup C = $\{ FFFF, FFFV, FFVF, FVFE, VFFF, VVVV \}$
 B \cap C = $\{ FFFF \}$

(f) A \cup B = $\{ FFFF, VVVV, FFFV, FFVF, FVFE, VFFF \}$
 A \cap B = \emptyset

2.1 Q. (5)

A family consisting of three persons - A, B and C - goes to a medical clinic that always has a doctor at each station 1, 2, and 3. During a certain week, each member of the family visits the clinic once and is assigned at random to a station. The experiment consists of recording the station number for each member. one outcome is (1, 2, 1) for A to station 1, B to station 2, and C to station 1.

- List all the 27 outcomes in the sample space.
- List all outcomes in the event that all three members go to the same station.
- List all outcomes in the event that all members go to different stations.
- List all outcomes in the event that no one goes to station 2.

Ans: (a) Total outcomes = $3^3 = 27$
 Sample space S is given by
~~S~~

$$S = \left\{ \begin{array}{lll} (1,1,1), & (2,2,2), & (3,3,3) \\ (1,1,2), & (2,2,3), & (3,3,1) \\ (1,1,3), & (2,2,1), & (3,3,2) \\ (1,2,1), & (2,3,2), & (3,1,3) \\ (1,3,1), & (2,1,2), & (3,2,3) \\ (1,2,2), & (2,3,3), & (3,1,1) \\ (1,2,3), & (2,3,1), & (3,1,2) \\ (1,3,2), & (2,1,3), & (3,2,1) \\ (1,3,3), & (2,1,1), & (3,2,2) \end{array} \right\}$$

(b) $A =$ three members go to the same station
 $= \{(1,1,1), (2,2,2), (3,3,3)\}$

(c) $B =$ all three members go to different stations
 $= \{(1,2,3), (1,3,2), (2,3,1), (2,1,3), (3,1,2), (3,2,1)\}$

(d) $C =$ all outcomes in the event that ~~all members~~
~~go to different stations~~ no one goes
to station 2.
 $= \{(1,1,1), (1,1,3), (1,3,3), (3,3,3), (1,3,1), (3,3,1), (3,1,3), (3,1,1)\}$