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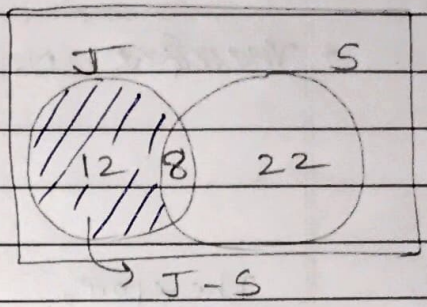
Given, $P(J) = 20\%$
$P(S) = 30\%$
$P(J \cap S) = 8\%$

→ Ans 1.1 : $\frac{P(J \cap S)}{P(S)}$

(a) $P(J|S) = \frac{4}{15} = \boxed{0.2667}$

(b) $P(J|S') = \frac{12}{70} = \boxed{0.1714}$

(c) $P(J \cap S | J \cup S) = \frac{4}{21} = \boxed{0.1904}$



→ Ans. 1.2 :

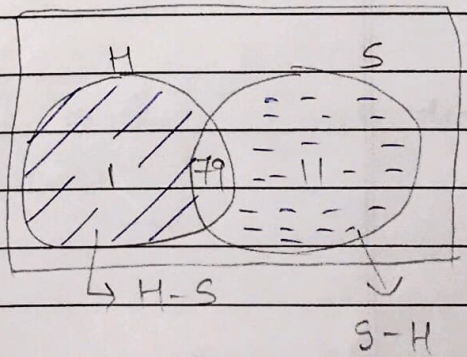
$P(H) = 80\%$, $P(S) = 90\%$, $P(H \cup S) = 91\%$

$\therefore P(H \cup S) = P(H) + P(S) + P(H \cap S)$
$\therefore P(H \cap S) = P(H) + P(S) - P(H \cup S)$
$= 80 + 90 - 91$
$\therefore P(H \cap S) = 79\%$

(a) $P(H \text{ only}) = 80 - 79$
$= \boxed{1\%}$

(b) $P(S \text{ only}) = 90 - 79$
$= \boxed{11\%}$

(c) $P((H \cup S)') = 100 - 91 = \boxed{9\%}$



→ Ans 1.3:

- $P(J) = 20\%$, $P(S) = 30\%$, $P(J \cap S) = 8\%$

* Two events are independent if:
$P(A|B) = P(A)$ or $P(A \cap B) = P(A) \cdot P(B)$

* Now, $P(J|S) = \frac{P(J \cap S)}{P(S)}$

$= \frac{8}{30} = \frac{4}{15}$.

Therefore, $P(J|S) \neq P(J)$

Also, $P(J) \cdot P(S) = 0.20 \times 0.30 = 0.06 \neq P(J \cap S)$

- Hence, the events "Jerry is at the bank" and "Susan is at the bank" are not independent.

→ They are dependent.

→ Ans 1.4:

(a) $P(\text{Sum} = 6)$:

$\Rightarrow P(S=6) = \frac{5}{36}$

S ↘	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

- Second die shows 5

$\therefore P(D_2) = \frac{6}{36} = \frac{1}{6}$

$\therefore P(S=6 \mid D_2) = \frac{1}{6} \neq P(S=6)$

$\therefore$ Hence, events "Sum is 6" and "second die shows 5" are not independents.

(b) $P(\text{Sum} = 7) = P(S=7) = \frac{6}{36} = \frac{1}{6}$

- First die shows 5

$\therefore P(D_1) = \frac{6}{36} = \frac{1}{6}$

$\therefore P(S=7 \mid D_1) = \frac{1}{6}$

$= P(S=7)$ $\left[\because P(A \mid B) = P(A)\right]$

$\therefore$ Hence, events "Sum is 7" and "first die shows 5" are independent.

→ Ans 1.5 : {Chances of oil in TX}

• $P(TX) = 60\%$	$P(O/TX) = 30\%$
• $P(NJ) = 10\%$	$P(O/AK) = 20\%$
	$P(O/NJ) = 10\%$

(a) → $P(O)$ = Probability of finding oil,

$= P(O/TX)\,P(TX) + P(O/AK) + P(O/NJ)\,P(NJ)$

$= (0.3)(0.6) + (0.2)(0.3) + (0.1)(0.1)$

$= 0.18 + 0.06 + 0.01$

$\therefore P(O) = 0.25$

$= \boxed{25\%}$

(b) → Probability they drilled in TX and found oil,

$\therefore P(TX/O) = \dfrac{P(TX \cap O)}{P(O)}$

$= \dfrac{P(O/TX)\,P(TX)}{P(O)}$

$= \dfrac{(0.3)(0.6)}{0.25}$

$= 0.72$

$\therefore P(TX/O) = \boxed{72\%}$

→ Ans 1.6 :

→ Probability of passenger surviving = P(Ps)

(a) Passenger not survived,

$$\therefore P(Ps') = \frac{1490}{2201}$$

(b) Passenger staying in first class.,

$$\therefore P(\text{first}) = \frac{325}{2201}$$

(c) First Class Passenger, given the passenger survived,

$$\therefore P(\text{first} \mid Ps) = \frac{P(\text{first} \cap Ps)}{P(Ps)}$$

$$= \frac{203}{711}$$

(d) $$P(\text{first} \mid Ps) = \frac{203}{711} \neq \frac{325}{2201} = P(\text{first})$$

$$\left[\therefore P(A|B) \neq P(A)\right]$$

∴ Hence, survival and staying in first class are not independent.

∴ They are dependent.

(e) Passenger in first class and a child, given passenger survived,

$\therefore P(\text{first} \cap \text{child} \mid P_s) = \boxed{\frac{6}{711}}$

(f) Passenger was an adult, given passenger survived,

$\therefore P(\text{adult} \mid P_s) = \boxed{\frac{654}{711}}$

(g) Given passenger survived,

$\therefore$ we know, $P(\text{first} \mid P_s) = \frac{203}{711}$

$\therefore P(\text{first} \mid \underset{\text{child}}{\text{age}}, P_s) = \frac{6}{57} \neq P(\text{first} \mid P_s)$

$\Rightarrow$ Hence, given that passenger survived, age and staying in first class are not independent.

$\rightarrow$ They are {dependent}