

Name: Sidharth Pareek
CUID: 20005837

* Homework 1.1

$$P(J) = \frac{20}{100} = \frac{1}{5}$$

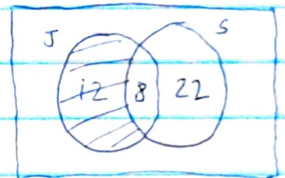
$$P(S) = \frac{30}{100} = \frac{3}{10}$$

$$P(J \cap S) = \frac{8}{100} = \frac{2}{25}$$

$$a) \quad P(J|S) = \frac{P(J \cap S)}{P(S)} = \frac{2/25}{3/10} = \frac{4}{15}$$

$$\rightarrow P(J|S) = 0.267$$

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



$$\rightarrow P(J|S') = 0.171$$

$$c) \quad P(J \cap S | J \cup S) = \frac{P(J \cap S)}{P(J \cup S)} = \frac{8}{42}$$

$$\rightarrow P(J \cap S | J \cup S) = 0.190$$

* Homework 1.2:

$$P(H) = \frac{80}{100}$$

$$P(S) = \frac{90}{100}$$

$$P(H \cup S) = \frac{91}{100}$$

$$P(H \cup S) = P(H) + P(S) - P(H \cap S)$$

$$P(H \cap S) = \frac{79}{100}$$

$$a) P(H_{\text{only}}) = P(H) - P(H \cap S)$$

$$= \frac{1}{100} = 0.01$$

$$\rightarrow P(H_{\text{only}}) = 0.01$$

$$b) P(S_{\text{only}}) = P(S) - P(H \cap S)$$

$$= \frac{11}{100} = 0.11$$

$$\rightarrow P(S_{\text{only}}) = 0.11$$

$$c) P((H \cup S)') = 1 - P(H \cup S)$$

$$= \frac{9}{100}$$

$$\rightarrow P((H \cup S)') = \frac{9}{100}$$

* Homework 1.3:

$$P(J) = \frac{20}{100}$$

$$P(S) = \frac{30}{100}$$

$$P(J \cap S) = \frac{8}{100}$$

Condition for independent events:

$$P(J|S) = P(J) \quad \text{or} \quad P(J \cap S) = P(J) \cdot P(S)$$

$$\begin{aligned} P(J|S) &= \frac{P(J \cap S)}{P(S)} \\ &= \frac{8}{30} \end{aligned}$$

$$\begin{aligned} P(J \cap S) &= P(J) \cdot P(S) \\ &= \frac{20}{100} \cdot \frac{30}{100} \\ &= \frac{6}{100} \end{aligned}$$

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

$$P(J \cap S) \neq P(J) \cdot P(S)$$

\therefore Therefore both events are not independent, in fact they are dependent.

* Homework 1.4:

$$a) \quad P(\text{sum} = 6) = \frac{5}{36}$$

$$P(\text{second die} = 5) = \frac{6}{36}$$

	1	2	3	4	5	6
1	1	2	3	4	5	6
2	2	3	4	5	6	7
3	3	4	5	6	7	8
4	4	5	6	7	8	9
5	5	6	7	8	9	10
6	6	7	8	9	10	11

$$P(\text{sum} = 6 / \text{second die} = 5) = \frac{1/36}{6/36} = \frac{1}{6} \neq P(\text{sum} = 6)$$

∴ The events are not independent.
Thus we can say they are dependent.

$$b) \quad P(\text{sum} = 7) = \frac{6}{36} = \frac{1}{6}$$

$$P(\text{first die} = 5) = \frac{6}{36} = \frac{1}{6}$$

$$P(\text{sum} = 7 / \text{first die} = 5) = \frac{1/36}{6/36} = \frac{1}{6} = P(\text{sum} = 7)$$

∴ The events are independent.

* homework 1.5 :

$$P(TX) = \frac{60}{100}$$

$$P(NJ) = \frac{10}{100}$$

$$\begin{aligned} P(AR) &= 1 - \frac{60}{100} - \frac{10}{100} \\ &= \frac{30}{100} \end{aligned}$$

$$P(O|TX) = \frac{30}{100}$$

$$P(O|NJ) = \frac{10}{100}$$

$$P(O|AR) = \frac{20}{100}$$

$$P(O) = P(O \cap TX) + P(O \cap NJ) + P(O \cap AR)$$

$$= P(O|TX) \cdot P(TX) + P(O|NJ) \cdot P(NJ) +$$

$$P(O|AR) \cdot P(AR)$$

$$= \frac{60}{100} \cdot \frac{30}{100} + \frac{10}{100} \cdot \frac{10}{100} + \frac{30}{100} \cdot \frac{20}{100}$$

$$= \frac{25}{100}$$

$$P(O) = 0.25$$

* Probability of finding oil = 0.25

$$b) P(Tx | O) = \frac{P(O | Tx) \cdot P(Tx)}{P(O)}$$

$$= \frac{\frac{30}{100} \cdot \frac{60}{100}}{\frac{25}{100}}$$

$$= \frac{18}{25} = 0.72$$

→ Probability that the oil is found in Texas given that the oil has been found = 0.72

* homework 1.6:

$$a) P(S') = \frac{1490}{2201} = 0.677$$

$$b) P(\text{passenger in } 1^{st} \text{ class}) = \frac{325}{2201} = 0.148$$

$$c) P(1^{st} / S) = \frac{P(1^{st} \cap S)}{P(S)} = \frac{203}{711} = 0.287$$

$$d) P(1^{st} / S) = 0.287 \neq P(1^{st}) = 0.148$$

Hence they are not independent. They are dependent events.

$$e) P(\text{child in first class} / \text{survived}) = \frac{6}{711}$$

$$= 0.008$$

$$f) P(A|S) = \frac{P(A \cap S)}{P(S)} = \frac{654}{711} = 0.920$$

$$g) P(1^{st} / S) = \frac{203}{711}$$

$$P(1^{st} | \text{child} / S) = \frac{6}{57} \neq P(1^{st} / S)$$

Thus the events are not independent.
Hence the events are dependent.