"Law of Complementation"

$$P(A^c) = 1 - P(A)$$

Q-1: A Coin is tossed 4 times in succession. What is the probability that at least one head occurs?

sol,-

Total occurances $= 2^4 = 16$.

At least one head $\longrightarrow$ opposite (no. head)

$\downarrow$

(T T T T)

$\therefore$ P(at least one head) $= 1 - P(no. head)$

$$= 1 - \frac{1}{16} = \frac{15}{16}.$$

Q-2: Find y;

X	0	1	2	3	4
P(X)	0.16	0.09	0.26	y	0.31

sol :-

we know that $\sum P(x) = 1$

$\Rightarrow 0.16 + 0.09 + 0.26 + y + 0.31 = 1$

$$0.82 + y = 1$$

$$\therefore y = 1 - 0.82$$

$$= 0.18$$

①

"Additive Law"

If A and B are two events, then

$$P(A \cup B) = P(A) + P(B) - P(A \cap B).$$

Ex# 2.29

Q-1: John is going to graduate from an industrial engineering department in a university by the end of the semester. After being interviewed at two companies be likes, he assesses that his probability of getting an offer from Company **A** is **0.8**, and his probability of getting an offer from Company **B** is **0.6**. If he believes that the probability that he will get offers from **both** companies is **0.5**, what is the probability that he will get at least one offer from these two companies?

Sol :-

$$P(A) = 0.8$$
$$P(B) = 0.6$$
$$\Rightarrow P(A \cap B) = 0.5$$

$$P(A \cup B) = ?$$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$= 0.8 + 0.6 - 0.5$$

$$= 0.9.$$

②

Q-2:-

Education	Male	female	Total
Elementary	38	45	83
Secondary	28	50	78
College	22	17	39
Total	88	112	200

If a person is picked at random from this group, find the probability that

a) the person is a male or a college educator.

Sol:- $P(\text{Male or College Educator}) = P$

$$\Rightarrow P(M \cup C) = P(M) + P(C) - P(M \cap C)$$

where

$$P(M) = 88/200$$

$$P(C) = 39/200$$

$$P(M \cap C) = 22/200$$

$$\therefore P(M \cup C) = \frac{88}{200} + \frac{39}{200} - \frac{22}{200}$$

$$= \frac{105}{200} = 0.525$$

③

b) the selected person is a female or an elementary educator.

sol:- $P(F \cup E) = ?$

Pg #163
Q-3:-

Age Group.

Movies per Month	E_5 <30	E_6 30 to 50	E_7 >50	Total
E_1 ≥ 10 movies	200	100	100	400
E_2 3 to 9 movies	600	900	400	1900
E_3 1 to 2 movies	400	600	500	1500
E_4 0 movies	700	500	0	1200
Total	1900	2100	1000	5000

i) P (selected person is b/w 30 to 50 years or he/she watched 1 to 2 movies per month)=?

sol: - $P(E_6 \cup E_3) = P(E_6) + P(E_3) - P(E_6 \cap E_3)$

$$= \frac{2100}{5000} + \frac{1500}{5000} - \frac{600}{5000}$$

$$= \frac{3000}{5000} = \frac{3}{5} = 0.6$$

④

Practice: A class contains 10 men and 20 women of which half the men and half the women have brown eyes. Find the prob. that a person chosen at random is a man or has brown eyes.

Sol. **Hint:**

	Brown eyes	other coloured eyes	
Men	5	5	10
Women	10	10	20
Total	15	15	30

Practice: In a group of 20 adults, 4 out of the 7 women and 2 out of the 13 men wear glasses. What is the prob. that a person chosen at random from the group is a women or some one who wear glasses.

Sol. **Hint**

	Wear Glasses	Without glasses	
Men	2	11	13
Women	4	3	7
Total	6	14	20

⑤

As we know that

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

* If two events A and B are mutually exclusive events, then

$$P(A \cap B) = 0$$

∴ $P(A \cup B) = P(A) + P(B)$

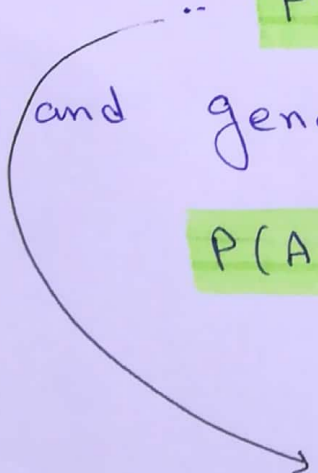* If two events A and B are mutually exclusive and exhaustive events, then

$$P(A \cap B) = 0$$

and

$$P(A \cup B) = 1$$

∴ $P(A) + P(B) = 1$.

and generally

$$P(A_1) + P(A_2) + \cdots + P(A_k) = 1.$$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$
$$1 = P(A) + P(B) - 0$$

fill in the blank:-

If two events A and B are Mautually exclusive and exhaustive events, with $P(A) = \frac{7}{13}$, then $P(B) = $ _____.