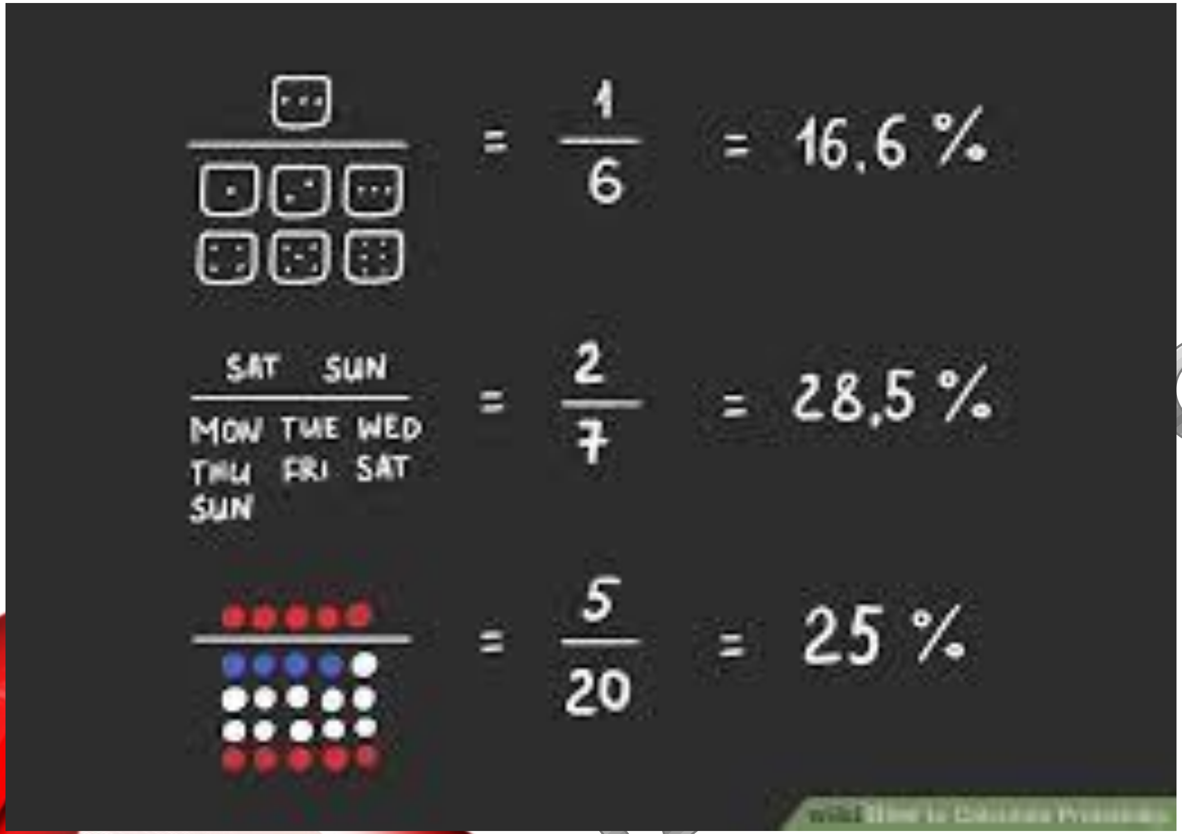
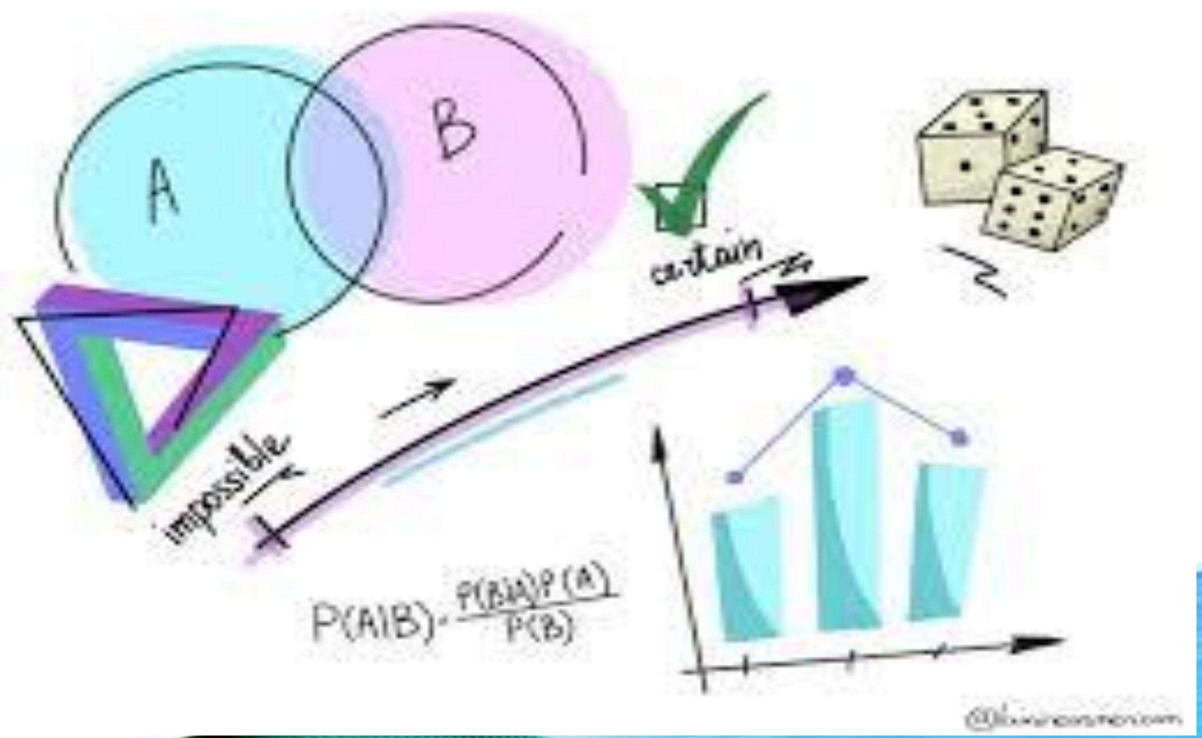
PROBABILITY





CLASS 11
MODULE 6

RECAP

Probability of an event $P(A) = \frac{n(A)}{n(S)}$

If A is any event, then P(not A) = 1 – P(A)

P(A) + P(not A) = 1

If A and B are mutually exclusive, then P(A or B) = P(A) + P(B)

If A and B are any two events, then P(A or B) = P(A) + P(B) – P(A and B) equivalently, $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$$P(E^c \cap F^c) = P((E \cup F)^c) = 1 - P(E \cup F)$$

$$P(E^c \cup F^c) = P((E \cap F)^c) = 1 - P(E \cap F)$$

8. Three coins are tossed once. Find the probability of getting

Ex 16.3

(i)	3 heads	(ii)	2 heads	(iii)	atleast 2 heads
(iv)	atmost 2 heads	(v)	no head	(vi)	3 tails
(vii)	exactly two tails	(viii)	no tail	(ix)	atmost two tails

S = {HHH, HHT, HTH, THH, HTT, THT, TTH, TTT}

$$P(A) = \frac{\text{Number of outcomes favourable to A}}{\text{Total number of possible outcomes}} = \frac{n(A)}{n(S)}$$

$n(S) = 2^3 = 8$

(i) Let B be the event of the occurrence of 3 heads. Accordingly, B = {HHH}

$$\therefore P(B) = \frac{n(B)}{n(S)} = \frac{1}{8}$$

(ii) Let C be the event of the occurrence of 2 heads. Accordingly, C = {HHT, HTH, THH}

$$\therefore P(C) = \frac{n(C)}{n(S)} = \frac{3}{8}$$

(iii) Let D be the event of the occurrence of at least 2 heads.

D = {HHH, HHT, HTH, THH}

$$\therefore P(D) = \frac{n(D)}{n(S)} = \frac{4}{8} = \frac{1}{2}$$

(iv) atmost 2 heads

(iv) Let E be the event of the occurrence of at most 2 heads.
Accordingly, E = {HHT, HTH, THH, HTT, THT, TTH, TTT}

$$\therefore P(E)=\frac{n(E)}{n(S)}=\frac{7}{8}$$

(v) no heads

(v) Let F be the event of the occurrence of no head.
Accordingly, F = (TTT}

$$\therefore P(F)=\frac{n(F)}{n(S)}=\frac{1}{8}$$

(vi) 3 tails

(vi) Let G be the event of the occurrence of 3 tails.
Accordingly, G = {TTT}

$$\therefore P(G)=\frac{n(G)}{n(S)}=\frac{1}{8}$$

(vii) exactly two tails

(vii) Let H be the event of the occurrence of exactly 2 tails.
Accordingly, H = {HTT, THT, TTH}

$$\therefore P(H)=\frac{n(H)}{n(S)}=\frac{3}{8}$$

(vii) no tail

(viii) Let I be the event of the occurrence of no tail.
Accordingly, I = {HHH}

$$\therefore P(I)=\frac{n(I)}{n(S)}=\frac{1}{8}$$

(ix) atmost two tails.

(ix) Let J be the event of the occurrence of at most 2 tails.
Accordingly, I = {HHH, HHT, HTH, THH, HTT, THT, TTH}

$$\therefore P(J)=\frac{n(J)}{n(S)}=\frac{7}{8}$$

Ex 16.3

14. Given $P(A) = \frac{3}{5}$ and $P(B) = \frac{1}{5}$. Find P(A or B), if A and B are mutually exclusive events.

$P(A \cup B) = P(A) + P(B)$ Since A and B are mutually exclusive events.

$= \frac{3}{5} + \frac{1}{5} = \frac{4}{5}$

15. If E and F are events such that $P(E) = \frac{1}{4}$, $P(F) = \frac{1}{2}$ and $P(E \text{ and } F) = \frac{1}{8}$, find (i) P(E or F), (ii) P(not E and not F).

$P(E) = \frac{1}{4}$, $P(F) = \frac{1}{2}$ $P(E \cap F) = \frac{1}{8}$

$P(E \cup F) = P(E) + P(F) - P(E \cap F)$

$= \frac{1}{4} + \frac{1}{2} - \frac{1}{8} = \frac{5}{8}$

(ii) P(not E and not F) = $P(\bar{E} \cap \bar{F})$

$= P(\overline{E \cup F})$

$= 1 - P(E \cup F)$

$= 1 - \frac{5}{8} = \frac{8-5}{8} = \frac{3}{8}$

Ex 16.3

16. Events E and F are such that P(not E or not F) = 0.25, State whether E and F are mutually exclusive.

Ans. Given: $P(\bar{E} \cup \bar{F}) = 0.25$

$\Rightarrow P(\overline{E \cap F}) = 0.25$

$\Rightarrow 1 - P(E \cap F) = 0.25$

$\Rightarrow P(E \cap F) = 1 - 0.25 = 0.75 \neq 0$

Therefore, E and F are not mutually exclusive events.

Ex 16.3

19. In an entrance test that is graded on the basis of two examinations, the probability of a randomly chosen student passing the first examination is 0.8 and the probability of passing the second examination is 0.7. The probability of passing at least one of them is 0.95. What is the probability of passing both?

Ans. Let A be the event that the student passes the first examination

B be the event that the students passes the second examination.

$P(A) = 0.8$

$P(B) = 0.7$

$P(A \cup B) = 0.95$

probability of passing both $P(A \cap B)$

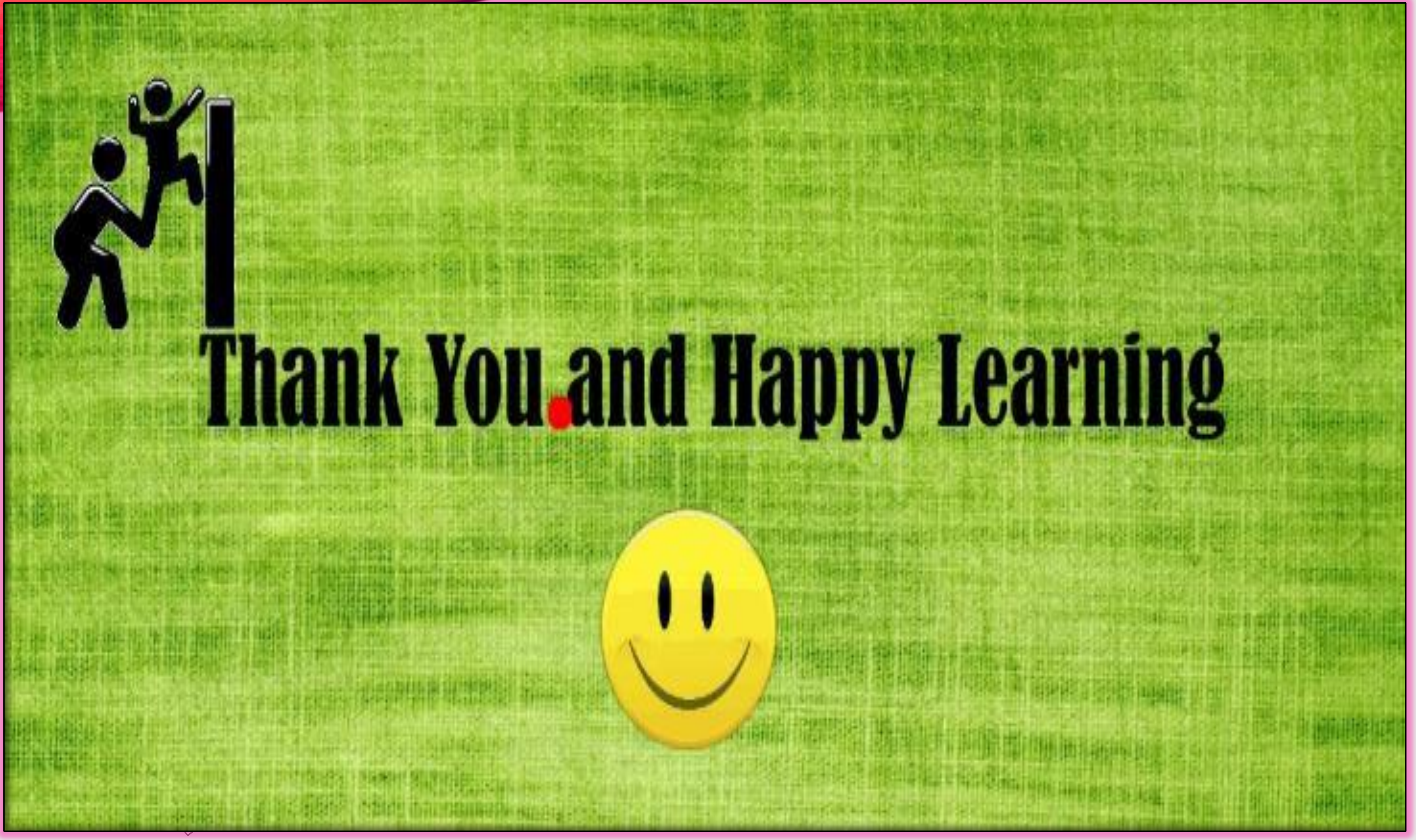
$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$\Rightarrow 0.95 = 0.8 + 0.7 - P(A \cap B)$

$\Rightarrow P(A \cap B) = 1.5 - 0.95 = 0.55$

Fill in the blank in the following table:

	P(A)	P(B)	$P(A \cap B)$	$P(A \cup B)$
(i)	0.35	...	0.25	0.6
(ii)	0.5	0.35	...	0.7


Thank You and Happy Learning