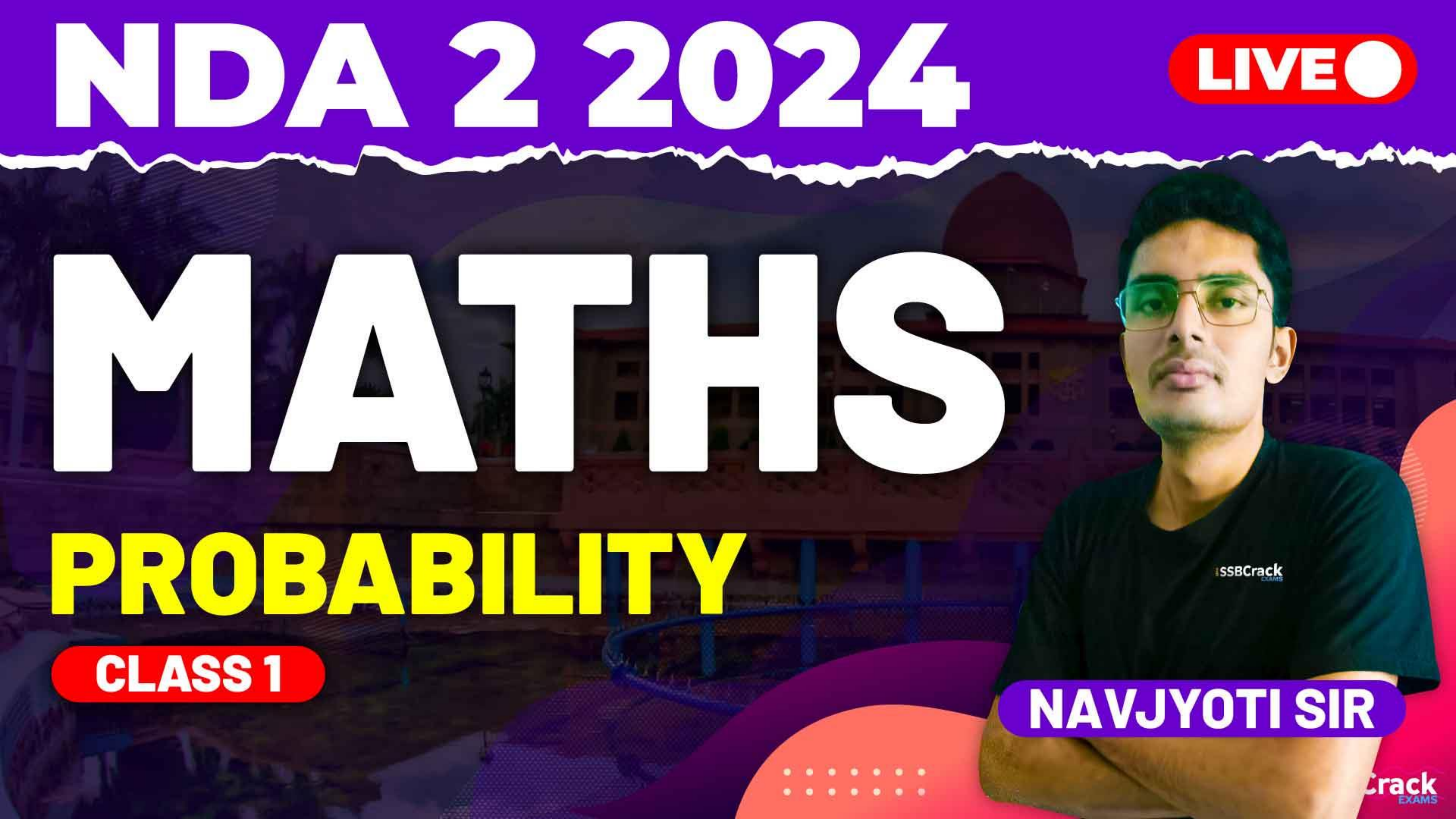

NDA 2 2024
LIVE
MATHS
PROBABILITY
CLASS 1
NAVJYOTI SIR
SSBCrack EXAMS

05 July 2024 Live Classes Schedule

8:00AM	05 JULY 2024 DAILY CURRENT AFFAIRS	RUBY MA'AM
9:00AM	05 JULY 2024 DAILY DEFENCE UPDATES	DIVYANSHU SIR

SSB INTERVIEW LIVE CLASSES

9:00AM	OVERVIEW OF TAT & WAT	ANURADHA MA'AM

NDA 2 2024 LIVE CLASSES

11:30AM	GK - WORLD HISTORY - CLASS 1	RUBY MA'AM
1:00PM	GS - PHYSICS - CLASS 5	NAVJYOTI SIR
2:30PM	GS - CHEMISTRY MCQS - CLASS 10	SHIVANGI MA'AM
4:00PM	MATHS - PROBABILITY - CLASS 1	NAVJYOTI SIR
5:30PM	ENGLISH - PARTS OF SPEECH - CLASS 3	ANURADHA MA'AM

CDS 2 2024 LIVE CLASSES

11:30AM	GK - WORLD HISTORY - CLASS 1	RUBY MA'AM
1:00PM	GS - PHYSICS - CLASS 5	NAVJYOTI SIR
2:30PM	GS - CHEMISTRY MCQS - CLASS 10	SHIVANGI MA'AM
5:30PM	ENGLISH - PARTS OF SPEECH - CLASS 3	ANURADHA MA'AM

RANDOM EXPERIMENT

· **An Experiment**: is some procedure (or process) that we do and it results in an outcome.

A random experiment: is an experiment we do not know its exact outcome in advance but we know the set of all possible outcomes.

EXAMPLES: Toss a coin: Sample space= {T, H}

2. Roll a die, observe the score on top. Sample space = {1, 2, 3, 4, 5, 6,}.

3. Throw a basketball, record the number of attempts to the first basket.
Sample space = {1, 2, 3, 4, ...}.

SAMPLE SPACE

A **sample space** is the set of all possible outcomes in an experiment.

Example:
Two coins are tossed. Represent the sample space for this experiment by making a list, a table, and a tree diagram.
(H – Head, T – Tail)

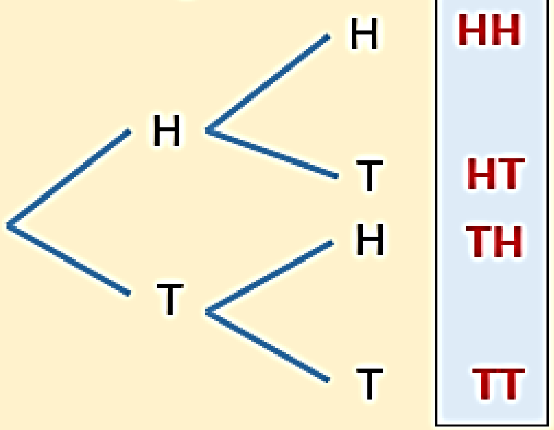
List:

HH **HT** **TH** **TT**

Table:

	H	T
H	HH	HT
T	TH	TT

Tree Diagram:



The sample space is {HH, HT, TH, TT}

S — Sample space

set of possible outcomes

$n(S)$

PROBABILITY

Probability of occurence of an event A,

$$P(A) = \frac{\text{No. of outcomes in favour of } A}{\text{Total no. of possible outcomes}} = \frac{n(A)}{n(S)}$$

$$0 \leq P(A) \leq 1$$

$$P(\text{not occuring of } A) = 1 - P(A)$$

Eg. - Getting a head in tossing a coin

$P(A) = \frac{1}{2}$

$A = \{H\}$ $\quad S = \{H, T\}$

$n(A) = 1$ $\quad n(S) = 2$

EQUAL LIKELY EVENTS

Two or more events (or sample points) are equally likely, if none of them is biased over the other. Suppose a number is picked from numbers 1 to 20, then events defined as

A : Picked number is even and B : Picked number is odd, are equally likely as in given numbers there are 10 odd numbers and 10 even numbers.

→ events having equal probabilities.

MUTUALLY EXCLUSIVE EVENTS

A , B are events,

if $A \cap B = \phi \Rightarrow A, B$ are mutually exclusive.

EXHAUSTIVE EVENTS

A, B

$A \cup B = S \Rightarrow A, B$ are exhaustive.

Eg Die $\longrightarrow S = \{1, 2, 3, 4, 5, 6\}$

A : number greater than 3

B : number $\underbrace{1 \text{ or } 2 \text{ or } 3}$

SSBCrack EXAMS

COMPLEMENT OF EVENT

The complement of an event A denoted by $\overline{A}$, A' or A^c is the set of all sample points of the space other than the sample points in A.

e.g., Let $S = \{1, 2, 3, 4, 5, 6\}$.

If $A = \{1, 3, 5, 6\}$,

then $A^c = \{2, 4\}$

$[A', \bar{A}]$

INDEPENDENT EVENTS

Two events A and B are independent events, if the happening (or non-happening) of any does not affect the happening (or non-happening) of other. For example an urn contains 4 red and 5 green balls. A is an Ist event that one green ball is drawn. B is 2nd event that a red ball is drawn.

EXAMPLE

An ordinary dice is thrown. The probability that the number appearing on the dice greater than 3 is

(a) $\frac{1}{5}$ (b) $\frac{1}{3}$

(c) $\frac{1}{2}$ (d) $\frac{1}{4}$

EXAMPLE

An ordinary dice is thrown. The probability that the number appearing on the dice greater than 3 is

(a) $\frac{1}{5}$ (b) $\frac{1}{3}$

(c) $\frac{1}{2}$ (d) $\frac{1}{4}$

$A = \{4, 5, 6\}$ $n(A) = 3$

$S = \{1, 2, 3, 4, 5, 6\}$ $n(S) = 6$

$P(A) = \frac{3}{6} = \frac{1}{2}$

Ans: (c)

SSBCrack EXAMS

VENN DIAGRAM: TYPE 1

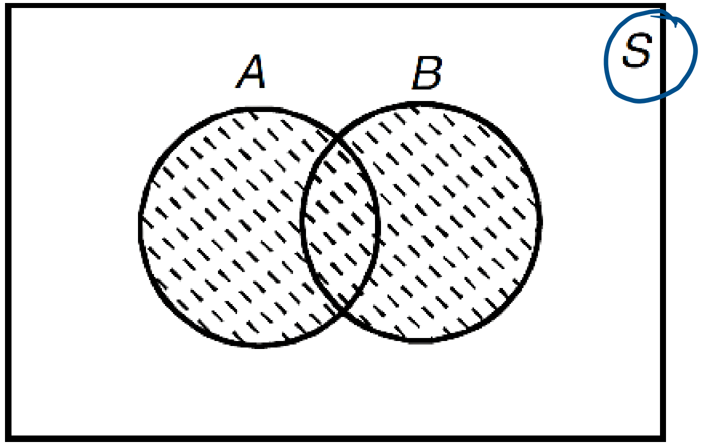
$$\frac{n(A \cup B)}{n(S)} = \frac{n(A) + n(B) - n(A \cap B)}{n(S)}$$

We have only two events A and B

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

   (Addition theorem for two events)

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



$A \cup B$ (Shaded portion)

2. $P(A^cB^c) = 1 - P(A \cup B)$
3. $P(A^cB) = P(B) - P(AB)$

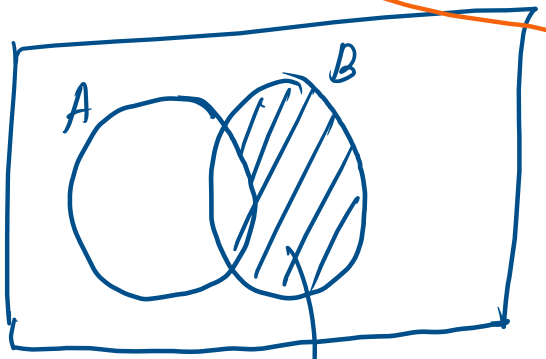
   (Probability of occurrence of exactly B event)
4. $P(AB^c) = P(A) - P(AB)$

   (Probability of occurrence of exactly A event)

(De-Morgan Law — $A' \cap B' = (A \cup B)' = S - (A \cup B)$

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

$$P(A' \cap B) = P(B - (A \cap B)) = \underline{P(B) - P(A \cap B)}$$



$$\underline{B - (B \cap A)}$$

or, $\underline{B - (A \cap B)}$

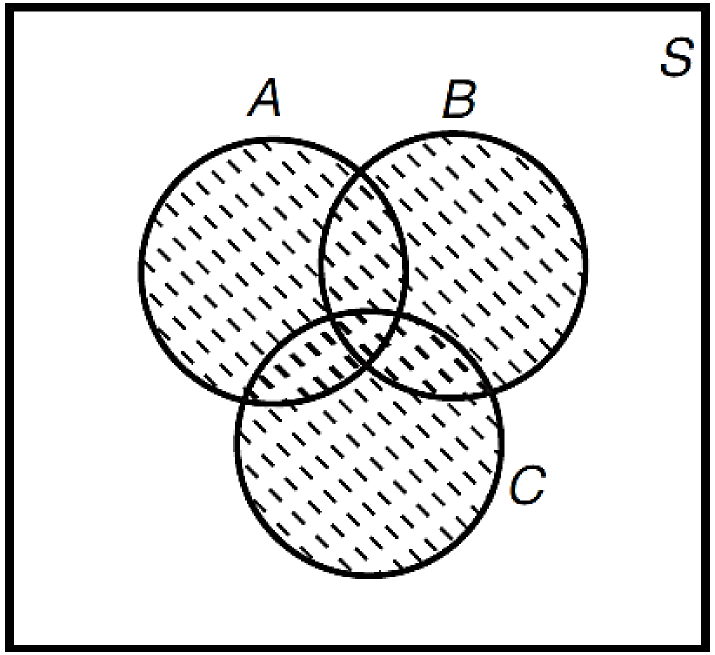
(Subtract intersection of A & B from set not having the complement)

$$P(A \cap B') = P(A - (A \cap B)) = \underline{P(A) - P(A \cap B)}$$

SSBCrack EXAMS

VENN DIAGRAM: TYPE 2

When we have three events A, B and C



SSBCrack EXAMS

VENN DIAGRAM: TYPE 2

1. $P(A \cup B \cup C) = P(A) + P(B) + P(C)$
$- P(AB) - P(BC) - P(CA) + P(ABC)$
(Addition theorem for three events)

2. If A, B and C are mutually exclusive events, then
$P(A \cup B \cup C) = P(A) + P(B) + P(C)$

3. If A, B and C are mutually exclusive and exhaustive events, then $P(A) + P(B) + P(C) = 1$.

(As $A \cup B \cup C = S$ — sample space)

EXAMPLE

Let A and B be the two possible outcomes of an experiment and $P(A) = 0.4, P(B) = x$ and $P(A \cup B) = 0.7$. What is value of x, the events A and B are mutually exclusive?

(a) 0.3 ✓
(b) 0.2
(c) 0.5
(d) 0.7

$A \cap B = \phi$

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

$P(A \cap B) = 0$

$$0.7 = 0.4 + x$$

$$x = 0.7 - 0.4 = 0.3$$

EXAMPLE

Let A and B be the two possible outcomes of an experiment and $P(A) = 0.4, P(B) = x$ and $P(A \cup B) = 0.7$. What is value of x, the events A and B are mutually exclusive?

(a) 0.3 (b) 0.2

(c) 0.5 (d) 0.7

Ans: (a)

Directions

Consider A and B are

two non-mutually exclusive events.

If $P(A) = \frac{1}{4}$, $P(B) = \frac{2}{5}$ and $P(A \cup B) = \frac{1}{2}$,

Q) The value of $P(A \cap B)$ is

(a) $\frac{4}{13}$

(b) $\frac{3}{20}$

(c) $\frac{3}{43}$

(d) None of these

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

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

$$x = \frac{13}{20} - \frac{1}{2} = \frac{13-10}{20} = \frac{3}{20}$$

Q) The value of $P(A \cap B)$ is

(a) $\frac{4}{13}$

(b) $\frac{3}{20}$

(c) $\frac{3}{43}$

(d) None of these

Ans: (b)

Q) The value of $P(A \cap B')$ is

(a) $\frac{1}{10}$

(b) $\frac{2}{13}$

(c) $\frac{1}{5}$

(d) None of these

$P(A) - P(A \cap B) = \frac{1}{4} - \frac{3}{20} = \frac{5-3}{20} = \frac{2}{20} = \frac{1}{10}$

Q) The value of $P(A \cap B')$ is

(a) $\frac{1}{10}$

(b) $\frac{2}{13}$

(c) $\frac{1}{5}$

(d) None of these

Ans: (a)

Q) The value of $P(A' \cap B')$ is

(a) $\frac{1}{3}$ (b) $\frac{1}{2}$

(c) $\frac{1}{5}$ (d) None of these

$1 - P(A \cup B)$

$1 - \frac{1}{2} = \frac{1}{2}$

Q) The value of $P(A' \cap B')$ is

(a) $\frac{1}{3}$

(b) $\frac{1}{2}$

(c) $\frac{1}{5}$

(d) None of these

Ans: (b)

SSBCrack EXAMS

CONDITIONAL PROBABILITY

The probability that one event happens given that another event is already known to have happened is called a **conditional probability.** Suppose we know that event *A* has happened. Then the probability that event *B* happens *given* that event *A* has happened is denoted by *P(B | A).*

Read | as "given that" or "under the condition that"

(B's sample space = Favourable outcomes of A)

Die

A : an even number —— $A = \{2, 4, 6\}$

B : a number multiple of 3 $B = \{3, 6\}$

$\left(P(B/A) = \frac{1}{3}\right)$

SSBCrack EXAMS

CONDITIONAL PROBABILITY

In order to calculate conditional probability:

1. Identify the number of desired outcomes under the condition.
2. Identify the total number of outcomes under the condition.
3. Write the probability.

$$P(B \mid A) = \frac{P(B \cap A)}{P(A)} = \frac{P(A \cap B)}{P(A)}, \quad P(A) > 0$$

$A : \{2, 4, 6\}$

$B : \{3, 6\}$

$A \cap B = \{6\}$

$$P(B/A) = \frac{P(A \cap B)}{P(A)} = \frac{\frac{n(A \cap B)}{n(S)}}{\frac{n(A)}{n(S)}} = \frac{n(A \cap B)}{n(A)} = \frac{1}{3}$$

MULTIPLICATION RULE

$$P(A/B) = \frac{P(A)}{P(A \cap B)}$$

$$\boxed{P(A) = P(A/B) \times P(A \cap B)}$$

SSBCrack EXAMS

BAYE'S THEOREM

Let $A_1, A_2, A_3, \ldots, A_n$ be certain events which are mutually exclusive in pairs and which are exhaustive. Let A be an event which occurs with A_1, also with A_2, also with $A_3, \ldots$, also with A_n. Then, Baye's theorem states that

$$P\left(\frac{A_k}{A}\right) = \frac{P(A_k)\,P\left(\frac{A}{A_k}\right)}{P(A_1)\,P\left(\frac{A}{A_1}\right) + P(A_2)\,P\left(\frac{A}{A_2}\right) + \ldots + P(A_n)\,P\left(\frac{A}{A_n}\right)}$$

EXAMPLE

D : screw is defective.

The chances of defective screws in three boxes A, B and C are $\frac{1}{5}$, $\frac{1}{6}$ and $\frac{1}{7}$, respectively. A box is selected at random and a screw drawn from it at random is found to be defective. Find the probability that it came from box A is

(a) $\frac{42}{107}$ (b) $\frac{41}{141}$ (c) $\frac{42}{243}$ (d) None of these

$P(A)$, $P(B)$ & $P(C)$ — probabilities of choosing boxes A, B & C.

$P(D/A) = \frac{1}{5}$

$P(D/B) = \frac{1}{6}$

$P(D/C) = \frac{1}{7}$

$$P(A/D) = \frac{P(A)P(D/A)}{P(A)P(D/A) + P(B)P(D/B) + P(C)P(D/C)}$$

$P(A) = \frac{1}{3} = P(B) = P(C)$

$$P(A|D) = \frac{\frac{1}{3}\times\frac{1}{5}}{\frac{1}{3}\times\frac{1}{5}+\frac{1}{3}\times\frac{1}{6}+\frac{1}{3}\times\frac{1}{7}}$$

$$= \frac{1}{15} \Big/ \frac{1}{15}+\frac{1}{18}+\frac{1}{21}$$

$$= \frac{1}{5} \Big/ \frac{1}{5}+\frac{1}{6}+\frac{1}{7}$$

$$\frac{\frac{1}{5}}{= \frac{42+35+30}{210}}$$

$$= \frac{1}{\cancel{5}} \times \frac{\overset{42}{\cancel{210}}}{107}$$

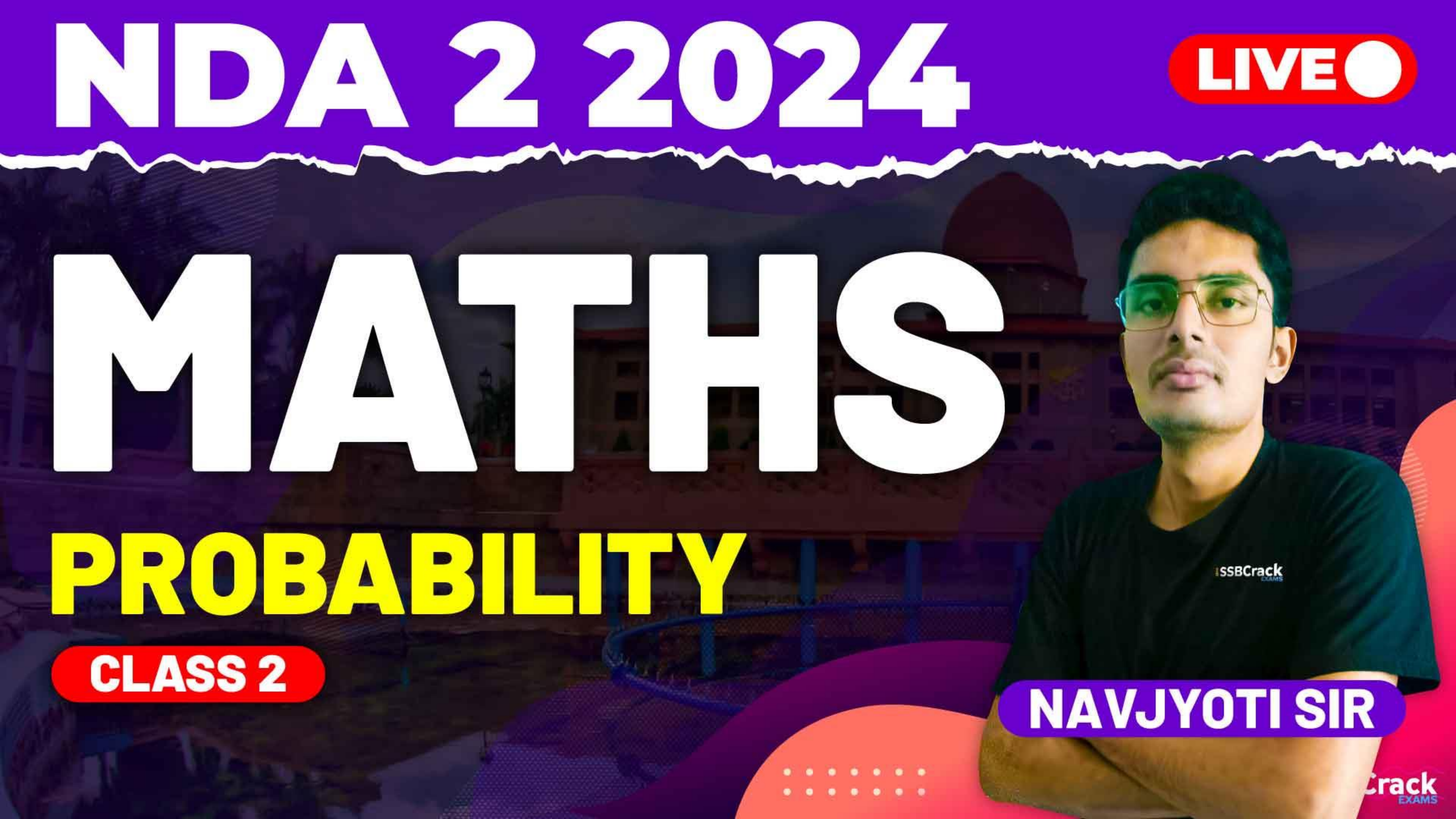
$$= \frac{42}{107} =$$

EXAMPLE

The chances of defective screws in three boxes A, B and C are $\frac{1}{5}, \frac{1}{6}$ and $\frac{1}{7}$, respectively. A box is selected at random and a screw drawn from it at random is found to be defective. Find the probability that it came from box A is

(a) $\frac{42}{107}$ (b) $\frac{41}{141}$ (c) $\frac{42}{243}$ (d) None of these

Ans: (a)


NDA 2 2024
LIVE
MATHS
PROBABILITY
CLASS 2
SSBCrack EXAMS
NAVJYOTI SIR
Crack EXAMS