

# Multiplication Theorem on probability

**SUBJECT : (MATHEMATICS)**  
**CHAPTER NUMBER: 13**  
**CHAPTER NAME : PROBABILITY**

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**CHANGING YOUR TOMORROW**

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## Multiplication theorem on probability.

Let E and F are any two events, then,  $P(E \cap F) = P(F) \cdot P\left(\frac{E}{F}\right)$  where  $F \neq \phi$

and  $P(E/F)$  denotes the probability of occurrence of event E and F has already occurred.

### Proof:

Let S be the sample space. In case of occurrence of event E when F has already occurred, F works as sample space and

$E \cap F$  works as the event, therefore.

$$\therefore P\left(\frac{E}{F}\right) = \frac{|E \cap F|}{|F|} = \frac{\frac{|E \cap F|}{|S|}}{\frac{|F|}{|S|}} = \frac{P(E \cap F)}{P(F)}$$

$$P(E \cap F) = P(F) \cdot P\left(\frac{E}{F}\right) \text{ -----(1)}$$

## Example – 1

An urn contains 10 black and 5 white balls. Two balls are drawn from the urn one after the other without replacement. What is the probability that both drawn balls are black?

## Example – 2

Three cards are drawn successively without replacement from the pack of 52 well-shuffled cards.

What is the probability that the first two cards are kings and the third card drawn is an ace?

### Example – 3

A box of oranges is inspected by examining three randomly selected oranges drawn without replacement. If all the three oranges are good, the box is approved for sale otherwise it is rejected. Find the probability that a box containing 15 oranges out of which 12 are good and 3 are bad ones will be approved for sale.

## HOME ASSIGNMENT

Q1. Two cards are drawn at random and without replacement from a pack of 52 playing cards.

Find the probability that both cards are black.

Q2. An urn contains 5 black and 7 white balls. Two balls are drawn from the urn one after the other without replacement. What is the probability that both drawn balls are red?

Q3. Three cards are drawn successively without replacement from the pack of 52 well-shuffled cards. What is the probability that the first two cards are Queens and the third card drawn is Jack?

**THANKING YOU**

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