



Safari Academy

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☎+251(0)116-607203 ☎+251(0)911-469878 ☎3628 [www. Safari-academy.com](http://www.Safari-academy.com) Addis Ababa, Ethiopia

2022/23 Academic Year

Mathematics Lesson Note

For Grade **11**

Rules of probability

I. Addition rule

If A and B are any event then

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

$$2. P(A \cup B) = P(A) + P(B), \text{ If } A \text{ and } B \text{ are mutually exclusive.}$$

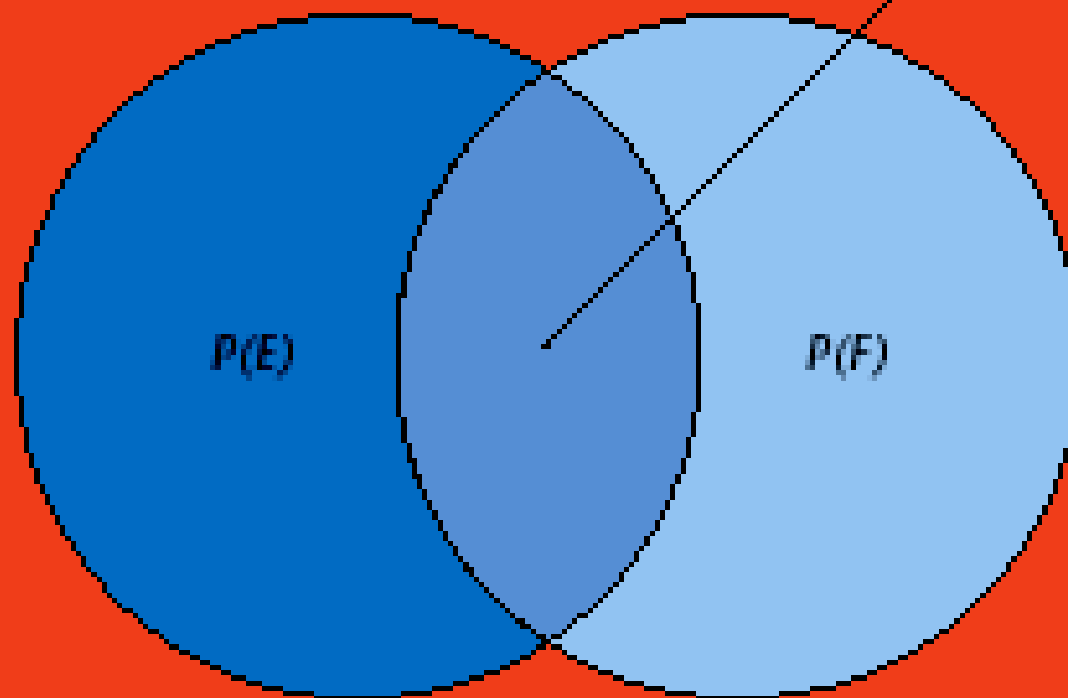
i.e. $A \cap B = \emptyset$

$$P(A \text{ or } B) = P(A \cup B),$$

Venn diagrams represent events as circles enclosed in a rectangle. The rectangle represents the sample space and each circle represents an event.

Area of entire region = $P(S) = 1$

E and F



If events E and F have no simple events in common or cannot occur simultaneously, they are said to be **disjoint** or **mutually exclusive**.

The Multiplication Rule

The probability that two events E and F both occur is

$$P(E \text{ and } F) = P(E) \cdot P(F | E)$$

In words, the probability of E and F is the probability of event E occurring times the probability of event F occurring given the occurrence of event E .

Two events E and F are **independent** if the occurrence of event E in a probability experiment does not affect the probability of event F . Two events are **dependent** if the occurrence of event E in a probability experiment affects the probability of event F .

Definition of Independent Events

Two events E and F are independent if and only if

$$P(F \mid E) = P(F) \text{ or } P(E \mid F) = P(E)$$

II. Multiplication rule

If A and B are any two events, the probability that both events

occurred denoted by $P(A \cap B) = P(A) \cdot P(B)$ is given by

- i. $P(A \cap B) = P(A) \cdot P(B)$ if A and B are independent event
- ii. $P(A \cap B) = P(A) \cdot P(B|A)$ if A and B are dependent event
(conditional probability) $P(B|A)$

I. The conditional probability of event A given that B has

already occurred is defined by $P(A|B) = \frac{P(A \cap B)}{P(B)}$

II. The conditional probability of event B given that A has

already occurred is defined by $P(B|A) = \frac{P(A \cap B)}{P(A)}$

Examples on Dependent Event

1. A box contain 6 red and 9 black ball. If two balls are drawing

what is the probability that

- a. Both are black
- b. Both are red (with out replacement)
- c. Both are black (with replacement)
- d. red then black

Examples on Independent event

1. In tossing of two coin , the event getting head (H) on the first coin and the event getting head (H) on the second coin are independent .

Examples

1. A box containing 5 red balls ,3 blue balls and 4 white balls.

one balls is drawn at random . Find the probability that is

a. red or blue

b. white or red

c. not blue

d. neither red nor blue

CONTIUED

2. A number is selected at random from the set of integer from

1 to 20 inclusive . Find the probability that the number selected

is a. Multiple of 2 or 3

 b. Multiple of 2 and 3

the two events and are not mutually exclusive.

NOTE n = and are mutually exclusive.

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$$\begin{aligned} \text{a. } &= \{2, 4, 6, 8, 10, 12, 14, 16, 18, 20\} & n() &= 10 \\ &= \{3, 6, 9, 12, 15, 18\} & n() &= 6 \quad n() \end{aligned}$$

$$= 3$$

$$\begin{aligned} p(\text{or}) &= p() = p() + p() - p() \\ &= + - \\ &= \end{aligned}$$

$$\text{b. } p() = p() = p().p()$$

$$. =$$

Exercise

1. A die and coin is tossed together . Find the probability of getting
 - a. four and head
 - b. three and tail
 - c. odd number and head
 - d. even number and tail

2. A box contains 5 white and 4 red balls. If two balls are drawn one after the other without replacement . Find the probability that

- a. Both are red
- b. Both are white
- c. The first ball is red and the second is white
- d. both are different color