

Assignment

Homework: Probability - Worksheet 9

Grade 12	GS – LS – ES	Statistics and Probability	Probability	Worksheet 9	Probability Tree
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I. (Lebanese Baccalaureate) A cafeteria sells dessert and coffee only. A customer can buy one dessert, one cup of coffee, both or none. In this cafeteria:

- 70% of the customers buy dessert, among which 40% buy coffee.
- among the customers who do not buy dessert, 35% do not buy coffee.

One customer of this cafeteria is randomly selected and interviewed. Consider the following events:

D: "The interviewed customer buys a dessert"

C: "The interviewed customer buys a cup of coffee"

- 1) a- Calculate the probabilities $P(C \cap D)$ and $P(C \cap \bar{D})$.
b- Deduce that $P(C) = 0.475$
- 2) A customer does not buy a cup of coffee. Calculate the probability that this customer does not buy a dessert.
- 3) In this cafeteria, the price of a dessert is 7000 LL and the price of a cup of coffee is 3000 LL.
a- Verify that the probability that the interviewed customer pays 10000 LL is 0.28.
b- Calculate the probability that the interviewed customer pays 7000 LL.

II. (Lebanese Baccalaureate) In 2017, the students of the third secondary classes of a certain school are distributed as follows:

- 50% of the students are in the ES section of which 60% succeeded in the official exam.
- 10% of the students are in the GS section of which 80% succeeded in the official exam.
- 40% of the students are in the LS section.
- 60% of the students succeeded in the official exam.

Part A One student is randomly selected from the third secondary students of this school. Consider the following events:

E: "The selected student is in the ES section"

G: "The selected student is in the GS section"

L: "The selected student is in the LS section"

S: "The selected student succeeded in the official exam"

- 1) a- Calculate the probabilities $P(E \cap S)$ and $P(G \cap S)$.
b- Prove that $P(L \cap S) = 0.22$
- 2) The selected student succeeded in the official exam. Calculate the probability that this student is in the LS section.

Part B There are 50 students in the third secondary classes in this school in 2017.

A computer software selects randomly and simultaneously the names of three students from the 50 students.

- 1) Verify that 30 students of this school succeeded in the official exam.
- 2) Verify that the probability that only one student among the three selected students succeeded in the official exam is $\frac{57}{196}$.

Assignment

Homework: Probability - Worksheet 6

Grade 12	GS – LS – ES	Statistics and Probability	Probability	Worksheet 6	Conditional Probability
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I. The table below gives the distribution of the students in a secondary school.

	Girls	Boys
First year	86	120
Second year	32	102
Third year	72	88

One student is selected randomly from the school and interviewed.

Consider the following events:

G: "The selected student is a girl"

F: "The selected student is in the first year"

S: "The selected student is in the second year"

T: "The selected student is in the third year"

- 1) Calculate $P(G)$, $P(F)$, and $P(\bar{S})$.
- 2) Calculate $P(F \cap G)$ and $P(T \cap \bar{G})$
- 3) Calculate $P(S \cup G)$
- 4) Calculate $P(S / G)$, $P(G / \bar{S})$, $P(G / S)$, and $P(\bar{G} / \bar{S})$.
- 5) The selected student is a boy. What is the probability of being in the second year?
- 6) Calculate the probability of selecting a student in the third year knowing that it is a boy.
- 7) Given that the selected student is a girl, what is the probability of being in the third year?
- 8) Calculate the probability of selecting a boy who is not in the first year.

II. G and L are two events of the same sample space Ω .

- 1) Find $P(G \cap L)$ if $P(G) = 0.4$ and $P(L / G) = 0.2$
- 2) Find $P(\bar{L} / \bar{G})$ if $P(G) = 0.4$ and $P(\bar{L} \cap \bar{G}) = 0.54$
- 3) Find $P(G \cup L)$ if $P(G) = 0.4$, $P(L) = 0.14$, $P(L / G) = 0.2$

Assignment

Homework: Probability - Worksheet 5

Grade 12	GS – LS – ES	Statistics and Probability	Probability	Worksheet 5	Compound Events
<p>I. U and V are two urns such that: U contains 5 red, 3 black, 2 white balls V contains 2 red, 4 black, 5 white balls Part A 4 balls are chosen randomly and simultaneously from V. Consider the following events: A: "The chosen balls have the same color" B: "Exactly 2 red balls are chosen" C: "At least 2 white balls are chosen" Calculate $P(A)$, $P(B)$, and $P(C)$. Part B 3 balls are chosen randomly and successively with replacement from U.</p> <ol style="list-style-type: none"> 1) Calculate the probability of choosing balls having the same color. 2) Calculate the probability of choosing at most 2 black balls. 					
<p>Part C One ball is chosen from U and one ball is chosen from V</p> <ol style="list-style-type: none"> 1) Prove that the probability of choosing two balls having the same color is $\frac{16}{55}$. 2) Calculate the probability of choosing balls having different colors. <p>Part D The balls of the two urns are put in an urn W. 5 balls are chosen randomly and successively without replacement from W.</p> <ol style="list-style-type: none"> 1) Calculate the probability of choosing 5 non-white balls. 2) Prove that the probability of choosing exactly 2 white balls is $\frac{364}{969}$. 					
<p>II. B_1 and B_2 are two bags such that:</p> <ul style="list-style-type: none"> • B_1 contains 5 apples and 7 oranges. • B_2 contains 8 apples and 3 oranges. <p>Two pieces are selected randomly and successively with replacement from B_1 and three pieces are selected randomly and simultaneously from B_2.</p> <ol style="list-style-type: none"> 1) Calculate the probability of selecting 5 pieces of the same type. 2) Calculate the probability of selecting 5 pieces of different types. 3) Calculate the probability of selecting only one apple from each bag. 4) Calculate the probability of selecting one orange only. 					

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Homework: Probability - Worksheet 7

Grade 12	GS – LS – ES	Statistics and Probability	Probability	Worksheet 7	Conditional Probability
<p>I. A and B are two events of the same universe Ω.</p> <ol style="list-style-type: none"> 1) Let $P(B / A) = 0.6$ and $P(A \cap B) = 0.3$. Calculate $P(A)$. 2) Let $P(A) = 0.3$, $P(B) = 0.7$, and $P(A \cup B) = 0.8$. Calculate $P(A \cap B)$, $P(A / B)$, and $P(B / A)$. 3) Let $P(B) = 2P(A)$, $P(A \cup B) = 0.5$, and $P(B / A) = 0.5$. Calculate $P(A)$ and $P(B)$. 4) Let $P(B / A) = 0.5$, $P(A / B) = 0.3$, and $P(B) = P(A) + 0.3$. Calculate $P(A)$, $P(B)$, and $P(A \cap B)$. 					
<p>II. A and B are two events of the same universe Ω.</p> <ol style="list-style-type: none"> 1) Let $P(A \cap \bar{B}) = \frac{2}{11}$ and $P(A \cap B) = \frac{7}{33}$. Calculate $P(A)$ and $P(\bar{A})$. 2) Let $P(A) = \frac{17}{37}$ and $P(A \cap \bar{B}) = \frac{7}{74}$. Calculate $P(A \cap B)$. 3) Let $P(A / B) = \frac{3}{25}$, $P(A / \bar{B}) = \frac{7}{25}$, and $P(B) = \frac{2}{3}$. Calculate $P(A \cap B)$, $P(A \cap \bar{B})$, $P(A)$, $P(B / A)$, $P(B \cap \bar{A})$, and $P(B / \bar{A})$. 					
<p>III. A and B are two events of the same universe Ω such that $P(A / B) = a$, $P(B) = c$, and $P(A / \bar{B}) = b$. Calculate, in terms of a, b, and c, the probabilities $P(A \cap B)$, $P(A \cap \bar{B})$, $P(A)$, $P(B / A)$, $P(B \cap \bar{A})$, and $P(B / \bar{A})$.</p> <p>IV. Show that $P(\bar{B} / A) = 1 - P(B / A)$.</p>					

Assignment

Homework: Probability - Worksheet 3

Grade 12	GS – LS – ES	Statistics and Probability	Probability	Worksheet 3	Definition and Properties									
<p>I. A coin is tossed twice. Consider the events: A: "The obtained faces are two heads" B: "The obtained faces are different" C: "The obtained faces are the same" D: "The first obtained face is a head" E: "The first obtained face is a head and the second obtained face is a tail" F: "The obtained face is odd" G: "The obtained faces are heads or tails"</p> <p>1) List all the elements of Ω, A, B, C, D, E, F, and G. 2) Name a couple of events that are: a- Incompatible b- Opposite</p>		<p>II. An urn contains 10 red balls, 5 blue balls, and 7 green balls. One ball is selected randomly from the urn. Consider the events: A: "The selected ball is red" B: "The selected ball is blue" C: "The selected ball is green" D: "The selected ball is black" E: "The selected ball is red or blue" F: "The selected ball is green and red" G: "The selected ball is not green" Calculate $P(A)$, $P(B)$, $P(C)$, $P(D)$, $P(E)$, $P(F)$, and $P(G)$.</p>		<p>III. The table below shows the number of Lebanese and non-Lebanese visitors (males and females) to a museum.</p> <table><tr><td></td><td>Lebanese</td><td>Non-Lebanese</td></tr><tr><td>Male</td><td>130</td><td>90</td></tr><tr><td>Female</td><td>110</td><td>75</td></tr></table> <p>One visitor is selected randomly and interviewed. Consider the events: M: "The selected visitor is a male" L: "The selected visitor is Lebanese"</p> <p>1) Calculate $P(M)$ and $P(L)$. 2) Calculate $P(\overline{M})$. 3) Calculate the probability of selecting a visitor who is a Lebanese female.</p>			Lebanese	Non-Lebanese	Male	130	90	Female	110	75
	Lebanese	Non-Lebanese												
Male	130	90												
Female	110	75												

Assignment

Homework: Probability - Worksheet 8 (A)

Grade 12	GS – LS – ES	Statistics and Probability	Probability	Worksheet 8 (A)	Conditional Probability
<p>I. U_1 and U_2 are two urns such that U_1 contains 5 black balls and 4 white balls and U_2 contains 6 black balls and 3 white balls. One ball is chosen from U_1. If the chosen ball from U_1 is white, it will be returned back to U_1; otherwise, if the chosen ball from U_1 is black, it will be put in U_2. After, two balls are chosen randomly and simultaneously from U_2. Consider the following events:</p> <p>A: "The chosen ball from U_1 is black"</p> <p>B: "The chosen balls from U_2 are black"</p> <p>1) Calculate $P(A)$ and prove that $P(B / A) = \frac{7}{15}$. Deduce $P(B \cap A)$.</p> <p>2) Calculate $P(B \cap \overline{A})$ and $P(B)$.</p> <p>3) Calculate the probability of choosing a black ball from U_1, knowing that the chosen balls from U_2 are not black.</p>		<p>II. The customer service department in a supermarket organizes a game to offer vouchers to its clients. For this purpose, an urn is placed at the entrance of the supermarket. The urn contains 3 red balls, 2 white balls, and 1 black ball. A client who wants to participate in the game selects, simultaneously and randomly, three balls from the urn. Consider the following events:</p> <p>A: "The three selected balls have the same color"</p> <p>B: "The three selected balls have three different colors"</p> <p>C: "The selected balls have different colors"</p> <p>D: "Only two of the three selected balls have the same color"</p> <p>1) Calculate the probabilities $P(A)$, $P(B)$, and $P(C)$.</p> <p>2) Show that $P(D) = \frac{13}{20}$.</p>			