Department of Statistics and Operations Research

College of Science

King Saud University

STAT 145

Solution of the H. W. 3

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Student Name	
Student Number	
Section	
Attendance_Number	

1	2	3	4	5	6	7	8	9	10
A	B	A	D	D	C	B	A	C	C

11	12	13	14	15	16	17	18	19	20
B	C	A	B	D	D	A	C	B	A

Question No. 1

The following table shows 100 people classified by income level and the number of cigarettes smoked daily:

Income level	No. of cigarettes smoked daily			Total
	No Cigarettes (A)	From one to five (B)	More than five (C)	
Low (L)	15	12	3	30
Middle (M)	5	25	20	50
Upper (U)	5	13	2	20
Total	25	50	25	100

The experiment is to select one of these people at random, then:

(1) The probability P(B) equals:

(A) 0.50	(B) 0.25	(C) 0.75	(D) 0.30

Solution:

$$P(B) = \frac{50}{100}$$

$$= 0.50$$

(2) The probability $P(A \cap L)$ equals:

(A) 0.25	(B) 0.15	(C) 0.50	(D) 0.60

Solution:

$$P(A \cap L) = \frac{15}{100}$$

$$= 0.15$$

(3) The probability $P(C \mid U)$ equals:

(A) 0.10	(B) 0.20	(C) 0.30	(D) 0.40

Solution:

$$P(C|U) = \frac{P(C \cap U)}{P(U)}$$

$$= \frac{2}{20} = \frac{1}{10} = 0.10$$

(4) The probability $P(A \cup M)$ equals to:

(A) 0.75	(B) 0.10	(C) 0.20	(D) 0.70

Solution:

$$P(U \cap M) = P(U) + P(M) - P(U \cap M)$$

$$= \frac{20}{100} + \frac{50}{100} - P(\phi)$$

$$= 0.20 + 0.50 - 0 = 0.70$$

Question No. 2

If A, B are two events defined on the same sample space such that $P(A) = 0.6$, $P(B) = 0.3$ and $P(A \cup B) = 0.7$, then :

(5) The probability $P(A^c)$ equals to:

(A) 0.3	(B) 0.6	(C) 0.7	(D) 0.4

Solution:

$$P(A^c) = 1 - P(A) = 1 - 0.6 = 0.4$$

(6) The probability $P(A \cap B)$ equals to:

(A) 0.6	(B) 0.7	(C) 0.2	(D) 0.5

Solution:

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

$$\therefore P(A \cap B) = 0.6 + 0.3 - 0.7 = 0.2$$

(7) The probability $P(A \cup B)^c$ equals to:

(A) 0.8	(B) 0.3	(C) 0.7	(D) 0.2

Solution:

$$P(A \cup B)^c = 1 - P(A \cup B)$$
$$= 1 - 0.7$$
$$= 0.3$$

(8) The probability $P(A^c \cap B)$ equals to:

(A) 0.1	(B) 0.3	(C) 0.2	(D) 0.9

Solution:

$$P(A^c \cap B) = P(B) - P(A \cap B)$$
$$= 0.3 - 0.2$$
$$= 0.1$$

Question No. 2

Suppose that we have two events A and B such that:
$P(A) = 0.4$, $P(B) = 0.5$, $P(A \cap B) = 0.2$.

(9) The probability $P(A \cup B)$ equals to:

(A) 0.1
(B) 0.9
(C) 0.7
(D) 0.8

Solution:

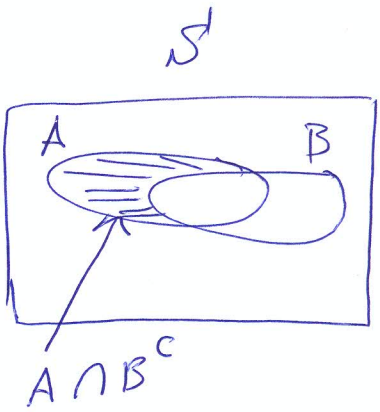
$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$
$$= 0.4 + 0.5 - 0.2$$
$$= 0.7$$

(10) The probability $P(A \cap B^C)$ equals to:

(A) 0.5
(B) 0.4
(C) 0.2
(D) 0.1

Solution:

$$P(A \cap B^c) = P(A) - P(A \cap B)$$
$$= 0.4 - 0.2$$
$$= 0.2$$



(11) The probability $P(A^C \cap B)$ equals to:

(A) 0.5
(B) 0.3
(C) 0.2
(D) 0.7

Solution:

$$P(A^c \cap B) = P(B) - P(A \cap B)$$
$$= 0.5 - 0.2$$
$$= 0.3$$

(12) The probability $P(A^C \cap B^C)$ equals to:

(A) 0.1
(B) 0.7
(C) 0.3
(D) 0.6

Solution:

$$P(A^c \cap B^c) = P(A \cup B)^c \quad \text{نظرية}$$
$$= 1 - P(A \cup B)$$
$$= 1 - 0.7 = 0.3$$

(13) The probability $P(A^C)$ equals to:

(A) 0.6
(B) 0.4
(C) 0.2
(D) 0.5

Solution:

$$P(A^c) = 1 - P(A) = 1 - 0.4 = 0.6$$

(14) The probability $P(A \mid B)$ equals to:

(A) 0.1
(B) 0.4
(C) 0.9
(D) 0.5

Solution:

$$P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{0.2}{0.5} = 0.4$$

(15) The probability $P(B \mid A)$ equals to:

(A) 0.4
(B) 0.1
(C) 0.9
(D) 0.5

Solution:

$$P(B|A) = \frac{P(A \cap B)}{P(A)} = \frac{0.2}{0.4} = 0.5$$

(16) The events A and B are:

(A) Exhaustive events
(B) Disjoint (mutually exclusive)
(C) Not independent
(D) Independent

Solution:

$P(A \cap B) = 0.2$ & $P(A) \times P(B) = 0.4 \times 0.5 = 0.2$

$\therefore P(A \cap B) = P(A) \times P(B) \Rightarrow$ Independent

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Question No. 3

In a random experiment:

$\Omega = \{1, 2, 3, 4, 5, 6\}$

$F = \{2, 4, 6\}, \quad G = \{1, 3, 5\}$

$K = \{2, 3, 4, 5\}, \quad E = \{4, 5, 6\}$

Then

(17) $P(F^c) =$

(A) 0.5 (B) 0.6 (C) 0 (D) 0.33

Solution:

$$P(F^c) = 1 - P(F)$$
$$= 1 - 3/6 = 0.5$$

(18) $P(F \cap G) =$

A) 0.5 (B) 0.6 (C) 0 (D) 0.33

Solution:

$$F \cap G = \phi$$
$$P(F \cap G) = P(\phi) = 0$$

(19) $P(K \cap E)^c =$ $P((K \cap E)^C)$

(A) 0.67 (B) 0.33 (C) 0.8 (D) 0.9

Solution:

$$P(K \cap E)^c = 1 - P(K \cap E)$$
$$= 1 - \frac{2}{6} = 0.33$$

$K \cap E = \{4,5\}$

(20) $P(K^c \cap E) =$

(A) 0.167 (B) 0.67 (C) 0 (D) 1

Solution:

$$P(K^c \cap E) = \frac{1}{6}$$

$K^c = \{1,6\}$

$K^c \cap E = \{6\}$

مع تمنياتي بالتوفيق