

ASSIGNMENT

Reg no;2023/DSCE/0083/SS

Question 1: (10 marks)

A professor thinks students who live on campus are more likely to get As in the probability course. To check this theory, the professor combines the data from the past

few years. 600 students have taken the course, 120 students have gotten As, 200 students lived on campus, 80 students lived off campus and got As.

- (a). Does this data suggest that "getting an A" and "living on campus" are dependent or independent?
- (b). If events A and B are independent. What is the condition for two events A and B, to be independent?

Question 2: (10 marks)

Suppose that I want to purchase a smart phone. I can choose either a large or a small screen; a 64GB, 128GB, or 256GB storage capacity, and a black or white cover.

- (a) How many different options do I have?
- (b) What are these options?

SOLUTION ONE

1(A)

If two events, k and B , are independent, then the probability of k and B occurring together is the product of their individual probabilities: $P(k \text{ and } B) = P(k) * P(B)$.

If the events are dependent, then the probability of k given B (or B given k) is not equal to the product of the probabilities of k and B : $P(k | B) \neq P(k) * P(B)$.

Total number of students

600 Number of students who got As (k) =

120 Number of students who lived on campus (B)

200 Number of students who lived off campus = $600 - 200$

400 Number of students who lived off campus and got As = $120 - 80 = 40$

$P(k)$ = Probability of getting a k

= Number of students who got As / Total number of students

= $120 / 600$

= $1/5$

$P(B)$ = Probability of living on campus

= Number of students who lived on campus / Total number of students

= $200 / 600$

= $1/3$

$P(k \text{ and } B)$ = Probability of getting an A and living on campus

= Number of students who got As and lived on campus / Total number of students

= $80 / 600$

= $4/30$

= $2/15$

if $P(k | B) = P(k \text{ and } B) / P(B)$:

$P(k | B)$ = Probability of getting an A given that the student lived on campus

$$= P(k \text{ and } B) / P(B)$$

$$= (2/15) / (1/3)$$

$$= (2/15) * (3/1)$$

$$= 6/15$$

$$= 2/5$$

$$P(k | B) = 2/5$$

Since $P(k | B) \neq P(k)$ (which is $1/5$)

\Thus, "getting an K" and "living on campus" are dependent events.

1(b)

If events K and B are independent. What is the condition for two events K and B, to be independent?

$$P(K \cap B) = P(K) * P(B)$$

$P(K)$ represents the probability of event K occurring

$P(B)$ represents the probability of event B occurring

$P(K \cap B)$ represents the joint probability of both events K and B occurring

In this equation:

If the equation holds true, then events K and B are independent.

If the equation does not hold true, i.e., $P(K \cap B)$ is not equal to $P(K) * P(B)$, then events K and B are dependent. In this case, the occurrence of one event provides information or influences the probability of the other event occurring, indicating a statistical relationship between the two event

Question 2

(a)

We have to multiply the number of choices for each category

Screen size: large or small(2choices)

Storage capacity: There are 3 options - 64GB, 128GB, or 256GB.

Cover color: There are 2 options - black or white cover.

Total number of options = (Number of options for screen size) × (Number of options for storage capacity) × (Number of options for cover color) Total number of options

= 2 (screen sizes) × 3 (storage capacities) × 2 (cover colors) Total number of options

= 2 × 3 × 2 Total number of options

= 12

Therefore, you have a total of 12 different options

(b)

Smallscreen,64gb storage, white cover

Smallscreen,128gbstorage, black cover

Smallscreen,256gb storage, black cover

Smallscreen,128gbstorage, white cover

Smallscreen,256gb storage, white cover

Smallscreen,64gb storage, black cover

Large screen,64gb storage, black cover

Large screen,64gb storage, white cover

Large screen,128gb storage, black cover

largescreen,256gb storage, black cover

largescreen,128gbstorage, white cover

largescreen,256gb storage, white cover

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