

CIT 5920 — Lecture 12: Independence & Random Variables

17 - 17 Oct 2024

Poll results

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- Can you see this?
- Can you hear me?
- Are the events “drawing an Ace” and “drawing a Spade” independent when drawing one card from a deck?
- How many possible values for X ? (provide them all)
- What would you like to do now in last ten minutes?
- Quiz: Conditional Probability

Can you see this?

007

Yes



No (wait how are you voting then? 🤖)

0 %

Can you hear me?

019

Yes



74 %

No



26 %

Are the events “drawing an Ace” and “drawing a Spade” independent when drawing one card from a deck?

0 1 9

Yes



No



Unsure



How many possible values for X? (provide them all)

0 1 7

- 2 3 4 5 6 7 8 9 10 11 12
- 18
- 2,3,4,5,6,7,8,9,10,11,12
- 2,3,4,5,6,7,8,9,10,11,12
- Any number between 2 and 12
- 13
- 2, 3, 4, ..., 12
- 11
- 2,3,4,5,6,7,8,9,10,11,12
- 2 and 12
- 1 to 6
- 11
- 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
- 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
- 2 to 12
- 36
- 6
- 2,3,4,5,6,7,8,9,10,11,12
- 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

What would you like to do now in last ten minutes?

020

Quiz on Conditional probability



75 %

New topic: Indicator Variables



15 %

We want to leave early because this is a pain and we've been polite for already a long time



10 %

Quiz: Conditional Probability (1/10)

0 2 7

What is the general formula for conditional probability?

$$P(E | F) = P(E \cap F) + P(F)$$

 7 %

$$P(E | F) = P(E \cap F) / P(F) \checkmark$$

 85 %

$$P(E | F) = P(E) / P(F)$$

 0 %

$$P(E | F) = P(F) / P(E \cap F)$$

 7 %

Quiz: Conditional Probability (2/10)

0 2 8

Which of the following best describes conditional probability?

The likelihood of an event occurring based on the occurrence of another event.



 100 %

The likelihood of two events occurring simultaneously.

 0 %

The likelihood of an event not occurring.

 0 %

The total probability of all possible outcomes of an event.

 0 %

Quiz: Conditional Probability (3/10)

0 2 9

Which of the following conditions is NOT a criteria for declaring 2 events to be independent?

$P(E | F) = P(E)$

☐ 3 %

$P(E \cap F) = P(E) + P(F)$ ☒

☒ 86 %

$P(E \cap F) = P(E)P(F)$

☐ 10 %

$P(F | E) = P(F)$

☐ 0 %

Quiz: Conditional Probability (4/10)

029

A bag contains 3 red balls and 2 blue balls. What is the probability of drawing a blue ball?

1/5

☐ 3 %

2/5 ☒

☒ 97 %

3/5

☐ 0 %

1

☐ 0 %

Quiz: Conditional Probability (5/10)

0 2 8

A bag contains 3 red balls and 2 blue balls. If you draw one ball at random, what is the probability it is blue given that it is not red?

1/5

 7 %

2/5

 18 %

3/5

 4 %

1 

 71 %

Quiz: Conditional Probability (6/10)

0 2 5

In a deck of cards, what is the probability of drawing a queen given that you drew a face card?

(1/2)

1/4



1/3 ✓



1/2



1/12



4/12 ✓



Quiz: Conditional Probability (6/10)

0 2 5

In a deck of cards, what is the probability of drawing a queen given that you drew a face card?

(2/2)

2/4

☐ 0 %

Quiz: Conditional Probability (7/10)

0 2 9

Which of the following best describes events that are mutually exclusive?

Events that can both occur at the same time.

☐ 0 %

Events that have no impact on each other's occurrence.

☐ 38 %

Events where the occurrence of one means the other cannot occur.

☒ 59 %

Events that always occur together.

☐ 3 %

Quiz: Conditional Probability (8/10)

026

Which of the following best describes events that are independent?

Events that can both occur at the same time.

☐ 8 %

Events that have no impact on each other's occurrence. ✓

☒ 92 %

Events where the occurrence of one means the other cannot occur.

☐ 0 %

Events that always occur together.

☐ 0 %

Quiz: Conditional Probability (9/10)

0 2 9

If two events A and B are independent, which of the following is true?

$P(A | B) = P(A)$ ✓



$P(A \cap B) = 0$



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



$P(A | B) = 0$



Quiz: Conditional Probability (10/10)

0 2 8

If two events are mutually exclusive, what is the probability that they both occur?

0 ✓



86 %

1/2

0 %

1

4 %

Cannot be determined

11 %