

Conditional Probability

Definition:

The probability that A occurs given that B occurs is called the conditional probability of "A given B" and is written $P(A | B)$

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Examples of Conditional Scenarios

- What is the probability that someone is in the Harrison band if you know the person is a freshman?
- What is the probability of drawing an ace in a game of go fish if you know that you already have two of them?
- What is the probability of drawing a Queen if you know that it is a face card?

The "Lawyers and Liars" Scenario

- There are 100 people at a party
- Forty are liars.
- Twenty-five are lawyers.
- 15 of the lawyers are liars.

A non-conditional Scenario: What is the probability that you randomly pick a lawyer?

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The "Lawyers and Liars" Scenario

- There are 100 people at a party
- Forty are liars.
- Twenty-five are lawyers.
- 15 of the lawyers are liars.

A Conditional Scenario: What is the probability that you pick a liar if you know that the person you are talking to is a lawyer?

A Formula and How to Use it

- There are 100 people at a party
- Forty are liars.
- Twenty-five are lawyers.
- 15 of the lawyers are liars.

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

A Conditional Scenario: What is the probability that you pick a liar if you know that the person you are talking to is a lawyer?

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Using the formula

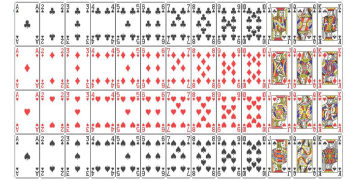
Determine $P(B|A)$ using the following data:

$$P(A) = .54$$

$$P(B) = .3$$

$$P(A \cap B) = .216$$

What is the probability of drawing a Queen if you know that it is a face card?



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In a class of students, the following data table summarizes how many students passed a test and complete the homework due the day of the test. What is the probability that a student completed the homework given that they passed the test?

	Passed Test	Failed Test
Completed HW	15	3
Did not Complete HW	4	6

More Conditional From a table

The following table shows data collected about new born babies. What is the probability of picking a baby with brown eyes if you know the baby has a slow heart rate?

	Slow heart rate (<100 bpm)	Fast heart rate (>100 bpm)
Brown eyes	6	2
Blue eyes	4	8

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More Conditional From a table

The following table shows data collected about new born babies. What is the probability of picking a baby with a fast heart rate if you know the baby has blue eyes?

	Slow heart rate (<100 bpm)	Fast heart rate (>100 bpm)
Brown eyes	6	2
Blue eyes	4	8

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