Answers: Law of Total Probability and Bayes’ Theorem

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Summary

Answers to questions relating to the guide on the Law of Total Probability and Bayes’ Theorem.

*These are the answers to [Questions: Law of Total Probability and Bayes’ Theorem].*

**Please attempt the questions before reading these answers.**

## Q1

#### 1.1.

You know:



Using the law of total probability:

So the probability that a randomly chosen patient recovers is .

#### 1.2.

You know:

* ,
* ,
* ,

Using the law of total probability:

So the probability that a randomly chosen student finishes their lunch is .

#### 1.3.

You know:

* ,
* ,
* ,

Using the law of total probability:

So the probability that a randomly selected product is defective is .

#### 1.4.

You know:

* ,
* ,
* ,

Using the law of total probability:

So the probability that the student completes their homework is .

## Q2

#### 2.1.

You know:

* (where means the person does not have the disease)

Using the law of total probability:

Now applying Bayes’ theorem:

So the probability that the person has the disease, given that they test positive, is approximately .

#### 2.2.

You know:



Using the law of total probability:

Then applying Bayes’ theorem gives:

So the probability that it actually rains, given that the forecast predicts rain, is approximately .

#### 2.3.

You know:



Using the law of total probability:

Then applying Bayes’ theorem gives:

So the probability that the item came from Machine B, given that it is faulty, is approximately .

#### 2.4.

You know:



Using the law of total probability:

Then applying Bayes’ theorem gives:

So the probability that the sweet is red, given that it has a wrapper, is approximately .

## Version history and licensing

v1.0: initial version created 05/25 by Sophie Chowgule as part of a University of St Andrews VIP project.

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