AI1110 - Probability and Random Variables Assignment 6

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Example 4

In a school, there are 1000 students, out of which 430 are girls. It is known that out of 430, 10% of the girls study in class XII. What is the probability that a student chosen randomly studies in Class XII given that the chosen student is a girl?

Solution

See table 1 and table 2 for input probabilities

Events	Description
$X = 0$	Student is girl
$X = 1$	Student is boy
$Y = i; i \in \{1, 2...12\}$	Student is in class i

Table: 1

Probability	Value
$\Pr(X = 0)$	$\frac{430}{1000} = \frac{43}{100}$
$\Pr(Y = 12, X = 0)$	$\frac{43}{1000}$
$\Pr(Y = 12 \vert X = 0)$	?

Table: 2

The desired probability is obtained using table 2 as follows

$$\Pr\left(Y = 12 | X = 0\right) = \frac{\Pr\left(Y = 12, X = 0\right)}{\Pr\left(X = 0\right)} \text{ (Bayes' Theorem)} \quad (1)$$

$$\Pr\left(Y = 12 | X = 0\right) = \frac{\frac{43}{1000}}{\frac{43}{100}} = \frac{1}{10} \quad (2)$$