

# AI1103 - Assignment 1

Monika Kharadi - CS20BTECH11026

## PROBLEM

2.12. In a school, there are 1000 students, out of which 430 are girls. It is known that out of 430, 10 percent of 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 ?

$$= \frac{\frac{43}{1000} \cdot \frac{1}{2}}{\frac{387}{1000} \cdot \frac{1}{2} + \frac{43}{1000} \cdot \frac{1}{2}} \quad (4)$$

$$= \frac{\left(\frac{43}{1000}\right)}{\left(\frac{430}{1000}\right)} \quad (5)$$

$$= \frac{1}{10} \quad (6)$$

## SOLUTION

Total number of students : 1000

Total number of girls : 430

Total number of girls in Class XII : 10 % of total girls

$$= \frac{10 * 430}{100} = 43 \quad (1)$$

Let  $X \in \{0, 1\}$  be the random variable such that 1 represents girl, 0 represents boy.

X	P(X)
1	$\frac{430}{1000}$
0	$\frac{570}{1000}$

Let  $Y \in \{0, 1\}$  be the random variable such that 1 represents chosen student is in Class XII, 0 represents chosen student is not in Class XII.

Y	P(Y)
1	$\frac{1}{2}$
0	$\frac{1}{2}$

Probability	Chosen Student	Value
$P(X = 1 Y = 0)$	girl not in Class XII	$\frac{387}{1000}$
$P(X = 1 Y = 1)$	girl in Class XII	$\frac{43}{1000}$

Now,

$$P(Y = 1|X = 1) \quad (2)$$

$$= \frac{P(X = 1|Y = 1) \cdot P(Y = 1)}{\sum_{i=0}^1 P(X = 1|Y = i) \cdot P(Y = i)} \quad (3)$$

$$= \frac{P(X=1|Y=1)P(Y=1)}{P(X=1|Y=0)P(Y=0)+P(X=1|Y=1)P(Y=1)}$$

Hence, the probability that a student chosen randomly studies in Class XII given that the chosen student is a girl is 0.1.