

# Probability Assignment

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Of the students in a college, it is known that 60% reside in hostel and 40% are day scholars (not residing in hostel). Previous year results report that 30% of all students who reside in hostel attain A grade and 20% of day scholars attain A grade in their annual examination. At the end of the year, one student is chosen at random from the college and he has an A grade, what is the probability that the student is a hostlier?

## Solution

Using Baye's Rule:

Let the probability of students living in hostel be  $\Pr(H=1)$ , therefore the students who are day scholars can be given as  $\Pr(H=0)$

The probability of the students getting grade A is given as  $\Pr(A=1)$ .

By given information,

$$\Pr(H=1) = \frac{60}{100} \quad (1)$$

$$\Pr(H=0) = \frac{40}{100} \quad (2)$$

$$\Pr(A=1 | H=1) = \frac{30}{100} \quad (3)$$

$$\Pr(A=1 | H=0) = \frac{20}{100} \quad (4)$$

Thus,

$$\Pr(A=1) = \sum_{i=0}^1 \Pr(A = 1 | H = i) \Pr(H=i) \quad (5)$$

$$\begin{aligned} \Pr(A=1) &= \Pr(A = 1 | H = 0) \Pr(H = 0) \\ &\quad + \Pr(A = 1 | H = 1) \Pr(H = 1) \end{aligned} \quad (6)$$

$$\Pr(A=1) = \left( \frac{20}{100} \times \frac{40}{100} \right) + \left( \frac{30}{100} \times \frac{60}{100} \right) \quad (7)$$

$$\Pr(A=1) = \frac{26}{100} \quad (8)$$

$$\Pr(H=1 | A=1) = \frac{\Pr(A=1 | H=1) \Pr(H=1)}{\Pr(A=1)} \quad (9)$$

$$\Pr(H=1 | A=1) = \frac{9}{13} \quad (10)$$

The probability that the student is a hostlier who has A grade is  $\frac{9}{13}$ .