

Probability Assignment

GINNA SHREYANI

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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,

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

$$\Pr(A = 1) = \Pr(A = 1|H = 0) \Pr(H = 0) + \quad (6)$$

$$\Pr(A = 1|H = 1) \Pr(H = 1) \quad (7)$$

$$\Pr(A = 1) = \left(\frac{20}{100} \times \frac{40}{100} \right) + \left(\frac{30}{100} \times \frac{60}{100} \right) \quad (8)$$

$$\Pr(A = 1) = \frac{26}{100} \quad (9)$$

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

$$\Pr(H = 1|A = 1) = \frac{9}{13} \quad (11)$$

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