

Total Probability Theorem

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Q-1 If 60% of boys opted for maths and 40% of girls opted for maths, what is the probability that maths is chosen if half of the population is girls.

Sol $\rightarrow P(\text{maths}) = P(\text{boys})P(\text{maths}|\text{boys}) + P(\text{girls})P(\text{maths}|\text{girls})$

$$= \frac{1}{2} \left(\frac{60}{100} \right) + \frac{1}{2} \left(\frac{40}{100} \right)$$
$$= \frac{1}{2}$$

Q-2 A problem is given to 5 students P, Q, R, S, T, of the probability of solving the problem individually is $\frac{1}{2}$, $\frac{1}{3}$, $\frac{2}{3}$, $\frac{1}{5}$, $\frac{1}{6}$ respectively, then find the probability that the problem is solved.

~~Q-2~~
~~Sol~~

Sol $\rightarrow P(A) = P(G)P(A|G) + \dots + P(G_5)P(A|G_5)$

$$= \frac{1}{5} \frac{1}{2} + \frac{1}{5} \frac{1}{3} + \frac{1}{5} \frac{2}{3} + \frac{1}{5} \frac{1}{5} + \frac{1}{5} \frac{1}{6}$$
$$= 0.37$$

Q-3 Write the Total probability theorem for n terms and write the theorem where total probability theorem is used?

$$P(A) = P(G_1)P(A/G_1) + P(G_2)P(A/G_2) + P(G_3)P(A/G_3) + \dots + P(G_n)P(A/G_n)$$

It is used in Bayes's theorem.

$$P(E_i|A) = \frac{P(A/G_i) \cdot P(G_i)}{P(A/G_1) \cdot P(G_1) + P(A/G_2) \cdot P(G_2)}$$