

Answer on Question #42093– Math - Statistics and Probability

Question:

There are two groups of subjects, one of which consists of 5 science subjects and 3 engineering subjects and the other consists of 3 science subjects and 5 engineering subjects. An unbiased die is cast. If number 3 or number 5 turns up, a subject is selected at random from the first group. Otherwise, a subject is selected random from the second group. Find the probability that an engineering subject is selected ultimately.

Solution:

A six-sided **die** is said to be **unbiased** if it is equally likely to show any of its six sides.

By formula of total probability

$$\Pr(A) = \Pr(A|H_1) \cdot \Pr(H_1) + \Pr(A|H_2) \cdot \Pr(H_2), \quad (1)$$

where events are the following:

A = "an engineering subject is selected ultimately",

H_1 = "a subject is selected at random from the first group",

H_2 = "a subject is selected at random from the second group",

$A|H_1$ = "an engineering subject is selected ultimately given a subject is selected at random from the first group",

$A|H_2$ = "an engineering subject is selected ultimately given a subject is selected at random from the second group".

When unbiased die is cast the probability that number 3 or number 5 turns up is $\Pr(H_1) = \frac{2}{6} = \frac{1}{3}$, and the probability that number 1,2,4,6 will turn up is $\Pr(H_2) = 1 - \frac{1}{3} = \frac{2}{3}$ (probability of the complementary event)

The probability of selecting engineering subject from the first group is $\Pr(A|H_1) = \frac{3}{8}$.

The probability of selecting engineering subject from the second group is $\Pr(A|H_2) = \frac{5}{8}$.

So, by formula (1), the probability of selecting the engineering subject ultimately is

$$\Pr(A) = \frac{1}{3} * \frac{3}{8} + \frac{2}{3} * \frac{5}{8} = \frac{3+10}{24} = \frac{13}{24}.$$

Answer: $\frac{13}{24}$.