

Answer on Question #55356 – Math – Statistics and Probability

Question

The probabilities of a boy passing English and Mathematics tests are a and b respectively. Find the probability of the boy failing both tests.

Solution

If probability of a boy passing English test is

$$Prob(\text{English pass}) = a,$$

then probability of a boy failing English test is

$$Prob(\text{English fail}) = 1 - Prob(\text{English pass}) = 1 - a,$$

because it is always the case that either boy passes the test or fails it.

Thus, by the complement rule for probability,

$$Prob(\text{English pass}) + Prob(\text{English fail}) = 1.$$

Similarly, if probability of a boy passing Mathematics test is

$$Prob(\text{Mathematics pass}) = b,$$

then probability of a boy failing Mathematics test is

$$Prob(\text{Mathematics fail}) = 1 - Prob(\text{Mathematics pass}) = 1 - b.$$

So, according to the multiplication rule of probability for independent events,

the probability of failing both test is

$$\begin{aligned} Prob(\text{both fail}) &= Prob(\text{English fail and Mathematics fail}) = \\ &= Prob(\text{English fail}) \cdot Prob(\text{Mathematics fail}) = (1 - a)(1 - b). \end{aligned}$$

This is true, because events “English fail” and “Mathematics fail” are independent (no event implies or influences the result of the other).

Answer: $(1 - a)(1 - b)$.