Answer on Question #44239 – Math - Statistics and Probability

A sprinkler system inside an office building has two types of activation devices, D1 and D2, which operate independently. When there is a fire, if either device operates correctly, the sprinkler system is turned on. In case of fire, the probability that D1 operates correctly is $P_1 = 0.95$, and the probability that D2 operates correctly is $P_2 = 0.92$. Find the probability that

a. Both D1 and D2 will operate correctly.

b. The sprinkler system will come on.

c. The sprinkler system will fail.

Solution

a. The probability that both D1 and D2 will operate correctly is

$$P(\text{both D1 and D2 will operate correctly}) = \\ = |probability\ of\ intersection\ of\ independent\ events| = P_1 \cdot P_2 = \\ = 0.95 \cdot 0.92 = 0.874.$$

b. The probability that the sprinkler system will come on is

$$P(\text{the sprinkler system will come on}) = 1 - P(\text{the sprinkler system will fail}) = \\ = 1 - P(\text{both D1 and D2 will fail}) = \\ = |probability\ of\ intersection\ of\ independent\ events| = \\ = 1 - (1 - P_1)(1 - P_2) = 1 - (1 - 0.95)(1 - 0.92) = 0.996.$$

c. The probability that the sprinkler system will fail is

$$P(\text{the sprinkler system will fail}) = P(\text{both D1 and D2 will fail}) = \\ = |probability\ of\ intersection\ of\ independent\ events| = \\ = (1 - P_1)(1 - P_2) = (1 - 0.95)(1 - 0.92) = 0.004.$$