Exercises Section 2.5 [Page 80]

71. An oil exploration company currently has two active projects, one in Asia and the other in Europe. Let A be the event that the Asian project is successful and B be the event that the European project is successful. Suppose that A and B are independent events with $P(A) = 0.4$ and $P(B) = 0.7$.
a. If the Asian project is not successful, what is the probability that the European project is also not successful? Explain your reasoning.

b. What is the probability that at least one of the two projects will be successful?

c. Given that at least one of the two projects is successful, what is the probability that only the Asia project is successful?

73. If A and B are independent events, show that A' and B are also independent. [*Hint*: First establish a relationship between $P(A' \cap B)$, $P(B)$, and $P(A \cap B)$.]

74. suppose that the proportions of blood phenotypes in a particular population are as follows:

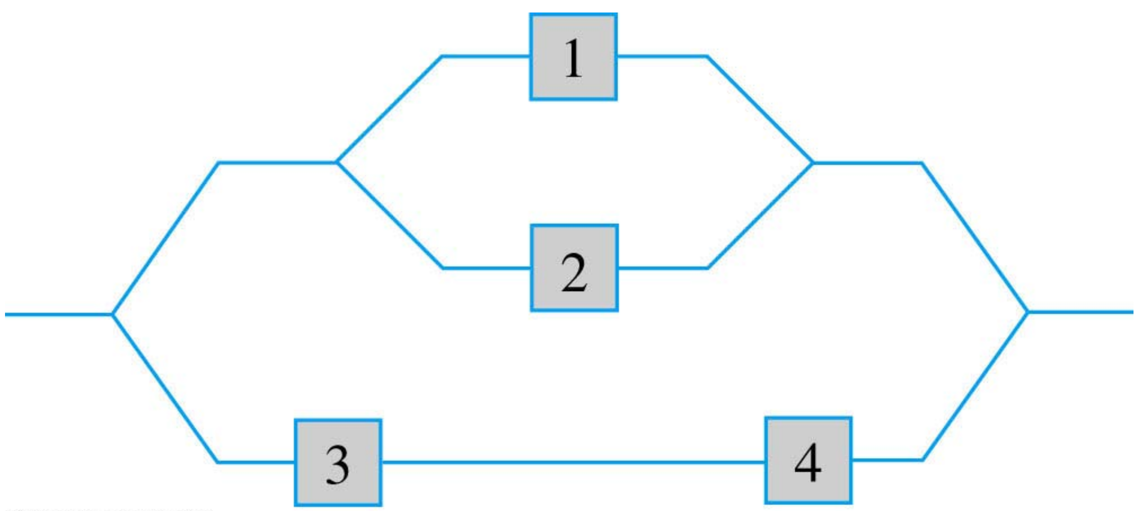
A	B	AB	O
.42	.10	.04	.44

Assuming that the phenotypes of two randomly selected individuals are independent of one another, what is the probability that both phenotypes are O? What is the probability that the phenotypes of two randomly selected individuals match?

77. An aircraft seam requires 25 rivets. The seam will have to be reworked in any of these rivets is defective. Suppose rivets are defective independently of one another, each with the same probability.
a. If 20% of all seams need reworking, what is the probability that a rivet is defective?

b. How small should the probability of a defective rivet be to ensure that only 10% of all seams need reworking?

80. Consider the system of components connected as in the accompanying picture. Components 1 and 2 are connected in parallel, so that subsystem works if and only if either 1 or 2 works; since 3 and 4 are connected in series, that subsystem works if and only if both 3 and 4 work. If components work independently of one another and $P(\text{component works}) = 0.9$, calculate $P(\text{system works})$.



82. Consider independently rolling two fair dice, one red and the other green. Let A be the event that the red die shows 3 dots, B be the event that the green die shows 4 dots, and C be the event that the total number of dots showing on the two dice is 7. Are these events pairwise independent (i.e., are A and B independent events, are A and C independent, and are B and C independent)? Are the three events mutually independent?

83. Components arriving at a distributor are checked for defects by two different inspectors (each component is checked by both inspectors). The first inspector detects 90% of all defectives that are present, and the second inspector does likewise. At least one inspector does not detect a defect on 20% of all defective components. What is the probability that the following occur?

a. A defective component will be detected only by the first inspector? By exactly one of the two inspectors?

b. All three defective components in a batch escape detection by both inspectors (assuming inspections of different components are independent of one another)?

84. Seventy percent of all vehicles examined at a certain emissions inspection station pass the inspection. Assuming that successive vehicles pass or fail independently of one another, calculate the following probabilities.

a. $P(\text{all of the next three vehicles inspected pass})$

b. $P(\text{at least one of the next three vehicles inspected fails})$

c. $P(\text{exactly one of the next three vehicles inspected pass})$

d. $P(\text{at most one of the next three vehicles inspected pass})$

e. Given that at least one of the next three vehicles passes inspection, what is the probability that all three pass (a conditional probability)?