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PR1 - PROBSTAT

2.53 The probability that an American industry will locate in Shanghai, China, is 0.7, the probability that it will locate in Beijing, China, is 0.4, and the probability that it will locate in either Shanghai or Beijing or both is 0.8. What is the probability that the industry will locate

(a) in both cities?

(b) in neither city?

$P(S) = 0,7$ (shanghai)

$P(B) = 0,4$ (beijing)

$P(S \cup B) = 0,8$

a) Both cities $= P(S \cap B)$

$P(S \cap B) = P(S) + P(B) - P(S \cup B)$

$= 0,7 + 0,4 - 0,8$

$= 0,3$

b) neither city $= P((S \cup B)^c)$

$= 1 - P(S \cup B)$

$= 1 - 0,8$

$= 0,2$

2.63 According to *Consumer Digest* (July/August 1996), the probable location of personal computers (PC) in the home is as follows:

Adult bedroom:	0.03 = P(A)
Child bedroom:	0.15 = P(C)
Other bedroom:	0.14 = P(O)
Office or den:	0.40 = P(D)
Other rooms:	0.28 = P(R)

(a) What is the probability that a PC is in a bedroom?

(b) What is the probability that it is not in a bedroom?

(c) Suppose a household is selected at random from households with a PC; in what room would you expect to find a PC?

a) in bedroom $= P(B)$

$P(B) = P(A) + P(C) + P(O)$

$= 0,03 + 0,15 + 0,14$

$= 0,32$

b) $P(B^c) = 1 - P(B)$

$= 1 - 0,32$

$= 0,68$

c) Office or den because it has the biggest probability (0,40)

2.79 In *USA Today* (Sept. 5, 1996), the results of a survey involving the use of sleepwear while traveling were listed as follows:

	Male	Female	Total
Underwear	0.220	0.024	0.244
Nightgown	0.002	0.180	0.182
Nothing	0.160	0.018	0.178
Pajamas	0.102	0.073	0.175
T-shirt	0.046	0.088	0.134
Other	0.084	0.003	0.087

(a) What is the probability that a traveler is a female who sleeps in the nude?

(b) What is the probability that a traveler is male?

(c) Assuming the traveler is male, what is the probability that he sleeps in pajamas?

(d) What is the probability that a traveler is male if the traveler sleeps in pajamas or a T-shirt?

a) 0,018 (from the table)

b) male = 0,220 + 0,002 + 0,160 + 0,102 + 0,046 + 0,084

= 0,614

c) male = 0,614

male in pajamas = 0,102

$P(A) = \frac{0,102}{0,614} = 0,166$

d) male that wear pajamas or t-shirt = 0,102 + 0,046 = 0,148

total that wear pajamas or t-shirt = 0,175 + 0,134 = 0,309

$P(A) = \frac{0,148}{0,309} = 0,479$

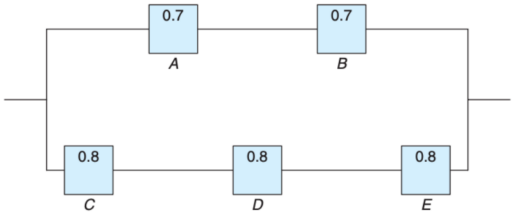

Figure 2.11: Diagram for Exercise 2.93.

2.93 A circuit system is given in Figure 2.11. Assume the components fail independently.

(a) What is the probability that the entire system works?

(b) Given that the system works, what is the probability that the component A is not working?

a) 2 seri yg diparalel

$P = 1 - (1-(0,7)(0,7))(1-(0,8)(0,8)(0,8))$

= 0,75112

b) S = system works

$P(A^c \mid S^c) = \frac{P(A^c \cap S^c)}{P(S^c)}$

$= \frac{P(A^c)(1-P(C \cap D \cap E))}{1-P(S)}$

$= \frac{(1-P(A))(1-P(C \cap D \cap E))}{1-P(S)}$

$= \frac{(0,3)(1-(0,8)(0,8)(0,8))}{1-0,75112}$

= 0,58824

2.95 In a certain region of the country it is known from past experience that the probability of selecting an adult over 40 years of age with cancer is 0.05. If the probability of a doctor correctly diagnosing a person with cancer as having the disease is 0.78 and the probability of incorrectly diagnosing a person without cancer as having the disease is 0.06, what is the probability that an adult over 40 years of age is diagnosed as having cancer?

C → cancer , D → diagnored

$P(C) = 0,05$; $P(C^c) = 1 - 0,05 = 0,95$

$P(D|C) = 0,78$

$P(D|C^c) = 0,06$

$P(D)$?

$$P(D) = P(D \cap C) + P(D \cap C^c)$$
$$= P(C) \cdot P(D|C) + P(C^c) \cdot P(D|C^c)$$
$$= (0,05)(0,78) + (0,95)(0,06)$$
$$= 0,096$$

2.101 A paint-store chain produces and sells latex and semigloss paint. Based on long-range sales, the probability that a customer will purchase latex paint is 0.75. Of those that purchase latex paint, 60% also purchase rollers. But only 30% of semigloss paint buyers purchase rollers. A randomly selected buyer purchases a roller and a can of paint. What is the probability that the paint is latex?

L → latex

L^c → semiglors

R → rollers

$P(L|R)$?

$P(L) = 0,75$

$P(R|L) = 0,60$

$P(R|L^c) = 0,30$

$$P(L|R) = \frac{P(R|L)\,P(L)}{P(R|L)\,P(L) + P(R|L^c)\,P(L^c)}$$
$$= \frac{(0,60)(0,75)}{(0,60)(0,75) + (0,30)(0,25)}$$
$$= 0,85714$$