3.58 With reference to Figure 3.12, find

 (a) $P(A|B)$;

 (b) $P(B|\overline{C})$;

 (c) $P(A \cap B|C)$:

 (d) $P(B \cup C|\overline{A})$:

 (e) $P(A|B \cup C)$;

 (f) $P(A|B \cap C)$:

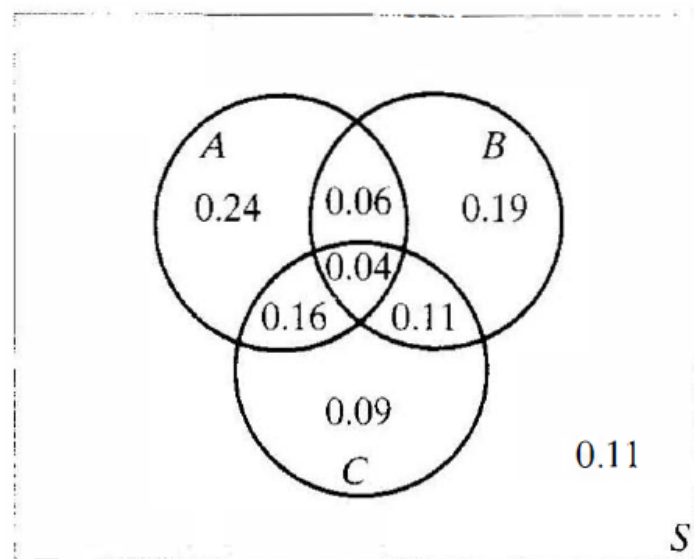 (g) $P(A \cap B \cap C|B \cap C)$;

 (h) $P(A \cap B \cap C|B \cup C)$.

Figure 3.12

3.62 If the probabilities are 0.98, 0.96, and 0.95 that a newly manufactured bottle of soap will be free of major defects, free of minor blemishes, and free of major defects and minor blemishes, find the probability that a bottle

 (a) that is free of major defects will also be free of minor blemishes

 (b) that is free of minor blemishes will also be free of major defects

3.63 Given that $P(A) = 0.60$, $P(B) = 0.40$, and $P(A \cap B) = 0.24$, verify that

(a) $P(A \mid B) = P(A)$;

(b) $P(A \mid \overline{B}) = P(A)$;

(c) $P(B \mid A) = P(B)$;

(d) $P(B \mid \overline{A}) = P(B)$.

3.64 Among the 24 invoices prepared by a billing department, 4 contain errors while the others do not. If we randomly check 2 of these invoices, what are the probabilities that

(a) both will contain errors;

(b) neither will contain an error?

3.65 Among 60 automobile repair parts loaded on a truck in San Francisco, 45 are destined for Seattle and 15 for Vancouver. If two of the parts are unloaded in Portland by mistake and the "selection" is random, what are the probabilities that

(a) both parts should have gone to Seattle;

(b) both parts should have gone to Vancouver;

(c) one should have gone to Seattle and one to Vancouver?

3.66 Two random digits will be selected using a random number generator (all 100 pairs of digits are equally likely). Find the probabilities of getting

(a) two 5's;

(b) first a 5 and then a digit less than 5.

3.67 If $P(A) = 0.60$, $P(B) = 0.45$, and $P(A \cap B) = 0.27$, are A and B independent?

3.68 If the odds are 5 to 3 that an event M will not occur, 2 to 1 that event N will occur, and 4 to 1 that they will not both occur, are the two events M and N independent?

3.69 Find the probabilities of getting

(a) eight heads in a row with a balanced coin;

(b) three 3's and then a 4 or a 5 in four rolls of a balanced die;

(c) five multiple-choice questions answered correctly. if for each question the probability of answering it correctly is $\frac{1}{3}$.

3.70 For three or more events which are not independent, the probability that they will all occur is obtained by multiplying the probability that one of the events will occur, times the probability that a second of the events will occur given that the first event has occurred, times the probability that a third of the events will occur given that the first two events have occurred. and so on. For instance, for three events we can write

$$P(A \cap B \cap C) = P(A) \cdot P(B|A) \cdot P(C|A \cap B)$$

and we find that the probability of drawing without replacement three aces in a row from an ordinary deck of 52 playing cards is

$$\frac{4}{52} \cdot \frac{3}{51} \cdot \frac{2}{50} = \frac{1}{5.525}$$

(a) If six bullets, of which three are blanks. are randomly inserted into a gun, what is the probability that the first three bullets fired will all be blanks?

(b) In a certain city during the month of May, the probability that a rainy day will be followed by another rainy day is 0.80 and the probability that a sunny day will be followed by a rainy day is 0.60. Assuming that each day is classified as being either rainy or sunny and that the weather on any given day depends only on the weather the day before, find the probability that in the given city a rainy day in May is followed by two more rainy days, then a sunny day, and finally another rainy day.

(c) A department store which bills its charge-account customers once a month has found that if a customer pays promptly one month, the probability is 0.90 that he will also pay promptly the next month; however, if a customer does not pay promptly one month, the probability that he will pay promptly the next month is only 0.50. What is the probability that a customer who has paid promptly one month will not pay promptly the next three months?

(d) If 5 of a company's 12 delivery trucks do not meet emission standards and 4 of the 12 trucks are randomly picked for inspection, what is the probability that none of them meets emission standards?

3.71 At an electronics plant, it is known from past experience that the probability is 0.83 that a new worker who has attended the company's training program will meet the production quota and that the corresponding probability is 0.35 for a new worker who has not attended the company's training program. If 80% of all new workers attend the training program, what is the probability that a new worker will meet the production quota?

3.72 With reference to the preceding exercise, find the probability that a new worker who meets the production quota will have attended the company's training program.

3.73 A consulting firm rents cars from three agencies, 20% from agency D, 20% from agency E, and 60% from agency F. If 10% of the cars from D, 12% of the cars from E, and 4% of the cars from F have bad tires, what is the probability that the firm will get a car with bad tires?

3.74 With reference to Exercise 3.73, what is the probability that a car with bad tires rented by the firm came from agency F?

3.75 Use the information on the tree diagram of Figure 3.16 to determine the value of

(a) $P(A)$;

(b) $P(B \mid A)$;

(c) $P(B \mid \bar{A})$.
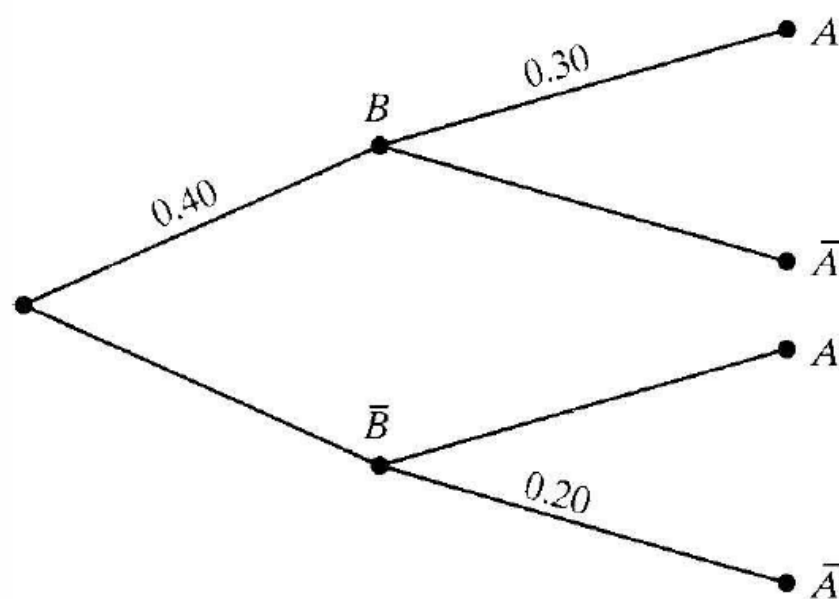
Figure 3.16 Diagram for Exercise 3.75

3.76 With reference to the example on page 72, find the probabilities that a voltage regulator that performs according to specifications came

3.78 Two firms V and W consider bidding on a road-building job, which may or may not be awarded depending on the amounts of the bids. Firm V submits a bid and the probability is $\frac{3}{4}$ that it will get the job provided firm W does not bid. The probability is $\frac{3}{4}$ that W will bid, and if it does, the probability that V will get the job is only $\frac{1}{3}$.

(a) What is the probability that V will get the job?

(b) If V gets the job, what is the probability that W did not bid?

3.79 Engineers in charge of maintaining our nuclear fleet must continually check for corrosion inside the pipes that are part of the cooling systems. The inside condition of the pipes cannot be observed directly but a nondestructive test can give an indication of possible corrosion. This test is not infallible. The test has probability 0.7 of detecting corrosion when it is present but it also has probability 0.2 of falsely indicating internal corrosion. Suppose the probability that any section of pipe has internal corrosion is 0.1.

(a) Determine the probability that a section of pipe has internal corrosion, given that the test indicates its presence.

(b) Determine the probability that a section of pipe has internal corrosion, given that the test is negative.