1. Randomly choose two different digits between one and nine inclusive.
   a) Determine the probability that these are the numbers one and nine.
   b) Determine the probability that the three will be drawn.
   c) Determine the probability that these are two odd numbers knowing that their sum is even.

2. Randomly choose two different digits between one and nine inclusive.
   a) Determine the probability that these are the numbers one and nine.
   b) Determine the probability that the three will be drawn.
   c) Determine the probability that these are two odd numbers knowing that their sum is even.

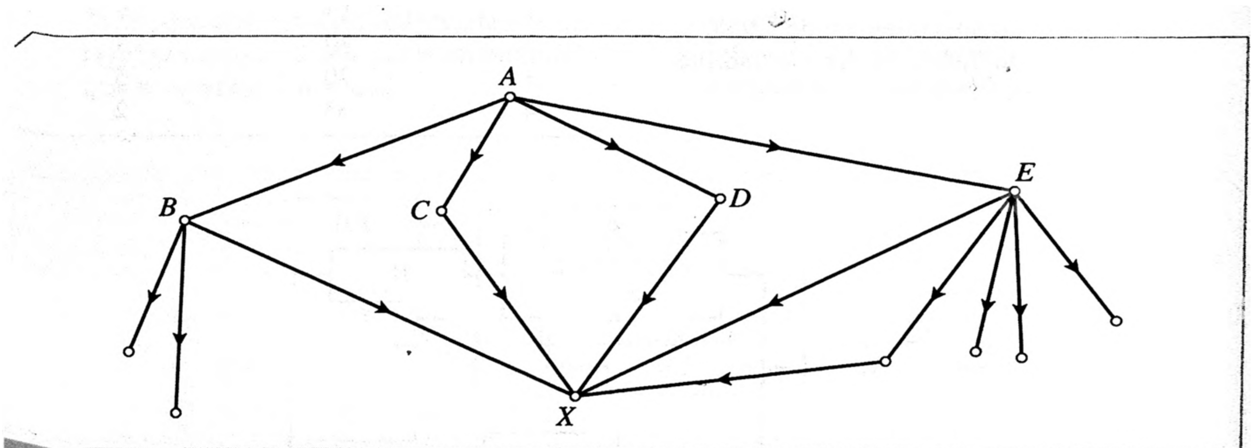

Figure 1.20 **Exercice 1.40**

3. The three most popular options for a certain type of car are:
   A Automatic transmission. B Power steering C Radio.
   A sales analysis has shown that buyers choose options in the following proportions:
   - Option A: 70%.
   - Option B: 75%.
   - Option C: 80%.
   - OptionAouB: 80%.
   - OptionAouC: 85%.
   - OptionBouC: 90%.
   - OptionAouBouC: 95%.

   Calculate the probabilities of the following events:
   D The buyer chooses one of the three options.
   E The buyer chooses radio only.

F The buyer does not choose any of the options.
G The buyer chooses exactly one of the three options.

4. A market study of the preferences of consumers of three car brands A, B, and C according to their income level (F: Low, M: Medium, E: High) resulted in the following table:

marque \ revenu	F	M	E
A	0,10	0,13	0,02
B	0,20	0,12	0,08
C	0,10	0,15	0,10

It can be seen, for example, that the probability that a low-income consumer prefers brand A is 10%, that is, $P(F \cap A) = 0.1$.
Calculate the probabilities $P(B \mid E)$, $P(M \mid C)$, $P(A \mid M)$, $P(M \mid A)$, $P(M \cap B \mid C)$, and $P(F \cup M \mid C)$.

5. A hydroelectric power station has two generators. Due to maintenance or occasional breakdown, generators may be out of order.
   We define the events:

   A The first generator is out of order.
   B The second generator is out of order.

   By experience, we estimate the probabilities of these events at $P(A) = 0.01$ and $P(B) = 0.02$.
   A temperature above 30◦C corresponds to the event T with probability $P(T) = 0.30$.
   Under these conditions, there is an increased demand for power for air conditioning.
   The plant's capacity to meet this demand is:

   S (satisfactory): if both generators are working and the temperature is below 30◦C.
   F (low): if one of the two generators is out of use and the temperature is above 30◦C.
   M (marginal): in other cases.
   We consider that the events A, B and T are independent.

   5.1. Describe the sample space Ω with A, B and T.
   5.2. Express the events S, F, M in terms of A, B and T.
   5.3. Calculate the probability that there is exactly one exhausted generator.
   5.4. Calculate P (S), P (F) and P (M).

6. The quantity of water stored in a tank can be represented by three states:

R Completed.

M Half full.

V Empty.

Due to the random nature of the flow of water entering the reservoir as well as the flow out to meet demand, the amount of water stored may change from state to state during the season. The (conditional) transition probabilities from one state to another between the start and end of the season are:

début \ fin	V_f	M_f	R_f
V_d	0,4	0,5	0,1
M_d	0,3	0,3	0,4
R_d	0,1	0,7	0,2

For example, P (Mf | Vd) = 0.5.
Suppose that at the start of the first season, P (Vd) = 0.1, P (Md) = 0.7 and P (Rd) = 0.2.
Calculate the probabilities that the reservoir

6.1. Either completed at the end of the first season.
6.2. Don't be empty at the end of the first season.
6.3. Either completed at the end of the second season.
6.4. Don't be empty at the end of the second season.

And finally
6.5. Determine the probabilities of each state after three seasons.