

PRACTICE QUESTIONS PROBABILITY TREES

EXERCISE – 2.9

PROBABILITY TREES

1. Tom travels to work either by bus or by train or by bicycle. The probabilities that he travels by bus is 0.3, by trains is 0.5 and by bicycle is 0.2. the probability that he arrives on time is 0.6 if he travels by bus, 0.9 if he travels by train and 0.8 if he travels by bicycle.
 - (i) Draw a tree diagram to show this information.
 - (ii) Find the probability that Tom does not arrive at work on time.
 - (iii) Find the conditional probability that Tom travelled by bus, given that he does not arrive at work on time.

(Ans : 0.21, 0.571)

2. The people living in 3 houses are classified as children (C), parents (P) or grandparents (G). The numbers living in each house are shown in the table below.

House number 1	House number 2	House number 3
4C, 1P, 2G	2C, 2P, 3G	1C, 1G

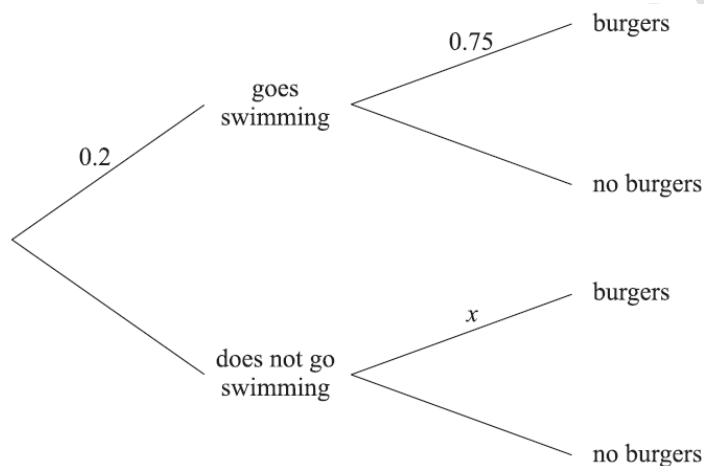
- (i) All the people in all 3 houses meet for a party. One person at the party is chosen at random. Calculate the probability of choosing a grandparent.
 - (ii) A house is chosen at random. Then a person in that house is chosen at random. Using a tree diagram, or otherwise, calculate the probability that the person chosen is a grandparent.
 - (iii) Given that the person chosen by the method in part (ii) is a grandparent, calculate the probability that there is also a parent living in the house.

(Ans : $3/8, 17/42, 10/17$)
3. In a certain country 54% of the population is male. It is known that 5% of the males are colour-blind and 2% of the females are colour-blind. A person is chosen at random and found to be colour-blind. By drawing a tree diagram, or otherwise, find the probability that this person is male.

(Ans : 0.7458)
4. When Don plays tennis, 65% of his first serves go into the correct area of the court. If the first serve goes into the correct area, his chance of winning the point is 90%. If his first serve does not go into the correct area, Don is allowed a second serve, and of these, 80% go into the correct area. If the second serve goes into the correct area, his chance of winning the point is 60%. If neither serve goes into the correct area, Don loses the point.
 - (i) Draw a tree diagram to represent this information.
 - (ii) Using your tree diagram, find the probability that Don loses the point.
 - (iii) Find the conditional probability that Don's first serve went into the correct area, given that he loses the point.

(Ans : 0.247, 0.263)

5. When Andrea needs a taxi, she rings one of three taxi companies, A , B or C . 50% of her calls are to taxi company A , 30% to B and 20% to C . A taxi from company A arrives late 4% of the time, a taxi from company B arrives late 6% of the time and a taxi from company C arrives late 17% of the time.
- (i) Find the probability that, when Andrea rings for a taxi, it arrives late.
- (ii) Given that Andrea's taxi arrives late, find the conditional probability that she rang company B .
- (Ans : 0.072, 0.250)
6. The probability that Henk goes swimming on any day is 0.2. On a day when he goes swimming, the probability that Henk has burgers for supper is 0.75. On a day when he does not go swimming the probability that he has burgers for supper is x . This information is shown on the following tree diagram.



The probability that Henk has burgers for supper on any day is 0.5.

- (i) Find x .
- (ii) Given that Henk has burgers for supper, find the probability that he went swimming that day.

(Ans : 0.4375, 0.3)

7. There are three sets of traffic lights on Karinne's journey to work. The independent probabilities that Karinne has to stop at the first, second and third set of lights are 0.4, 0.8 and 0.3 respectively.
- (i) Draw a tree diagram to show this information.
- (ii) Find the probability that Karinne has to stop at each of the first two sets of lights but does not have to stop at the third set.
- (iii) Find the probability that Karinne has to stop at exactly two of the three sets of lights.
- (iv) Find the probability that Karinne has to stop at the first set of lights, given that she has to stop at exactly two sets of lights.
- (Ans : 0.224, 0.392, 0.633)

8. Fabio drinks coffee each morning. He chooses Americano, Cappuccino or Latte with probabilities 0.5, 0.3 and 0.2 respectively. If he chooses Americano he either drinks it immediately with probability 0.8, or leaves it to drink later. If he chooses Cappuccino he either drinks it immediately with probability 0.6, or leaves it to drink later. If he chooses Latte he either drinks it immediately with probability 0.1, or leaves it to drink later.

(a) Find the probability that Fabio chooses Americano and leaves it to drink later.

(b) Fabio drinks his coffee immediately. Find the probability that he chose Latte.

(Ans : 0.1, 0.0333)

9. On Saturday afternoons Ali goes shopping with probability 0.25, or goes to the cinema with probability 0.35 or stays at home. If he goes shopping the probability that he spends more than \$50 is 0.7. If he goes to the cinema the probability that he spends more than \$50 is 0.8. If he stays at home he spends \$10 on a pizza.

(a) Find the probability that Ali will go to the cinema and spend less than \$50.

(b) Given that he spends less than \$50, find the probability that he went to the cinema.

(Ans : 0.07, 0.128)

10. At a zoo, rides are offered on elephants, camels and jungle tractors. Ravi has money for only one ride. To decide which ride to choose, he tosses a fair coin twice. If he gets 2 heads he will go on the elephant ride, if he gets 2 tails he will go on the camel ride and if he gets 1 of each he will go on the jungle tractor ride.

(i) Find the probabilities that he goes on each of the three rides.

The probabilities that Ravi is frightened on each of the rides are as follows:

elephant ride $\frac{6}{10}$, camel ride $\frac{7}{10}$, jungle tractor ride $\frac{8}{10}$.

(ii) Draw a fully labelled tree diagram showing the rides that Ravi could take and whether or not he is frightened.

Ravi goes on a ride.

(iii) Find the probability that he is frightened.

(iv) Given that Ravi is **not** frightened, find the probability that he went on the camel ride.

(Ans : $\frac{1}{4}, \frac{1}{4}, \frac{1}{2}, 0.725, 0.273$)