# Probability by Tree Diagrams

The probability that you will draw a tree diagram in each question is 1.

### Section A

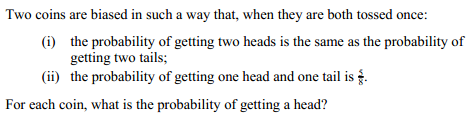
1. There are 12 sweets in a bag, of which 4 are blue and the rest are red. I take out two sweets. What is the probability that:
   1. I remove two red sweets?
   2. I remove at least one red sweet?
2. Jane wears make up 70% of the time. On the weekend, find the probability that
   1. She wears make up both days.
   2. She wears make up either Saturday or Sunday (but not both).
   3. She wears make up at least once.
3. On my way to work, I drive through two sets of road works with traffic lights which only show green or red. I know that the probability of the first set being green is . If the first set of lights is green, then the probability of the second set being green is . If, however, the first set of lights is red, then the probability of the second set being green is . What is the probability that:
   1. I get held up at exactly one set of lights?
   2. I get held up at least once?
   3. Over a term I make 90 journeys to work. On how many days can I expect to get held up at both set of lights?

### Section B

1. In my wardrobe are some coloured socks. There are 7 green socks, 3 blue socks and 2 red socks. I take a sock out of the wardrobe, put it on, and then take out a second sock from the wardrobe. Draw a tree diagram, and find:
   1. The probability that I am wearing two socks of the same colour?
   2. The probability that I am wearing at least one green sock?
2. Three Highgate pupils, let's call them Daniel, Larry and Tom, are sometimes late for school. Daniel is late with probability 0.3, Larry is late with probability 0.4 and Tom is late with probability 0.7.
   1. What is the probability that all three arrived at school today on time?
   2. What is the probability that at least one of them arrived at school today on time?
3. The Geography department carried out a survey to find out how people travelled to school. 40% of Highgate students come by car, 20% travel by bus, 15% walk, and the rest use the tube. Of those coming by car, the ratio of the boys who live more than a mile away to those living less than a mile away was 5:3. This ratio for those who travelled by bus was 3:2, and for those walking was 1:2. Everyone who uses the tube lives more than a mile away. What percentage of Highgate boys lives more than a mile away?
4. On holiday in the Bahamas, I noticed in the harbour that the ratio of luxury yachts: catamarans: speedboats: fishing boats was 2: 3: 4: 6. 30% of the luxury yachts needed repainting. 45% of the catamarans needed repainting. 60% of the speedboats needed repainting 75% of the fishing boats needed repainting. What percentage of all the boats in the harbour needed repainting?

### Section C

1. There are 15 sweets in a bag, of which some are red. Experience suggests that, if I pick one sweet and then pick another sweet without replacing the first sweet, the probability that I pick two red sweets is . How many red sweets are there in the bag?
2. Two pupils, let's call them James and Liam, are sometimes late for school. James is late with probability 0.4. Over the last 20 weeks of school there were 45 days on which exactly one of James and Liam were late. What is the probability that Liam is late?
3. In my wardrobe are ten coloured socks; each sock is either stripy or plain but the stripy socks outnumber the plain socks. Experience suggests that, if I pick one sock at random and then pick another without replacing the first sock, the probability that I pick two socks of different colours is . How many stripy socks are there in my wardrobe?
4. Every morning I drink either a cup of tea or a cup of coffee. My choice is completely independent of the previous day’s choice. The probability that I drink at least one cup of tea over two successive mornings is . What is the probability that I choose a cup of tea over a cup of coffee?
5. There are some black balls and some red balls in a bag. The probability of getting at least one red ball when I take out two balls one after the other (replacing the first before taking the second) is 9/10. What is the ratio of black balls to red balls in the bag?



12.

# Probability by Tree Diagrams - Homework

### Draw a tree diagram to complement your answer to every question.

1. Andrew loves to play tennis. If it is a sunny day, the probability that he plays tennis is 0.7. If it is not a sunny day the probability that he plays tennis is 0.4. The probability that Saturday will not be sunny is 0.15.
   1. Peter drew a tree diagram to represent this situation in which the first pair of branches were labelled “sunny” and “plays tennis”. Explain clearly why Peter’s tree is incorrect.
   2. Draw the correct tree diagram to represent this situation and use it to work out the probability that Andrew plays tennis on Saturday.
2. There are 20 sweets in a bag, of which 8 are blue and 12 are red. I take out two sweets. What is the probability that:
   1. I remove two different sweets?
   2. If, instead, I take out three sweets, what is the probability that at least one is red? [Hints: how can you extend your tree? What do you know about “at least”?]
3. I am a keen gardener, and in my garden I am growing a wisteria, a rhododendron and a clematis. I believe that the probability that each one will flower this year is 0.3, 0.5 and 0.8 respectively.
   1. What is the probability that all three plants will flower?
   2. What is the probability that at least two of the plants will flower?
4. There are some sweets in a bag, of which 6 are orange and the rest are purple. Experience suggests that, if I pick one sweet and then pick another sweet without replacing the first sweet, the probability that I pick two orange sweets is . How many sweets are there in the bag?
5. \* In a certain factory, microchips are made by two machines. Machine A makes a proportion *p* of the chips, where 0 < *p* < 1, and machine B makes the rest. 80% of the chips made by machine A are perfect, but only 60% of those made by machine B are perfect. The chips are sorted into two groups: group 1 contains those that are perfect and group 2 contains those that are imperfect.
   1. In a large random sample taken from group 1, it is found that  were made by machine A. Use this value to find an estimate for *p*.
   2. \*\* Subsequently, it is discovered that the sorting process is faulty: there is a probability of  that a perfect chip is assigned to group 2 and a probability of  that an imperfect group is assigned to group 1. Taking into account this additional information, find a new estimate for *p*.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 0.655 | 0.505 | 0.95 | 0.12 | 0.55 | 15 | 1/3 | 46/85 |