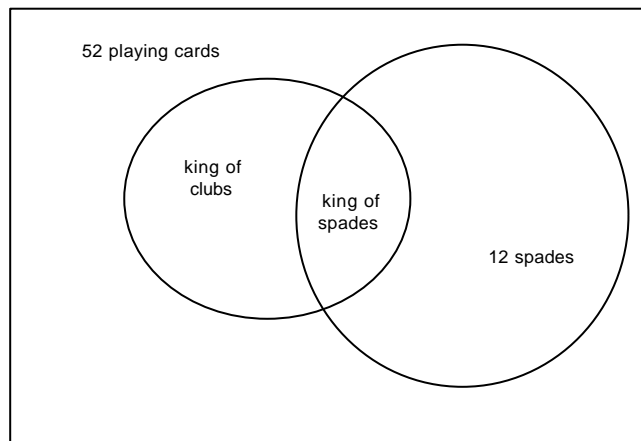




Chapter 1: Probability – The Underlying Principles

Progress Questions

1. The fact that a coin is spun 10 times and results in 9 heads and 1 tails may lead you to suspect that the coin is biased, but each toss of the coin is independent of all the others and so will not be influenced by all the others. The probability of a heads or a tails is the same on each throw (i.e. 0.5 or 50%) so we cannot safely predict the outcome with certainty. While it is unlikely that you would gain this result, it is not out of the question because it is a possible result. I would be deeply suspicious, however. When you reach chapter 9, you will discover that there are statistical tests you can apply to a result to determine the probability of gaining your observed results assuming there is no bias.
2. There are 2 black kings and 13 spades in a pack of playing cards. I am more likely to draw a spade of any denomination than a black king. The probabilities are 2 in 52 for the kings and 13 in 52 for any spade. Of course, one of the kings is a spade so, using a Venn diagram, the probabilities can be calculated more easily. The probability of drawing a black king remains 2 in 52 (i.e. approximately 3.8%) and of drawing a spade that is not a king, 12 in 52 (i.e. approximately 23%).



3. This is an example of the need to use the multiplication rule. The probability of drawing a black card first is 26 in 52 (i.e. 0.5). The probability of then drawing a red card is 26 in 51 (i.e. 0.51). Therefore, the probability of this combination is: $0.5 \times 0.51 = 0.255 = 25.5\%$. The odds are quite high because of the high proportions of each type of card.