Section 1: Working with probability

Exercise level 2

1. An octahedral die (eight sided, numbered 1 to 8) is thrown twice.
   The score is the difference between the 2 scores, always subtracting the smaller from the larger, so that the score is 0 or a positive value.
   e.g. if the dice shows 4 and 6, the score is 6 – 4 = 2.

   Show on a sample space diagram all the possible outcomes and show in a table all the possible scores and associated probabilities.

2. Over a long period of time I have worked out the probability that my train is late on a Sunday is 0.3. Train journey times are independent.
   (i) Draw a tree diagram to show the possible outcomes for my next 2 journeys on a Sunday.
   (ii) From the tree diagram calculate the probability that
   (*A*) both journeys are on time,
   (*B*) only one journey is on time.

3. In the build up to the Olympics a high jumper measured his success at a particular height. He has a maximum of 3 attempts at this height; once he has jumped successfully he does not jump that height again.

   On 60% of occasions he clears it at the first attempt.
   When he attempts the height for the second time he is successful in 75% of the attempts.
   When he attempts the height for the third time he is successful in only 30% of the attempts.
   (i) Draw a tree diagram to show the possible outcomes for his next 3 attempts.
   (ii) From the tree diagram calculate the probability that
   (*A*) he fails on all 3 attempts,
   (*B*) he fails at the first attempt but passes on the second or third attempt,
   (*C*) he successfully clears the height.

4. Redditch is well known for its number of roundabouts, to connect sections of the new town.
   A hassled Head of Mathematics travels to work by car and often gets delayed at 3 roundabouts.

   The probability of a delay at the first roundabout is 0.4.
   The probability of a delay at the second roundabout is 0.6.
   The probability of a delay at the third roundabout is 0.7.

   (i) Draw a tree diagram to show the possible outcomes and probabilities for the next journey.
   (ii) Find the probability that the Head of Mathematics is
   (A) delayed at all 3 roundabouts,
   (B) delayed at only 1 roundabout,
   (C) delayed at 2 or more roundabouts.

Edexcel AS Probability 1 Exercise

5. A bag contains 2 red discs and 3 blue discs. Two discs are drawn at random, with replacement, from the bag. Calculate the probability that
   (i) the first disc is red and the second disc is blue.
   (ii) both discs are blue
   (iii) the two discs are the same colour.

6. A popular car is available in a variety of models with 30% of them being three-door hatchbacks, 55% of them being five-door hatchbacks and the remainder being convertibles.
   Of the three-door hatchbacks, 60% are fitted with a 1.1-litre petrol engine, 15% are fitted with a 1.4-litre petrol engine and the remaining 25% are fitted with a diesel engine.
   The corresponding figures for the five-door hatchbacks are 15%, 55% and 30% respectively, and for the convertibles are 5%, 85% and 10% respectively.
   (i) One of these popular cars is chosen at random. Find the probability that
      (a) it is a five-door hatchback fitted with a 1.4-litre petrol engine
      (b) it has a diesel engine
      (c) it is a convertible or it is fitted with a 1.4-litre petrol engine
   (ii) Two of these popular cars are chosen at random. Find the probability that they have the same type of engine.

7. Three fair dice are thrown. What is the probability the exactly two of the scores are sixes?

8. The probability that a light bulb is faulty is 0.05. In a pack of 10 light bulbs, what is the probability that there will be at least one faulty light bulb?

9. A biased coin with P(H) = 0.47 is tossed three times. What is the most likely outcome?

10. At a fair it is estimated that the probability of winning a particular game is 0.05. The entry fee is 50p, and there is a £10 prize, plus the entry fee refunded, for a win. What is the expectation of my winnings per game?