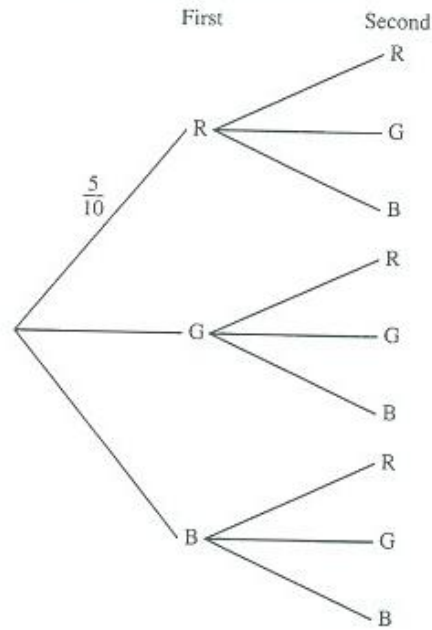**Topic 19**

Probability

1. A bag contains 5 red sweets, 4 green sweets and 1 blue sweet.
    Two sweets are taken out at random, without replacement.
    (a)

    Copy and complete the tree diagram to show this information.   [2]
    (b) Find, in its simplest form, the probability that
        (i)   two blue sweets are taken,   [1]
        (ii) both sweets are the same colour,   [2]
        (iii) one of the sweets taken is blue.   [2]
                                                                        (N2011/P2/Q10b)

2. A bag contains 10 red marbles, 5 blue marbles and 3 yellow marbles.
    (a) A marble is chosen at random and then replaced.
        What is the probability that it is a red marble?   [1]
    (b) How many more blue marbles must be placed in the bag so that the probability of
        choosing a blue marble would be $\frac{1}{2}$?   [1]
                                                                         (N2012/P1/Q3)

3. This table shows information about a group of students.

	Male	Female
Right-handed	6	5
Left-handed	3	2

(a) A member of the group is selected at random.
Find, as a fraction in its lowest terms, the probability that the student is
   (i) a right-handed male, [1]
   (ii) a female. [1]

(b) Two members are selected at random from the whole group of students.
Find, as a fraction in its lowest terms, the probability that
   (i) they are both males, [2]
   (ii) neither of them is a right-handed female. [2]

(N2012/P2/Q10b)

4. A bag contains five counters, numbered 1, 2, 3, 4 and 5.
Two counters are taken from the bag at random, one after the other, without replacement.
(a) Draw a possibility diagram to represent the outcomes. [1]
(b) Find, in its simplest form, the probability that
   (i) both counters have numbers less than 3, [1]
   (ii) neither counter has an even number, [1]
   (iii) the sum of the numbers is 10, [1]
   (iv) the product of the numbers is less than 6. [1]

(N2013/P2/Q10a)

5. The diagram shows a spinner with eight numbered sectors.

Each time the pointer is spun it is equally likely to stop on any of the sectors.
(a) The pointer is spun once.
Find the probability that it stops on an even number. [1]
(b) Anil spins the pointer twice.
Find the probability that the pointer stops on an even number both times. [1]
(c) Rin spins the pointer twice.
Her score is found by adding the numbers from her two spins.
Find the probability that her score is **not** 2. [2]

(N2014/P1/Q20)

76 In a class of 25 children, there are 13 boys and 12 girls.
Two of the children are selected at random to represent the class at a conference.
(a) Draw a tree diagram to show the probabilities of the possible outcomes. [2]
(b) Find, as a fraction in its simplest form, the probability that
    (i)   two girls are selected, [1]
    (ii) one boy and one girl are selected. [2]
    (N2014/P2/Q10b)

7. A bag contains 10 marbles, n of which are red and the rest are yellow.
A marble is chosen at random and not replaced.
(a) Write down, in terms of n, the probability that the marble is yellow. [1]
    A second marble is chosen at random.
(b) Find, in terms of n, the probability that both marbles are yellow. [1]
(c) (i)   The probability that both marbles are yellow is $\frac{1}{15}$.
          Show that $n^2 - 19n + 84 = 0$. [2]
    (ii) Solve the equation $n^2 - 19n + 84 = 0$ to find the number of yellow marbles in the
          bag. [3]
          (N2015/P1/Q24)

8. The table shows the ages of the 240 people who entered the cycle race.

Age (a years)		$20 \leqslant a < 30$	$30 \leqslant a < 40$	$40 \leqslant a < 50$	$50 \leqslant a < 60$
Frequency	Men	35	46	24	15
	Women	27	34	41	18

(a) One of these people is selected at random.
    Find, as a fraction in its lowest terms, the probability that the person is
    (i)   a man aged 50 or more, [1]
    (ii) aged under 30. [1]
(b) Two of these people are selected at random.
    Find the probability that **both** of them are women aged under 40.
    Give your answer as a decimal correct to three significant figures. [2]
    (N2015/P2/Q10b)

9. A bag contains 9 white balls, 5 red balls and 2 black balls.
Two balls are taken from the bag without replacement.
(a) Draw a tree diagram to show the probabilities of the possible outcomes. [2]
(b) Find, as a fraction in its simplest form, the probability that
    (i)   the two balls are the same colour, [2]
    (ii) at least one of the balls is white. [2]
    (N2016/P2/Q9b)

10. The table summarises the number of passengers in each of the cars in the morning.

Number of passengers	0	1	2	3	4
Number of cars	34	17	13	11	5

(a) One of the cars is selected at random.
Find the probability that it has no passengers. [1]
(b) Two of the cars are selected at random.
Find, as a fraction in its simplest form, the probability that
(i) they both had four passengers, [2]
(ii) one had more than two passengers and the other had fewer than two passengers. [2]

(N2017/P2/Q9b)

11. This table gives information about the ages of the mothers of the babies born in the hospital on one day and the sexes of their babies.
Each of the mothers gave birth to only one baby.

	Mother aged under 30	Mother aged 30 or over
Boy	3	9
Girl	7	6

(a) One of these mothers is selected at random.
Find, as a fraction in its lowest terms, the probability that she is under 30. [1]
(b) Two of the mothers are selected at random.
Find the probability that
(i) they both have a baby girl, [2]
(ii) they are both aged 30 or over, but only one has a baby boy. [2]

(N2018/P2/Q9b)

12. A bag contains 8 red counters, 9 green counters and 3 yellow counters.
(a) A counter is chosen at random and then replaced.
What is the probability that it is **not** a yellow counter? [1]
(b) x green counters are removed from the bag .
The probability of choosing a red counter is now $\frac{2}{3}$.
Find the value of x. [1]

(N2019/P1/Q7)

13. A bag contains 16 red counters and 9 blue counters.
Two counters are taken from the bag at random without replacement.
(a) Shen says the probability that both counters are blue is $\frac{81}{625}$.
Explain what he has done wrong. [1]
(b) Draw a tree diagram to show the probabilities of the possible outcomes. [2]
(c) Find, as a fraction in its simplest form, the probability that only one of the counters is red. [2]

(N2019/P2/Q9b)