2 The Splash Club has 26 members, of whom 16 are swimmers and 10 are divers. No member is both a swimmer and a diver. The club committee consists of 6 of these 26 members.

In how many ways can the club committee be selected if it must include at least 2 swimmers and at least 2 divers? [4]

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3 A committee of 6 people is to be chosen from 9 women and 5 men.

(a) Find the number of ways in which the 6 people can be chosen if there must be more women than men on the committee. [3]

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The 9 women and 5 men include a sister and brother.

(b) Find the number of ways in which the committee can be chosen if the sister and brother cannot both be on the committee. [3]

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5 A security code consists of 2 letters followed by a 4-digit number. The letters are chosen from {A, B, C, D, E} and the digits are chosen from {1, 2, 3, 4, 5, 6, 7}. No letter or digit may appear more than once. An example of a code is BE3216.

(a) How many different codes can be formed? [2]

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(b) Find the number of different codes that include the letter A or the digit 5 or both. [3]

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A security code is formed at random.

(c) Find the probability that the code is DE followed by a number between 4500 and 5000. [3]

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7 A group of 15 friends visit an adventure park. The group consists of four families.

- Mr and Mrs Kenny and their four children
- Mr and Mrs Lizo and their three children
- Mrs Martin and her child
- Mr and Mrs Nantes

The group travel to the park in three cars, one containing 6 people, one containing 5 people and one containing 4 people. The cars are driven by Mr Lizo, Mrs Martin and Mr Nantes respectively.

(a) In how many different ways can the remaining 12 members of the group be divided between the three cars? [3]

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The group enter the park by walking through a gate one at a time.

(b) In how many different orders can the 15 friends go through the gate if Mr Lizo goes first and each family stays together? [3]

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In the park, the group enter a competition which requires a team of 4 adults and 3 children.

(c) In how many ways can the team be chosen from the group of 15 so that the 3 children are all from different families? [2]

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(d) In how many ways can the team be chosen so that at least one of Mr Kenny or Mr Lizo is included? [3]

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6 Jai and his wife Kaz are having a party. Jai has invited five friends and each friend will bring his wife.

(a) At the beginning of the party, the 12 people will stand in a line for a photograph.

(i) How many different arrangements are there of the 12 people if Jai stands next to Kaz and each friend stands next to his own wife? [3]

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(ii) How many different arrangements are there of the 12 people if Jai and Kaz occupy the two middle positions in the line, with Jai's five friends on one side and the five wives of the friends on the other side? [2]

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(b) For a competition during the party, the 12 people are divided at random into a group of 5, a group of 4 and a group of 3.

Find the probability that Jai and Kaz are in the same group as each other. [5]

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5 The 8 letters in the word RESERVED are arranged in a random order.

(a) Find the probability that the arrangement has V as the first letter and E as the last letter. [3]

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(b) Find the probability that the arrangement has both Rs together given that all three Es are together. [4]

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6 **(a)** Find the number of different arrangements of the 9 letters in the word HAPPINESS. [1]

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(b) Find the number of different arrangements of the 9 letters in the word HAPPINESS in which the first and last letters are not the same as each other. [3]

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(c) Find the number of different arrangements of the 9 letters in the word HAPPINESS in which the two Ps are together and there are exactly two letters between the two Ss. [4]

The 9 letters in the word HAPPINESS are divided at random into a group of 5 and a group of 4.

(d) Find the probability that both Ps are in one group and both Ss are in the other group. [3]

6 **(a)** Find the number of different arrangements of the 9 letters in the word ACTIVATED. [2]

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(b) Find the number of different arrangements of the 9 letters in the word ACTIVATED in which there are at least 5 letters between the two As. [3]

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Five letters are selected at random from the 9 letters in the word ACTIVATED.

(c) Find the probability that the selection does **not** contain more Ts than As. [5]

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