6. In a class of 24 students, there are 14 boys and 10 girls.
In a particular week three students celebrate their birthdays.
What is the probability that these three students
(i) are three boys or three girls
(ii) have their birthdays falling on different days of the week?

(i) $P(\text{3 boys or 3 girls}) = \dfrac{\binom{14}{3} + \binom{10}{3}}{\binom{24}{3}} = \dfrac{11}{46}$

(ii) $P(\text{3 on different days}) = ?$
$= \left(\frac{7}{7}\right)\left(\frac{6}{7}\right)\left(\frac{5}{7}\right) = \frac{30}{49}$

10. A box contains letters used in a word-game. At a certain stage in the game, the 8 letters in the box are A, A, C, E, L, P, P, P. One player draws, at random, 3 letters in succession without replacing them. Calculate the probability that
(i) the letters P, E, A are drawn in that order
(ii) the letters P, E, A are drawn in any order
(iii) the 3 letters drawn do not include E or P
(iv) the 3 letters drawn are either all consonants or all vowels.

(i) $P(P, E, A) = \dfrac{3 \times 1 \times 2}{8P3} = \dfrac{1}{56}$

arrangement order matters ⇒ permutation

(ii) $P(\text{PEA in any order}) = \frac{1}{56} \times 6 = \frac{3}{28}$

6 ways of arranging P, E, A: $3 \times 2 \times 1 = 6$

(iii) $P(\text{letters not inc. E or P}) = \dfrac{4 \times 3 \times 2}{8P3} = \dfrac{1}{14}$

(iv) $P(\text{all vowels or all consonants}) = \dfrac{3 \times 2 \times 1 + 5 \times 4 \times 3}{8P3}$
$= \frac{11}{56}$