

There are three games. In how many ways can one play one game each day so that one can play each of the three at least once during five days (a school week)?

Solution:

- The set \mathcal{U} consists of all arrangements of size 5 taken from the set of three games, with repetitions allowed.
 - $|\mathcal{U}| = 3^5$.
- The set A represents the subset of all sequences of five games played during the week without playing Game One. The set B and C are defined similarly, leaving out Game Two and Game Three, respectively.
 - $|A|=|B|=|C|=2^5$.
 - $|A \cap B| = |A \cap C| = |B \cap C| = 1^5 = 1$.
 - $|A \cap B \cap C| = 0$.
- So by the preceding formula there are

$$\begin{aligned}
 |\bar{A} \cap \bar{B} \cap \bar{C}| &= U - |A \cup B \cup C| \\
 &= U - \{|A| + |B| + |C| - |A \cap B| - |A \cap C| - |B \cap C| + |A \cap B \cap C|\} \\
 &= 3^5 - \{3 \times 2^5 - 3 \times 1^5 + 0\} \\
 &= 3^5 - 93 \\
 &= 150
 \end{aligned}$$

ways the student can select his daily games during a school week and play each type of game at least once.