Math 323 - Assignment 1

Sada Sólomon, Ignacio - Id 260708051

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Problem 1

Suppose a family contains two children of different ages, and we are interested in the gender of these children. Let F denote a female child, and M denote male child, such that the ordered pair FM denotes an older female child and a younger male child without loss of generality. In the set S, we thus have:

$$S = \{FF,\, FM,\, MF,\, MM\}$$

Let A denote the subset of possibilities containing no males, B denote the subset containing two males, and C the subset containing at least one male. List the elements of $A, B, C, A \cap B, A \cup B, A \cap C, A \cup C, B \cap C, B \cup C$, and $C \cap \bar{B}$.

Solution.

$$\begin{aligned}
A &= \{FF\} \\
B &= \{MM\} \\
\bar{B} &= \{FF,\, FM,\, MF\} \\
C &= \{FM,\, MF,\, MM\} \\
A \cap B &= \{\} = \varnothing \\
A \cup B &= \{FF,\, MM\} \\
A \cap C &= \{\} = \varnothing \\
A \cup C &= \{FF,\, FM,\, MF,\, MM\} = S \\
B \cap C &= \{MM\} = B \\
B \cup C &= \{FM,\, MF,\, MM\} = C \\
C \cap \bar{B} &= \{FM,\, MF\}
\end{aligned}$$