Generalizations of the Möbius Function

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The classical Möbius function is an important arithmetic function in number theory. The posets Möbius function was the subject of Rotas paper published in 1964 which laid the foundation of the modern combinatorics. We will investigate links that can be established between Möbius functions relative to arithmetic convolutions and posets Möbius functions. These will be extended to special semigroups and their corresponding posets. Finally, a category approach of the above is described using the concept of Möbius category in the sense of Leroux.