On the number of mappings with images of a fixed size

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In order to design a good hashing algorithm, we need to analyze the random mapping from a set of keys to a set of addresses. When more than one key are mapped to a same address, it is called a collision; collisions are often unavoidable, especially with a large set of keys. While investigating collisions of a hashing algorithm, we came across the question of the number of mappings between two finite sets with images of a fixed size. A general formula for such a number is enumerated, and it represents the number of distributions of distinctive objects into distinctive boxes with no empty box, which occurs when the codomain and the set of images are of the same size.

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