

Introductory Combinatorics - The Pigeonhole Principle

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October 9, 2022

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1 Simple Form

Pigeonhole principle: If $n + 1$ objects are distributed into n boxes, then at least one box has two or more elements in it.

2 Strong Form

Pigeonhole principle: Let q_1, q_2, q_n be positive integers. If

$$q_1 + q_2 + \cdots + q_n - n + 1 \tag{1}$$

objects are distributed into n boxes, then the first box contains at least q_1 objects, or the second box contains at least q_2 objects, ..., or the n^{th} box contains at least q_n objects.

3 A Theorem of Ramsey