

Applications of symmetry via the lemma that is not Burnside's

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Abstract:

If you want to count the number of tiles in your floor, you probably will not count each one individually, but be lazy and look for a short cut. For instance, if the room is rectangular and walking part of its perimeter you discover there are 8 tiles along the north wall and 6 tiles along the west wall, you expect 48 tiles total. This short cut employs the power of symmetry. (And a bit of algebra.)

In this talk, I'll discuss a powerful counting method that is often referred to as Burnside's Lemma, although it goes back to Frobenius (1887) and Cauchy (1845). This method uses symmetry and a bit more algebra. I will illustrate the lemma by counting necklaces strung with colored beads. Other applications include counting: isomers of a given molecule; crystal structures; chords in a twelve-tone musical scale; Latin squares; finite automata.