# Analysis of competing interactions in some rings modeled by the Ising spins

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Recently, a new classification of spin frustration in geometrically frustrated quantum spin systems described by the Heisenberg model has been put forward [1] and pursued [2,3]. In particular, the notion of the third type of frustration was introduced in Ref.[1] which does not alter the nonfrustrated ground state. Here we discuss three Ising ring systems with competing interactions which are analogs of quantum systems considered in Ref. [2] and show that they exhibit similar properties. For example, the archetypal system of three antiferromagnetically coupled spins $s$ has two *magnetically* degenerated ground states with $|M| = s$, when $0 < J_{1\,3} = \alpha < 1 = J_{1\,2} = J_{2\,3}$. The same effect is observed in the centered rings and systems with antiferromagnetic couplings between the second neighbors which are the geometrically frustrated systems due to the competing interactions.

**References:**

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