Summary: We observe that every self-dual ternary code determines a holomorphic $\mathcal{N} = 1$ superconformal field theory. This provides ternary constructions of some well-known holomorphic $\mathcal{N} = 1$ superconformal field theories (SCFTs), including Duncan’s “supermoonshine” model and the fermionic “beauty and the beast” model of Dixon, Ginsparg, and Harvey. Along the way, we clarify some issues related to orbifolds of fermionic holomorphic CFTs. We give a simple coding-theoretic description of the supersymmetric index and conjecture that for every self-dual ternary code this index is divisible by 24; we are able to prove this conjecture except in the case when the code has length 12 mod 24. Lastly, we discuss a conjecture of Stolz and Teichner relating $\mathcal{N} = 1$ SCFTs with Topological Modular Forms. This conjecture implies constraints on the supersymmetric indexes of arbitrary holomorphic SCFTs, and suggests (but does not require) that there should be, for each $k$, a holomorphic $\mathcal{N} = 1$ SCFT of central charge $12k$ and index $24/\gcd(k, 24)$. We give ternary code constructions of SCFTs realizing this suggestion for $k \leq 5$.

MSC:
17B69 Vertex operators; vertex operator algebras and related structures
94B05 Linear codes (general theory)
81Q60 Supersymmetry and quantum mechanics
55N20 Generalized (extraordinary) homology and cohomology theories in algebraic topology

Keywords:
supersymmetry; vertex operator algebras; linear codes; moonshine; TMF

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References:

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