FROM 1-2-3 CONJECTURE TO RIEMANN HYPOTHESIS

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The following, innocently looking question was asked in [1]: *Can the edges of any non-trivial graph be assigned weights from $\{1, 2, 3\}$ so that adjacent vertices have different sums of incident edge weights?* There exist many variations on this problem in which one tries to get a graph coloring by other manipulations on vertex degrees. It turns out, unexpectedly, that one of them is related to some deep number theoretic problems, like Graham's *gcd*-problem, Erdős Discrepancy Problem, or even the Riemann Hypothesis.

References

[1] M. Karoński, T. Łuczak, and A. Thomason, Edge weights and vertex colours, J Combin Theory Ser B 91 (2004), 151–157.