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