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Defective acyclic colourings of planar graphs

A vertex colouring of a graph G is called acyclic if the colouring is proper and any two colour classes induce an acyclic subgraph of G. It was shown by Borodin (1979) that every planar graph has an acyclic 5-colouring. Mondal, Nishat, Rahman, and Whitesides (2013) show that any planar triangulation can be made acyclically 3-colourable by subdividing $2n - 5$ of its edges exactly once each, and acyclically 4-colourable by subdividing $\frac{3}{2}n - \frac{7}{2}$ of its edges exactly once each. We extend and complement these results by providing bounds on the number of edges whose deletion will make a planar graph acyclically 3-colourable or 4-colourable, and providing tight bounds on the minimum number of edges one needs to remove from a planar graph in order to turn any proper 3-colouring or 4-colouring into an acyclic colouring. Joint work with On-Hei Solomon Lo and Xuding Zhu.