

Proper edge-colorings which forbid rainbow cycles

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Which graphs have proper edge colorings such that no cycle is rainbow with respect to the coloring? As is typical for “mixed hypergraph” coloring problems in which one class of hyperedges is forbidden to be monochromatic while another class of hyperedges is forbidden to be rainbow, the question can be sharpened to: given a graph G , with which integers k can the edges of G be colored with exactly k colors appearing so that no two adjacent edges are the same color, and no cycle in G is rainbow? The set of such k will be a subset of the set of consecutive integers $\{\text{chromatic index of } G, \dots, |V(G)| - 1\}$. We give some answers for some classes of graphs, and make a start on a forbidden subgraph characterization of the graphs for which some such coloring exists.