Random planar graphs with \( n \) vertices and \( m \) edges

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Let \( P_{n,m} \) denote a graph taken uniformly at random from the set of all labelled planar graphs with \( n \) vertices and \( m(n) \) edges. We shall use counting arguments to explore the probability that \( P_{n,m} \) has a component or subgraph isomorphic to \( H \), for various fixed \( H \), as \( n \to \infty \). In particular, we will investigate exactly when the probabilities are bounded away from 0 and/or 1, showing that there is different behaviour depending on both the graph \( H \) and the ratio \( m/n \).

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