# Weighted Graphs Take 2

Can we reduce "Shortest Paths on a weighted graph" to "shortest paths on an unweighted graph"?

I.e., someone wrote you a library function UnweightedSP can you use that to find the shortest paths in a weighted graph?

UnweightedSP probably does BFS...but we're not going to care exactly how it does what it does (just that it does it correctly).

### Reduce 3-coloring to 4-coloring

Let's reduce 3-coloring to 4-coloring

#### 3-coloring

Input: Undirected Graph G

Output: True if the vertices of G can be labeled with red, green, and blue so that no edge has both of its endpoints colored the same color. False if it cannot.

#### 4-coloring

Input: Undirected Graph G

Output: True if the vertices of G can be labeled with red,green, blue, and orange so that no edge has both of its endpoints colored the same color. False if it cannot.

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0.6

0.97

0.2

## Another Application of Shortest Paths

Let each edge's weight be the probability a message is sent successfully across the edge.

What's the probability we get our message all the way across a path? -It's the product of the edge weights.

We only know how to handle sums of edge weights.

Is there a way to turn products into sums?

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