/r/vexillologygreatcirclejerk – SOLUTION

CRUMS 2020 — December 12, 2020
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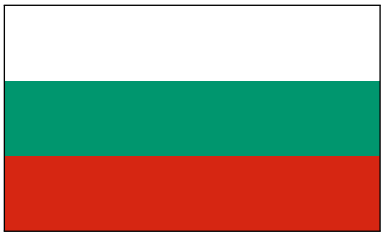
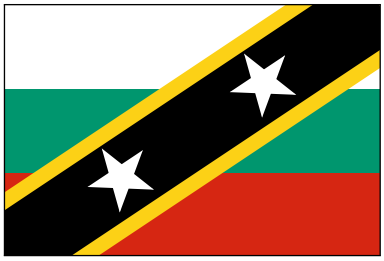
The title of this puzzle references the reddit community `/r/vexillologycirclejerk`, which discusses joke flags otherwise unsuitable for the main flag subreddit, `/r/vexillology`. Many of the flags posted to `/r/vexillologycirclejerk` are parodies and mashups of existing flag designs. Likewise, the nine flags in this puzzle are mashups of existing national flags:

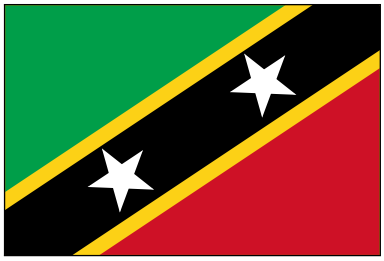
Albania

Curaçao



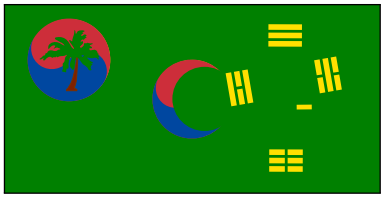
Bulgaria

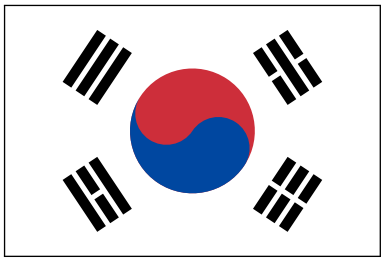




Saint Kitts and Nevis

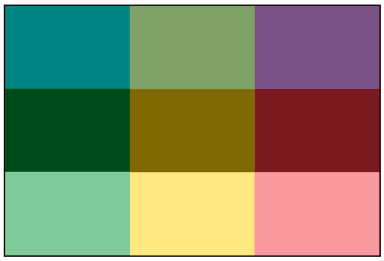
Cocos (Keeling) Islands



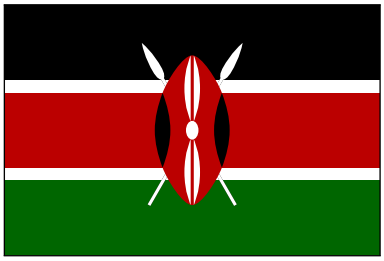


South Korea

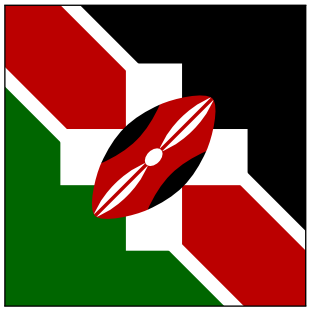
Estonia

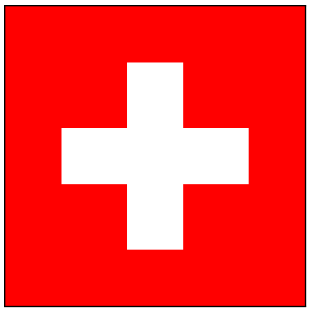


Mali

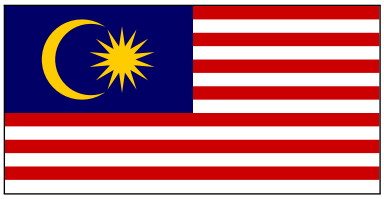


Kenya

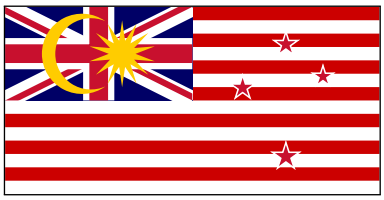


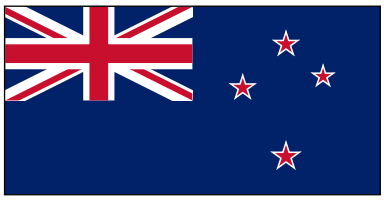


Switzerland

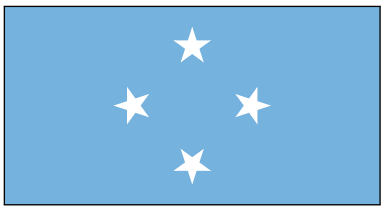


Malaysia

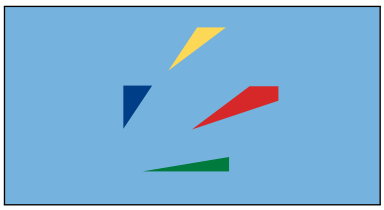




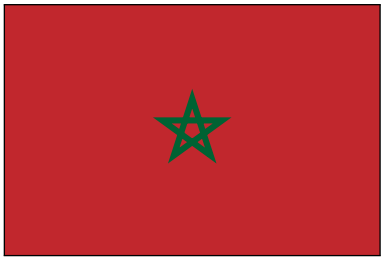
New Zealand



Micronesia

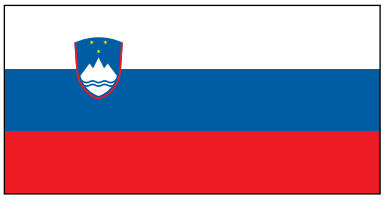


Seychelles



Morocco

Slovakia



Slovenia

Togo

The replacement `/r/vexillologycirclejerk` to `/r/vexillologygreatcirclejerk` suggests the use of great circles, paths of minimal distance between two points on the surface of a sphere. Coupled with the flavor/intro text "international alliances of capital importance," we're led to plot great circle routes between the capitals of the two countries in each flag mashup.

A figure containing these nine great circles is shown on the following page. Right off the bat, we note an unexpected triple intersection of great circles near Malaysia.[1] If we zoom in on Europe, we see two additional triple intersections, one in Italy and another on the coast of France.

[1] We would only expect simple intersections if the geodesics were random.

By zooming in to a scale of a few miles, we can see the small triangles that form each apparent triple intersection. These small triangles surround the countries of Monaco, Singapore, and Vatican City, which are distinguished as the world's only city-states. The 9-letter answer to this puzzle (as indicated by the 9 dashes on the bottom of the puzzle page) is **CITYSTATE**.

CONSTRUCTION NOTES

Several early ideas for Col. Mustard's puzzle involved cities, states, and extraction using elements drawn on a map. Eventually, we took the CITYSTATE answer more literally and converged on the geodesic-drawing puzzle seen here.

This is one of those puzzles with *just enough* flexibility to come together. There are currently 195 sovereign states recognized by the United Nations, which give 18915 possible pairs for geodesic construction. Since the surface area of the Earth is around 197 million square miles, we'd expect a few geodesics to come within five miles of a given point on Earth.[2] Unfortunately,

- cities cluster on the globe (and most geodesic paths aren't 4000 miles long anyway)
- these geodesics tend to point in similar directions, making the triangles long and thin

To increase the variation in our set of geodesics, we extended our list of countries to include some islands of varying levels of autonomy. Two of these, Curaçao (Netherlands) and Cocos (Keeling) Islands (Australia), made it into the final draft of the puzzle.

[2]Each geodesic arc is at most 4000 miles long and thus defines a narrow strip of "close enough" of at most 20000 square miles. This represents about one-ten-thousandth of the Earth's surface.