

Assignment 4: Vector Analysis

(60 Points, 6 Points Each, 3 Points for answers and 3 Points for explanations)

Data available under Resources>UK Data.

The provided [uk_data.gpkg](#) GeoPackage contains a variety of data layers for the United Kingdom, including the following that you will use in this assignment:

uk_bound: boundary of entire United Kingdom

countries_bound: boundaries of England, Wales, Scotland, and Northern Ireland

district_bound: all districts in the United Kingdom

geo_bedrock: bedrock geology

geo_surficial: surficial geology

geo_faults: fault lines

geo_dykes: geologic dykes

airports: major airports

places: major cities

roads: major roads

railroads: major railroads

The geology data are from the British Geological Survey. The political boundaries are from the United Kingdom Data Service. All other layers are from Natural Earth.

*There are some geometric issues with the geology data that will cause some tools to fail. To prevent this issue, you need to set “Invalid features filtering” to “skip (ignore) features with invalid geometries.” This is available here: Settings > Options > General.

Questions

Use vector geoprocessing, analysis, and query tools to answer the following questions. There are generally multiple ways to find each answer. For each question, provide your answer **(3 Points)** and a brief description of how you obtained it **(3 Points)**.

1. How many districts (**district_bound**) have at least some of their extent within 50 kilometers of London (**town_polys**)?
2. How many **districts** have all their land area within 50 kilometers of **London**?
3. How many **districts** have their centroid within 50 kilometers of **London**?

4. Which district (**district_bound**) has the longest length of mapped railroads (**railroads**)? (Hint: The “Sum Line Lengths” tool failed for me and will not work in this instance. So, you will need to complete this task using vector overlay and other common vector analysis methods).
5. Which **district** has the largest density of mapped **railroads**?
6. What is the latitude of the most northern extent of the United Kingdom (**uk_bound**)?
7. How many separate polygons make up the United Kingdom extent as represented in the **uk_bound** data layer?
8. What is the radius in kilometers of the smallest circle that would completely encompass the United Kingdom (**uk_bound**)?
9. Is London (**town_polys**) within the extent of a convex hull calculated for all of the geologic dykes (**geo_dykes**) mapped in the United Kingdom?
10. How many dykes (**geo_dykes**) have their centroid within the extent of Scotland (**countries_bound**)?

Deliverables

- Answers and explanations for the 10 questions.