MAPS⬢GIS
Lane Community College   NSF# 0603492

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Exploring Plate Tectonics and Landforms

Prior Skills: You will need to know how to turn layers on and off, use the ID tool and, zoom in and out of the map, toggle from layers to the legend, and perform a search (Boolean) query.

Objectives: You will be able to describe the spatial pattern of earthquakes in relationship to plate movement. Use Boolean logic to study the relationship between tectonic plates and landforms.

Remember**,** computer steps are indicated by a ▶ symbol and questions you need to answer are numbered.

Please record your answers on a separate sheet of paper.

▶ Go to the Plate Tectonics website http://arcgis.lanecc.edu/website/tectonics

When you open the map the visible layers are Continents and Ocean.

▶ Make **Quakes** both **Active** and **Visible** by selecting the box and the circle. (Click in the box, the circle is already selected).
▶ **Refresh** the map.

Refresh Map
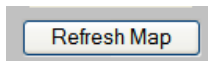
All quakes shown will have a magnitude of 5 or greater and are from approximately the last 4,000 years.

- Use the ID tool and click on one of the earthquakes (i.e. quake). A data table known as an *attribute table* will appear at the bottom the screen with details of that particular event.

There are 14 *attributes* (pieces of information) listed for each quake event in this data table.
    a) Rec -A record number
    b) FID – an item number
    c) Year
    d) Month
    e) Day
    f) Tsunami – Tsu indicates a tsunami is associated with this event
    g) Name of the event
    h) Latitude of focus
    i) Longitude of focus
    j) Fdepth – depth of the focus in Kilometers
    k) Mag – > 5 magnitude on the Rector scale
    l) Mercalli - a scale used to record "felt" or "seen" damage

m) Deaths   - number of deaths

n) Damage – 1(less than %1 million), 2($1 - $5 million), 3($5 – $24 million), 4($25 million and over)

o) Home - # damaged – 1(1 to 50), 2(51 to 100), 3(101 to 1000), 4(1001 or more),

1. Describe the **spatial occurrence** of earthquakes in relationship to the continents. Spatial occurrence means the spatial **arrangement**, distribution **patterns** and **location** of a geographic feature. Are patterns **dispersed** (spread out evenly)? Are they **clustered** (clumped or grouped)? Are they **linear** (in a line**)**? Or are they **random** (no identifiable pattern)? Spatial occurrence also refers to the **location in relationship** to other features.

▶ Turn off Earthquake→ and turn on **Volcano** →. Make Volcano **Active** and **Visible** → **Refresh** the map.

▶ Use the **ID** tool and click on one of the volcano symbols.

2. What attribute data is available for the Volcano data layer?

3. Describe the spatial occurrence of volcanoes?

4. How is the spatial distribution or patterns of earthquakes and volcanoes similar or different?

5. Turn on "**Plates**". What is the relationship between plates and earthquakes and volcanoes?

6. Look at the printed map below showing generalized plate movement (see red arrows). List two examples of plates that are diverging and give the directions are they moving.

7. List two examples of plates which are converging and give the directions they are moving.
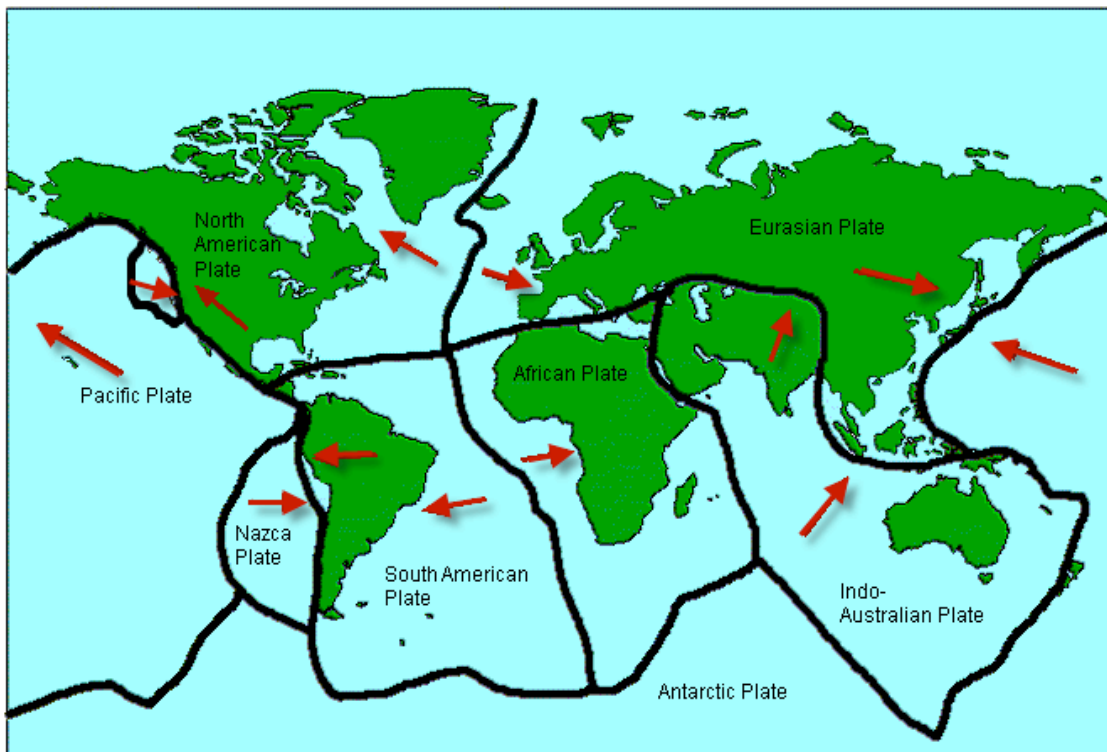
Make Landforms both **Visible** and **Active** → Make Plates and City **Visible** → Turn off Earthquakes and

Volcanoes → **Refresh** the map.

You are going to use a *process call **Boolean Logic*** to explore the relationship between **plates** and **landforms**. *Boolean logic* refers to the "logical" relationship among search terms using operators such as = (equal to), > (greater than), < (less than), and commands of OR, AND.

▶ Click on the query tool → Set the table below the map to match the illustration given here

▶ Use the dropdown menu tab to set the Field, Operator, and Sample Values.

▶ Click Add to Query String →Execute

The features that met your **"query"** will be highlighted and shown in a data table below the map.

8. How many convergent features are listed?

▶ Clear you query using the eraser

This map does not distinguish between convergence of continental plates and the convergence of oceanic plates.

9. Name all mountain ranges on this map resulting from convergence between oceanic plates and continental plates?

▶ Set up a new query to match the Boolean Logic statement below.

10. Name landform features resulting from divergent plates? What types of plates are involved for each feature; oceanic or continental?

▶ Make City both **Visible** and **Active** and **Refresh** the map.-->Create a new query statement [CAPITAL = "Y"] and execute the *"query"* This will highlight all capital cities. Zoom in to see South America.

11. Name the capital cities in South America located near or in a mountain range created by subduction of seafloor plates?

12. Why is understanding the relationship between these cities and subduction important?