# NCEA Math Lesson Plan

**Grade:** 5 **Subject:** Mathematics

**Domain:**
Geometry

**Standard Number(s) and Description:**
5.G.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

**Vocabulary to be Highlighted:**
X-axis, y-axis, vertical, horizontal, origin, coordinate, plot, scale

**Mathematical Practices (#):**
4. Model with mathematics.
6. Attend to precision.

**Essential Questions:**
Can I get a sense of the length of the travels of these historical figures?
How do the directions on the grid relate to the directions in real life?
Am I accurately plotting the points?
Do the points seem to be right in relation to one another?

**Materials/Tools (include technology):**
Biblical maps (journeys of Jesus' missionary tours or highlighted places of His life, the journeys of Paul, the journey of the Israelites out of Egypt, etc.)
Grid printed on clear graph paper
Graph paper or graph whiteboards for students
Rulers

**Connections to Other Math Domains:**
Measurement as students explore distances with a ruler
Numbers in Base Ten as students calculate distances that are vertical or horizontal

**Connections to Other Subject Areas:**
Art
Religion
Geography/Social Studies

**Catholic Identity Component:**
Students will get a sense of the magnitude of the Biblical world and relate it to their own experience.

**Resources (attachments):**
Many good maps are available here: http://goodnewspirit.com/pdf7200mapsandgraphs.pdf

**Activities/Timeline:**
Prior to the lesson, choose the map(s) that students will explore. Lay the clear grid over each map, and record the coordinates of the important items on the map (stay in the first quadrant). If the map is very small/large, use a proportional grid to record the coordinates. The students can use ¼ inch graph paper/whiteboard to plot, regardless of the size of the original map. Locate a local map (county or state), for students to use as a reference. Record the coordinates (scaled appropriately to your Biblical map) of two well-known points on the local map. For ease, one local attraction can be placed at the origin.

1. To begin the class, show students the map they will be working with. Discuss the journey the Biblical figures took, recalling lessons about those people with which the students are familiar. Show how a grid can be superimposed over the map. Ask students if they know about the grid system used to navigate the world (latitude and longitude); reference to GPS or geocaching might help activate knowledge. Have a brief discussion about this, and introduce to the students their activity for the day. They will be using a simple coordinate grid to record the important points of the map, and using the grid to help them judge distances and get a sense of the magnitude of the Biblical world.

2. Review with students, or introduce, the x- and y- directions on the coordinate grid. To help them remember which coordinate represents which direction, introduce the idea of "x to the left, y to the sky." Show how the x-axis runs left and right (horizontal-related to horizon), and the y-axis runs up and down (vertical). Discuss with students what those directions mean on a standard map (N, S, W, E). Plot a point or two as an example.

3. Give students their graphing materials. Either call out the coordinates or present students with a list of coordinates and place names for them to plot. Students can work side by side and compare their maps as an accuracy check. Once plots are complete, explore the map.

4. Find two points that are (mostly) vertical or horizontal from one another. Ask students to decide how far apart they are, first speaking in grid units, and then applying the scale of the map to get an answer in miles or kilometers. Repeat this with as many locations as possible.

5. Next have students measure with their rulers the oblique distance from one point to another. Once they record that measurement, they can lay the ruler horizontally on the grid to determine how many units long that distance was, and finish the conversion to miles or kilometers using the scale.
Ask students to find two distances that are about the same.

6. Add to their map, in a different color, the two local points of interest. Have students determine the distance between these points. Ask students to compare this distance to distances on the map. Which are shorter? Which are longer? Are any almost the same? How many "trips" between the local points of interest did it take for Jesus/Paul/the Israelites to get from _____ to _____? Can you imagine walking all of that?

**Formative Assessment (what to look for, how/when to look):**
Watch students as they plot. Look for students to begin in the corner, at the origin, and then count out. Correct students who begin counting 1 at the axis. Watch for students with greater understanding to plot from a previous point and count forward/back on either axis to get to the next point, rather than starting from the origin every time.
Look for students to plot in an organized manner (x first, then y). Look for students who might be confusing the x and y directions.
As students measure, watch for them to line up the zero of the ruler with their first point.

**Summative Assessment:**
Give students a new list of places to plot on a grid. Ask them to determine a vertical/horizontal distance, given a scale. Ask them to determine an oblique distance. Remind them of the local distance and have them find a distance that is similar. Ask them to analyze which places might be easily walkable, and which would be more efficiently covered using other modes of transportation.