# Using the Ohio Highway Map to Teach Mathematics

*by Marialice Kollar*

Mt. Gilead is a small, rural community about an hour north of Columbus, Ohio, with two exits off the interstate. We have 400 students in the high school with 50 students currently enrolled in Pre-Algebra. These students have been unhappily going through the repetitions of general math topics and the Ohio Map unit described below actually excited a few of them! Here is what I did. First, in August, I requested 50 "Official Ohio Highway Maps" from the Department of Transportation. In September, we started Pre-Algebra with our maps. The first day we found Mt. Gilead on the map using the grid of letters across the top and numbers down the side. We made the connection between the map grid and the x and y coordinate axes, and talked about how easy it was to find a community on the map thanks to the grid labels. We talked about the best places to visit in Ohio, like Sea World, Kings Island, the Pro Football Hall of Fame and the State Capitol, and used the maps to figure out how far these places are from Mt. Gilead. We used the legend to find the mileage scale and used rulers to measure the distance, then converted to the real distance using ratios. More math! Another fun part of the class was at the end when we had to fold the maps! Many of the students commented that they had never used a map before and some students admitted that even their parents did not ever use a map!

The second day, we again brought out the maps. This time, we learned about mileage markers and exit numbers and what they mean. In Ohio, the mileage markers and exit numbers correspond to the distance either north or east of the border depending on the direction of the interstate. We also discussed odd/even rules for interstates and state routes. Most students had never heard of the reasons for the numbers and were surprised by them. Some students actually went home and looked at the whole United States to see that those same rules worked nationwide. We talked about patterns of numbers and looked up zip codes to see how they were also patterned. More math! Students actually like math!

We then looked at the counties. This turned out to be a perfect introduction to graph theory and the four color theorem! We traced the counties and created a graph with vertices for counties and edges between counties which share a border. I let the students work together and help each other find a coloring with four colors. There are 88 counties in Ohio, so this took quite a bit of time!

We figured distances between the 5 major cities of Ohio and tried to minimize driving time from Mt.Gilead to these cities. We discussed the UPS and Federal Express delivery systems and related them to our maps. This was a good introduction to Euler and his famous "Konigsberg Bridge" problem, as well as Hamiltonian circuits and the "Traveling Salesman Problem". The students began to immediately try to connect Dayton, Toledo, Cincinnati, Columbus, and Akron/Canton. It was great! Many students were impressed to find that the interstates were constructed to help in commuting between these cities. Students wondered if bus routes were constructed using similar strategies. "Is this really math?", they wondered. We continued to use the maps for two more weeks; by using the maps, my students and I had fun learning math and were excited about doing something different!

To order Ohio maps, write to
the Ohio Department of Transportation
25 South Front Street
Room 712 Columbus, Ohio 43215,
or call (614) 466-7170.
It takes about three weeks for them to arrive so write early!