Math Journal:
City Planning with Absolute Value

Many small towns in the United States do not have a large enough population to support a rescue squad or paramedic unit by themselves. Frequently they must depend on larger nearby towns to serve their emergency medical needs. However, these small towns often have a small group of people to serve as *first responders,* trained medical personnel that will report to an emergency call to stabilize the patient while waiting for the paramedics from the larger town.

Plain View, North Carolina is such a town and has most of its residences along Main Street which runs west to east through town. The Plain View city council has proposed a construction project to build a rescue station along Main Street to serve as a headquarters for the Plain View first responders. Your job is to determine where along Main Street the rescue station should be built.

Assume that Main Street is a straight line passing through the center of town. The center of town is represented as zero on the number line below. The town has residences at the following locations on Main Street:

- 8 miles west of town center
- 3 miles west of town center
- 1 mile west of town center
- 3 miles east of town center

- 5 miles east of town center
- 6 miles east of town center
- 7 miles east of town center

Answer the questions to determine the BEST location for where the rescue station should be built.

1. Let x represent the unknown position of the rescue station. Write an absolute value expression for the distance between the station and each of the seven houses.

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-8   0   8
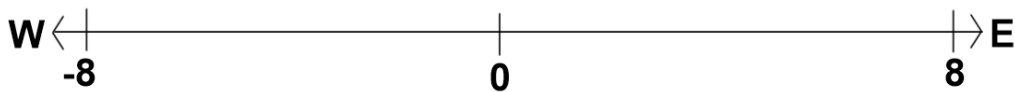
2. To write a function for the total distance, y, between the station and all of the houses it will serve, add together all of the expressions from #1 above.

3. Use graphing technology to make a graph of the function from #2. NEATLY sketch the graph below.
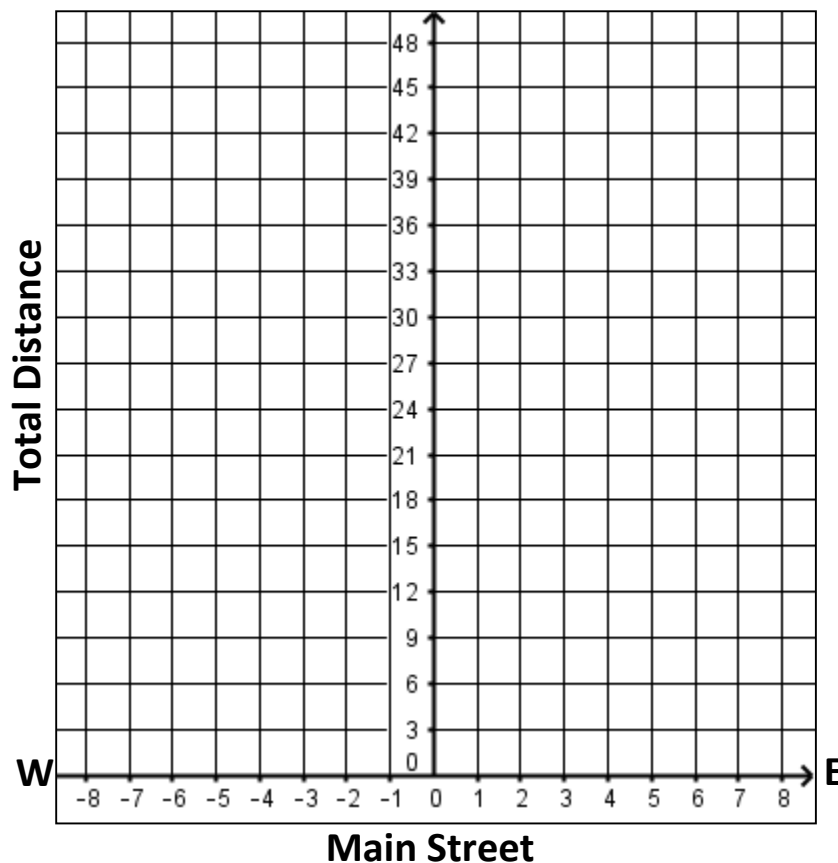
4. Use your graph to find the location of the station on Main Street that minimizes the total distance between the station and all of the houses. At what location should the station be built?

5. Suppose the Plain View city council would only approve the funding if the station could be located within 10 miles of each house along Main Street. Will this project for the rescue station be approved for construction? Explain.

6. Determine the BEST location for the rescue station. At what address should the station be built to both minimize the total distance all houses are from the station **AND** meet the city council's approval for funding? Explain.