



Sample Activity:
The Least Expensive Cable

from the Pre-AP workshop

Pre-AP[®]: Topics for AP Vertical Teams[®]
in Mathematics

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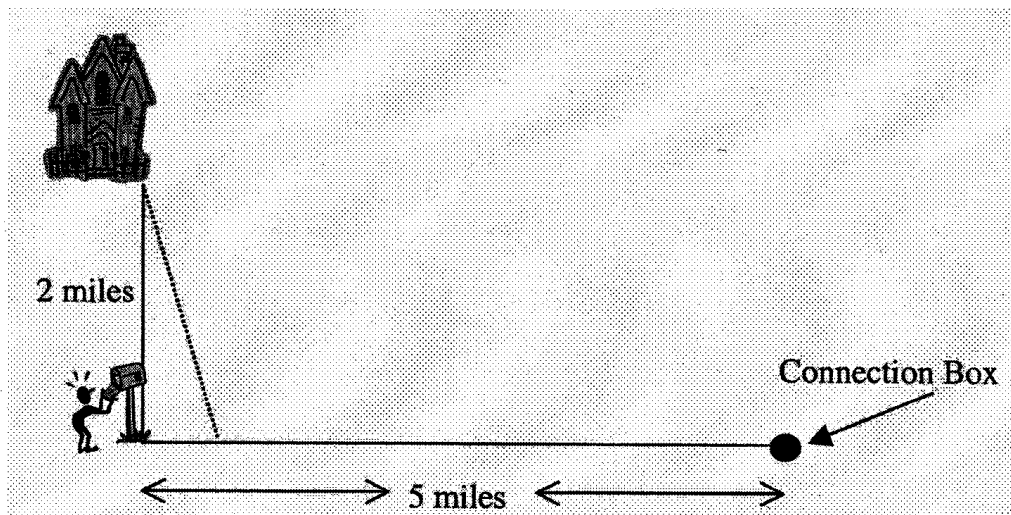
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Pre-AP: Topics for AP Vertical Teams in Mathematics Sample Activity

The Least Expensive Cable

In this activity, you will be working with a partner who should be from a grade level or subject area different from your own.

Better Cable Company must provide service to a customer whose house is located 2 miles from the main highway. The nearest connection box for the cable is located 5 miles down the highway from the customer's driveway. The installation cost is \$14 per mile for any cable that is laid from the house to the highway. (The cable may be laid along the driveway to the house or across the field.) The cost is \$10 per mile when the cable is laid along the highway. Determine where the cable should be laid so that the installation cost is as low as possible.



1. How much will the customer have to pay if the cable is laid 5 miles along the highway and 2 miles along the drive to the house? Show your calculations. Do you think that this cable will be the least expensive possibility? Explain your reasoning.

2. Do you think a cable that runs directly from the house to the connection box will be the least expensive possibility? Explain your reasoning.

3. Model the situation with a sketch drawn to scale allowing one inch to represent one mile. Represent the house, the mailbox, and the connection box as points-H (house), M (mailbox), and C (connection box).

4. On your drawing, locate a point P on the highway that will be $\frac{1}{2}$ mile from the mailbox. The cable company is going to lay the cable so that it follows the highway from the connection box to this point P and then crosses the field to point H where the cable connects to the house.

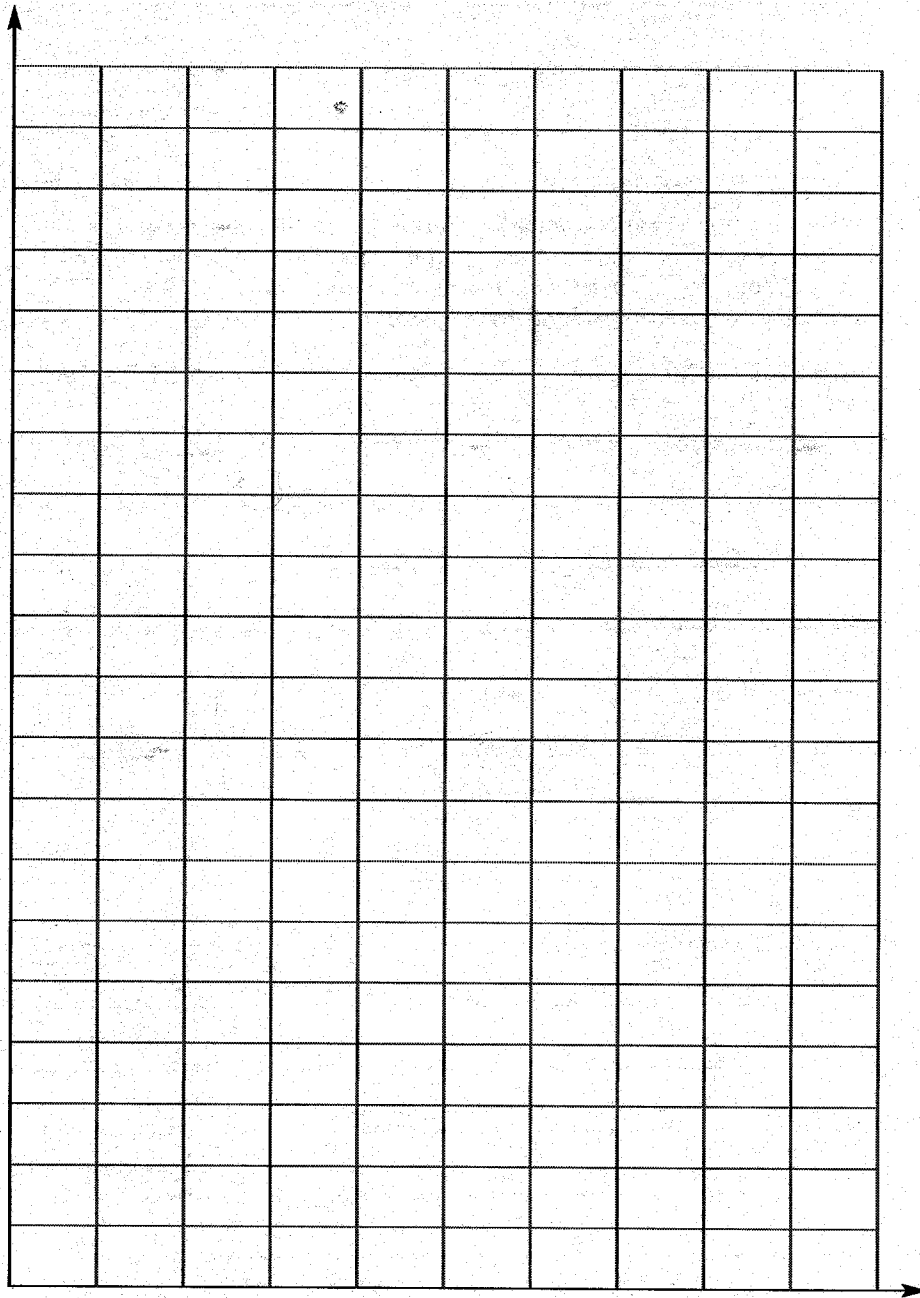
Carefully use your ruler to sketch the cable on your scale drawing.

5. As accurately as you can, measure the length of cable that follows the highway. Convert your fractional measurement to decimal form. Calculate the cost of this portion of the cable. (Remember that the cable costs \$10 per mile when it is installed along the highway.) Measure the length of the cable that crosses the field and calculate its cost (\$14 per mile). Enter your numbers in the chart provided on the next page and calculate the total cost.

6. Repeat the process from question 5 for the other distances and complete the table.

Distance from mailbox to point P (miles)	Length of cable from house to highway (fractional form, miles)	Length of cable from house to highway (decimal form, miles)	Cost of cable from house to highway (dollars)	Length of cable along highway to connection box (miles)	Cost of cable along highway to connection box (dollars)	Total cost of cable installation (dollars)
0.5 mile						
1.0 mile						
1.5 miles						
2.0 miles						
2.5 miles						
3.0 miles						
3.5 miles						
4.0 miles						
4.5 miles						
5.0 miles						

7. You should discuss with your partner how to label and scale the graph below. After you have done so, plot the total cost of the cable installation as a function of the distance from the mailbox. (The first cost that you calculated for the chart was 0.5 miles from the mailbox.) Include the calculation from question 1 as the point 0 miles from the mailbox.



8. Using a red mark, locate the point on your graph that represents the cost of the least expensive cable installation. In order to provide the least expensive cable, how far from the mailbox should the cable be located? What would be the approximate cost of the least expensive cable?

Teacher reflection: What mathematics from your particular class or grade level was covered in the activity that you just completed? When you cover that content, skill, or strategy, determine if you are introducing it, teaching it, reviewing it, or expecting students to master it.