Subways - Lesson 3 - Distance Formula - TD

Lesson Overview -
In this lesson, students will use the distance formula to examine distances that the trains travel on their map with an eye towards efficiency. They will examine questions such as:

- What is the total distance of tracks on your map?
- Could this distance be reduced, thereby reducing costs?
- How would you redesign your map to make it more efficient?

As students continue to build their Riverville Subway Maps, they will consider expense, efficiency, and maintenance while practicing the distance formula.

This is the starter map. Load this file onto student iPads as it is the correct aspect ratio. Students will see the map image in Choreo Graph and then create a subway map with this as the background. (Students can also use the subway map that they already designed from Lesson 1.)

One unit on the grid in Choreo Graph = ¼ mile = .25 mile

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Riverville

- Armstrong
- Holiday
- School
- Bird
- Thelonious
- Simone
- Miles
- Hospital
- Coltrane
- Museum
- Museum
- Spalding
- Fitzgerald
Distance formula

\[ d = \sqrt{ (x_2 - x_1)^2 + (y_2 - y_1)^2 } \]

**Learning Objectives:**

<table>
<thead>
<tr>
<th>Distance Formula</th>
<th>Activity: Students will learn the distance formula and find distances between stations, landmarks, and will start to think about minimizing traveling distances.</th>
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<td></td>
<td><strong>Objective:</strong> SWBAT apply the distance formula to real-world distance problems.</td>
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**What you need to get started:** Set of iPads with the Choreo Graph app, student sheets

**Time Needed:** 1-2 class periods

**Collaboration and Group Work**

These lessons are designed for students to work individually, in pairs, or in groups. Each student should do all the work on their own sheets, and the iPad should be shared across group members as equally as possible.

We suggest that groups be no larger than four students. Four or more students in a group will require extra attention to make sure that every group member is contributing equally.

**Lesson Plan**

**Introduction**

1) Each student travels a different distance to school every day. You could introduce this lesson with a quick discussion about all the distances that people need to cover in their day-to-day lives.
2) Share the distance formula on the board, work through an example, and have students find at least one distance on their own.

**To do**

1) Students will follow the instructions on their sheets.
2) They will find key distances and answer the questions included below.
3) Check for understanding as students explore distance.
Sharing
1) With each lesson, spend some time allowing the students to share their work with the class. In this lesson, students can share the longest and shortest distances on their maps, as well as the estimated total distance of their subway lines.
2) You might also invite students to start thinking about aspects of their maps that could be improved upon. Examples: Were of your lines were unnecessary? Or that it could have been easier to get from one point to another if you had designed the map a little differently?

Wrapup
If necessary, have students label their iPads so they will be able to return to them for the next lessons.

Questions:
1) Using the subways lines that you created on your map, the coordinates from your table in Lesson 1, find the following total distance that a passenger must travel on a train to make the following trips, (show your work using the distance formula):
   a) Armstrong to Fitzgerald
   b) Bird to Coltrane
   c) Simone to the Museum

2) Based on the distances you have calculated, what do you estimate the total distance of subway tracks to be on your entire map? (Show how you arrived at that estimation.)

3) Now that you have found some distances that your citizens will be traveling to get from one point to another, do you notice any aspects your map that could be improved upon? For example, do you see the need for a line that wasn’t there? Or, are there lines that you could leave out?

4) Did you draw a subway line directly from Armstrong to Jones? If not, why not? Wouldn’t that be the most direct route?

5) What is the most difficult or tricky about using the distance formula?
The map students use for this lesson should look something like this map. Choreo Graph provides the coordinates and line segments representing the subway lines.