**Subways - Lesson 5 - Efficiency - SD**

**Introduction**

Subway passengers are interested in traveling the city safely and fast. How well does your map move people around the city? Could distances be reduced? Could there be ways to create the network of lines so that citizens could get from one point in the city to another in the fastest way possible?

This is the starter map. You will find this map picture in Choreo Graph and use it to create a subway map as the background. (You can also use the subway map that you already designed from Lesson 1.)

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

**Introduction**

The dictionary definition of efficiency: The ability to accomplish something with the least waste of time and effort. As you have been working with your maps, you have been learning the building blocks that help to develop efficient systems. Cities need to think about how many citizens will need to use the subway? How long will it take them to get around in one subway system compared to another? How much will it all cost? How many safety precautions can be ignored in the name of saving money? Where should the local stations go to help with all these questions?
To do
In Lessons 2 through 4 you explored coordinate translations, the distance formula and linear equations to create new stations. As you think through the following questions, incorporate those concepts if they help to maximize efficiency.

1) Will minimizing total distance of track be the best way to maximize efficiency for travelers around the city? Why or why not? Use some mathematical reasoning in your answers.

2) How does creating new local stations help to improve efficiency of getting around the city?

3) Adding trains to your system would help to move more people around the city. What is the most number of trains that you would add to each line? Why is that the most?

4) With your added trains, would you have some running on parallel tracks in the opposite direction? If so, why would that help?

5) When it comes to designing and building an entire subway system, what are three examples of very important aspects to consider? And, what are three more examples of important physical parts of the system? (One example for each is given.)

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<tr>
<th>Example: Safety</th>
<th>Example: Trains</th>
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6) As we have seen, efficiency is complex. Describe the things that you would take into account if you were to make a new map, starting from scratch.
The map you use for this lesson should look something like this map. Choreo Graph provides the coordinates and line segments of your subway lines.