VCE General Mathematics Unit 2

Learning activity: Rail networks and types of graphs

Introduction

The rail network in any large city is structured and complex.

Research a rail network in one of the Australian Capital cities. Also research proposed changes to this city’s rail network that will take place in the next 10 years.

Part 1

Choose 10 rail stations from at least three different lines in your chosen city.

1. Construct a network involving these 10 stations using vertices and edges and current or planned connections that exist between each station.
2. Describe the network constructed using the language and type of graph.
3. Choose two stations from the constructed network and from different lines. Display and describe the current walk that would be needed to travel between these stations. Include how this journey could be made more efficient.
4. Discuss and justify the number of edges that would need to be included to enable efficient travel between two selected stations. Also include a discussion on the benefits and limitations linked to cost, economy and infrastructure.

Part 2

1. Using a detailed map include distances between stations on a network of the 10 selected stations taken from at least three separate lines.
2. If a communication cable was included in the network, investigate where it would be added to ensure the shortest amount of cable was used.
3. Calculate the distance needed to travel to every station. Investigate how this distance could be minimised by the addition of other connections between stations. Discuss the cost that would be linked to the additional connections, the total length of the additional connections and if this would be a viable option.

Areas of study

The following content from the areas of study is addressed through this learning activity.

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| **Unit 2** |
| **Area of study** | **Topic** | **Content dot points** |
| Discrete mathematics | Graph and networks | 1, 3, 4, 5 |

Outcomes

The following outcomes, key knowledge and key skills are addressed through this task.

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| **Unit 2** |
| **Outcome** | **Key knowledge dot point** | **Key skills dot point** |
| 1 | 1, 2, 3 | 2, 3, 4, 5 |
| 2 | 1, 2, 3, 4 | 1, 2, 3, 4 |
| 3 | 1, 2, 5 | 1, 2, 8, 10, 11 |