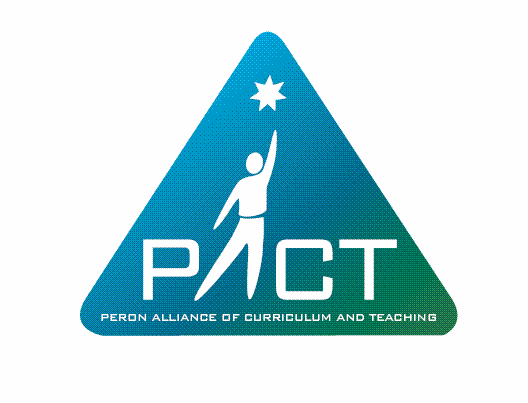
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| Baldivis logo cropped | **Mathematics Applications Unit 3 & 4 Year 12**  **Investigation 2, 2020**  **Topic – Networks Investigation** | | | |  |
| **Equipment:** | *SCSA Formula sheets, CAS calculator* | | | | |
|  | | | | | |
| **Date out:** | | *Week \_\_\_\_ Date \_\_\_\_\_\_\_\_* | **Date Due:** | *Week \_\_\_\_ Date \_\_\_\_\_\_\_\_* | |
| **Task Weighting:** | | *5% of the year* |  |  | |
| **Important Information:**  In this topic (Graphs and Networks) you have studied ways of constructing different types of networks to model practical situations. For this investigation you are required to decide on a tour around local places of interest. Your mathematical investigation will be recorded in a report, the suggested format of which is on page 3. | | | | | |

**Chinese postman problem:**

This problem involves minimising the total distance walked by a postman delivering mail. The postman must begin and end his journey at one vertex of the network and must visit each edge of the network at least once.

It is based on **Euler’s** findings of **traversable** graphs.

Remember that a traversable graph is one that can be drawn without taking a pen from the paper and without retracing an edge.

In graph theory you are trying to find an **Eulerian Trail** if one exists.

**Travelling salesman problem:**

This problem involves minimising the total distance travelled by a salesman to visit a range of different places. The salesman must begin and end his journey at one vertex within the network and must visit each vertex at least once.

Ideally, you want to find a **Hamiltonian Cycle** (where each vertex is visited exactly once, starting and finishing at the same vertex) of minimum weight.

**No one has yet found an algorithm to solve this problem!**

The only way to minimise the tour is to find all of them and pick the shortest, which in most cases is not practical as there are too many possibilities.

**Part 1: Formulate the problem to be solved**

A group of exchange students will be visiting Baldivis Secondary College later in the year. You have been asked to plan a tour for them to show them some of the top tourism locations in the Perth metropolitan area over three days. The intention is to give the visitors a good idea of the history and culture of Perth.

Your task is to design an itinerary for the entire time. You should describe the route in detail, giving estimates of the journey distance between each place and the next, the time you are allowing for each part of the journey and the time to be spent at each stop for activities planned.

You need to include the following locations:

* WA Maritime Museum
* Kings Park
* Rockingham foreshore
* Rottnest Island
* Cottesloe Beach
* As well as 5 other locations and activities of your choice that helps paint a picture of Perth.

The exchange students will be living in Baldivis.

**Part 2: Solve the basic problem**

Create the network diagram from the basic information you have collected and solve the problem(s) you have posed.

You will need to be clear about the types of transport used. You are permitted to use a mix of transport. You will also need to be provide details of your choice of travel route.

**Part 3: Investigate the effects of possible changes**

Provide a contingency plan should COVID-19 restrictions be increased in Western Australia, clearly show what changes will occur.

Restrictions include:

* Beaches being closed
* A maximum of 60 minutes allowable in public spaces like parks
* Travel restricted to within postcode regions with only essential services being exempt

**Part 4: Conclusion**

Analyse and compare your results from Part 2 and 3, including the reasonableness of your prediction. Your discussion should include consideration of the effects of simplifying assumptions and the limitations on the practicality and reliability of your solution.

**Writing up your work**

* Provide an outline of the problem to be explored
* Explain how you identified and found the appropriate data
* Explain the method you used to find a solution
* Explain the application of the mathematics involved, including:
  + Generation or collection of relevant data and information, with a summary of the process of collection
  + Mathematical calculations and results, with appropriate representations
  + Discussion and interpretation of results, including consideration of the reasonableness of your results.
* Draw conclusions and summarise your findings
* A bibliography and appendices if appropriate

The format of an investigation report may be written or multimodal.

The report should be a maximum of six pages, including diagrams, if written or the equivalent in multimodal form.

SCSA Grade descriptions have been provided to give you information on what to include in your report in order to maximise your achievement.