

Further Maths – summer work

We will spend the first term covering all of the decision module, so the summer work for further maths is to create flip learning notes on the first chapter.

The links are as follows:

- <http://mathswebsite.com/a-level/edexcel/decision-1/algorithms/v/algorithms>
- <http://mathswebsite.com/a-level/edexcel/decision-1/algorithms/v/bubble-sort-algorithm>
- <http://mathswebsite.com/a-level/edexcel/decision-1/algorithms/v/quick-sort-algorithm>
- <http://mathswebsite.com/a-level/edexcel/decision-1/algorithms/v/bin-packing-algorithms>
- <http://mathswebsite.com/a-level/ocr/decision-1/sorting-algorithms/v/orderefficiency-of-algorithm>

See below for an example of flip learning from a current year 12 student. This is the standard of work we expect.

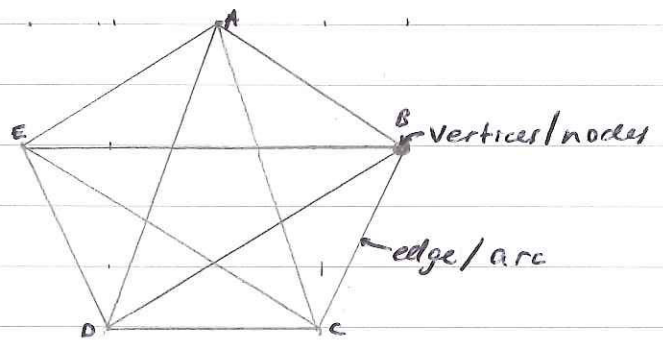
Hope you have a good summer and we look forward to seeing you in September.

Decision 1 - Graphs

Graph Theory - Study of graphs to determine and model how objects are connected/related to each other:

- The London Tube map is an example of a graph
- Chemical bonds and compounds are examples of graphs.
- Microchips show a graph between nodes.
- Computer networks are represented by a graph
- Family tree (relations between people of a family)
- Social networks (LinkedIn, Facebook, Twitter...)

A graph is a set of vertices/nodes and a set of edges/arcs that connect them. The order of a vertex is the number of edges or arcs connected to it.



Vertices - A, B, C, D, E

Orders - A:4, B:4, C:4, D:4, E:4

Edges - AB, AC, AD, AE, BD, BE, BC, CE, CD, CE, DE.

1. Vertices: A, B, C, D, E

Orders: A:2, B:2, C:2, D:1, E:1

Nodes: AB, AC, BC, DE

2. Vertices: A, B, C, D, E

Orders: AB, BC, AE, CE, DE, ED, BB

Nodes: A:2, B:3, C:2, D:2, E:4

A simple graph does not have any loops/multiarcs

1. 5 ✓

2. 8 ✓

3. 5 ✓

4. 6 ✓

5. Arc ✓ / edge ✓

6. Node / Vertex ✓

7. Multiarc ✓

8. Non-simple graph ✓

9. simple graph ✓

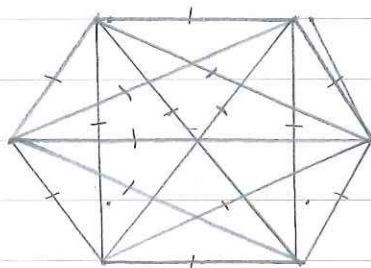
10. Loop ✓

Handshaking Lemma

The sum of all orders of the vertices / nodes of any graph = $2 \times$ number of edges.

A complete graph is a graph where every vertex / node is connected to every other vertex / node directly by an arc / edge.

i. $K_6 \rightarrow$
15 arcs / edges



2. $\frac{1}{2}(n-1)$ or $\frac{n-1}{2}$ arcs / edges \times $\frac{n(n-1)}{2}$

3. S, P

- A network is a weighted graph
- weighted - numbers assigned to arcs / edges
- A ~~digram~~ ^{digraph} is a graph where arcs have a direction
- isomorphic graphs are graphs drawn differently but show the same data.
- A subgraph is part of an ~~origi~~ original graph, but has some arcs removed.
- A path is a sequence of edges / arcs

- A walk is a path where a vertex is revisited.
- Cycle / circuit is where you start and end at the same vertex.
- A tree is a graph with no cycles.
- Spanning tree - a subgraph of and a tree that connects all its vertices. For any graph with n vertices, any spanning tree must have $n-1$ edges.

i. $S, P,$

ii. R, Y, U, X

iii. R, P, Q, S, U, W, X, Y

iv. W, X