INKMATHS FLASHCARDS

Decision Mathematics 1 algorithms and networks

14 cards · fronts and backs

Print double-sided, flipping on the long edge, and each answer lands behind its question. Cut along the card borders.

Definitions in precise wording, the standard results the formulae booklet does not print, a check-yourself question per topic, and the slips that lose marks. The same cards run on the website with spaced-repetition scheduling, at inkmaths.co.uk/flashcards.

DEFINITION

Define: Order of an algorithm.

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DEFINITION

Define: Bin packing lower bound.

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DEFINITION

Define: Eulerian and semi-Eulerian.

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DEFINITION

Define: Minimum spanning tree.

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DEFINITION

Define: Dijkstra's rule.

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STANDARD RESULT

Route inspection:

shortest closed route = ?

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DEFINITION

Define: Travelling salesman lower bound.

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DEFINITION

Define: Critical activity.

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DEFINITION

The total of the items divided by the bin size, rounded up. If an algorithm achieves it the packing is optimal; falling short proves nothing either way.

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DEFINITION

How the number of operations grows with the size n of the problem. An order n^2 algorithm takes four times as long on a list twice as long.

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DEFINITION

Connects all n nodes with n - 1 edges and no cycle, at least total weight. Prim grows from a node; Kruskal works down the sorted edges rejecting cycles. Both give the same total.

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DEFINITION

No odd nodes means a closed trail exists using every edge once; exactly two odd nodes means such a trail exists but must start and end at them; more than two means neither.

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STANDARD RESULT

total weight + cheapest pairing of the odd nodes

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DEFINITION

Make permanent the smallest temporary label anywhere in the network, not the cheapest edge from where you are. Read the route back by differencing final labels against edge weights.

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DEFINITION

One whose earliest and latest start times agree, so it has zero float. The critical activities form a continuous path whose durations total the project duration.

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DEFINITION

Delete a node, find a minimum spanning tree on what is left, then add back the two shortest edges from the deleted node. Any tour at all gives an upper bound.

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STANDARD RESULT

Total float:

float = ?

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STANDARD RESULT

Lower bound on workers:

least workers = ?

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DEFINITION

Define: Slack, surplus and artificial.

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DEFINITION

Define: The Simplex rules.

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SPOT THE ERROR

Say what is wrong with this claim:

The nearest neighbour algorithm gives the shortest tour.

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CHECK YOURSELF

Why must the number of odd nodes in any graph be even?

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STANDARD RESULT

total work ÷ project duration, rounded up

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STANDARD RESULT

latest finish – earliest start – duration

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DEFINITION

Pivot on the most negative entry in the objective row, choosing the row by the smallest non-negative ratio of value to pivot-column entry. Stop when no negative entries remain.

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DEFINITION

A ≤ constraint gains a slack variable; a ≥ constraint loses a surplus variable and then gains an artificial one so that a starting solution exists at all.

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CHECK YOURSELF

The orders total twice the number of edges, which is even. The even nodes contribute an even amount, so the odd ones must too, which needs an even number of them.

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SPOT THE ERROR

It gives a valid tour, and so an upper bound, but it never looks ahead. On the standard five-node network it returns 117 when the best tour is 109.

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