

Teaching D2 using the online resources

Chapter 1: Linear programming, the simplex method

- This chapter is quite challenging for students. It can be difficult to teach and off-putting for students.
- It is worth taking some time to make sure that they can interpret tableaux at every stage of the working – including giving values of the slack/surplus variables.
- Don't be tempted to take too long on this chapter – it can easily become “death by simplex”. Students are expected to have a good understanding of what the method is doing but are not going to be asked to perform long and complicated simplex tableaux in the exam.
- When starting out on basic simplex and again when doing 2 stage simplex and big M method, it is worth tackling a reasonably complex 2 variable problem and working the simple alongside a graph. This gives students a much clearer picture of how the simplex algorithm works and what it is actually doing. This can make tackling 3 or 4 variable problems less intimidating.
- Don't forget to subtract the surplus variables when tackling 2 stage simplex.
- Some find it difficult to subtract multiples of M and hence make algebraic errors in the big M method
- Students may be asked to do an ordinary simplex but it is unlikely that they will be asked to do a full 2-stage or big M
- Two stage simplex has come up on the exam more often than big M

Chapter 2: Networks

- Route inspection is the topic which students seem to find easiest so this could be tackled first.
- TSP uses the MST algorithms learned in D1 so make sure the students are secure in this first.
- It is important to distinguish between TSP and RI and which to use for what type of problem.
- When teaching TSP, make sure students understand the distinction between the classical problem, which uses a complete network, and the practical problem, which almost certainly doesn't.
- When finding a lower bound for TSP, we use the method where a vertex is deleted. The resulting lower bound DOES NOT give a tour, except in exceptional circumstances.
- Students don't understand why it is the GREATEST lower bound and LEAST upper bound.
- Floyd's algorithm is straightforward but takes a bit of time to do thoroughly.
- When applying Floyd's algorithm students can easily get lost using the distance and the route matrices side by side.
- Draw attention to the way to change the route matrix
- Use colours – highlighter pens are indispensable when doing Floyd's algorithm.

Chapter 3: Decision analysis

- Decision analysis is a dynamic tool. The power of decision analysis is not in the numbers at the decision node, it is the ability to change the utilities and probabilities and see how this affects the decision node.
- When drawing a decision tree you can use increase in wealth (profit) or total wealth but it is important to be consistent.
- EMV can be calculated in the same way as expectation in statistics. You do not need to have drawn a decision tree in order to calculate the EMV for a situation.
- When considering utility always use total wealth, since utility is a function of wealth.
- The utility function is specific to a person or situation and is given for each problem. It can be loosely described as a measure of “happiness”

Chapter 4: Logic and Boolean algebra

- Students usually prefer to use truth tables to prove logical propositions. They need to know, or be able to work out, the truth tables.
- They do need to know how to use the laws of Boolean algebra as well – it can be specified on the exam paper.
- Students must be able to distinguish between a combinatorial circuit and a switching circuit.
- They can be asked to produce tables of outputs for circuits
- They are not required to memorise the half adder.

D2 Online resources

Teaching D2 using the online resources

Every chapter contains

- A glossary of terms
- An end of chapter assessment – the answers to this are in the teachers resources

Every section within the chapter contains

- A study plan
- Crucial points that students need to be aware of when learning the material
- Notes that explain the topic and more examples than are in the textbook.
- Worked solutions to some of the questions in the textbook.

A multiple choice test which can printed off and used in class or be done online by registered students. They will receive instant feedback.

The additional resources are being added to all the time. Below is a list of some of the things currently available

Topic	section	about	Additional resources
Linear Programming	The simplex method	The initial simplex tableau, Manipulating systems of equations, The simplex method	Interactive excel
	Problems involving \geq constraints,	Terminology, Post-optimal analysis, Two-stage simplex, The big M method	Interactive excel
	Problem solving	Equalities and practicalities	
Networks	Route inspection	Euler Cycles. Solving route inspection problems	Power point
	Travelling salesperson	Hamiltonian cycles. The travelling salesperson problem, The practical problem and the classical problem, Upper and lower bounds, Tour building	Power point
	Floyd's algorithm	Drawing an activity network, identifying a critical path, earliest and latest event times, float	Power point
Decision analysis	Decision analysis	Construct and interpret Decision trees. Calculate EMV. Understand Utility functions and use utility to compare alternatives	
Logic	Propositional calculus and truth tables	Be able to understand and form compound propositions using the correct symbols. Use truth tables to analyse propositions	
	Boolean algebra	Manipulate Boolean expressions and use the laws of Boolean algebra	
	Switching circuits	Be able to model compound propositions with simple switching and combinatorial circuits.	