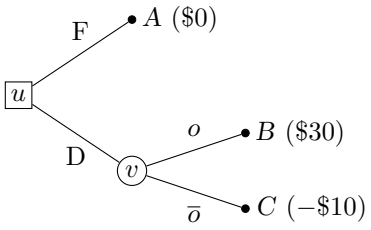
GSOE9210 Engineering Decisions

Problem Set 01

1. The decision tree of the oil drilling example discussed in lectures is shown below. Values are in units of millions.



   (a) What type of node is u? v? B?
   (b) The root node of this tree is of what type?
   (c) Suppose that the dollar values given don't include the additional cost of extracting oil. If the extraction cost is $5, how should the tree be modified?

2. For the problems below, discussed in lectures, draw decision trees and decision tables.

   (a) The necklace insurance problem.
   Assume that the value of the necklace is $1000 and the annual cost of insurance is $5, and that insurance will reimburse the buyer for the full value of the necklace.
   (b) The football club inventory problem.

   How would you modify the representations above if Alice had two insurance policies to choose from?

3. *Sam's dining problem*

   Sam is about to order a two-course meal at a restaurant. He has the following course choices: for the main course he can order either pasta or a salad. After the main course, he will be given the choice of either desert or coffee.

   Initially he is unsure as to whether or not either of the first course options will leave him feeling full.

   For this decision problem identify:

   (a) the actions
   (b) the possible states

The menu prices are:

Mains	Price
pasta	\$14
salad	\$10

Deserts	Price
desert	\$8
coffee	\$3

Once you've decided on the actions and states, draw a decision tree in which the outcomes are measured by the total cost of the meal.

4. Modify the decision tree for the dining problem above for the case where Sam gives a 10% tip if the main course is filling.

5. Suppose that finishing with desert always leaves Sam feeling full. If Sam wants to ensure that he finishes his meal feeling full but wants to minimise the cost of the meal, what should be Sam's 'policy'?

   Hint: A policy must guarantee a unique outcome given a state. Informally, a policy for this problem might look like something like: "Choose X first; if y happens, then choose Z."

6.* Draw a decision table for Sam's dining problem.

   Hint: A decision table must represent a function mapping each pair consisting of an action and a state to a *unique* outcome.