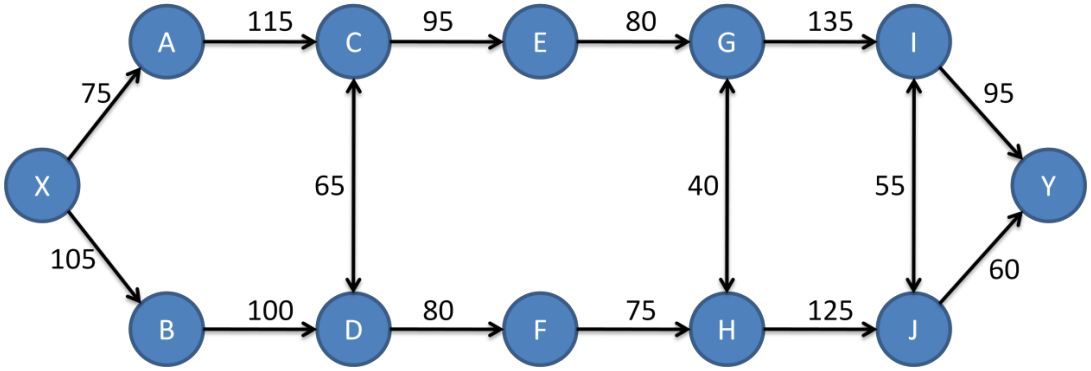
MATH3202/7232 Operations Research & Mathematical Planning 2017

Week 11 – Optimising the Family Drive

A family is setting out to drive between two cities, X and Y. These cities are joined by two main highways, with some options to cross over between the highways. The highways can be drawn as follows, with distances marked in kilometres.



Along the way the family will need to stop for fuel and food. The costs of these vary as follows:

City	Cost of family meal ($)	Fuel cost (cents/L)
A	80	152
B	43	152
C	40	186
D	40	153
E	74	123
F	72	143
G	78	186
H	45	124
I	73	191
J	55	126

Due to holiday traffic, the car travels at an average speed of 60km/hr. The family has just fed before setting off and can go at most 4 hours between meals (end of one meal to start of the next). They will eat with friends on arrival at Y. The car uses 10 litres per 100 kilometres and can safely go at most 400km on a tank. Whenever the family stops to refuel it completely fills the tank. The tank is full on setting off. When the car arrives at the destination it will need to be refuelled at a cost of $1.20 per litre.

a) Write down a general-purpose formulation for calculating the cheapest way to get from X to Y.

b) Perhaps the family wants to have the fewest stops possible (where a stop for both food and petrol counts as only one stop). Modify your formulation to calculate the cheapest way to travel, amongst journeys that also have the smallest number of stops.