Assignment One: Search
Solution

Question One

(a) The state space can be seen as containing tuples $((x, y), c)$ where x is the horizontal position, y is the vertical position and c is a Boolean variable that specifies whether the robot has coffee.

(b) There are 87 states (there are 45 squares the robot could be at with coffee and 42 squares the robot could be without coffee).

(c) The start state is ((3,2),False)

(d) See `http://cs.ubc.ca/~poole/cs322/2020/as1/coffee.py`
    To run this file, put this in the same directory as the provided files.

(e) $goal(s)$ should be True when $s = ((3, 4), \mathit{True})$ and False otherwise.

(f) One least-cost solution is ((3, 2), False) $\longrightarrow$ ((4, 2), False) $\longrightarrow$ ((5, 2), False) $\longrightarrow$ ((6, 2), False) $\longrightarrow$ ((6, 3), False) $\longrightarrow$ ((6, 4), False) $\longrightarrow$ ((7, 4), True) $\longrightarrow$ ((6, 4), True) $\longrightarrow$ ((6, 5), True) $\longrightarrow$ ((5, 5), True) $\longrightarrow$ ((4, 5), True) $\longrightarrow$ ((3, 5), True) $\longrightarrow$ ((3, 4), True)

Question Two

(a) See `http://cs.ubc.ca/~poole/cs322/2020/as1/ubcfood.py`
    Add this to the directory containing the other python codes.

(b) Here is a trace:

```
$ python -i ubcfood.py
>>> ubcfoodsearcher = Searcher(ubcfood)
>>> ubcfoodsearcher.search()
4 paths have been expanded and 3 paths remain in the frontier
DMP --> CSX --> Poke
>>> ubcfoodsearcher.search()
6 paths have been expanded and 3 paths remain in the frontier
DMP --> CSX --> Forestry --> BAW
>>> ubcfoodsearcher.search()
7 paths have been expanded and 2 paths remain in the frontier
DMP --> CSX --> Forestry --> Timmies
>>> ubcfoodsearcher.search()
9 paths have been expanded and 2 paths remain in the frontier
DMP --> Forestry --> BAW
```

```
>>> ubcfoodsearcher.search()
10 paths have been expanded and 1 paths remain in the frontier
DMP --> Forestry --> Timmies
>>> ubcfoodsearcher.search()
11 paths have been expanded and 0 paths remain in the frontier
DMP --> Starbucks
>>> ubcfoodsearcher.search()
No (more) solutions. Total of 11 paths expanded.
>>>
```

Question Three

It should not have taken more than a few hours. Most of this should have been in getting the Python to run (which, once you have done it once you can use this experience for the rest of the term) and understanding the material, not in doing busy work. I hope it was reasonable, and you learned something.