Assignment 1: Solutions
IS711: Learning and Planning in Intelligent Systems

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1 Question #1

1.1 Answer to Question #1.1

We can formulate the problem with the following definitions:

- **State space**:
  - the top block on the table
- **Initial state**:
  - the top block on the table is the block A
- **Goal state**:
  - the top block on the table is the block C
- **Possible Operators**:
- **Path cost**:

1.2 Answer to Question #1.2

In the initial state con0, we can do the operation moveTo(2,1), moveToTable(2), moveTo(1,2), moveToTable(1), and get different configurations respectively, con1, con2, con3, con4, based on the formula f(n) = g(n) + h(n), we can get the estimated the cost of each configuration and

the first four nodes with the search tree are shown below, clearly indicate: the order of expansion of each node; the action corresponding to each edge of the tree; the state, f(n) value that sum of heuristic value with real cost.

2 Question #2

Cutting:40hrs, Assembly:42hrs, Finishing: 25hrs Sofa: $201hrofcutting, 2hrsofassembly, 1hroffinishingChair : 30$ 2 hrs of cutting, 1 hr of assembly, 1 hr of finishing

The calculation is as follows:

- **Variables**: X1 : manufacture one unit of sofa X2: manufacture one unit of chair
- **Constraints**:
- **Objective**:
- **Solution**:

3 Question #3

Let's use(X,Y) represent the value that the first dice is X, and the second is Y, total 36 possibilities of the results for (X,Y) of rolling two fair six-sided dice at one time.

P(win $1 in first round) = P(1,1) + P(2,3) + P(3,2) + P(1,4) + P(4,1) + P(1,6) + P(6,1) + P(3,4) + P(4,3) +P(2,5) +P(5,2) + P(4,6) + P(6,4)+ P(5,5) = 7/18

P(lose $1 in first round) = P(1,5) + P(5,1) + P(3,3) +P(2,4)+ P(4,2) +P(6,6) = 1/6

P(play one more round) = 1- 7/18 - 1/6 =4/9

P(win $2 in second round | play one more round) = P(2,2) + P(1,3) + P(3,1) + P(1,5) + P(5,1) + P(3,3)+P(4,2)+P(2,4)+P(6,1) +P(6,1)+ P(3,4) + P(4,3) +P(2,5) +P(5,2) + P(2,6) + P(6,2) +P (3,5) + P(5,3) + P(4,4) = 19/36

P(lose $1 in second round | play one more round) = 1- 17/36 = 5/9 Expected value of game: (7/18)*1 +(1/6)*(-1) + (4/9)*(19/36)*2 + (4/9)*(17/36)*(-1)=13/27> 0 P(winning) = P(win $1 in first round) + P(play one more round)* P(win $2 in second round | play one more round) = 101/162 The probability of winning is 101/162 As expected value is much bigger than 0, and win probability is bigger than 0.5, I will play this game.

4 Question #4

4.1 Answer to Question #4.1

4.2 Answer to Question #4.2

4.3 Answer to Question #4.3

5 Question #5

6 Question #6

6.1 Answer to Question #6.a

6.2 Answer to Question #6.b