Homework1

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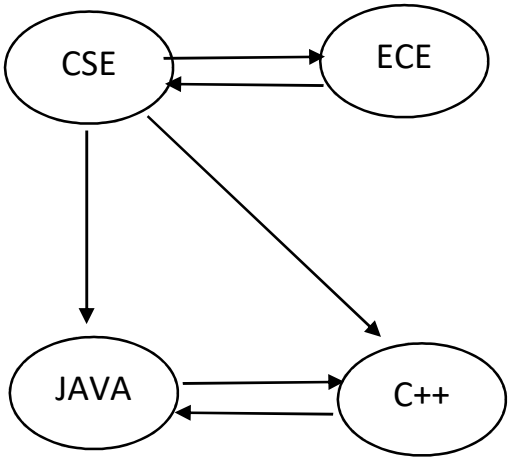
1.

(1)



P(CSE)=<0.8, 0.2>;

P(ECE)=<0.2, 0.8>;

CSE	P(ECE|CSE)
T	<0, 1>
F	<1, 0>

ECE	P(CSE|ECE)
T	<0, 1>
F	<1, 0>

CSE	P(JAVA|CSE)
T	<0.75, 0.25>
F	<0.5, 0.5>

CSE	P(C++|CSE)
T	<0.25, 0.75>
F	<0.5, 0.5>

(2) P(CSE|C++)=P(C++|CSE) P(CSE) / P(C++)=α P(C++|CSE) P(CSE)= α*<0.25*0.8, 0.5*0.2>= α<0.2, 0.1>

So, the probability which the C++ program is from a CSE student is 0.2 and the probability which the C++ program is from a ECE student is 0.1.

Thus, it is more likely to be from a CSE student.

(3) Suppose x% of the class is CSE students.

P(CSE|C++)= α*<0.25*x, 0.5*(1-x)>

According to the question, we can get:

0.25*x=0.5*(1-x)

So, x=2/3. 2/3 of the class is CSE student and 1/3 of the class is ECE students.

2.

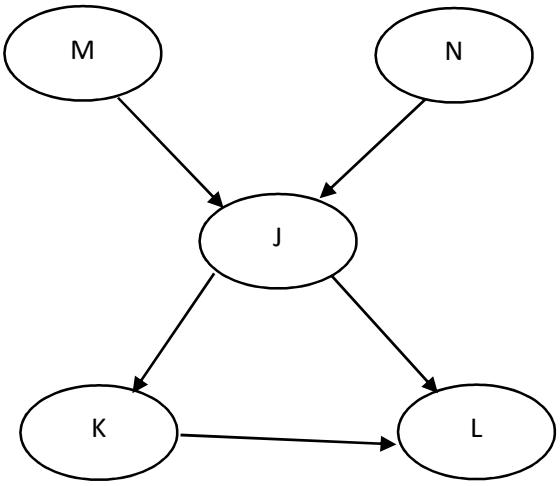
(1) $P(M|J,K,L,N) = \frac{P(M,J,K,L,N)}{P(J,K,L,N)} = \frac{P(L|J,K,M,N)P(J,K,M,N)}{P(J,K,L,N)} = \frac{P(L|J,K)P(K|J,M,N)P(J,M,N)}{P(J,K,L,N)}$

$= \frac{P(L|J,K)P(K|J)P(J|M,N)P(M,N)}{P(J,K,L,N)} = \frac{P(L|J,K)P(K|J)P(J|M,N)P(N|M)P(M)}{P(J,K,L,N)}$

$= \frac{P(L|J,K)P(K|J)P(J|M,N)P(N)P(M)}{P(J,K,L,N)} = \frac{P(L|J,K)P(K|J)P(J|M,N)P(N)P(M)}{\Sigma_m P(J,K,L,N,m)}$

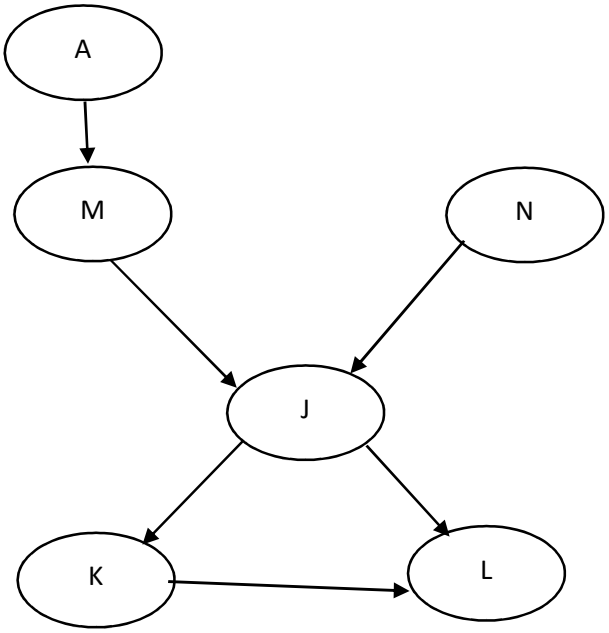
$= \frac{P(L|J,K)P(K|J)P(J|M,N)P(N)P(M)}{\Sigma_m[P(L|J,K)P(K|J)P(J|m,N)P(N)P(m)]}$

(2)



(3) J, L

(4) Insert node A to the network shown as below.



3.

(1)

P(BAR/BAR/BAR) = $(0.2)^3$=0.008

P(BELL/BELL/BELL)=0.008

P(ORANGE/ORANGE/ORANGE)=0.008

P(LEMON/LEMON/LEMON)=0.008

P(CHERRY/CHERRY/CHERRY)=0.008

P(CHERRY/CHERRY/?)=0.2*0.2-0.008=0.032

P(CHERRY/?/?)=0.2-0.032-0.008=0.16

The expected payback percentage is:

25*0.008+10*0.008+5*0.008+4*0.008+3*0.008+2*0.032+1*0.16=0.6

(2) Suppose that casino offer x coins as the “jackpot” (BAR/BAR/BAR),

x*0.008+10*0.008+5*0.008+4*0.008+3*0.008+2*0.032+1*0.16=1

Then, x=75

(3) We win if either all symbols are same (denoted as event A), or if the first symbol is CHERRY (denoted as event B).

Then,

P(A V B)=P(A)+P(B)-P(A ∧ B) = 0.2*0.2*0.2*5+0.2-0.008=0.232

(4)

mean: 24.3726

medium: 15

The code of C++ is as blow:

```
#include<iostream>
#include<vector>
#include<cstdlib>
#include<ctime>
using namespace std;
class Solution {
public:
	int simulation() {
		int money = 10;
		int num = 0;
		vector<int> bet(3);
		while (money > 0) {
			money--;
			num++;
			for (int i = 0; i < 3; i++) {
				int b = rand() % 5;
				//0: BAR; 1: BELL; 2: ORANGE; 3: LEMON; 4: CHERRY
				bet[i]=b;
			}
			if (bet[0] == bet[1] && bet[1] == bet[2]) {
				if (bet[0] == 0)
					money += 25;
				else if (bet[0] == 1)
					money += 10;
				else if (bet[0] == 2)
					money += 5;
				else if (bet[0] == 3)
					money += 4;
				else if (bet[0] == 4)
					money += 3;
			}
			else if (bet[0] == 4) {
				if (bet[1] == 4)
					money += 2;
				else
```

```
                                money += 1;
                        }
                }
                return num;
        }
};
int main() {
        srand((unsigned)time(NULL));
        Solution s;
        vector<int> nums;
        double mean = 0;
        double medium = 0;
        for (int i = 0; i < 10000; i++) {
                nums.push_back(s.simulation());
                mean += nums.back();
        }
        sort(nums.begin(), nums.end());
        mean /= 10000;
        medium = (nums[5000] + nums[4999]) / 2;
        cout << "mean: " << mean << endl;
        cout << "medium: " << medium << endl;
        return 0;
}
```