

In the name of God

PL homework #1

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2) Construct a trace of the execution of the following program (i.e. complete the following proof).

1. parentOf(john, mary).	Fact
2. parentOf(kay, john).	Fact
3. parentOf(bill, kay).	Fact
4. ancestorOf(X,Y) if parentOf(X,Y).	Rule
5. ancestorOf(X,Z) if parentOf(X,Y) and ancestorOf(Y,Z).	Rule
6. not ancestorOf(bill, mary).	Assumption
7. ancestorOf(john, mary).	1,4,Unification,MP
8. ancestorOf(kay, mary).	2,5,7,Unification,MP
9. ancestorOf(bill, mary).	3,5,8,Unification,MP
10. Contradiction.	6,8

4) Construct a trace of the execution of the following program.

N := 4;

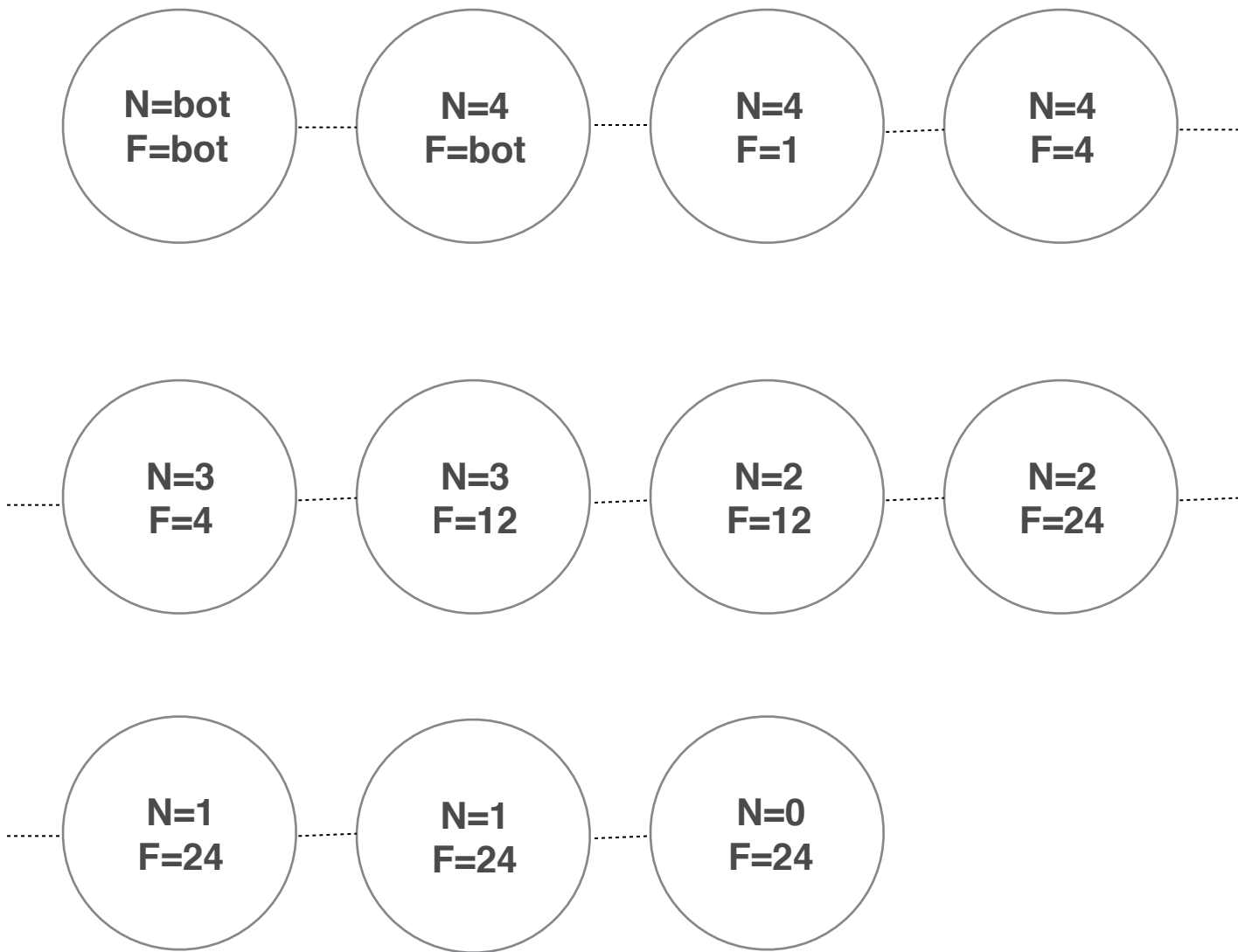
F:=1;

While N>0 do

F :=N\*F;

N =N-1;

end;



5) Using the following definition of a list,

- list([ ]) -- the empty list
- list([X|L]) if list(L) -- first element is X the rest of the list is L
- [X<sub>0</sub>, ..., X<sub>n</sub>] is an abbreviation for [X<sub>0</sub>|...[X<sub>n</sub>|[ ]]...]

complete the following computation (proof) and determine the result of concatenating the two lists.

1.concat([ ],L,L)

Fact

2.concat([X|L<sub>0</sub>],L<sub>1</sub>,[X|L<sub>2</sub>]) if concat(L<sub>0</sub>,L<sub>1</sub>,L<sub>2</sub>)

Rule

3.¬concat([0,1],[a,b],L)

Assumption

- |   |        |
|---|--------|
| 4. $\neg \text{concat}([1],[a,b],L')$   | 2,3,MT |
| 5. $\neg \text{concat}([], [a,b], L'')$ | 2,4,MT |
| 6. $L'' \neq [a,b]$                     | 1,5,MT |

Result = concat( [0,1] , [a,b] , [0,1,a,b] )

6) Classify the following languages in terms of a computational model: Ada, APL, BASIC, C, COBOL, FORTRAN, Haskell, Icon, LISP, Pascal, Prolog, SNOBOL.

Ada : imperative, APL : functional, BASIC : imperative, C : imperative , COBOL : imperative, FORTRAN : imperative, Haskell : pure functional, Icon : imperative, LISP : functional(and imperative), Pascal : imperative, Prolog : logic, SNOBOL : functional(and logic).

7) For the following applications, determine an appropriate computational model which might serve to provide a solution.

automated teller machine : imperative, flight-control system : functional,  
a legal advice service : logic, nuclear power station monitoring system: functional, an industrial robot : functional.

10) What programming language constructs of C are dependent on the local environment.

In C language, local structures are more than global structures. as an example,function definitions and variable definitions and etc. are defined locally in program code and structures such as “define”s are defined globally and we can not change them based on data flow in blocks of our program.

13) Compare two programming languages from the same computational paradigm with respect to the programming language design principles.

C is strong and good in Implementation , Simplicity , Extensibility , Regularity and Computational Completeness.

JAVA is strong and good in Simplicity, Regularity, Computational Completeness but is not good and weak in Implementation, Extensibility .  
C is more efficient and Java is more readable and writable.

14) Construct a program in your favorite language to do one of the following:

- a. Perform numerical integration where the function is passed as a parameter.
- b. Perform sorting where the less-than function is passed as a parameter.

b :

```
public static void main(String[] arg) {  
    Vector<Item> item = getItem() ;  
    LessThanFunction ltf = get_ltf() ;  
    Sort(item , ltf) ;  
}  
  
Private void sort(Vector<Record> records , LessThanFunction lessThan) {  
    For(int i = 0 ; i < records.size() ; i ++ ) {  
        Record min = records.elementAt(i) ;  
        For(int j = i ; j < records.size() ; j++)  
            If(check(lessThan , records.elementAt(j) , min)  
                Min = record.elementAt(j) ;  
        Records.swap(min , elementAt(i)) ;  
    }  
}
```

```

private LessThanFunction get_Ltf() {
    do{
        String str = input.readStreamFully() ;
    }while(SyntaxErr(str)) ;

    return new LessThanFunction(str) ;
}

private String check(LessThanFunction ltf , Item a , Item b) {
    if(ltf.equals("<"))
        return "a < b" ;
    else if(ltf.equals("="))
        return "a = b" ;
    else if(ltf.equals(">"))
        return "a > b" ;
}

```