This assignment consists of two exercises to produce DCGs for parts of English. The grammars should provide agreement between subject and verb and also convert the present tense into the past. Answers to both questions are to be handed in by Fri 13th November. Answers should include fully commented listings together with illustrative results. You should also email a copy of the working code to p.w.grant@swansea.ac.uk (call the two attachments <username>-1.pl and <username>-2.pl.). Late submissions will suffer a penalty of 10% per day.

1. Construct a DCG to recognise the fragment of English consisting of simple sentences built up from the following lexicon:

- Animate nouns: dog, cat, girl, boy.
- Inanimate nouns: ball, book, cake, toy.
- Transitive verbs: chase, hate, love.
- Determiners: a, the, every, all, many.
- Pronouns: I, you, he, she, it, one, we, they.
- Present participles of above verbs: chasing, hating, loving.
- Auxiliary verb: to be (am, are, is).

All verbs are in the present tense, but must have correct noun/pronoun verb agreement. The present tense can also be constructed from the auxiliary verb to be together with the present participle. Only animate nouns or pronouns can be the subject of the given verbs. The determiners must be followed by the correct plurality of the noun — so all boys is correct but every boys is not. Plurals can be used without quantifiers — so dogs chase cats is correct but dog chases cat is not.

Examples of sentences are:
- all girls are loving many dogs
- I am hating all cats
- we love the dog; she hates all boys

2. Extend the above grammar to generate also a term representing the parse tree of the sentence and a list representing the past tense of the sentence so e.g. ?-phrase(sentence(S,P),['I',am,loving,he, girl]) instantiates S to the term representing the parse tree, e.g. this could be s(pn('I'),vp(v(aux(am), pp(loving)),np(d(the), n(girl)))) and P is instantiated to ['I', was, loving, the, girl] ; and for the sentence the dog chases many cats S would be s(np(det(the),n(dog))),vp(chases,np(det(many),n(cats)))) with past tense sentence P = [the,dog,chased,many,cats].

Use the predicate p_tree/2, given in lectures (and over page), to display the term in a simple tree format.
% code for printing out a term in simple tree format

% print N spaces
spaces(0).
spaces(N) :-
    N>0,
    write(' '),N1 is N-1,
    spaces(N1).

% print the tree
p_tree(Tm,D) :-
    atom(Tm),!,
    spaces(D),write(Tm).

p_tree(Tm,D) :-
    Tm =.. [F|Args],
    spaces(D),write(F),write('('),nl,
    D1 is D+3,
    p_tree_lst(Args,D1),
    spaces(D),write(')').

% print a list of trees
p_tree_lst([Tm],D) :- !,
    p_tree(Tm,D),nl.

p_tree_lst([Tm|Tms],D) :- !,
    p_tree(Tm,D),write(','),nl,
    p_tree_lst(Tms,D).