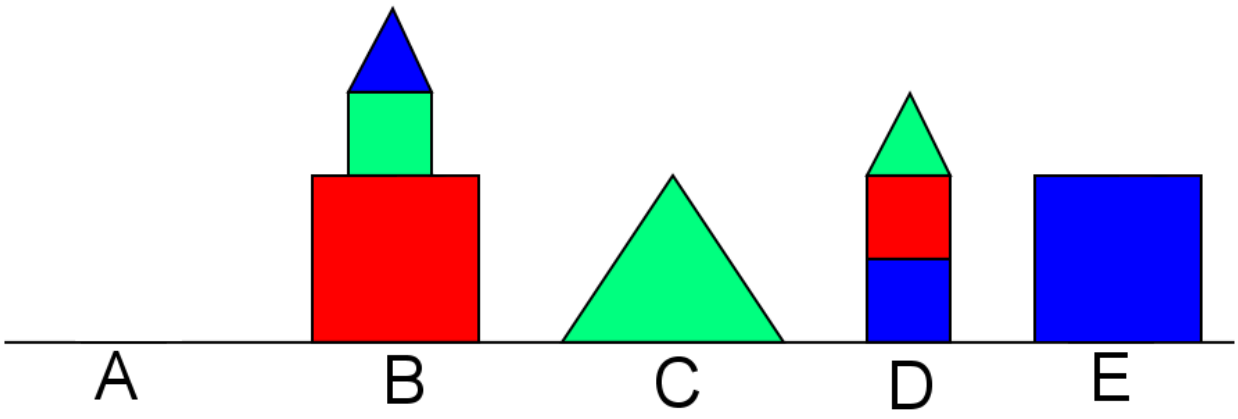
Blocks World: Work with your partner(s) to understand and write Prolog relations which understand natural language about the blocks world.

Consider the following world containing blocks.



- The blocks can be cubes or pyramids.
- The blocks can be located either on the table or on another block.
- Each block is on at most one other block (which must be a cube) and has at most one other block directly on it.
- The table is divided into five contiguous areas, A,B,C,D, and E from left to right.
- Each block on the table is located in exactly one of these areas, and each table area has at most one block directly on it.

Follow the instructions:

1. Build a world model in Prolog that expresses the basic facts about colors, sizes, shapes, and locations of the blocks in the diagram above.

2. Write clauses defining the relations *beside(x,y)* which holds when block x and y are both on the table in two adjacent areas, and *above(x,y)* which holds when block x is somewhere above block y.

3. Test out your world model by writing Prolog queries that answer the following questions:
    a. Is there a big green block?

    b. Is a block above a big block?

    c. Is a cube above a green block?

    d. Is a blue block beside a green block?

4. We want to be able to make natural language queries about the blocks world with English noun phrases such as:

    a. np([a,pyramid],B).
    b. np([any, small,cube],B).
    c. np([a,block,on,the,big,cube],B).
    d. np([a,cube,beside,a,green,pyramid],B).
    e. np([a,cube,below,a,green,pyramid,on,a,red,block],B).
       Note: This phrase is ambiguous
    f. np([a,blue,pyramid,above,a,block,beside,the,large,green,pyramid],B).

    In order to do this, build a Prolog lexicon of articles, adjectives, common nouns, and prepositions including all the words in the six example noun phrases. The word *any* should be treated as an article.

5. Copy the Prolog parser which is in file ch8_3.pl . Then test the noun phrases above, and any others you would like to try, and check that it is capable of identifying the blocks being referred to in your scene.