NATURAL LANGUAGE ISSUES: The DB & KB should have rules/facts for all the concepts indicated in this handout (and/or discussed in class and/or mentioned in the questions) plus other related ones. So, YES, you need a rules for "below" AND "above" AND "under", in order to ask the following 2 questions in English-like Prolog:

1.) Which object is below the prism? `below(X,thePrism).`
2.) Which object is above the rock? `above(X,theRock).`

Yes, it would be more efficient code-wise to just have 1 rule, say for "below", and then to just ask question #2 as: `below(theRock,X).` However, the Prolog predicates used should reflect the actual language of a natural language (English) question as much as possible, so we could more easily add an automated natural language translator module. AI knowledge-based systems need to be adaptable and easy to change and easy to add to and as well as fit the nature of the real world problem. And in a future asgn we might want to add a true natural language interface and ask Robbie English QUESTIONS rather than Prolog QUERIES.

`"Dear Robbie, would you please tell me which object is above the rock?"`

MEANINGS OF TERMS: Natural language (i.e., "everyday English") is sometimes ambiguous. Just so Robbie and I (the tester) agree about the meaning of terms (so he'll get 100% correct answers when you test him), I'm assuming the following (as well as the meanings we agree upon in class):

- thing means everything in the world including the objects, Robbie and the table,
  whereas object means just the objects, but not Robbie nor the table.
  [Careful of this when you translate the questions into queries].
- use the natural language (English) order of words in a sentence for parameter order
  `below(X,thePrism).` means "X is below the prism" and NOT "the prism is below X"
- the marble / the 5 (individual) blocks / the pencil are small,
  the rock / the tube / the dish / the box are big
  and the rest are medium
- colors of things: transparent: prism, marble
  black: table, Robbie, cube, glass, tube, ball yellow: pencil
  white: baseball, cup, dish, all 5 blocks, balloon grey: box, rock
- white, yellow and transparent things are light (colored), black & grey things are dark
- left means "directly next door to" on the left (though not necessarily touching) without any other objects in between AND at the same horizontal level AND actually directly ON the table) whereas
- somewhereLeft means there may or may not be intervening objects, and/or the 2 designated objects could be on different horizontal planes
- on means actually sitting directly on top of, touching
- under includes both directly underneath and somewhere underneath (but the blocks must be in the same vertical plane)
- use the same idea for below and above as for under
- under and below mean exactly the same thing
- nextTo means directly left/right/on (which does not include "somewhere..." or diagonally nearby)
  [and does not include Robbie's hand, but DOES include the table]
- assume there's always room on the table for more objects (because Robbie could always slide objects over and the table can stretch)
- for orientation, it doesn't matter for cubes and spheres (i.e., they're always onBase, onSide, and onTop) but cylinders/disks/odd_cones are onBase (and onTop) when one of their flat sides is down – otherwise they're on they're onSide
- hollow things include: aBox, aGlass, aCup, aTube aBalloon (based on their TYPE rather than based on the object itself). The other objects (and Robbie and the table) are solid things
- MORE DISCUSSIONS IN CLASS - once we reach a consensus in class, then that becomes TRUTH