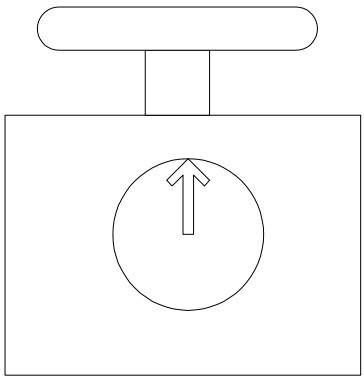
Representation and Modelling CS4012
Tutorial 1

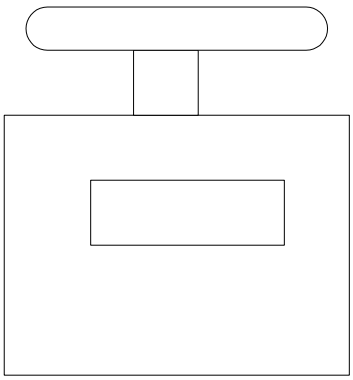
(Note these questions are adapted from a previous exam paper)

1. Give an example of each of the following types of models and explain your answer
    a. An iconic model
    b. An analogic model
    c. A symbolic model
2. Is the model in the diagram below a static or dynamic model?

3. There are two types of scales illustrated below, each presenting a model of an item's weight.



Scales A



Scales B

    a. What type of model does 'Scales A' present?
    b. What type of model does 'Scales B' present?
    c. Explain briefly how one of the models relies on the user's faculty of recognition while the other can be used with some observation
4. Consider a beaker which can contain a volume of liquid. Suppose a ruler is used to measure the height of liquid in the beaker.

    a. Explain why you consider the ruler to be an iconic, analogic or symbolic model of the volume of the liquid in the beaker
    b. Explain what you understand by the technical inadequacy of using this ruler method in a context where high precision is required, for example, in measuring pharmaceuticals.
    c. Explain why you consider the height measurement to be a static or dynamic model of the volume of liquid in the beaker

5. Describe two types of air pressure gauge, one of which is an analogic model and the other a symbolic model of the amount of air in a tyre.
6. What type of model would a specification for a pc be?
7. A model can be considered to be an _____ because it highlights some attributes by including them and hides others by leaving them out.
8. List three attributes of a student that might be of interest to student services and explain why you have chosen them in terms of reasoning and the user of the model.
9. What type of model is a mathematical model of an optimisation problem?
10. List the characteristics of an optimisation problem
11. Now back to the question from the lecture….

The Precision Tool Company(PTC) is a manufacturer of precision screws. It has two main lines, wood screws and metal screws which it sells for 20 and 25 euro respectively per box. The material costs for each box are 10, 8 euro respectively and overhead costs are 5000 euro per week. All screws have to pass through a slotting machine(SM) and threading machine(TM). A box of wood screws requires 3 mins in the SM and 2 mins in the TM. A box of metal screws requires 2 mins on the SM and 8 mins on the TM. In a week each machine is available for 60 hours. The company needs your help to identify the number of boxes of each type of screw they should produce to maximize their profits.

1. Formulate this optimisation problem as a linear problem.
2. Draw a graph illustrating the feasible region
3. Identify the points at the corners of this feasible region
4. Determine which one of these points is the optimal solution to the problem.