

**ii homework check: Cagey Problem**

**ii note: A Design Problem – Mathematical Modeling**

A scale diagram is a representation of an actual building or site but on a much smaller scale. For example, a blueprint is a scale drawing that imparts important information about your home and is used by architects, engineers, electricians and carpenters.

In our design problem, you are given important information necessary to build a site plan for a laser tag facility. It is important to follow all codes and bylaws for your building to be viable in the real world.

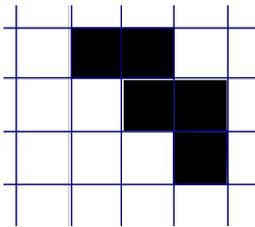
**ii homework assignment: A Design Problem**

## A Design Problem

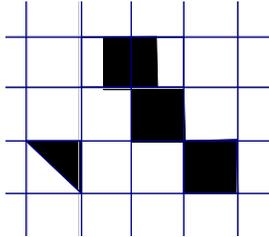
*You are an architect hired to design a multi-level building for a client who wants to open a laser tag business. As the head architect, you must ensure the integrity of all bylaws and codes.*

### REQUIREMENTS AND BYLAWS:

1. The lot is 100m by 100m with a large redwood tree in the exact centre. The tree must be preserved with an open space of at least 5m in all directions.
2. The town bylaw requires a fire route of at least 10m at the sides and back of the buildings.
3. The client wants a variety of interesting footprints to look over – one of small base area, one of medium base area, and one of large base area. *No two areas can be the same.*
4. Each storey of the building will have the same footprint as the base and be 4m in height.
5. There are certain restrictions to your scale diagram.



ALLOWED



NOT ALLOWED

**Problem:** *How does the volume of the building change as the height increases?*

As part of your report,

1. Make a hypothesis as to the relationship between volume and height.
2. Draw 3 scale diagrams that comply with the requirements and bylaws.
3. For each of the footprints, complete tables that include height, base area, and volume. Complete the finite differences for volume and height.
4. Describe each of the relationships between height and volume using graphs, words, and equations.
5. Is the data continuous or discrete? Be sure this is reflected in your graphs by a thin or dotted line.
6. What is the connection between base area and the equation? Be specific and use proper vocabulary. How do the equation and graph of volume vs height change if the base area is  $1250\text{m}^2$ ? ...  $4750\text{m}^2$ ? Write the equations of these two new relations without the use of graphs or tables.
7. Can you suggest a base area that would yield a graph steeper than all of yours? A base area that yields a graph flatter than all of yours?