

Title: Build a Block**Brief Overview:**

Given a set of parameters students will design a city block. They will write responses to explain and justify their reasons for their design choices.

Link to Standards:

- **Problem Solving** Students will demonstrate the ability to solve mathematics problems with open-ended answers.
- **Communication** Students will demonstrate the ability to communicate mathematically.
- **Reasoning** Students will justify their reasoning for responses to real-world designing questions.
- **Connections** Students will design a city block and prepare a writing sample demonstrating their understanding of the connection between visualization and perspective involved in the design of a city block.
- **Number & Number Relationships** Students will demonstrate the ability to apply estimation strategies in computation with the use of visualization in measurement and problem solving.
- **Patterns & Functions** Students will demonstrate the ability to recognize numeric and geometric relationships and generalize a relation from a model.
- **Probability** Students will use simulations to develop a model for a city block.
- **Geometry** Students will demonstrate the ability to apply geometric relationships using three-dimensional objects.
- **Measurement** Students will demonstrate and apply concepts of measurement to the interdisciplinary real-world problem solving required to design a city block.

Grade/Level:

Grade 6-8 with heterogeneous groupings.

Duration/Length:

This activity is intended for one period per day for four days within the context of an interdisciplinary team.

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Finding volume
- Finding area/surface area
- Performing basic operations on a calculator

Objectives:

Students will:

- Construct an energy-efficient design for a city block of square prism buildings surrounding a green space.
- Explain the reasons for their design decisions.
- Derive exposed surface area calculations, excluding the roof.

Materials/Resources/Printed Materials:

- Multi-links or any type of unit block
- Graph paper
- Isometric worksheets
- *Building Perspective*, a computer program
- Colored pencils

Development Procedures:

- Develop visualization using the isometric worksheet(s).
- Use the computer program to test an application.
- Design individual city blocks, drawing 4 perspectives, 1 from each direction (N,S,E,W).
- Write a description and rationale for the designs selected.

Authors:

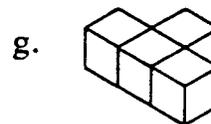
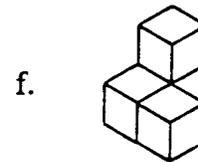
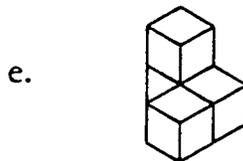
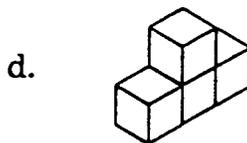
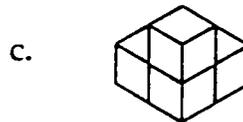
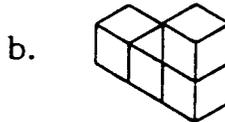
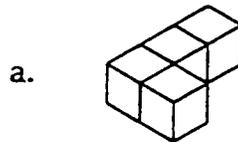
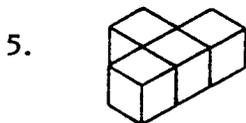
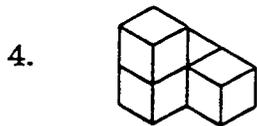
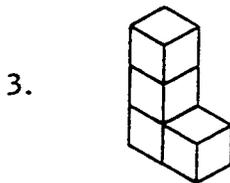
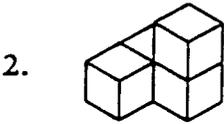
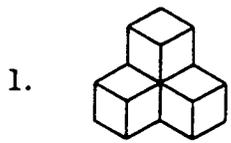
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Matching Rotations

Match each house on the left side with any house on the right side that could be a rotation of it. Rotations can be made by turning the house or by lifting it. Some of the houses on the left may match more than one of the houses on the right, and some may have no matches.

First try matching the structures in your head. Then you can check them using a set of four cubes.

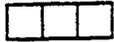
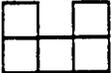
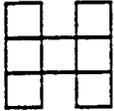
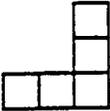
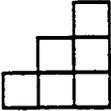
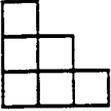
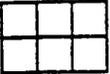
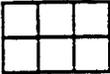
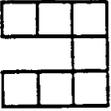
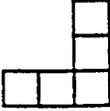
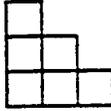


6. Choose two of the houses on the left and draw a different rotation of each one. Do not identify which of the houses you are using for your drawings. Other students may be asked to figure out the rotations you've drawn.

Reading Orthogonal Drawings

For each problem, you are given three views of a modular house. Your job is to build the house. Record the number of cubes you use for each house.

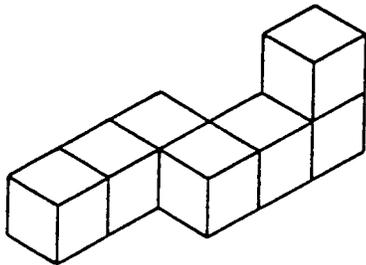
Orthogonal Drawings

	Top	Front	Right Side
1.			
2.			
3.			
4.			
5.			
6.			

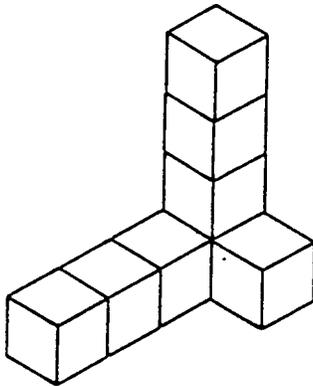
Making Orthogonal Drawings

For each problem, you are given an isometric drawing of a modular house. Your job is to make orthogonal drawings showing the top, front, and right side of the house.

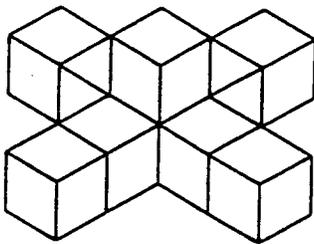
1.



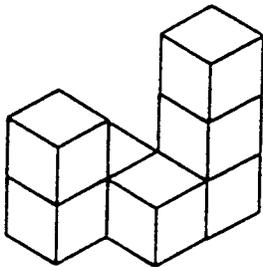
2.



3.



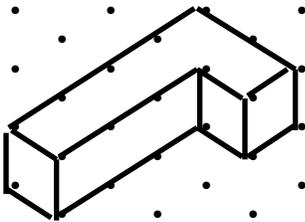
4.



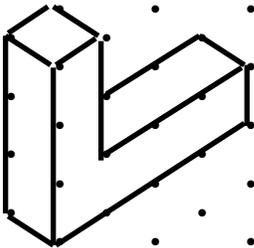
DRAWING SOLIDS

For each solid shown, do the following:

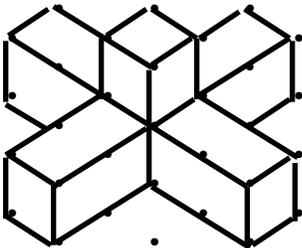
- Build the solid from cubes.
- Copy the drawing.
- Count the number of cubes used in the drawing.
- Check your count from the solid.



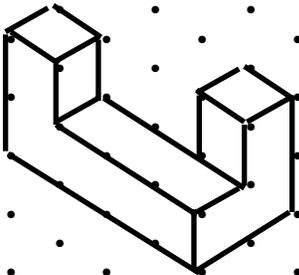
Number
of cubes___



Number
of cubes___



Number
of cubes___



Number
of cubes___

CULMINATING ACTIVITY:

Design Your Block

You are trying to earn a contract to design a city block. Your block will consist of eight buildings and a green space. The size of the buildings varies from one story to five stories.

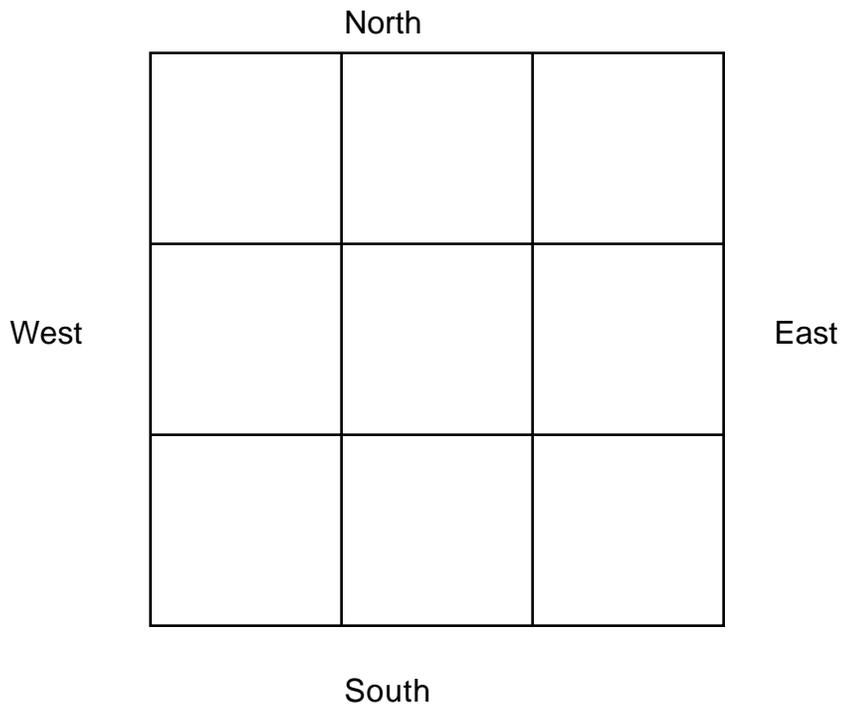
You are to arrange the eight buildings and green space on a 3 X 3 grid. Each building has a base of one square unit.

- 1 building is one story
- 2 buildings are two stories
- 2 buildings are three stories
- 2 buildings are four stories
- 1 building is five stories

*each cube represents one story

Remember, you want to win the contract ! Your design must be energy efficient and visually attractive.

After you decide on the layout of your city block, record the number of stories of each building in each square on the grid below. Do not forget your green space.



Culminating Writing Activity:

BUILDERS ALERT!

The city is awarding contracts for the design and construction of a city block. You need to write a proposal to the mayor and city council explaining why you should be selected to develop and produce this project. Include as many convincing factors as possible, but remember the council requires at least three .

According to reports from previous contractors, the following factors may be especially important:

- energy efficiency (Heat and air conditioning are lost through exterior walls and windows.)
- exposure to the sun (Give consideration to the directions N, S, E, W.)
- visual appeal (You want to provide a variety in building size and placement.)

EXTENSIONS:

- You have been asked to paint the exterior faces of each building **excluding the roof**. Given the dimensions of each cube as one unit by one unit by one unit, determine the exposed surface area for each building.
- If 2.5 gallons of paint covers one square unit, calculate the amount of paint needed to paint the exterior faces of each building.
- If a gallon of paint costs \$14.95, what is the cost to paint each building.
- *Building Perspective*, computer software by Sunburst.

Scoring Rubric

Culminating Activity:

Design Your Block

# of points	Explanation
1	Student has the number of stories and a green space on the grid.
0	Student has not recorded the number of stories on the grid.

Directional Views

4	Student has correctly drawn all 4 directional views.
3	Student has correctly drawn 3 directional views.
2	Student has correctly drawn 2 directional views.
1	Student has correctly drawn 1 directional view.
0	No drawings at all or incorrect drawings of each view.

Builders Alert

2	Student has included at least 3 factors.
1	Student has made an attempt , but has not included 3 factors.
0	Student made no attempt to write a response.