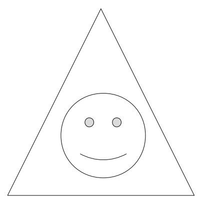
Montlake Math Challenge

January 22, 2009

The Happy Cheese Factory

At the Happy Cheese Facotry, triangular blocks of cheese are packaged in cardboard containers that are shaped like the cheese. A block of cheese can fit into its container in a number of ways.

Problem 1: Draw a picture representing each way a block of cheese can fit into its container. Remember, the cheese has a front side and a back side! The first picture has been drawn for you:



Problem 2: Number the corners of your triangle as 1, 2, 3. In each picture from the previous problem, in what position does corner 1 end? Corner 2? Corner 3?

	Corner 1	Corner 2	Corner 3
Picture 1			
Picture 2			
Picture 3			
Picture 4			
Picture 5			
Picture 6			

Problem 3: We can represent each row of the above table as a list **(a,b,c)** where **a** is the position of corner 1, **b** is the position of corner 2, and **c** is the position of corner 3. Represent each of the rows of the above table as such a list.

Problem 4: Let **O** denote the action of doing nothing to our triangle. Let **R** denote the action of rotating our triangle counterclockwise once. Let **F** denote the action of flipping our triangle across a vertical line through the top corner.

Represent R and F as lists as you did in problem 3.

Problem 5: When I write **R ∘ F**, I mean that I will first apply **F** (flip my triangle) then apply **R** (rotate my triangle). Represent the following actions as lists like you did in problem 3:

O
R
R ∘ R
F
R ∘ F
R ∘ R ∘ F

Problem 6: Fill in the following table. **Be Careful!!!** The entry in row **F** and column **R** should be filled with **F ○ R** but the entry in row **R** and column **F** should be filled with **R ○ F**. Use the blank area at the bottom of the page to do scratch work!

	O	R	R ○ R	F	R ○ F	F ○ R
O						
R						
R ○ R						
F						
R ○ F						
F ○ R						