

**Combinatorial Geometry**  
**Number 9, Number 9**

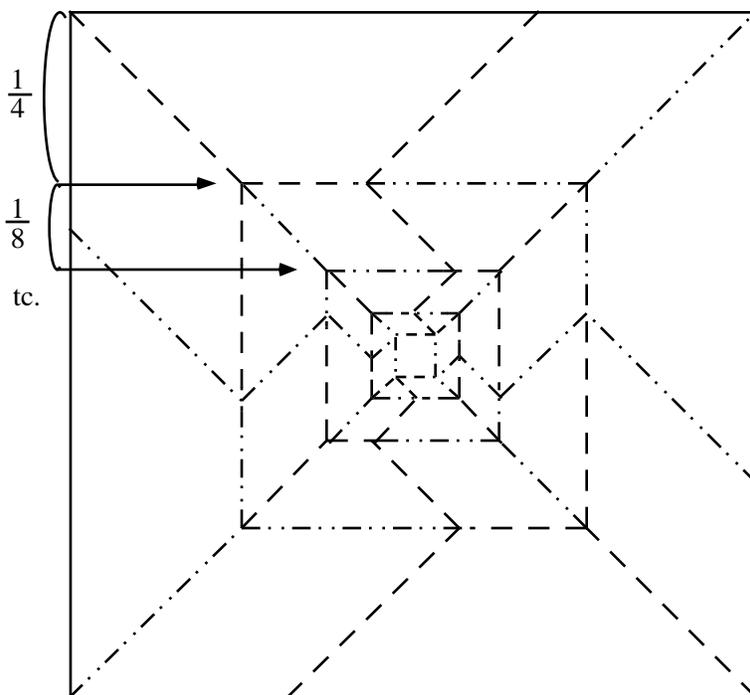
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(1) Design your own origami model. Your write-up should include a finished model, a drawing of the crease pattern (labeled to indicate what parts of the paper do what), and a brief explanation of how you created the design. You may either create:

(a) an animal model (Keep it simple! Like, a fish or lizard. Don't try a complex insect or anything too crazy! If it looks more like a Martian than an animal, that's OK. I'll be grading it based on how you designed it and your crease pattern, not on artistic ability.)

(b) an origami tessellation (We've seen only the square twist tessellation so far. Come up with one of your own. You could try using triangle twists instead, or use square and triangles together, or how about hexagon twists? Octagon twists?)

(2) Fold the following crease pattern in a piece of origami paper and collapse it flat. Describe the types of symmetries that the finished model has (i.e., what kind of rotational symmetry, flipping, etc).



(3) You want to give a present to someone special, and you decide to give him/her a unit cube. But now you need to wrap it, and you want to do so using as little of your precious paper as possible! Thus you want to wrap the unit cube with the conditions

- (a) the paper you're using is a rectangle, and
- (b) only one side of your paper is exposed when it is wrapped.

What is the minimum area rectangle you'll need to do this?

(4) The following is sort of known as the "Margalles Napkin Problem": Is it possible to fold a square napkin into a flat object whose perimeter is greater than the original napkin? Use square paper instead of a napkin to see if you can do this.