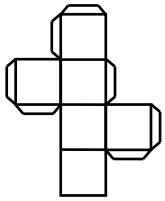
A Demonstration of the Formula for a Pyramid
$V = \frac{1}{3} \cdot A_{Base} \cdot H$

The basic idea

- Any pyramid has a volume equal to one-third the box that it fits into. Why is this so? This exercise is intended to be a hands-on demonstration of this fact.
- The first step is to transform the pyramid (in our imagination) so that its apex moves from above the center of the base to a point directly above one of the corners of the base. We know, because of the *shear and stretch*, that this new "tilting pyramid" has the same volume as the original pyramid.
- If the box is a perfect cube, then we can fit three of these tilting pyramids into the box, thereby showing why the formula has the fraction $\frac{1}{3}$. This is a fun 3-D puzzle!

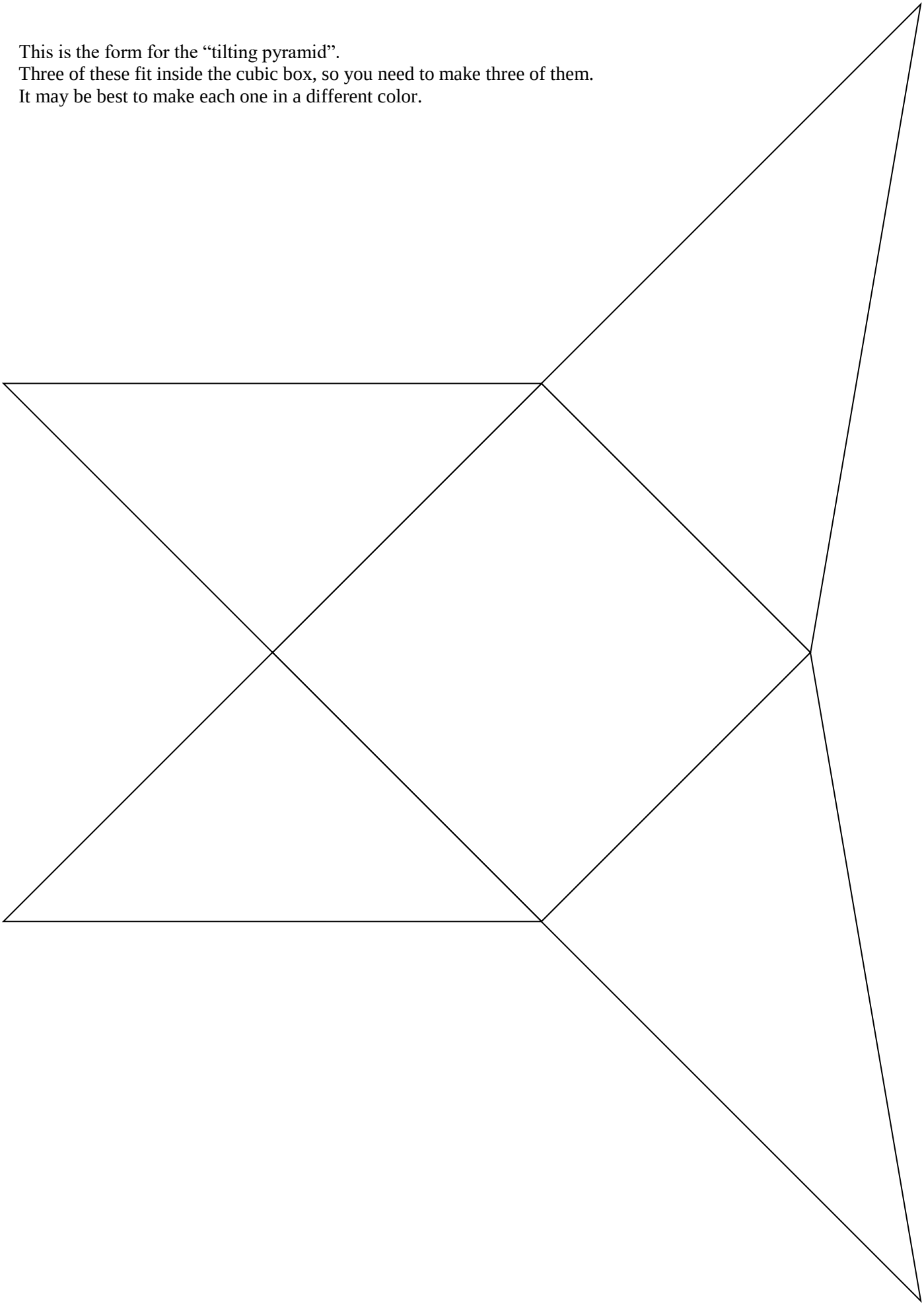
How to make the models (You need to make 5 models!)

- *The "Normal" Pyramid*. The net for this pyramid is on the next page. It has a 3" x 3" square base, and has a height of 3 inches.
- *The "Tilting" Pyramids*. The net for the "tilting pyramid" is on the next page. It also has a 3" x 3" square base, and has a height of 3 inches. **You need to make three of these**.
- *The Cubic Box*. This net is *not* given on the next page – you have to make it yourself. One possible net for the cube is shown here. The edges for this cube need to be slightly greater than 3 inches (about 3 and $\frac{1}{16}$ inches) so that there is room to fit the three tilting pyramids.



- *General Tips*.
  - *Equipment you will need:* Ruler, compass, pencil, scissors, glue, toothpick, pin, colored pencils.
  - Constructing these models out of paper is a real exercise in accuracy and careful work.
  - Use stiff paper, such as paper from a file folder.
  - With each model, you need to plan on where to put the tabs. Each tab should run along the entire edge.
  - *Folding*. After the net is cut out, folds need to be made along certain edges by placing a ruler along the edge, folding the paper up, and then going over the fold a couple of times with your finger nail.
  - *Gluing*. The last part of the construction is gluing it together. This is a slow process, since after gluing a few tabs, it must be allowed to dry somewhat before gluing more tabs. It is best if the tabs are strategically placed in the net in such a way that the last face that gets glued has no tabs on it This allows the last face to be gently pressed into place onto tabs (with glue on them) that are connected to other faces.

This is the form for the “tilting pyramid”.
Three of these fit inside the cubic box, so you need to make three of them.
It may be best to make each one in a different color.



This is the form for the “normal” pyramid.
You need one of these.