

### I. Duplicating and Subdividing:

The first several problems (from Lessons in Mathematics and Art, Lesson 4) don't use any ideas more sophisticated than the geometry we've used in class to develop the perspective techniques we have so far: parallel lines, similar triangles, diagonals bisect each other, etc. However, they are not merely replicating or adapting what we've already done – for these problems, *you* develop *new* techniques. Brainstorm not only with friends in the class but also with people outside of class - all sorts of people can get caught up in these questions! Allow yourself enough time to really think about them over several days, and **enjoy them!**

Print out several copies of the section of roadside fence.

1. Treating the given solid outline as one section of fence, draw a copy that is a duplicate of the original –with the top of its *nearest* fencepost occurring at the point  $P$ . (In other words, there should be a space between the two sections of fence).

Explain (mathematically) why this technique works.

**Note:** It is just a coincidence that  $P$  is close to where a diagonal through the midpoint of the side hits;  $P$  could be *anywhere* along the top rail. The point is that sometimes we want to draw an exact copy of a rectangle some arbitrary distance from the original.

2. Draw a duplicate of the section of fence (in the same plane as the original), this time with the top of its *far* fencepost at the point  $P$ .

Explain (mathematically) why this technique works.

**Note:** Again, there is nothing special about where  $P$  is, it could be anywhere on the extension of the top fence rail. Your new rectangle may or may not overlap with the original section of fence. Being able to draw two overlapping identical rectangles in perspective comes in handy when drawing such things as a partially open sliding glass door or window, for instance.

3. Draw 2 vertical fenceposts to divide the fence into 3 equal sections. (This may seem easy at first, but 3 equal sections is much different from 2, 4, 8, 16 etc.)

Explain (mathematically) why this technique works.

**II. Anamorphic Art:**

Print out copies of the drawing you'd like to convert to anamorphic art (a primitive flower) and of the grid you're going to draw it on.

4. Find where you should place your eye so that the perspective grid the flower sits on looks like a square grid. (If you orient the paper so that the actual parallel lines are horizontal, then you will use a horizon line to do this; if you orient it so that the actual parallel lines are vertical, you will use a "verizon" line.)
5. First, orient the straight-on grid oriented and the perspective grid the same way: both are 18 x 24 grids; have the 18 square-long rows either both be horizontal or both be vertical. Note where the tracing of the flower crosses the grid, and mark the corresponding points on the rectangular grid. Connect your points appropriately to obtain an anamorphic drawing of the flower.

**CONCEPTS TO TAKE INTO ACCOUNT:**

- i. Points on the two grids where the lines of the grid intersect correspond exactly, so places where the flower crosses such an intersection point are the most reliable transfer points.
- ii. Proportion is preserved on the lines that are still parallel on the perspective grid. For instance, halfway along such a side of a square on the perspective grid corresponds to halfway along the corresponding side of the corresponding square on the straight-on grid. Thus places where the drawing crosses one of these still-parallel lines are fairly reliable transfer points.
- iii. Proportion is *not* preserved on the lines that are *not* parallel on the perspective grid. Halfway back along a square on the perspective grid corresponds to less than halfway along on the straight-on grid. Places where the drawing crosses one of *these* lines are not reliable transfer points and should be avoided if possible.

If you want to color your completed anamorphic art, please do!

6. Roughly where should the viewer place their eye (to the left, right, top, or bottom of your drawing?), and at what angle should they look at this picture, so that it looks the same as if you are looking straight at the drawing of the flower I provided?