

Rapid Visualization

Great visual thinkers throughout history have kept records of their ideas in one form or another. (Leonardo da Vinci's sketchbooks are world famous.) Idea logs are an integral part of visual thinking and problem solving processes. Therefore, it's important for designers to develop their own style of keeping an idea log and to sense how useful idea logs can be.

An idea log is a place to do and store graphic ideation—both exploratory and developmental. It is not graphic communication to others. As Bob McKim has written, “In an idea log, you are trying to develop an idea that is worth communicating.”¹

There are many reasons why designers should keep an idea log. One is to record your ideas so you won't forget them. And paradoxically, to record your ideas so you can forget them—and go on to even better ideas. Idea logs help you clear your mind of old ideas so there is “space” for new ones. We call this *purg-ing* ideas. They also help to define and clarify vague ideas floating around in your head, because “one good idea leads to another.” Idea logs provide space to treat your ideas like they are valuable and important, which they are, and to record your thought process for future reference. They can also be important for legal reasons, especially patent protection.

Like other creative techniques, the guiding principles for idea logs are to be fluent and flexible, and to gleefully suspend judgment. In this case, this means never erase. Some other helpful suggestions include:

- Choose a log which is appropriate for the project you are working on. Hopefully this will be in a form which allow you to carry it with you.

- Orient the pages so that you can turn through them and easily see the flow of thinking. Just how to do this in a designerly way is not at all obvious, since practically every means of keeping a notebook is flawed. Spiral sketchbooks have good paper, but are ugly and don't allow adding or rearranging pages. Nor do handsome bound books which have the additional problem of breaking when clippings and extra material are added to them. Three ring binders overcome some of these problems, but don't protect their contents well. They tend to become ratty almost instantly. Worse from my standpoint, they are awkward to handle. Given these trade-offs, I suggest designers seriously consider the use of binding machines.

- Be visual all the time, and be verbal when labeling because explanations help clarify ideas.

Charles Darwin once said “In order to be a good observer one must be an active theorizer.”² Drawing may be one of the best techniques for learning to make hypotheses, because it requires making guesses in an iterative fashion. But in most engineering education, the vehicle for teaching such drawing are courses that emphasize graphics as a communication skill rather than as an aid to thinking.

Drawing is both a perceptual and a motor skill. The way to learn it is do it, and the more you draw the better you get. There are many different kinds of drawings useful for the design process: thumbnail sketches, design drawings, orthographic projections, sections, presentation renderings, etc. To be an effective visual thinker, rapid visualization—fast, freehand perspective—is an indispensable tool.

My first rules for drawing are as follows: no pencils (use black pens), no “chicken scratching” (short, scratchy, uncommitted strokes with no purpose), and use three line weights (layout with light lines, outline with heavy line, detail with a medium line).

My feeling about design is, the more you draw the more ideas you get—so why stop? There are, of course, many reasons. You may get tired or have some other functional reasons. Perhaps the deadline has arrived. Or perhaps you've designed the ultimate product (unlikely).

A great place to start is with simple, geometric objects. I ask my students to start by drawing a pocket knife, or a stapler, and use line weights to create distance. If feasible, I suggest drawing things life size.

I have a few main critiques of most people's tendencies with perspective drawing. The first is that there is no need to use a straightedge. Rulers are training wheels, but control comes with speed. You can't ride a bicycle slow.

References

1. Robert McKim, *Experiences in Visual Thinking*, 1980
2. William J.J. Gordon, *Synectics*, 1971

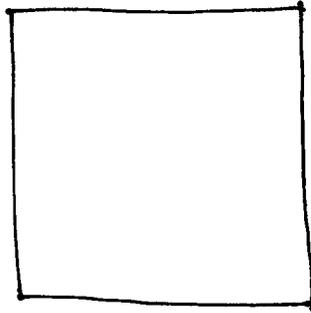
Rolf A. **Faste Foundation** for Design Creativity

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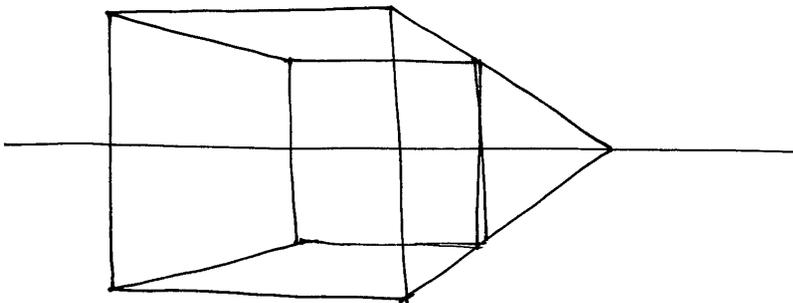
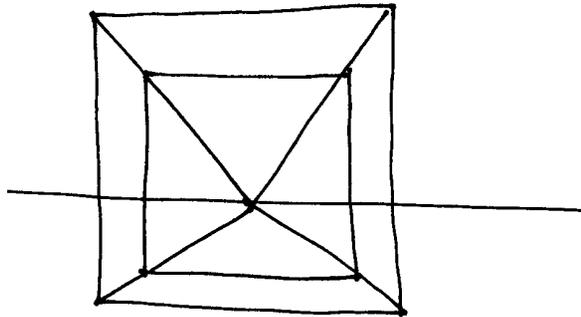
One Point Perspective

Most anything that can be designed benefits from the ability to draw cubes, so let's begin by drawing some cubes in perspective.

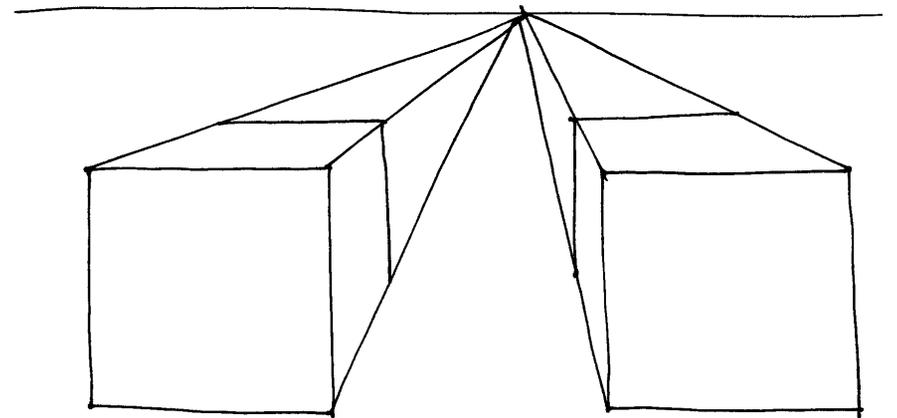
1.
In one point perspective, the "front" face of a cube is always a square. All of your vertical and horizontal lines will remain parallel to the edges of the square.



2.
To complete your cube, add a horizon line and a vanishing point. All of the lines indicating depth in your drawing will converge to this point.



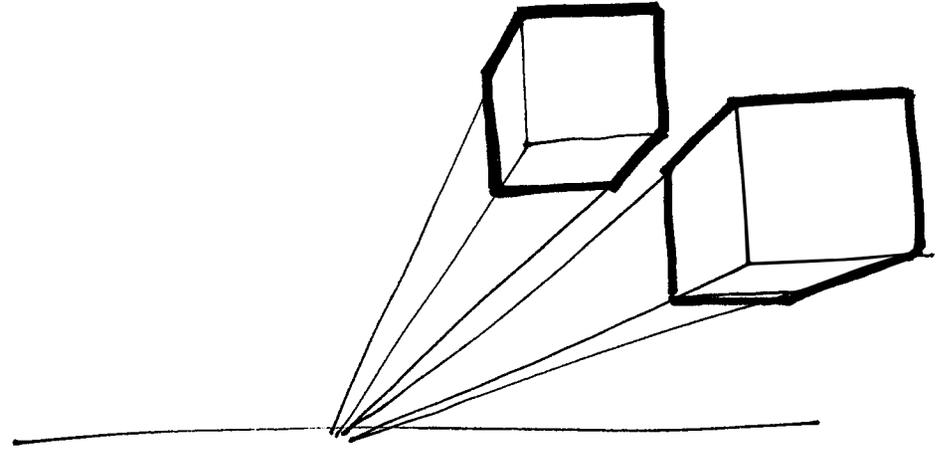
3.
Now draw numerous cubes converging to the vanishing point. Experiment with cubes off to either side, both above and below the horizon, and closer and farther away from the viewer.



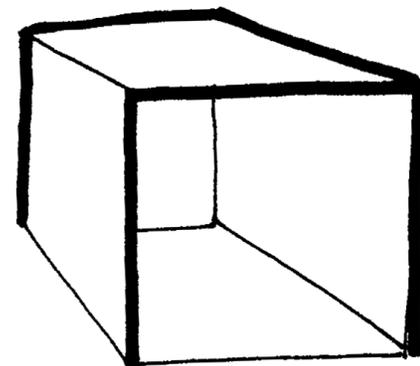
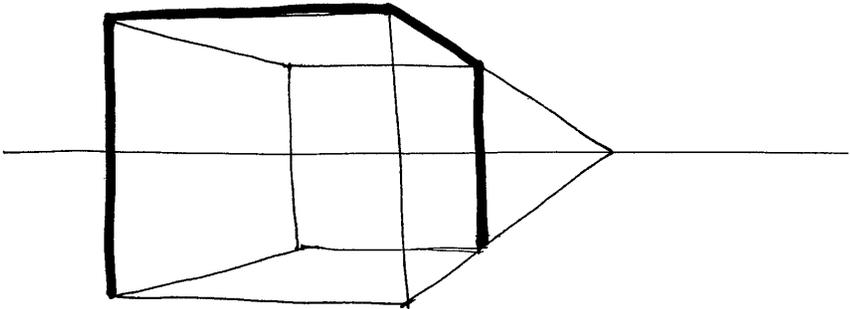
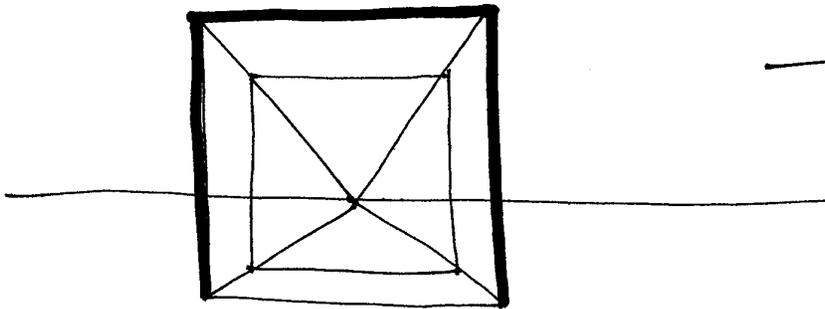
Tiger Lines

A simple powerful tool is to shade with thicker line contours, in particular the lines that separate the edge of an object from the open space behind it. These contours are known as “tiger lines.” Tiger lines emphasize the way our eyes naturally perceive the edges of objects with trepidation—behind each tiger line a saber-toothed tiger might be hiding!

In the drawings below, notice that the thicker lines are on the top and sides of each cube, but not where the cube meets the ground.



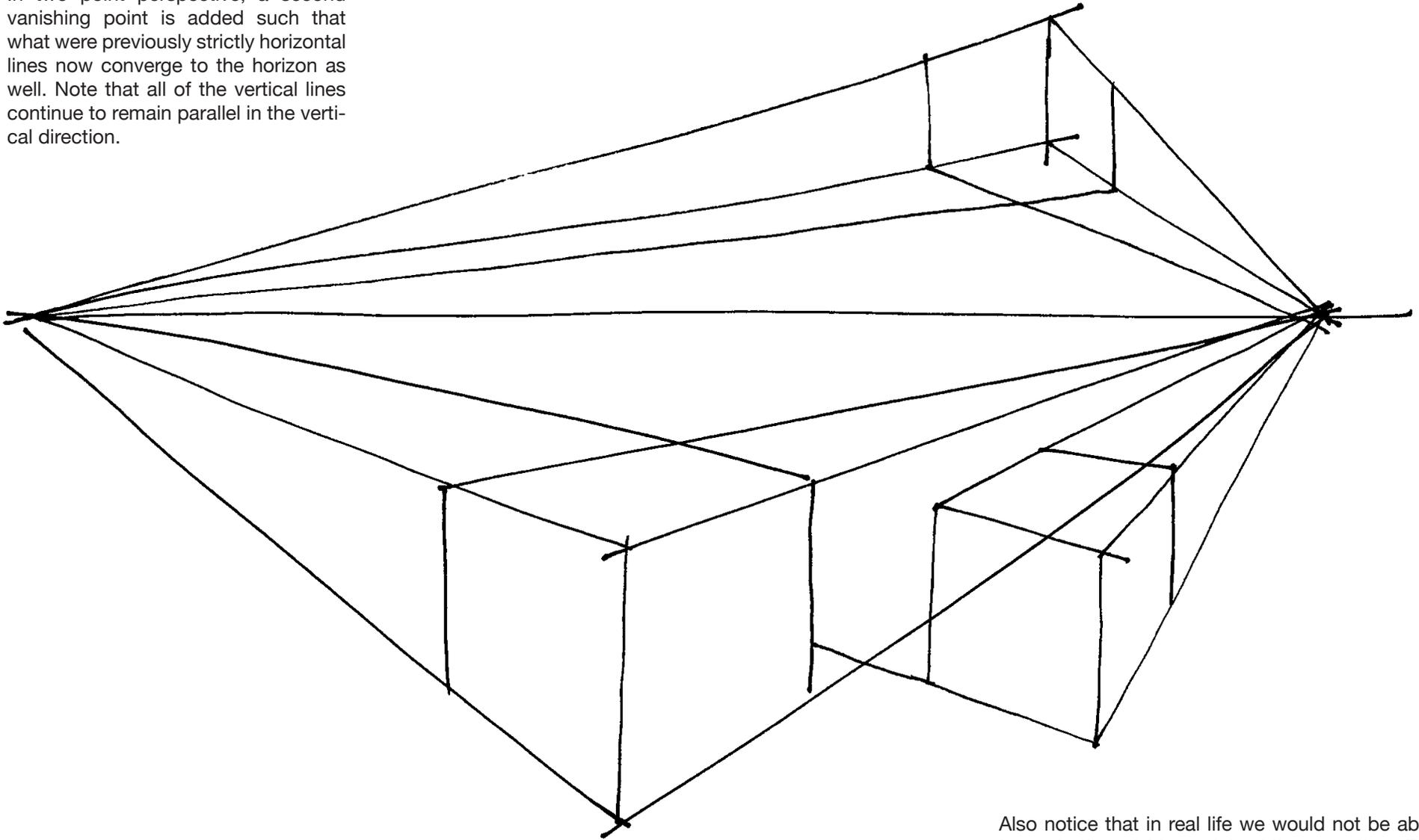
Note that floating cubes may have tiger lines all around them...



...and “open face” cubes may have tiger lines emphasizing their interior.

Two Point Perspective

In two point perspective, a second vanishing point is added such that what were previously strictly horizontal lines now converge to the horizon as well. Note that all of the vertical lines continue to remain parallel in the vertical direction.

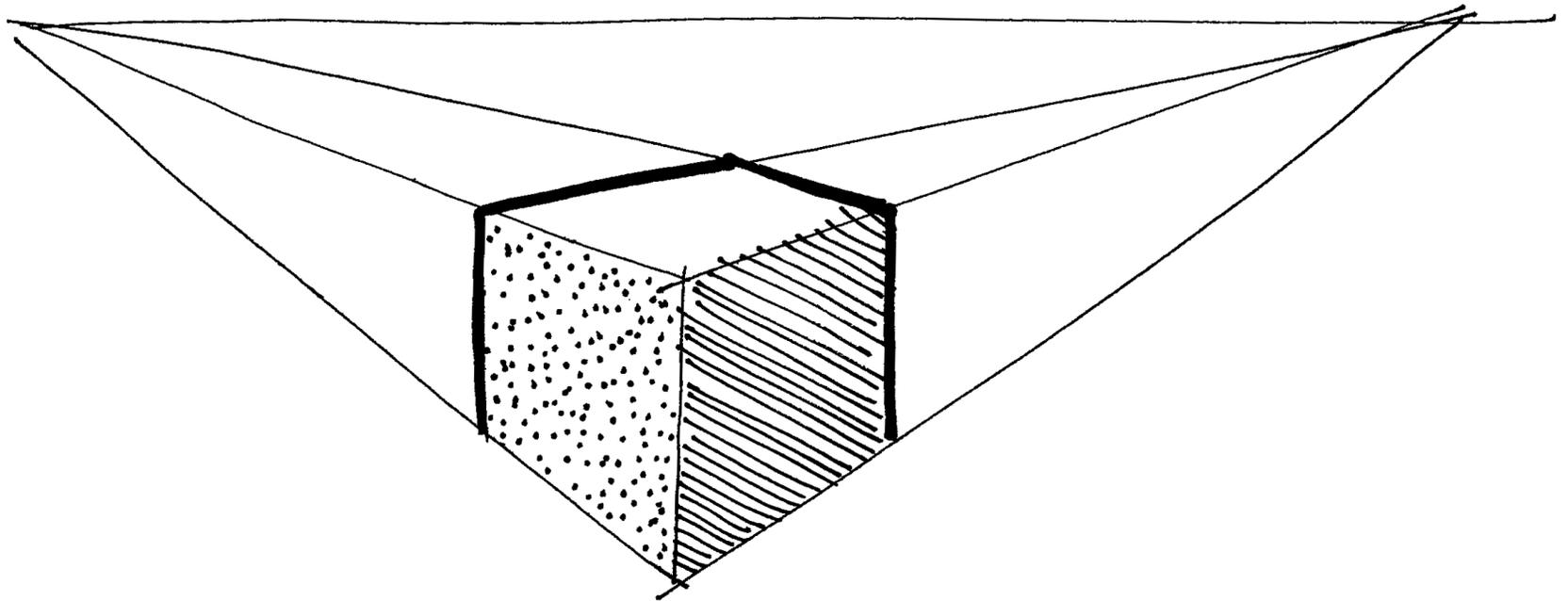
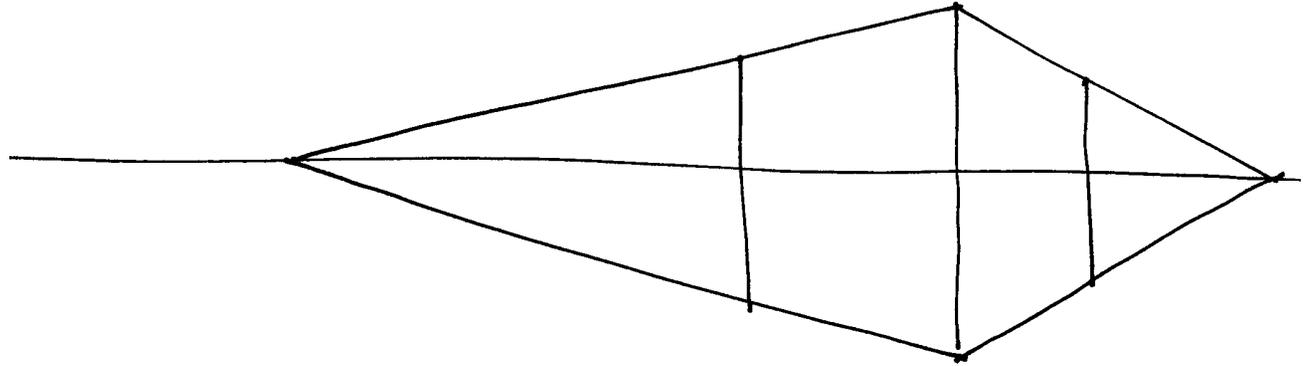


Also notice that in real life we would not be able to see both vanishing points at the same time. For this reason, a control circle is often drawn spanning about a third of the distance between the vanishing points. Objects in this circle will not appear warped. Thus in practical terms it is not unusual for your vanishing points to lie off of the page.

Two Point Perspective, Continued

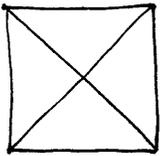
Here is a quick quiz to help you practice everything we've covered so far:

Construct a nice cube resting on the ground. When you are done with your construction, shade your drawing (with lines and/or speckling, as shown below) and emphasize tiger lines. There are some good questions to ask yourself: Are parallel lines on the cube converging on the same vanishing points? Are the vanishing points located on a horizontal line? (On or off the page is OK). Does the cube look like a cube, with each surface looking like a square? Are the tiger lines drawn in the right places, separating object from "space"?



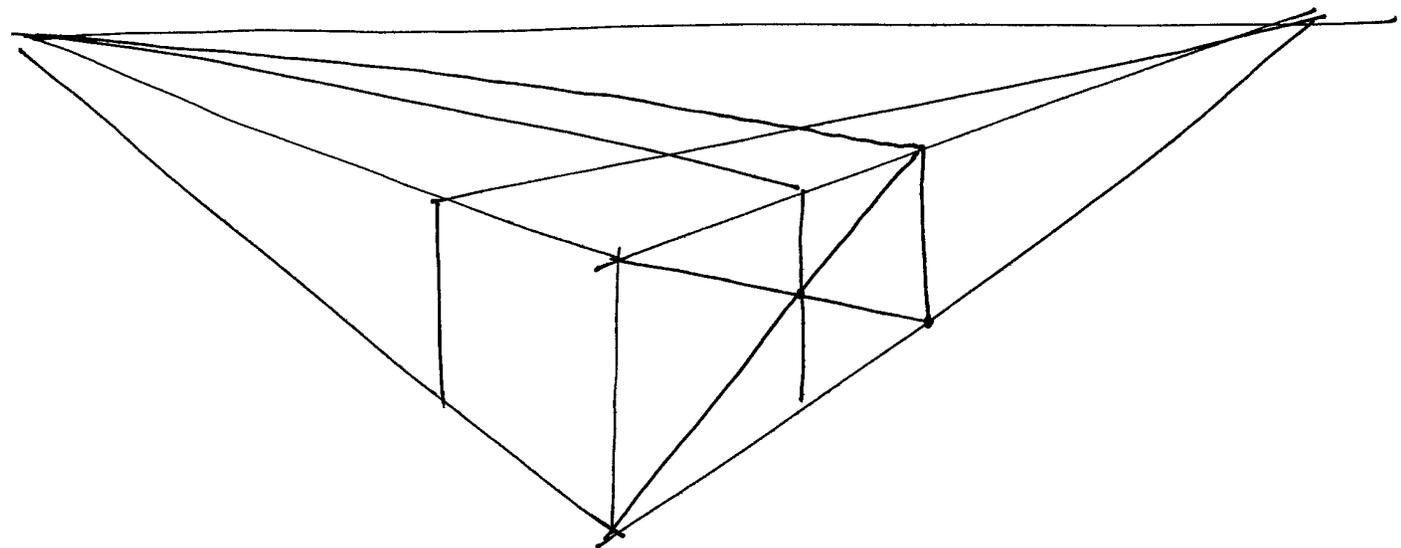
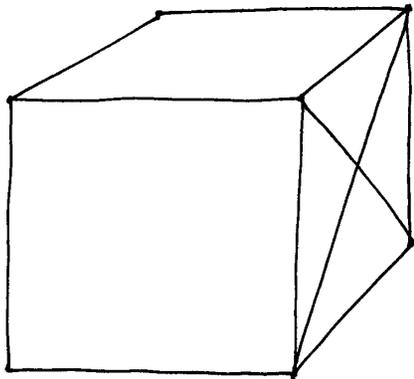
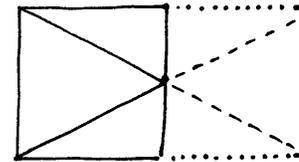
Locating the Center of a Square

When drawing in perspective, being able to locate the center of a square is a useful trick. The simple rule for determining the center of a square is the same as it is in two dimensions: the center of a square is where its diagonals intersect.



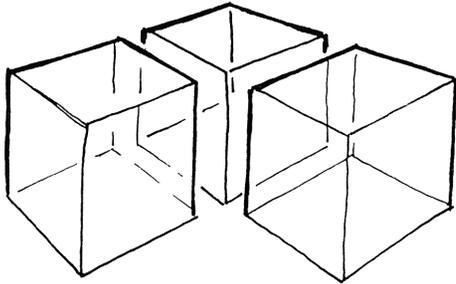
This is particularly useful for constructing complex shapes, such as stacks of boxes that are all aligned with each other through a central axis.

Furthermore, it should be noted that the same rule is true for any rectangle, whether or not it is perfectly square. Imagine that we have one square and we would like to make a second square of exactly the same size sitting next to it. When the edge of the first square is envisioned as the “center” of a rectangle two squares wide, as shown to the right, this property can be used to “project” a second square of equal dimension into the perspective space. This allows us to build up objects constructed out of numerous similar units.

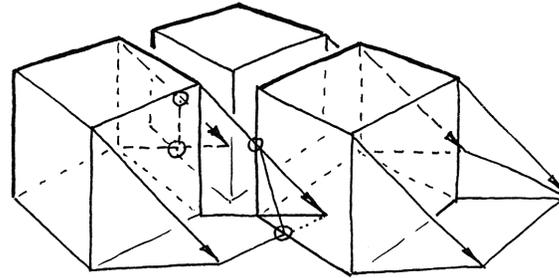


Casting Shadows

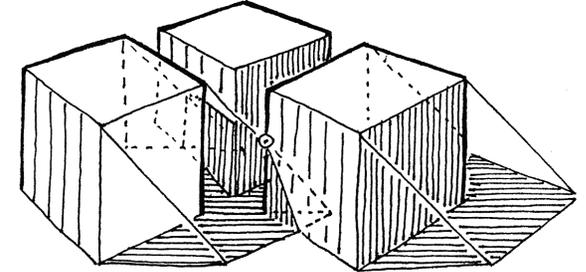
Next let's have a quick look at casting shadows. The easiest way to start with shadows is to imagine the light coming down on your object, from the side, at exactly 45 degrees.



1. Let's start by constructing three cubes on an L shaped "footprint" that will cast shadows on the ground.

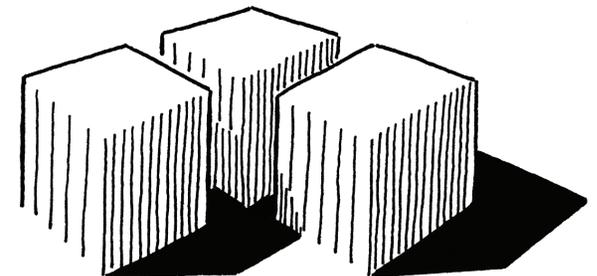


2. Next, let's construct the shadows cast by the cubes. How do we do this? Well, we know that shadows are defined by rays of light, and can construct lines coming down at 45° from the top of each cube. Eventually these rays must hit the ground. To keep things easy, exactly where on the ground is simply a horizontal line from the base of each cube. That's it! Note how the shadow from the left-most cube is constructed as it hits the cube on the right.



3. Now add shadows and shading, still showing the construction lines.

4. There are many ways to finish a drawing like this. For example, you can do an overlay of the three cubes onto a new sheet of paper. A light-table is a useful tool. If necessary you can use a pencil to do a first cut, ink your drawing, and then erase—but if you do, I recommend still lightly inking your construction lines so that you can see the thinking that went into your forms. In this example, note the indication of edges exclusively by shading and line-weight to make a strong image:



Casting Shadows, Continued

Here is another example of casting shadows parallel to the picture plane:

