

How to picture what you really see

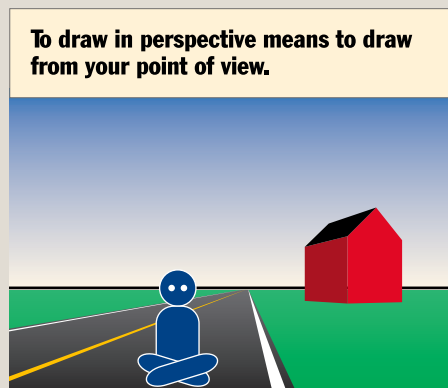
How to draw in perspective

By Andy Markley and staff

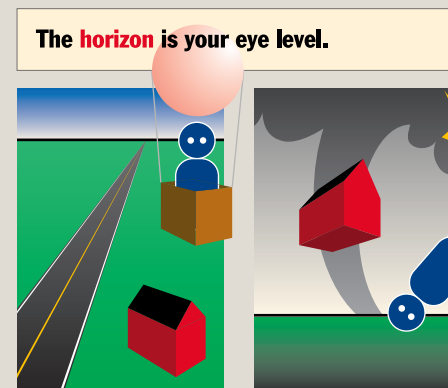
What quality is it that makes an illustrated object look real—that gives it form and mass and sets it in space? It's that the object has been drawn in *perspective*. Perspective is a law of nature—it is how we see. It governs our perception so uniformly that even the most unobservant viewer can detect its absence. Here's how to draw on flat paper the 3-D world you live in:



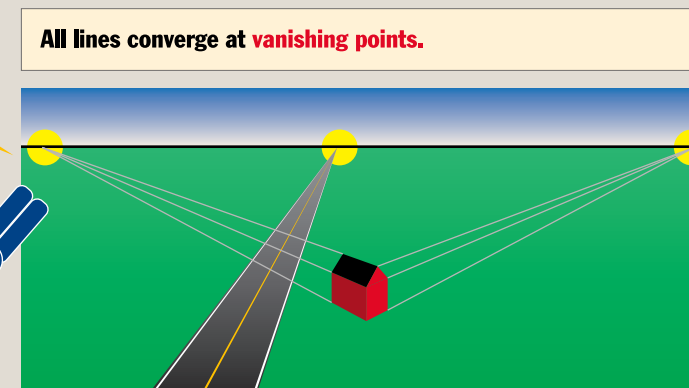
You can see that the front of the house is equally high on both ends . . . and that the side of the house is a square . . . and that from an angle, two sides of the house can be seen at once. But in real life, actual dimensions are not what you see. You see a . . . third dimension: depth. Depth makes distant things appear smaller, with funny angles.



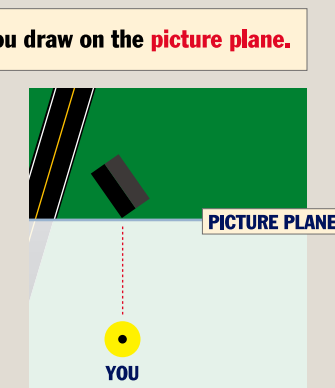
To our eyes, we are literally at the center of the universe. As we move, the size, shape and location of everything we see shift relative to us. *The one constant is the horizon.*



The horizon is the perceived boundary between earth and sky. **The horizon is your eye level.** It moves up and down as you move up and down. Objects appear on, below or above the horizon.



As objects recede from you, they appear to grow small, smaller, smallest until eventually they meet the horizon and vanish. **Vanishing points are on the horizon.** This is as far as you can see; when you say "over the horizon," you're talking about beyond your view.



The picture plane is your drawing surface. Everything behind it is in the picture; everything in front of it is not.

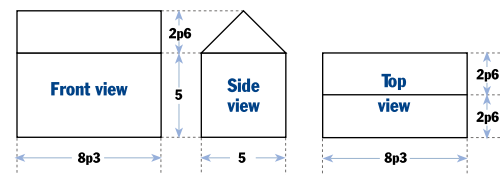


How to draw the house

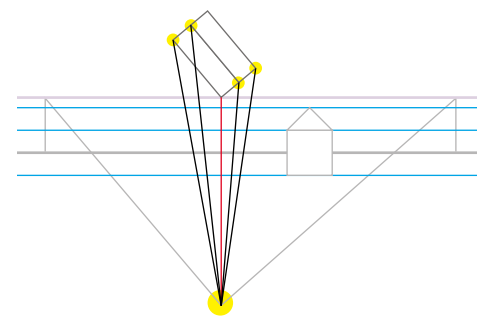
The correct way to draw in perspective is from a scale plan, which is a flat view of the front, side and top of the object. From a scale plan you can determine the exact size, location and elevation of any object, as well as your distance from it. An accurate scale plan ensures an accurate perspective view, which is important if your picture is to appear solid and real.

Using FreeHand? In the following steps, you'll be making lots of diagonal lines. It's fastest and most accurate to rule just one, clone it, then drag the new end point where you want it.

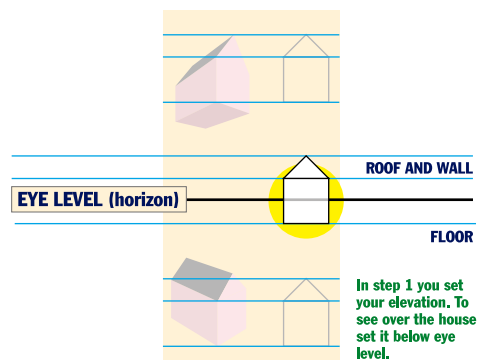
Set up a wide page, then begin by drawing this scale plan of the house:



(Perspective drawing takes a lot of elbow room; the measurements above are about the biggest you can use and still see everything at once in actual size on a 13-inch monitor.) **Before continuing, turn on Snap to point and Snap to guides.**

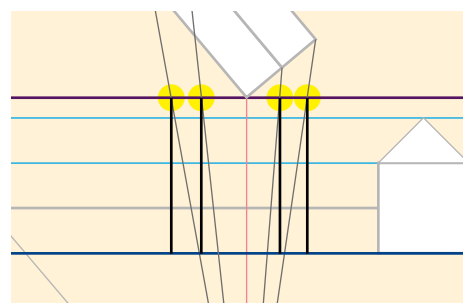


5. MARK YOUR LINES OF SIGHT From your vantage point you can see only some of the house at once. Rule sight lines from you directly to the outermost points you'd see—in this case the corners of the house and the peak of the roof.

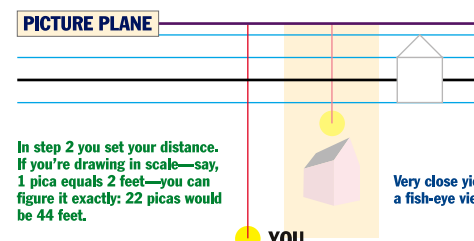


1. SET YOUR ELEVATION One-third down the page, rule a long horizon line* and set the side wall of the house midway through it. Drag horizontal ruler guides to mark the roof, wall height and floor.

*You'll be ruling lines mainly for clarity. It'll ease your work later if you also drag a ruler guide underneath each one. Click off Preview first.

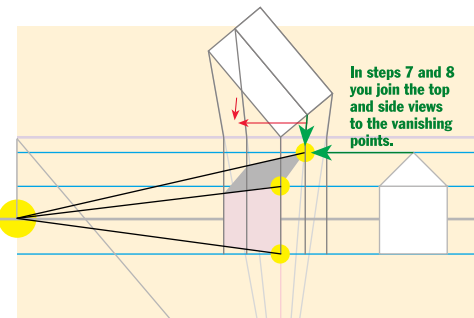


6. MARK THE VERTICALS Starting at the point each sight line crosses the picture plane, rule a vertical line to the floor of the house. Accuracy here is very important; turn off Preview and zoom way in. Our fat lines are for clarity. Hairlines work best.

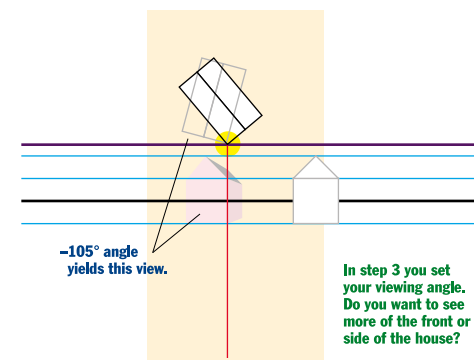


In step 2 you set your distance. If you're drawing in scale—say, 1 pica equals 2 feet—you can figure it exactly: 22 picas would be 44 feet.

2. SET YOUR DISTANCE Rule a long picture plane anywhere above both horizon and side view. From the picture plane, rule a vertical line straight down to you, 22 picas in this case. The distance matters; the longer the line, the farther away you are.

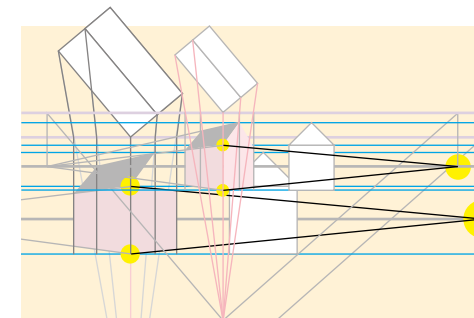


7. VANISH LEFT Rule lines from the left vanishing point to the frontmost corners and roof peak as shown. These lines reveal the correct height and angles of the left wall and roof peak.

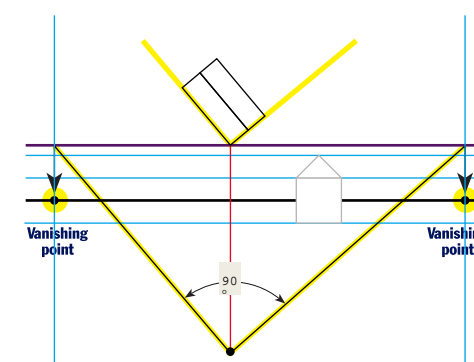


-105° angle yields this view.

3. SET YOUR VIEWING ANGLE Rotate the top view into position where the vertical line touches the picture plane, at any angle (here it's -50°). To draw accurately, at least one point of any picture must touch the picture plane at this spot.

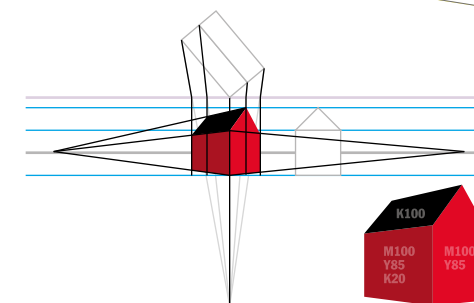


8. VANISH RIGHT In the same way, rule lines from the right vanishing point to the frontmost corners as shown to find the correct height and angles for the right wall. You now have all the reference lines you need to draw the house.



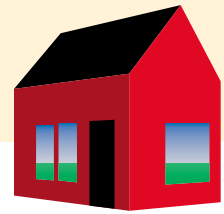
4. FIND THE VANISHING POINTS Vanishing points parallel the sides of the house. Rule each parallel line from you to the picture plane, then straight down to the horizon.

Steps 2 and 4 are why you need room. Our drawing fits on the paper, but a long viewing distance or a faint angle will extend vanishing points to the pasteboard.



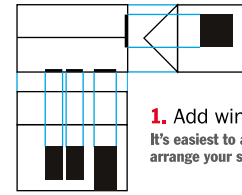
9. DRAW THE HOUSE Using the lines as guides, with the Pen tool click three closed paths—one for the roof and one for each wall. Fill, adding more black to one side for a shadow. Hide all reference lines. Perfect 3-D, in scale!

How to draw windows and a door

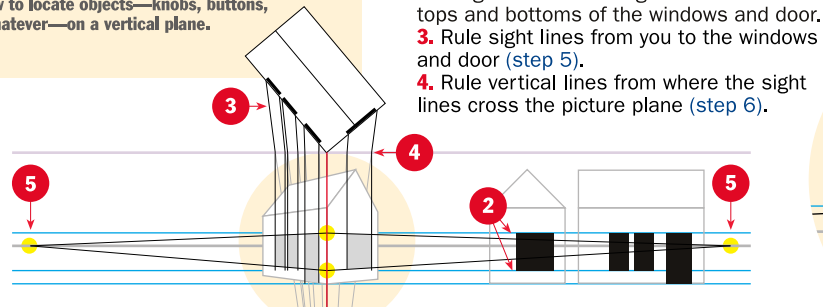


This time, instead of measuring the house, just measure the windows.

This is how to locate objects—knobs, buttons, bumps, whatever—on a vertical plane.

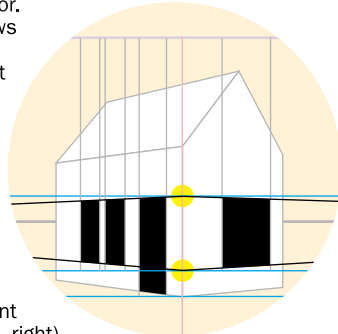


1. Add windows and a door to your scale plan
It's easiest to align windows and door in all three views if you first arrange your scale plan as shown. Ruler guides help.



In case you forgot how already, the reminders in blue refer to steps on the previous page.

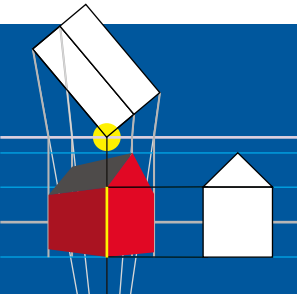
2. Drag horizontal ruler guides to mark the tops and bottoms of the windows and door.
3. Rule sight lines from you to the windows and door (step 5).
4. Rule vertical lines from where the sight lines cross the picture plane (step 6).



5. Rule two lines from each vanishing point to the frontmost corner as shown* (inset, right) (steps 7 and 8). These lines reveal the correct heights and angles of the windows and door. Use the pen tool to draw them in. Fill.

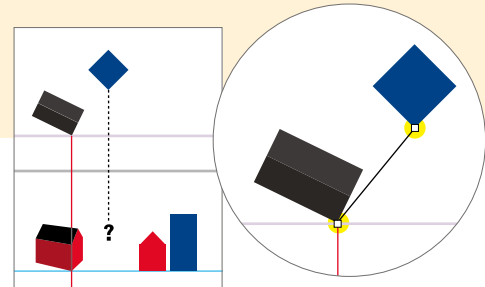
*Perspective's measuring stick

If you imagine the drawing surface—the picture plane—as a window through which you view the scene, only stuff that touches the window—in this case the edge of the house—appears actual size; everything else will be smaller. This point, or edge, is our measuring stick; from it we can measure the size—and pinpoint the location—of any object in the scene.



How to draw another object

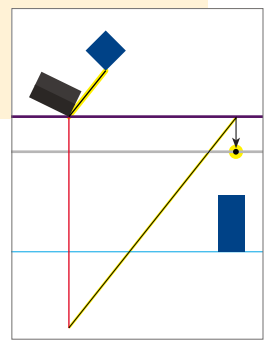
It's easy once you find where to put it.



We want the silo* behind and to the right of the house. We know where the edge of the house lands—it touches the picture plane and thus the ground line—but where does the silo go?

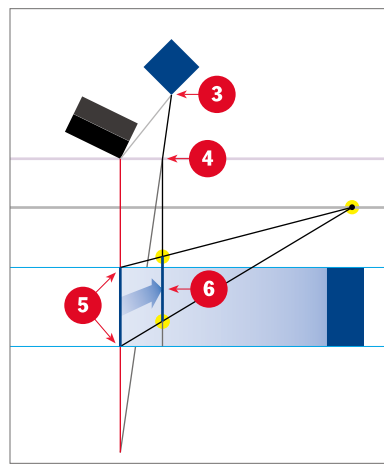
1. DRAW A BEELINE

In the top view, rule a beeline from the master point to the frontmost point on the silo. This connects the silo to our "measuring stick."



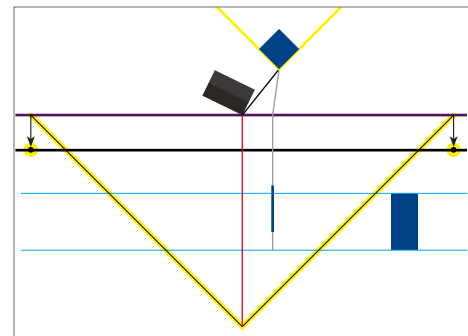
2. FIND ITS VANISHING POINT

Rule a line parallel to the beeline from you to the picture plane, then straight down to the horizon (step 4).



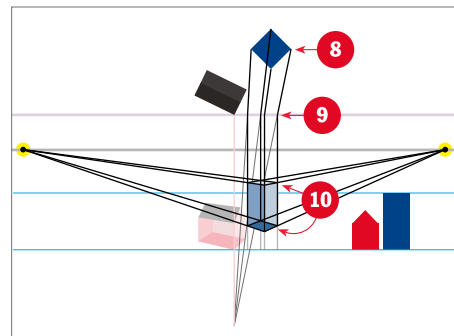
3. Rule a sight line from you directly to the corner of the silo (step 5). **4.** From the point it crosses the picture plane, rule a vertical line to the floor of the silo (step 6). Now the side view becomes important: **5.** Rule lines from the vanishing point to the top and bottom of the silo at the vertical sight line (our "measuring stick."). These lines reveal the exact height of the silo all the way to the horizon. **6.** At the point where the diagonals cross the vertical silo marker, rule your line.

*We know this isn't really a silo; a real silo is a cylinder, and it has a roof, and it's down by the barn, not up by the house. But silo is a nice, short word for what basically is just a box.

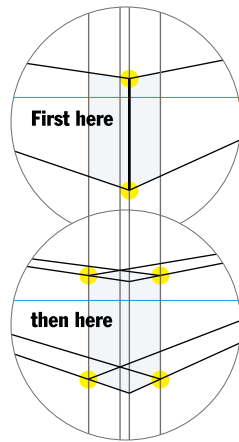


7. FIND THE VANISHING POINTS OF THE SILO

Rule lines that parallel the sides of the silo from you to the picture plane, then straight down to the horizon (step 4).

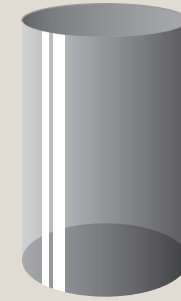


8. Rule sight lines from you directly to the remaining corners of the silo (step 5). **9.** From the point each sight line crosses the picture plane, rule a vertical line to the floor of the silo (step 6). **10.** Rule lines from the left and right vanishing points to the corners of the silo in the picture (insets, right). Where these lines intersect, draw the silo. Whew!



How to draw circles and unusual shapes

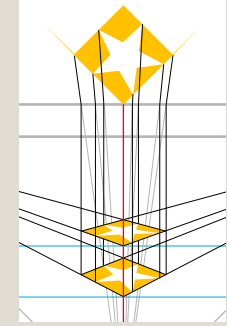
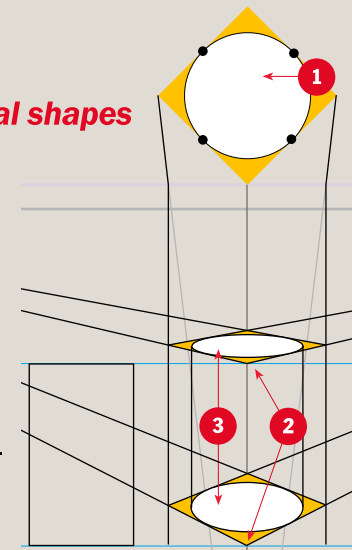
A circle has no apparent vanishing points; an odd shape has too many. To draw them easily, put them in rectangles:



TO DRAW A CYLINDER:

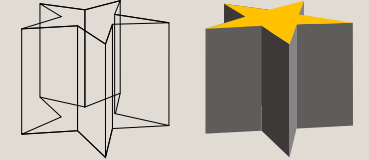
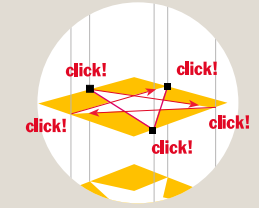
1. Draw a circle in a square of exactly the same size. Rotate both into position above the picture plane.
2. Draw two squares in perspective—one at the height guide, one at the base guide.
3. Draw ellipses inside both squares that just touch the edges. Add vertical lines for the sides.

Strictly speaking, an ellipse is not the same as a circle in true perspective. You can rotate, skew or otherwise jimmy it (which often works), but this is as close as you'll get without 3-D software.



TO DRAW A STAR:

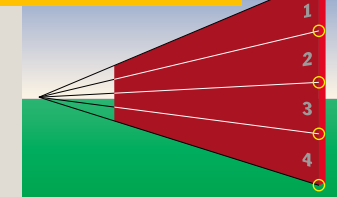
1. Draw a star in a square that touches all its points. Rotate both into position above the picture plane.
2. Draw two squares in perspective—one at the height guide, one at the base guide.
3. Rule sight lines from you to the star points and mark the verticals as before. These verticals will locate the star points on the rectangles. With the Pen tool, click-click-click two stars, then join them with vertical lines.



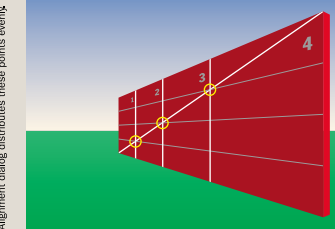
Quick tips on spacing and height

Not every drawing must be to scale. Here's how to calculate simple views quickly:

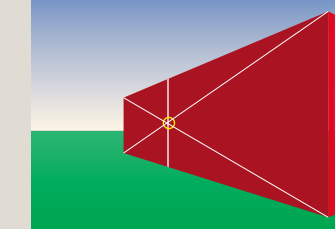
How to divide a wall . . .



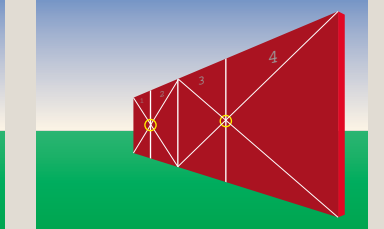
There are two ways: Set a vanishing point, then rule one horizontal line for each segment you'll want.



Rule a diagonal corner to corner. Subdivide at intersections. Works for sidewalk cracks, pillars, etc.

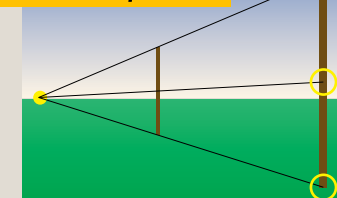


How to find the center of a plane: Crisscross lines corner to corner; the center is at the intersection.

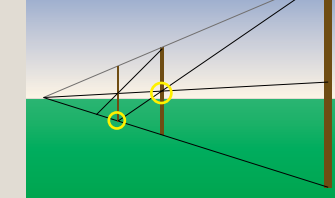


Divide space into quarters, eighths and so forth the same way. This method needs no vanishing points.

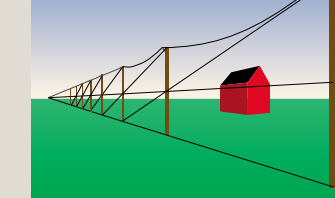
find a row of poles . . .



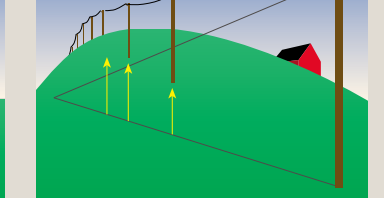
Rule lines from the vanishing point to the top, middle and base of a foreground pole. Draw a second pole any distance away, as shown.



Where's the third pole go? Rule a line from the top of the first through the center of the second, to the ground. Plant the pole there, . . .

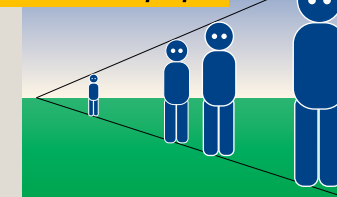


then continue down the line. This technique finds both height and location of evenly spaced objects: street lamps, railroad ties.

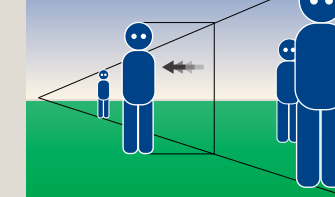


To cross a hill or valley, just push the poles straight up or down; the spacing—and perspective—will remain correct.

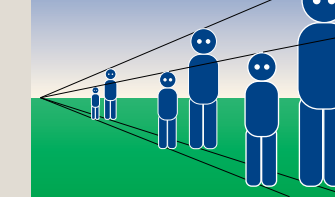
fill a field with people



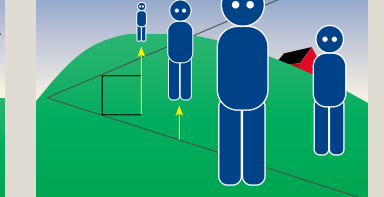
How tall are people in the field? First draw them in perspective . . .



then slide them straight left or right; they'll retain their correct height.



Shorter (or taller) objects get their own vanishing lines.



As with the poles, they'll be correct whether up, down or sideways.