artist daily
presents

UNDERSTANDING LINEAR PERSPECTIVE DRAWING

Atmospheric Perspective, One-Point Perspective, Two-Point Perspective...

PLUS: What IS a Vanishing Point?

ATMOSPHERIC PERSPECTIVE

If you've ever taken a summer drive through hilly country you've probably noticed that those green distant hills look pretty blue. Or if it's fall, a distant hill may appear bluish-purple even though you know darn well it's really yellow, red and brown. What you're seeing is something called atmospheric perspective, or aerial perspective. The layer of air between you and the hill causes a shift in color. The air contains impurities such as smoke particles, water droplets and pollen that prevent some of the light from the hill from reaching your eyes. The impurities act as a filter, letting the cooler, bluish colors through and blocking a lot of the warmer reds and yellows. In addition to blocking some colors, the atmosphere also cuts down the total amount of light that reaches your eye, so the distant hills look paler than they really are.

Photo courtesy of Jeffrey Metzger

Atmospheric Perspective: A Living Example

In this photo of the Chianti region of Italy, the shift from strong, warm colors in the foreground to fainter, cooler colors in the distance is an example of atmospheric perspective.

MAINE
Oil and alkyd on canvas
18" x 24" (45.7cm x 61cm)

DISTANT HILLS

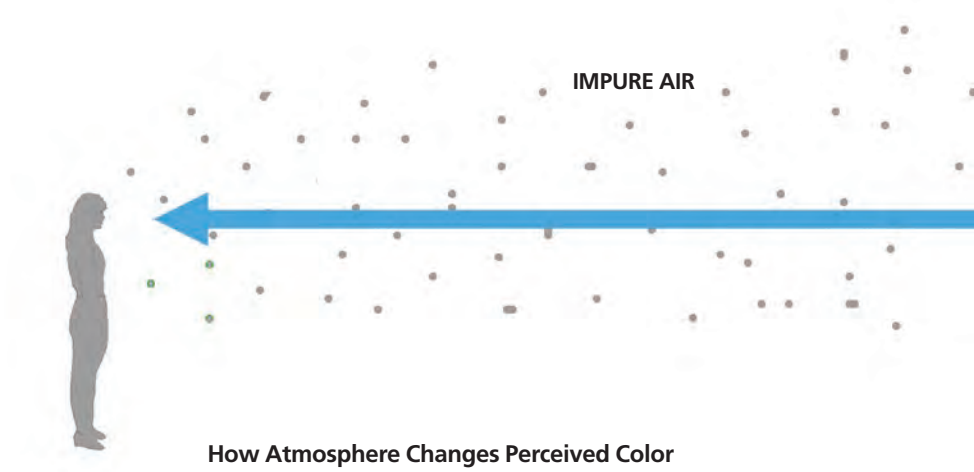
When you look at any distant object—a hill, a city skyline, a barn—it does not look the same as it would up close. The air between you and the object acts like a veil or filter that inhibits the passage of light from the object to your eyes. The dirtier the air, the greater the filtering effect. It happens that shorter light waves (those at the blue end of the spectrum) reach us more easily than longer waves (those at the red end of the spectrum).

TWO KINDS OF CHANGE

Particles in the atmosphere inhibit certain colors of light from passing through, as we've seen; they also reduce the total amount of light that gets through. So in addition to a color shift there is a value shift; that is, distant objects look paler than they really are. To mimic this effect, you should normally paint a distant hill a pale blue rather than a strong, dark blue.

TIP

The golden rule of painting realistically is to trust your eye and paint what you see.



How Atmosphere Changes Perceived Color

The green of the hill is made of a mixture of colors—blue, yellow, red and more. The short blue light waves pass easily through the atmosphere, but other colors get partially blocked and dispersed by the particles in the air.

Distant Hills Usually Look Pale and Bluish

These mountains provide a textbook example of atmospheric perspective. The farther away each hill is, the bluer and paler it looks. Because the air around these mountains contains significant pollution, there is an abrupt change from the colorful foliage in the foreground to the bluish hills in the distance. The clearer the air, the more gradual the transitions of color and value.

BLUE RIDGE MOUNTAINS
Pastel with watercolor underpainting on Whatman watercolor board
12" × 16" (30.5cm × 40.6cm)

CHOOSING YOUR MEDIUM

Perspective techniques work no matter what medium you use, but sometimes your choice of mediums can simplify life a little. For instance, if you want soft edges you might choose watercolor or pastel rather than acrylic. For the painting on the opposite page, I chose pastel, making it easier to create soft edges and to vary the tones of the distant mountains.

For this painting I used mounted cold-pressed watercolor paper as my support because I like its slightly irregular texture better than the monotonous texture of many standard pastel papers. But the watercolor paper is white, so unless the paper is first coated with color, lots of tiny white specks will show through. To get around that, I first did a rough, broad underpainting in watercolor, as shown here, covering the white of the paper. Knowing I would need lots of small darks in the foreground to give form to the foliage, I underpainted that area with dark watercolor.

Watercolor underpainting for *Blue Ridge Mountains*.

THE EXCEPTIONS

Painting distant objects bluish and pale is a good rule of thumb, but don't be slavish about this. Thank goodness there are always exceptions in nature. Here are some examples.

Autumn Foliage Can Change the Rules

In fall, the hills are covered with reds, yellows and browns. Those colors are so dominant that from a distance the hills that might in another season seem blue now look reddish blue, or purple.

Nature Sometimes Does the Unexpected

One of the distant hills appears darker, not lighter, than the nearer hills. This may occur because a cloud is casting a shadow over that hill. Another reason may be that that particular hill is densely covered with evergreen trees, making it much darker than those covered with deciduous trees, grasses or snow.

DISTANT BUILDINGS

The effect of distance on hills or mountains is hard to miss. Even though they're far away, they're big and they grab our attention. With smaller objects, such as buildings, the effect of distance is not so dramatic, but it's still important. Almost any building will appear slightly dulled in color (grayer) and lighter in value as it recedes. Other qualities change, too, such as the crispness of edges and the amount of visible detail. Sometimes you see colors and values in distant objects that seem not to obey the rules because atmospheric conditions, such as the time of day and the color of the sky, alter what you see.

CITY AIR VS. COUNTRY AIR

Atmospheric perspective in city or village scenes is often more exaggerated than in open country scenes because city air may be much more polluted than country air. Sometimes haze or smog can be so dense that it severely limits how far you can see at all. It may not be much fun to breathe that stuff, but painting it can certainly help create distance and mood.

Typical City Smog

The hills in the distance are hazy and bluish. But even over much shorter distances—from the foreground buildings to the buildings a little farther away—you see a definite increase in haziness and loss of color intensity. Notice that the white towers in the distance are grayed due to the particles in the atmosphere.

The Effect of Atmospheric Perspective on a White Building

At left are some possible effects of atmospheric perspective on three buildings: red, yellow and white. This is a day when the air has its normal content of dust and water droplets; if the air were perfectly clear (a rarity for most of us), the changes in color and value might be barely noticeable.

But the white building isn't behaving! In the distance it appears darker than up close, which seems to go against the rules. However, if you think about it, up close the white is already as bright and vibrant as it can get and it can't get any lighter in the distance. But, like other colors, it can and does get *grayer*.

Dense Fog

Here the air is dense with water droplets (fog), and the atmospheric perspective is pronounced. Nothing is visible in the far distance; the red brick building in the middle distance is deeply shrouded and the white building right behind it is almost lost. Scenes like this give the artist a great opportunity for drama.

WHAT IS VALUE?

Value *is the relative lightness or darkness of a color. Other terms for value are* tone *and* shade. *White is the lightest, or highest, value and black is the darkest, or lowest. In the design of realistic drawings or paintings, skillful use of values is extremely important, not only for suggesting distance and defining form, but for providing visual excitement. For example, placing strong dark blue or red or black next to bright white creates a contrast that demands the viewer's attention. An effective design technique is to draw or paint big areas of a picture in middle values, reserving strong value contrasts—sparks—for parts of the picture where you want to grab the viewer's interest. When planning a composition, consider employing just a few values—often three are enough—to nail down the key areas of the design. Then, as you paint, you can introduce as many in-between values as you need.*

Three simple scales of values from 1 (black or darkest) to 5 (white or brightest).

DEMONSTRATION

STAGING: RECEDING WOODS

To get atmospheric effects, I often begin a painting with a pale, fuzzy lay-in followed by a series of increasingly stronger, more distinct layers. Building a picture in this way, in stages, allows you to feel your way forward. You can use this approach in any medium, but it's particularly useful in transparent watercolor, as shown in this demonstration.

MATERIALS

WATERCOLORS

Alizarin Crimson, Burnt Sienna, Cadmium Yellow Light, Cobalt Blue

PAPER

140-lb. (300gsm) cold-pressed paper, 11" × 15" (27.9cm × 38.1cm)

BRUSHES

All synthetic: 2-inch (51mm) flat, 1-inch (25mm) flat, no. 12 round, no. 6 rigger

OTHER

Soft pencil

1 Draw the Major Shapes, Then Paint the First Washes

Using a soft pencil, draw faint outlines of major shapes on your watercolor paper, such as the foreground tree and stream, and indicate the edge of the background woods. The less you draw at this stage, the freer you'll be to "draw" with your brush later on. Thoroughly soak the paper and pour off excess water. With a large brush, paint big splotches of very pale yellow, red and blue all over the paper. While the paper is still wet, paint pale blue trees in the background woods area. Now allow the surface of the paper to dry thoroughly.

2 ***Paint the Next Stage of Trees***

Paint the next stage of woods right over the soft background, using stronger, warmer blues than before. The trees you paint at this stage are closer to the viewer, so they should be darker and hard-edged, not quite so cool in color, but still with very little detail. Now you have two stages of woods: fuzzy, distant trees and slightly sharper, closer ones.

3 ***Continue Painting Toward the Foreground***

Now paint the trees in the middle-ground, and finally, those in the foreground. You can move back and forth from middle trees to foreground trees, and even go back into the distant ones until you feel you have a good progression from fuzzy distant woods to the stronger foreground. As you paint the nearby trees, make them warmer in color and more detailed.

4 ***Finish***

Paint the stream, the sloping banks, the cast shadows and the tree details. Let the stream fade at the bottom of the picture or, if you wish, continue the stream all the way into the foreground. Inspect your work by looking at it in a mirror; seeing it reversed makes it easier to spot odd shapes, poor values and other weaknesses.

WOODS STREAM
Watercolor on Arches 140-lb. (300gsm) cold-pressed paper
11" × 15" (27.9cm × 38.1cm)

USING COMPLEMENTARY COLORS

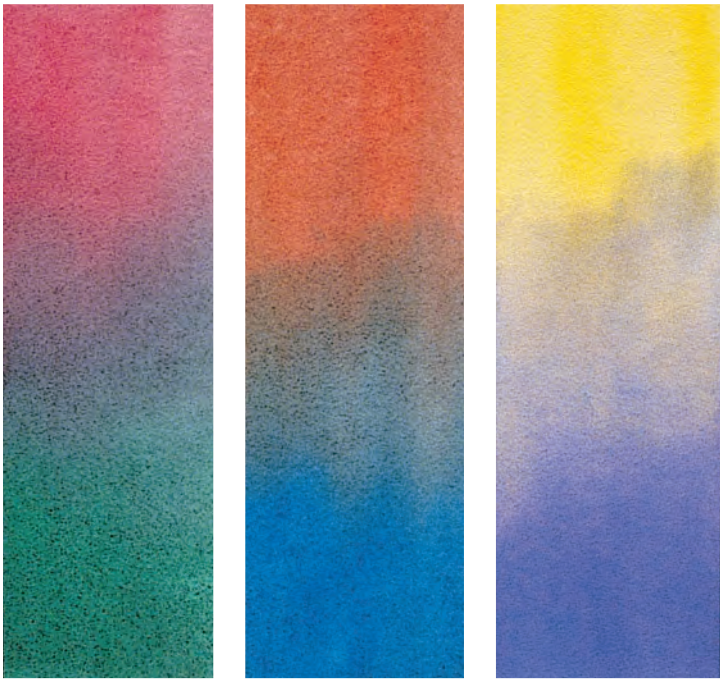
An important technique for creating atmospheric perspective in a painting is graying, or muting, colors in the distance. You can do this by painting a distant object its *local color* and then glazing over the local color with diluted black or gray. Or you can mix black, white or gray with the local color before applying it. But those methods usually won't give you the most pleasing results; such color mixes can be dull and uninteresting. It's usually more effective to tone down (gray) a color by mixing it with some of its complement.

To understand complements, let's briefly revisit an old standby, the color wheel. In its simplest form, the color wheel arranges the three primary pigment colors—red, yellow and blue—equally distant around a circle. Those three colors are called primaries because, theoretically, you can use them to mix any other color except white. Between pairs of primaries are the *secondary* colors: orange, green and purple. Colors directly opposite one another on the wheel are called *complements*. Green is the complement of red, red is the complement of green, purple is the complement of yellow, yellow is the complement of purple, and so on.

THE COLOR WHEEL
1. Primary (Red) 2. Primary (Yellow) 3. Primary (Blue) 4. Secondary (Green) 5. Secondary (Purple) 6. Secondary (Orange)

Mixing Complements

Any primary color mixed with its complement gives a range of grays. The colors used here are: Alizarin Crimson + Phthalocyanine Green; Phthalocyanine Blue + orange mixed from Alizarin Crimson and Aureolin; and Aureolin + purple mixed from Cobalt Blue and Alizarin Crimson.



Red and green *Orange and blue* *Yellow and purple*

HOW COMPLEMENTS WORK

The nifty thing about complements is this: If you add to a color a little of its complement, you get a grayed version of the color and the grayed version is almost always more lively than if you had simply mixed the color with black.

Complementary colors are useful in suggesting atmospheric perspective. Add just a touch of red to that distant green hill color and presto!—you've pushed the hill back a mile or two. But there's a little more to it than that (wouldn't you know?) The results you get depend on exactly which color pigments you mix; for example, Alizarin Crimson + Phthalocyanine Green will give you one set of grays, but substituting Cadmium Red (or any other red) for Alizarin will give you a different set of grays. And to make matters worse, your medium can make a difference. For instance, Cobalt Blue + Cadmium Orange oils will yield a different set of grays than Cobalt Blue + Cadmium Orange watercolors. But don't be put off by those issues. The truth is, whatever medium you're currently working in, you'll quickly get used to what works with what.

DEFINITION

LOCAL COLOR:
The actual color of an object unaffected by conditions such as atmospheric haze or unusual lighting.

TRY THIS

On a piece of white mat board, paper or canvas, lay out six blobs of color: red, yellow and blue (the primaries) across the top row, and under them, green, purple and orange (the secondaries). Use whatever medium you like; watercolor is quick and easy. Using a clean brush or a painting knife, carefully mix a primary with its complement. Vary the amounts of each to see what variety of grays you get. Notice how a little too much of one color or the other can give you muck instead of a delicate gray!

Mixing Complements
Here I've laid out watercolor paint and have begun mixing two of my colors.

1, 2, 3: primaries
4, 5, 6: complements

ADVANCING AND RECEDING COLORS

We've seen that, as a rule, distant objects appear bluish and those same objects seen up close are generally warmer in color. We can stretch that observation a bit and come up with this handy guideline: *Warm colors advance, cool colors recede.* Why that should be so is a matter of human perception; when you paint objects in the foreground in warm tones and objects in the distance in cool ones, you're mimicking the way we see.

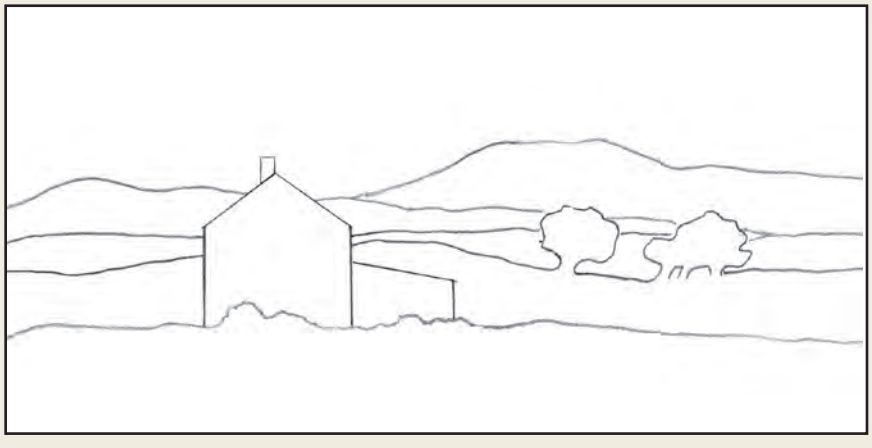
Warm Colors Advance; Cool Ones Recede
The warmest, "hottest" colors seem to come forward and yell at you while the cooler ones quietly recede.

An Experiment in Rule Reversal
In this sketch, there isn't much depth because the warm colors are in back and the cool ones are up front.

A Warmer Foreground Is More Convincing
By warming the foreground and cooling the distance, we improve the apparent sense of depth.

TRY THIS

Trace this sketch and try your own color combinations to see which ones seem best to create a sense of distance.



ABOUT THOSE RULES

You're an artist. You may break the rules anytime it suits you—isn't that handy? The "rule" that warm colors should be up front and cools in the rear works well enough most of the time, but often—very often—I hope you'll be tempted to turn things upside down. Never be a slave to the rules!

A Perfect Warm-to-Cool Scene
This scene is most obedient: warm as can be up front, nice and cool in the distance. It's made to order for a painting.

Sometimes You Can Break the Rule
This painting reverses the warm-to-cool rule: it's cool up front and hot in the distance. It works because of the use of linear perspective and other perspective techniques: the road leading into the picture, fence posts that diminish in size as they recede into the distance, overlapping objects, more detail in the foreground than in the distance.

CHARLIE'S PLACE
Watercolor on Arches 140-lb. (300gsm) cold-pressed paper
18" × 24" (45.7cm × 61cm)

WARM AND COOL

We use the terms warm *and* cool *because of associations with familiar things. Warm conjures up red, yellow and orange things, such as the sun or fire; cool suggests bluish stuff, such as ice.*

ONE-POINT PERSPECTIVE

All linear perspective is based on the idea that parallel lines receding from you seem to meet in the distance. They do this despite the fact that they are parallel and therefore should never meet.

You know the tracks are parallel, yet they meet at a point on the horizon. The tracks never really meet, of course, but they seem to. This is not so different from a row of posts or trees looking smaller and smaller as they recede. In fact, you can think of the wooden ties between the train tracks as if they were a row of posts that happen to be lying flat on the ground.

Converging Parallel Lines
These parallel tracks seem to meet at a point on the horizon.

DEFINITION

LINEAR PERSPECTIVE: *The technique of creating the illusion of distance with parallel lines that converge as they recede.*

WHITE HOUSE
Watercolor on Arches 140-lb. (300gsm) cold-pressed paper
18" × 24" (45.7cm × 61cm)

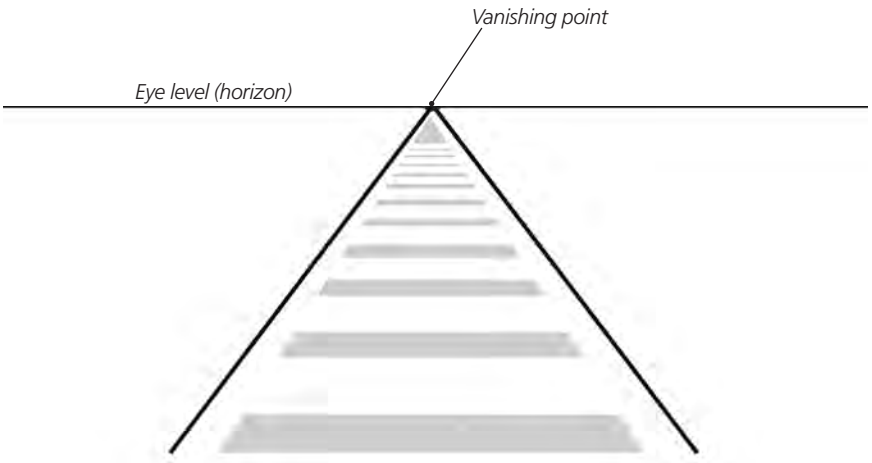
WHAT IS ONE-POINT LINEAR PERSPECTIVE?

One-point perspective is a special example of linear perspective in which all receding parallel lines meet at a single point, as do the railroad tracks on the preceding page.

HORIZON VS. EYE LEVEL

We're all pretty familiar with what the horizon is. In the railroad picture you can see where the flat land meets the sky; that imaginary line where sky meets land is the horizon. If we were at sea, the horizon would be the line where the sky meets the sea. In one-point and two-point perspective all vanishing points lie on the horizon, so it's important that we know where the horizon is. If your scene includes flat land or the ocean, finding the horizon is a snap; you can clearly see it. But suppose there are objects in the way, such as hills, and you can't see the horizon, so you can't tell where to place a vanishing point. What to do?

We scrap the term *horizon* and substitute *eye level*. They are the same thing, but while you can't always tell where the horizon is, you do know where your eye level is: it's an imaginary horizontal plane passing through your eyes. If you stand up, your eye level rises with you; if you sit down, your eye level lowers.



WHAT IF I TILT MY HEAD?

That's a question I'm asked a lot when I define eye level. The answer is, it doesn't matter if you tilt your head up, down or sideways. You can wink, blink, close your eyes, rub them—no matter what you do, eye level always stays the same. It's still a horizontal plane passing through your eyes, and that plane is parallel to the ground *(which, after all, is what* horizontal *means).*

OK, so if you tilt your head to one side so one eye is lower than the other, then what? We'll just split the difference and say eye level is a horizontal plane across the bridge of your nose, halfway between your eyes!

DEFINITIONS

VANISHING POINT: *Where receding parallel lines meet (vanish). In one-point perspective, there is only one vanishing point.*

EYE LEVEL: *A horizontal plane through your eyes extending outward in all directions.*

EYE LEVEL

Understanding eye level is critical to understanding linear perspective, so let's take a closer look. Eye level is an imaginary horizontal plane extending outward from your eyes in all directions. Everything you see is either above, below, or at your eye level. In designing any realistic picture, it's imperative that you establish right off the bat exactly where the eye level in the picture will be.

You can see for yourself how important your eye level is by doing a simple experiment. Place any object, such as a mug, at the edge of a table. Stand up and look down at it; then kneel and look straight across at it; and finally, crouch low to the floor and look again. You'll see something like the three mugs shown on this page.

As you change your eye level, notice how different the mug looks. All its parts, such as its curved mouth and its handle, take on different shapes depending on the level from which you view them. If you were to draw the mug, you'd have to decide which position you like best and then stick with it. If you changed your mind partway through the drawing, you wouldn't end up with a realistic mug.

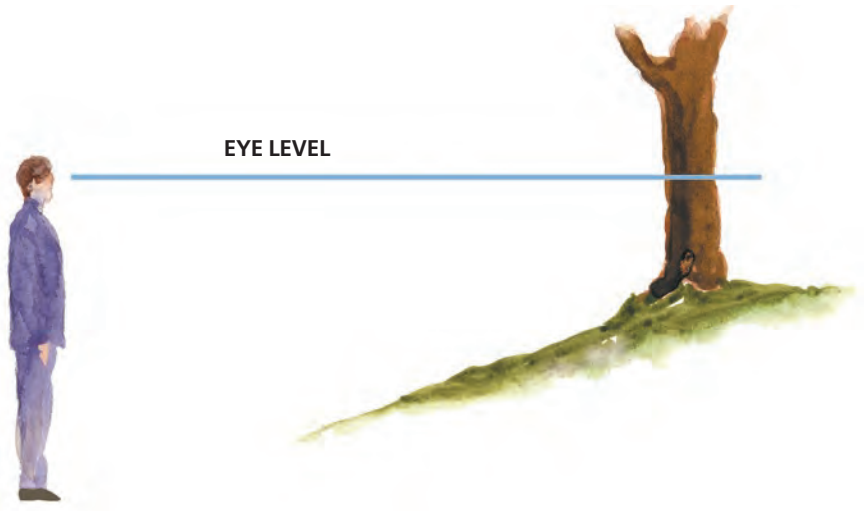
From Above
Mug seen from a high eye level.

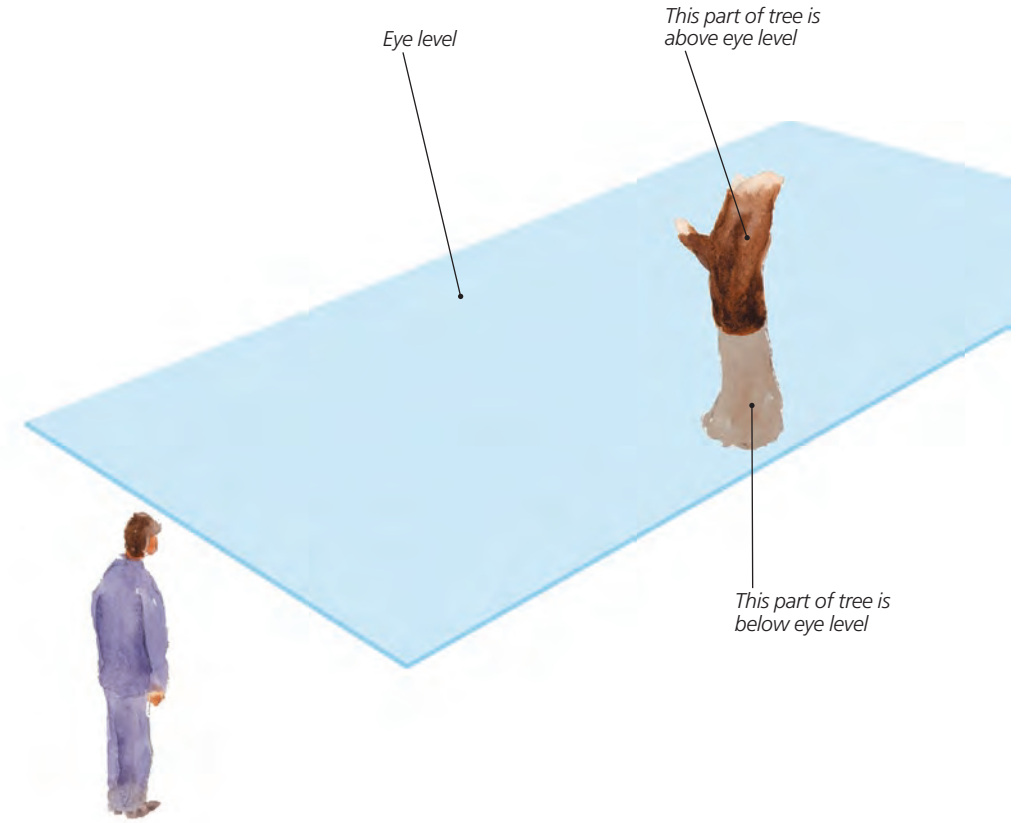
Head On
Mug seen at eye level.

From Below
Eye level is below the mug.

HANG IT ANYWHERE!

Eye level has to do only with the scene in your picture. It has nothing to do with how high or how low your picture ends up hanging on a wall.



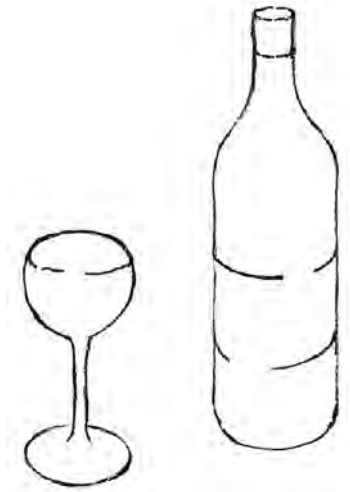


Above and Below

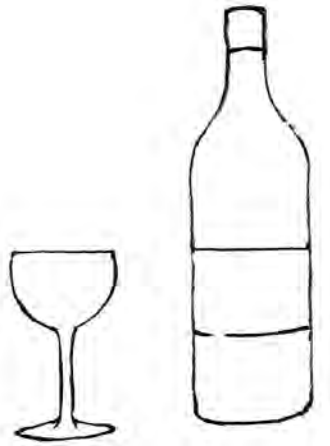
A way to think about eye level: Imagine a huge sheet of glass parallel to the ground and at the level of your eyes. Everything above the glass is above your eye level and everything below the glass is below your eye level.

WHY EYE LEVEL IS IMPORTANT

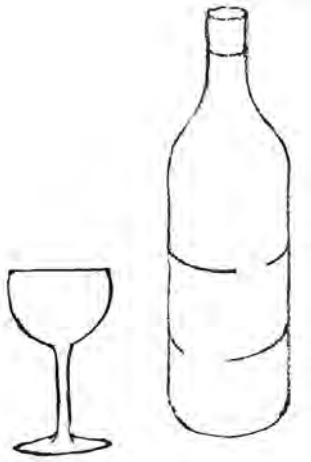
Changing your mind about eye levels partway through a drawing will introduce inconsistencies in the composition that will probably destroy its effectiveness. If your subject is a landscape and you draw one building from a particular eye level and another from a higher or lower eye level, the buildings will not seem compatible. A casual viewer may not know a thing about linear perspective, but she'll know something isn't right about the picture. If your subject is a still life, the results can be even more confusing because the closer you are to your subject, the more damaging the shift of a few inches in eye level may be.



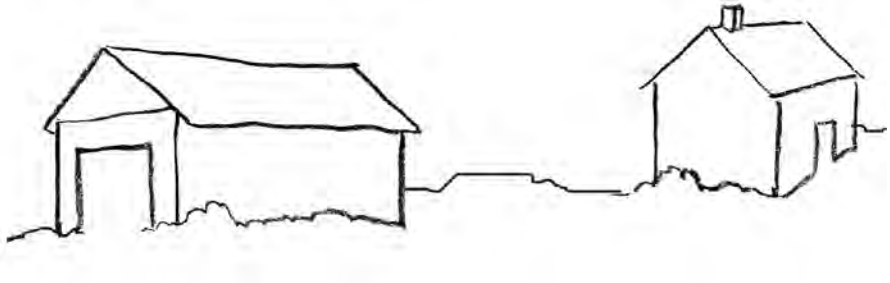
High Eye Level
A still life sketched from a standing position (high eye level).



Lower Eye Level
The same still life sketched from a sitting position (low eye level).



A Still Life In Trouble
Here's what happened when I sketched the bottle from a standing position and the glass from a sitting position. They clearly don't belong in the same picture unless perhaps the bottle is standing on a tilted surface and the glass, on a flat surface.



A Landscape Gone Wrong
The barn is sketched from a low eye level, but the house, from a higher eye level. They obviously don't belong in the same picture. This confusion may arise if you design a picture based on objects from different photographs.

USING BOXES TO DRAW OBJECTS IN PERSPECTIVE

Much linear perspective involves three-dimensional rectangular objects, or boxes. Buildings are obvious examples—and we'll spend a lot of time dealing with them—but many other things can also be considered boxes. A stretch of our railroad, for instance, can be thought of as a long, thin box.

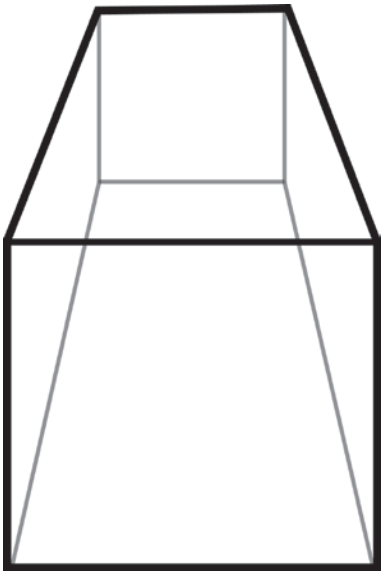
Railroad-in-a-Box
Think of this set of railroad tracks as a thin box.

DRAW ANYTHING INSIDE A BOX

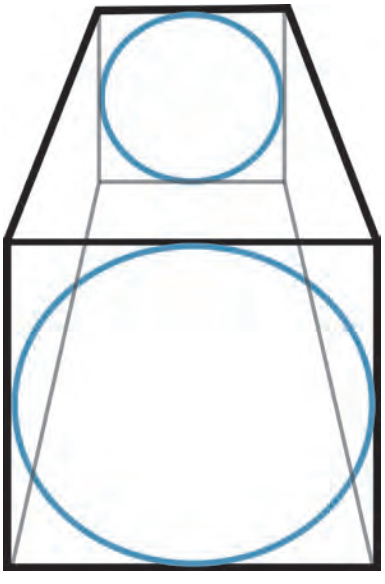
You can get a handle on drawing almost any object in linear perspective if you imagine the object confined inside a box. It's not always necessary to actually draw the box, but if you learn to visualize the box it can help your drawing. For example, a rounded tube can be easier to draw in perspective if you first picture it within a box.

BOX IT UP

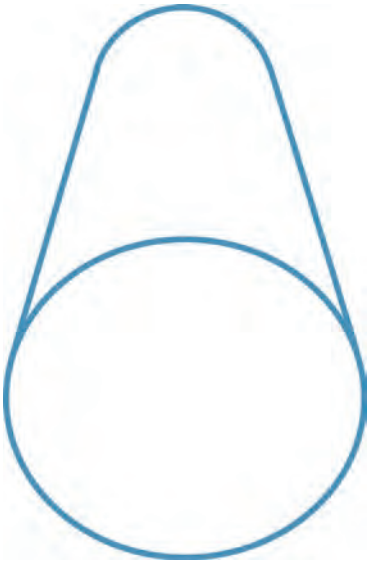
Envision objects either as boxes or combinations of boxes or as being drawn inside boxes. Boxes are at the heart of all linear perspective.



1 ***Draw the Box***
Draw a box in perspective.



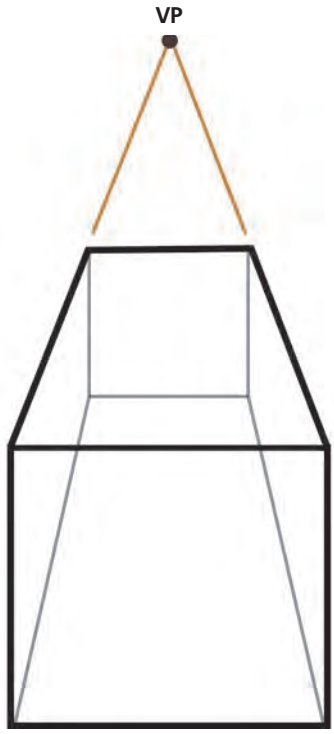
2 ***Add Circles***
Use the outlines of the box to inscribe circles for the ends of the tube.



3 ***Erase the Box, Then Finish***
Discard the box and finish the tube.

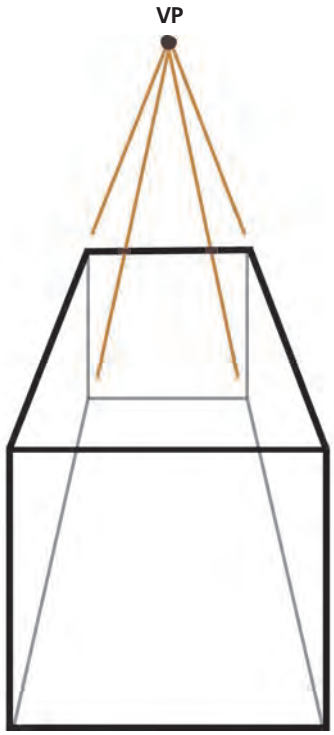
VANISHING POINTS

Let's return to the box on the preceding page. It's drawn in one-point linear perspective. What that means is that all of the box's receding parallel lines converge at a point at eye-level.



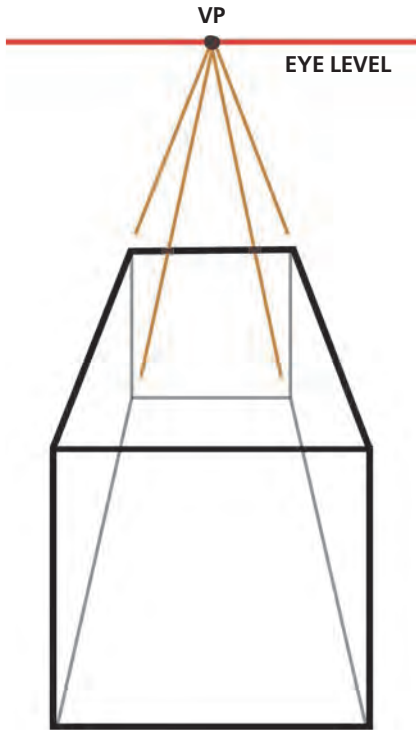
Receding Lines Meet at the Vanishing Point

If you extend the upper edges of the box, they meet at a place called the vanishing point (VP). You're looking down on the top of this box.



Hidden Receding Lines Meet at the Same VP

The box has another pair of receding lines—those at the bottom of the box—but they're hidden. Imagine the box is made of glass, so you can see all its edges. Mentally extend the bottom edges. They meet at the vanishing point, same as the top edges.



The VP Is Always at Eye Level

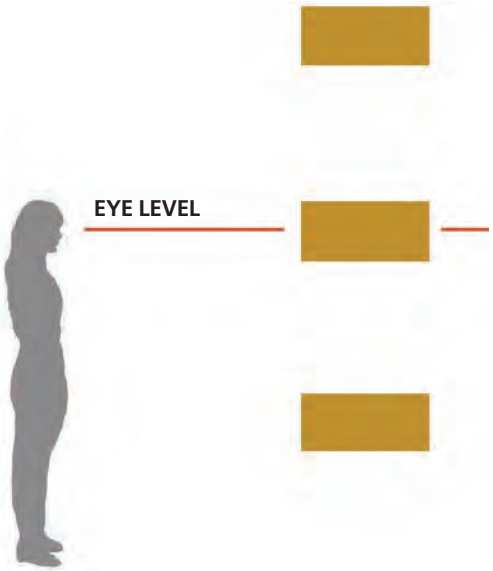
The vanishing point is always at eye level, so a horizontal line drawn through the vanishing point represents eye level.

DEFINITION

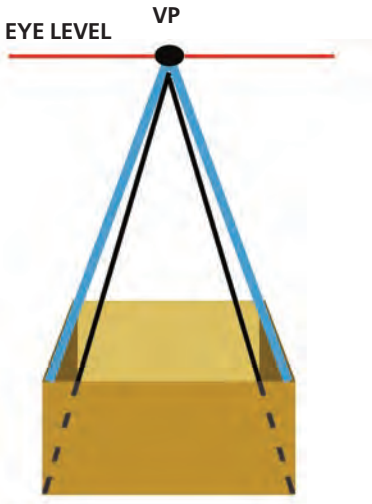
VANISHING POINT: *Receding parallel lines converge in the distance at eye level. The point where they meet is called a* vanishing point. *In one-point perspective all receding lines meet at a single vanishing point; in two-point perspective sets of lines meet at two vanishing points. In three-point perspective we'll find vanishing points that are not at eye level.*

BOXES FROM ALL ANGLES

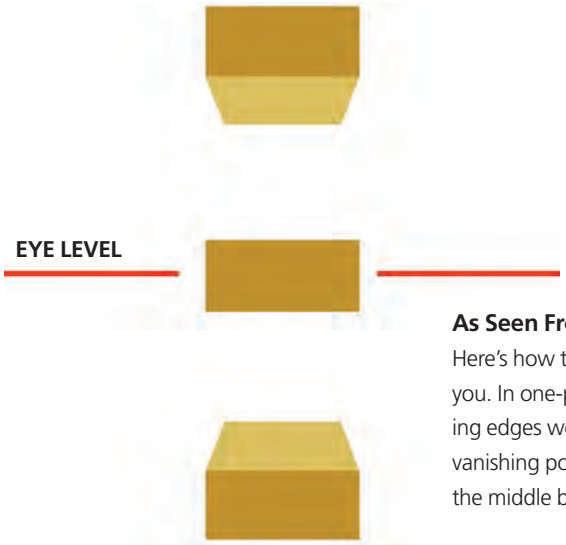
Just about everything around you is a box. The room you're in (unless you're in the Oval Office) is a box. Your desk, your books, your cabinets, your sink—they're all are boxes or they can all be inscribed in boxes. How you see those boxes depends on whether they're directly in front of you, above you, or below you.



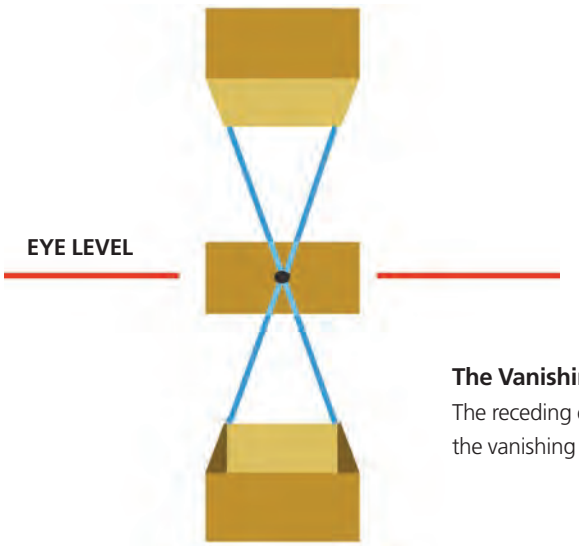
You and Three Boxes, Seen From the Side
Imagine three identical boxes, one directly in front of you (that is, at eye level), one above, one below.



Construction Lines for the Hidden Edges
Here's the topless lower box showing construction lines for both the top edges (heavy blue lines) and the hidden bottom edges (narrow dark lines).



As Seen From Your Eye Level
Here's how the three boxes would appear to you. In one-point perspective, all their receding edges would converge toward a single vanishing point at eye level, directly beyond the middle box.



The Vanishing Point
The receding edges of the boxes converge at the vanishing point behind the middle box.

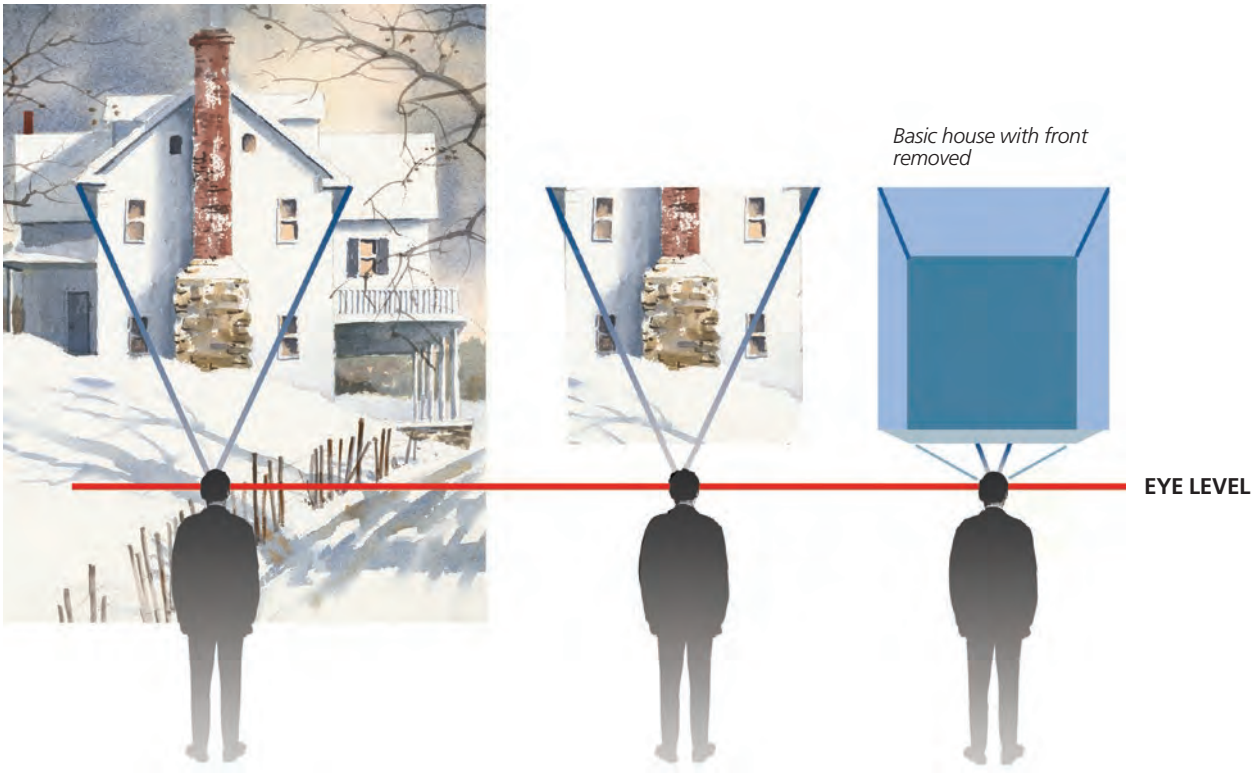
AN EXAMPLE OF ONE-POINT PERSPECTIVE

The house below is rendered in one-point perspective. The eye level is below the bottom floor of the house. If you discard all the roofs, gables, porches and so on, you reduce the house to its basic form: a box. Alongside the house, below, I've shown the box. All the parts I've left out can be considered more boxes tacked onto this basic box.

IS IT ALL OR NOTHING?

Look again at the painting of the house and you'll notice that, while the house is shown in one-point perspective, the shed at the right is not. It's slightly turned and you see a bit of one of its sides; it's actually in two-point perspective. It's not necessary that an entire picture be rendered in one-point perspective. Some are, of course, including the examples on the next page. But in many instances, the viewpoint is such that one object is dead-on in front of you and is seen in one-point perspective, while another object is to your right or left and is seen in two-point.

Look at the house painting again. Imagine that the viewer shifts to the right, about halfway across the scene. From that viewpoint, he would no longer see the house in one-point perspective; he would see part of the side of the house and it would be in two-point perspective.

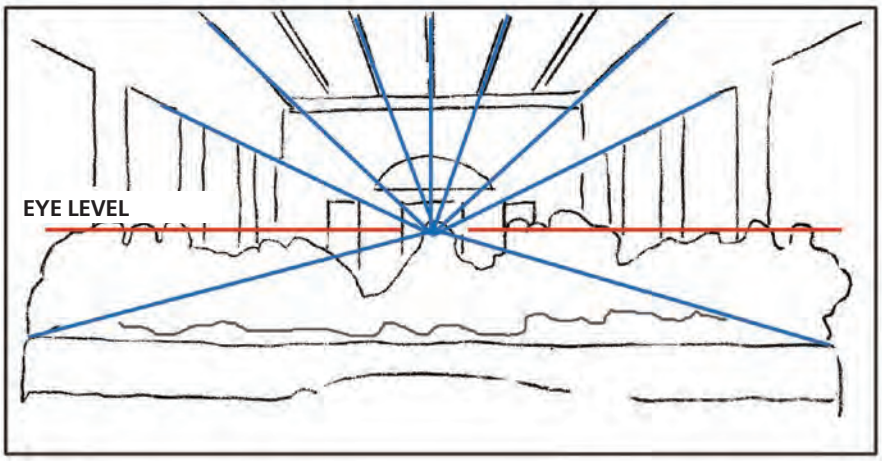


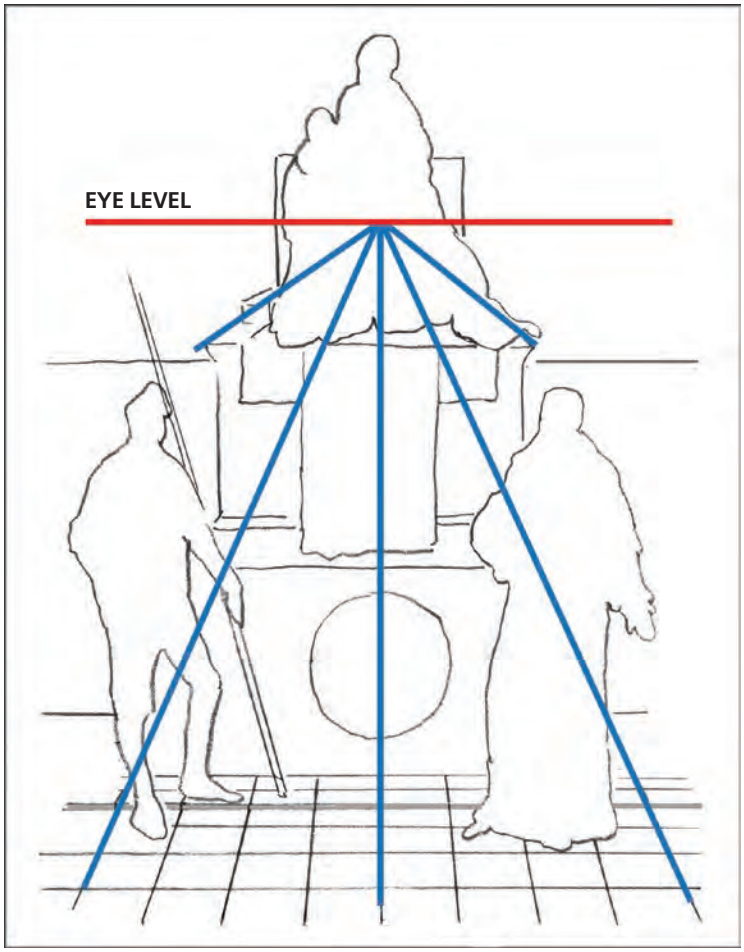
House in One-Point Perspective

A house seen in one-point perspective by a viewer whose eye level is centered below the house. The blue box represents just the basic house without the added-on side sections, porches and so on. The front face of the box is removed so you can see the edges retreating toward the vanishing point.

RENAISSANCE EXAMPLES OF ONE-POINT PERSPECTIVE

It was once more fashionable to depict a scene in one-point perspective than it is today. Many Renaissance scenes were drawn in one-point. Sometimes the artist liked the stability and symmetry of one-point; sometimes he used one-point because it conveys a sense of calm and order; and sometimes, no doubt, he simply liked playing with the then-newly discovered concept of linear perspective.





The Last Supper

This is a sketch of probably the most famous painting done in one-point perspective, Leonardo da Vinci's *Last Supper*, done between 1495 and 1497. All receding parallel lines—walls, ceiling, edges of table—converge at a single point near the center of the picture. One-point is a powerful way to focus attention where the artist wants it—in this case, on Christ. In this picture, Leonardo has placed the viewer's eye level at the same level as Christ's eyes.

Castelfranco Madonna

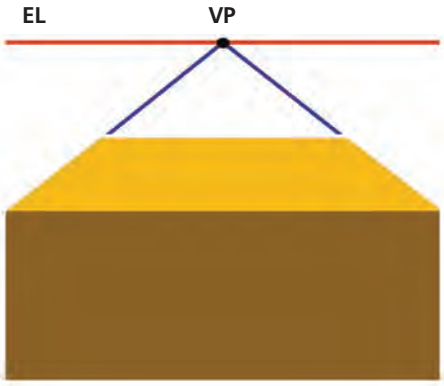
One-point perspective plays a big part in the symmetrical painting *Castelfranco Madonna*, done around 1500 by Giorgione. Notice, in this sketch of the painting, that there's a small step up in the tile floor (the figure on the left, St. George, has his left foot on the upper step). The step provides a little break in the tile lines.

A BIT OF HISTORY

The concept and the rules that make linear perspective work were first devised by Renaissance architect Filippo Brunelleschi. Many artists immediately adopted Brunelleschi's perspective system and their paintings began to look three-dimensional. Brunelleschi is not known to have written down his ideas; that was done later by another Renaissance architect, Leon Battista Alberti.

TWO-POINT PERSPECTIVE

When you can see only one face of a rectangular box, you're seeing it in one-point perspective. If you can see two of its faces, the box is in two-point perspective. There's a fuzzy area where so little of a second face is visible that it's reasonable to stick with one-point; but the truth is, that's a two-point view.



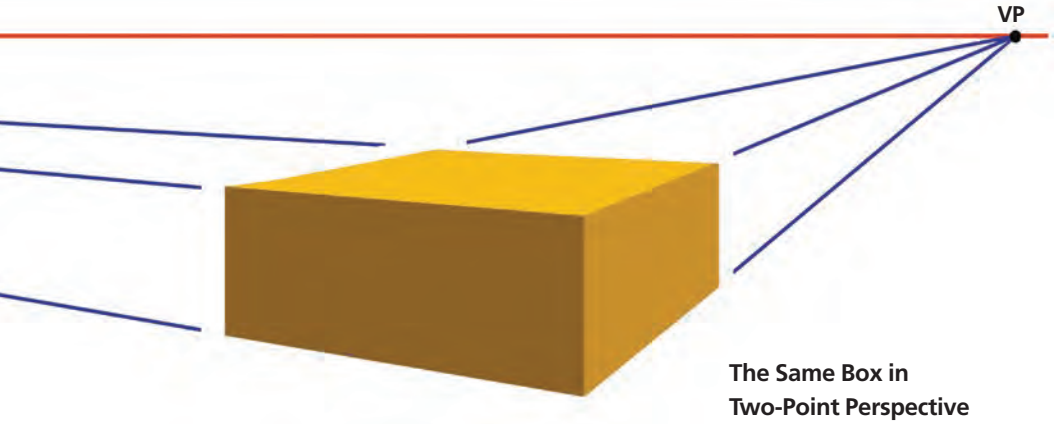
Box in One-Point Perspective

MARYLAND FARM
Watercolor on Arches 140-lb. (300gsm) cold-pressed paper 18" × 24" (45.7 cm × 61 cm)

ABBREVIATIONS

These are abbreviations we'll use:

EL = eye level
VP = vanishing point
PP = picture plane



The Same Box in Two-Point Perspective

DEFINITION

TWO-POINT PERSPECTIVE: *A type of linear perspective in which one set of receding lines meets at one vanishing point and another set meets at a second vanishing point, both at eye level.*

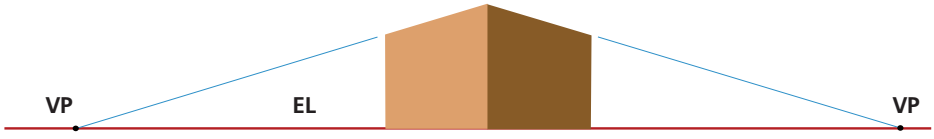
LOCATING VANISHING POINTS

If you look at a box in two-point perspective, both its vanishing points lie at eye level—but *where* at eye level? Let's take a cube and see what happens when it is turned to different positions.

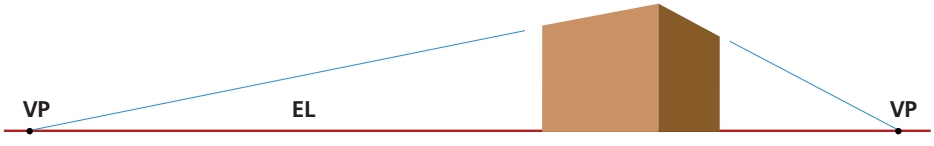
BOXES THAT BEHAVE

Linear perspective is based on ordinary boxlike objects whose tops and bottoms are parallel to the ground. Every normal building, for example, is such a box, and so is a piece of furniture sitting on a floor or a book resting on a shelf. Objects that are tilted don't obey the rules of linear perspective.

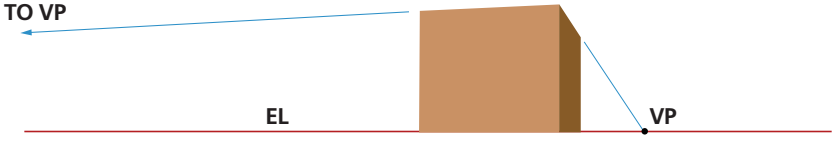
A Cube in One-Point Perspective
This cube is in one-point perspective. Its vanishing point is hidden behind it at eye level.



Rotating the Cube Creates Two-Point Perspective
Now the cube is turned so you can see equal portions of two of its sides, so it's in two-point perspective. The two vanishing points are equally distant to the right and left.



Turn the Cube More, and the Vanishing Points Move
Now you see more of one side than the other, and the vanishing points have shifted.



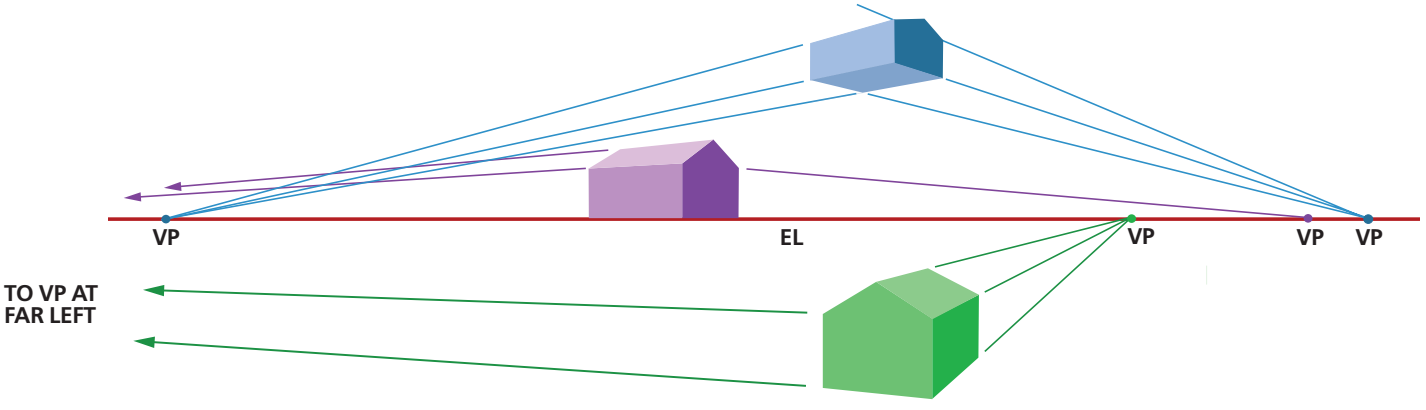
Vanishing Points Can Be Off the Page
In this position one vanishing point lies close to the cube but the other is way off the page. You would have to tape extra sheets alongside the drawing and extend the construction lines if you wanted to locate the missing vanishing point.

EYE LEVEL AND VANISHING POINTS

Always begin a picture by knowing where you intend the eye level to be. If necessary, draw a light horizontal line across the picture as a reminder. As you draw objects in perspective, remember that their vanishing points must lie somewhere along the eye-level line.

Suppose your picture includes objects that are above, below and at eye level. An example would be a landscape with buildings straight ahead, buildings high on a hill and buildings down in a valley; another example is a still life in which some objects are on a table, some near the ceiling and some on the floor.

Each object has its own unique set of vanishing points. The vanishing points for one object in a scene don't necessarily coincide (although they sometimes do) with those of another object in that same scene; but no matter how many different objects there are, their vanishing points all lie at eye level.

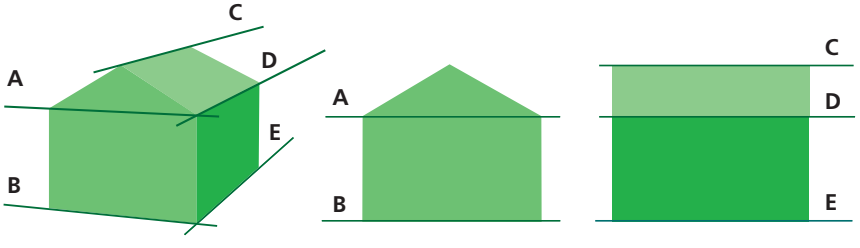


The Vanishing Point Is Always At Eye Level

These three houses sit at different levels in the scene: one on a hill, one in a valley and the other straight ahead. No matter how you turn them, all their vanishing points lie somewhere on the eye level. The vanishing points for the blue house on the hill happen to lie close enough to the house that they fit on these pages. Only one of the purple house's vanishing points is on the page; the other is far to the left. The same is true of the green house down in the gully; one of its vanishing points is off to the left. What's important is that each house has a pair of vanishing points and they all lie somewhere along the eye-level line.

Parallel Lines Converge

Here's a closer look at the green building from the previous illustration. There are two sets of receding parallel lines in this building: lines A and B in the front view and lines C, D and E in the side view. The vertical lines are also parallel, but since they are not receding from us, they don't converge.



HOW TO GET THE ANGLES RIGHT

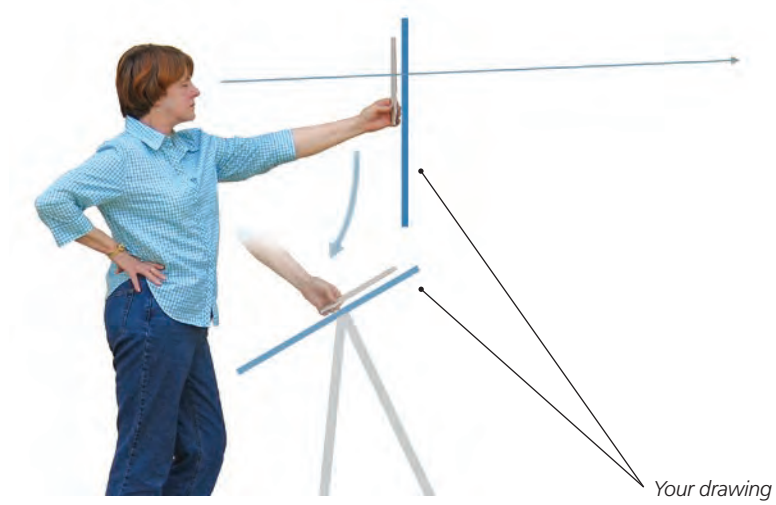
We talk a lot about vanishing points in linear perspective, but I'll tell you a secret: you never have to bother with them if you get all the angles right in the first place. If a line recedes toward the horizon and you draw it accurately, it will automatically cross the horizon right at the vanishing point. So, although we discuss vanishing points as a handy way of visualizing what's going on in linear perspective, it's those slants, or angles, we're really after. Art stores offer a number of gadgets to help get angles right, but you can do just as well with two simple measuring techniques that don't cost anything.

Method 1: Pencil

Hold a pencil (or any straightedge) at arm's length, elbow locked, and with the pencil parallel to the picture plane. Swivel your wrist to align the pencil with an edge of the object you want to draw. Keeping the pencil at that same slant, move it to your drawing surface and with another pencil copy the angle onto your paper.

THE KEY TO USING EITHER METHOD

These angle-measurement methods are practically foolproof, but with either method it's vital that you keep your elbow locked and don't allow your wrist to twist. The idea is to imagine you're holding the measuring tool (either a pencil or jaws) flat against an upright sheet of glass and that you're looking at the subject somewhere beyond the glass. Think of the imaginary glass sheet as your picture standing on end. Hold the tool flat against the "glass." Then imagine, as you lower the tool to your paper, that you're also lowering the imaginary sheet of glass to your paper, still holding the tool flat against the glass.



Keep Your Elbow Locked—and Don't Twist

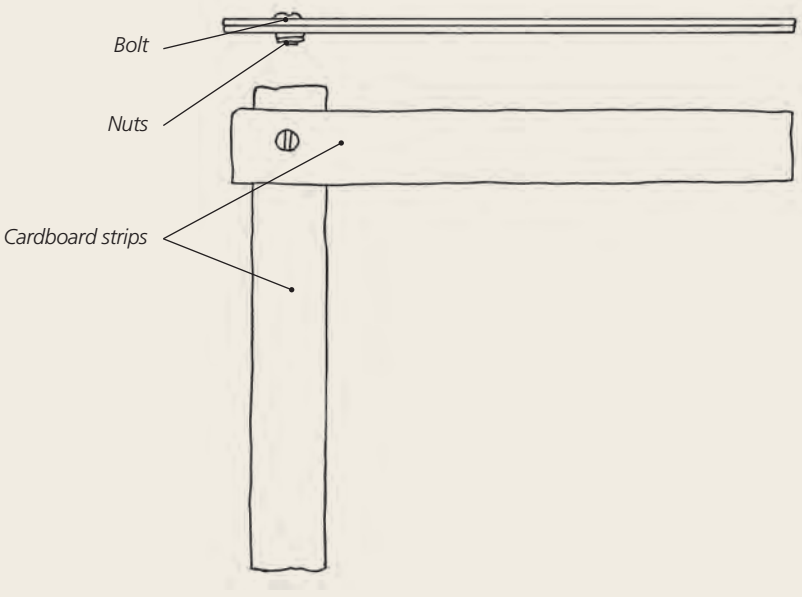
Think of your picture plane as transparent and upright, like a window. You're looking through that window at a subject some distance away and copying the subject's angles.

Method 2: Perspective Jaws

This is my favorite way of getting angles right. It requires a set of "jaws": two strips of cardboard fastened snugly at one end so you can move the strips apart at any angle you wish. Hold the jaws at arm's length, elbow locked (just like method 1), and align one jaw with any edge of your subject. Then rotate the other jaw to line up with some other edge; now you've got the angle between the two edges. Lower the jaws to your paper and copy the angle. It's practically foolproof!

TRY THIS

Making your own perspective jaws is easy. Cut two strips of cardboard (such as mat board) about an inch (25mm) wide and six or seven inches (15–18cm) long. Drill a hole through them at one end and fasten the strips with any type of fastener that will hold them snugly together but still allow them to move. A bolt with two nuts is a good option; the reason for two nuts is that the second one acts as a locknut to keep the first nut from loosening as you open and close the jaws. The jaws must be fastened tightly enough to stay put once you open them to a particular angle; they must not slip as you lower them to your drawing.



DEMONSTRATION

MORE ABOUT VANISHING POINTS

You don't begin a drawing with vanishing points. You begin by drawing what you see. You try to get the right slants to all those receding lines and, with a little luck, you finish without ever having located a vanishing point. Oh, happy day!

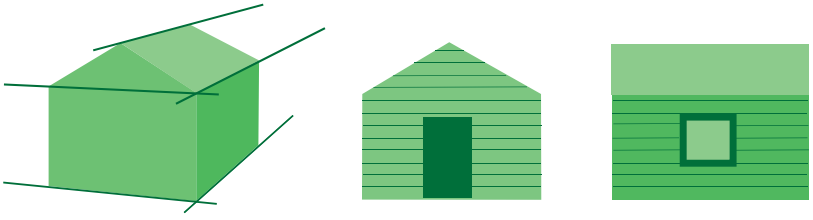
But suppose that, when you're done, your drawing looks cockeyed. You may not always know why it's not right, but you do know one or more objects don't look natural. It may be time to locate some vanishing points. How do you locate one? What are the rules?

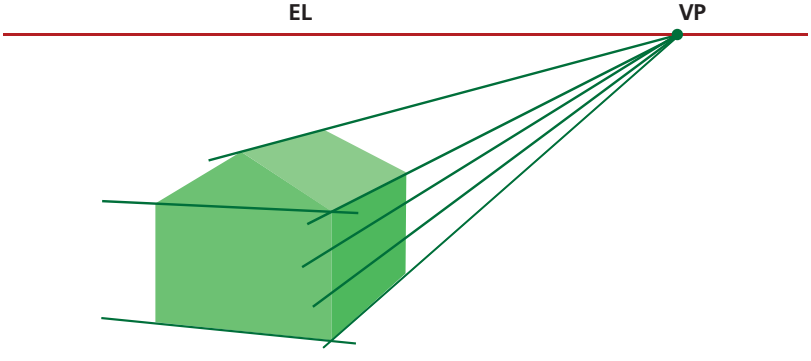
First, decide exactly where in your picture the eye level is. Remember, eye level is an imaginary flat horizontal plane passing through your eyes. Draw a line on your picture representing that level. Now look hard at your subject and pick out an important receding horizontal line either above or below eye level, perhaps the top edge of a roof. Use your perspective jaws carefully to determine the slope, or angle, of that line and copy that line on your picture. Where that line crosses the eye-level line, that's a vanishing point. And now that you have the vanishing point, all the lines in the building that are *parallel* to the roof line should end up at that vanishing point. That's the beauty of locating a VP: once you have it, it dictates the angle for other lines. You don't have to think about their slopes, or angles, you just aim them at the vanishing point.

Suppose you're satisfied with the basic lines showing the house in perspective, below (you've used the jaws to get those lines right). You've located the vanishing points and now you want to add some details to the house: a window, a door and some siding. You want them, of course, to be in proper perspective. You can add them easily by drawing lines from the object to the vanishing point.

1 Start With a Basic House

Here's a house in two-point perspective. Its vanishing points are established and we want to add a door to the front wall, a window to the side wall and some siding on both walls.



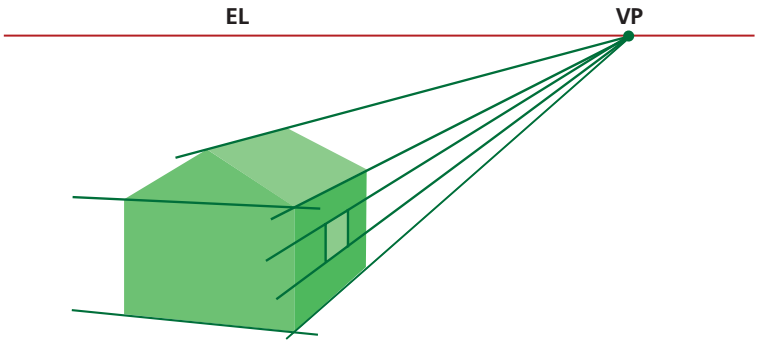


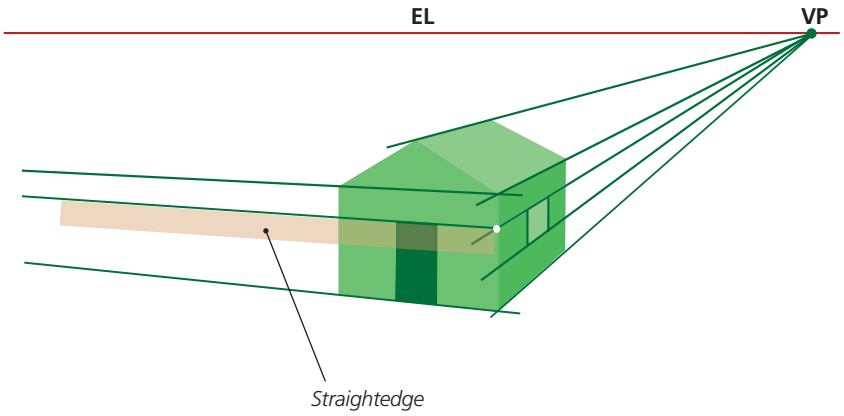
2 Draw Lines to the Vanishing Point For the Top and Bottom Edges of a Window

If you're dealing with an ordinary rectangular window, its top and bottom edges are parallel to the top and bottom edges of the wall in which the window is placed. The window's horizontal receding edges will slant toward the same vanishing point as the wall's horizontal receding edges.

3 *Finish the Window With Vertical Lines*

Draw vertical lines to finish the window. You can place the verticals farther toward the front of the house or farther toward the rear—wherever you prefer. Later we'll see how to center a window in a wall.



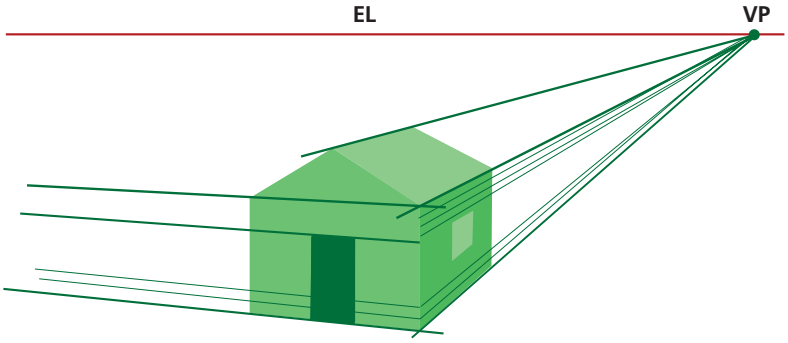


4 *Add a Door Using Lines to the Other Vanishing Point*

Build the doorway in the front face of the house the same way you inserted the window in the side of the house, but this time draw the construction lines toward the other vanishing point. Since that vanishing point lies pretty far off the paper, the only way to locate it exactly is to tape some extra paper onto the drawing and extend the eye-level line much farther to the left. But that's rarely necessary. Instead, lay a straightedge on the drawing at about the height you want for the doorway and then adjust the slant of the straightedge so that, by eyeballing, you think it's aimed at that far-left vanishing point. Your guess will usually be close enough.

5 *Add Siding*

To add siding in perspective, draw evenly spaced lines from each vanishing point toward the building. An easy way to do this is to keep one end of a straightedge positioned at a vanishing point and swivel the other end of the straightedge in even increments. In the case where you can't see the vanishing point, make an educated guess. I've shown just a few of the lines of siding. Notice the siding on one side of the building lines up with the siding on the other side (good carpenter).



HINT FOR STEP 4

The top edges of doors and windows in many buildings are at the same height. So you can determine the height of the door by starting its construction line at the corner of the house at the point (the white dot in step four) where it meets the window construction line.

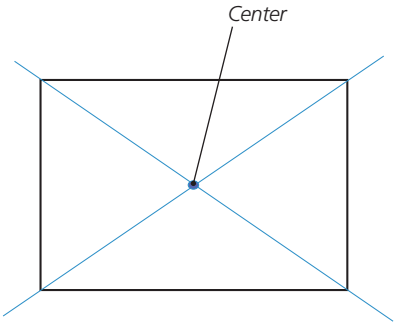
PERSPECTIVE CENTER

If you were to measure the walls of the green house in the previous example, you'd find the door and the window lie at the centers of their respective walls. But in the perspective view, things are different: they are now at the *perspective centers* of their walls. Let's see what that means.

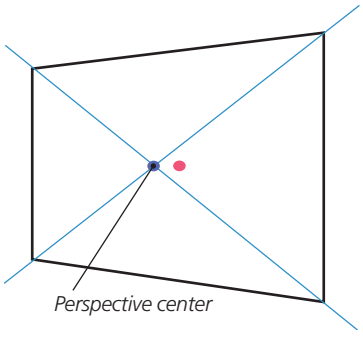
To find the center of a rectangle, you draw diagonals across it; the center is located where the diagonals meet. To find the center of that same rectangle in perspective, you do the same thing: simply draw crossing diagonals.

WHY THE PERSPECTIVE CENTER IS IMPORTANT

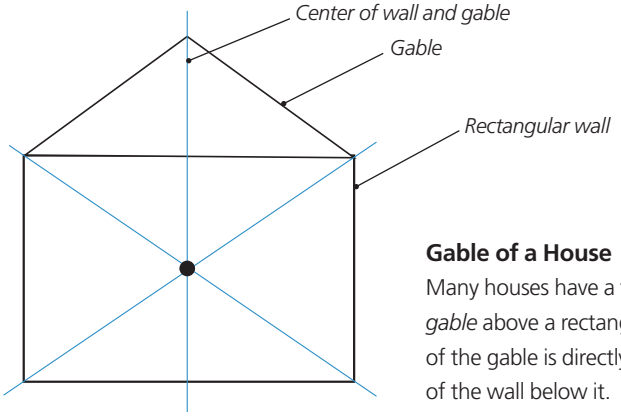
Knowing where to locate the perspective center of a rectangle helps you to locate and draw other objects within that rectangle, such as doors and windows. It also helps you locate the peak of a gable in perspective.



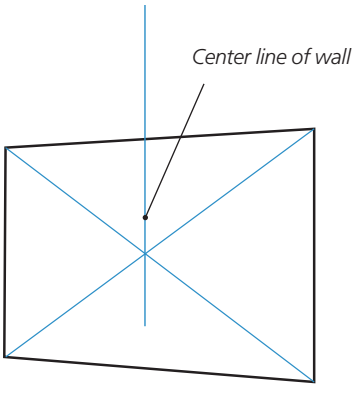
Center of a Rectangle
To find a rectangle's center, draw its diagonals.

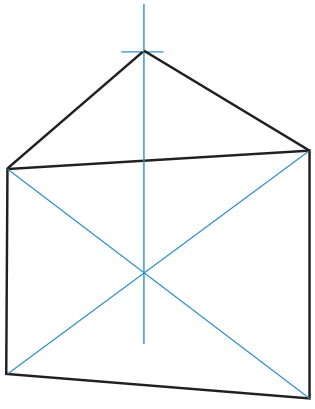


Center of a Rectangle in Perspective
The halfway-point is at the red dot, but the perspective center is the point where the diagonals cross.



Gable of a House
Many houses have a triangular part called a *gable* above a rectangular wall. The center of the gable is directly in line with the center of the wall below it.





Gable of a House in Perspective
Here is the wall turned in perspective. To add the gable above the wall, you need to find the wall's centerline (far left). Mark off the gable's height anywhere you wish along the centerline and draw lines connecting that point with the upper corners of the wall (near left). The gable is done and everything is in perspective.

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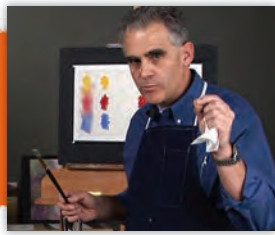

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