handprint : basic mixing method

handprint.com (http://www.handprint.com/HP/WCL/mix.html)

basic mixing method

Artists use the color wheel to **improvise a specific color** approximately as described below. The idea that we are improvising is important, because it means we use the color wheel as a compass, to point us in the right direction, rather than as a precise color calculator.

The idea of improvising color gives you permission to plunge in and swim the mixing process using your experience and your eyes. Clinging to habitual color formulas only inhibits your basic confidence. Color mixing is as easy as riding a bike all "color theory" concepts are just training wheels to help you learn the trick of color balance.

First, some general comments. You may have a large palette of paints to choose from, but almost every possible color mixture and mixing problem can be approached using only the six paints of the secondary palette (http://www.handprint.com/HP/WCL/palette4e.html). Many choices of six paints are practical, but here I assume the palette consists of:

1. hansa yellow medium (PY97 (http://www.handprint.com/HP/WCL/watery.html#PY97))
2. cadmium scarlet (PR108 (http://www.handprint.com/HP/WCL

/waterr.html#PR108))
3. *quinacridone rose* (PV19 (http://www.handprint.com/HP/WCL/waterc.html#PV19R))
4. *ultramarine blue* (PB29 (http://www.handprint.com/HP/WCL/waterb.html#PB29))
5. *phthalocyanine blue GS* (PB15:3 (http://www.handprint.com/HP/WCL/waterb.html#PB15))
6. *phthalocyanine green YS* (PG36 (http://www.handprint.com/HP/WCL/waterg.html#PG36)).

For more discussion of these paint choices, see the section on the secondary color wheel (http://www.handprint.com/HP/WCL/color13.html#secondary). For a discussion of how to use the six paint palette to master color and color mixing, see an intuitive color study (http://www.handprint.com/HP/WCL/intstud.html).

If you are unsure where different colors or their matching pigments are located on the color wheel, refer to the artist's color wheel (http://www.handprint.com/HP/WCL/wheel.html) and the explanatory tour of the color wheel (http://www.handprint.com/HP/WCL/color16.html#tourwheel) for orientation.

color theory

(http://www.handprint.com/HP/WCL/wcolor.html)

Our example assumes we are trying to mix a color match for burnt sienna (http://www.handprint.com/HP/WCL/earthp.html), that is, a somewhat dulled, mid valued orange. The same example is used in the sections on mixing paints in the page on working with paints (http://www.handprint.com/HP/WCL

/tech14.html), which should be studied along with this page.

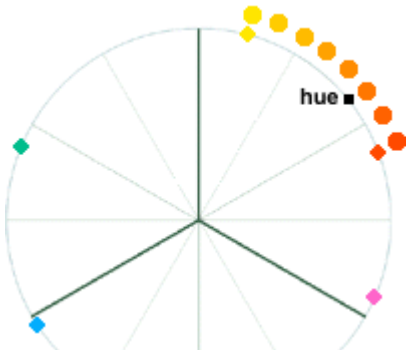
1

Before you can start, you have to know where you are going. **Locate the color you want to mix on the artist's color wheel (http://www.handprint.com /HP/WCL/wheel.html)**, as follows:

a First, identify the approximate hue (http://www.handprint.com/HP/WCL /color3.html#colormakinghue) you want to mix as a point on the circumference of the color wheel.

Think of the color wheel as a clock face (http://www.handprint.com/HP/WCL /intstud.html#step8), and the location of hues as the position of the clock's minute hand around the circle. A pale yellow is at 12 o'clock, a deep yellow is at 11 o'clock, red orange is at 10 o'clock, and a crimson red is at 9 o'clock. Identifying the hue means you must identify the minute location of the hue around the color wheel.

Our example uses a color equivalent to the standard "burnt sienna" (red iron oxide) paint. Burnt sienna is a dull orange hue, so it is somewhere between the deep yellow and red orange color points (http://www.handprint.com/HP/WCL /color16.html#point2) on the color wheel, or between 10 and 11 o'clock, as shown by the arc of color samples in the illustration at right. I decide the hue is close to 10 o'clock or red orange ("hue" in the diagram).

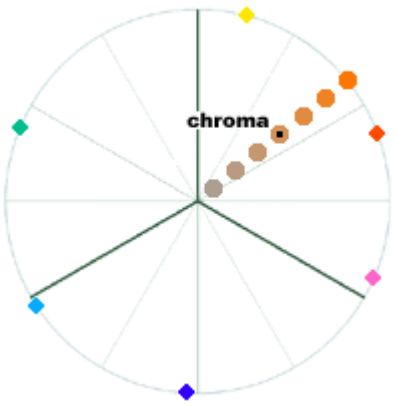


b Next, identify the approximate chroma (http://www.handprint.com/HP/WCL/color3.html#colormakingchroma) (saturation) of the color you want to mix as its location between the circumference and center of the wheel.

The brightest, most intense color you can obtain with your paints is at the circumference, and a completely dull, gray or neutral color is at the center. You must judge the proportion of pure color vs. pure gray that seems to be in the color.

If you are unsure about the hue and chroma of the color, you can compare the color you want to mix with paint colors you are familiar with, then use the location of the most similar paint color, as shown on the artist's color wheel (http://www.handprint.com/HP/WCL/wheel.html), as your mixing point.

Burnt sienna is a moderately saturated orange, so I guess it is located roughly half way from the center to the circumference, a chroma of about 50% (diagram at right).

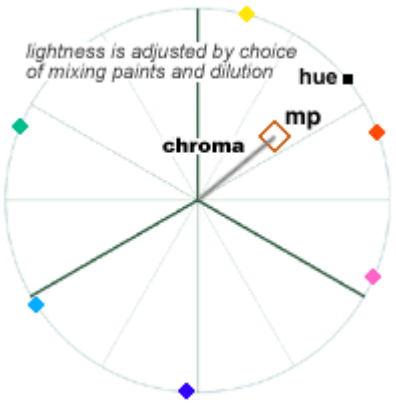


c The location of the color you want to mix, the **mixing point** (**mp**), is the combination of these hue and chroma judgments on the color wheel.

The lightness (http://www.handprint.com/HP/WCL/color3.html#colormakingvalue) or value of the color cannot be specified on a

color wheel. Instead, you must adjust the lightness of the color mixture by (1) choosing light or dark paints to mix the color, and (2) by diluting the color with water or white paint if it is too dark, or diluting the color with black paint if it is too light. You can choose paints with a similar light or dark value to the color you want to mix by choosing a paint that most resembles this target color, then comparing its value with the value of other paints on the artist's value wheel (http://www.handprint.com/HP/WCL/vwheel.html).

Again: the color wheel is not geometrically precise (http://www.handprint.com/HP/WCL/color14.html#fallacy), so you will only be able roughly to locate the mixing point. But roughly is good enough.



2

Next, **identify all the pairs of paints** that create a mixing line passing through or near the mixing point. These lines connect the two **mixing colors** that get you most or all of the way to the color you want.

If a mixing line does not pass through the mixing point, but inside it (closer to the center of the color wheel), then you can approximate the hue, but at a duller chroma. The only way to pull the mixture to a brighter color is to add a paint of the same hue but much higher saturation or intensity. This is as illogical as starting from black and trying to brighten the color by adding intense paints.

So you **limit your selection of mixing lines** to those that (1) pass *outside* the mixing point (along the circumference of the color wheel), or (2) pass *near* the mixing point *and close to the center of the color wheel*.

As you see in the diagram, our six paint palette gives us four alternative mixing lines ...

1. hansa yellow PY97 and cadmium scarlet PR108
2. hansa yellow PY97 and quinacridone rose PV19
3. cadmium scarlet PR108 and phthalo green YS PG36
4. cadmium scarlet PR108 and phthalo blue GS PB15

While we're at it, notice that, if we wanted to mix a very intense, bright orange of the same hue as the burnt sienna, there is really only one mixing line available to do the job ...

1. hansa yellow PY97 and cadmium scarlet PR108

... which illustrates the universal color mixing rule that **dull, dark colors can be mixed in more ways** than intense or light valued colors.

But which of these four paint combinations gives the "best" color mixture? That depends on the **color appearance** you want in the finished color, and the **mixing strategy** you want to use to get there.

As the diagram shows, all mixing pairs reach the mixing point by one of two contrasting mixing strategies: **hue shift or chroma shift**.

Choosing the *hue shift* strategy means you are especially concerned to get the hue of the color correct, so you want two mixing colors that let you adjust the hue very carefully; then you approximate the chroma as a finishing touch. Typically you do

this because **the target color is highly saturated**, so to mix it you are forced to choose two paints close to it on the circumference of the color wheel. In the example, the mixing pairs hansa yellow (PY97) with either cadmium scarlet (PR108) or quinacridone rose (PV19) provide a hue shift mixing line.

Choosing the *chroma shift* strategy means you are especially concerned to get the dullness of the color correct. Typically you do this because **the target color is a near neutral or specific dark value** that is shifted slightly in the direction of a red, yellow, green or blue hue, so to mix it you are forced to choose two paints at opposite sides of the color wheel. This gives a mixing line that passes close to the neutral center of the color wheel. In the example, the mixing pairs cadmium scarlet (PR108) with either phthalo green (PG36) or phthalo blue (PB15:3) provide a chroma shift mixing line.

Our target burnt sienna color is moderately unsaturated, so it is somewhere in between these two extremes: both a hue shift or chroma shift mixture would be practical to mix the color.

A second consideration is the **contrasting *texture* or *mixing compatibility* of the pigments** in the two mixing colors, an issue nicely illustrated in Jim Kosvanec's Transparent Color Wheel (http://www.handprint.com/HP/WCL/book3.html#kosvanec). This is especially important when two paints are mixed in roughly equal proportions, and/or when the resulting mixture is close to a gray: the two paints play an equal role in the finished color, so both pigment textures (http://www.handprint.com/HP/WCL/tech17.html#paints) will be on maximum display. If the mixture is dominated by one color, with the second paint only used to tweak the hue a little, then your main texture concern is choosing that dominant paint; the tweaking color is of minor importance.

Finally, even if there is a dominant paint, the two paints can be chosen to **adjust the handling properties** of the mixture. For example, mixing a powdery

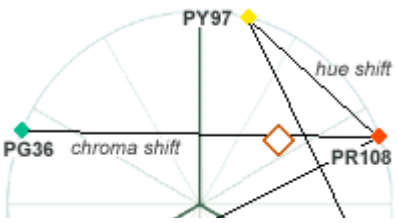
pigment such as cadmium scarlet with a synthetic organic pigment such as phthalo green can actually increase the tendency of the cadmium pigment to flocculate or texture in thin washes. Mixing a green color from a synthetic organic pigment like phthalo green and a heavy inorganic pigment like yellow ochre produces a mixture that will readily separate in juicy washes, producing a mottled, two tone effect.

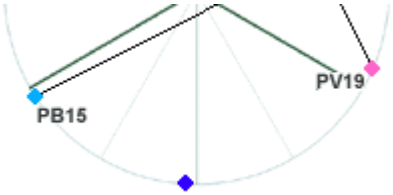
There are many possible pigment combination effects. I want only to alert you to their importance so that you can watch for them and learn from your own mixing experience. And I want to make the general point that **selecting your mixing colors is the most creative part of color mixing**, and is worth special care.

In the example palette, we can get a pretty good burnt sienna color using just two paints cadmium scarlet with the phthalo green paint to dull it toward brown. Or we can use phthalo blue to get a slightly redder mixture. But we know from mixing experience that these mixtures will (1) result in a dark valued sienna color, and (2) will consist primarily of the cadmium paint, and so will appear relatively dense and dull at moderate saturation.

Or we can start with a mixture of hansa yellow and a red paint. We know from experience that these mixtures will (1) result in a lighter valued orange color, (2) require the use of a third paint to adjust the chroma and value, and (3) let us choose a greater number of pigment alternatives in the mixture.

Let's assume, then, that we want to include some of the powdery texture of the cadmium, but without the phthalo dulling, so we choose cadmium scarlet (PR108) and hansa yellow (PY97) as our mixing colors.





3

If the mixing line between the two paints *passes through* the mixing point, then **you only need those two paints** to get the target color (and you can skip to step 4).

If the mixing line only passes *close to* the mixing point, then you need three paints to mix the color two to get the hue, and one more to shift that chroma towards the center of the wheel, dulling the mixture; or two to get the chroma, and one more to shift the hue, changing the color bias.

In that case you **choose a third paint that creates a triangle enclosing the mixing point**. This third paint should also be chosen to help you get the value, texture, or handling attributes that you want in the mixture.

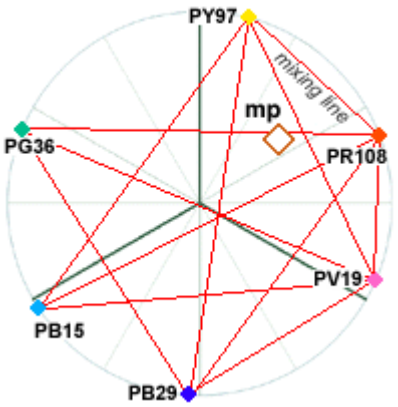
The diagram shows *all* the possible mixing triangles based on the four possible mixing lines described in step 2. This is just to remind you of the creative possibilities you have available even with only six paints to get a specific color mixture.

However, we've already chosen cadmium scarlet (PR108) and hansa yellow (PY97) to produce the basic orange hue. Given the remaining paints on the palette, we can choose between phthalocyanine blue (PB15) or ultramarine blue (PB29) as the third ingredient: both paints make a triangle that encloses the mixing point.

Our mixing colors will create a powdery and smoothly mixing color that is ideal

for wash applications, but can appear dull if applied too thickly. So let's assume we choose ultramarine blue (PB29), because (1) its flocculating texture can accent the powdery texture of the cadmium, (2) it harmonizes well with the hansa yellow, and (3) its dark value will help us darken the mixture toward the value of burnt sienna, which is quite a bit darker than the typical orange mixture. (Compare the locations of cadmium orange PO20 or benzimida orange PO62, ultramarine blue PB29 and burnt sienna PBr7 on the artist's value wheel (http://www.handprint.com/HP/WCL/vwheel.html).)

This mixing strategy illustrates the key point that **artists mix paints, not "colors"**. Because we are thinking in terms of specific paint combinations, and are not stuck in the dim and foggy world of abstract "color" mixtures, we have more control over *all* the visual effects that paints can create.



4

So we end up with at most three paints to mix the target color.

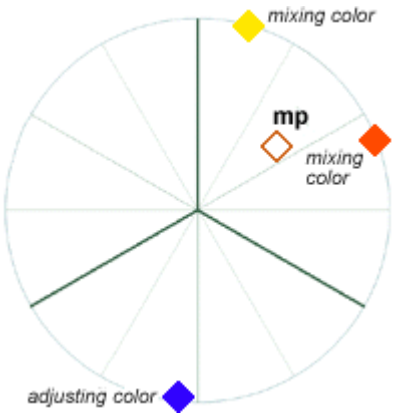
The **mixing colors** are the two paints that define your primary mixing line the mixing line that passes closest to the mixing point. These paints get you most of the way to the mixing point, and primarily determine the texture, transparency and staining qualities of the mixture.

The mixing colors are easiest to work with when they produce mixtures that are

more saturated than the mixing point (their mixing line is between the mixing point and the circumference of the wheel). This is because **paints lose chroma, but shift less in hue, as they dry**, so the hue of the mixed color can be judged accurately while the paints are still wet. Use the more saturated mixture to get close to the correct hue, then add the **adjusting color** to reduce the chroma of this mixture.

The adjusting color is usually the paint that is *furthest from the mixing point*, so it will be used in the smallest quantities, and has the least impact on the staining, transparency and texture of the mixture.

You may have many more paints to choose from on your palette, so you will have many more alternatives for mixing the target color. But the logic is the same within the range of effects your palette can offer.



5

Now we have to **estimate the approximate proportions** required for the two mixing colors. This is especially helpful if you need a large color mixture (for example, to prepare a wash solution), but even if you are working with small quantities of paint, it is nice to know where you are going.

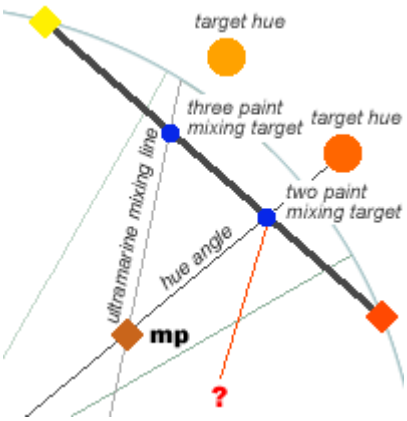
a First of all, what specific hue are we aiming for with our two mixing colors? The common novice mistake is to aim for the *hue of the mixing point*, which in the

example is equal to the hue angle of the mixing point or a deep (reddish) orange. This is the **two paint mixing target** as shown in the diagram.

But this neglects the effect of adding the ultramarine blue to darken the color! What happens then? The mixture heads south (toward ultramarine blue) from the two paint mixing target, but misses the mixing point completely and ends up at a mixture that is both too red and too saturated (**?** in the diagram).

Now what? Now the novice is completely lost. How to get back to the mixing point? Adding more ultramarine blue only makes the color redder, so to bring it back the novice has to add more yellow paint *a lot* more yellow paint. But the color will still be too saturated, so the novice might try to dull it with a green paint. Now he's juggling *four paints,* and faces a lot of back and forth mixing adjustments to reach the desired color.

The answer here is to **adjust the two paint target color to compensate for the hue shift caused by third paint**. To do this, draw a second mixing line from ultramarine blue through the mixing point to the mixing color mixing line: this gives the hue you want to mix (the **three paint mixing target** in the diagram). As you see, this locates a target color on the color wheel that is closer to a deep yellow or a light (yellowish) orange. In other words, we want to use much less cadmium scarlet and more hansa yellow in the mixture.



b Now that you know where you're headed, take a moment to form an explicit, conscious idea of how you intend to get there.

The novice usually has in mind a **target hue**, in this case a yellow orange, and merrily jumps in to mix the color with the "colors" on his palette. This nearly always causes him to overshoot the color because one paint dominates the other. He's lost control as soon as he gets started.

Instead, **make an estimate of the paint proportions** that will be necessary to create the target hue.

To do this, divide the mixing line at the location of the mixing point. This creates two line segments of different lengths. These indicate the proportions of the two mixing colors that will be required to approximate the hue of the mixing point, assuming the *tinting strength and lightness* of the two paints are equal.

If the mixing point lies about halfway between the two mixing colors on the color wheel, then it will divide the mixing line between them into two equal line segments. Then each paint will contribute 1/(1+1) = 1/2 to the total mixture. We need to mix the paints in equal amounts.

In the diagram, the target hue is located about 2/3d's the distance from scarlet to yellow, so the paints would be mixed in a ratio of about 2 to 1. However, the ratios apply to each color only after you **switch their ratios**. That is, the ratio of 2/(2+1) = 2/3 applies to the hansa yellow, and 1/(2+1) = 1/3 applies to the cadmium scarlet.

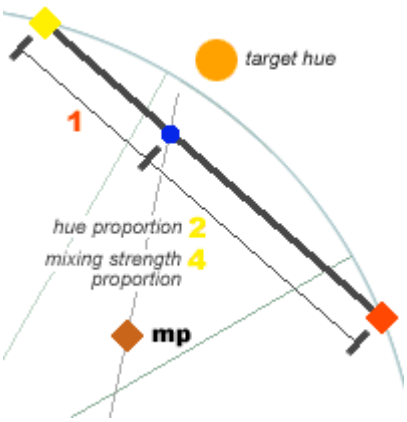
If this is unclear to you, **visualize the mixing line as a seesaw or scale**, balanced at the target hue. How "heavy" must the cadmium scarlet be to balance the cadmium yellow? Obviously, because it is on the long side of the seesaw, it can be much lighter to balance something sitting on the shorter end. Because the

cadmium scarlet is sitting on the short side of the balance, it must be lighter that is, less of it is required in the mixture.

This 1:2 ratio is shown as the **hue proportion** in the diagram. However, this assumes equal mixing strength in the two paints. But that assumption is incorrect, for two reasons: (1) a darker color such as scarlet will dominate a lighter paint like yellow or white, and (2) the dense cadmium pigment has a higher tinting strength than the hansa yellow. In combination, both factors mean the cadmium scarlet will be much more potent in deciding the hue of a mixture with hansa yellow.

To compensate, you must adjust your proportions accordingly by increasing the ratio of hansa yellow to cadmium scarlet. Experience will help you decide the actual proportions you will need to use for specific pairs of paints. In this case, the **mixing strength proportion** is probably closer to 1:4, or 20% cadmium scarlet to 80% hansa yellow.

The purpose of this step is simply to make you aware of how your paints are going to behave when they are combined, so that you can anticipate their influence as you mix them. A common novice mixing mistake is being "surprised" by the strength of one paint in relation to the other, which throws you off balance right at the start.



On your mixing tray or palette, **lay out enough pure water to cover completely the area you intend to paint**. This is especially important when you are mixing a wash: you do not want to run out of mixture before you have completed the entire wash area!

Remember: it is *always* more wasteful to botch a wash in a painting because you run out of paint (and must stop to mix more paint that will not match perfectly the color you mixed before), than it is to throw away a little excess wash mixture.

Now, **add the subordinate paint** (the mixing color with the weaker mixing strength) to the water until you get the concentration (thickness) of paint you want. In the example, the weaker color will be the hansa yellow, because it is lighter valued. So add hansa yellow until you get the density of paint mixture you need.

The reason you do this with the subordinate paint is because this is typically the paint that contributes the largest quantity to the color mixture. So it has the most impact on the paint thickness or dilution. You also reduce the effect of the added second or third paints because of the added quantity of water, which makes it less likely that these paints will hijack the mixture by being too strong.

Paint the mixture on a scrap of paper, if necessary, to check that it is the right dilution.

7

Now you improvise! **Add the dominant paint gradually**, up to the proportions you estimate will create your color. But **observe the mixture carefully**, and stop when the hue is close to correct.

Take your time with this step **don't assume you "know how much paint to**

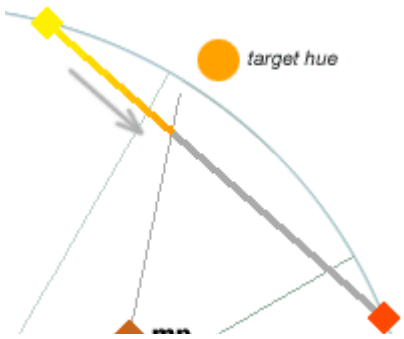
add!" It's not improvisation then, it's brushing your teeth. Plus, you only learn by continual careful observation, not by closing your eyes with your habits.

Watch the color gradually grow and ripen under your brush. Watch the texture and vibrancy change. You may revise your original decision and decide a warmer or cooler mixture will be more attractive.

If you are unsure of your paints, **test the mixture** on a piece of paper and **let it dry for at least five minutes**. There are three different problems here. Mixtures on the palette will not look the same as the mixture dried on the paper! The only way to judge the mixture is to look at it on the paper. The final drying shift (http://www.handprint.com/HP/WCL/cds.html) takes time to develop; paint mixtures have a surprising tendency to keep changing color even after they are "dry." Some paint mixtures (such as a cobalt and a quinacridone) tend to separate as they dry, producing a mottled or "iridescent" color appearance.

If the mixture is the wrong hue, adjust toward the hue required by adding one or the other (but not both) of the mixing colors. Add water as needed to return to the correct concentration (http://www.handprint.com/HP/WCL /tech16.html#range) of paint and water.

It's always better to come up short than go too far in this part of the mixing improvisation. If you go too far with the dominant color, it takes much more of the subordinate color to bring the mixture back to where it was. You'll end up with way too much paint or a mixture that is too concentrated.



When you are close to the correct hue, **add the adjusting color** in very small amounts to make final shift in the mixture.

The adjusting color can modify the hue, saturation and value of the mixture. In the diagram, adding the adjusting color, ultramarine blue, darkens the color value, neutralizes the color (makes it less saturated), and also shifts the hue toward red.

Watch all three color attributes carefully as you adjust the mixture. Remember in particular that **watercolors lose saturation as they dry**: the mixed paint on your palette will look darker and more intense than it will appear on the paper.

This is the most complex and delicate part of the color mixing, so this is where your familiarity with the paints and your understanding of color mixing will finally become your only guides. This is also the point where you will most often get sucked into a fruitless mixing back and forth to find the right color.

If this happens, your fundamental problem is that the more paint you have mixed, the more paint you will have to add to shift the color a noticeable amount. This quickly becomes an accelerating waste of paint. The solution is to **throw out some of the mixture**. It is *always* more effective to drain off some of the mixture with a thirsty brush and continue mixing with what's left, than to keep adding more paint to a flooding pool.

Finally, no matter how confident you are, it is always a good idea to **test the mixture** one last time on scrap paper especially if you are mixing paint for a large wash or for a color area that must be "just right" to get the effect you want.

The "mix on the palette" method for building a color can help you work with mixtures made wet in wet, or by glazing.

The only trick with wet in wet mixtures is that you should **begin with the less staining paint** of the two mixing colors, regardless of mixing strength. The staining paint will get into the wet paper first, where it isn't going to mix with anything, making the color harder to budge by adding other paints. Thus, if you're mixing phthalo green and ultramarine blue to get a dark turquoise, apply the ultramarine in the right concentration, and add the phthalo green to it.

Glazing is more complex; see the page on using glazes (http://www.handprint.com/HP/WCL/tech25.html). In general, you want to order the glazes from light to dark, warm to cool, and opaque to transparent. (Staining, in itself, is much less of a consideration.) This approach produces the most homogenous final color, but it is not always easy to rank paints using those criteria. For example, we'd could start with hansa yellow (light valued, warm, transparent), then add a diluted glaze of cadmium scarlet (dark valued, warm, opaque), and finally a thin mixture of ultramarine blue (dark valued, cool, semitransparent).

Some art tutorials, for example by Stephen Quiller or Hilary Page, describe a color mixing procedure using *four* paints.

To get a burnt sienna color, the student is told to mix cadmium scarlet and hansa yellow to get an orange hue (as before), then to mix ultramarine with phthalo blue to get exactly the complementary shade of middle blue hue, and finally to mix the orange and blue together to get the dull sienna color.

This method is needlessly complicated and almost always wasteful.

Anything you can do with four paints you can do just as well with three. Only two paints are needed to establish the hue, and the third to adjust the saturation and value (and sometimes also to adjust the texture or handling attributes).

Like a table, the four paint method often wobbles around the mixing point because the exact balance is hard to find. The three paint method, like a three legged stool, is a rock solid method to get to the mixing point with minimum effort or guesswork.

(http://www.handprint.com/HP/WCL/wcolor.html)

handprint.com (http://www.handprint.com/HP/WCL/mix.html)