

## Blend modes notes

These are my notes on blend modes, garnered from a range of sources, including the official Affinity Photo videos (by James Ritson). – Dave (dmstraker)

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## History

The 19 original blends first appeared in Photoshop 3.0 in 1994 when Layers first appeared.

- Normal, Dissolve | Darken, Multiply, Colour Burn, Darken Colour | Lighten, Screen Colour Dodge, Lighter Colour | Overlay, Soft light, Hard light | Difference, Exclusion | Hue, Saturation, Colour, Luminosity

Five further blends added in Photoshop 7 in 2002.

- | Linear Burn | Linear Dodge (add) | Vivid Light, Linear Light, Pin Light | |

Another in Photoshop CS 2003

- | | | Hard Mix | |

And in Photoshop CS5 2010

- | | | Subtract, Divide | |

Painting modes also include

- Behind, Clear

Overall, then, there are 27 PS blend modes:

- Normal: Normal, Dissolve, (plus Behind and Clear in paint tools only)
- Darken: Darken, Multiply, Colour Burn, Linear Burn, Darken Colour
- Lighten: Lighten, Screen Colour Dodge, Linear Dodge (Add), Lighter Colour
- Blend: Overlay, Soft light, Hard light, Vivid Light, Linear Light, Pin Light, Hard Mix
- Inversion: Difference, Exclusion, Subtract, Divide
- Colour: Hue, Saturation, Colour, Luminosity

Affinity Photo additions:

- Average
- Negation
- Reflect
- Glow
- Contrast Negate
- Erase

## Basics

- Any item in layers panel can use blending modes, including pixel layers, adjustment layers and groups.
- Blends happen one pixel at a time, between top *blend* layer and bottom *base* layer, giving a *result* layer. Base + Blend = Result. (This is used in 'formula' below).
- Opacity often moderates the blend effect, allowing more of the base layer to be seen.
- A transparent Blend pixel will show an unaltered Base pixel.
- Opacity and Fill have the same result in 19 of the 27 blend modes.
- Many stronger blends work better at low opacity. Try changing this before giving up on a blend.

## Normal category

<i>Action</i>	Basic
<i>Effect</i>	
<i>Use</i>	

### Normal

<i>Action</i>	Top blend layer only is visible except when transparent.
<i>Formula</i>	Result = Blend (with Base at 100% - Opacity, as with all blends)
<i>Effect</i>	Layers below blocked.
<i>Use</i>	<p>Use in merged layer that combines layers below.</p> <p>Use in frequency separation portraits to blend out hotspots and uneven skin. Low opacity. Do before dodge/burn.</p> <p>Non-destructive painting: New pixel layer, Blend Mode: Normal. Paint on empty layer. Lets you play with Opacity, blend, etc.</p>

### Dissolve

<i>Action</i>	<p>Diffusion dither pattern based on random selection of Base or Blend layer pixels. High opacity selects more Blend pixels. Low opacity selects more Base pixels.</p> <p>No anti-aliasing is used, so result may appear harsh.</p>
<i>Formula</i>	Result = random choice of Blend or Base.
<i>Effect</i>	<p>Looks like Normal when 100% Opacity.</p> <p>Pixels are not blended. You get either a blend pixel or base pixel.</p>
<i>Use</i>	<p>To create granulated or grainy effects over an image or layer.</p> <p>Noise: Add pixel layer and fill with selected colour. Blend Mode: Dissolve.</p>

## Darken Category

<i>Action</i>	Darker pixels on blend layer are visible. Lighter ones become translucent.
<i>Effect</i>	<p>When Blend layer is white, Base layer pixels are unchanged (white is neutral colour).</p> <p>All other Blend layer colours darken the Base pixels.</p>
<i>Use</i>	<p>Create darker elements of image.</p> <p>Affinity: Unsharp Mask and Blend Mode. Radius right up. Blend Mode: Darken. This 'thickens up' only darker areas such as window frames.</p>

### Darken

<i>Action</i>	Looks at luminance of blend and base pixels. Selects whichever is darker. Uses RGB channels separately (unlike Darker Colour).
<i>Formula</i>	In each RGB channel: Result = darker of Blend or Base.
<i>Effect</i>	Black opaque. White transparent. Greys look kind of translucent (as individual pixels vary). Not very attractive.
<i>Use</i>	<p>Often need to reduce Opacity. Creates a darkened/faded look at about 65% Opacity.</p> <p>Combine masks to create new mask that combines black areas from each mask.</p>

	<p>Sharpen without white halos: Duplicate layer. Sharpen the duplicate, allowing white halos. Blend mode: Darken. You keep the dark side of lines, but lose the white side as the darker original takes precedence.</p> <p>Use with Lighten to create a soft-focus effect. Blur two layers and apply Darken mode to one and Lighten mode to the other to do this. The Opacity of each layer can be adjusted for the best effect.</p> <p>Use with Unsharp Mask to 'thicken up' darker areas such as window frames. Also to increase contrast in underexposed images (radius slider right up).</p> <p>To remove halo after haze removal: Add Gaussian Blur, checking 'Preserve alpha', blend mode: Darken, radius about 20. This gives darkish halo. Then invert the Gaussian Blur layer (Layer/Invert). Then paint in white over any visible haloing (this uses built-in mask for all adjustments) to restore dark halo. Then reopen Gaussian Blur and reduce Opacity until halo disappears (dark halo is counterbalancing light halo).</p> <p>Note: Multiply often better for general darkening.</p>
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## Multiply

<i>Action</i>	<p>Multiplies base luminosity by blend luminosity to give result luminosity. So <math>0.5 \times 0.5 = 0.25</math> (darker). White in blend layer has no effect. Darker greys progressively darken the image.</p> <p>Opposite of Screen. White is transparent.</p>
<i>Formula</i>	In each RGB channel: $\text{Result} = (\text{Base} * \text{Blend}) / 255$
<i>Effect</i>	<p>Nicer version of Darken. Image looks more 'real' than Darken as colours are retained. The effect is similar to sandwiching two filmstrip layers.</p> <p>Creates more saturated colours.</p> <p>This mode is symmetric, so exchanging two layers does not change the result.</p> <p>If both layers have the same picture, the result is the same as a gamma correction, with gamma=2.</p>
<i>Use</i>	<p>25-75% Opacity often best.</p> <p>Darken areas that are too light, especially if more detail is wanted in those areas. Duplicate layer and set the Blend mode of new layer to Multiply. Mask to constrain effect if needed.</p> <p>Two similar layers with Multiply result in darker image. Can be a useful trick to cope with under-exposure. Even better: Add curves or levels layer rather than duplicate image as this saves a lot on file size (and offers adjustment too).</p> <p>Multiply makes white disappear, so white page with black text on top of image shows image underneath. Opacity makes white page transparent.</p> <p>Blending darker object into a lighter background: Add as two layers and Multiply. Make sure dark object has light surroundings and light background has no dark areas. Select object and place on separate layer as needed.</p> <p>Darken background: Duplicate layer. Add curve and drag up left node to 25% of way up. Mask black this to focus area (like people). Blend Mode: Multiply.</p> <p>Darken highlights: Duplicate layer. Constrain to highlights with Blend Ranges. Blend Mode: Multiply.</p>

	<p>Fix faded photo: Add Levels adjustment layer. Blend Mode: Multiply. Duplicate for deeper effect.</p> <p>Vignette: Use to darken the corners of a vignette.</p> <p>Intensifying lighting: Duplicate lighting layer and set blend mode to Multiply. Increase Ambient, Specular and Shininess. Retweak Ambience on original layer and widen the cone a bit.</p> <p>Add colour cast: Layers/New Adjustment Layer/Recolour. Change Hue to orange. Turn down saturation for faint brown (woody scene). Blend Mode: Multiply. Come back later to tinker with this if needed to take edge off orange hue.</p>
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### Colour Burn

<i>Action</i>	Darkens the base pixel to reflect the blend pixel by increasing the contrast between the two.
<i>Formula</i>	For each RGB channel, Result = Base + N% of Blend. (N is higher for darker Blend).
<i>Effect</i>	<p>Darker than Multiply. Increases the contrast between colours rather than brightness. Base layer becomes darker, more contrasty, and picks up more of the blend colour as the blend colour becomes darker.</p> <p>Darkens the bottom colour pixels relative to the values of the top colour pixels. More highly saturated mid tones. Reduced highlights. Looks very similar to using Burn tool. White pixels make no change to blended layers.</p> <p>Changes with Opacity.</p>
<i>Use</i>	<p>Often better at 50% Opacity.</p> <p>Use to boost saturation and contrast. Deepen colours.</p> <p>Compensate for dark ground and light sky: Duplicate layer. In duplicate, select only sky. Blend mode: Colour Burn. Blue of sky is deepened, but white clouds are unaffected.</p> <p>Darken light areas: Duplicate layer. Blend Mode: Colour Burn. Mask out shadows and darks.</p> <p>Cartoon effect: Duplicate layer. Filters/Detect/Detect Edges. Layer/Invert. Blend Mode: Colour Burn. Add curves above it all and pull up midtones. (you can also make the layer black/white)</p>

### Linear Burn

<i>Action</i>	<p>Darkens base pixel, based on the value of the blend pixel colour.</p> <p>Acts on brightness rather than contrast.</p>
<i>Formula</i>	<p>X = Darkened Base. The darker the Blend colour, the greater the darkening effect.</p> <p>Result = X + N% of Blend. (N is higher for darker Blend).</p>
<i>Effect</i>	<p>Darker than Multiply.</p> <p>Less contrast or saturated than Colour Burn.</p> <p>Creates the greatest contrast in dark tones than any other blend mode in this Darken category.</p> <p>White Blend does not change Base. Darker Blend intensifies effect.</p> <p>Note: Colour Burn increases contrast of Base as Blend gets darker. Linear Burn does not increase the contrast.</p>

<i>Use</i>	Make tone and colour adjustments based on tone of Blend colour. Create washed-out effects and dark, vintage fades at about 75% Opacity. Intensify leaves: Duplicate background. Blend Mode: Linear Burn. Adjust Opacity.
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### Darker Colour

<i>Action</i>	Compares the total of all channel values for the blend and base colour and displays the lower value colour. Note: does not blend just pixels. Looks at composite of RGB channels, not individually (which Darken does).
<i>Formula</i>	
<i>Effect</i>	Very similar to Darken. Unattractive.
<i>Use</i>	Odd effects.

### Lighten category

<i>Action</i>	Lightens parts of image.
<i>Effect</i>	Opposites of each Darken mode. Black on Blend layer results in unchanged Base layer colour. Black is hence neutral colour. All other Blend layer colours lighten Base colours.
<i>Use</i>	Selective lightening.

### Lighten

<i>Action</i>	Looks at the colour information in each channel and selects the lightest base or blend colour. As with Darken, uses RGB channels separately.
<i>Formula</i>	For each of RGB: Result = Lighter of Base or Blend.
<i>Effect</i>	Brighter tones are unchanged while darker ones blend with the colours and tones below. Looks a bit like a foggy day with increasing blend layer lightness. Dark is transparent, White just goes white.
<i>Use</i>	Use in frequency separation portraits to lighten areas such as under eyes. Combine masks to create new mask that combines white areas from each mask. Perk up dominant eye in portrait: Select background layer. Layer/New Live Filter Layer/Live Unsharp Mask layer. Radius 100. Blend mode: Lighten. Layer/Invert, then paint in white on eye to sharpen/brighten it. Ensure Opacity high enough. Sharpen stars: Filters/Sharpen/Unsharp Mask. Blend Mode: Lighten. Radius right up.

### Screen

<i>Action</i>	Multiplies the inverse of the blend and base colours per RGB channel. Reduces contrast rather than brightness. Opposite of Multiply.
<i>Formula</i>	For each of RGB: Result = $255 - ((255 - \text{Base Color}) * (255 - \text{Blend Color})) / 255$
<i>Effect</i>	Nicer version of Lighten. Black is transparent. White remains. Acts like projecting multiple images onto the same screen. Makes images look like they have been bleached.
<i>Use</i>	Popular blend mode. Creating brightened/faded look.

	<p>Often used to lighten areas that are too dark.</p> <p>Screen makes Black disappear. So white text on black background on top of image. Reduce Opacity to make black background fade.</p> <p>Useful for blending image taken on black background into other images.</p> <p>Lighten dark areas (eg shadows): Duplicate layer. Set duplicate blend mode to Screen. Use Blend Ranges to constrain to darker areas. Mask as needed.</p> <p>Fade: Duplicate layer. Change to monochrome. Blend Mode: Screen.</p> <p>Perk up old photo: Add Levels layer. Blend Mode: Multiply. Add another Levels layer. Blend Mode: Screen.</p>
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### Colour Dodge

<i>Action</i>	<p>Brightens the base colour to reflect the blend colour by decreasing contrast between them.</p> <p>Opposite of Colour Burn.</p>
<i>Formula</i>	In each of RGB: $\text{Result} = \text{Base} / (255 - \text{Blend})$
<i>Effect</i>	<p>Similar to Dodge brush. Saturated mid-tones, blown-out highlights.</p> <p>Lighter tones create vibrant colours and increase contrast. Darker pixels have no effect.</p>
<i>Use</i>	<p>Reduce Opacity.</p> <p>Brighten mid-tones and leave darks alone.</p> <p>Enliven dull clouds with bright sun and dark foreground: Duplicate layer. Blend mode: Colour Dodge. Mask out highlights and whites.</p>

### Linear Dodge (aka Add)

<i>Action</i>	Brightens the base colour to reflect the blend colour by increasing the brightness.
<i>Formula</i>	In each of RGB: $\text{Result} = \text{Base} + \text{Blend}$ (clipped at 255 white)
<i>Effect</i>	<p>Stronger than Screen or Colour Dodge.</p> <p>Like Colour Dodge but no contrast adjustment.</p> <p>If blend colour is black, no effect is seen. If it is white, the result is white.</p>
<i>Use</i>	<p>Create bright/flat fade.</p> <p>Lighten area such as clouds: Duplicate layer. Blend Mode: Linear Dodge. Adjust with Opacity. Mask out areas where effect is not wanted.</p>

### Lighter Colour

<i>Action</i>	Compares the total of all channel values for the blend and base colour and displays the higher value colour.
<i>Formula</i>	
<i>Effect</i>	Similar to Lighten.
<i>Use</i>	<p>Not often.</p> <p>e.g. Put image of fire on top of person in dark coat. Lighter Colour blend makes fire replace coat.</p>



## Contrast category

<i>Action</i>	Use both lighten and darken to increase contrast. Compares against 50% grey. Darker uses darken mode, lighter uses lighten mode.
<i>Effect</i>	All modes in this category, except for Hard Mix, make 50% grey transparent.
<i>Use</i>	Change contrast of image.

## Overlay

<i>Action</i>	<p>Uses Screen at half strength on colours lighter than 50% grey, and Multiply at half strength for colours darker than 50% grey. 'Half strength' does not mean 50% Opacity.</p> <p>This mode uses brightness of base layer. All other Contrast modes use the brightness of the blend layer. Overlay and Hard Light are 'commuted' as applying one to the blend layer has the same result as applying the other to the base layer and reversing the order of the layers.</p>
<i>Formula</i>	Result = If Blend lightness > 50% grey then Multiply, else Screen.
<i>Effect</i>	<p>Adds contrast. Dark blend colours shift mid-tones to darker colours. Light blend colours shift mid-tones to lighter colours.</p> <p>Generally tries to preserve Base pixel highlight and shadow.</p>
<i>Use</i>	<p>Along with Multiply and Screen, this is a very popular mode.</p> <p>Increasing contrast: Duplicate layer (or add curves/levels layer). Set Overlay mode. Adjust with Opacity. Duplicate again for stronger effect. Add Gaussian blur to top layer for glow effect.</p> <p>Sharpening: Use in High Pass Sharpen.</p> <p>Enhance edges: Duplicate layer. Filter/Detect/Detect Edges. Layer/Invert. Blend Mode: Overlay. Adjust Opacity and Mask to suit.</p> <p>Dodge/burn: Add layer with 50% grey. Set Overlay blend mode. Paint on with black brush to burn in dark tones. Use white brush and to lighten mid-tones and highlights. Control with Opacity.</p> <p>Colour intensification: Paint in black with Blend Mode: Overlay. Change strength of effect with Opacity.</p> <p>Add structure to sky: Paint texture brush, black, Blend Mode: Overlay.</p> <p>Diffuse glow: Layer/New Live Filter layer/Gaussian Blur. Check 'Preserve Alpha' [to stop image boundary blurring]. Increase radius (to about middle). Blend Mode: Overlay. Blend Ranges (cogwheel icon on layer): drag down left node. Uncheck Linear and drag down middle of left curve to apply effect only to highlights.</p> <p>Diffuse glow alternative: Select highlights: Select/Tonal range/Highlights. (or Ctrl-Shift-click on pixel layer icon.) Layer/New Live layer/Lens Blur. Check 'Preserve Alpha'. Increase radius (to about middle). Blend Mode: Overlay. Tweak radius to suit.</p> <p>Bring out lights: New pixel layer. Blend Mode: Overlay. Soft brush. Colour: white (sliders all right) with tweaks downwards (typically yellow, to bring out lights). Opacity about 40%. Paint over areas where there are lights or are lit, to bring out light more.</p> <p>Intensify colours: New pixel layer. Blend Mode: Overlay. Opacity about 25%. Click-drag colour dropper on colour panel to pick up common mid colour (eg orange) and click small circle by dropper to assign to brush colour. Tweak colour sliders to add</p>

	<p>drama. Paint over the areas where the colour is prevalent, particularly to strengthen key areas for visual attention. [Experiment with final tweak with Opacity]</p> <p>Colour toning: Rather than use adjustments, start with a white vector rectangle (LH toolbar) drawn over the image. Blend Mode: Overlay. Play with colour sliders to tint image.</p> <p>Reflect lights onto buildings: Add pixel layer. Blend Mode Overlay. Opacity 20-30%. Colour is light version of illumination colour (eg. Blue) and single-click paint hints of light on buildings or surroundings.</p> <p>Darken background: Layer/New Fill Layer. This starts with Gradient Tool selected. Set gradient to separate background from subject. Blend Mode: Overlay. Right gradient node a dark grey. Opacity right down to decrease white node effect.</p> <p>Intensify eyes: New pixel layer. Blend Mode: Overlay. Opacity 50%. Soft Paintbrush. Alt-click to pick up main colour in eye. Then vary this on the colour panel to something stronger. Paint around iris. Adjust with Opacity.</p>
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### Soft Light

<i>Action</i>	<p>If the blend colour (light source) is lighter than 50% grey, the image is lightened as if it were dodged. If the blend colour is darker than 50% grey, the image is darkened as if it were burned in.</p> <p>Uses Blend pixels to dodge and burn Base pixels.</p> <p>Uses gamma adjustment to darken or lighten. Pure black or white produces a distinctly darker or lighter area, but does not result in pure black or white.</p>
<i>Formula</i>	<p>Result = If Blend lightness &gt; 50% grey then darken, else lighten.</p> <p>Note: There are several different algorithms used to create soft light.</p>
<i>Effect</i>	<p>Like to Overlay, but softer and without the harsh contrast. Similar to shining a diffused spotlight on the image.</p> <p>Reduces contrast. If Base and Blend are both black, the result is dark grey. If Base and Blend are both white, then result is off-white.</p>
<i>Use</i>	<p>Create soft contrast.</p> <p>Reduce harsh shadows.</p> <p>Darken over-bright areas.</p> <p>Use for gentle High-Pass Sharpen.</p> <p>Tint: Add a pixel layer and make it a bold colour. Blend Mode: Soft Light. Reduce Opacity to shade tint down to desired level.</p> <p>Gentle Dodge and Burn: Add pixel layer, filled with 50% grey. Blend Mode: Soft Light. Paint with white to Dodge, and black to Burn. Control effect with Opacity and softened brush.</p> <p>Glow: Duplicate layer. Make black/white. Gaussian blur, very blurred. Blend Mode: Screen. Note: Can create halo, so use separated layers to constrain this.</p> <p>Soften: Add texture layer with Soft Light to create subtle texture. Control with Opacity.</p>

### Hard Light

<i>Action</i>	<p>If the blend colour is lighter than 50% grey, the result is lightened. If the blend colour is darker than 50% grey, the image is darkened.</p>
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	Uses Blend pixels to Multiply and Screen Base pixels.
<i>Formula</i>	Result = Base lightened if Blend < 50% grey, else Base darkened. Contrast also increased.
<i>Effect</i>	Like Soft Light taken to extremes. Similar to shining a harsh spotlight on the image. This is the 'reverse' of Overlay. It is not related to Soft Light. Reverse order of layers and it will look like Overlay.
<i>Use</i>	Useful for adding highlights. Reducing Opacity is often needed to get useful results. Strong Dodge and Burn: Add pixel layer, filled with 50% grey. Blend Mode: Hard Light. Paint with white to Dodge, and black to Burn. Control effect with Opacity and softened brush. Beware of colours getting a grey tinge. Put image of fire on top of person in dark coat. Bringing out water detail: Layer/New Live Filter Layer/High Pass filter. Monochrome. Radius 30-40 px. Select just HP layer. Right-click Invert (inverts mask). Soft paintbrush. Paint white to restore HP over water. Don't worry about a bit of overspill. Blend Mode: Hard light. Adjust opacity. Lighting glow: Add glow with Gaussian Blur, check 'Preserve alpha', radius 9, Blend Mode: Hard light. Layer/Invert. Soft paint brush, Opacity 50%, paint where light is hitting most strongly. Opacity 25%, paint the blur into darker areas at edges. Note that Hard Light glow is more contrasty than Overlay glow. Colour pop: White balance adjustment. Tweak. Blend Mode: Hard light. Pops colours, increases contrast. High Pass sharpening: Use for hard sharpening effect. Adding fog or haze: Add pixel layer. Draw fog: Gradient tool. Shift-drag down from top of screen to paint grey gradient. Ease off on darks: Blend Mode: Hard light. Blend ranges: pull down left side of left graph.

### Vivid Light

<i>Action</i>	If the blend colour is lighter than 50% grey, the image is lightened by decreasing the contrast. If the blend colour is darker than 50% grey, the image is darkened by increasing the contrast.
<i>Formula</i>	Result = if Blend < 50%, then decrease contrast, else increase contrast. Increase effect as Blend colour moves towards 0% or 100%.
<i>Effect</i>	Extreme version of Overlay or Soft Light. Base layer contrast changed.
<i>Use</i>	Add punch, lifting flat images. Reducing Opacity is often needed to get useful results. Changing Fill also changes the effect. Mask to target area as needed.

### Linear Light

<i>Action</i>	If the blend colour is lighter than 50% grey, the image is lightened by increasing the brightness. If the blend colour is darker than 50% grey, the image is darkened by decreasing the brightness. Uses Linear Dodge on lighter pixels and Linear Burn on darker pixels. Like Vivid Light, but acts on brightness rather than contrast.
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<i>Formula</i>	Result = if Blend < 50%, then decrease brightness, else increase brightness. Increase effect as Blend colour moves towards 0% or 100%.
<i>Effect</i>	Extreme contrastive effects.
<i>Use</i>	<p>Adds punch, lifting flat image. Reducing Opacity or Fill is often needed to get useful results.</p> <p>Bringing out water detail: Layer/New Live Filter Layer/High Pass filter. Monochrome. Radius 30-40 px. Select just HP layer. Right-click Invert (inverts mask). Soft paintbrush. Paint white to restore HP over water. Don't worry about a bit of overspill. Blend Mode: Linear light. Adjust opacity.</p> <p>Sharpen eye more: Select background. Add High Pass filter layer. Select Monochrome. Radius 2px. Select High Pass layer. Layer/Invert. Paint white over eye to expose High Pass. Blend Mode: Linear Light.</p> <p>Sharpening: Duplicate main layer. Filters/Sharpen/High Pass. Change radius to select amount of high frequency data to sharpen. To stick to smaller details, the mask will look less obvious. Blend Mode: Linear Light.</p>

### Pin Light

<i>Action</i>	If the blend colour is lighter than 50% grey, pixels darker than the blend colour are replaced, and pixels lighter than the blend colour do not change. If the blend colour is darker than 50% gray, pixels lighter than the blend colour are replaced, and pixels darker than the blend colour do not change.
<i>Formula</i>	<p>Result = if Blend &lt; 50% grey and Base darker than Blend, then darken Base else no change.</p> <p>If Blend &gt; 50% grey and Base lighter than Blend, lighten Base else no change.</p>
<i>Effect</i>	Blotchy. Removes all mid-tones.
<i>Use</i>	<p>Special effects.</p> <p>Edge effect: Unlock background. Filters/Detect/Detect Edges. Blend Mode: Pin Light. Add pixel layer beneath. Flood fill with chosen colour.</p>

### Hard Mix

<i>Action</i>	Adds the red, green and blue channel values of the blend colour to the RGB values of the base colour. If the resulting sum for a channel is 255 or greater, it receives a value of 255; if less than 255, a value of 0. Therefore, all blended pixels have red, green, and blue channel values of either 0 or 255.
<i>Formula</i>	For each of RGB, Result = if (Base + Blend) > 255 then 255 else 0.
<i>Effect</i>	Changes all pixels to RGB, CMY, white, or black. Consequent solarizing effect.
<i>Use</i>	<p>Creating half tones.</p> <p>Noisy image: Duplicate layer. Filter/Noise/Add Noise. Full up. Invert image. Blend Mode: Hard Mix.</p> <p>Woodcut effect: Make image black and white. Duplicate. Invert duplicate layer. Gaussian Blur duplicate layer. Blend mode: Hard Mix.</p> <p>Reduce Opacity for useful results.</p>

### Inversion category

<i>Action</i>	Blends layers based on difference between two layers.
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<i>Effect</i>	
<i>Use</i>	Various uses not related to changing final image (more for temporarily highlighting aspects image).

### Difference

<i>Action</i>	Subtracts either the blend colour from the base colour or the base colour from the blend colour, depending on which has the greater brightness value (uses absolute value of the difference).
<i>Formula</i>	For each of RGB: Result = Abs (Blend – Base). Any minus sign is removed.
<i>Effect</i>	White inverts colour. Black has no effect. Two identical images will appear black. When both Base and Blend are the same, Result is black. When they are opposite, result is white.  All-white Blend layer results in negative. All-black Blend layer results in normal Base colours.
<i>Use</i>	Aligning image stack pairs – any lack of alignment is seen clearly as non-black areas. Temporarily increase brightness of top layer a bit to see the images.

### Exclusion

<i>Action</i>	Like Difference except that the contrast is lower.
<i>Formula</i>	For each of RGB: Result = Abs (Base - N% of Blend), where N is less than 100.
<i>Effect</i>	Similar but lower contrast than Difference. White inverts, Black no effect. Mid-tones: 50% grey shows 50% grey.
<i>Use</i>	A neat use: Exclusion duplicate layer twice. B/W. Invert. Gives soft grey mono picture. Blend back with original. Several modes work, such as Multiply (play with Curves), Colour Burn (reduce Opacity) Soft Light, Colour (interesting mono).  Use to align images, like Difference. But you can always see the picture as well as the distinct non-overlapped areas.

### Subtract

<i>Action</i>	Subtracts the blend colour from the base colour. Negative values are clipped to zero.
<i>Formula</i>	Result = if (Base – Blend) < 0 then 0 [which is black], else (Base – Blend)
<i>Effect</i>	Progressively darkens by subtracting brightness.
<i>Use</i>	Sharpening: Duplicate layer. Filters/Detect/Detect Edges. Blend Mode: Subtract. Strong sharpening effect. Correct colours with HSL layer (nest under pixel layer) and turn Saturation right down. Add Gaussian Blur layer under pixel layer, small blur (.7).  Inverse sharpening: Duplicate layer. Layer/Invert. Filters/Detect/Detect Edges. Blend Mode: Subtract. Add Curves above everything, pulling up midtones for brightening.

### Divide

<i>Action</i>	Divides the blend colour from the base colour.
<i>Formula</i>	Result = if (Base/ Blend) > 1 then 1 [which is white], else (Base / Blend)
<i>Effect</i>	Opposite to Subtract.
<i>Use</i>	Brightening photos if the color is on grey or less.

	Remove a tint: Create layer that is the colour tint to remove. Blend Mode: Divide.
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## Component category

<i>Action</i>	Use combination of HSL to create blend.
<i>Effect</i>	
<i>Use</i>	Add one of HS or L to image.

## Hue

<i>Action</i>	Creates a result colour with the luminance and saturation of the base colour and the hue of the blend colour.
<i>Formula</i>	$\text{Result} = \text{Hue}(\text{Blend}) + \text{Saturation}(\text{Base}) + \text{Luminance}(\text{Base})$
<i>Effect</i>	Colour change effect. Creates mono image with any mono blend layer. Blend layer hues have weird psychedelic action.
<i>Use</i>	Change hues while maintaining tone and saturation. Add layer of new replacement hue. Use mask to restrict the hue to target areas. Eye colour change: Add new colour in pixel layer above eye. Blend Mode: Hue.

## Saturation

<i>Action</i>	Creates a result colour with the luminance and hue of the base colour and the saturation of the blend colour.
<i>Formula</i>	$\text{Result} = \text{Hue}(\text{Base}) + \text{Saturation}(\text{Blend}) + \text{Luminance}(\text{Base})$
<i>Effect</i>	Colour change effect. Creates mono image with any mono blend layer. No effect when colour is 50% grey.
<i>Use</i>	Good for isolating areas of colour. Works well for fading and intensifying colour. Colour pop: Duplicate layer. Select item to pop. Invert Selection. Fill with 50% grey. Blend Mode Saturation. Opacity changed to suit. (Variation: use gradient on grey).

## Colour

<i>Action</i>	Creates a result colour with the luminance of the base colour and the hue and saturation of the blend colour.
<i>Formula</i>	$\text{Result} = \text{Hue}(\text{Blend}) + \text{Saturation}(\text{Blend}) + \text{Luminance}(\text{Base})$
<i>Effect</i>	Preserves base layer luminosity. Colour comes from blend layer. Opposite of Luminosity.
<i>Use</i>	Colouring monochrome images and for tinting colour images. Whole image tint: New fill layer. Fill with desired colour. Blend Mode: Colour. Adjust with Opacity. Colour change: New layer. Paint over existing colour area (eg. car) with new colour. Blend Mode: Colour. (Constrain by selecting/refining area first). Turn down Opacity for tint. Use in frequency separation portraits to smooth out skin. Eye shadow: Add new pixel layer. Blend Mode: Colour. Select colour and paint it in with soft brush.

## Luminosity

<i>Action</i>	Creates a result colour with the hue and saturation of the base colour and the luminance of the blend colour. Reverse (commuted) effect of Colour mode.
<i>Formula</i>	Result = Hue(Base) + Saturation(Base) + Luminance(Blend)
<i>Effect</i>	Preserves colour of base layer. Luminosity comes from blend layer. Blended layer on top takes on the colours of the layer below. Opposite of Colour blend mode.
<i>Use</i>	Useful for sustaining colour. Used in colour correction and colour toning. Good for use with Levels or Curves when addressing luminosity issues, to avoid affecting hue or s Colour intensity: Add b/w adjustment layer. Turns b/w. Changing blue changes the luminosity of the sky. Blend Mode: Luminosity. Now colour picture again. Changing blue still changes luminosity of sky. Great for darkening skies (and other colours). Sharpening without halos: Sharpen on separate layer. Blend mode: Luminosity. (Only luminosity is used in sharpening in final image – colour comes from original image).

## Painting modes

<i>Action</i>	
<i>Effect</i>	
<i>Use</i>	Only available in paint brush modes.

## Behind

<i>Action</i>	Only lets you paint on transparent pixels.
<i>Formula</i>	
<i>Effect</i>	
<i>Use</i>	Useful for preserving image while painting in holes, borders, etc.

## Clear

<i>Action</i>	Painting deletes pixels.
<i>Formula</i>	
<i>Effect</i>	
<i>Use</i>	Much like eraser tool.

## Affinity adds

<i>Action</i>	These are blend modes added by Affinity Photo.
<i>Effect</i>	
<i>Use</i>	

## Average

<i>Action</i>	
<i>Formula</i>	
<i>Effect</i>	
<i>Use</i>	

**Negation**

<i>Action</i>	
<i>Formula</i>	
<i>Effect</i>	
<i>Use</i>	

**Reflect**

<i>Action</i>	
<i>Formula</i>	
<i>Effect</i>	
<i>Use</i>	<p>Changing eye colour: New pixel layer. Blend mode Reflect. 25% opacity. Darken colour of brush. Paint over eyes again to give more depth. Experiment with Opacity and blending of two pixel layers.</p> <p>Improve stone texture: Layer/New Adjustment Layer/Recolour. Orange. Lower saturation. Blend Mode: Reflect.</p>

**Glow**

<i>Action</i>	
<i>Formula</i>	
<i>Effect</i>	
<i>Use</i>	<p>Radial blend to create glowing punch: New pixel layer. Set radial gradient centred on focal point in image. In gradient colour (top context toolbar towards left) darken outer (right) colour. Blend Mode: glow. Darken white end of gradient to improve visibility in image. Re-adjust gradient nodes on photo.</p> <p>Improve stone texture: Layer/New Adjustment Layer/Recolour. Orange. Lower saturation. Blend Mode: Glow. Adjust opacity.</p> <p>Add radiance to lights: Add another pixel layer. Colour: light version of illumination colour (eg blue). Blend Mode: Glow. Opacity about 20%. Paint around illuminated areas of same colour to spread light, including reflections. Use cautiously as this doesn't blend as subtly as Overlay blending.</p>

**Contrast Negate**

<i>Action</i>	
<i>Formula</i>	
<i>Effect</i>	
<i>Use</i>	

**Erase**

<i>Action</i>	
<i>Formula</i>	
<i>Effect</i>	
<i>Use</i>	



## Group blending

<i>Action</i>	Group has default of pass-through blending mode, that does nothing. Change this and (a) layers in group are blended by their rules, then (b) the group composite is blended with layers below according to the group blend mode.
<i>Formula</i>	
<i>Effect</i>	
<i>Use</i>	Useful in compositing. Make group mode 'Normal'. Apply weird effect within group (eg. zany curves). Effect only happens to group. Copying group copies this effect to second group.