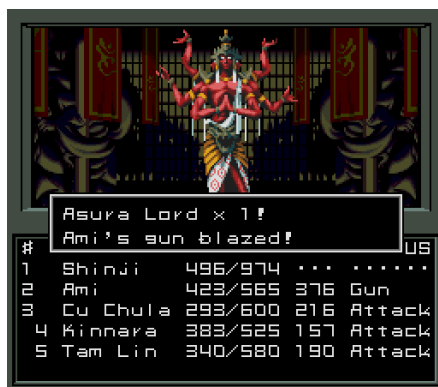# PIXEL LOGIC

The PDF archives
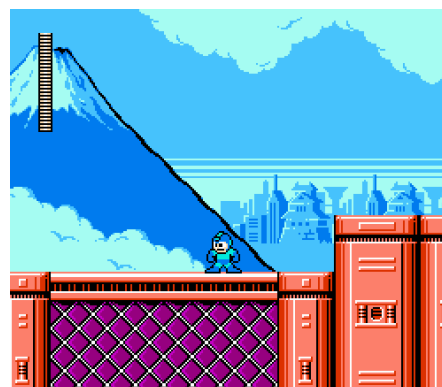
Chapter 3: Colour

Introduction

Colours are lots of fun but it can get tricky. They are the **most subjective** part of sprites as they build **the atmosphere of a game /picture**.

Batman (1989 , NES)

Shin Megami Tensei (1992 , SNES)

Mega Man 6 (1994 , NES)

Super Metroid (1994 ,SNES)
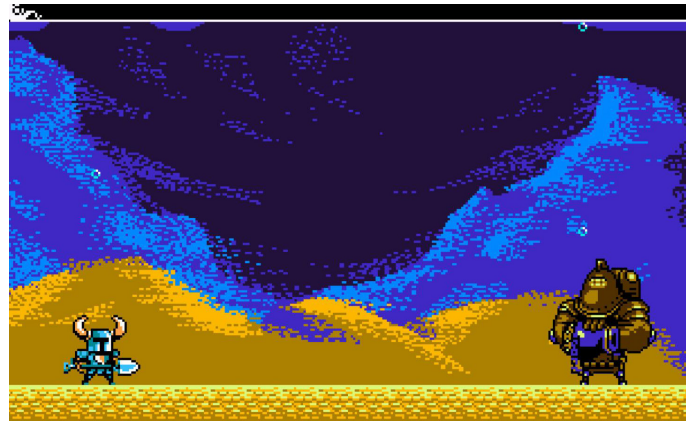

Tales of Phantasia (1995, SNES)

SMW2: Yoshi's Island (1995, SNES)

Red Earth (1996 , Arcade)

Breath of Fire IV (2000 , PS1)

Left: Drawn to Life (2007, NDS)
Top right : Shovel Knight (2014, Various)
Bottom right : Mighty Switch Force (2013, WiiU/3DS)

Colour theory is a universal skill.

It can be applied to all kinds of arts: from painting and photography to Interior design. **We won't delve into much detail here**, because it's something already taught in schools and tutorials regarding colour theory are widely spread across the internet. Colours can make or break an image, so make sure you know your basic colour theory skills.

For Pixel-logic we will just **focus on aspects *specifically* for pixel art and game design**.

SOME SECTIONS HAVE COLOURS WITH LOW BRIGHTNESS.
Colours are not displayed the same way on all monitors.
It's a common issue with art. **Please adjust your settings**!

How to pick colours

Pixel art is a digital art. Unlike traditional media, making colors works **with sliders**.
Here are the 3 factors that make up a colour for digital art. You can find them in all software.

**For this book, we will use Method 1 as the standard for
future pages and explanations that refer to colour picking.**

## Method 1 - The 3 Colour sliders

Hue

Saturation
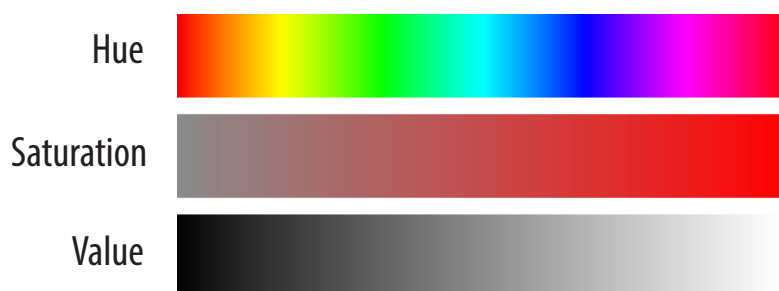
Value

Note: Some programs use *Brightness* instead of *Value*. It's just a different name.
When the third slider says *Luminosity* it goes towards white rather than the pure hue.

Most, if not all programs should have **extra colour pickers**.
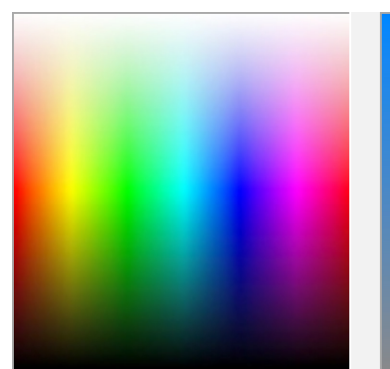These 3 factors are not displayed the same way in each program!
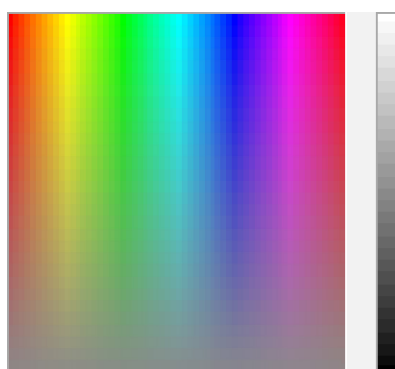
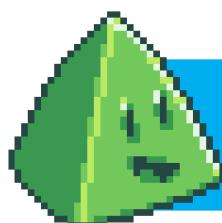**Hue** + Saturation / *Value*

MSPaint, GraphicsGale , Flash
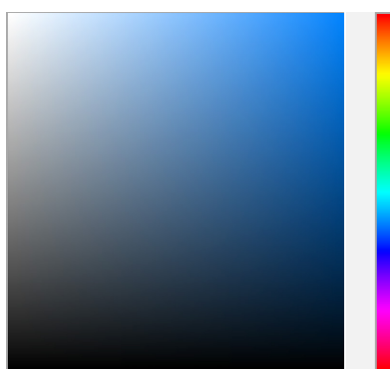
Value + Saturation / **Hue**

**Paint Tool SAI , Photoshop,
Clip/Manga Studio**

Hue + Saturation / *Value*

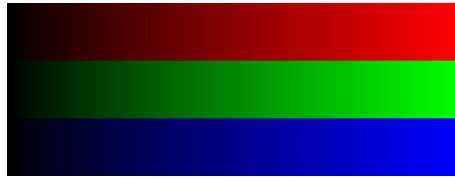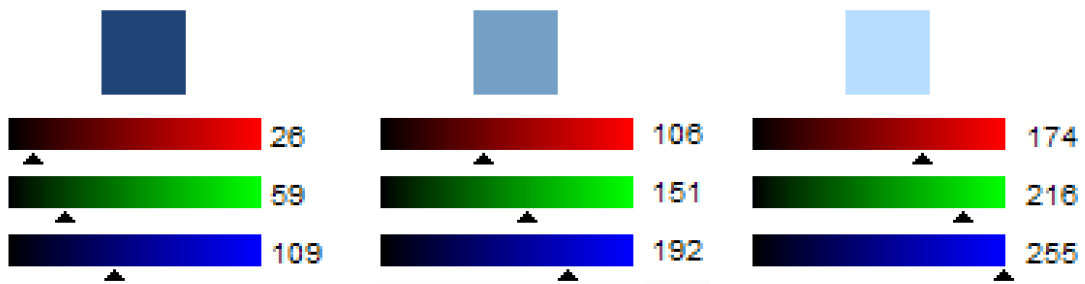**Pro Motion , Photoshop,**

Some programs use triangles or circles for picking colours instead
of a square. Don't worry: You'll always have what you need.
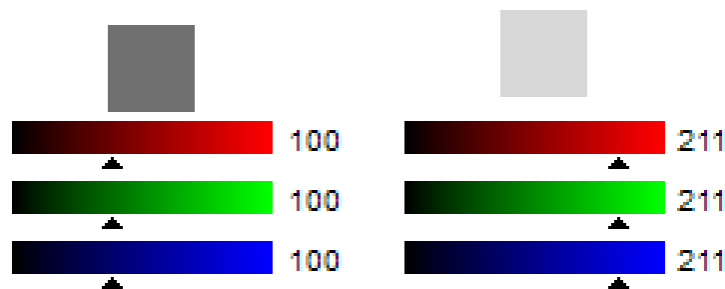
Method 2 – Red, Green, Blue
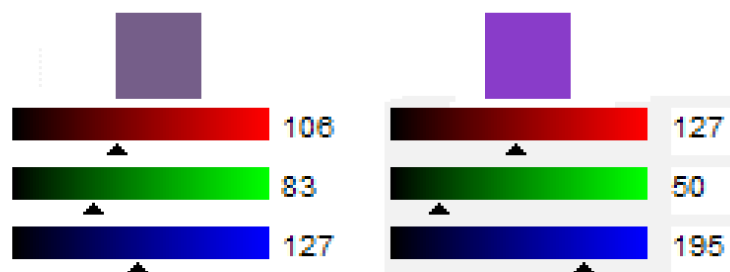
RGB, is an **additive** colouring method:

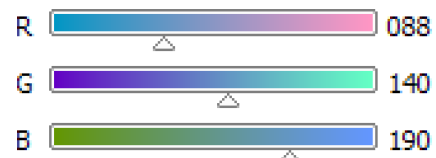To obtain **lighter colours**, you **add more** of each value.

26	106	174
59	151	216
109	192	255

To obtain pure **greys**, give **the same value to each slider**.

100	211
100	211
100	211

To obtain **duller colours**, move the sliders **closer together**.

106	127
83	50
127	195

Some programs help you mix colours by showing a preview of what colours you can possibly make.

R 088
G 140
B 190

Why make palettes?

Having a palette doesn't necessarily mean literally having colours on the side. You can still eye-drop colours within your pixel art. Don't worry.
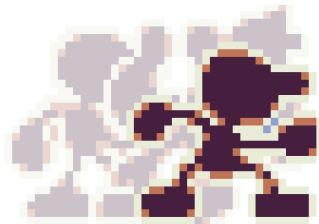
Saves you time

You save more time eye dropping the same colours, instead of recreating new ones or blending them.

Keeps you organized

If you're using loads of colours, you might get lost. It's a hassle trying to find colours if you're working with big art.

Makes animation easier

The more shades you have, the harder it is to animate sprites. You don't want colours to flash when your pixel art animates.

Here, a palette is not really needed here, just eye drop!

However ,this definitely requires a palette

*By guest artist Justin Cyr*

By guest artist Ahruon

Some programs will automatically generate a palette for you, so you don't have to!

Colour ramps

These are ramps. Simple!

Pixel art and **having a low amount of colours** go hand in hand.
A good way to do that, is by reusing the same colours across different shades.
You're not obliged to do this, but it can create some interesting harmo-
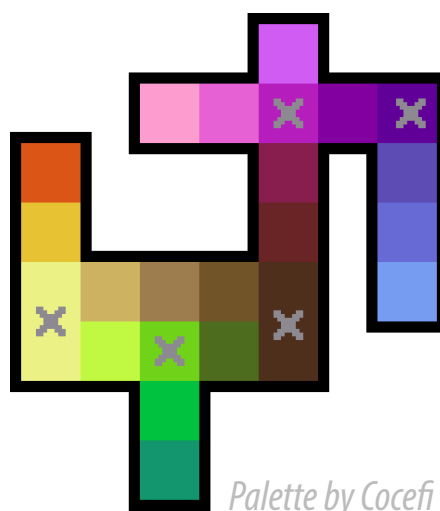
X = Shared colours

Palette by Cocefi

You might think: "This is confusing to me". It doesn't matter how you display your palette.
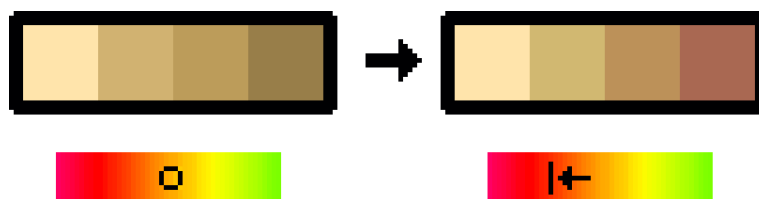
As long as YOU know how to use it. See?
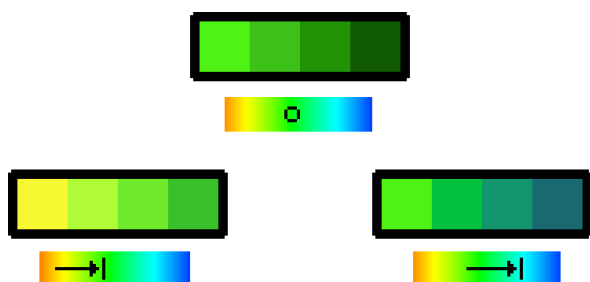You can still mix ramps!

Hue shifting

Hue shifting, also known as "coloured shadows" can also be applied to any other visual art. It makes your art more colourful and appealing to look at.
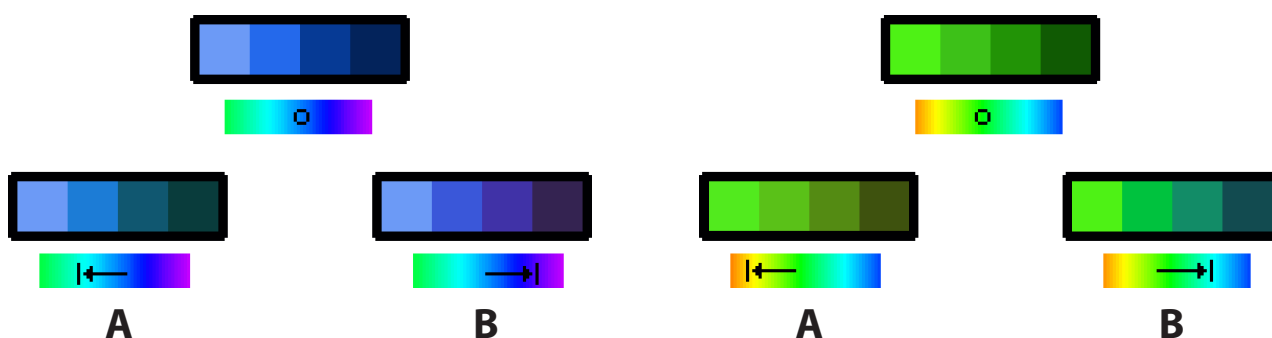
Method 1 - Regular hue shift

Light brown, used for every shade.
The shadow is boring black.

With every shade, they become more red.
The shadow is now warm red.

You can give green different moods by giving highlights and shadows different colours.

Do this by **shifting the hue sliders.**
It's up to you how much you shift hues.
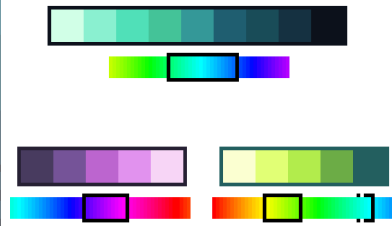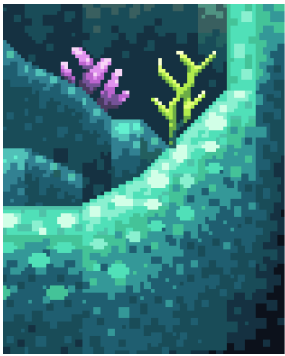
A

B

A

B

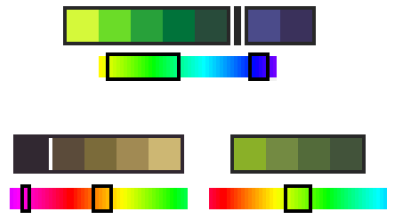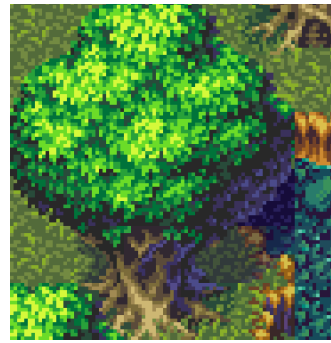You can hue shift left or right on the colour slider.
The **A** ramps hue shift towards yellow slightly, whereas the **B** ramps hue shift towards purple.

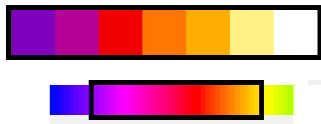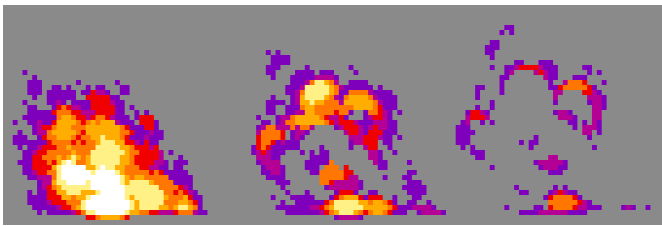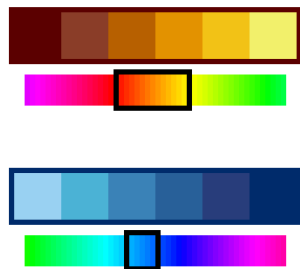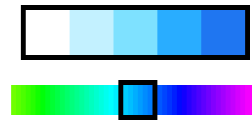**The A ramps look a bit odd. The B ramps are probably what you're familiar with.**
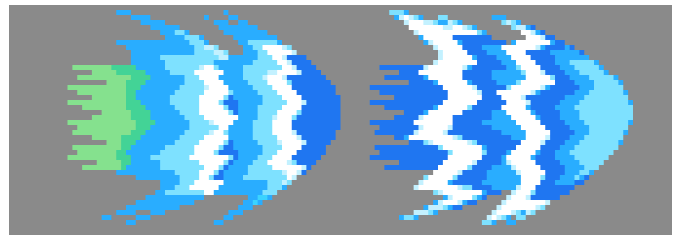
Sonic Rush Adventure (2007 , NDS)

Seiken Densetsu 3 (1995 , SNES)

Sonic Rush Adventure (2007 , NDS)

Mighty Gunvolt (2014 , 3DS)
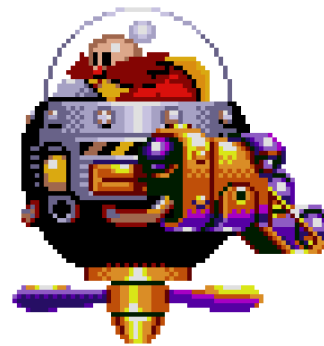
Sonic 3 (1994 , Genesis)
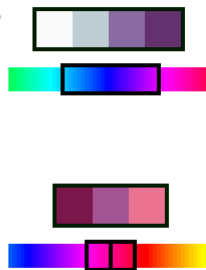
Coropata (2009 , NDS)

Yellow is the brightest colour of the rainbow. Purple is the darkest. **This is why generally people often hue shift from yellow to purple**.

light

hue shift gravitates towards purple

dark
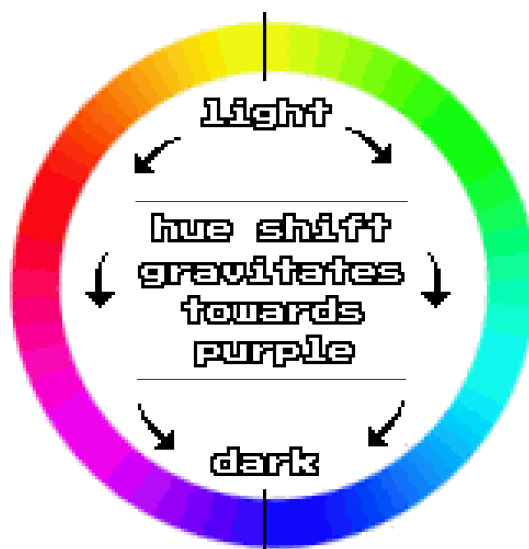
You can have subtle hue shift or drastic hue shift. It's a matter of preference.

Method 2 - Multiply layers

Instead of manually hue shifting ever colour ramp, you can experiment with shadows by using multiply layers. You can find them in more complex software.

MULTIPLY 50%

MULTIPLY 50%

MULTIPLY 50%
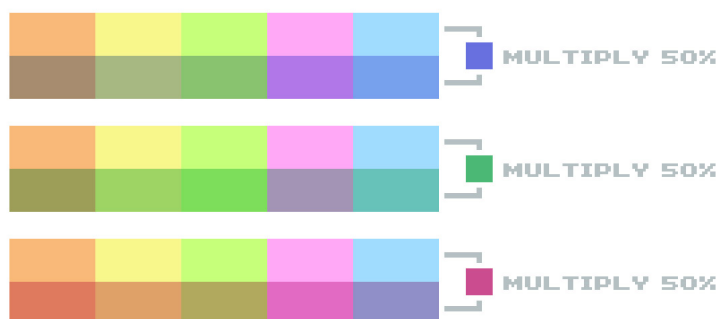
Palette by Cocefi

Once you found some cool combinations just eye-drop away!
The examples just show blue green and magenta, but you can use other colours!
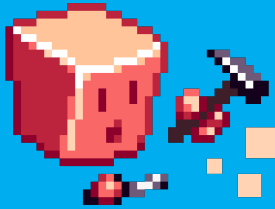
Saturation shift isn't just like hue shift. Hue is used to create an atmosphere or feeling.
Saturation is used to highlight a particular area of your shading.
Don't think of colours like numbers. Just experiment, and see what suits you.

All colours are the same saturation	*Mixed saturation*	*Saturated shadows- Desaturated highlights*	*Desaturated shadows - Saturated highlights*	*1 shade is heavily saturated*

The lighter shade is **vibrant**.
The darker shade is **dull**.

The lighter shade is **dull**.
The darker shade is **vibrant**.

By guest artist Ahruon

Conclusion

Take a look at this Tentacruel sprite, both in its original form and its manually edited versions.
See the differences? Small colour choices can have big effects!

flat

no
hue shift

hue shift
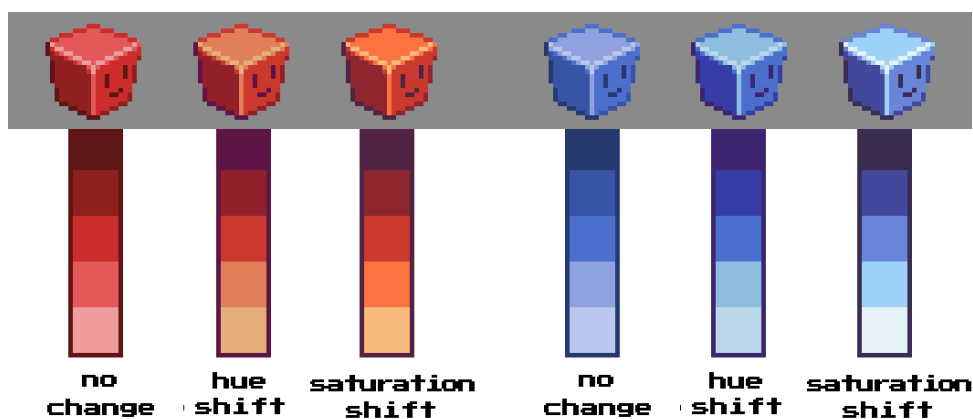
+green

+blue
multiply

+magenta

Pokémon Heart Gold/Soul Silver (2009, DS)

These are just a few methods to alter colours.
The key is to experiment and study other pictures you like.
Hue and saturation are ESSENTIAL to shading and anti-aliasing.

no
change

hue
shift

saturation
shift

no
change

hue
shift

saturation
shift

Black tones

You can do so much more to add style to your sprites!
Quite a few artists and games add a colour tint to the black or choose a dark grey.

Fire Emblem (GBA), Mega Man 7 (SNES), Mario Party Advance (GBA), Legend of Zelda: Link to the Past (SNES),
Mario & Luigi: Dream Team (NDS), Earthbound (SNES), Chrono Trigger (SNES), Breath of Fire IV (PS1)

There isn't a technical reason why pixel artists or games choose to do this.
It has got nothing to do with limitations. It's purely aesthetic!

From L to R : Super Mario Kart (SNES), SMW2: Yoshi's Island (SNES), SMA3: Yoshi's Island (GBA), Mario & Luigi:
Superstar Saga (GBA), Mario Party Advance (GBA), Mario & Luigi: Partners in Time (NDS), Yoshi's Island DS (NDS)

Black tones are not limited by game or style.
Even within the same game or **within the same style**, you can have **subtle differences**:

Dull purple

pure black

dark brown

dull cyan

Pokémon Black & White (2011, NDS)

Can't see the subtle differences? **Let's brighten them up a little bit**.

Dull purple

pure black

dark brown

dull cyan

Even though your monitor does not display these colours, remember that your pixel art is being shared online, on different platforms or different systems. Brightness will vary from each device.

Using greys

Greys are like the Ditto of colours. They can easily camouflage their way into a sprite without you even realizing it.
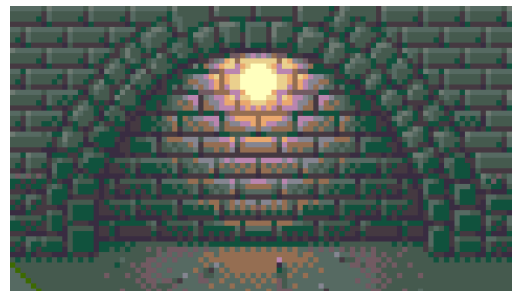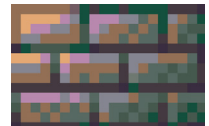
Especially with a limited palette. It works well with palettes that have special lightsources atmospheres: night time palettes, fiery red environments, toxic green glow and so much more!
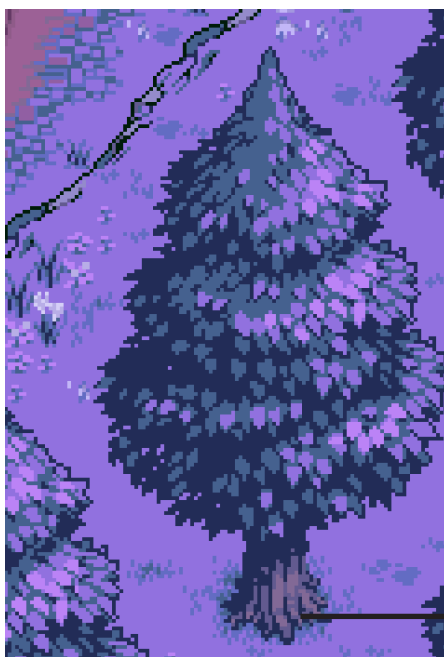
When you blend 2 complementary colours, you obtain almost a pure grey. It makes grey perfect for blending. Not pretty, but useful!
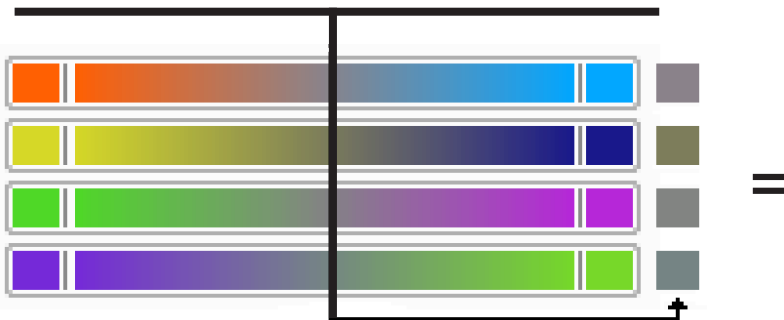
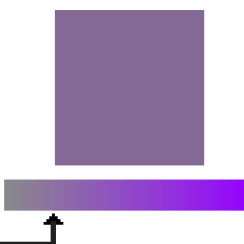Greys cancels out colours. It makes them neutral.

=

The Chaos Engine (1993, Amiga CD32)

This is a tree from *Boktai: The Sun Is In Your Hand* (2003, GBA). The overall mood and lighting of this scene is purple, and as such all the colours appear different than their usual hues.

The tree trunk *looks brown*, but under a night-time light. It's *actually a grey with hints of purple*.

If you de-saturate colours, you can easily fool people's eyes and mimic colours under a different light! That's why greys can easily blend in.

Use greys to substitute colours.

The use of greys will be mentioned again in the chapter "sub-pixeling".

Choosing colours I

Guest writer: Cocefi

Black tones

Try avoiding pure blacks unless it's truly necessary. You can use dark brown, deep purple, dark green or even dark grey instead!
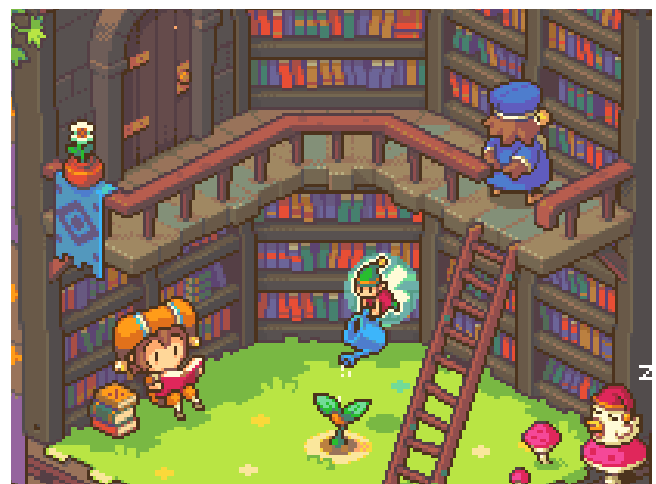
Shadows

Give shadows a colour tint too. Whenever possible, compliment the shadow colour with the highlight.

The soft pink roof has a dull purple shadow. Cocefi's highlights tend to have bright saturated colours. His shadows are a little bit desaturated and hue shift.
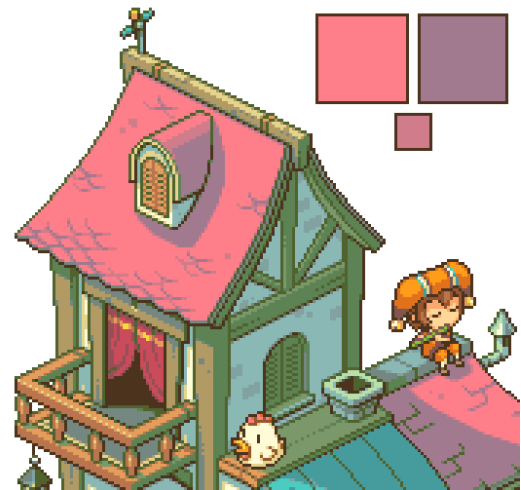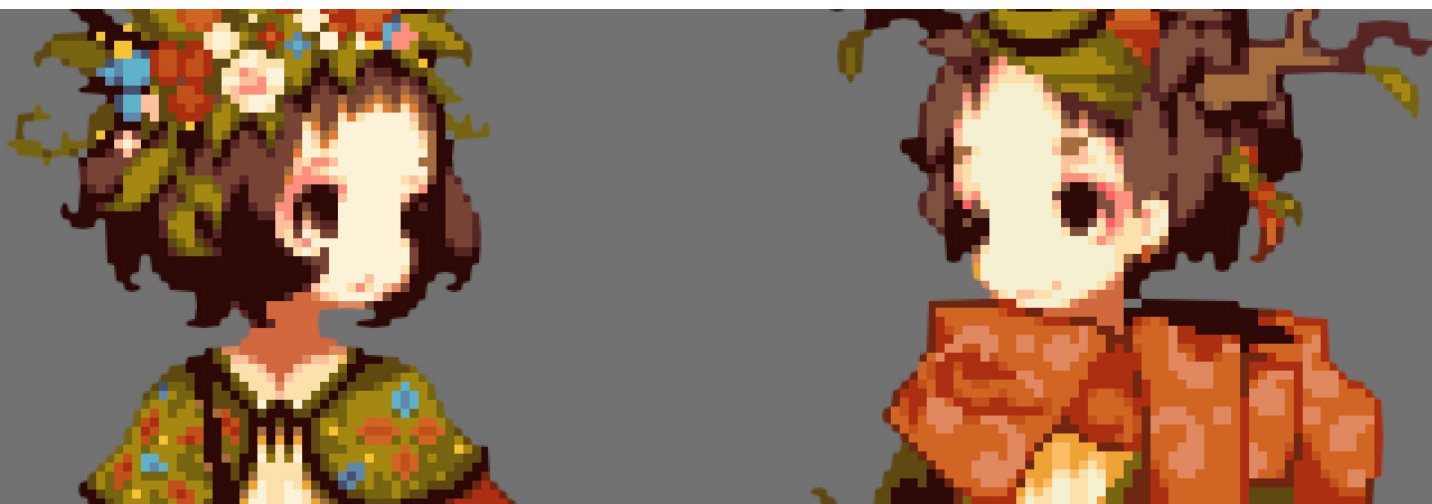
Experimenting

Don't be afraid to try weird colour combinations. There's a lot of Trial & Error involved. Make sure to fiddle around with the Hue/Saturation sliders, not just brightness for shading.

Choosing colours II

Guest writer: Syosa (しょさ)

**My favourite colour** is a dark purple (R,G,B)=(84,58,84).
I can make so **many colour ramps** and gradients **from one single colour**.
Reusing the same shadow colours makes pixel art looks more beautiful, I think.

When making colour ramps by the colour system (red, yellow, green...). I put **dark colours and light colours together as much as possible**. This is because it is easier to get an overall harmonised hue.
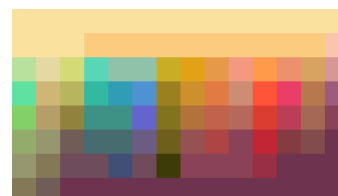
The **amount of colours** on your colour ramps **depends on the size** of your pixel art.
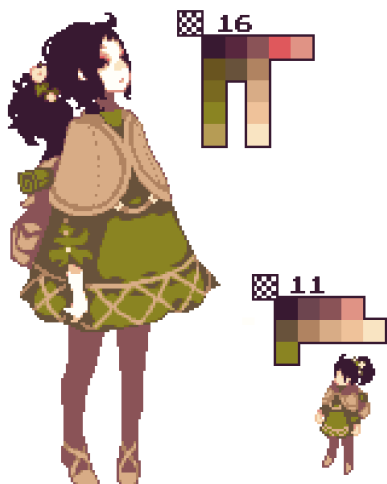
For small sprites, one ramp of 2-3 colours is enough, even if you have lots of different colours. You can't tell the difference between 2 similar colours at that size.
It doesn't have any impact.

Changing colours during progress

I change colours constantly. Take some time to look back. Look at pixel art by others then look at your own picture again. If I still feel uneasy after looking back over the colours, I change them all one-by-one.

Colour correction

This really depends on what the pixel art will be used for.

For prints and crafts

Colours can be severely restricted, so fix it accordingly.
Syosa is referring here to the CYMK print limitation that comes with printing digital work. Colours will change in according to this palette, so be wary when using RGB for print.

For web use

I embed the image in a **sRGB** ICC profile which allows me to see and deal with the effects of colour-change within browser.
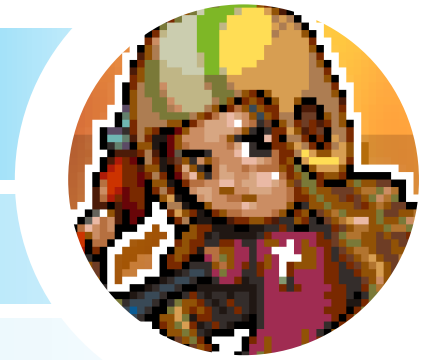
For games

Sometimes the colours do not match with those of other images, so even when the colouring of the image is fine in itself, I sometimes still end up adjusting it.

Syosa's advice was translated from his native language: Japanese.
Translation: Alexander Hicks

Choosing colours III
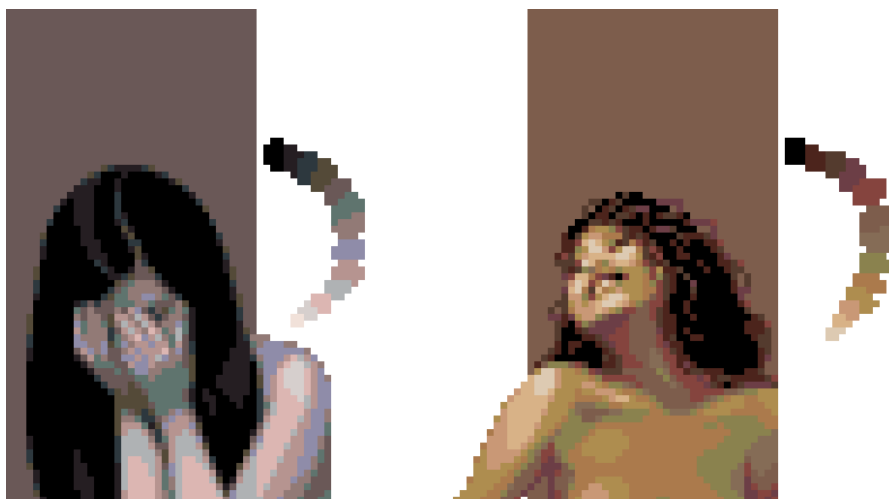
Guest writer: Jinn

Colors and Mood

While body language and facial expression can set the mood, painting with warmer or colder colours can increase the mood! Greys tend to be neutral colours.

Using blues, purples and teals can give you the impression of a **colder/sadder emotion**, while **reds, oranges and yellows** can give a **warmer/happier emotion**!

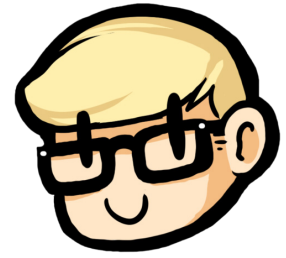**Don't be afraid to play with your colour ramps!**

Diversifying your colours will make your work more interesting to look at. It will break the monochromatic look. You can achieve this by using different hues in the same ramp.

Just make sure the colours will still blend well together. Experimentation is the key!
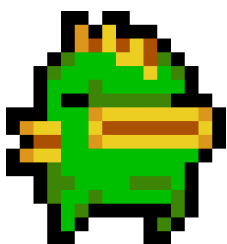
Contrast

Guest writer: Paul Veer

Readability is the #1 priority when choosing colours. I like to choose colours that **add a lot of contrast to sprites**. I always try to have **1 main colour** for each character I design. This colour either :

- makes up most of the character
- or highlights the most important features

I then use **a sub colour** to add extra features; usually a colour that contrasts a lot with the main colour. Contrast can be used to **make a character stand out from the background**. This is specifically aimed towards games. This isn't an issue with a static illustration, though.
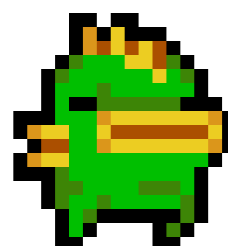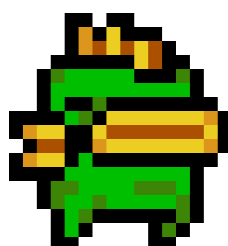
Nuclear Throne (PC)

Fish (left) is **mostly green**. I use a **yellow to highlight** his mouth and fins to emphasize his fish-like appearance. The brighter yellow contrasts well with the green.

If a black outline defined those details, the sprite would be muddy and less readable. A precious waste of pixels and space!

Paul introduced a very important concept: **Readability**, which will be the subject of **Chapter 4**.

Different limitations

Pixel art is born from limitations. Colours can be on affected by limits. Today, there are no limits, but artists still like to challenge themselves! Sometimes it can create beautiful effects.

However, when the general public talk about bit-graphics, **they confuse the console's processing power with the colour display.**
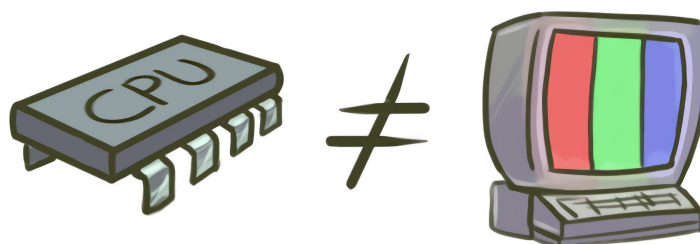
Consoles with the same microprocessor power don't have the same colour rules.

This confusion lead popular culture to refer to graphics from consoles before 1990 as **8-bit**, and **16-bit** for graphics after 1990 .

Most people see the lack of colours, but they aren't aware of the exact rules and limitations.
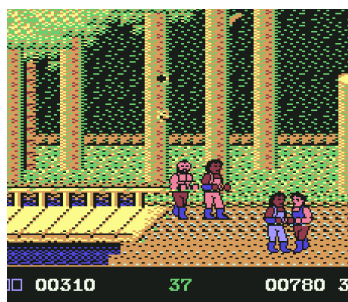
Look up the limitations of each console, or computer for more info. You'll be surprised!

Even as of 2015, modern day .**GIF image files still have a colour limitation of 256 colours**.

The format last updated in 1989 and is still 8 bits per pixel. 1 bit allows for 2 colours. In math, $256 = 2$ to the power of 8 ($=2^8$).
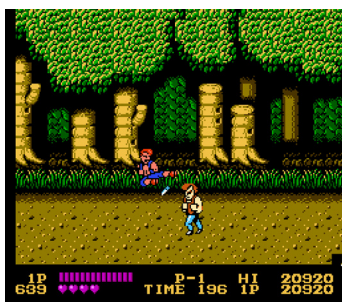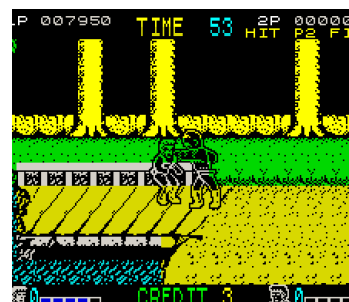

NES

Commodore64

Sega Master System

ZX Spectrum

Double Dragon looks different on each 8-bit console

Sprites with limited colours

This section is for people who want to replicate old video games, hacking a 2D video game or like to have fun with limitations. 1 colour you always include in the total colour count is transparency. For the sake of convenience I will exclude it from the next examples

My sprite originally had 25 colours
(24 + transparency).

There is 1 colour ramp for every main colour.
Yellow – Skin tone – Brown – Teal – Green – Grey

Reduced the colours from 24 to 20.

- Replaced the greys with the skin tones.
- The white shirt uses the skin tone. Not bad.
- Removed the darkest teal. It was barely visible.

15 colours. This is the final version I decided to use.
16 colours is usually the limit for most sprites.

- Fused the skin tones with the brown hair.
- Green and teal now share the same highlight.
- Removed the orange AA: it was barely visible.

10 colours. The sprite is still intact.
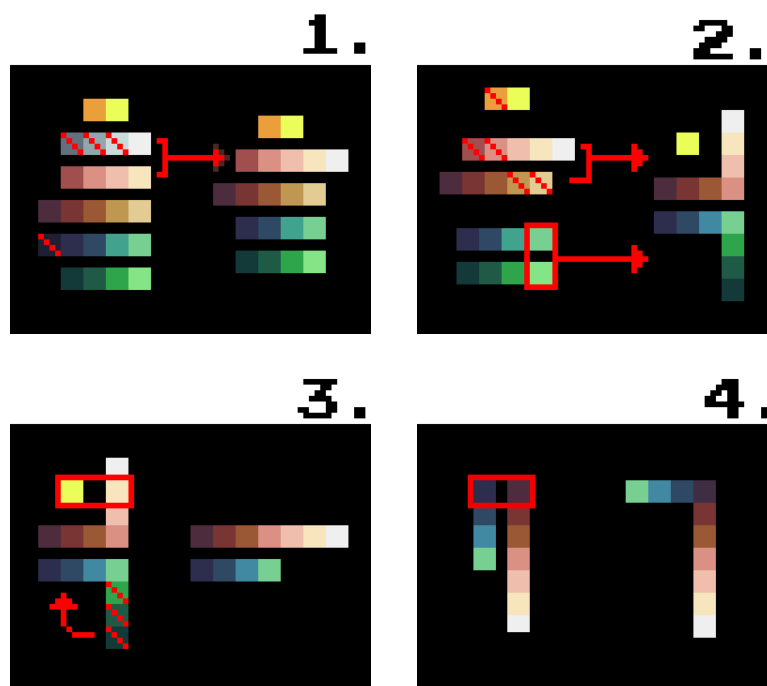It doesn't look weird . . . .yet.

- Swapped the yellow out for a skin tone.
- Recoloured the greens with the teal ramp.
- Fused the darkest shades with each other

Beyond 10 colours this particular sprite loses its quality, colours and detail.
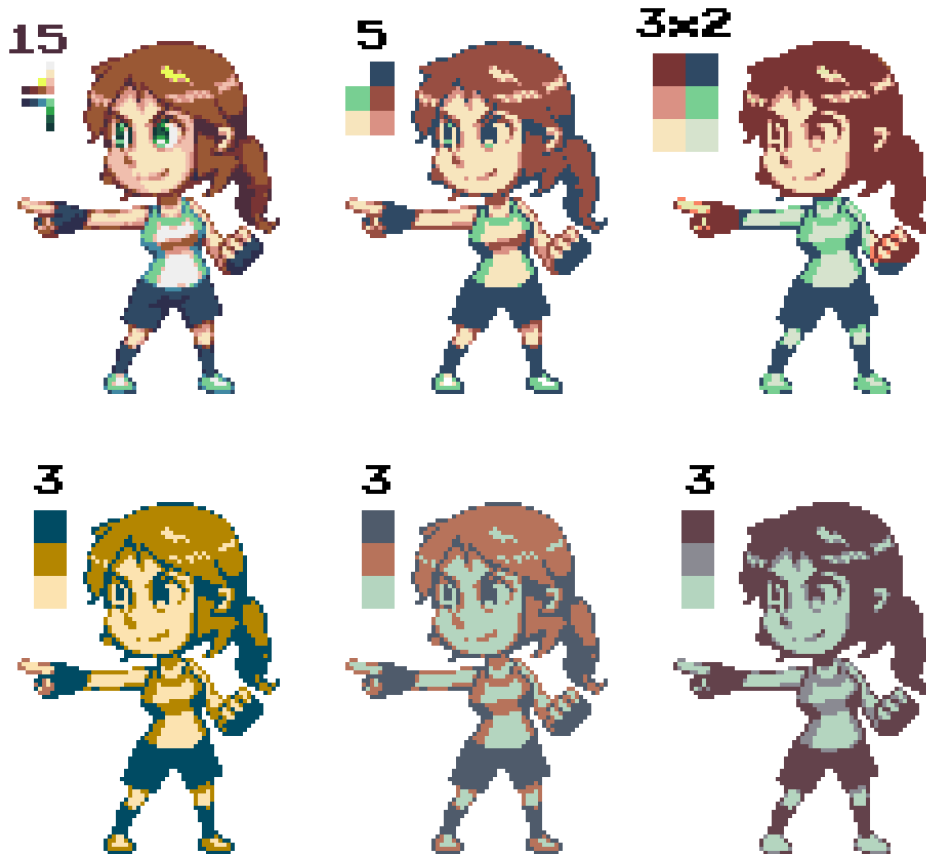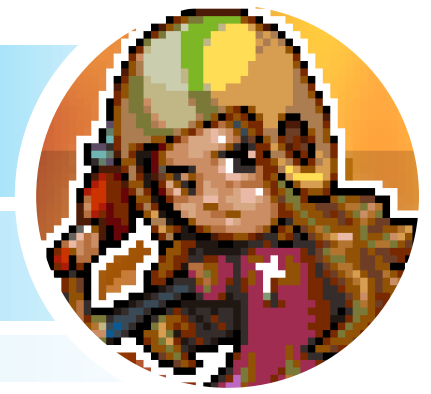

However, each sprite is different. There is no "one rule fits all" with colours.

## Step by step summary

Scenes with limited colours

Guest writer: Jinn

Re-use your colours to keep your palette small.

Colours can be re-used in the same piece without losing its value. You can place colours together that would otherwise belong to different ramps!

The reds on the hair = the bed and the night stand.
The dark skin tones = the bedsheets, the pillow and the wall.
The light skin tones = the candle.
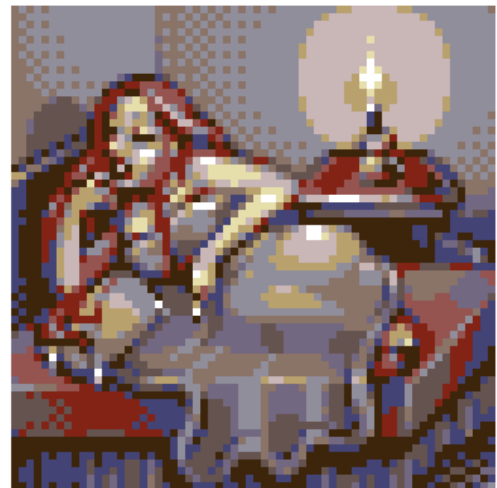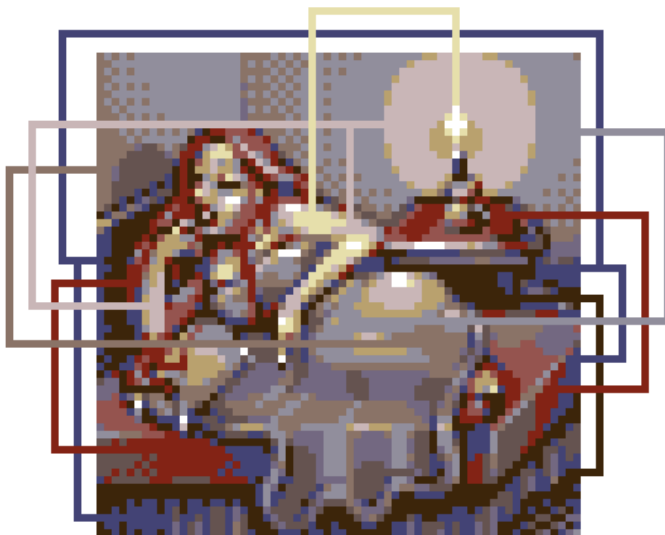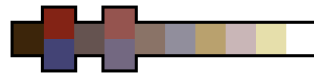
The key is to diversify your colors as much as possible. **Having different objects with the same colour touching directly will make them blend**. The sheets and bed have different colors, so they don't blend, while skin tone and sheets are the same colour, so they feel like a whole. The hair is purposefully red to separate the girl from the wall.

Extreme limitation

Guest writer: Cocefi

Sometimes for some extreme reason, we have to work with a severely limited ugly palette.
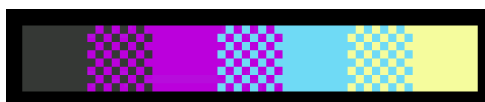

EWWW!

Luckily, we can make it more intuitive to use by rearranging the colours by how we perceive the colours in terms of luminosity. Some colours in the rainbow "feel" darker and lighter.


Groovy~

Guess you could call it *Xtreme* Hue-shifting. You can extend the palette further with **dithering** too. But be warned: excessive dithering can make a surface look textured or rough.

Conclusion

Colour is all about context. It doesn't just create the mood or atmosphere of your pixel art, it also defines the style. Colours can easily fool the eye, and with some practice, you'll be able to use them to your advantage.
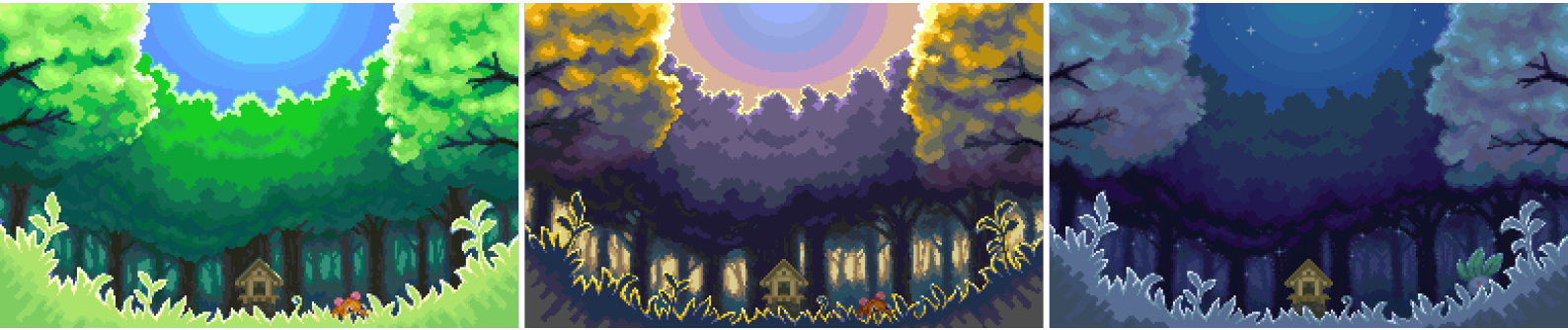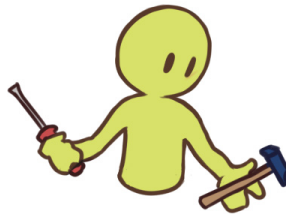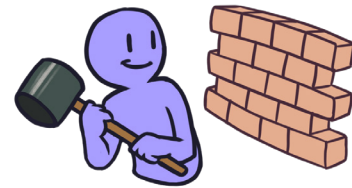

Pokémon Heart Gold/Soul Silver (2009, DS)

Food for thought

- Introduction
- How to pick colours
- Why make palettes?
- Colour ramps

Practice

- Hue shifting
- Black tones
- Greys
- Choosing colours I - III
- Contrast

Limitations
(optional)

- Different limitations
- Sprites
- Scenes
- Extreme limitation

Colouring doesn't stop at this chapter. Many other aspects use colours to their advantage to get the most out of pixel art. Just make sure to refresh your colour theory and remember:

Experiment!