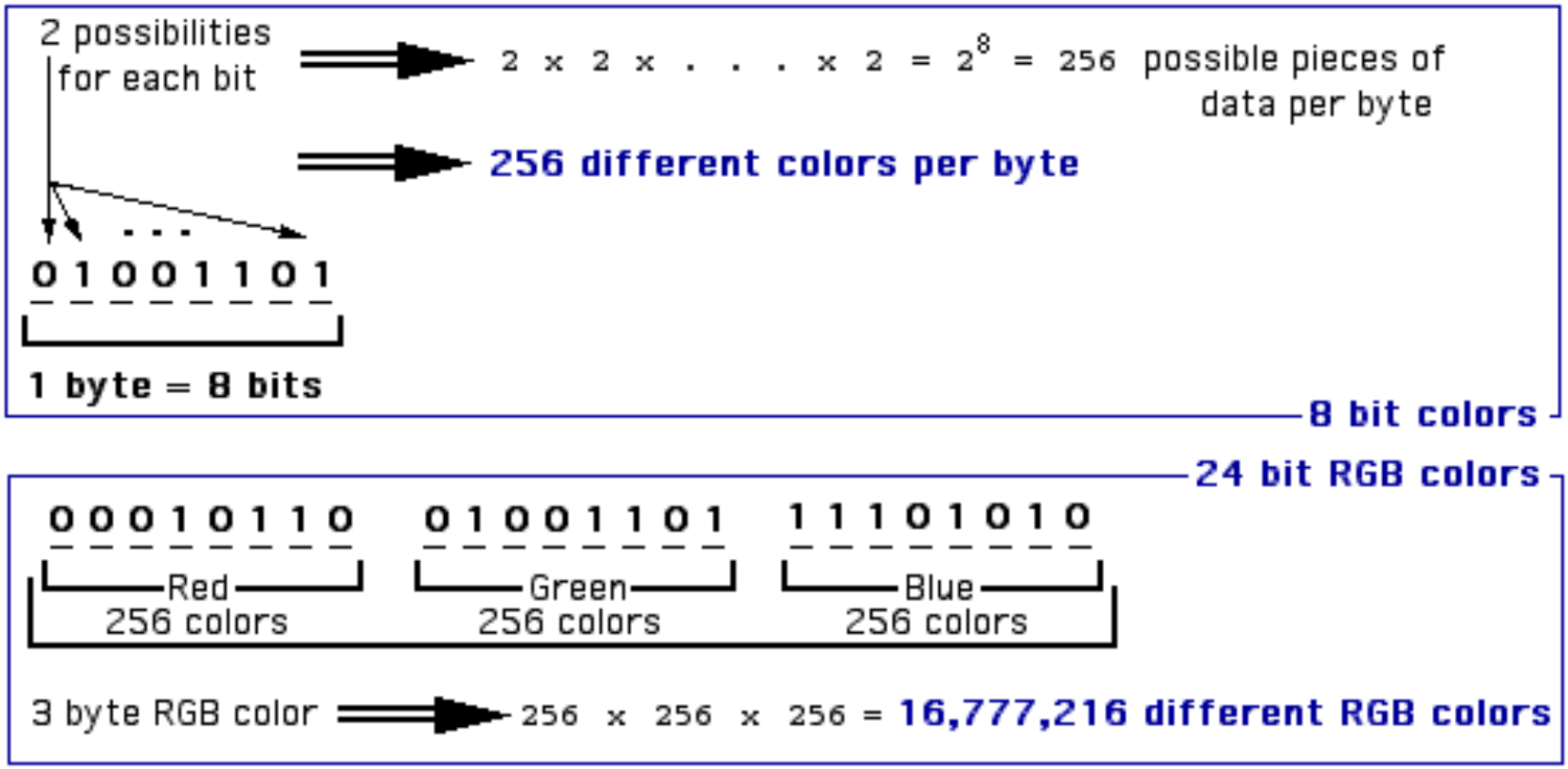
RGB Colors – Red, Green, Blue

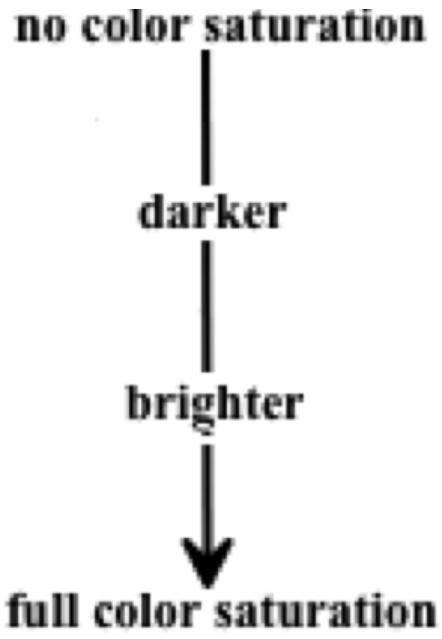
- 256 color shades per byte
- One byte for each of Red, Green, Blue
- Almost 16 million different RGB colors



The 256 shades of each RGB color component can be represented as color saturation levels from 0 to 255.

The higher the color saturation, the brighter the color gets. Each color component (Red, Green, or Blue) works like this.

This lists just a few of the 156 different possible shades.



0	**black – no saturation**
51	**dark – low saturation**
102	**medium-dark – medium-low saturation**
153	**medium-bright – medium-high saturation**
204	**bright – high saturation**
255	**brightest – full saturation**

`rgb()` notation lists saturation levels of each color component in order.

Pure colors contain 0 saturation of the other two colors.

Equal saturations of all three color components gives Grey.

Equal Red and Blue (but no green) gives roughly Purple.

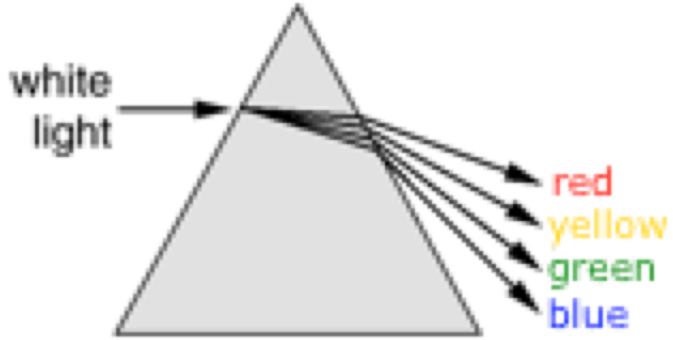
Black is no saturation of any of the colors: `rgb(0,0,0)`

White is full saturation of all colors: `rgb(255,255,255)`

Pure Colors			Mixed Colors	
Red	Green	Blue	Grey	Purple
			rgb(0,0,0)	
rgb(1,0,0)	rgb(0,1,0)	rgb(0,0,1)	rgb(1,1,1)	rgb(1,0,1)
rgb(51,0,0)	rgb(0,51,0)	rgb(0,0,51)	rgb(51,51,51)	rgb(51,0,51)
rgb(102,0,0)	rgb(0,102,0)	rgb(0,0,102)	rgb(102,102,102)	rgb(102,0,102)
rgb(153,0,0)	rgb(0,153,0)	rgb(0,0,153)	rgb(153,153,153)	rgb(153,0,153)
rgb(204,0,0)	rgb(0,204,0)	rgb(0,0,204)	rgb(204,204,204)	rgb(204,0,204)
rgb(255,0,0)	rgb(0,255,0)	rgb(0,0,255)	**rgb(255,255,255)**	rgb(255,0,255)

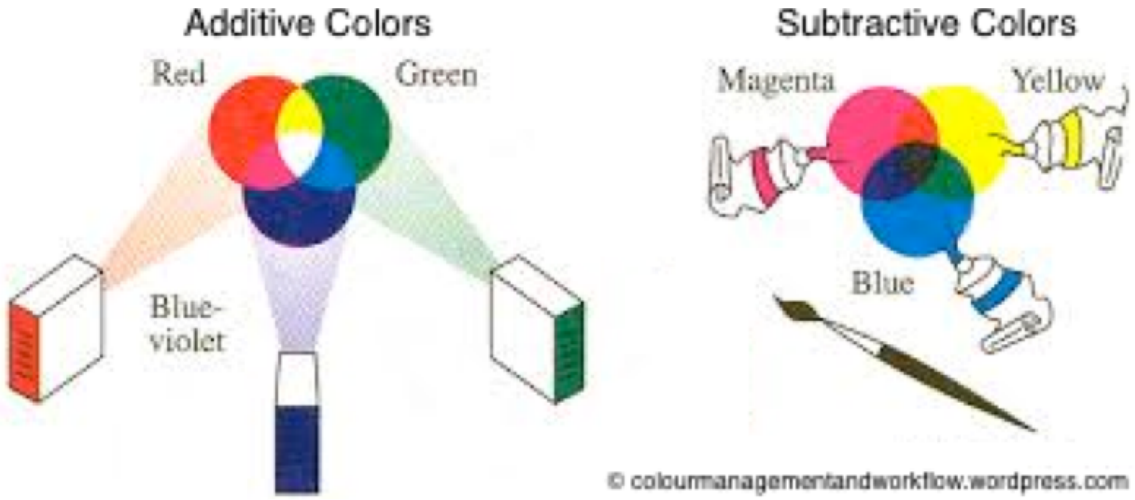
Surprising? Black: `rgb(0,0,0)` White: `rgb(255,255,255)`

No light in inter-stellar space - blackness.
White light from the sun – full spectrum of all colors.



RGB colors combine like visible light.

Light is *additive* – add more color saturation, it gets brighter.
Paint is *subtractive* – add more paint colors, it gets darker.



Most developers use *Hexadecimal* (*Hex*) notation.
Hexadecimal refers to base 16 numbers.

rgb(204,204,204) <------ both represent the same light grey ------> **#CCCCCC**

CC in Hex is equivalent 204, so the two colors are the same.

Binary numbers base 2 -- only 2digits -- 0,1

Base 10 numbers – 10 digits -- 0,1,2,3,4,5,6,7,8,9

Base 16 (hex) numbers – 16 digits -- 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F

A represents 10, B represents 11, . . . , F represents 15.

Each place requires a single digit, so you can't use 11, for example, because that's 2 digits.

Why is Hex useful in Computer Science?
A byte can always be represented as only two Hex digits!

The table to the right only lists a few out of the 256 total shades (could be R, G, or B).

The boldfaces ones (00,33,66,99,CC,FF) are called *Web Safe Shades*.

A Web Safe Color uses only Web Safe Shades.
#CC33FF is Web Safe -- #CCB2FF is not.

Using Web Safe colors was necessary in the early days of the Web, because old computer screens had limited color capabilities.

Hex	Base 10
00	**0**
1A	26
2F	47
33	**51**
4C	76
55	85
66	**102**
7D	125
81	129
99	**153**
A1	161
B2	178
CC	**204**
DD	221
E8	232
FF	**255**

Now you can freely use any of the almost 17 million RGB colors!

Pure Colors			Mixed Colors	
Red	Green	Blue	Grey	Purple
			rgb(0,0,0)	
rgb(1,0,0)	rgb(0,1,0)	rgb(0,0,1)	rgb(1,1,1)	rgb(1,0,1)
rgb(51,0,0)	rgb(0,51,0)	rgb(0,0,51)	rgb(51,51,51)	rgb(51,0,51)
rgb(102,0,0)	rgb(0,102,0)	rgb(0,0,102)	rgb(102,102,102)	rgb(102,0,102)
rgb(153,0,0)	rgb(0,153,0)	rgb(0,0,153)	rgb(153,153,153)	rgb(153,0,153)
rgb(204,0,0)	rgb(0,204,0)	rgb(0,0,204)	rgb(204,204,204)	rgb(204,0,204)
rgb(255,0,0)	rgb(0,255,0)	rgb(0,0,255)	**rgb(255,255,255)**	rgb(255,0,255)

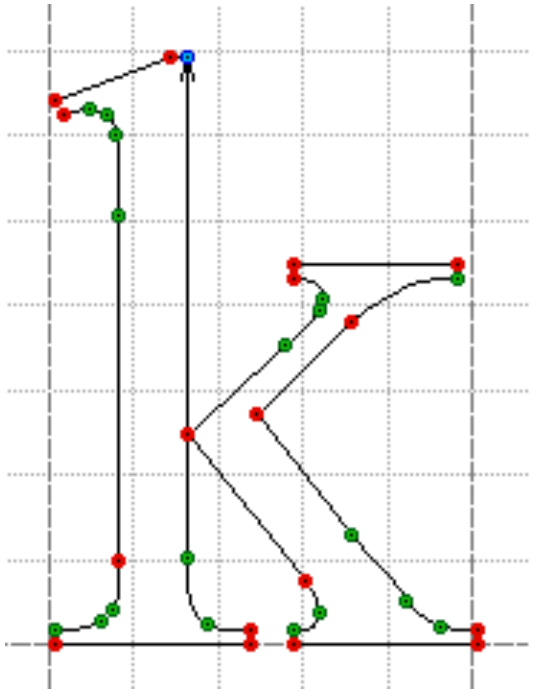
These tables list identical colors, but use different notations.

Most developers use Hex like below.

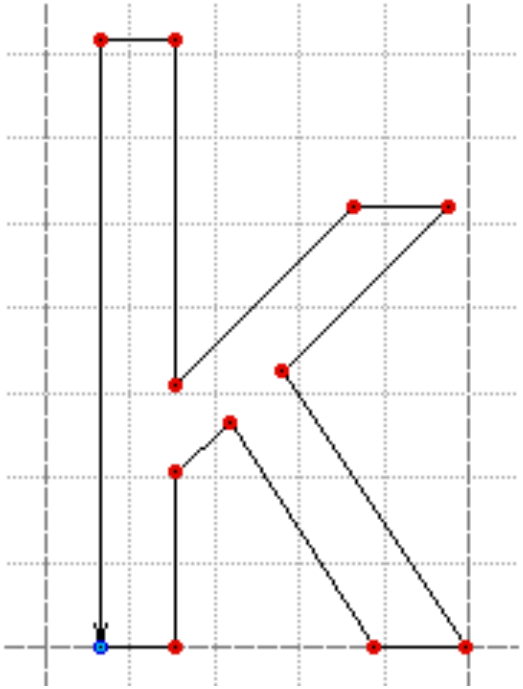
These tables show mostly Web Safe Colors, only as a convenience.

Pure Colors			Mixed Colors	
Red	Green	Blue	Grey	Purple
			#000000 (black)	
#010000	#000100	#000001	#010101	#010001
#330000	#003300	#000033	#333333	#330033
#660000	#006600	#000066	#666666	#660066
#990000	#009900	#000099	#999999	#990099
#CC0000	#00CC00	#0000CC	#CCCCCC	#CC00CC
#FF0000	#00FF00	#0000FF	**#FFFFFF (white)**	#FF00FF

Fonts for computers are files containing technical specs that show exactly how to draw the characters.



Serif font



Sans-Serif font

```
IsFixedPitch false
ItalicAngle 0.00
FontBBox -162 -408 886 1004
Ascender 674
Descender -257
XHeight 451
CapHeight 579
UnderlinePosition -178
UnderlineThickness 58
EncodingScheme FontSpecific
StartCharMetrics 391

C 106 ; WX 600 ; N j ; B 114 -192 450 672 ;
C 107 ; WX 600 ; N k ; B 51 0 574 639 ;
C 108 ; WX 600 ; N l ; B 91 0 530 639 ;
```

Some common fonts come with your operating system.
When you install software like Word, it might install other fonts.
You can go to free online font libraries and grab all sorts of weird fonts.

When you specify a font to be used in your Web page, remember that your Web page travels to other people's computers to be rendered by their browsers.

If you specify a strange font in your page (e.g. funky freaky gothic) that other people do not have on their computers, their browsers will simply ignore it and use a default font.

There is a way your page can tell a Web browser to actually download a funky font on-the-fly, but that is beyond the scope of this lesson.

W3Schools lists some *Web Safe Fonts* that everyone's computer should have. Thus they are safe to use in Web pages.

http://www.w3schools.com/cssref/css_websafe_fonts.asp

Not everyone even has Microsoft Word installed, so it's not even safe to choose funky fonts from the long list of fonts it will show you.