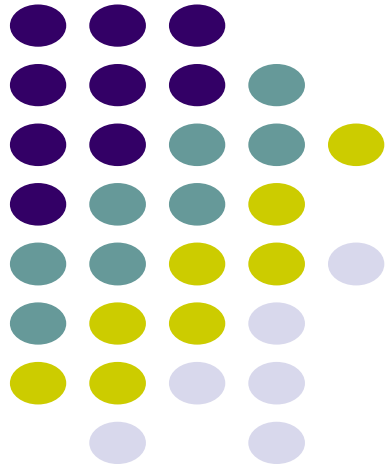
Computer Graphics (4731)
Digital Media Fundamentals

Joshua Cuneo




YOU'RE MISSING WORK TO SEE STAR WARS AGAIN?
WELL... YEAH.
WE WANTED TO SEE IT IN 2D FIRST. THEN RPX, 3D, IMAX, IMAX 3D...
AT THE DRIVE IN DOWN OFF I-5...
AND NOW?
WELL, THIS TIME I'M GONNA PUT SOME M&MS IN MY POPCORN. SEE HOW THAT CHANGES THE EXPERIENCE.
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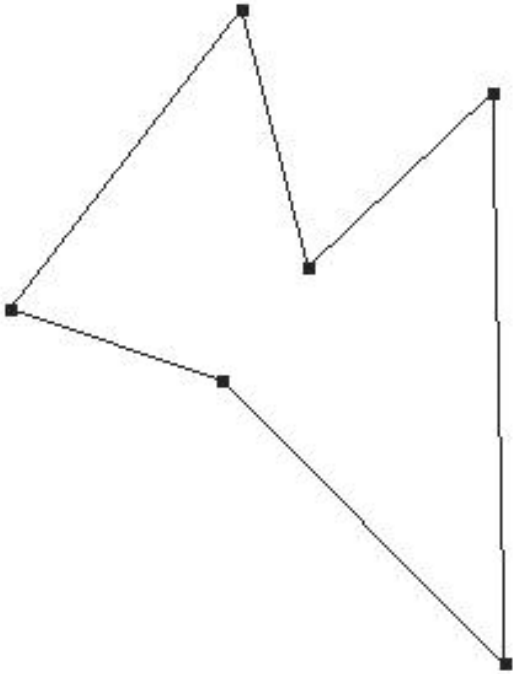
RM

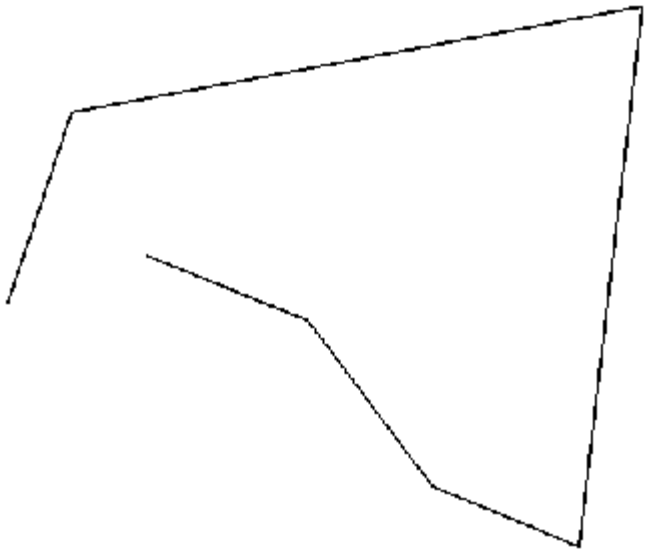
Vector

Square:
-Height = 5
-Color = red
-Starting position = 0, 0

Border:
-Thickness = 10
-Color = blue

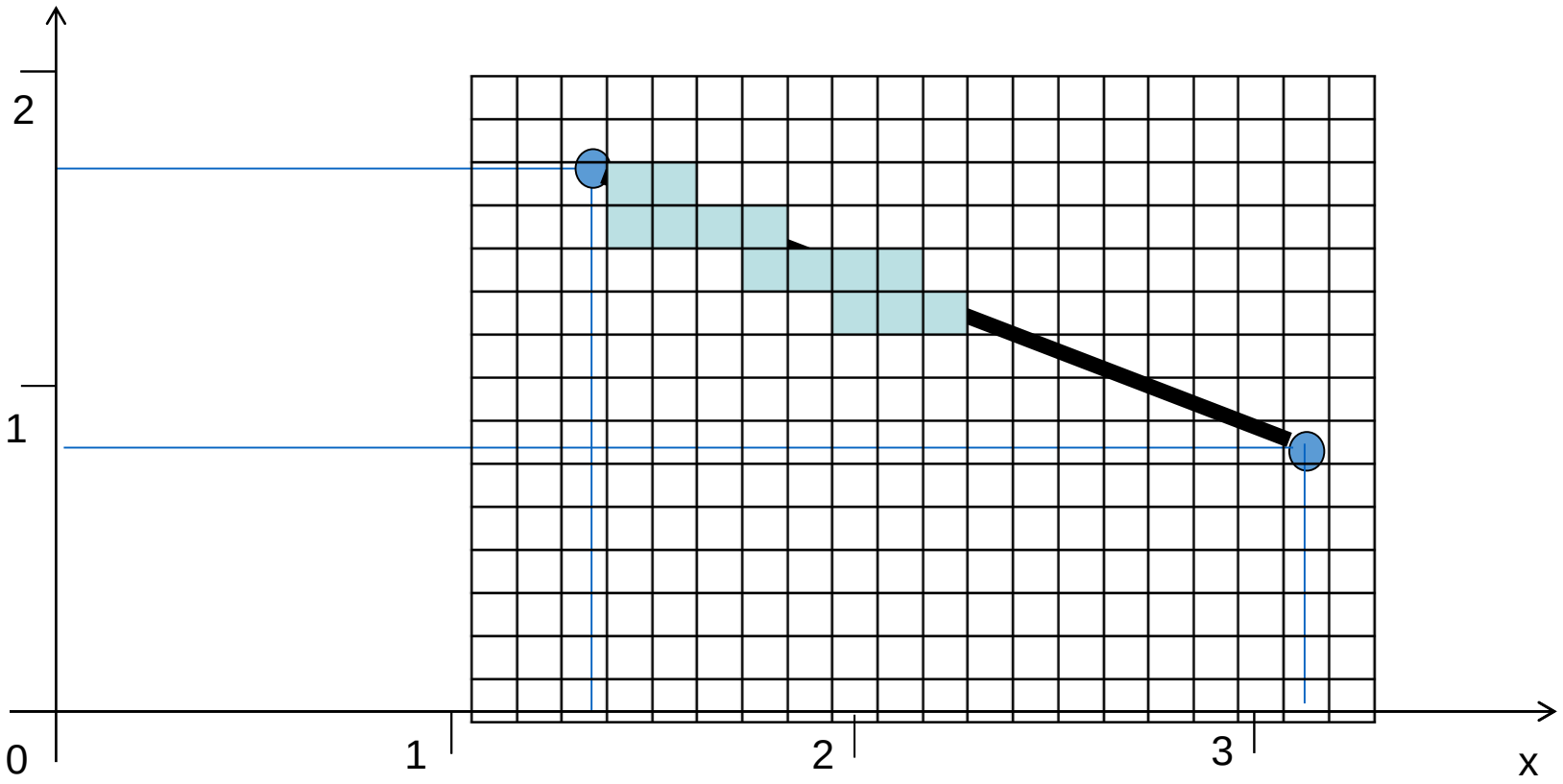


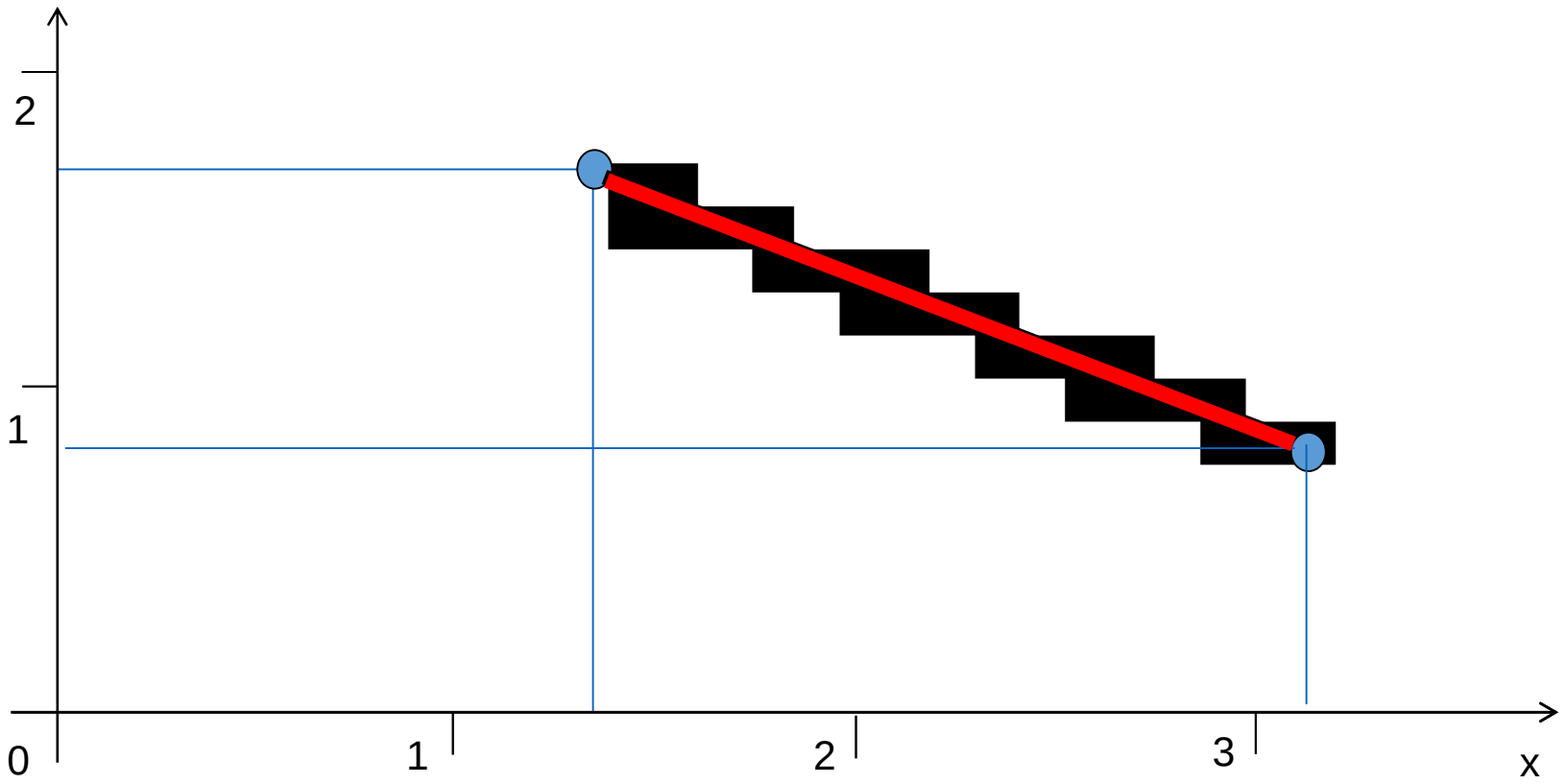
Closed Polyline

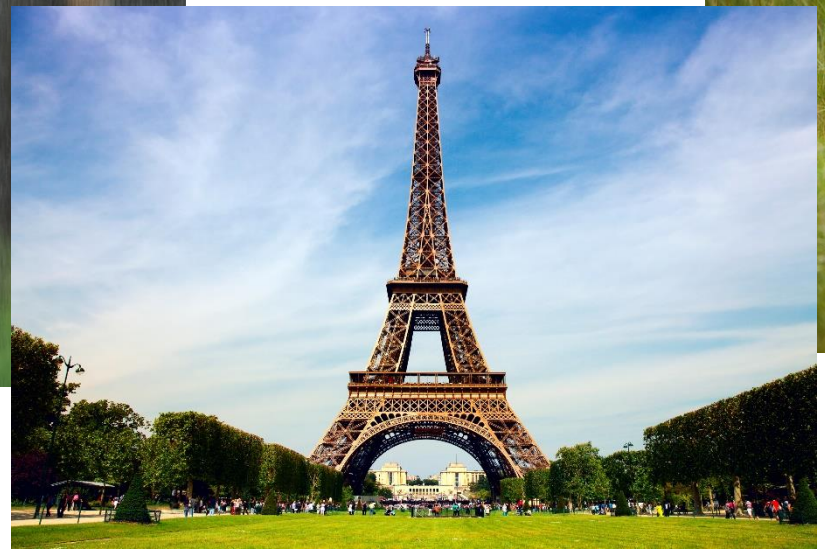


Open Polyline

Rasterization




2
1
0
1
2
3
x




EPSON


Nikon
D7100


Google

Bitmap

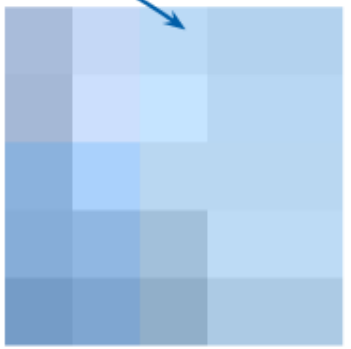
aka Raster Graphics

Logical Pixels

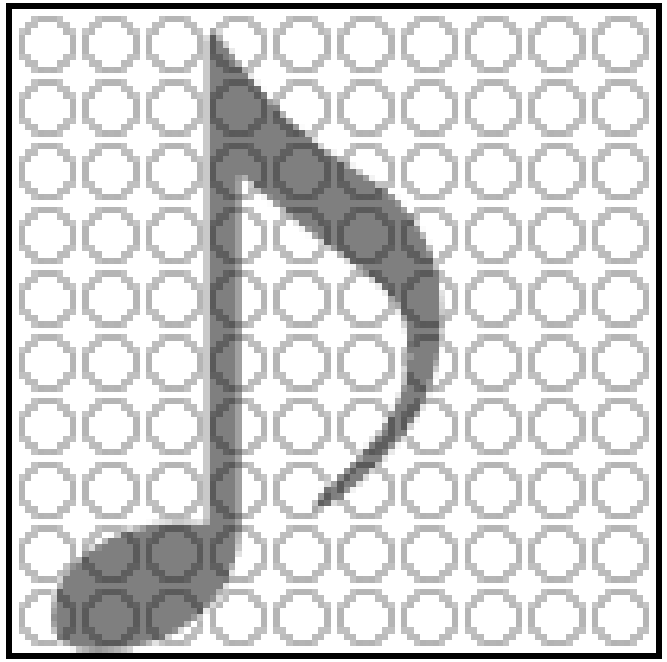
rendered to

Physical Pixels

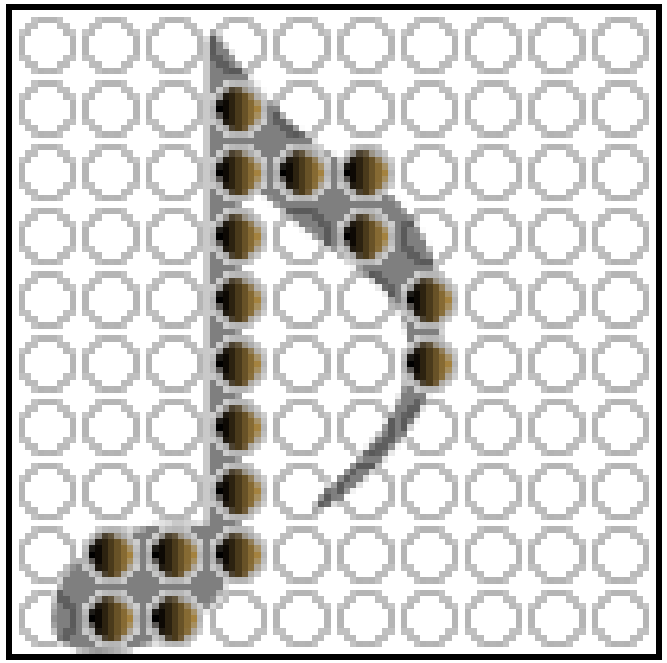
9BB5FF	B1CFFF	B0D2FF	A9CFFF	9FCBFF
86B5F9	B0DBFF	ADD9FF	A9D6FF	9FD3FF
7AACEB	A0CCFF	A6D3FF	A1D0FF	A0D0FF
74A8E2	87B7F9	99C4FF	A3D0FF	A2D0FF
6698D3	6491D5	7AA6EF	A1CEFF	A5D2FF



Pegboard Analogy



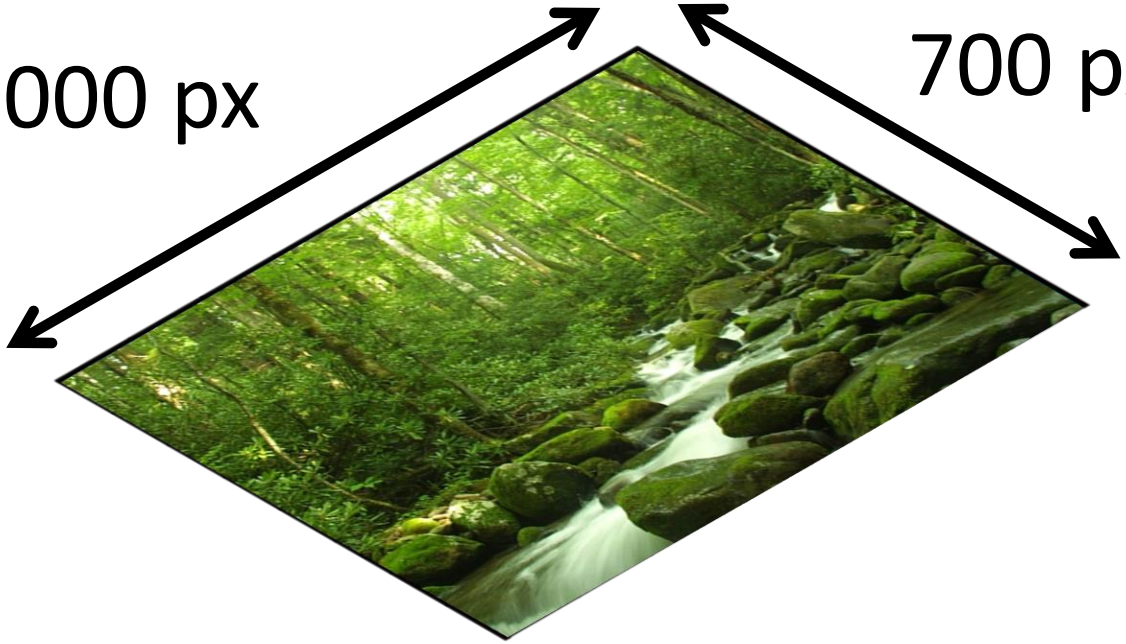
Pegboard Analogy

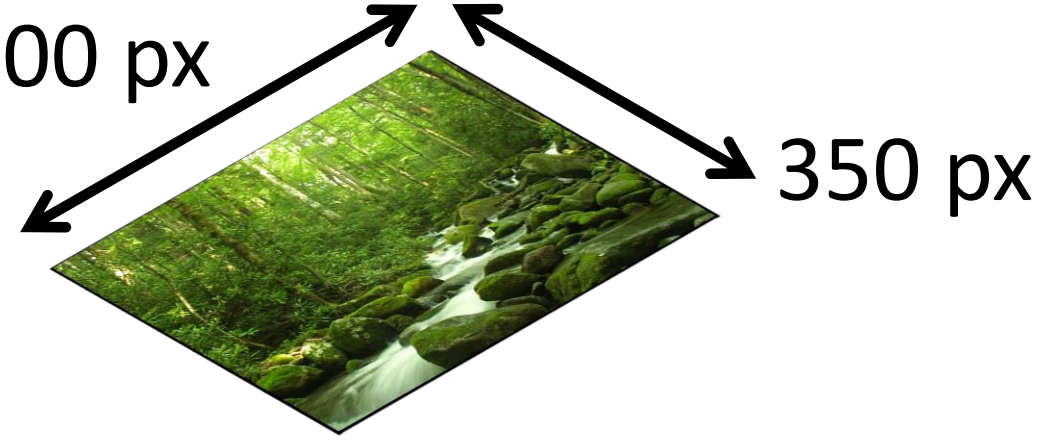


Resolution

Different sample size, same bit depth

1000 x 700 = 700,000 pixels





500 x 350 = 175,000 pixels

Image Size

640 px

480 px

Frame Aspect Ratio

Frame Size

1920 px

1080 px

Frame Aspect Ratio

$$4/3 = 640/480$$

$$16/9 = 1920/1080$$

480i

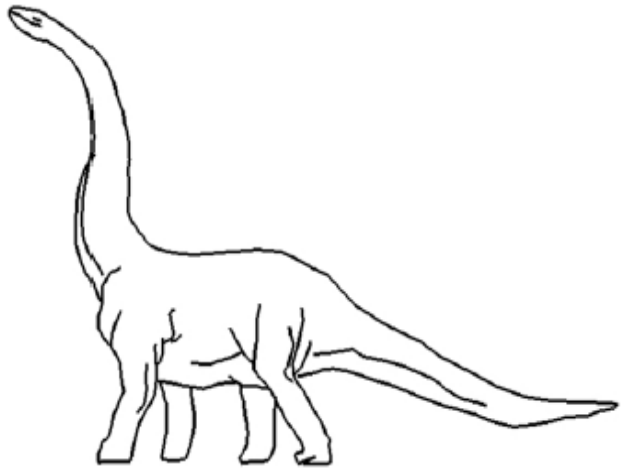
Frame height

1080p

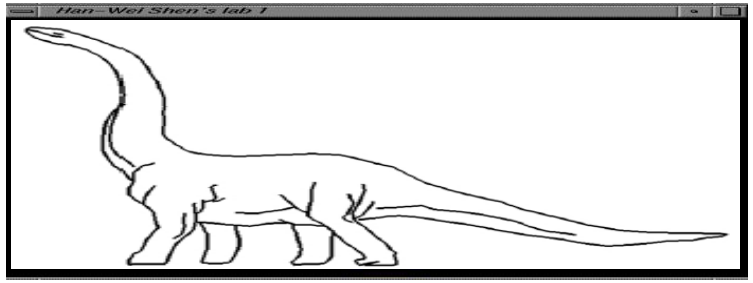
Frame height

Maintaining Aspect Ratios

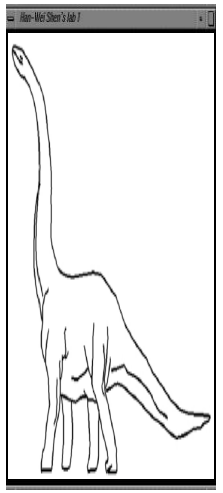
- Aspect ratio **R** = Width/Height of world window
- What if world window and viewport have different aspect ratios?
- Two possible cases:



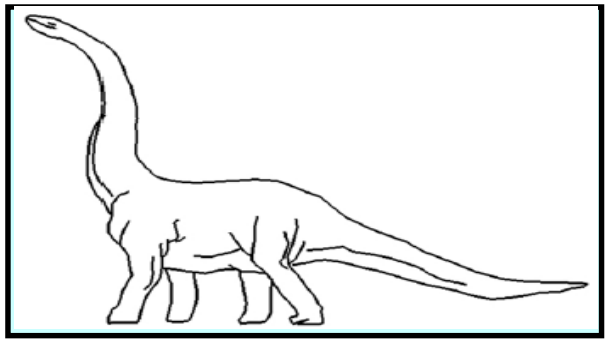
Case a: viewport too wide



Case b: viewport too tall



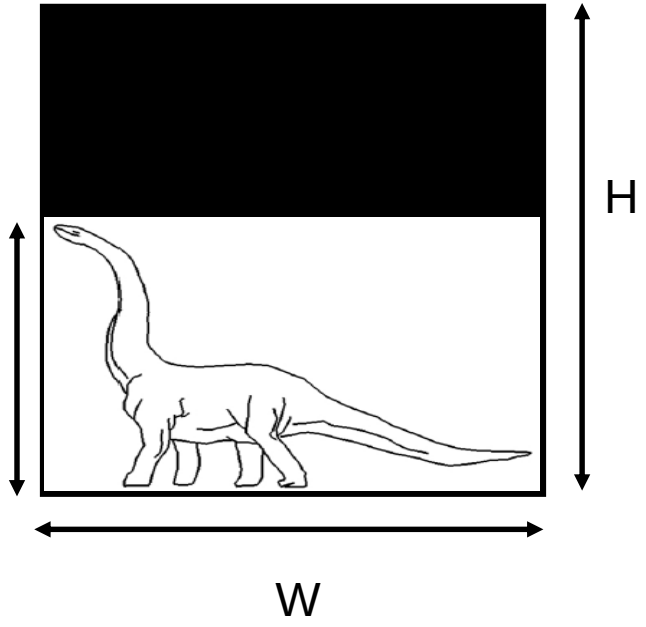
Aspect ratio **R**



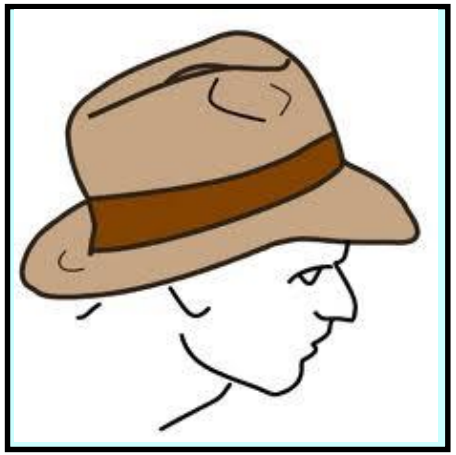
Window

W/R

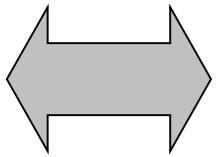
Viewport

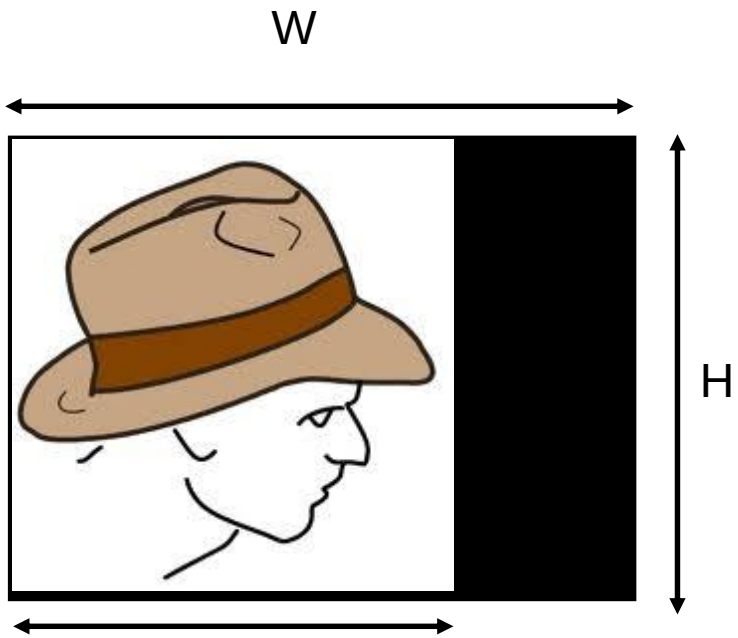


Aspect ratio **R**



Window





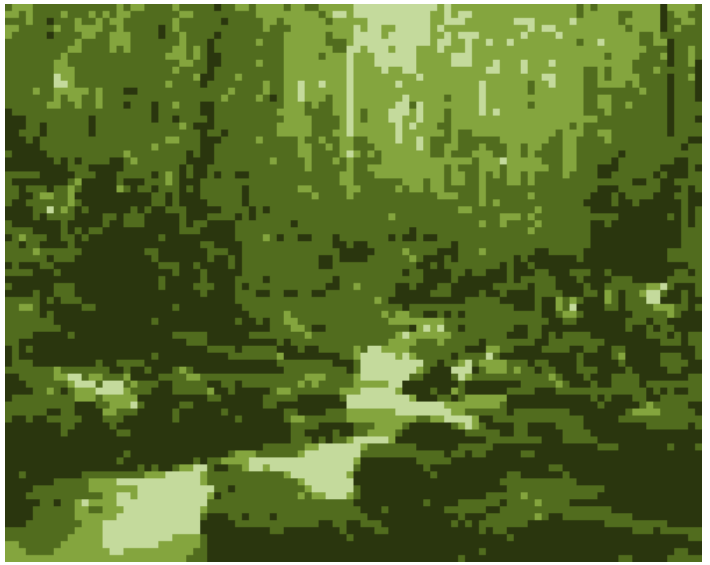
Viewport

Bit Depth

Same sample size, different quantization levels

8 colors

24 colors



4 colors

RGB Color

96 = 01100000

232 = 11101000

150 = 10010110

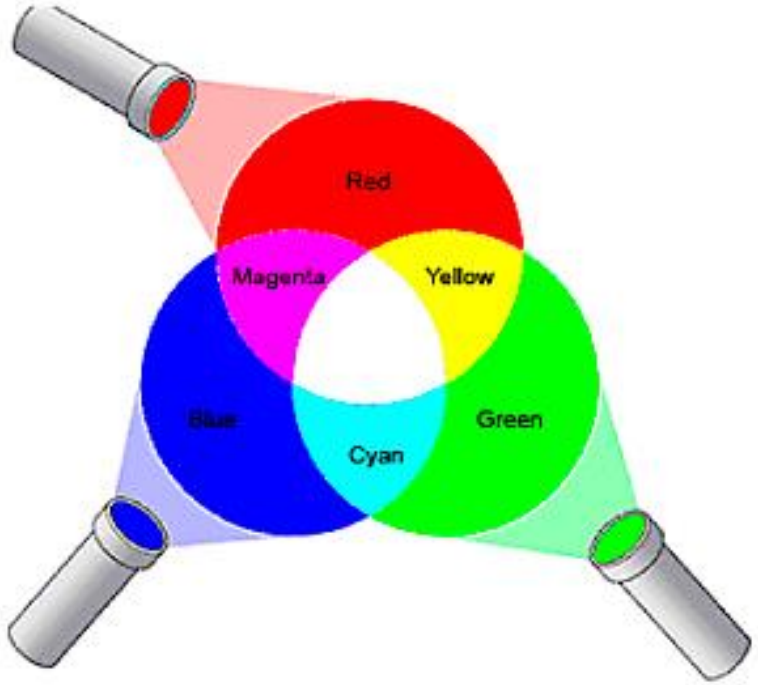
01100000 11101000 10010110


PUSH
84
T0841
Black
PUSH
84
T0842
Cyan
PUSH
84
T0843
Magenta
PUSH
84
T0844
Yellow

CMYK

RGB

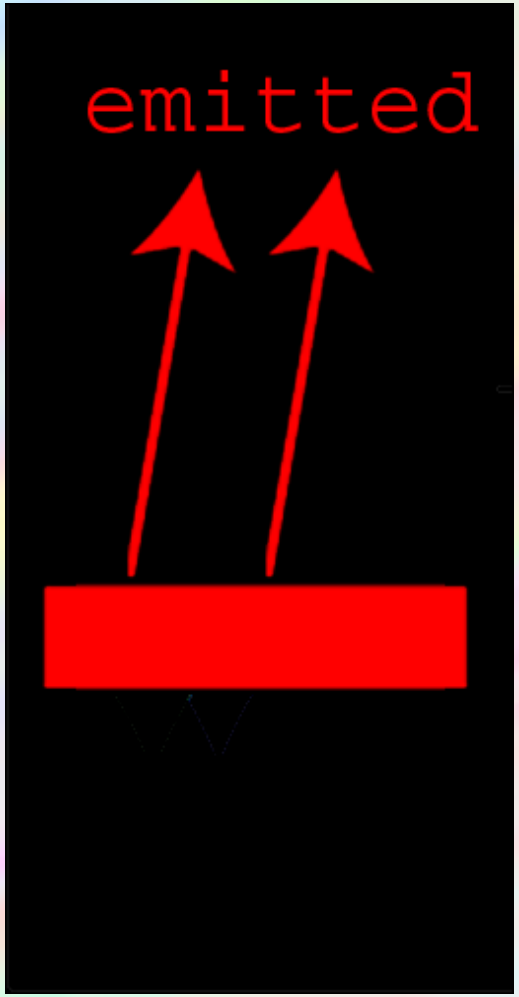
RGB



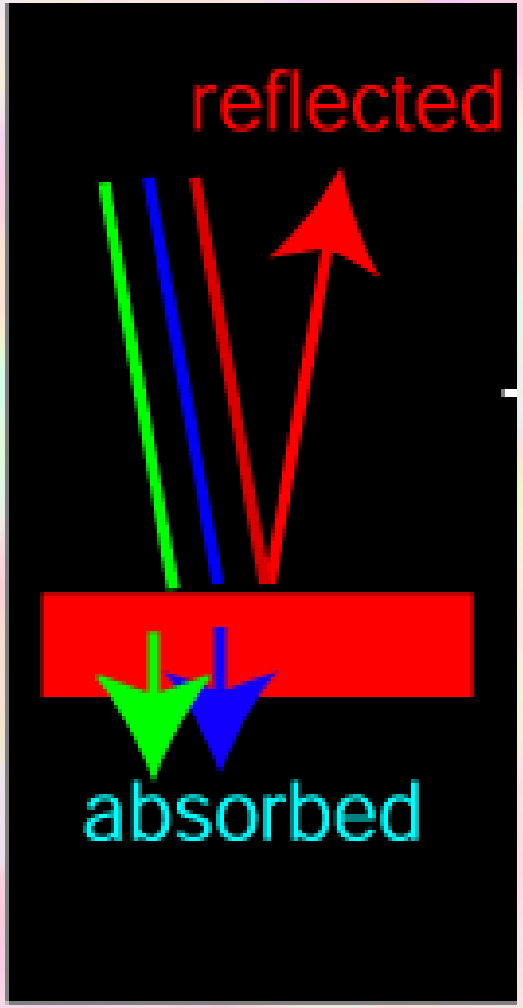
Additive

CMYK

Subtractive

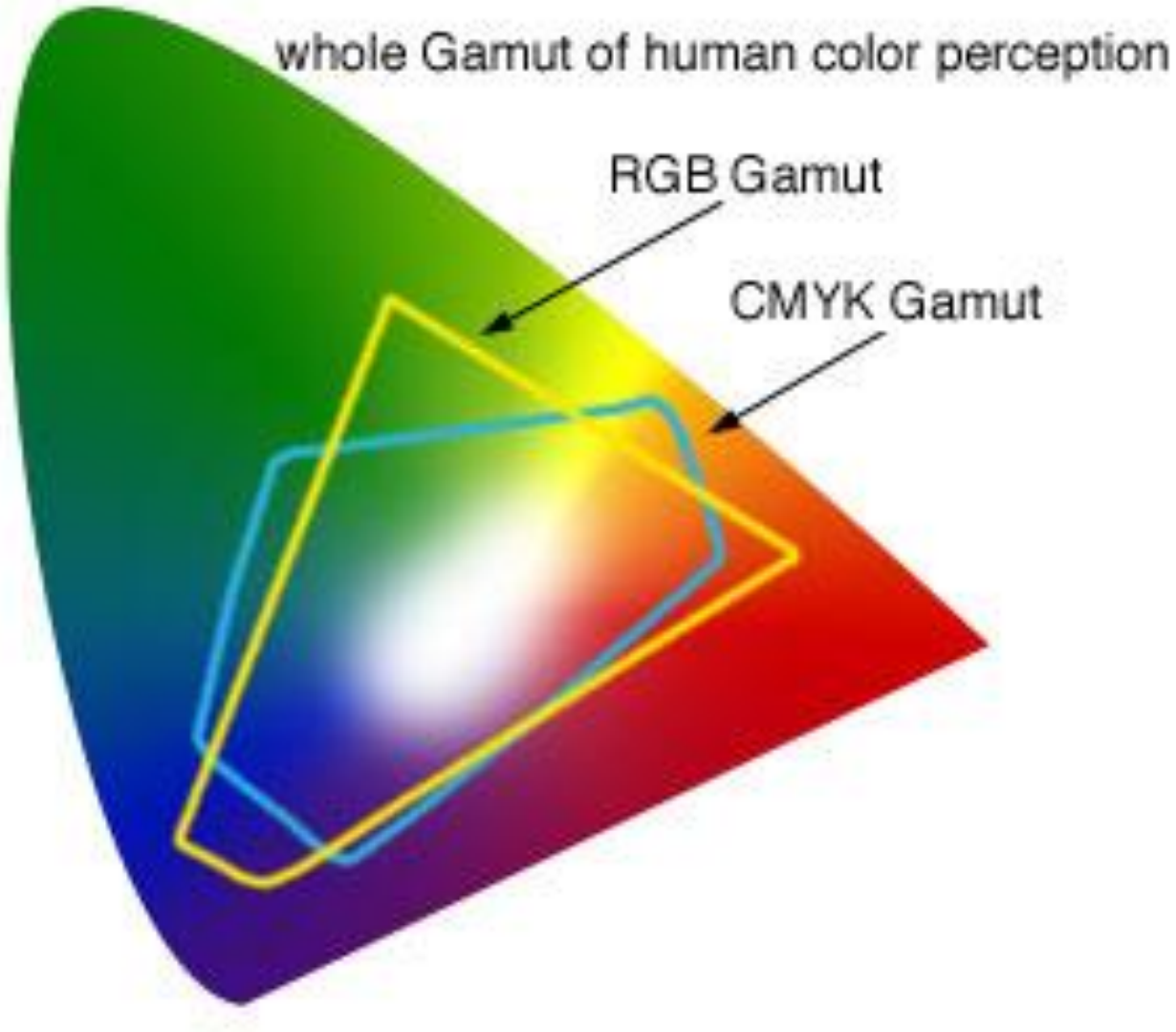


Screen
(Additive)

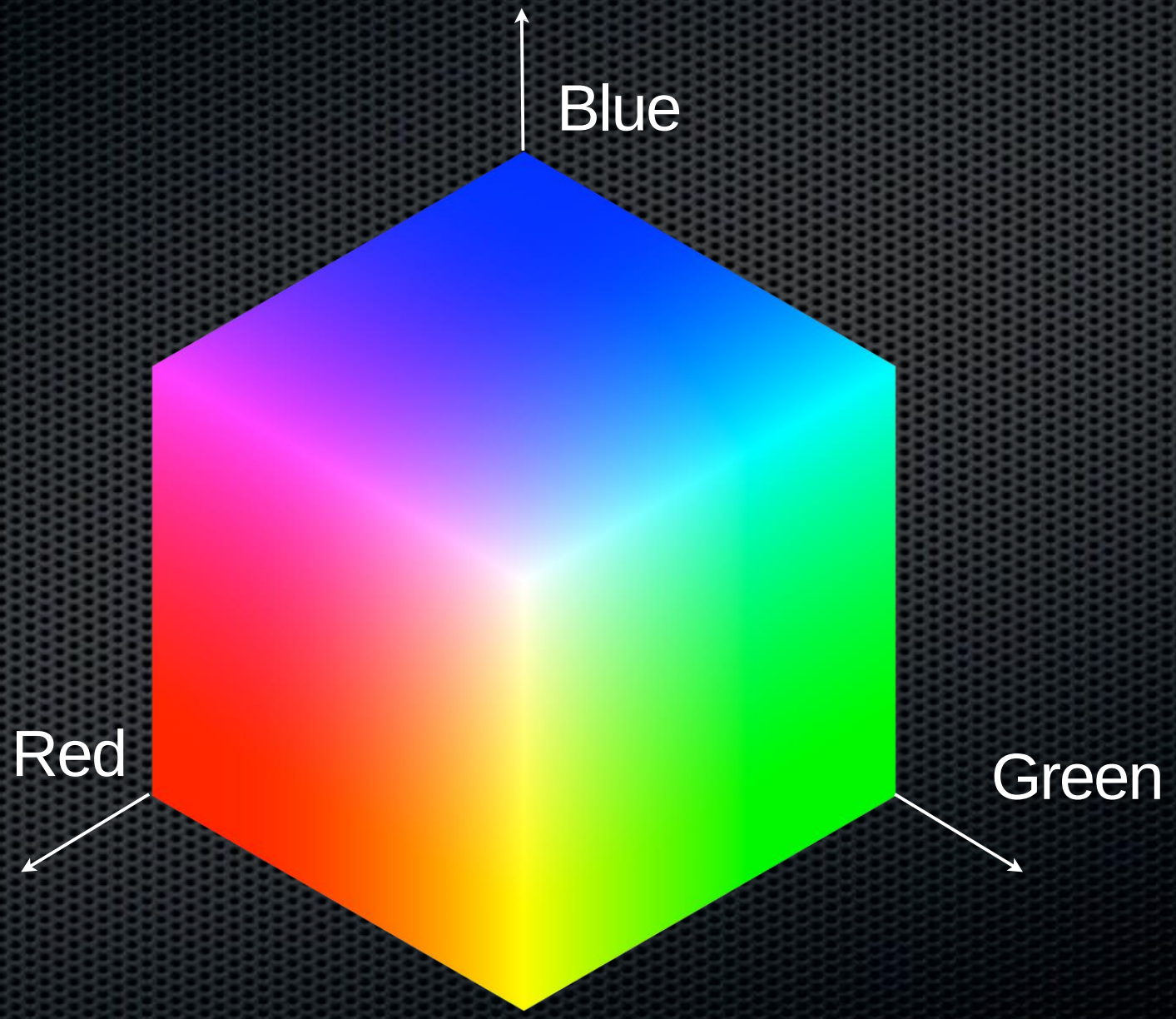


Print
(Subtractive)

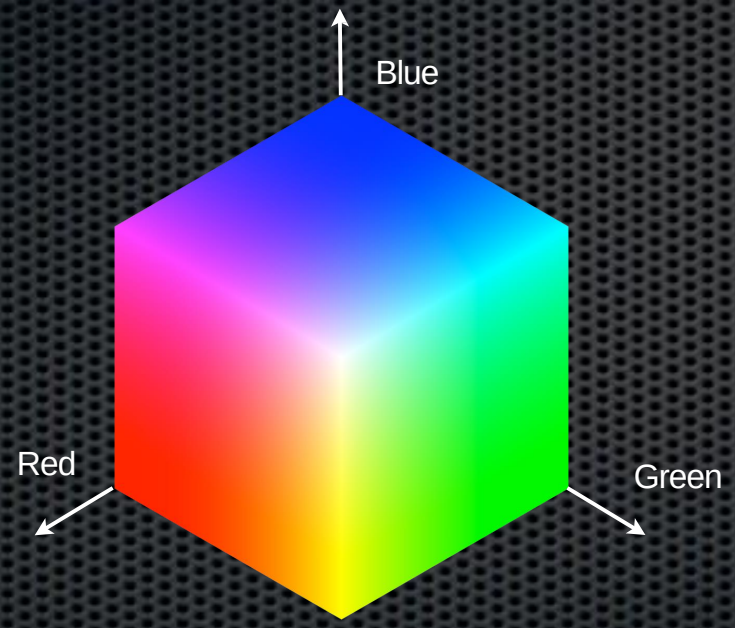
Color Gamut



Color

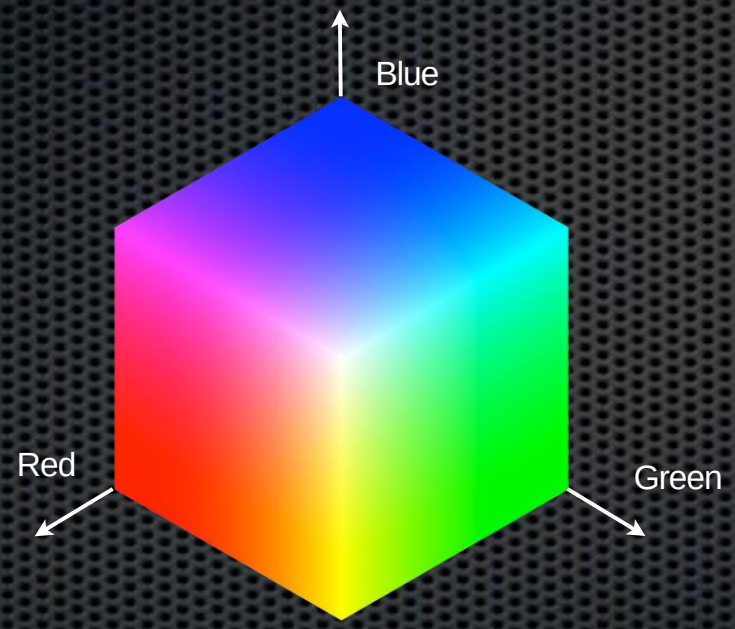


Color



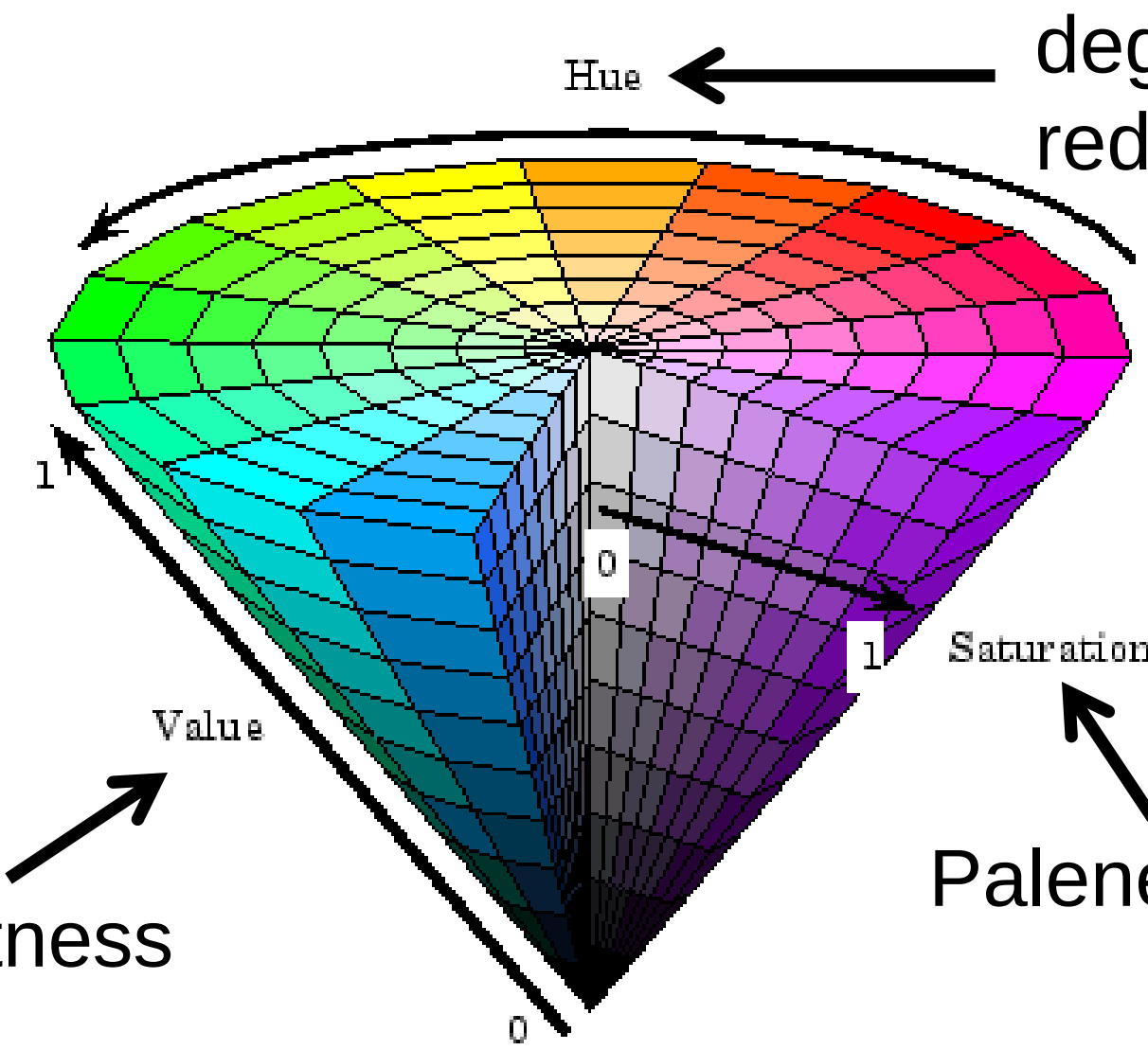
- Intuitive
- Accurate
- Fast

Color



- Intuitive
- Accurate
- Fast

HSV



degrees from red

Brightness

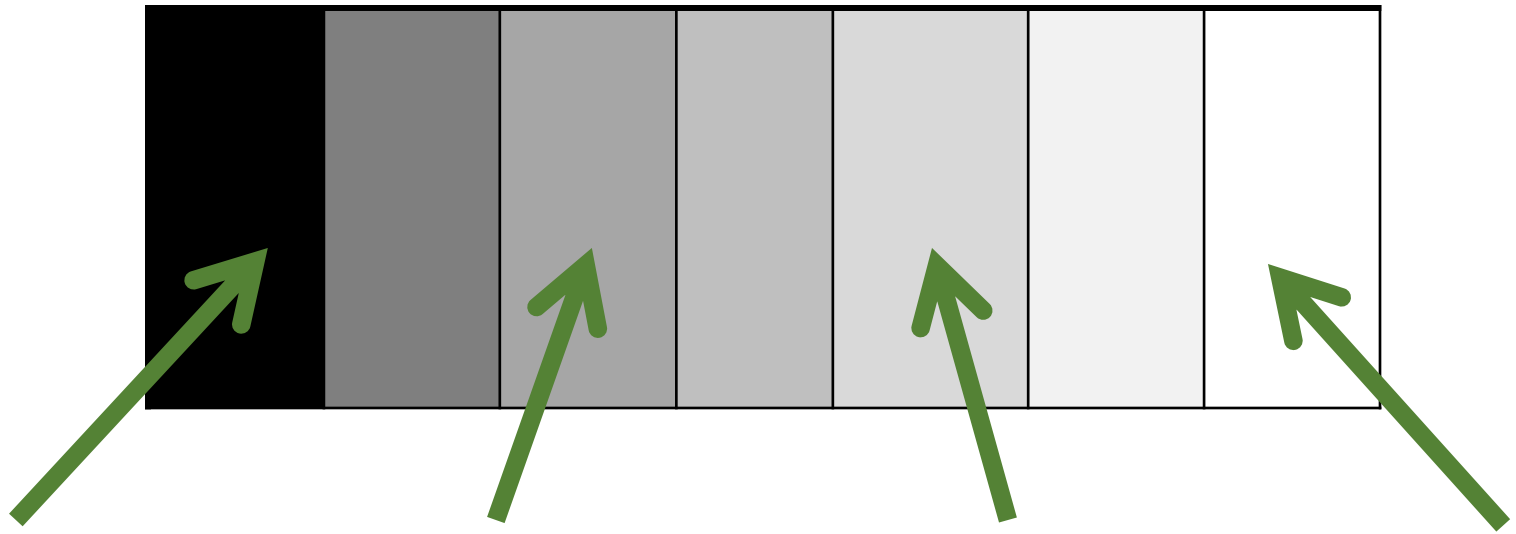
Paleness

Color

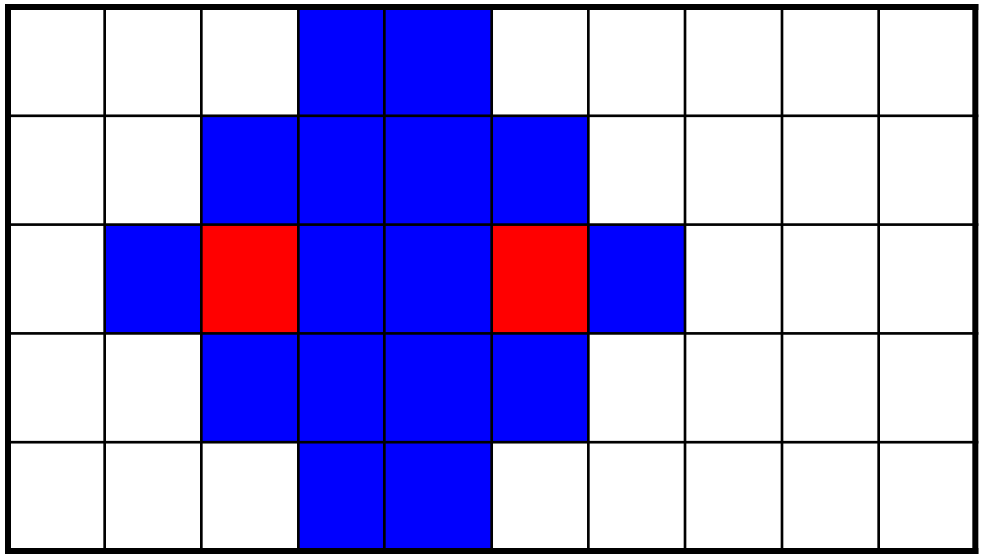
- Intuitive
- Accurate
- Fast

Color

- Intuitive
- Accurate
- Fast



000000 A6A6A6 D9D9D9 FFFFFF



255 255 255	255 255 255	255 255 255	0 0 255	0 0 255	255 255 255	255 255 255	255 255 255	255 255 255	255 255 255
255 255 255	255 255 255	0 0 255	0 0 255	0 0 255	0 0 255	255 255 255	255 255 255	255 255 255	255 255 255
255 255 255	0 0 255	255 0 0	0 0 255	0 0 255	255 0 0	0 0 255	255 255 255	255 255 255	255 255 255
255 255 255	255 255 255	0 0 255	0 0 255	0 0 255	0 0 255	255 255 255	255 255 255	255 255 255	255 255 255
255 255 255	255 255 255	255 255 255	0 0 255	0 0 255	255 255 255	255 255 255	255 255 255	255 255 255	255 255 255

1111 1111 . 1111 1111 . 1111 1111
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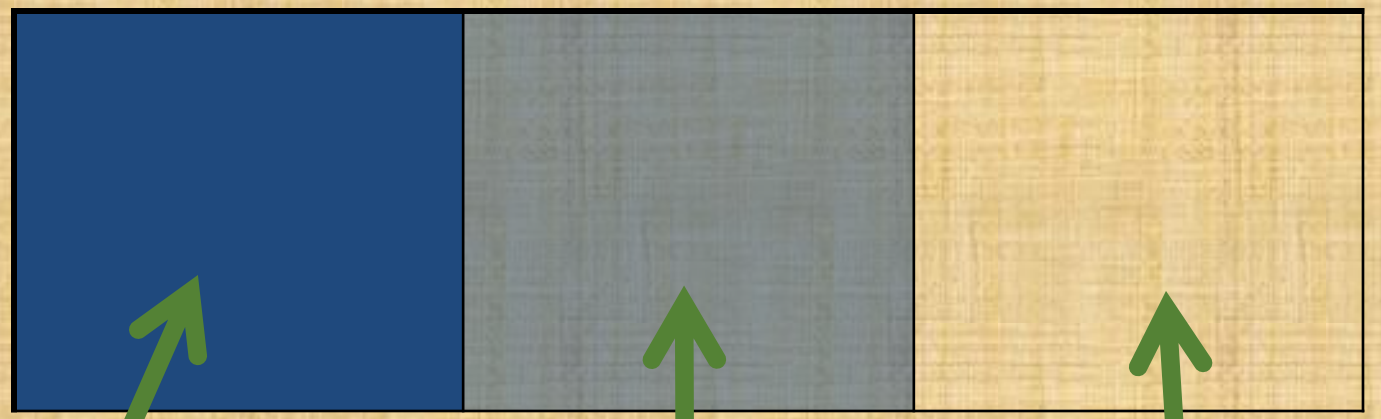
1111 1111 . 0000 0000 . 0000 0000
0000 0000 . 0000 0000 . 1111 1111
0000 0000 . 0000 0000 . 1111 1111
1111 1111 . 0000 0000 . 0000 0000
0000 0000 . 0000 0000 . 1111 1111
...

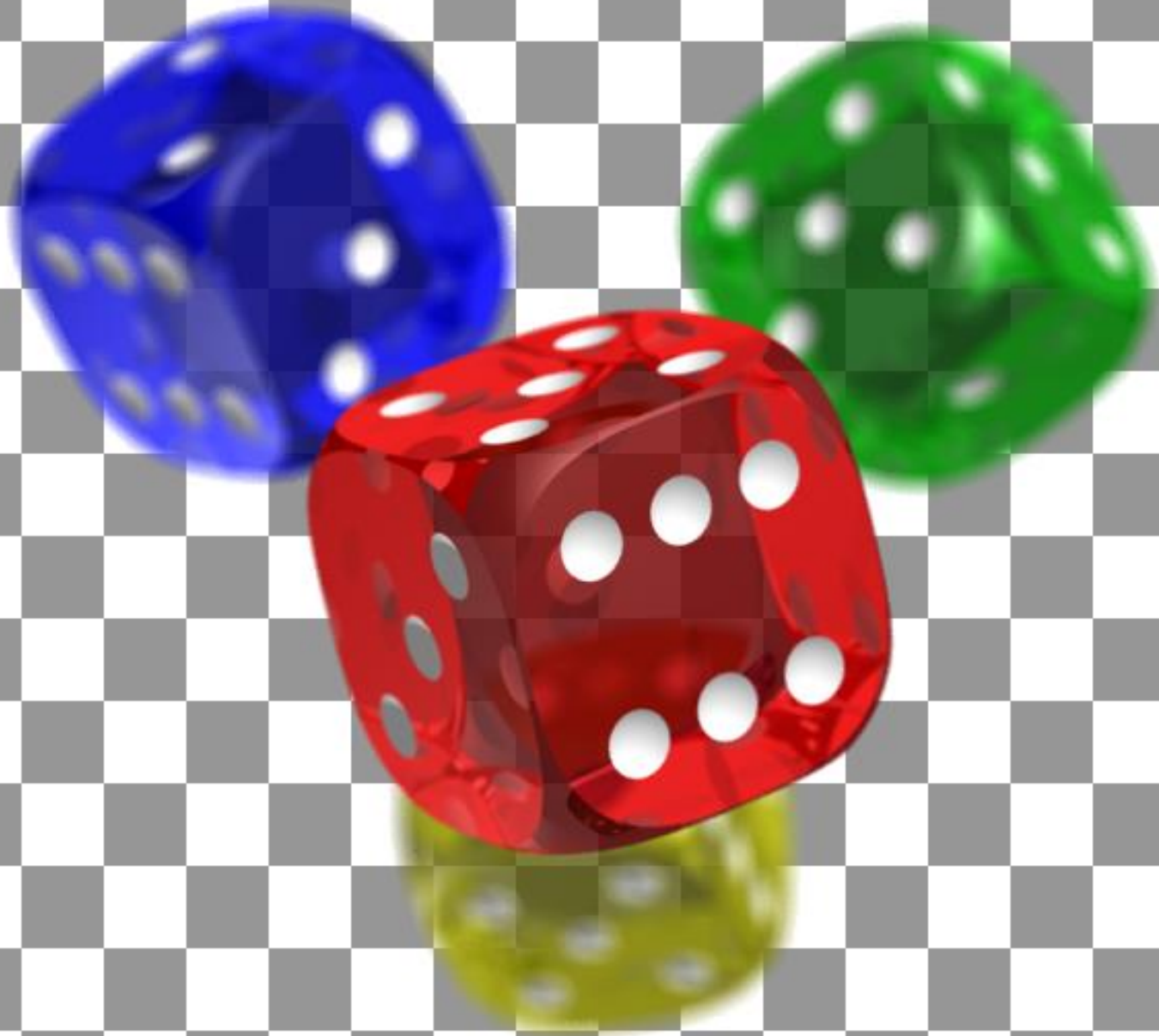
Alpha Channel



1F497DFF

1F497D7F

1F497D00



RGB Color

96 = 01100000

232 = 11101000

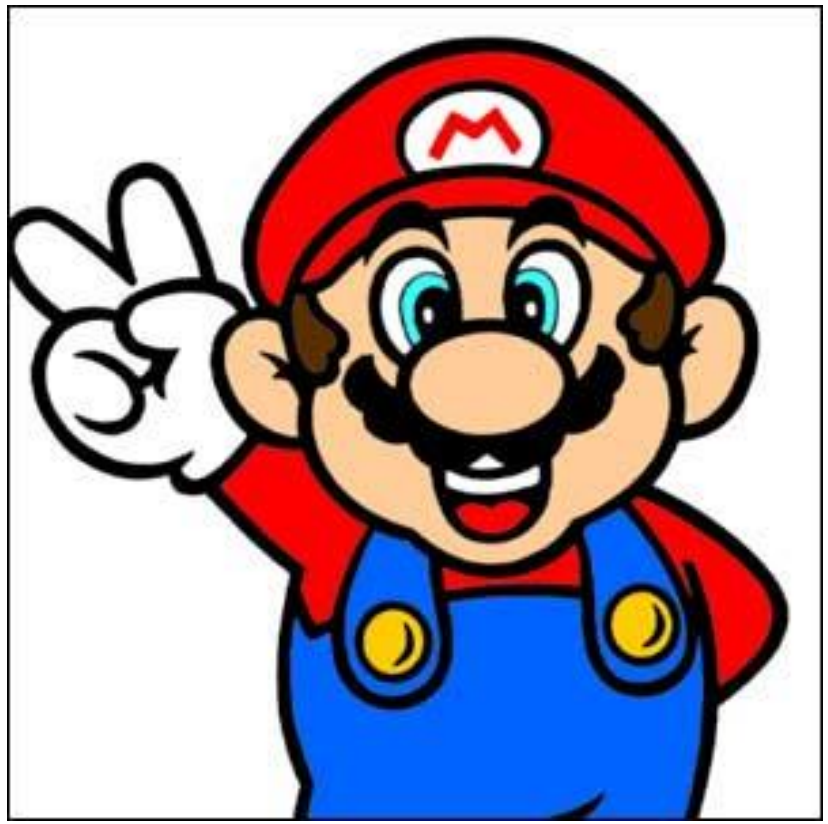
150 = 10010110

01100000 11101000 10010110

Decimal

Base 10

100s	10s	1s
1	0	9



Binary

Base 2

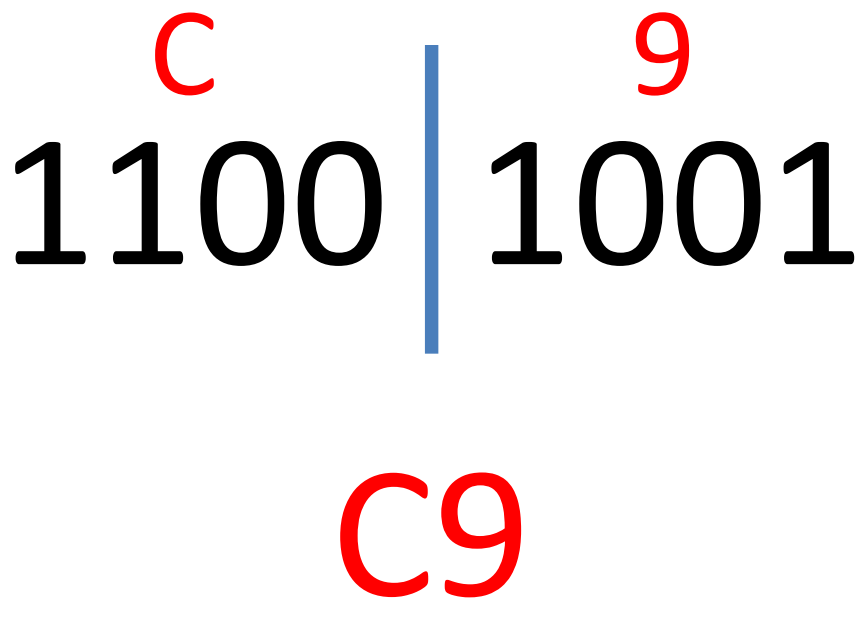
4s	2s	1s
1	0	1

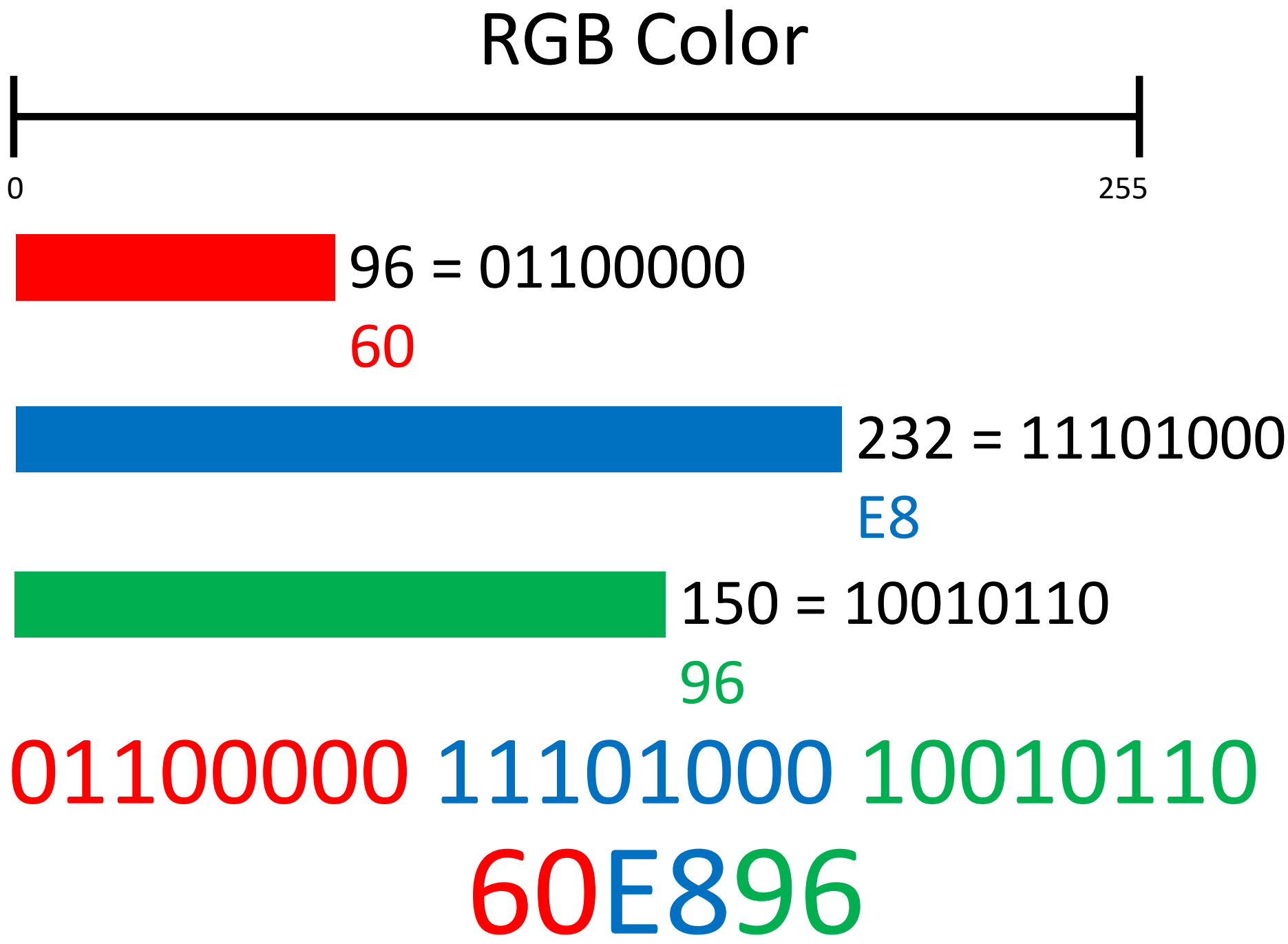
Hexadecimal

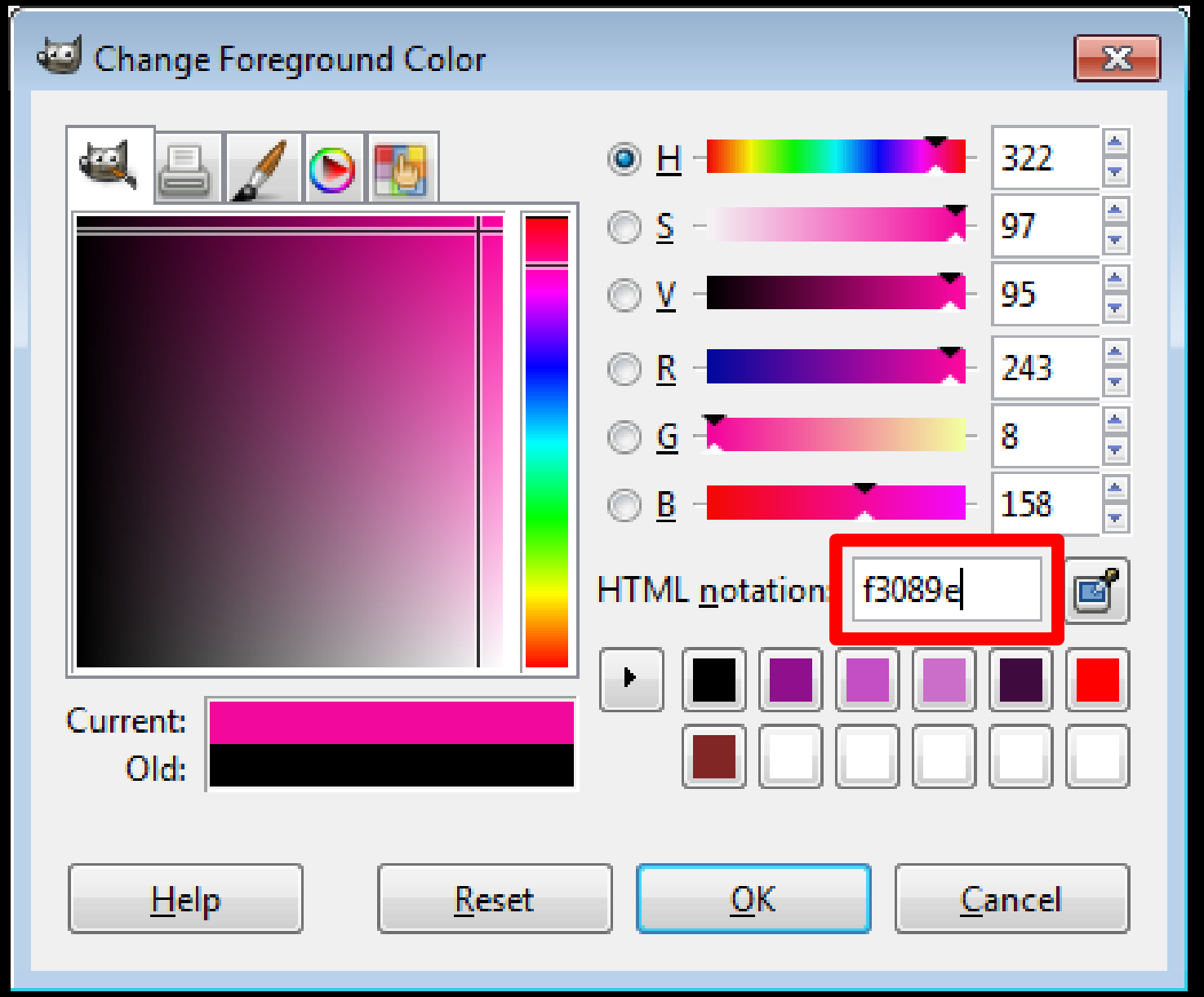
Base 16

256s 16s 1s

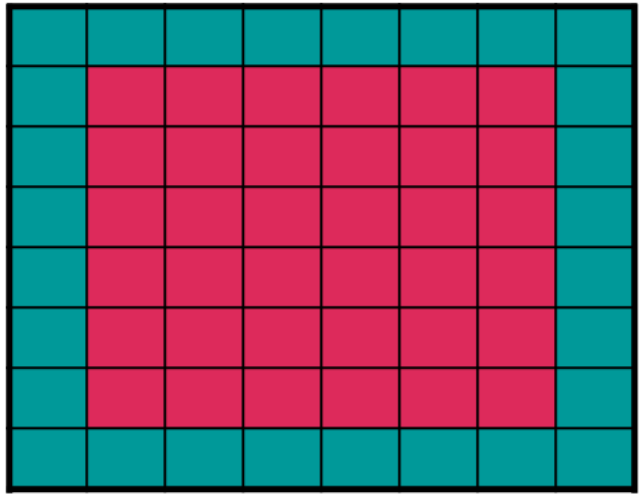
F 3 A


C
9
1100
1001
C9


RGB Color
0
255
96 = 01100000
60
232 = 11101000
E8
150 = 10010110
96
01100000 11101000 10010110
60E896


Change Foreground Color
H
322
S
97
V
95
R
243
G
8
B
158
HTML notation:
f3089e
Current:
Old:
Help
Reset
OK
Cancel

Indexed Image



64 pixels

0 0 0 0 0 0 0 0
0 1 1 1 1 1 1 0
0 1 1 1 1 1 1 0
0 1 1 1 1 1 1 0
0 1 1 1 1 1 1 0
0 1 1 1 1 1 1 0
0 1 1 1 1 1 1 0
0 1 1 1 1 1 1 0
0 0 0 0 0 0 0 0

8 x 8 x 1 bit = 64 bits = 8 bytes

Color Palettes

$$\text{Number of possible values} = 2^{(\text{number of bits})}$$

$$2^8 = 256$$

42 Bit Color

24 Bit Color