



Screen Layout Design and Color




- The screen design is an important part of the UI development
- A poor screen design may degrade user performance
- Screen layout must be carefully designed
- There are numerous guidelines (we have seen already some of them)

Screen Layout Guidelines

- Several types:

General layout of information

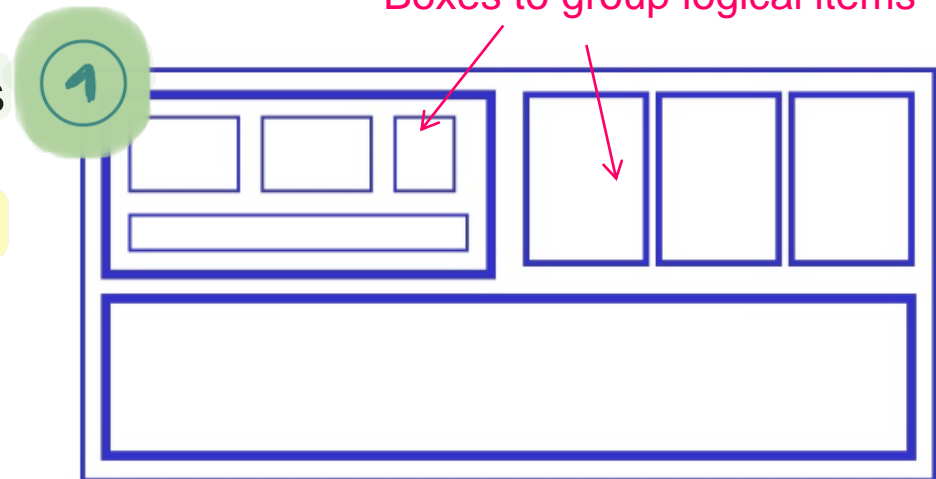
Text 

Numbers

Coding techniques (color and others)

Information layout

- Include only the needed information
- Include all needed information
- Begin at the top left corner and align left (in Western culture)
- Group items according to type
- Leave plenty of white space
- Use leaders in multiple columns
- This is related to how humans analyse an image



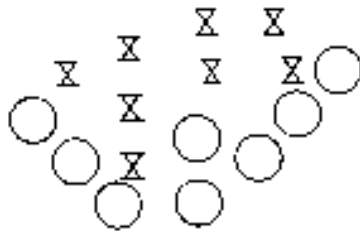
Gestalt Laws

Help understand how visual stimuli in a scene are perceived



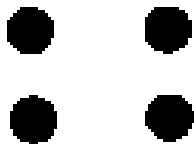
Proximity

Near stimuli are perceived as a group



Similarity

Similar stimuli tend to be grouped
(may override proximity)



Closure

Stimuli tend to be grouped
in complete figures



Simplicity

Ambiguous stimuli tend to be resolved
Using the simplest explanation



Good continuation

Stimuli tend to be grouped as to minimize
variations or discontinuities



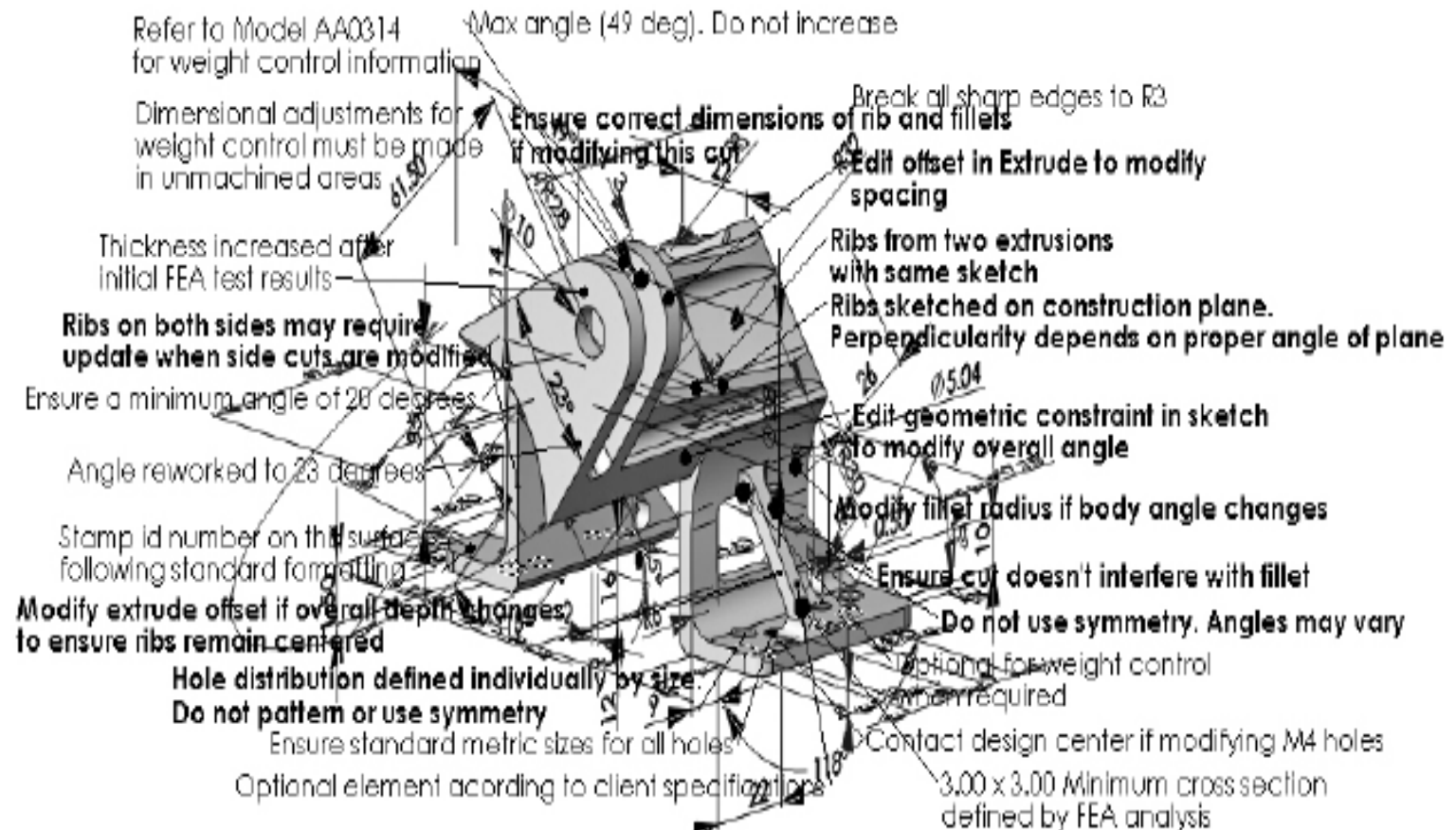
Symmetry

Regions delimited by symmetric tend
to be perceived as coherent figures

Include only the needed information

like this ...

Avoid Visual Clutter



Text

- Avoid using only capital letters (are more difficult to read)
- Avoid text with many capital letters
- Do not use too many fonts for emphasis
- In multiple columns use leaders or greying

use fonts for emphasis
(but not too many)

ABCDEF HIJKLM
NOPQRSTUVWXYZ

Alcântara - Terra			12:36			13:06			13:36	
Campolide	12:15		12:41	12:45		13:11	13:15		13:41	13:45
Rossio	12:19			12:49			13:19			13:49
Sete Rios		12:19	12:43		12:49	13:13		13:19	13:43	
Entrecampos		12:22	12:47		12:52	13:17		13:22	13:47	
Roma - Areeiro		12:24	12:49		12:54	13:19		13:24	13:49	

Use greying

In multiple columns it is difficult to read across gaps:

sherbert	75
toffee	120
chocolate	35
fruit gums	27
coconut dreams	85



use leaders

sherbert	_____	75
toffee	_____	120
chocolate	_____	35
fruit gums	_____	27
coconut dreams	_____	85

or greying

sherbert	75
toffee	120
chocolate	35
fruit gums	27
coconut dreams	85

- Messages shall:
 - Have a detail level adequate to user knowledge and experience
 - Be specific and understandable
 - Be brief and concise
 - Be positive
 - Be helpful

Error messages

Too verbose

better

The processing of the text editor yielded 23 pages of output	<u>Output 23 pages</u>
Error in SIZE field	<u>Error: SIZE range is 4 to 16</u>
Cannot exit before saving file	<u>Save file before exiting</u>
Bad/illegal file name	<u>Maximum file name length is 8 chars</u>
Syntax error 1542	<u>Unmatched left parenthesis in line 210</u>

Too vague

Positive only

Negative

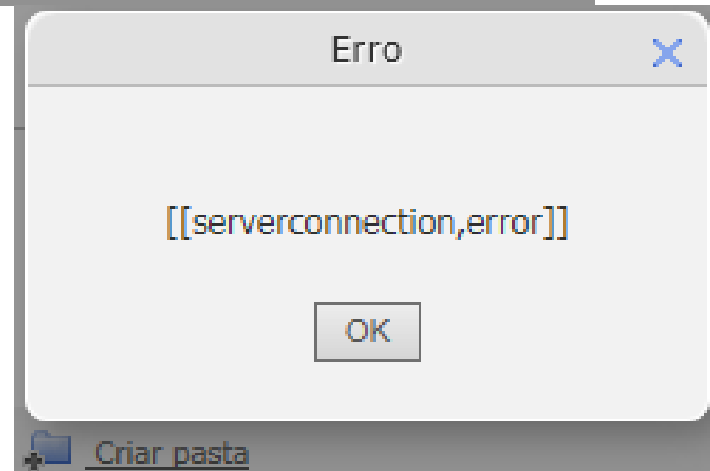
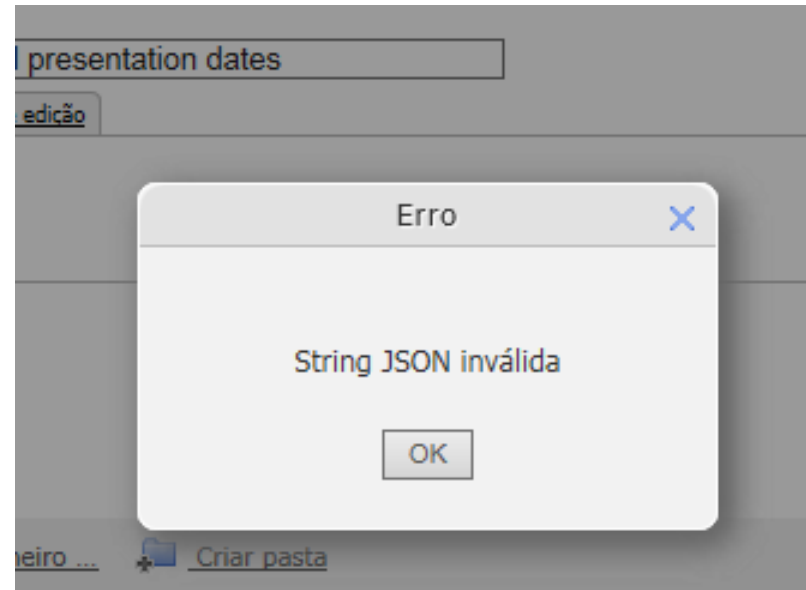
Not helpful

Examples of useless messages for users



Except (maybe) for Chinese people!

Moodle:

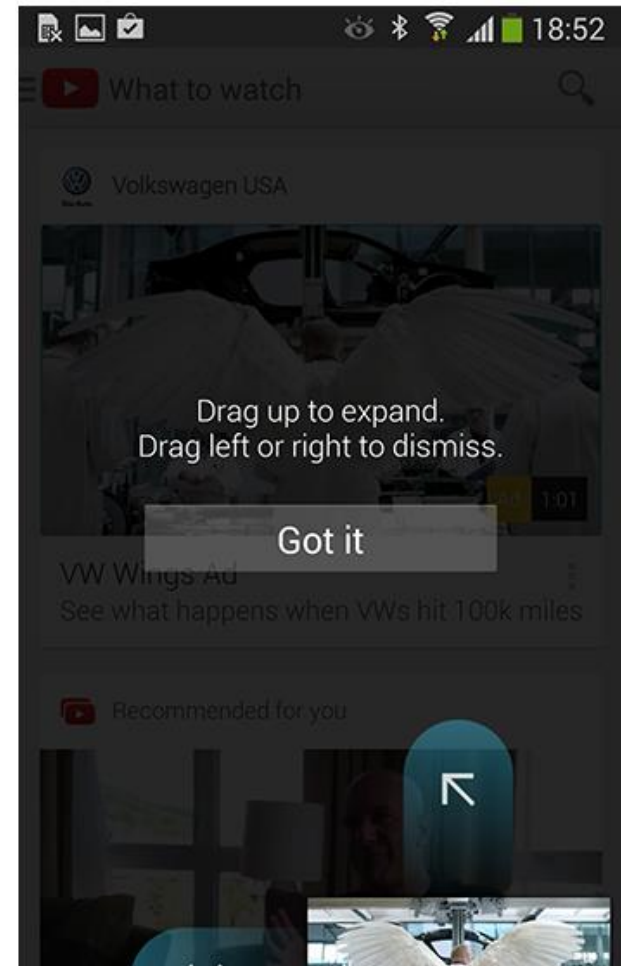


Instructional Overlays and Coach Marks for Mobile Apps

- Instructions in mobile applications must be designed for optimal scannability, as users tend to dismiss them quickly and do not read thoroughly

Main guidelines:

- Short, Focused Tips
- Avoid Chains of Tips
- Use Visuals When Possible
- Keep Tips Sparse



Numbers

- Integers shall be right justified
- Real numbers shall be aligned by the decimal point
- Avoid unnecessary zeros (at left)
- Long numbers shall be divided in groups of 3 or 4



Which is the largest?

532.56
179.3
256.317
15
73.948
1035
3.142
497.6256



627.865
1.005763
382.583
2502.56
432.935
2.0175
652.87
56.34

Align decimal points



75
120
35
27
85

Right align integers



Numbers

Better

10 100 1000 10000	10 100 1000 10000 ✓
100.00 25.365 5432.01 1.45591	100.00 25.365 5432.01 1.45591 ✓
10:1 p.m. 002	10:02 p.m. 2 ✓
6173954686	617-395-4686 ✓

Coding techniques

Blinking

Bold

Size

Font

Underlining

Shape

Special characters and icons

Proximity

Borders

Sound

Colour

Main guideline: use parsimoniously any coding technique!

Specific problems for different platforms: mobile

- Many guidelines are similar for mobile and desktop design, but their mobile interpretation is much more unforgiving
 - Context of use
 - Size of screen
 - Platform limitations



<http://www.nngroup.com/articles/mobile-sharpens-usability-guidelines/>

<https://developer.android.com/design/index.html>

Links on tablet and mobile usability

Raluca Budiu, The State of Mobile User Experience, NNGroup, March, 2015

<http://www.nngroup.com/articles/mobile-usability-update/>

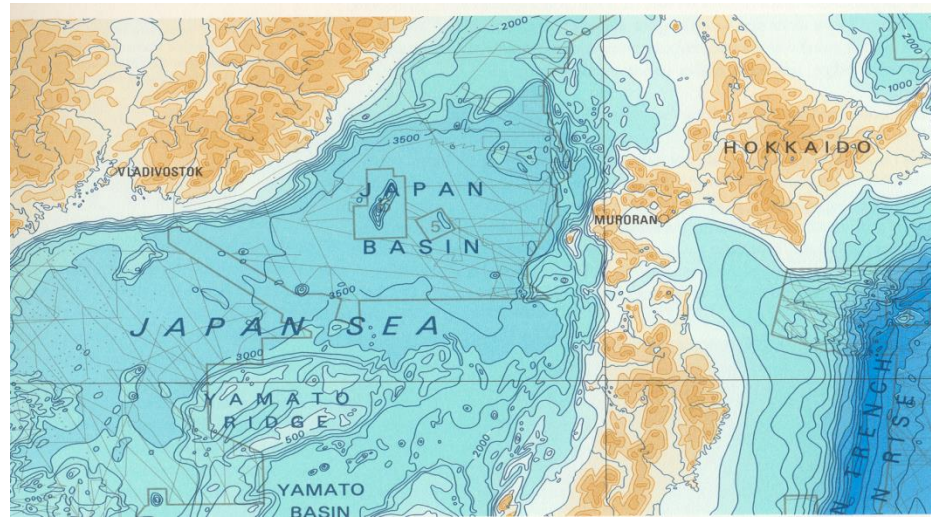
<https://developer.apple.com/library/ios/documentation/UserExperience/Conceptual/MobileHIG/>

<https://developer.android.com/design/index.html>



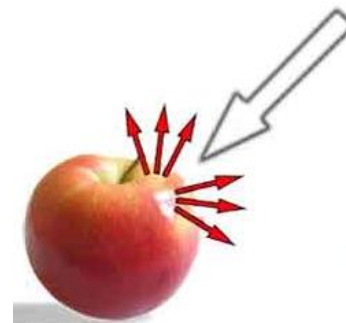
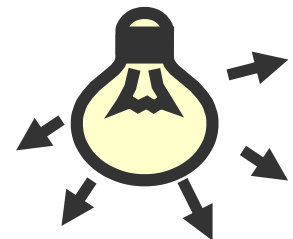
Universidade de Aveiro
Departamento de Electrónica,
Telecomunicações e Informática

Color usage



Color

- Color is a complex and multidisciplinary subject:
 - Physics
 - Physiology and psychology
 - Art and graphic design
 - Interactive systems design
- The perceived color of an object depends on the:
 - Material characteristics
 - Illumination
 - Ambient color
 - Human visual system



How many cherries?



(Ware, 2004)

How many cherries?



Color may support users in many tasks!
(yet, if not properly used may make them more difficult!)

Using color

Besides increasing realism, it may have the following **advantages**:

It may:

- Show the logical organization of the information displayed
- Represent approximate values
- Catch the attention
- Increase satisfaction
- Ease the search in complex displays
- Trigger emotions

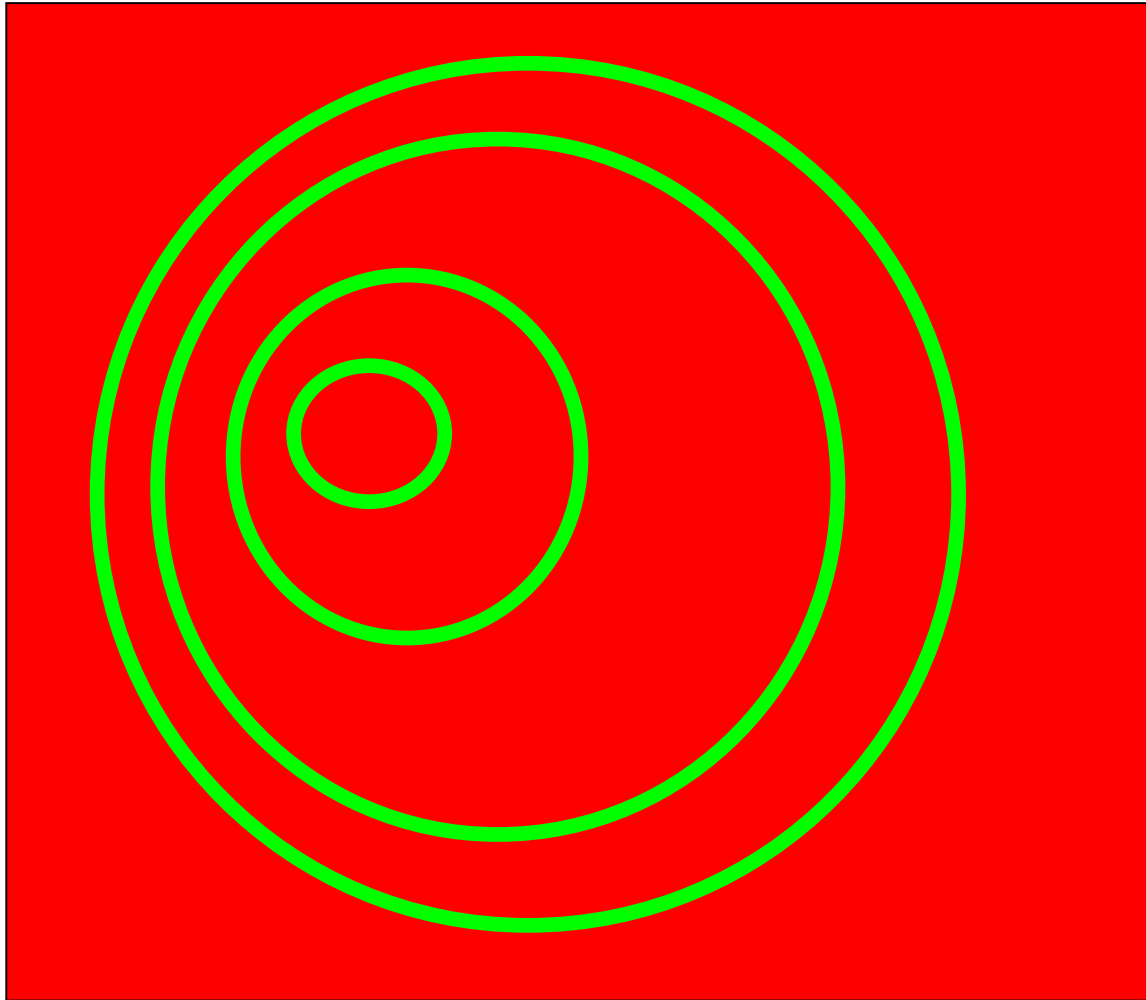
...

However, **it may degrade user's performance** if not used properly

Guidelines for using color

- **Use color parsimoniously**
- Use a limited number of colors
- Firstly make it work without color
- Use color coherently
- Avoid using simultaneously several saturated colors
- Do not convey information solely through color
- Make color coding support the user task
- Make the color coding as obvious as possible
- Allow the user to control the color code
- Take into account the cultural meaning of colors ...





Vermelho e Verde juntos: NÃO! // → Saturados

Saturated complementary colors should not be used simultaneously

Que terror...

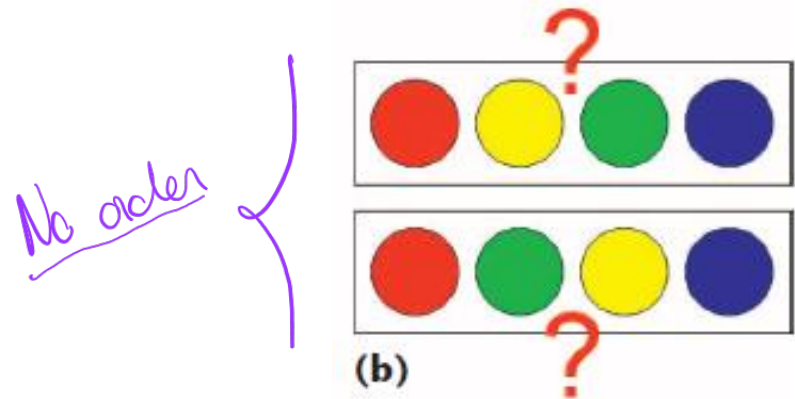
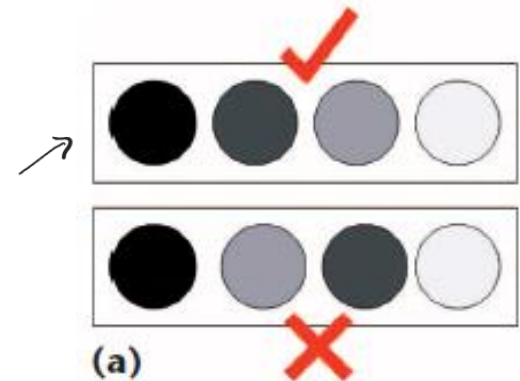


Small spots of color on a neutral background enhance relevant information

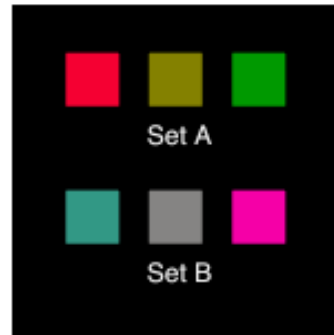
(Tufte, 1990) 31

- Do not expect to easily perceive order from color

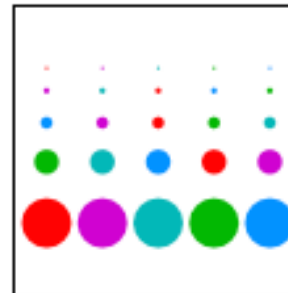
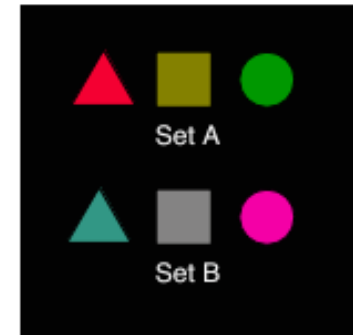
(Borland, Taylor II, 2007)



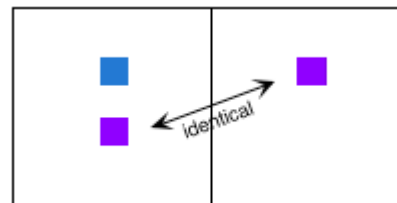
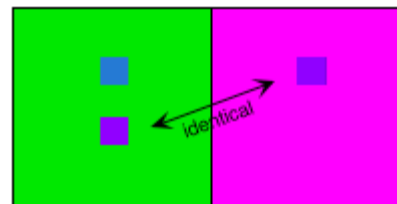
The elements within these sets look identical to deuteranopes, the most common kind of dichromat:



These can be discriminated on the basis of non-color differences:



Don't use colour coding on small elements



Use neutral gray surrounds where color judgments are critical.

Color Vision deficiencies

- $\approx 8\%$ of men and 1% of women have some type of color vision deficiency
- Generally it is genetic (associated to the X chromosome)
- Common deficiencies are explained by the lack of cones (color sensor cells in the retina) sensitive to the long and medium λ (dicromacies):
 - Protanopia (LW – “Red” cone)
 - Deuteranopia (MW – “Green” cone) (Daltonism)
- There are three types of inherited deficiencies:
 - Monocromacy (disorder or lack of all color sensitivity)
 - Dicromacy (disorder or lack of one type of cone)
 - Anomalous Tricromacy (disorder in cones)

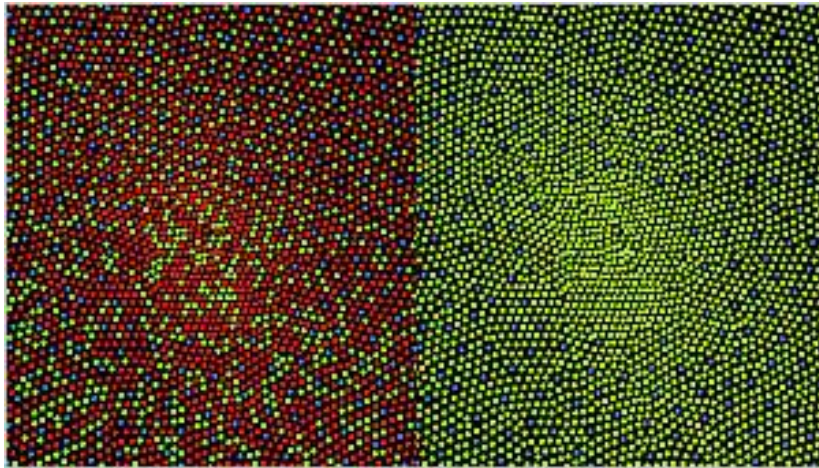
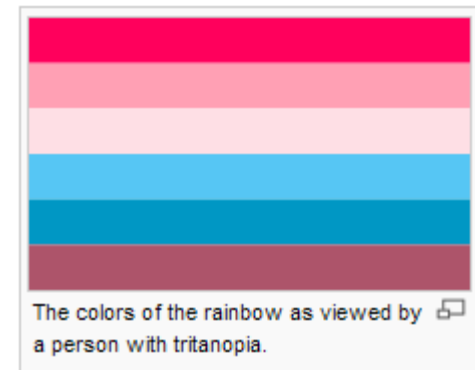
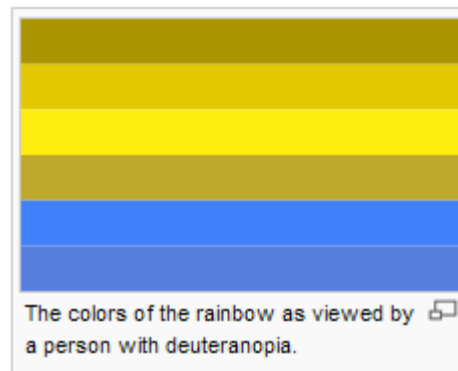


Illustration of the distribution of cone cells in the fovea of an individual with normal color vision (left), and a color blind (protanopic) retina. Note that the center of the fovea holds very few blue-sensitive cones.

http://en.wikipedia.org/wiki/Photoreceptor_cell

Rainbow colors as viewed by people suffering from color vision deficiencies

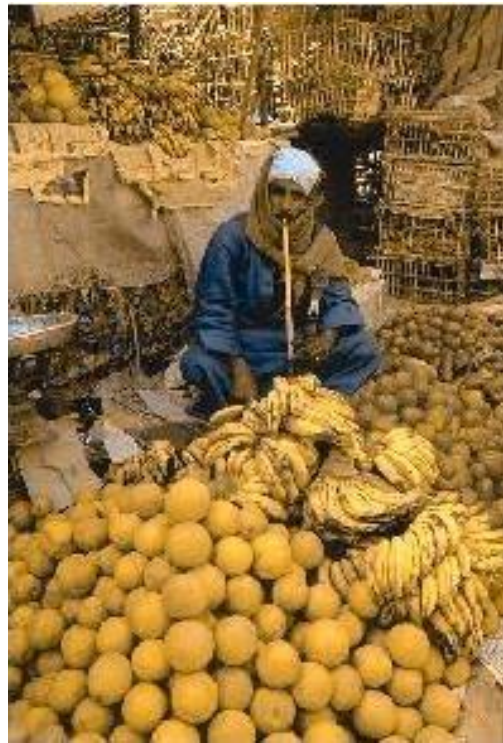


http://en.wikipedia.org/wiki/Color_blindness

Simulating color vision deficiencies



Original image as seen
by a normal observer

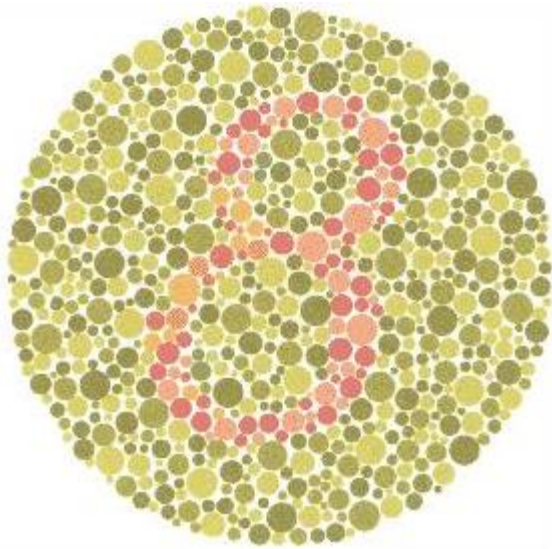


As seen by a deuteranope
(daltonic)

<http://www.daltonize.org/>

Simulating color vision deficiencies

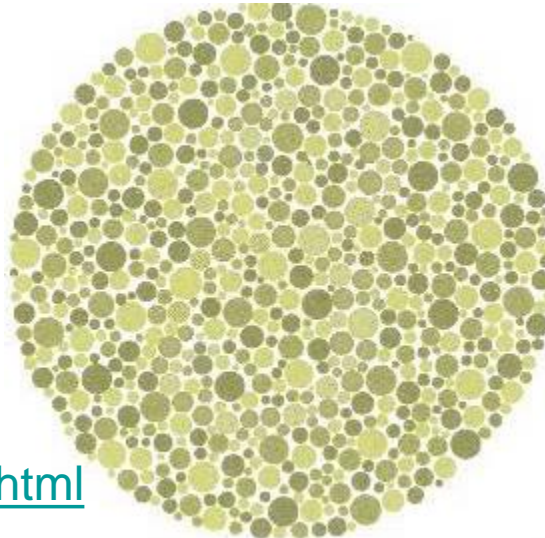
Ishihara-2



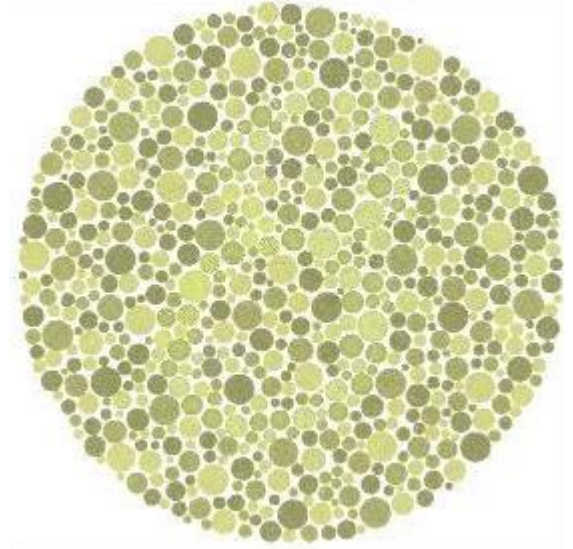
Original image as seen by a normal observer

As seen by an observer with a color vision deficiency:

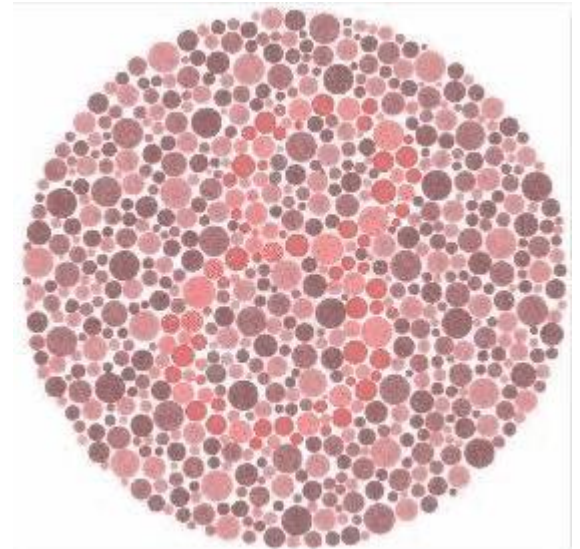
Red-Blind/Protanopia



Green-Blind/Deuteranopia



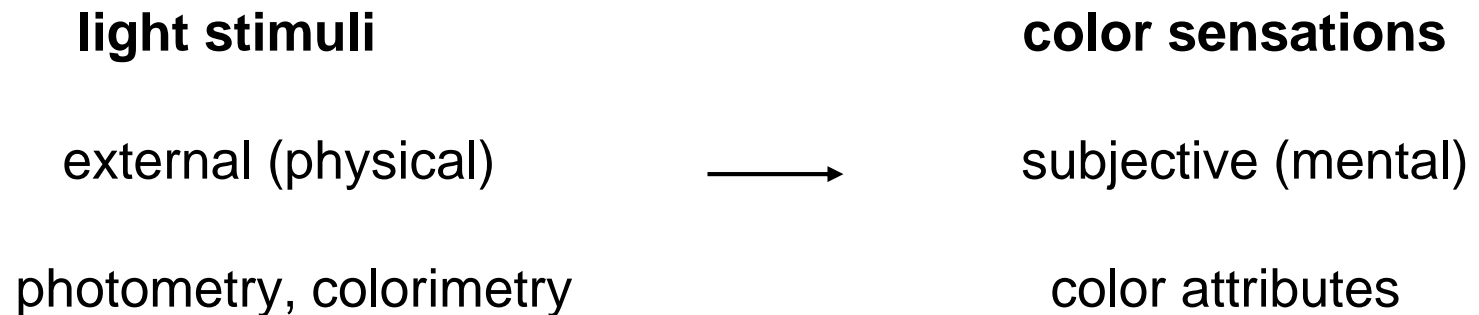
Blue-Blind/Tritanopia



<http://www.color-blindness.com/coblis/coblis.html>

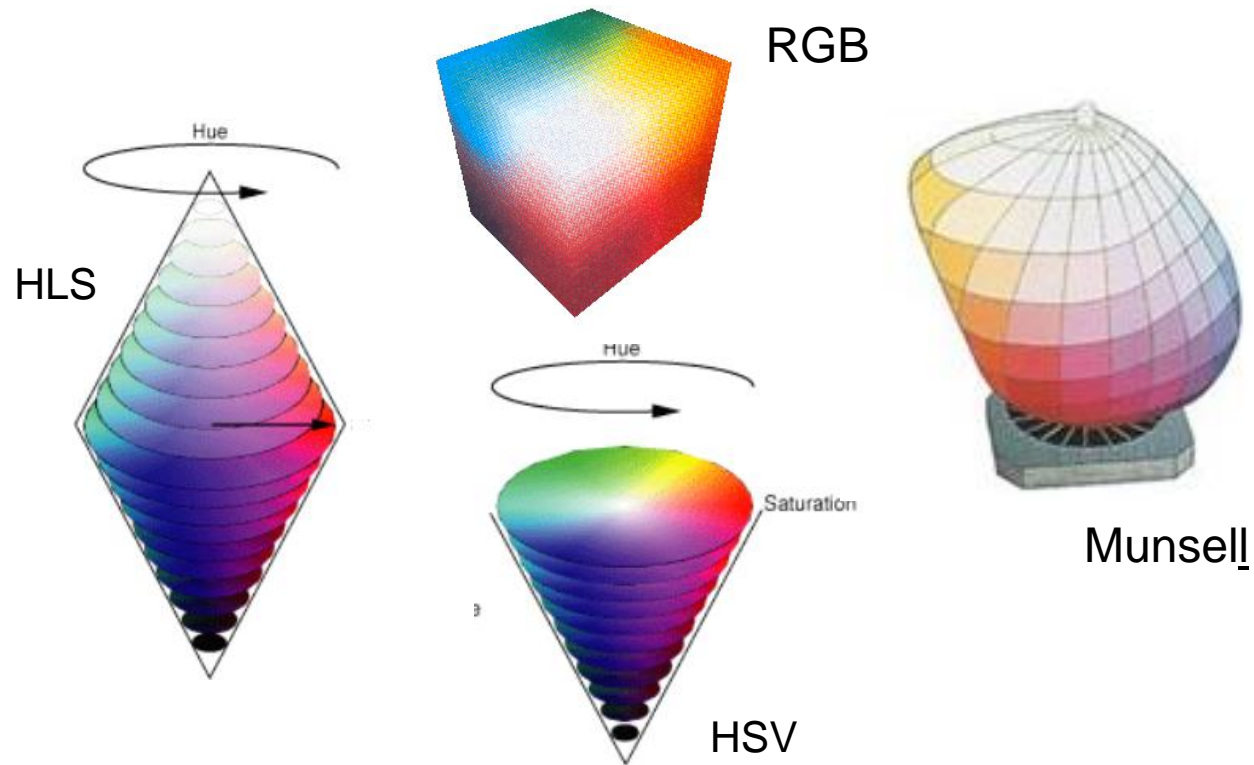
How can we describe color experience?

- Color perception happens in the mind due to light properties
- Different color descriptions are necessary for:





Color Models



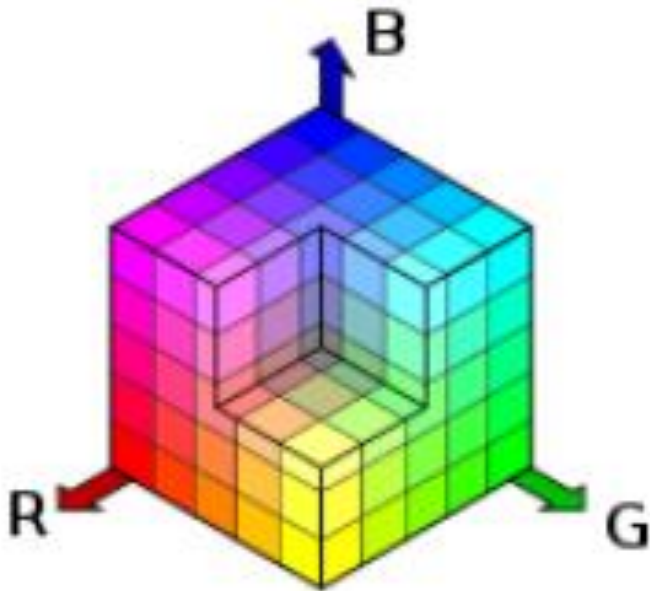
- Objects are perceived as having a color depending on the spectrum of the reflected light (or emitted)
- But different spectra may induce similar color sensations
- It is important to be able to describe color objectively
- There are two types of color production systems:
 - **Additive** (eg.: monitors, TV sets, projectors) → RGB
 - **Subtractive** (e.g.: printers) → CMY
- RGB and CMY are H/W oriented color models not adequate for users
- There are more color models ...

The RGB color model:



The **RGB color model** is an additive color model in which red, green, and blue light (the primary colors) are added to reproduce a broad array of colors.

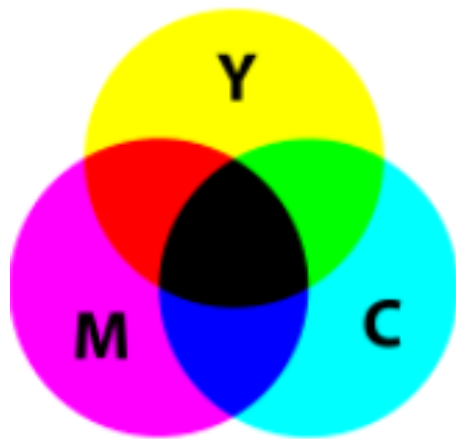
The color space is a cube in a Cartesian coordinate system



White -> 1, 1, 1

Black -> 0, 0, 0

https://en.wikipedia.org/wiki/RGB_color_model

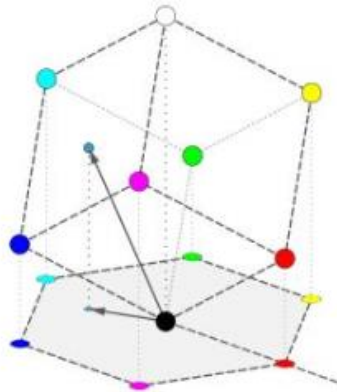


The **CMY color model** is a subtractive color model in which cyan, magenta, and yellow (the primary colors) are subtracted from white to reproduce a broad array of colors.

The color space is also a cube in a Cartesian coordinate system

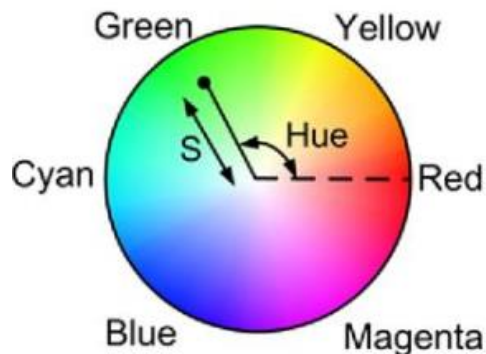
White -> 0, 0, 0

Black -> 1, 1, 1



There are other models more adequate to color specification by the users:

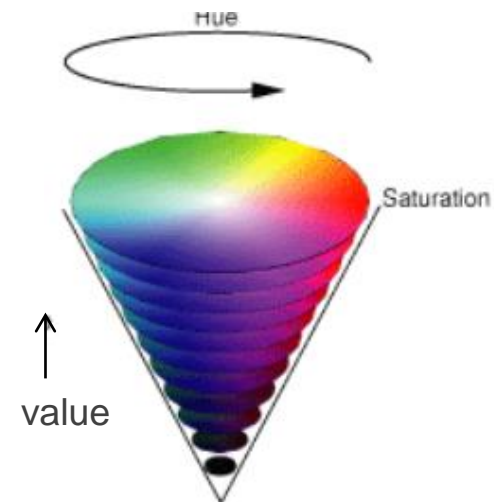
- HSV
- HLS



- Humans describe color based on 4 psychophysical variables related to physical variables:
 - Hue – the degree to which is similar to or different from stimuli that are described as red, green, blue, and yellow
 - Saturation – related to the amount of achromatic light
 - Lightness – related to the objects reflectance (for reflecting objects)
 - Brightness – for light emitting objects

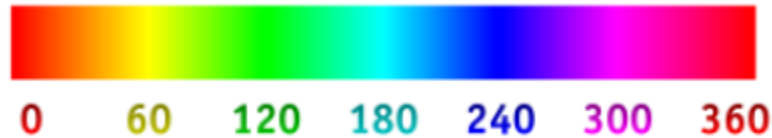


<https://en.wikipedia.org/wiki/Hue>



- HSV color model:

- Hue



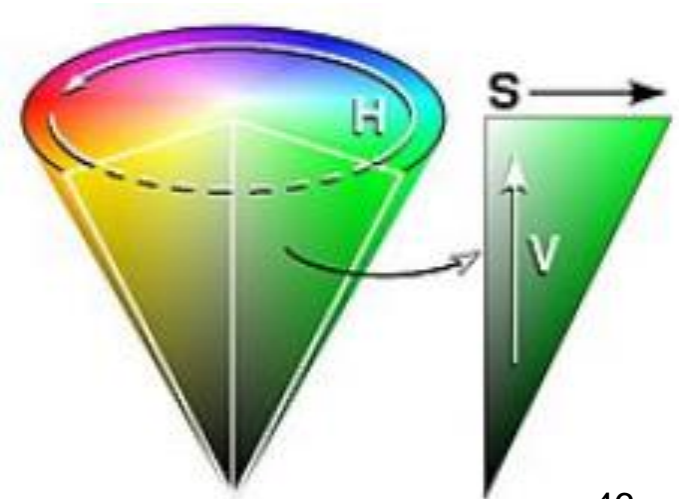
- Saturation – related to the amount of achromatic light

- Value - controls the brightness: 0% - pure black 100% - pure white

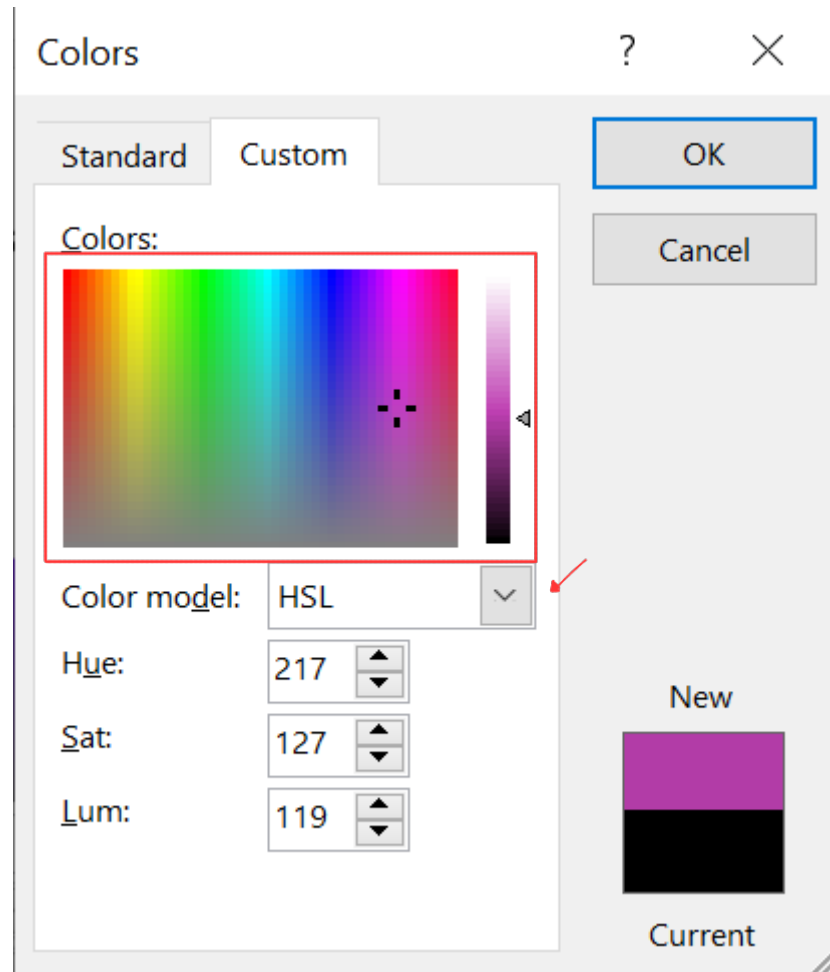
Uses cylindrical coordinates

<https://www.khanacademy.org/partner-content/pixar/color/color-101/v/color-3>

<https://programmingdesignsystems.com/color/color-models-and-color-spaces/index.html>



- Let the user select a color:



Interesting Links

- Introduction to color guidelines and standards (NASA)
http://colorusage.arc.nasa.gov/guidelines_0.php