HTML5 & CSS3

A chance to Do things Differently

Eng. Niveen Nasr El-Den
iTi

Day 3

Canvas

Canvas

- Canvas is a new HTML element
- A canvas is a rectangular area, that you control every pixel of it.
- The canvas element has several methods for drawing paths, boxes, circles, characters, and adding images...

Canvas

- <canvas> element is an HTML tag, with the exception that its contents are rendered with JavaScript.

- It creates a fixed size drawing surface that exposes one or more *rendering contexts* using canvas context object.

- Each canvas element can only have one context that can be “2d”.

Canvas

- Draw dynamic and interactive graphics
- Draw images using 2D drawing API
  - Lines, curves, paths, shapes, fill styles, etc.
- Useful for:
  - Graphs
  - Applications
  - Games and Puzzles
  - And more…

Steps to follow

- Place the canvas tag somewhere inside the HTML document,
- Access the canvas tag with JavaScript,
- Create a 2D context, and then
- Utilize the HTML5 Canvas API to draw visualizations.

```
<canvas id="myCanvas" width="300" height="150"></canvas>

<script>
    var canvas = document.getElementById('myCanvas');
    var context = canvas.getContext('2d');
    // do stuff here
</script>
```

Canvas Element & Canvas Context

- The canvas element is an actual DOM node that's embedded in the HTML page.
- The canvas context is an object with properties and methods that you can use to render graphics inside the canvas element.
- The context is *2d.*

Canvas Context Properties & Methods

- Color &Fill Styles
- Line
- Path
- Curve
  - Besier
  - Quadratic
- Shapes
  - Rectangle
  - Circle
  - Custom Shapes
- Text
- Shadows
- Images/Videos
- Clipping
- Transforms
  - Scale
  - Translate
  - Rotate
- Patterns
- Gradients
  - Linear
  - Radial

Line using HTML5 Canvas

- To draw a line using HTML5 Canvas

http://www.w3.org/TR/2dcontext/#building-paths

  - First, use the *beginPath()*
    - method to declare that we are about to draw a new path.
  - Next, use the *moveTo()*
    - method to position the context point (i.e. drawing cursor
  - Then, use the *lineTo()*
    - method to draw a straight line from the starting position to a new position.
  - Finally, to make the line visible, we can apply a stroke to the line using *stroke()*.
  - Note:
    - without declaring strokeStyle property before using stroke(), the stroke default color is black

Line useful Properties & Methods

- lineWidth
  - used to define width of the required line to be drawn in px,
  - should be declared before strokeStyle property.
- lineCap = square | round | butt
  - declares how the drawn line ends look
- lineJoin = bevel | round | miter
  - declares how two lines are joined together

Curves & Arcs Using HTML5 Canvas

arc(x, y, radius, startAngle, endAngle, antiClockwise);

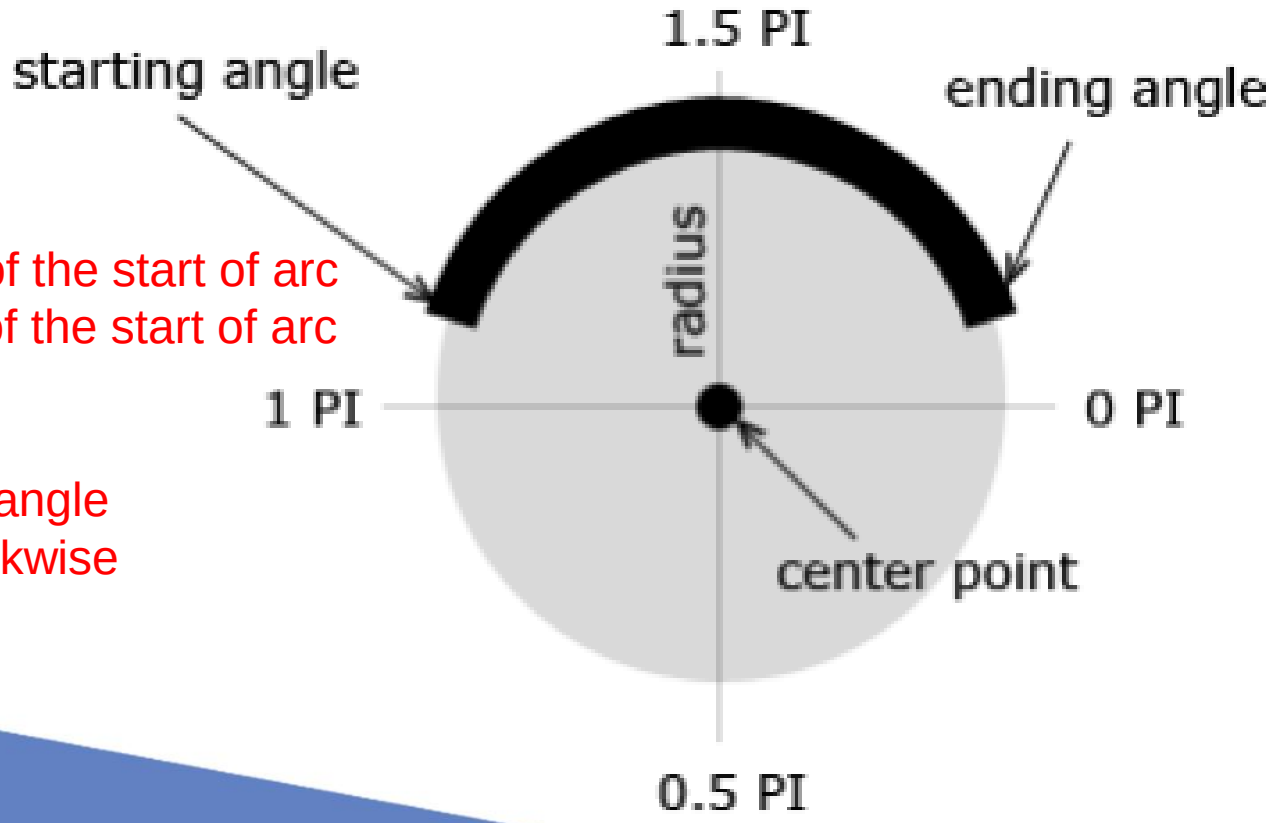
- An arc is nothing more than a section of the circumference of an imaginary circle that can be defined by *x*, *y*, and *radius*.
- *startAngle* and *endAngle*. These two angles are defined in radians.
- *antiClockwise* boolean value which defines the direction of the arc path between its two ending points, its default is false
  - i.e. the arc to be drawn is clockwise

Curves & Arcs Using HTML5 Canvas

- arc(x, y, radius, startAngle, endAngle, antiClockwise);
- arcTo(controlX,controlY,endX,endY,radius);

Example:

```
arc(
        210, // X coordinate of the start of arc
        210, // Y coordinate of the start of arc
        200,  // Radius
        0,     // Start angle
        Math.PI * 2,    // End angle
        true);          // Anticlockwise
```



Circle & Semi-Circle using HTML5 Canvas

- To draw a circle
  - Use *arc()* method and define its starting angle as 0 and the ending angle as 2 * PI.

```
arc(x, y, radius, 0, 2*Math.PI, anticlk);
```

- To draw a semi-circle
  - Use *arc()* method and define its ending angle has *startAngle* + PI.

```
arc(x, y, radius, sAngle,  sAngel+Math.PI, anticlk);
```

Rectangle using HTML5 Canvas

rect(x, y, width, height)

fillRect(x, y, width, height)

strokeRect(x, y, width, height)

clearRect(x, y, width, height)

- An HTML5 Canvas rectangle is positioned with *x* and *y* parameters, and is sized with *width* and *height* parameters.
- The rectangle is positioned about its top left corner.

Paths & shapes using HTML5 Canvas

- To create a path with HTML5 Canvas, connect multiple subpaths using
  - *lineTo()*,
  - *arcTo()*,
  - *quadraticCurveTo()*, and
  - *bezierCurveTo()*
- To create a custom shape
  - First create a path and mentioned above
  - Then, close it using the *closePath()*
- *Note:*
  - *beginPath()* is used in the beginning to start drawing a new path.
  - fillStyle property & fill() can be used to fill in color within drawn shape.

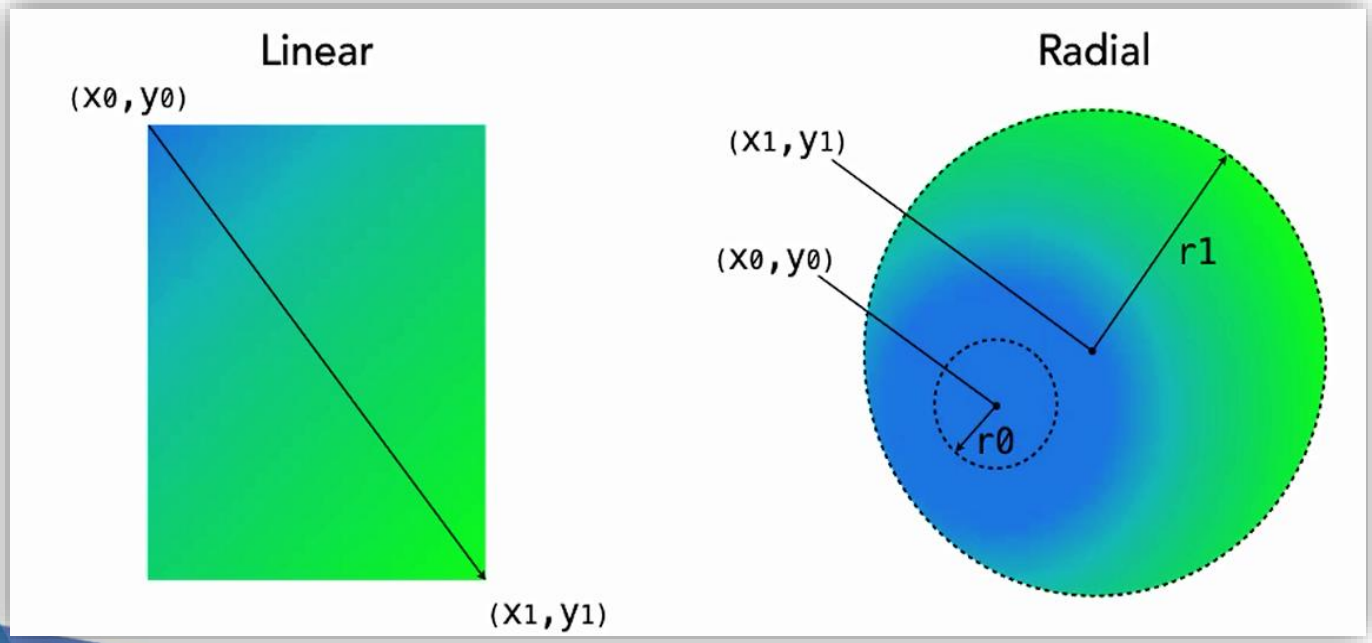
Text Properties & Methods

- font
  - style, size, font family
- fillStyle
  - color or rgb()
- fillText(txt, x, y)
- strokeStyle
  - color or rgb()
- strokeText(txt, x, y)
- textAlien, textBaseline, measureText(txt)…

http://diveintohtml5.info/canvas.html#text

Gradient

- Gradient can be used to fill rectangles, circles, lines, text, etc.. it can be used anywhere a stroke or fill is used
- Two types of gradient
  - Linear Gradient
  - Radial Gradient



Gradient

- Linear Gradient
  - ▻ `createLinearGradient(startX, startY, endX, endY);`
- Radial Gradient
  - ▻ `createRadialGradient(startX, startY, startRadius, endX, endY, endRadius);`
- Note:
  - ▻ Add color stops to create color transitions using `addColorStop(offset, color);`
    - It can be called multiple times to change a gradient
    - Its offset value between 0.0 and 1.0

Text Properties & Methods

- Font
  - style, size, font family, font weight, line height
- fillStyle
  - color or rgb()
- fillText(txt, x, y)
- strokeStyle
  - color or rgb()
- strokeText(txt, x, y)
- textAlien, textBaseline, measureText(txt)…

Dealing with Image

- To draw an image on canvas area we use
  - *drawImage(imgObj, x, y [, width, height])*
    - *imgObj* defines image required to be displayed, it must be created first and wait for being loaded befor instantiating drawImage().
    - *x,y defines* top left corner of the image relative to the top left corner of the canvas (0,0)
    - *width, height define width, height of the displayed image*
  - Note:
    - Construct your image object using “new Image()”

https://developer.mozilla.org/en-US/docs/Web/API/CanvasRenderingContext2D/drawImage

Transformation

- Transformation affects all drawing operations that come after it
- 3 basic transformation
  - Translate
  - Scale
  - Rotate
- Transformation is additive
- Its good using save() & restore() for the context state

Scaling, Rotating & Translating

- scale(x, y)
  - resize current drawing either bigger or smaller
- rotate(angle)
  - rotate the current context around the origin within the canvas area
- translate(x, y)
  - move current context within the canvas area into a different point

Saving & Restoring Canvas State

- Every canvas object contains a stack of drawing states.
- The canvas state can store:
  - strokeStyle
  - fillStyle
  - font
  - globalAlpha
  - lineWidth
  - lineCap
  - lineJoin
  - miterLimit
  - The current transformation matrix (rotation, scaling, translation)
  - shadowOffsetX
  - shadowOffsetY
  - shadowBlur
  - shadowColor
  - globalCompositeOperation
  - textAlign
  - textBaseline
  - The current clipping region

References

- http://slides.html5rocks.com
- http://www.tutorialspoint.com
- http://www.html5canvastutorials.com/tutorials/html5-canvas-element/
- http://okeschool.com/tutorial/549/canvas/canvas-basics/canvas-introduction.html
- http://cheatsheetworld.com/programming/html5-canvas-cheat-sheet/
- http://www.kirupa.com/canvas/canvas_transformations.htm

CSS3

Other Selectors & New Properties

Positioning Styles

- **Elements can be positioned as:**
  - **position:relative**
    → How to position an element relative to its normal position.
  - **position:absolute**
    → How to position an element using an absolute value.
  - **position:fixed**
    → How to position an element using fixed value
  - **position:static**
    → The default position of an element
  - **position:sticky**

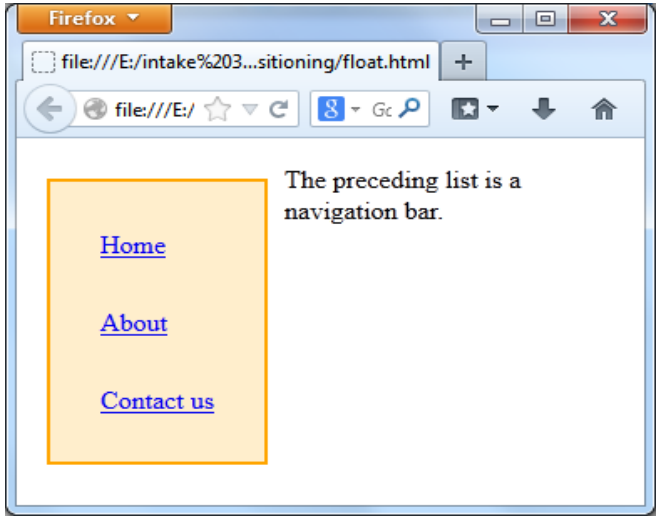
Positioning Styles
(offset properties)

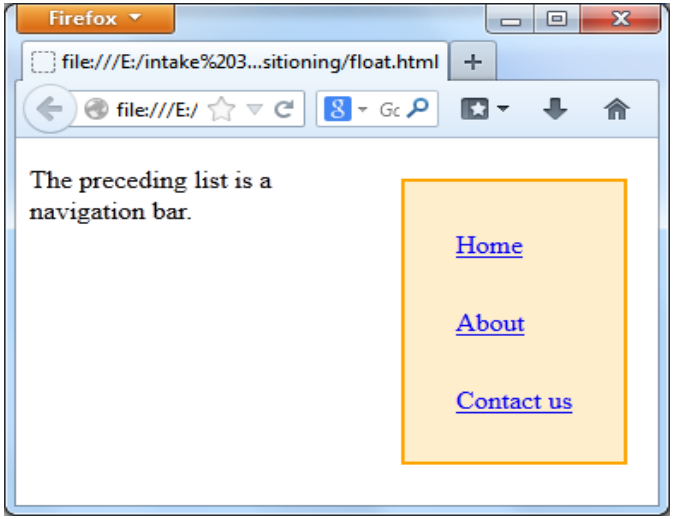
Property	Effects
left:*n*	Sets the left edge of the element relative to its container element; *n* is a *string* measurement unit, e.g., 100px.
top:*n*	Sets the top edge of the element relative to its container element; *n* is a *string* measurement unit, e.g., 100px
pixelLeft	Sets the left edge of the element relative to its container element; *n* is *numeric* for use in calculations, e.g., 100.
pixelTop	Sets the top edge of the element relative to its container element; *n* is *numeric* for use in calculations, e.g., 100.

Example!

float and clear

- Declares whether a box should float to the left or right of other content, or whether it should not be floated at all.





Example!

visibility

- The visibility property determines if an element is visible or not.

- Hidden element pre-allocates its space on the page if not positioned absolute

- The general format is:

  visibility:hidden|visible

Example!

display

- The **display** property differs from the visibility property in that it does *not* reserve space for hidden items
- **Some possible values for display:**

  1. none

  2. block

  3. inline

  4. inline-block

- **The general format is :**

  display:block|inline|none

  OR

  object.style.display="block|inline|none"

Example!

z-index

- The z-index property is used to place an element "behind" another element.
- z-index only affects elements that have a position value other than static
- Default z-index is 0.
- The higher number the higher priority. z-index: -1 has lower priority.
- The general format is:

  z-index:n

  OR

  object.style.zIndex=n

Example!

Dynamic sizing

Property	Effects
width:*value*	**Sets the width of the element; *n* is a string measurement, either in pixels or percentages.**
height:*n*	**Sets the height of the element; *n* is a string measurement, either in pixels or percentages.**
pixelWidth	**Sets the width of the element; *n* is numeric for use in calculations.**
pixelHeight	**Sets the height of the element; *n* is numeric for use in calculations.**

overflow

- Specifies if content of a block-level element should be clipped when it is larger than the parent element.

- **The general format is :**

  overflow:visible|hidden|scroll

  OR

  object.style.overflow=“visible|hidden|scroll "

Example!

CSS Selectors

- Several types of selectors are defined for use when implementing Style Sheets:
  - ✓ Simple Basic Selectors
  - ✓ Attribute selectors
  - ✓ Combinators
  - ✓ Pseudo-Classes
  - ✓ Pseudo-Elements
- A selector can contain a chain of one or more simple selectors separated by combinators, optionally followed by attribute selectors, ID selectors, or pseudo-classes. but it can contain only one pseudo-element, which must be appended to the last simple selector in the chain

Pseudo-Classes Selector

- A pseudo-class is similar to a class in HTML, but it's not specified explicitly in the markup.
- pseudo-class selectors
  - ✓ Dynamic
  - ✓ Link / Target
  - ✓ UI Element
  - ✓ Structural

Pseudo-Classes Selector

- Dynamic pseudo-class selectors
  - :active
    - matches any element that’s being activated by the user → the "pressed" state of a button-style link
  - :hover
    - matches elements that are being designated by a pointing device. i.e. when the mouse cursor rolls over a link, that link is in it's hover state and this will select it.
  - :focus
    - matches any element that’s currently in focus

Pseudo-Classes Selector

- Link / Target pseudo-class selector
  - :link
    - matches link elements that are unvisited
  - :visited
    - matches link elements that have been visited
  - :target
    - matches an element that's the target of a fragment identifier in the document's URI

Pseudo-Classes Selector

- UI element pseudo-class selectors
  - :enabled
    - matches user interface elements that are enabled
  - :disabled
    - matches user interface elements that are disabled
  - :checked
    - matches elements like checkboxes or radio buttons that are checked.
  - :valid
  - :required
  - etc.

Pseudo-Classes Selector

- Structural (Position-Number based) pseudo-class selectors
  - :first-child
  - :last-child
  - :only-child
  - :nth-child(n)
  - :nth-last-child(n)
  - :first-of-type
  - :last-of-type
  - :only-of-type
  - :nth-of-type(n)
  - :nth-last-of-type(n)
  - etc.

http://nthmaster.com/

Pseudo-Element Selector

- Pseudo-elements match virtual elements that don't exist explicitly in the document tree.
- In CSS1 and CSS2, pseudo-elements start with a colon (:) In CSS3, pseudo-elements start with a double colon (::), which differentiates them from pseudo-classes.
- :first-letter
  - represents the first character of the first line of text within an element
- :first-line
  - represents the first formatted line of text
- :before
  - specifies content to be inserted before another element
- :after
  - specifies content to be inserted after another element
- ::selection
  - represents a part of the document that's been highlighted by the user

https://oinam.github.io/entities/

https://developer.mozilla.org/en-US/docs/Web/CSS/Pseudo-elements

Specificity

A B C D

- **D** → Count of Types and Pseudo-elements selectors
- **C** → Count of Classes, Attributes, & Pseudo-classes selectors
- **B** → Count of ID selectors
- **A** → Count of Inline Style

Specificity

Example

```
body#home div#warning p.message { color: red; }
```

Inline Style	IDs	Classes, Attributes, and Pseudo-classes	Element Types and Pseudo-elements

Specificity

Example

```
ul#nav li.active a { color: red; }
```

Inline Style	IDs	Classes, Attributes, and Pseudo-classes	Element Types and Pseudo-elements

Specificity

Example

```
#footer *:not(nav) li{ color: red; }
```

Inline Style	IDs	Classes, Attributes, and Pseudo-classes	Element Types and Pseudo-elements

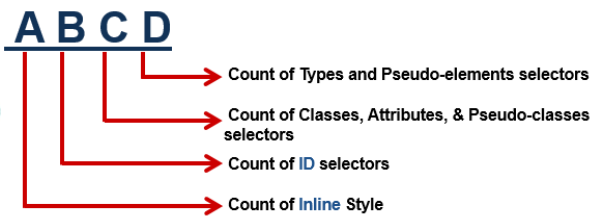
Note:
The **:not()** sort-of-pseudo-class adds no specificity by itself, only what's inside the parents is added to specificity value.

Specificity

Example

```
body#home div#warning p.message { color: red; }

p.message { color: green; }

#home #warning p.message { color: yellow; }

#warning p.message { color: white; }

body#home div#warning p.message { color: blue; }

p { color: teal; }

* body#home>div#warning p.message { color: red; }

#warning p { color: black; }
```

Specificity



Selector	A	B	C	D
body#home div#warning p.message	0	2	1	3
* body#home>div#warning p.message	0	2	1	3
body#home div#warning p.message	0	2	1	3
#home #warning p.message	0	2	1	1
#warning p.message	0	1	1	1
#warning p	0	1	0	1
p.message	0	0	1	1
p	0	0	0	1

Specificity Important Notes

- The universal selector (*) has no specificity value
- Pseudo-elements (e.g. :first-line) get 0,0,0,1 unlike their pseudo-class which get 0,0,1,0
- The pseudo-class :not() adds no specificity by itself, only what's inside it's parentheses
- The **!important** value appended a CSS property value is an *automatic win*.

New Properties

New Properties

- @rule
- Animation
- Transition
- Transformation (2D,3D)
- …etc.

Opacity

- Specifies the transparency of an element
- Opacity has a default initial value of 1
  - Range: 0.0 (invisible) to 1.0 (solid)
- Not inherited, but a child element less transparent than the parent.

Example!

Shadowing

- Text Shadow

http://www.cssmatic.com/

https://cssgenerator.org/box-shadow-css-generator.html

- Box Shadow
  - The box-shadow property allows designers to easily implement multiple drop shadows (outer or inner) on box elements, specifying values for color, size, blur and offset.

Example!

Vendor Extension Prefixes

http://expressprefixr.herokuapp.com/

Prefix	Organization
-moz-	Mozilla Foundation
-ms-	Microsoft
-o-	Opera Software
-webkit-	Safari and Chrome

@rule

- At-rules are instructions or directives to the CSS parser. They can be used for a variety of purposes.
  - @charset
  - @import
  - @media
  - @page
  - @font-face
  - @namespace
  - @keyframe

Font Style

@font-face & Different Formats

http://fontsquirrel.com/
https://www.dafont.com/

ttf	✔	✔	✔	✔	✔
otf	✔	✔	✔	✔	✔
svg	✔		✔		✔
eot				✔	
woff	✔	✔	✔	✔	✔

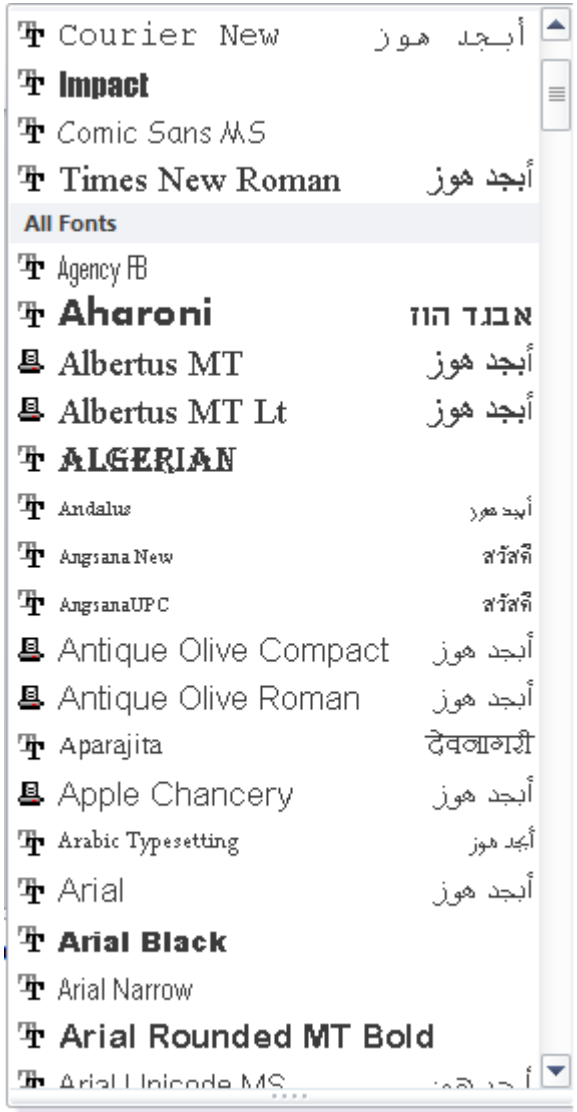
@font-face: allows specifying custom fonts

Example!

https://fonts.google.com/

Font Collections

- Serif
  - Time New Roman
- Sans-serif
  - Arial
- Cursive
  - *Comic sans*
- Fantacy
  - **Impact**
- Monospace
  - Courier New



Animation

Property	Description
@keyframes	Specifies the animation
animation	A shorthand property for all the animation properties below, except the animation-play-state property
animation-name	Specifies a name for the @keyframes animation
animation-duration	Specifies how many seconds an animation takes to complete one cycle
animation-timing-function	Specifies the speed curve of the animation (linear|ease|ease-in|ease-out|ease-in-out..)
animation-delay	Specifies when the animation will start
animation-iteration-count	Specifies the number of times an animation should be played
animation-direction	Specifies whether or not the animation should play in reverse on alternate cycles (normal|alternate..)

Transform

- Applies a 2D or 3D transformation to an element
  - rotate, scale, skew, translate.. etc.
  - i.e. scale(x,y), scale3d(x,y,z), scaleX(x), scaleY(y), scaleZ(z).. etc.

Example!

Transform

Property	Description
transform	Applies a 2D or 3D transformation to an element rotate, scale, skew, translate.. etc. i.e. scale(x,y), scale3d(x,y,z), scaleX(x), scaleY(y), scaleZ(z).. etc.
transform-origin	Allows you to change the position on transformed elements *x-axis y-axis z-axis*;

Example!

Transition

- Allows property changes in CSS values to occur smoothly over a specified duration.

Property	Description
transition	A shorthand property for setting the four transition properties
transition-property	Specifies the name of the CSS property the transition effect is for
transition-duration	Specifies how many seconds or milliseconds a transition effect takes to complete
transition-timing-function	Specifies the speed curve of the transition effect
transition-delay	Specifies when the transition effect will start

Example!

References

- http://css-tricks.com
- http://css.maxdesign.com.au/selectutorial
- https://developer.mozilla.org/en-US/docs/Web/API/Window/getComputedStyle
- http://code.tutsplus.com/
- http://www.sitepoint.com
- http://www.css3.info/
- https://www.html5rocks.com/en/tutorials/filters/understanding-css/
- https://css-tricks.com/examples/ShapesOfCSS/

Assignment