Drawing on the Web

HTML Canvas
The HTML canvas API is used to draw raster graphics in the browser using JavaScript.

With the canvas, one can illustrate, make photo compositions, and create animation dynamically on the web.

Canvas was first introduced by Apple for the Mac OS X Dashboard and later implemented in Safari and Chrome.

Today, the canvas is supported by all major web browsers.
Canvas Setup

The HTML canvas is a rectangular area on a web page, specified by the <canvas> element. width and height attributes define the size of the canvas; if none are specified, the canvas will be set to 300 × 150 pixels.

By default, the <canvas> element is transparent, with no border and no content.

One HTML page can include multiple canvas elements.
All drawing to the HTML canvas is done with JavaScript.

- First, access the `<canvas>` element with a DOM query.
- Then use its `getContext()` method to specify a two-dimensional drawing.

The canvas is a Cartesian grid whose upper left corner has coordinate (0, 0).
Canvas only supports two primitive (basic) shapes: rectangle and ellipse.

All other shapes must be created by combining one or more drawing paths.

There are a variety of path methods in the canvas API which make it possible to compose shapes.

These include methods for drawing line, arc, text, color, and image.
Canvas Animation

Since JavaScript is used to control the canvas, it is used for animation as well.

The basic steps are as follows:
1. Clear the canvas
2. Save the canvas state
3. Draw animated shapes
4. Restore the canvas state

The `requestAnimationFrame()` method is well-suited for canvas animation.
Canvas in Context

The canvas API opens up all sorts of possibilities for dynamic raster graphics in the web browser.

Note, however, that pixel data drawn to the canvas are not DOM elements.

That means regions of the canvas cannot be interacted with in the same way regions of, say, an SVG image can.

Keep in mind how these technologies intersect as well as how they diverge.
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Wikipedia: Radian
The HTML canvas uses radians for degrees of rotation.

A radian is what you get when you take the radius of a circle and wrap it around the outside.

\[ 180^\circ = \pi \]
\[ 360^\circ = \pi \times 2 \]
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#### HTML Canvas

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HTML Canvas

Location of Pixel

\[ x + y \times width \]
Drawing on the Web

HTML Canvas

(2, 1)

0 1 2 3
4 5 6 7
8 9 10 11
Drawing on the Web

HTML Canvas
Drawing on the Web

HTML Canvas
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Location of Pixel Color Channel

HTML Canvas

$(x + y \times \text{width}) \times 4$