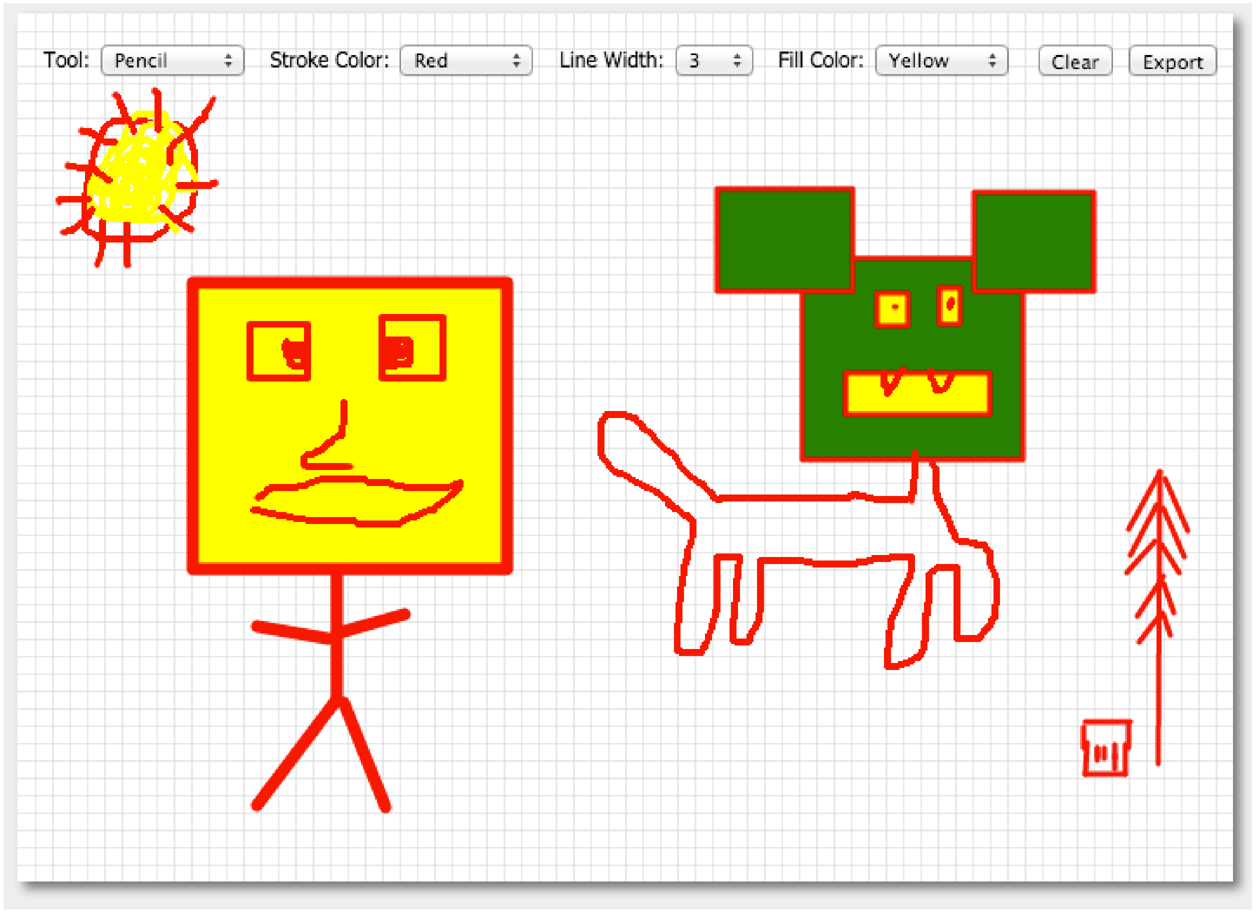
Canvas Painting App Part I

In this 2-part exercise we are going to build a canvas painting app that has the following capabilities:

- The drawing will happen on a “graph paper” background.
- Pencil, Rectangle, and Line tools
- Controls for stroke color, fill color, and line width
- a button for clearing the canvas
- a button for exporting the contents on the PNG
- Additionally, the Rectangle and line tools will allow the user to preview their drawing before it is committed to the canvas, and the operation will be cancelled if the user drags the pointer out of the canvas window.


Tool: Pencil
Stroke Color: Red
Line Width: 3
Fill Color: Yellow

Part A - Paint the Background Grid

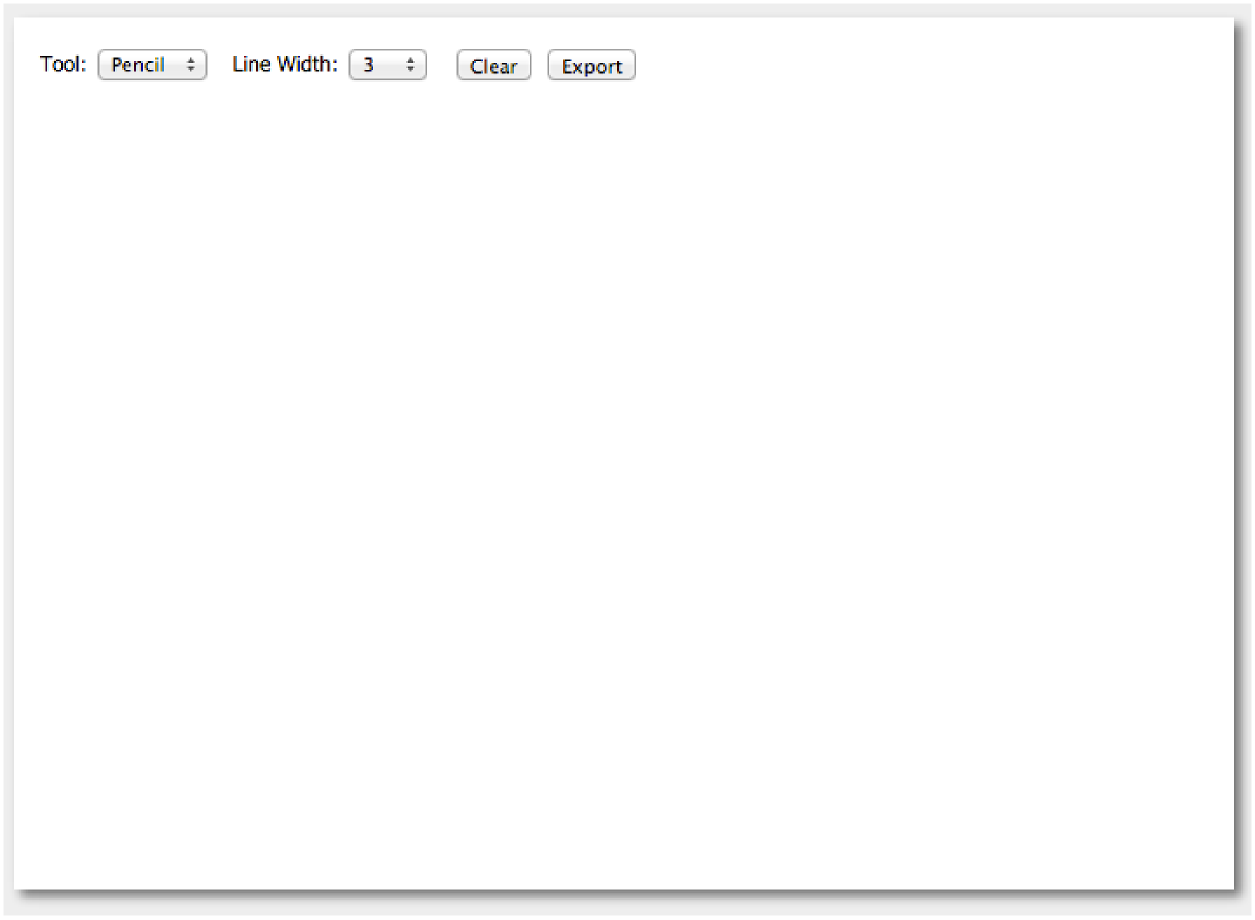
1) Download the start file, open it up in a text editor, and preview it in Chrome. There's not much going on yet as none of the controls work yet.

   Look over the HTML, CSS and JS:

   - note that the controls are *absolutely positioned* on top of the `<canvas>` element

   - there is a working `init()` function that is initializing our `ctx` and `canvas` globals

   - there are many functions already stubbed in for you, and three of them - `doClear()`, `doExport()`, and `getMouse()` - are fully complete and will not need to be modified by you.



*** As you type in code for this exercise, it is recommended that you frequently refresh the page and check the web inspector for syntax errors ***

2) Let's get coding. Declare the following values in the constants section:

```
// CONSTANTS
var DEFAULT_LINE_WIDTH = 3;
var DEFAULT_STROKE_STYLE = "red";
```

Note: These aren't really immutable constant values like you might have seen in other languages, the all caps names are just code conventions that make our code easier to read.

Fun fact: the next version of JavaScript (ECMAScript 6), has a *const* keyword in the specification that will create true constant values.

3) Make `init()` appear as follows

```
// FUNCTIONS
function init(){
      // initialize some globals
      canvas = document.querySelector('#mainCanvas');
      ctx = canvas.getContext('2d');
      lineWidth = DEFAULT_LINE_WIDTH;
      strokeStyle = DEFAULT_STROKE_STYLE;

      // set initial properties of the graphics context
      ctx.lineWidth = lineWidth;
      ctx.strokeStyle = strokeStyle;
      ctx.lineCap = "round"; // "butt", "round", "square" (default "butt")
      ctx.lineJoin = "round"; // "round", "bevel", "miter" (default "miter")

      drawGrid(ctx,'lightgray', 10, 10);

}
```

After adding this code and refreshing the page, there shouldn't be any errors and you should see 1/2 of the light-gray grid being drawn on the canvas - just the vertical lines.

4) Look over the `drawGrid()` function to see how it works, but we only included the code for the vertical lines.

Add another *for* loop in `drawGrid()` that will draw the missing horizontal lines. When you are done the canvas will look something like graph paper with 10-pixel square cells.

Part B - Building the pencil tool

1) First we'll hook up 4 mouse events to our 4 stubbed in callback functions. To do this, add the following code to the end of `init()`

```
// Hook up event listeners
canvas.onmousedown = doMousedown;
canvas.onmousemove = doMousemove;
canvas.onmouseup = doMouseup;
canvas.onmouseout = doMouseout;
```

Test the code by clicking the mouse and moving it outside of the canvas, you should see logs to the console as the applicable functions are fired. (Note: We didn't add a `console.log()` to `doMousemove()` because the large number of logs would have cluttered the console.)

2) To begin our pencil drawing, make `doMousedown()` appear as follows:

```
function doMousedown(e){
      dragging = true;

      // get location of mouse in canvas coordinates
      var mouse = getMouse(e);

      // PENCIL TOOL
      ctx.beginPath();

      // move pen to x,y of mouse
      ctx.moveTo(mouse.x, mouse.y);
}
```

3) Next we need to work on `doMouseMove()` - here's a start for you - including some helpful comments:

```
function doMousemove(e) {
      // bail out if the mouse button is not down
      if(! dragging) return;

      // get location of mouse in canvas coordinates
      var mouse = getMouse(e);

      // PENCIL TOOL
      // set ctx.strokeStyle and ctx.lineWidth to correct global values
      // YOUR CODE HERE

      // draw a line to x,y of mouse
      // YOUR CODE HERE

      // stroke the line
      // YOUR CODE HERE
}
```

Test the app. It should now draw when you click and drag. Unfortunately, it never stops drawing, so fix that by:

- heading to `doMouseup()`, and set `dragging` to `false` and close the path

- heading to `doMouseout()`, and set `dragging` to `false` and close the path

Now it should draw as you expect.

Part C - Enabling the GUI

1) First we'll get the `#lineWidthChooser` drop down working. We'll go ahead and give you the full solution to this:

- add the following to the end of `init()`

```
document.querySelector('#lineWidthChooser').onchange = doLineWidthChange;
```

- add the following function:

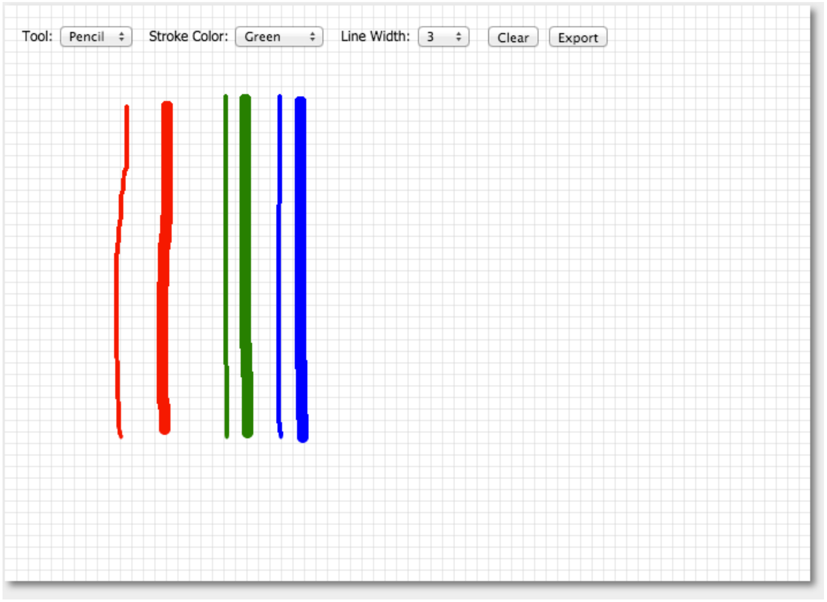
```
 function doLineWidthChange(e){
      lineWidth = e.target.value;
}
```

(or you could do the event handler as a one-liner with an anonymous function)

Test it - and you should see it function as expected. When you change the value of the line width chooser, the `lineWidth` global variable is then changed. And the next time you draw, inside of `doMousemove()` the `ctx.lineWidth` value is being changed to the current value of the `lineWidth` global variable.

2) Create a `<select id="strokeStyleChooser">` to allow the user to choose a `strokeStyle`. The values of the `<option>` tags should be CSS color keywords.

Hook up an `onchange` event handler as before, except this time it changes the value of the `strokeStyle` global variable.



3) Get the **Clear** and **Export** buttons working. The functions that need to be called have already been written for you - easy!

Part D – Submission

Rubric

DESCRIPTION	SCORE	VALUE %
Grid – Grid is completed and functional.		**10**
Grid Size – Grid is evenly sized.		**5**
Grid in Background – Grid draws in the background correctly.		**5**
Pencil Tool – Works correctly, starts drawing on mousedown and draws consistently as you move the mouse.		**20**
Pencil Stop – Pencil stops drawing on mouseup and mouseout.		**20**
Color Selector – Color selector works correctly and changes the drawing color.		**20**
Clear Button – Clear button clears the screen correctly.		**10**
Export Button – Export button works correctly and exports an image.		**10**
Errors Thrown – Any errors thrown in the console.		**-20% (this time)**
Additional Penalties – These are point deductions for poorly written code or improper code. There are no set values for penalties. The more penalties you make the more points you will lose.		
TOTAL		**100%**

ZIP and post - see dropbox for due date. **Include a link in your submission comments!** This assignment is worth 2X a regular homework, and we will be building on it next week, so be sure to do it!