Implementation Time

WE'LL COVER THE FOLLOWING

In the previous section, you learned at a high-level what goes into drawing and animating something on your canvas. You basically have two main steps:

1. Draw
2. Clear

In this section, we'll create a simple circle slide animation and see how these **draw** and **clear** steps map to lines of sweet JavaScript code.

Adding Your Canvas

The first thing we are going to do is add the `canvas` element that will house our beautiful animation. You've seen this a bunch of times already, and you probably already have a page setup. If you don't have a page already setup, create a blank HTML page and add the following HTML and CSS into it:

```
<!DOCTYPE html>
<html>

<head>
<title>Simple Canvas Example</title>
<style>
canvas {
    border: 10px #333 solid;
}
```

```
</style>
</head>


<body>
<div id="container">
    <canvas id="myCanvas" height="450" width="450"></canvas>
</div>
<script>

</script>
</body>
</html>
```

If you preview this in your browser, you will see an empty square outlined in a dark gray color.

Drawing Our Circle

The next step is to draw the circle we would like to animate. Inside your script tag, add the following lines:

```
var mainCanvas = document.querySelector("#myCanvas");
var mainContext = mainCanvas.getContext("2d");

var canvasWidth = mainCanvas.width;
var canvasHeight = mainCanvas.height;

function drawCircle() {

}
drawCircle();
```

There is nothing exciting going on here. We are just writing some boilerplate code to more easily access the `canvas` element and its drawing context. While this is pretty boring, the exciting stuff is about to happen...

Inside this `drawCircle` function, add the following code that will actually draw our circle:

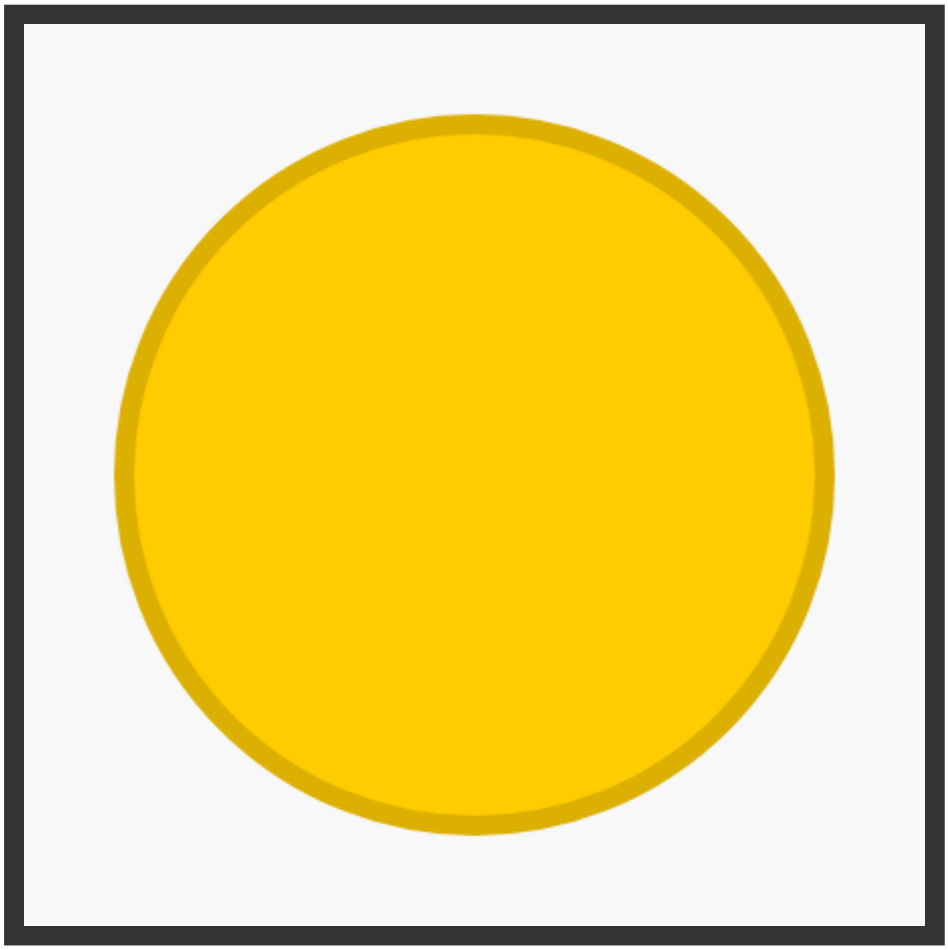
HTML JavaScript

```
1  var mainCanvas = document.querySelector("#myCanvas");
2  var mainContext = mainCanvas.getContext("2d");
3
4  var canvasWidth = mainCanvas.width;
5  var canvasHeight = mainCanvas.height;
6
7  function drawCircle() {
8    mainContext.clearRect(0, 0, canvasWidth, canvasHeight);
9
```

javascript

```
  // color in the background
  mainContext.fillStyle = "#F8F8F8";
  mainContext.fillRect(0, 0, canvasWidth, canvasHeight);

  // draw the circle
  mainContext.beginPath();

  var radius = 175;
  mainContext.arc(225, 225, radius, 0, Math.PI * 2, false);
  mainContext.closePath();

  mainContext.fillStyle = "#FFCC00";
  mainContext.fill();

  mainContext.lineWidth = 10;
  mainContext.strokeStyle = "#DCB001";
  mainContext.stroke();
}
drawCircle();
```

output

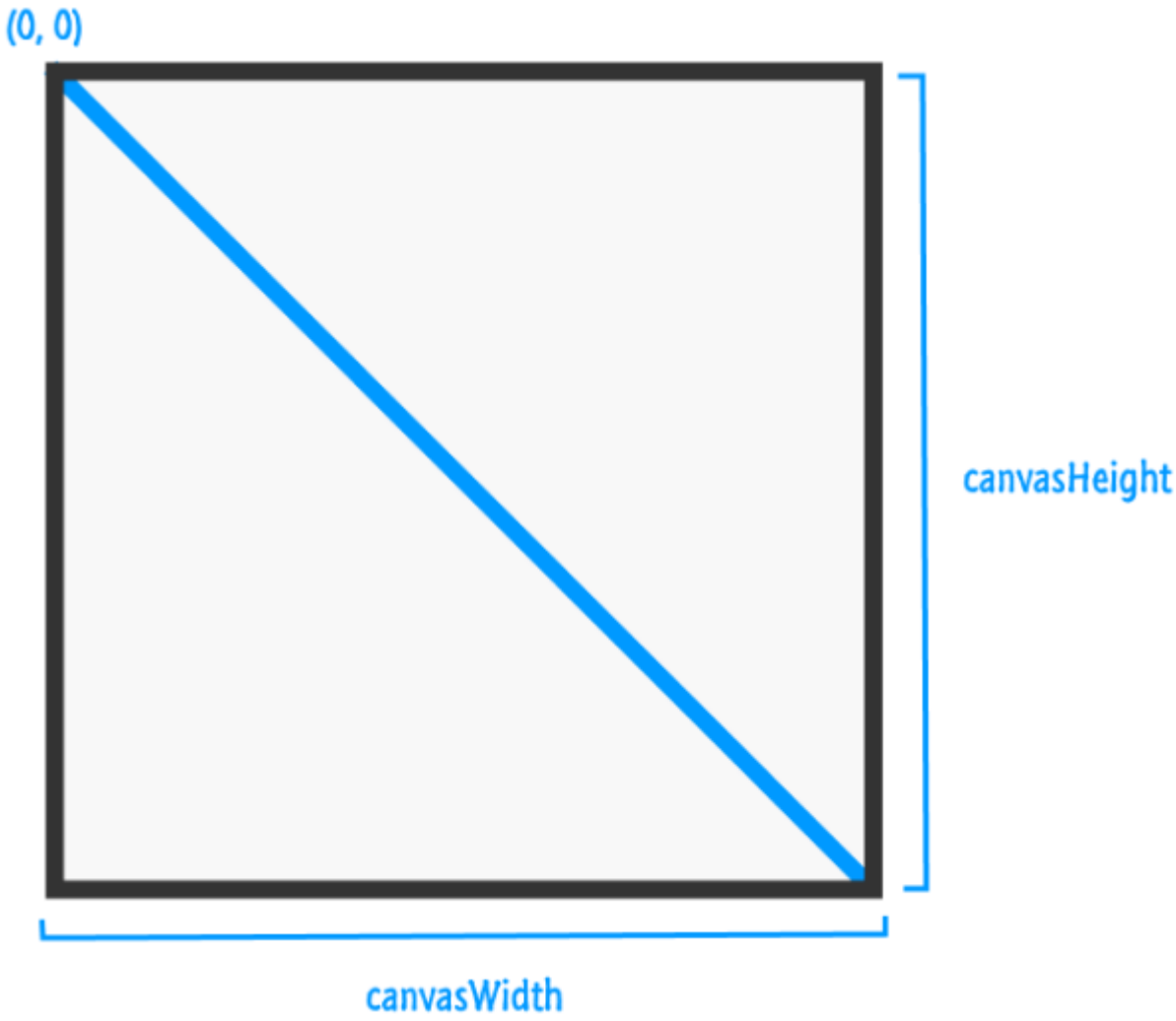


So far, almost everything we've done has been a review of all the `canvas`-related things we've been learning together. I mention **almost** because there is something new that I want to call out. That is the `clearRect` method:

```
mainContext.clearRect(0, 0, canvasWidth, canvasHeight);
```

The `clearRect` methods is responsible for the clear part of the two animation steps we need to implement.

This method takes the coordinates for the rectangular area you want to clear. Since we want to clear the entire area of our canvas, we define a rectangular area that starts at the top-left corner (0, 0) and has a size defined by the total width and height as specified by the `canvasWidth` and `canvasHeight` variables:



When that code runs, all of the pixels within that rectangular area are cleared out. After that line, all of the remaining code is just about getting our circle to appear. We've covered all of that code extensively in the Drawing Circles on a Canvas tutorial, so let's skip over all of that and focus on something totally new in the next section.

Animating Your Circle

It's all well and awesome that you have a yellow circle that shows up, but what we really want to do is animate this circle by having it slide from left to

right. More specifically, we want to animate our circle's x position value that controls where the circle is located horizontally. Doing this will require us to modify the x position value slightly every few milliseconds to create our animation's intermediate states.

The way we accomplish this is by using what is commonly known as an **animation loop**. An animation loop is a function that gets called very rapidly, and it is inside this function where you make the subtle changes **on each function call** that you'd like to see visualized. To help create these animation loops, you have a specialized function called `requestAnimationFrame` that takes care of both calling a function and ensuring you call that function repeatedly.

The way `requestAnimationFrame` works is pretty cool. It calls your animation loop repeatedly (boring), but it times each call to coincide with when your browser is about to paint the screen (awesomesauce!). This allows you to only execute the code inside your animation loop when it actually leads to a screen update, and that level of optimization puts more traditional timer-based loops like `setTimeOut` and `setInterval` out in the dust.

Anyway, let's actually see the `requestAnimationFrame` in action! Go ahead and add the following highlighted line towards the bottom of your `drawCircle` function:

```
function drawCircle() {
  mainContext.clearRect(0, 0, canvasWidth, canvasHeight);

  // color in the background
  mainContext.fillStyle = "#F8F8F8";
  mainContext.fillRect(0, 0, canvasWidth, canvasHeight);

  // draw the circle
  mainContext.beginPath();

  mainContext.arc(225, 225, 175, 0, Math.PI * 2, false);
  mainContext.closePath();

  mainContext.fillStyle = "#FFCC00";
  mainContext.fill();

  mainContext.lineWidth = 10;
  mainContext.strokeStyle = "#DCB001";
  mainContext.stroke();

  requestAnimationFrame(drawCircle);
}
```

To reiterate what we talked about earlier, what we've just done is told our

`requestAnimationFrame` function to call the `drawCircle` function every time

your browser decides to redraw. The number of times your browser will decide to redraw will vary based on whatever else is going on in your page, but typically you redraw at around 60 times a second (or once every 16.67 milliseconds). Putting it all together, our `drawCircle` function is going to get called around 60 times a second as well.

> ### Extra Credit
>
> If you want to learn more about `requestAnimationFrame` and all the awesome things it does, check out my Animating with requestAnimationFrame tutorial for the nitty gritty stuff.

Now, simply calling the `requestAnimationFrame` function isn't enough. We need to make some changes to how we draw our circle to ensure the horizontal position is changed slightly with each `drawCircle` call. That isn't too complicated, so to do this, make the changes on following line: 1, 12, 22-29.

```
var xPos = -500;

function drawCircle() {
  mainContext.clearRect(0, 0, canvasWidth, canvasHeight);

  // color in the background
  mainContext.fillStyle = "#F8F8F8";
  mainContext.fillRect(0, 0, canvasWidth, canvasHeight);

  // draw the circle
  mainContext.beginPath();
  mainContext.arc(xPos, 225, 175, 0, Math.PI * 2, false);
  mainContext.closePath();

  mainContext.fillStyle = "#FFCC00";
  mainContext.fill();

  mainContext.lineWidth = 10;
  mainContext.strokeStyle = "#DCB001";
  mainContext.stroke();

  xPos += 5;

  if (xPos > 1000) {
    xPos = -500;
  }

  requestAnimationFrame(drawCircle);
}
```

If you preview your page right now, you should see a circle that happily slides from one side of the canvas to another. **What you've just done is successfully created a simple animation!** Now, before we wrap things up for the night (or daytime...if you are an early morning reader), let's look at how the lines of code we added leads to our circle getting all animated.

How the Animation Works

To help you better understand what is going on, let's walk through the code together to ensure everything makes sense. Starting at the top, the first thing we did is declare and initialize a global variable called `xPos`:

```
var xPos = -500;
```

This variable will store our circle's horizontal position, and we've given it an initial value of -500. This declaration by itself doesn't affect our circle's position, for that is actually set by calling the `arc` method:

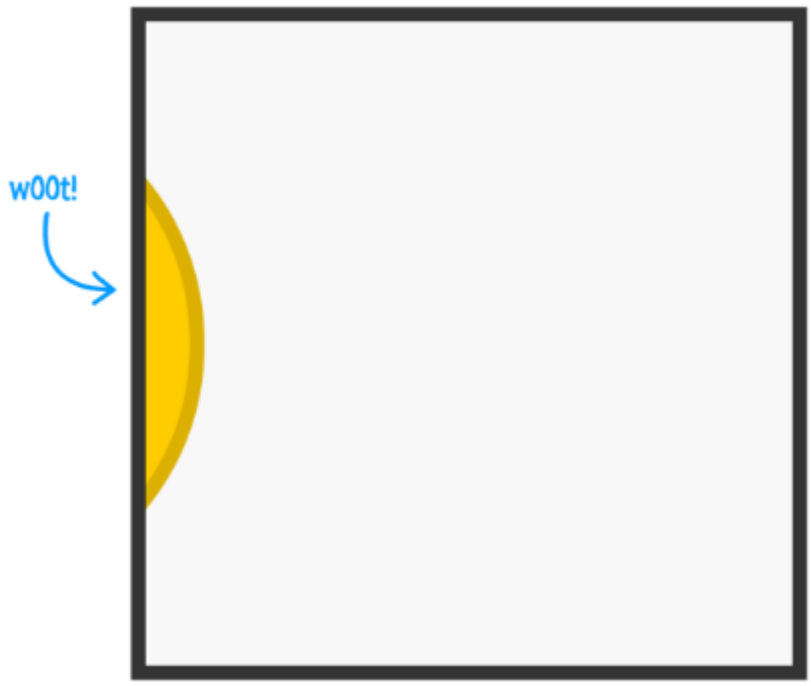
```
mainContext.arc(xPos, 225, 175, 0, Math.PI * 2, false);
```

The `arc` method's first argument determines the horizontal position we draw our circle. That's why instead of providing a hard coded value, we pass in our `xPos` variable instead. If we stopped right here, all we would have accomplished is drawing our circle at a horizontal position of -500.

The key to this animation is not leaving `xPos` alone. We change the value of `xPos` each time `drawCircle` is called by incrementing it slightly. We do that with the following line:

```
xPos += 5;
```

Each time `drawCircle` is called, the value of `xPos` is increased by 5. This change combined with the `arc` method call from earlier draws our circle five pixels to the right each time. Eventually, the value of `xPos` gets large enough where you can actually see the circle when it gets drawn:



The value of `xPos` will keep growing unless we stop it. Otherwise, our circle will slide past just once and never return to its starting position. To ensure our circle doesn't disappear forever once it slides past, we reset the `xPos` variable once it hits a value of 1000. That is handled by the following code:

```
if (xPos > 1000) {
  xPos = -500;
}
```

When our `xPos` value gets reset to -500, it's almost as if the animation restarts. Our `xPos` value slowly increments by 5 with each `drawCircle` call, hits a value of 1000, and then starts all over again with a value of -500. Somewhere along the way, its value ensures the circle is visible when the `arc` method is called. Phew!