CSIT884: Web Development

HTML Canvas Graphics, Drag and Drop

School of Computing and Information Technology
University of Wollongong

HTML 5

Canvas

- First introduced in WebKit by Apple for the OS X Dashboard, Graphic Canvas has since been implemented in other major browsers.
- Canvas is used to draw graphics, such as paths, boxes, circles, text, and images, on the fly, via JavaScript.

HTML 5

Drag and Drop

- Drag and Drop enables applications to use drag and drop features in browsers.

- The user can select draggable elements with a mouse, drag the elements to a droppable element, and drop those elements by releasing the mouse button.

Canvas

The `<canvas>` element is used to draw graphics on a web page.

```
<canvas id="mycanvas" width="1000" height="500"
style="border:1px solid black;">
Your browser does not support canvas.
</canvas>
```

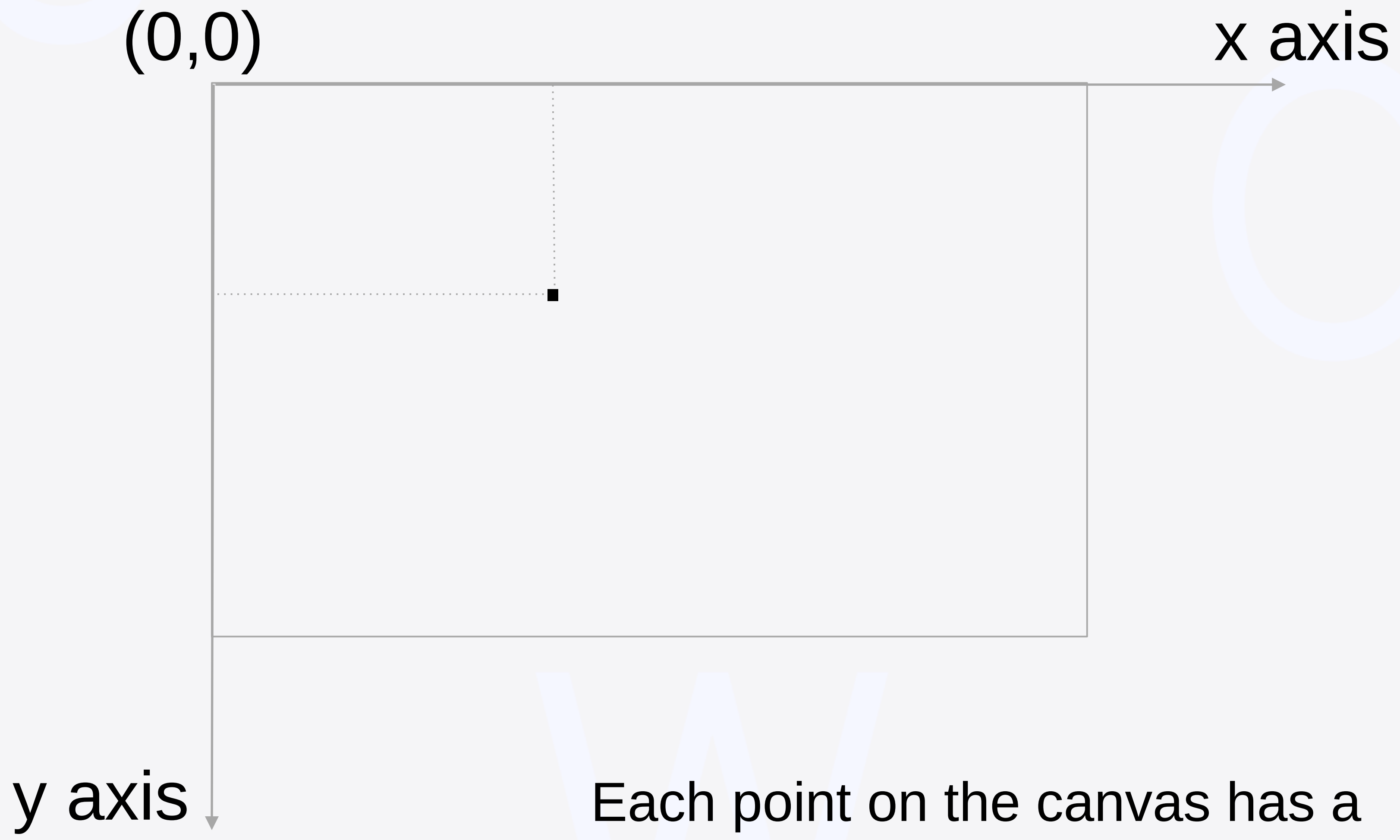
Canvas

The `<canvas>` element is used to draw graphics on a web page.

```
<canvas id="mycanvas" width="1000" height="500"
style="border:1px solid black;">
Your browser does not support canvas.
</canvas>
```

The `<canvas>` element is only a container for the graphics.
We must use JavaScript to actually draw the graphics content.

Canvas



Each point on the canvas has a coordinate (x,y)

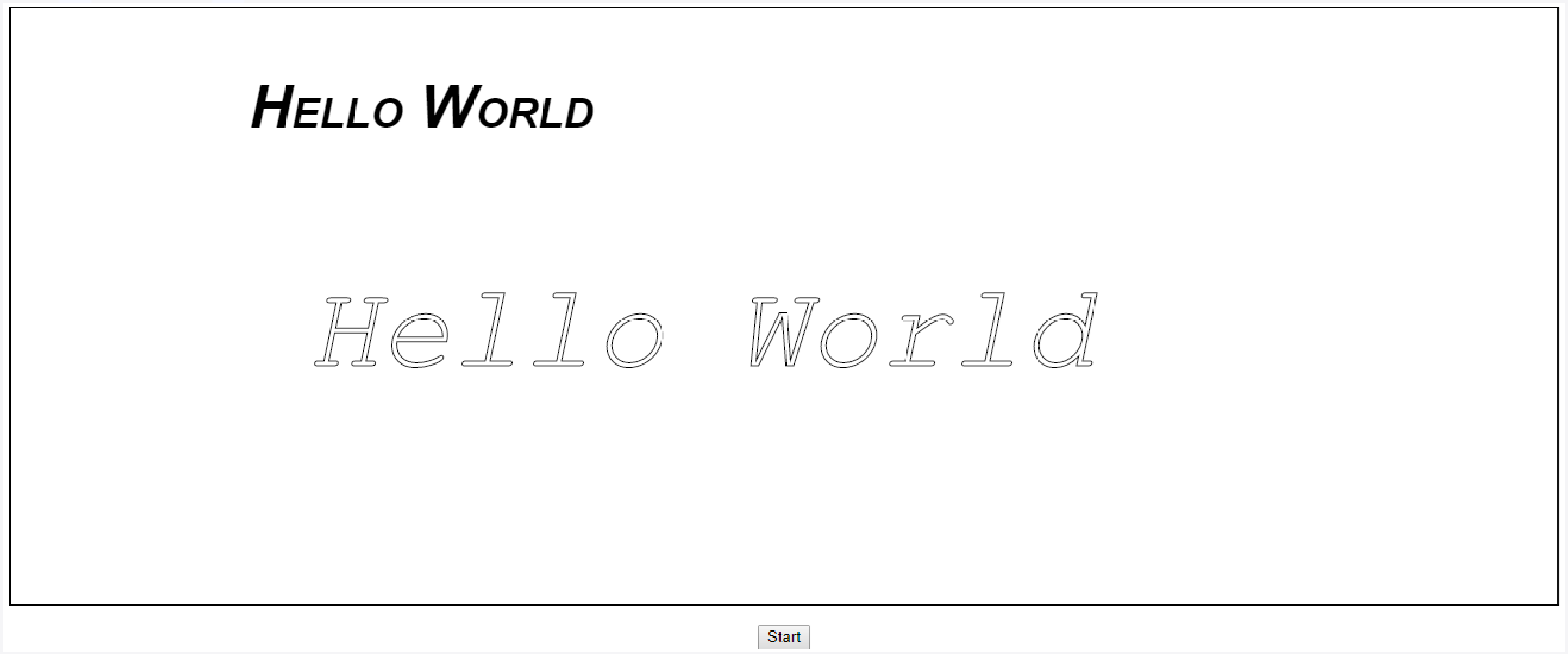
Canvas

CanvasRenderingContext2D is used for drawing text, images, shapes and other objects onto the canvas element. It provides the 2D rendering context for the drawing surface of a canvas element.

```
// get the canvas's 2d context
var canvas = document.getElementById("the-canvas-id");
var context = canvas.getContext("2d");
```

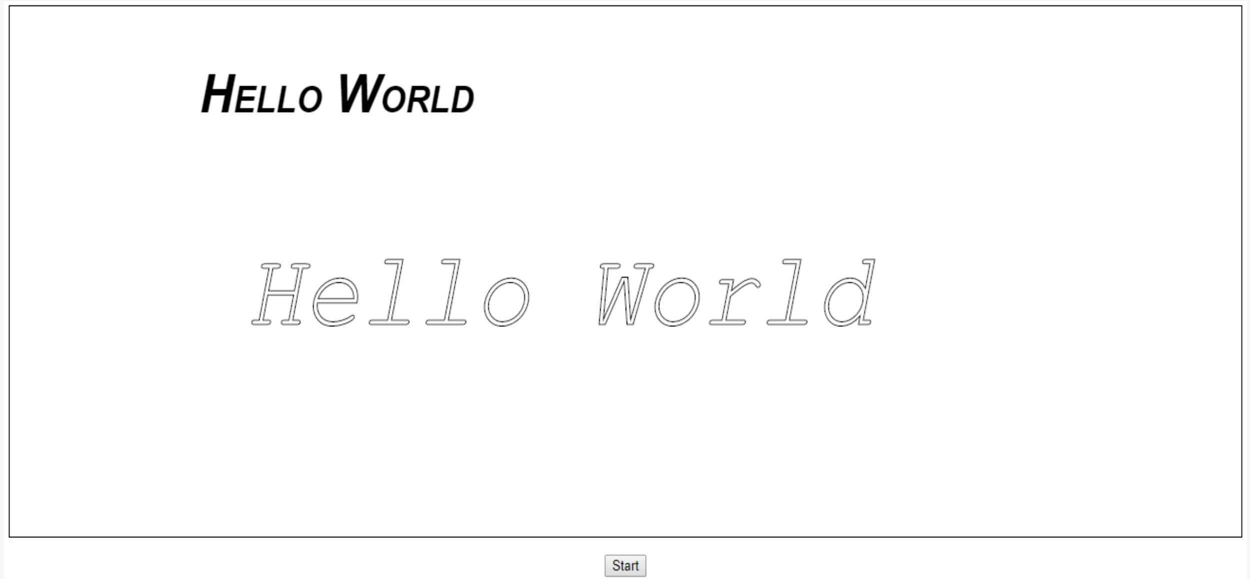
There are other rendering contexts for canvas that are not covered in this subject:
WebGLRenderingContext,
WebGL2RenderingContext

Hello World



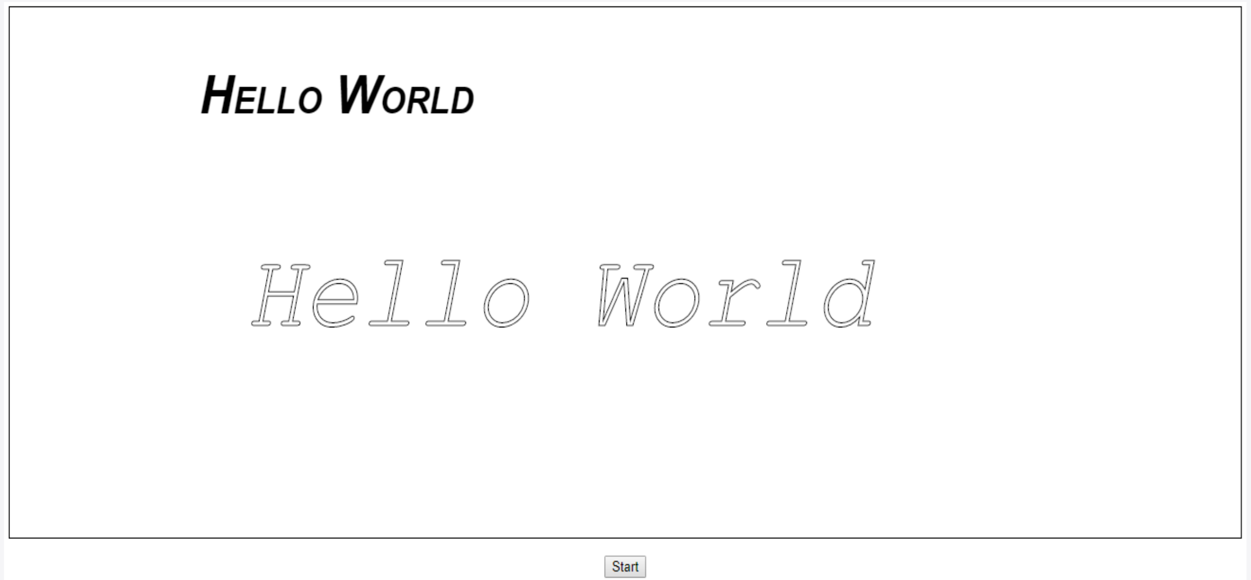
Hello World

```
<canvas id="canvas" width="1300" height="500"
style="border:1px solid black;">
Your browser does not support canvas.
</canvas>
<br /><br />
<button onClick="drawTextHello()">
Start
</button>
```



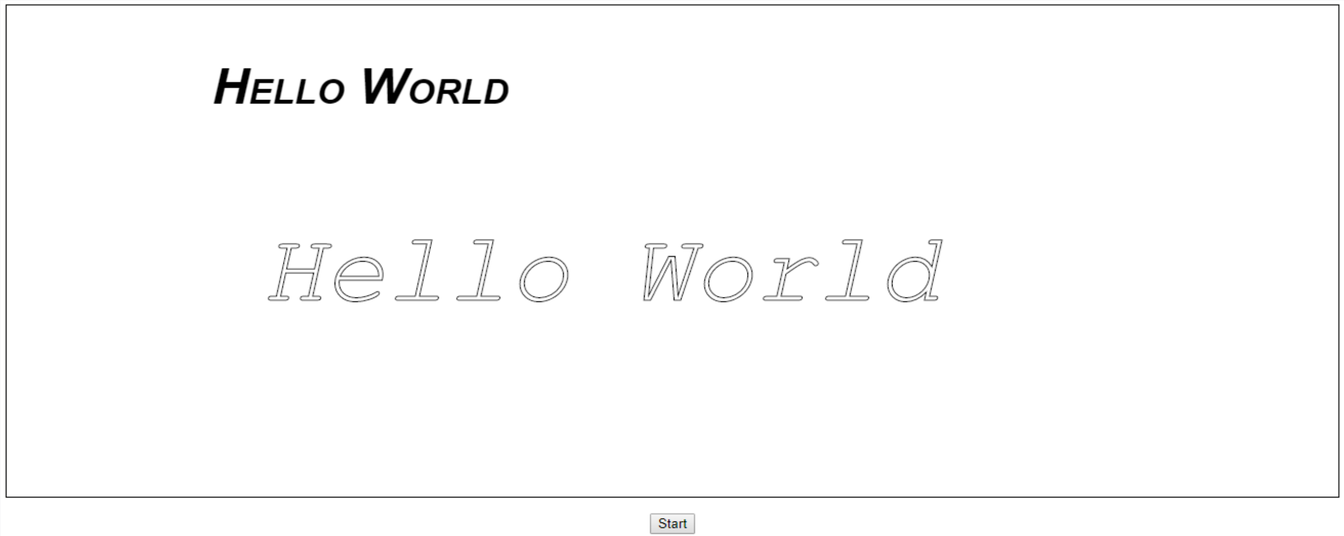
Hello World

```
function drawTextHello(){
  // get the canvas's 2d context

  // fillText


  // strokeText
}
```



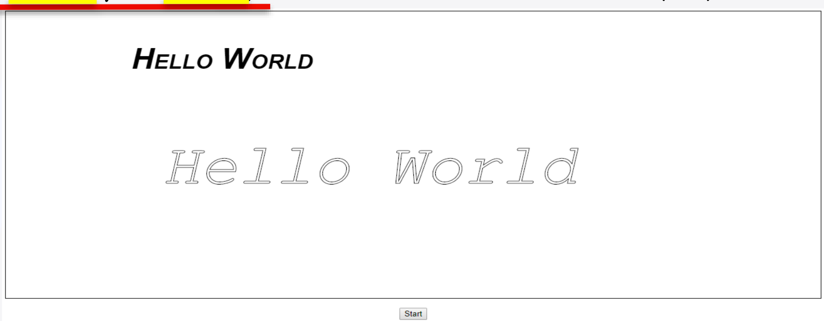
Hello World

```
function drawTextHello(){
  // get the canvas's 2d context
  var canvas = document.getElementById("canvas");
  var context = canvas.getContext("2d");

  // fillText


  // strokeText
}
```



Hello World

```
function drawTextHello(){
  // get the canvas's 2d context
  var canvas = document.getElementById("canvas");
  var context = canvas.getContext("2d");

  // fillText
  context.font = "italic small-caps bold 50px Arial";
  context.fillText("Hello World", 200, 100); . . . . . . .(1)

  // strokeText
  context.font = "oblique 100px Courier New";
  context.strokeText("Hello World", 250, 300); . . . . . .(2)
}
```

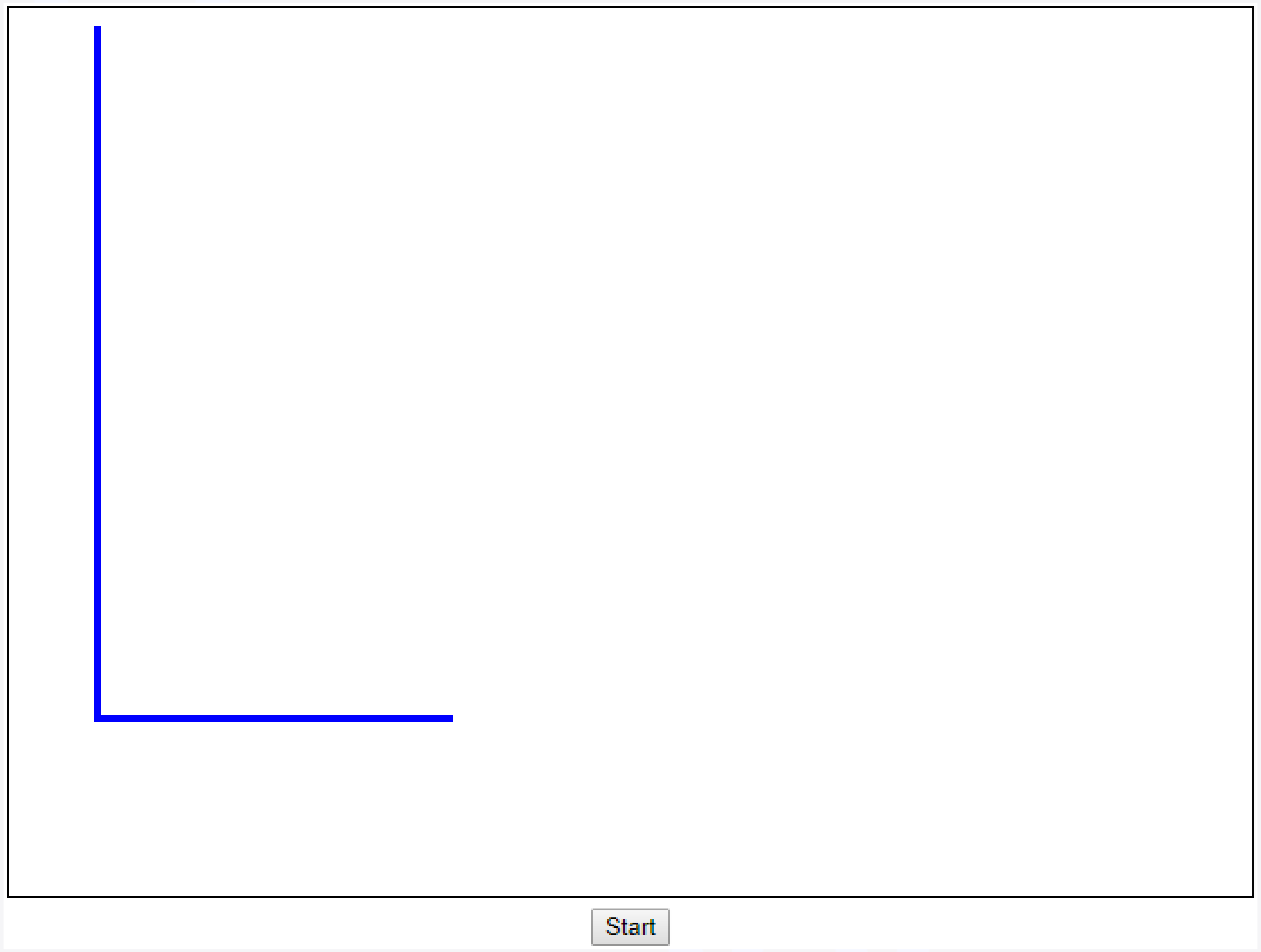


Clear canvas

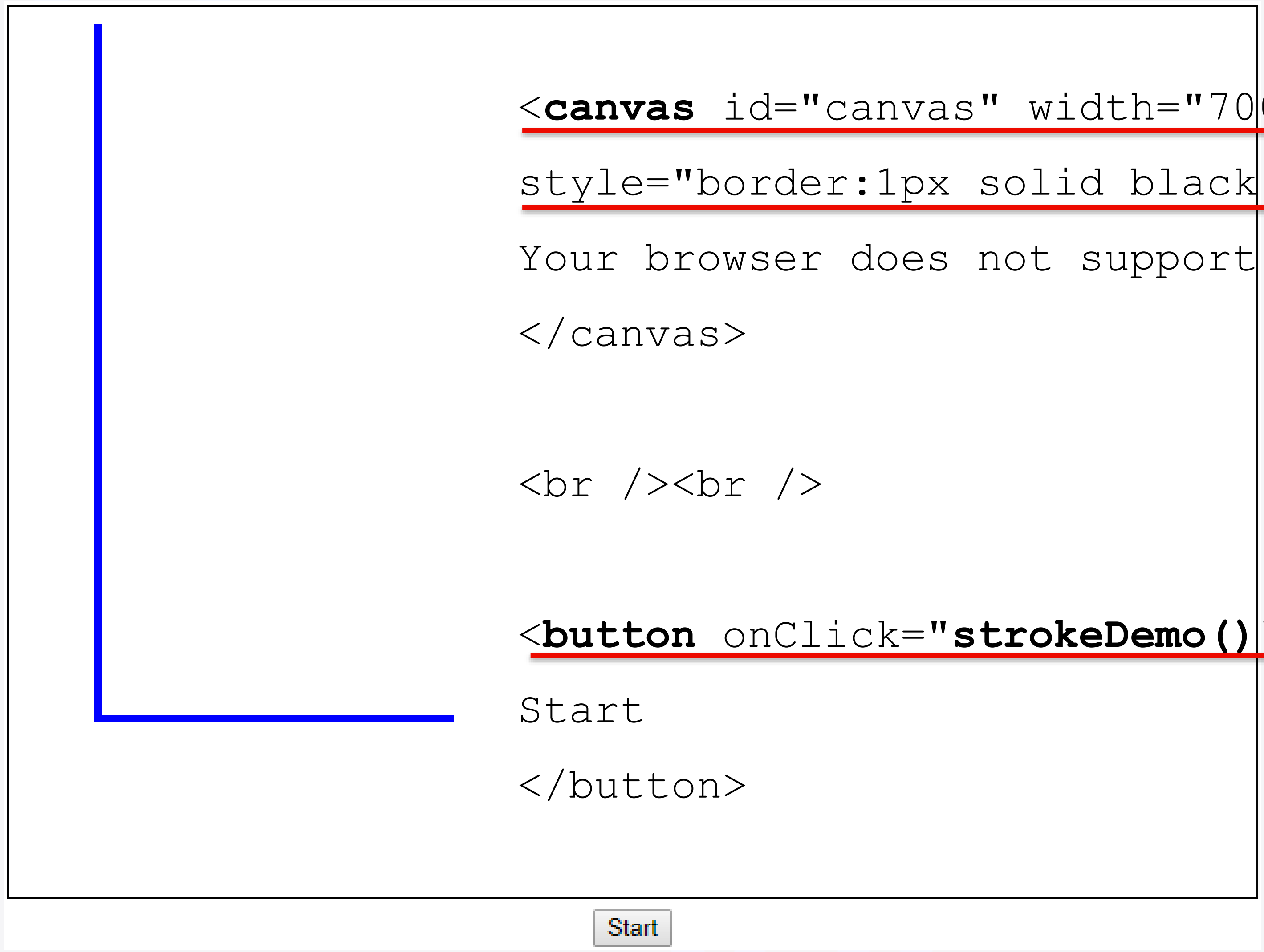
```
<button onClick="clearCanvas()">
  Clear canvas
</button>


// clear canvas area
function clearCanvas(){
  // get the canvas's 2d context
  var canvas = document.getElementById("canvas");
  var context = canvas.getContext("2d");
  // clear the canvas
  context.clearRect(0, 0, canvas.width, canvas.height);
}
```

Clear rectangle: `clearRect(x1, y1, x2, y2)`

Stroke Demo 1

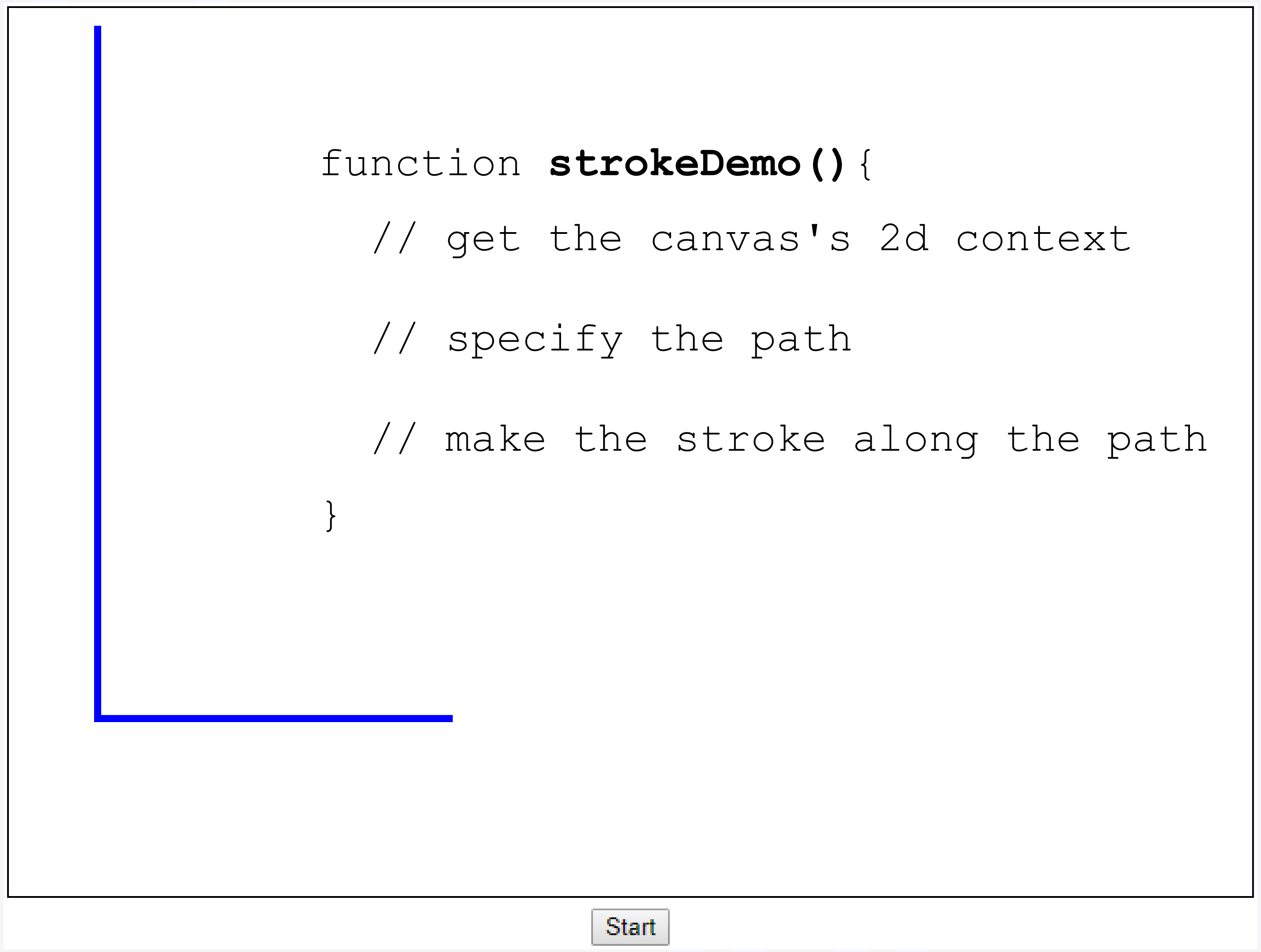


Stroke Demo 1



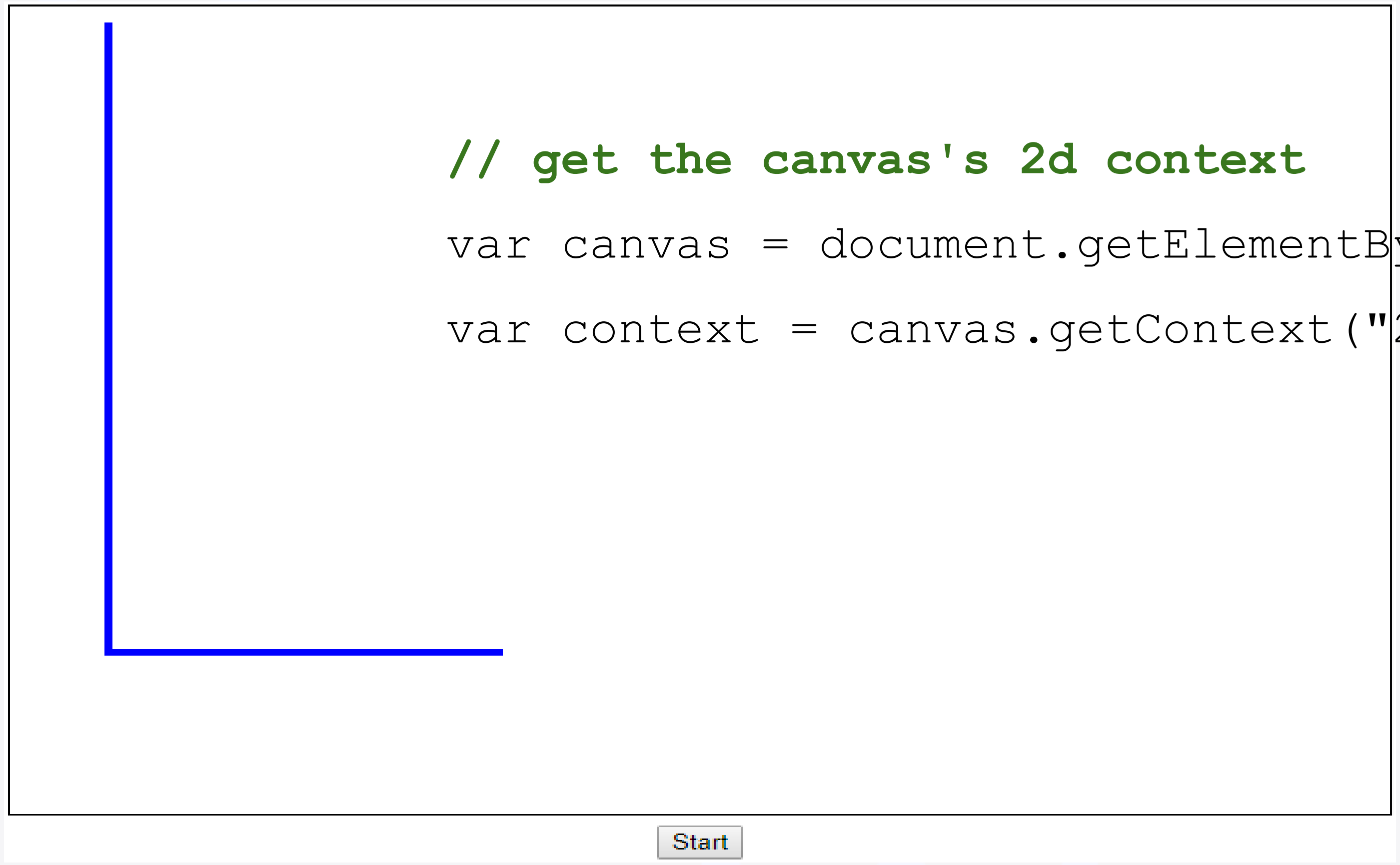
```
<canvas id="canvas" width="700" height="500"
style="border:1px solid black;">
Your browser does not support canvas.
</canvas>

<br /><br />

<button onClick="strokeDemo()">
Start
</button>
```

Stroke Demo 1



```
function strokeDemo(){
  // get the canvas's 2d context

  // specify the path

  // make the stroke along the path
}
```

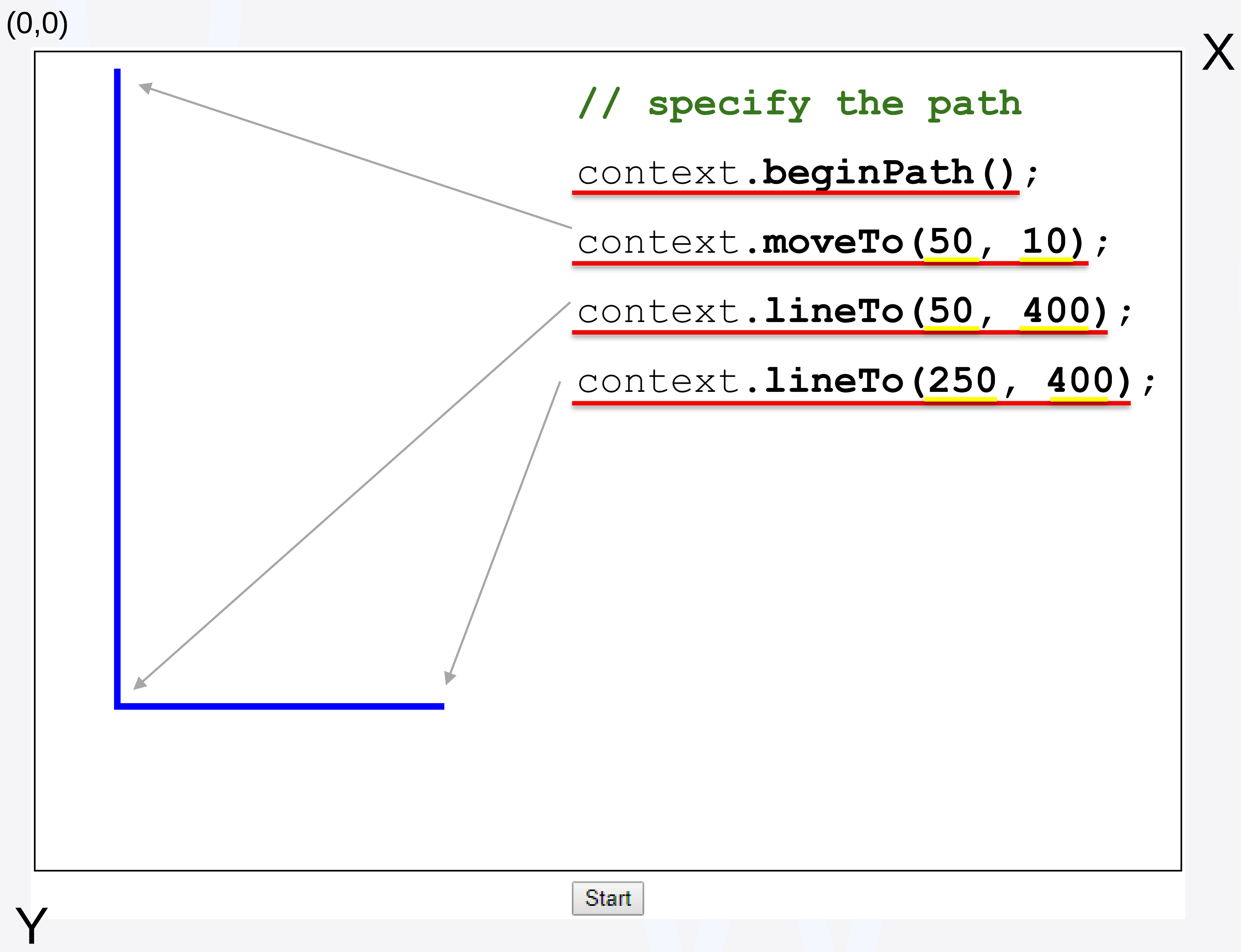
Stroke Demo 1



```
// get the canvas's 2d context
var canvas = document.getElementById("canvas");
var context = canvas.getContext("2d");
```

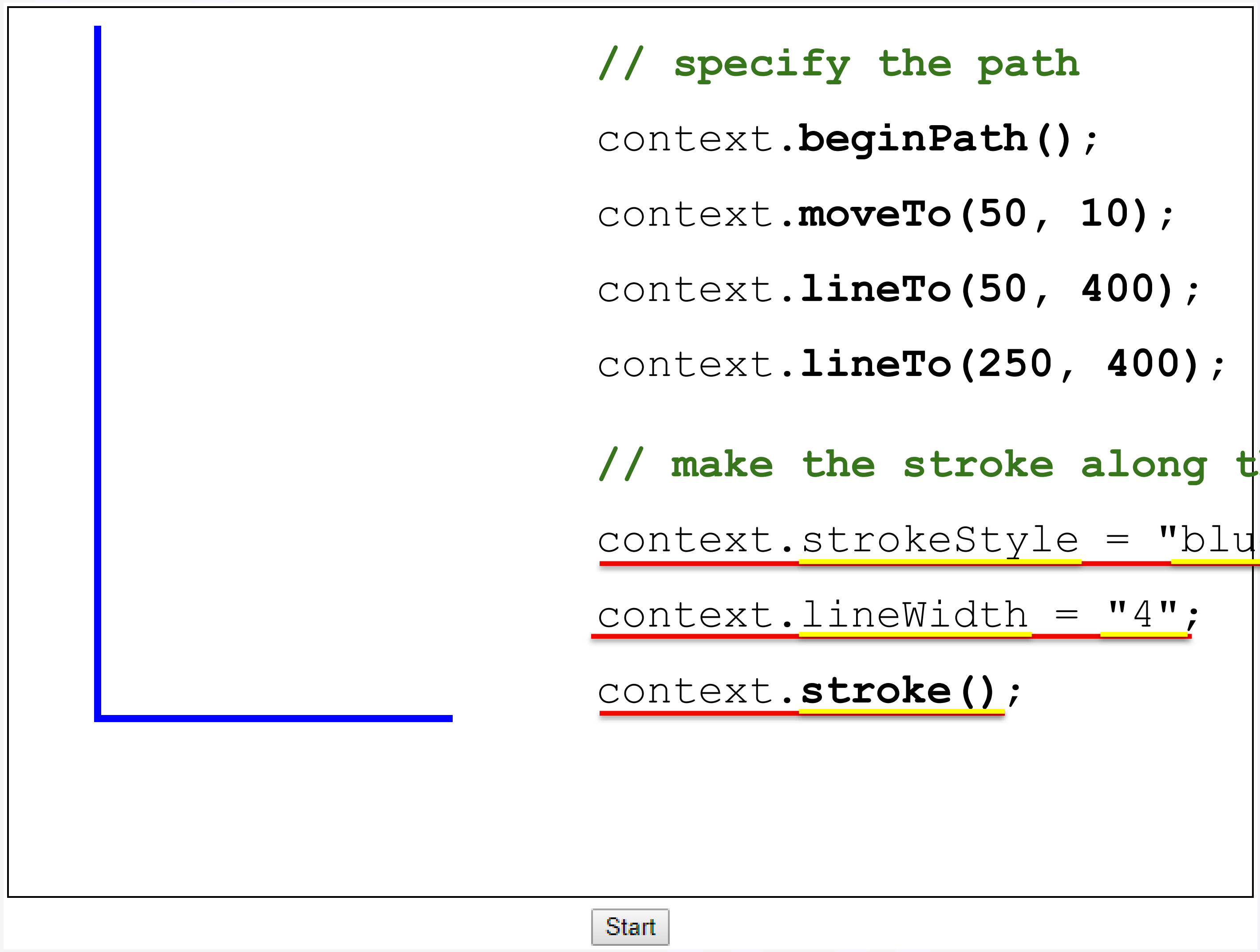
```
<canvas id="canvas" width="700" height="500"
style="border:1px solid black;">
Your browser does not support canvas.
</canvas>
```

Stroke Demo 1



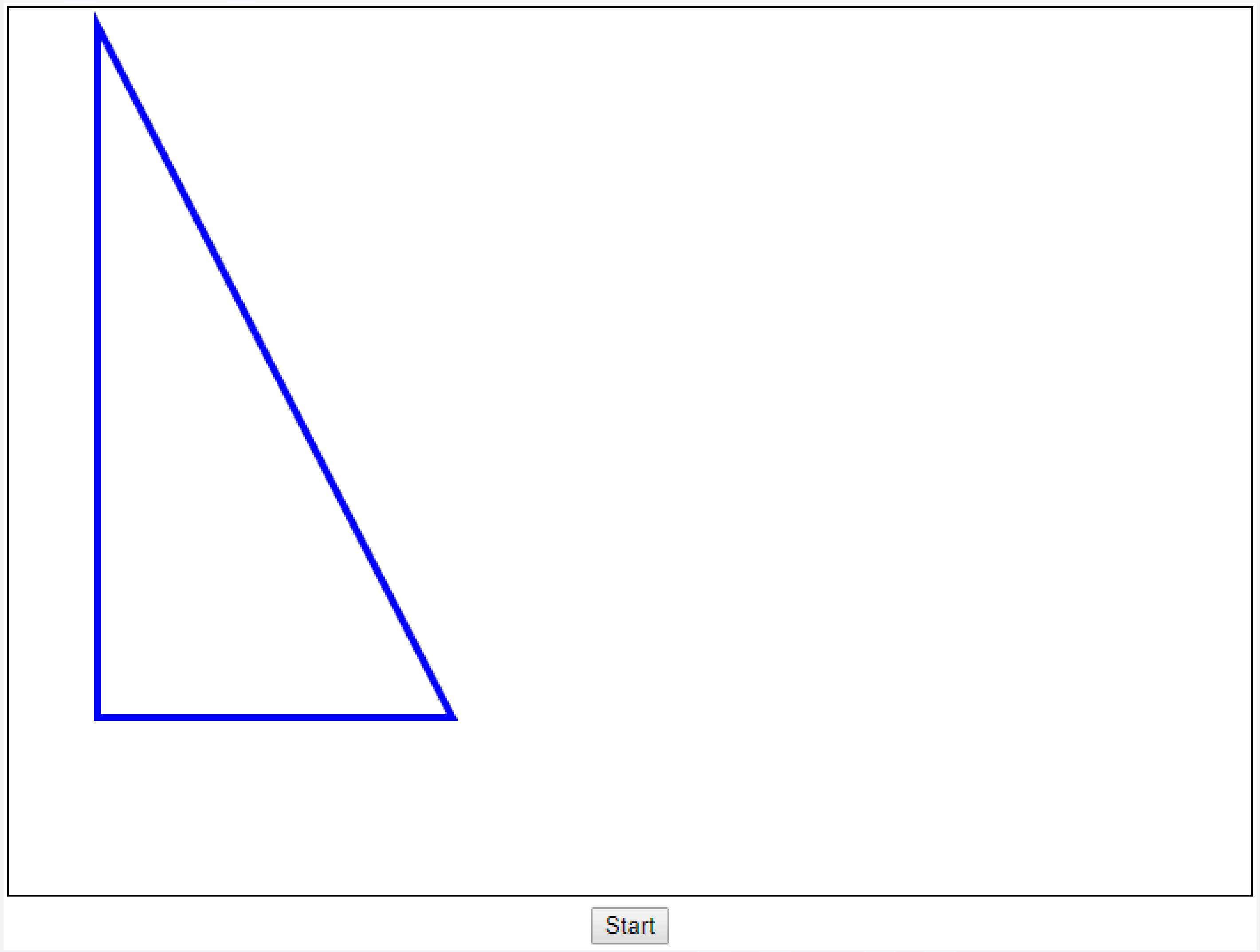
```
// specify the path
context.beginPath();
context.moveTo(50, 10);
context.lineTo(50, 400);
context.lineTo(250, 400);
```

Stroke Demo 1

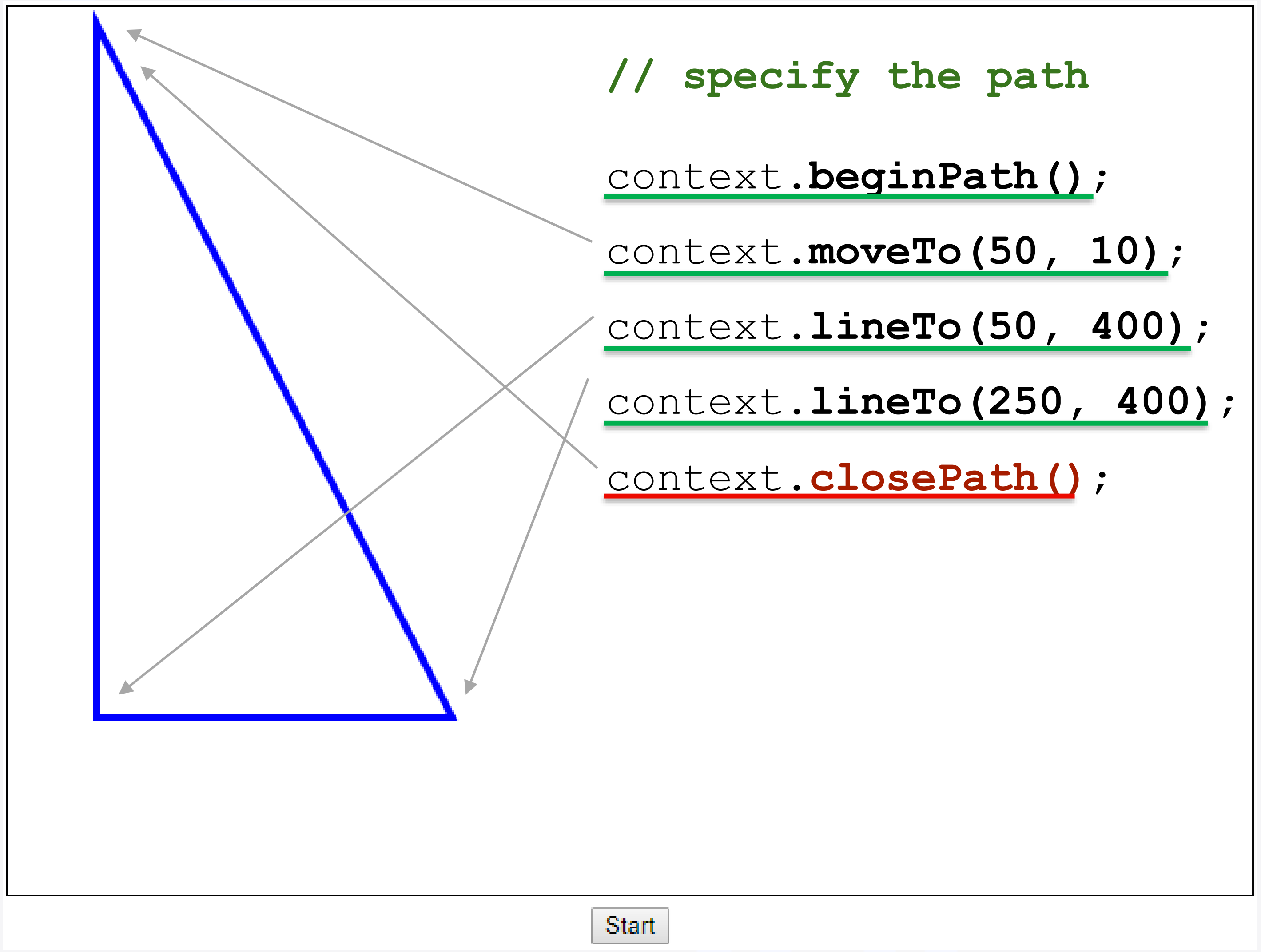


```
// specify the path
context.beginPath();
context.moveTo(50, 10);
context.lineTo(50, 400);
context.lineTo(250, 400);

// make the stroke along the path
context.strokeStyle = "blue";
context.lineWidth = "4";
context.stroke();
```

Stroke Demo 2

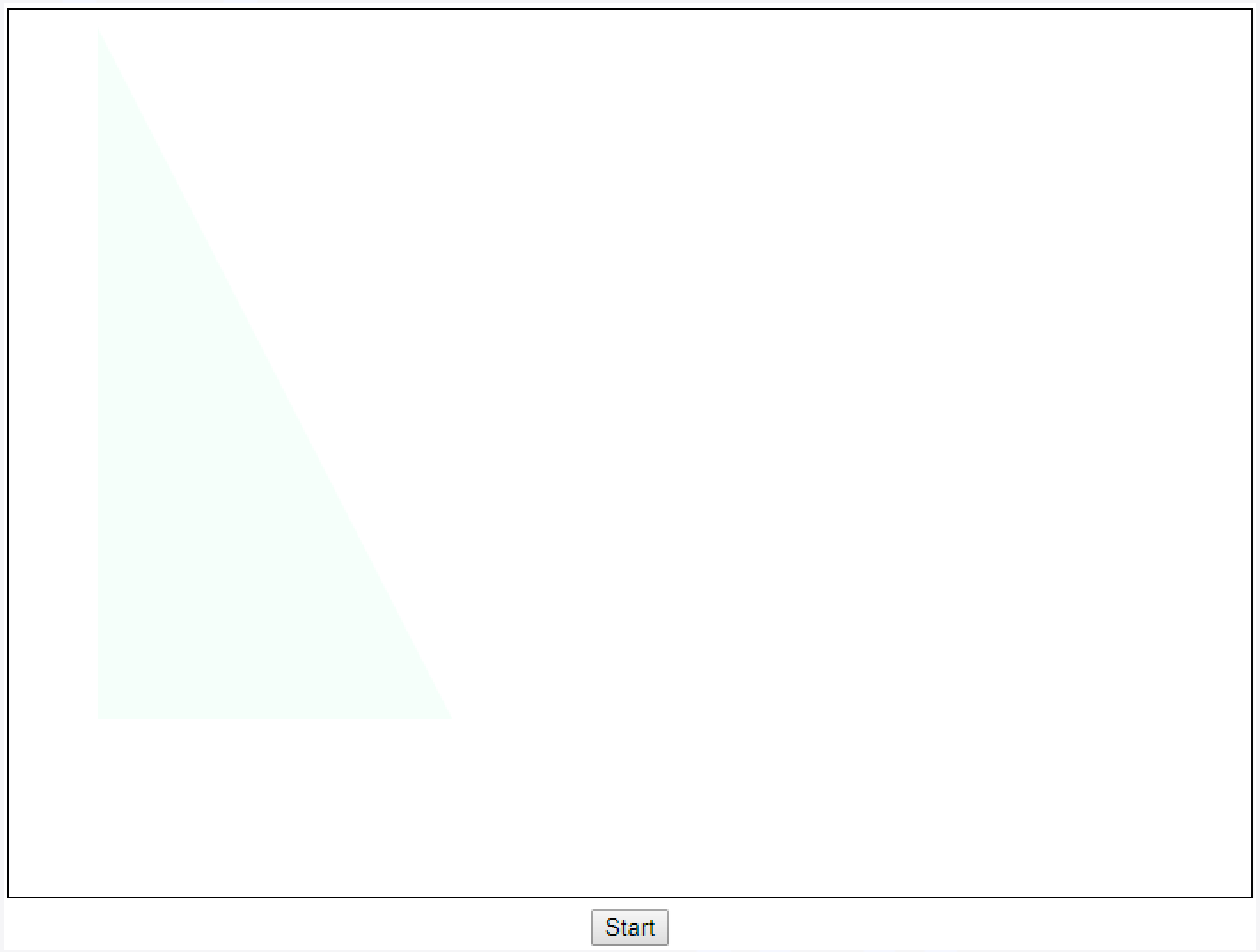


Stroke Demo 2

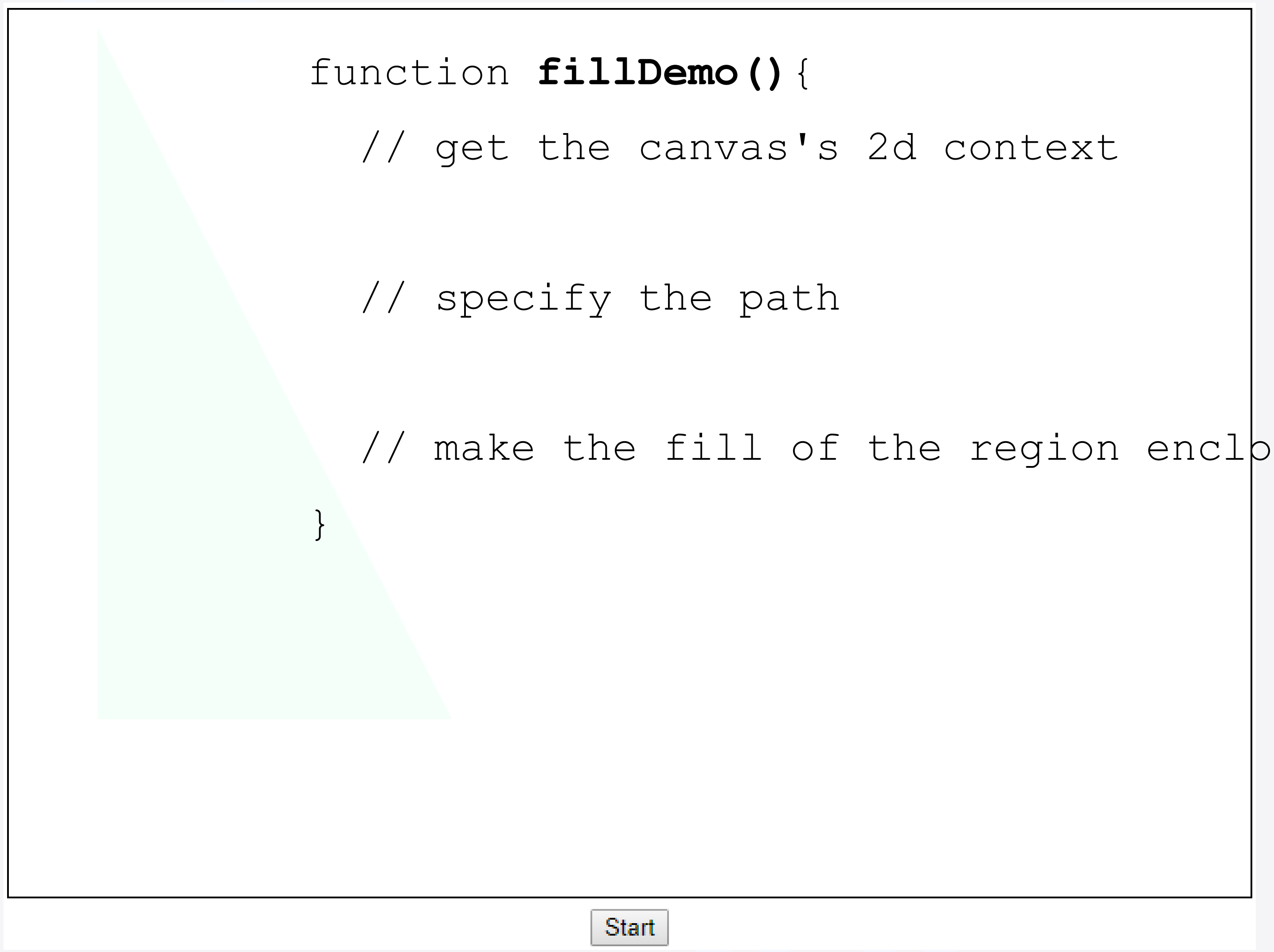


```
// specify the path

context.beginPath();
context.moveTo(50, 10);
context.lineTo(50, 400);
context.lineTo(250, 400);
context.closePath();
```

Fill Demo 1

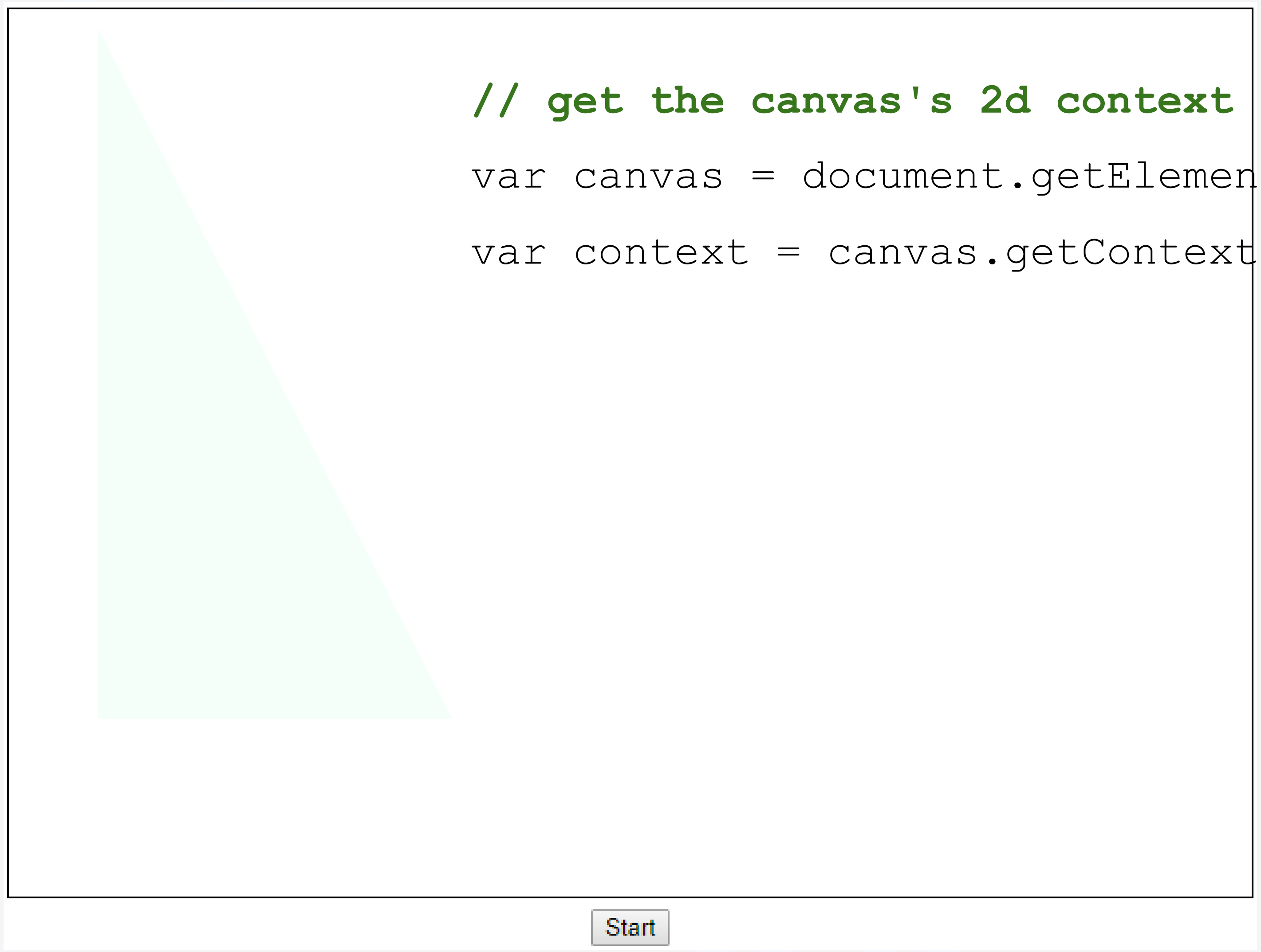


Fill Demo 1



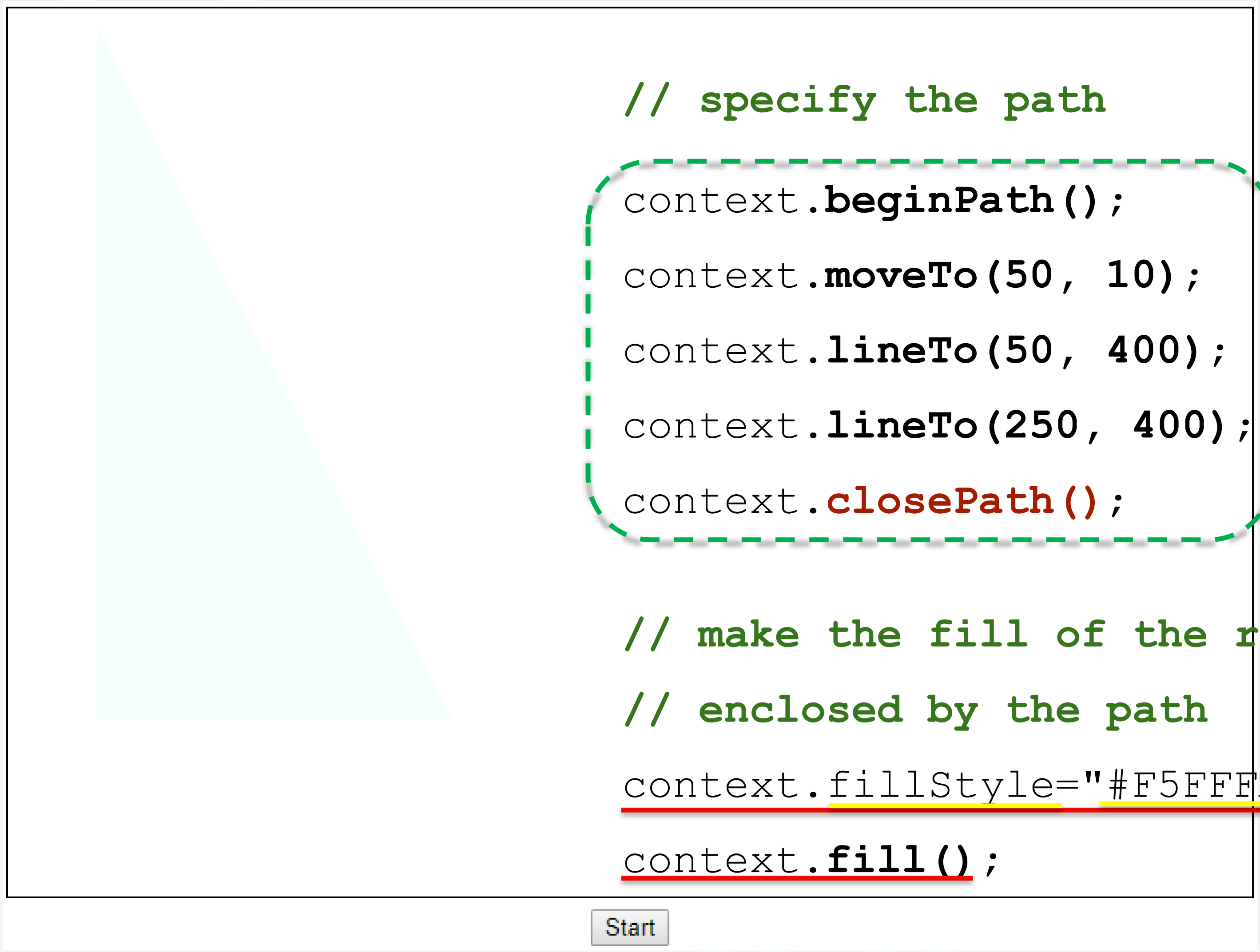
```
function fillDemo(){
  // get the canvas's 2d context


  // specify the path


  // make the fill of the region enclosed by the path
}
```

Fill Demo 1



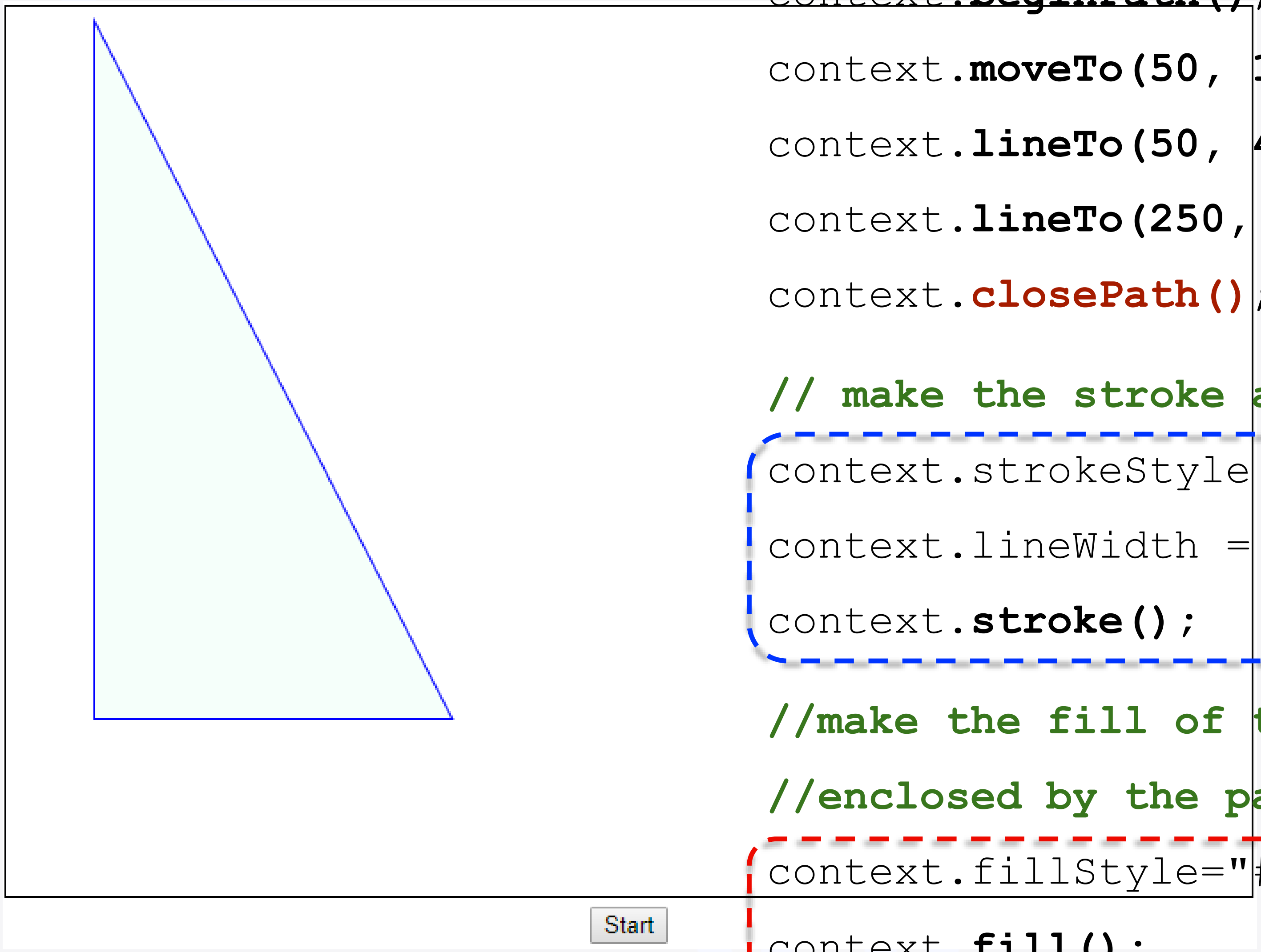
```
// get the canvas's 2d context
var canvas = document.getElementById("canvas");
var context = canvas.getContext("2d");
```

Fill Demo 1



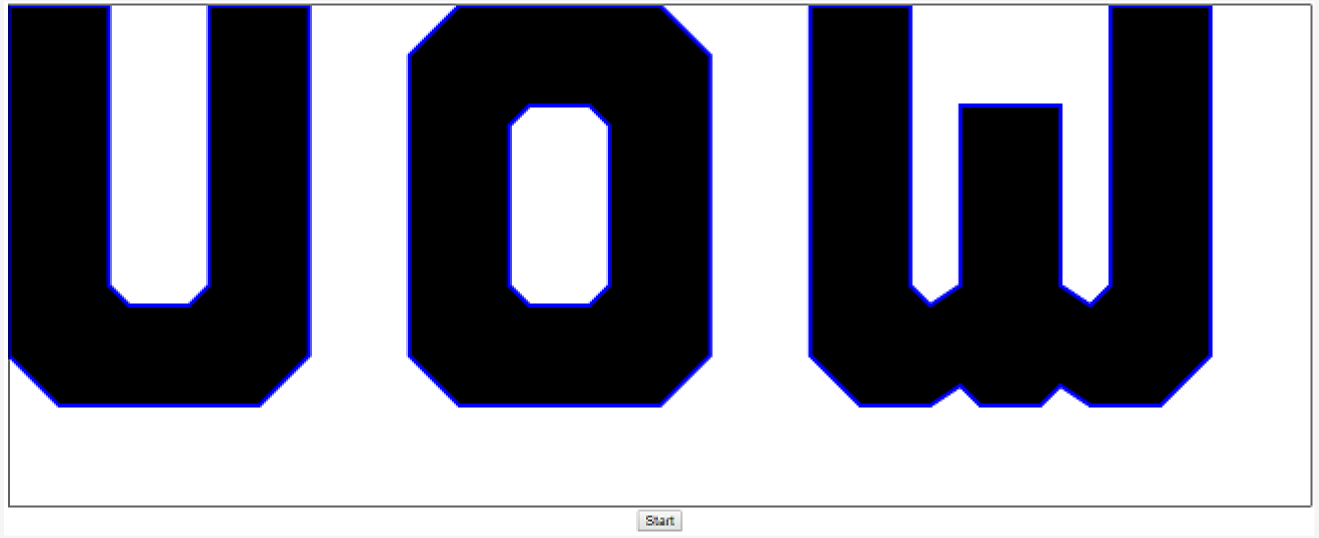
```
// specify the path

context.beginPath();

context.moveTo(50, 10);

context.lineTo(50, 400);

context.lineTo(250, 400);

context.closePath();


// make the fill of the region

// enclosed by the path

context.fillStyle="#F5FFFA";

context.fill();
```

Fill Demo 2

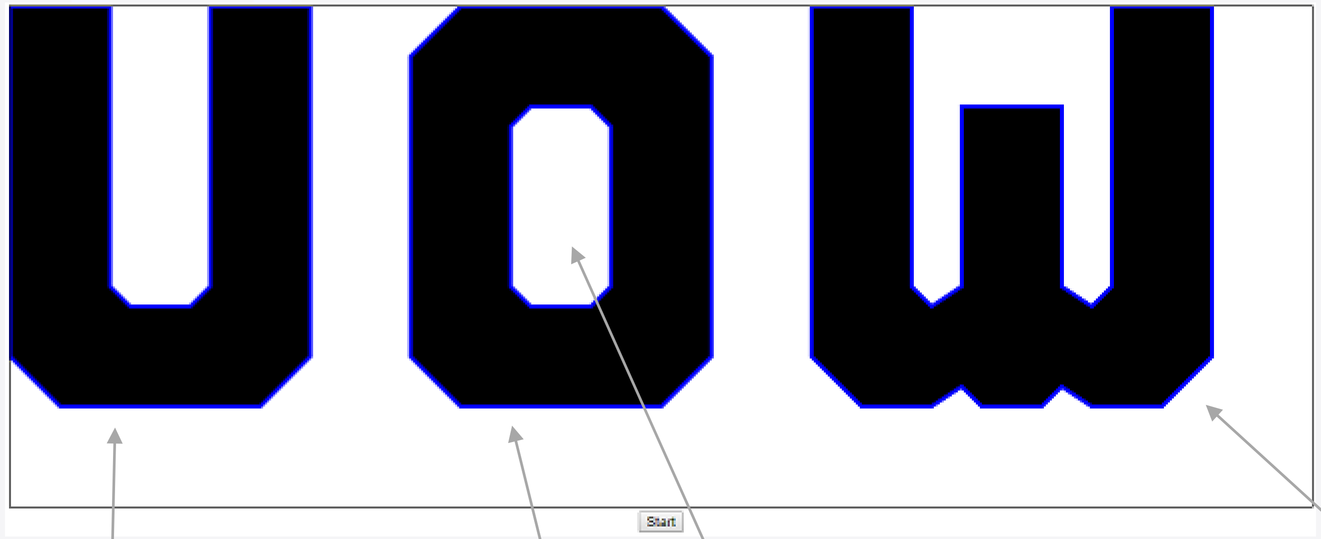


```
// specify the path
context.beginPath();
context.moveTo(50, 10);
context.lineTo(50, 400);
context.lineTo(250, 400);
context.closePath();

// make the stroke along the path
context.strokeStyle = "blue";
context.lineWidth = "2";
context.stroke();

//make the fill of the region
//enclosed by the path
context.fillStyle="#F5FFFA";
context.fill();
```

UOW



UOW



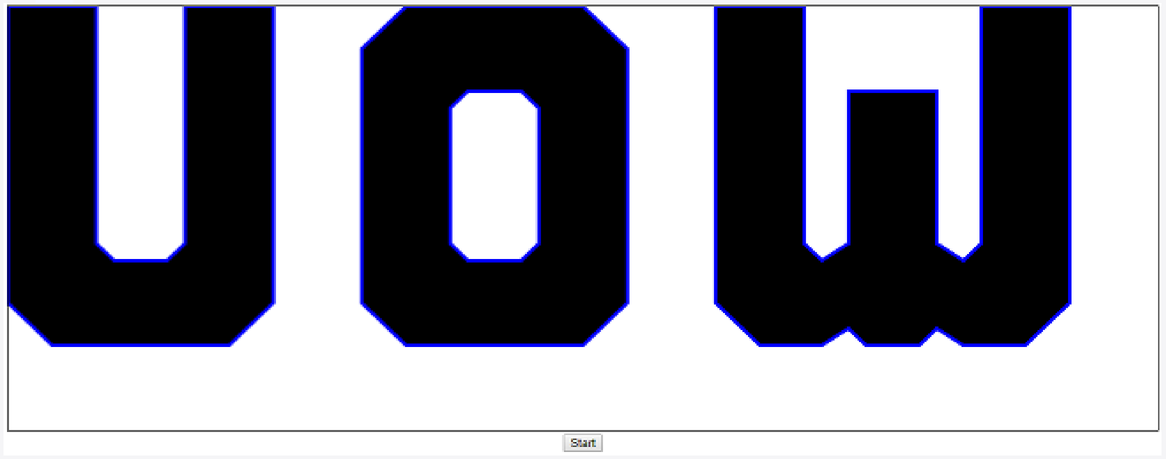
4. letter W
filled with black

3. letter O (**inner**)
filled with white

1. letter U
filled with black

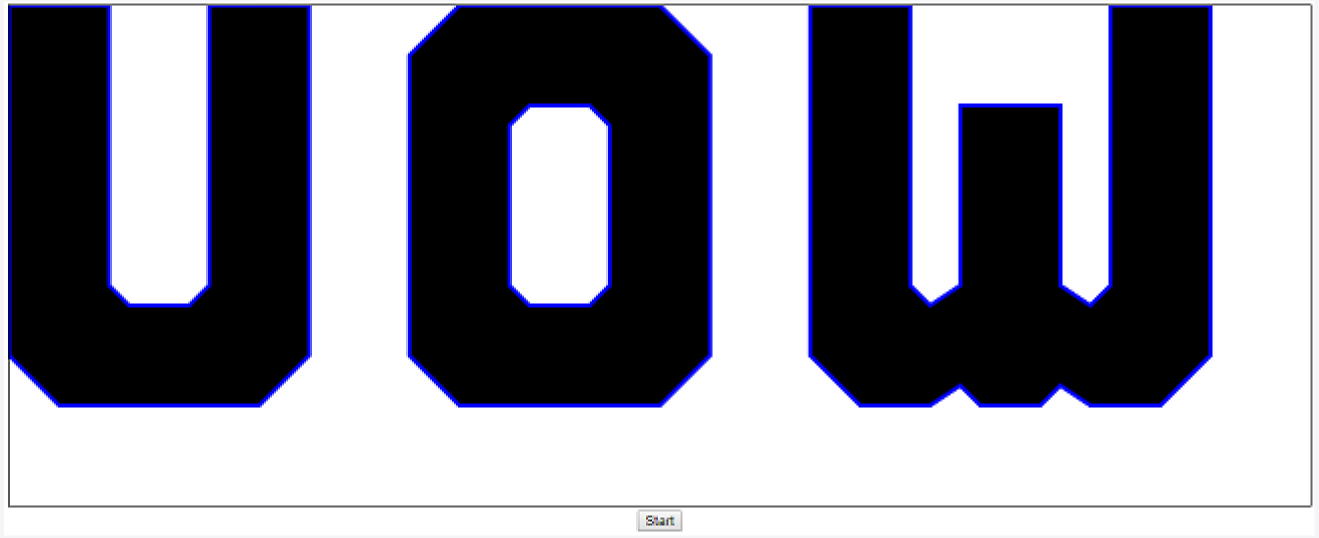
2. letter O (**outer**)
filled with black

UOW



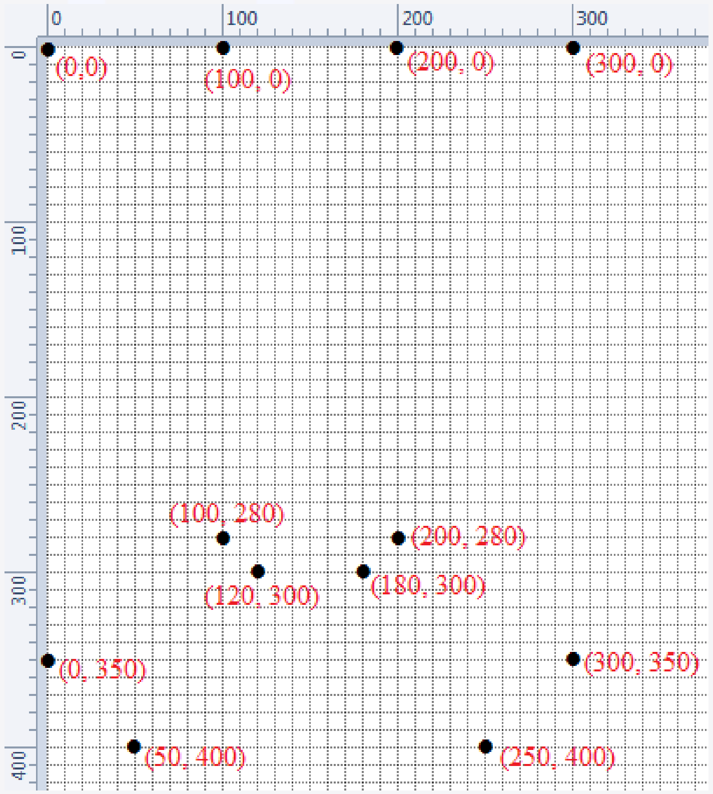
```
<canvas id="canvas" width="1300" height="500"
style="border:1px solid black;">
Your browser does not support canvas.
</canvas>

<br /><br />

<button onClick="drawUOW()">
Start
</button>
```

UOW



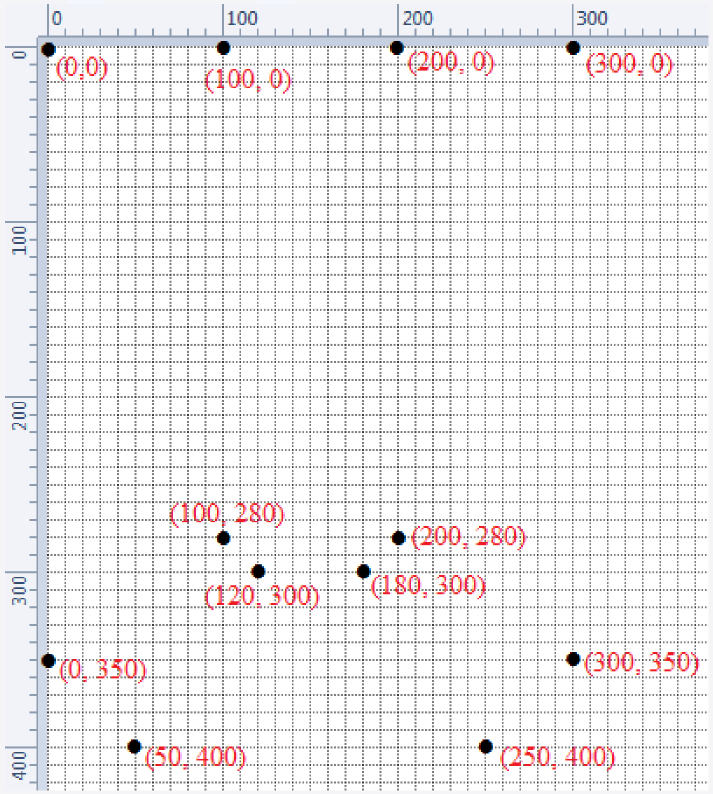
```
function drawUOW(){
  // get the canvas's 2d context
  // letter U
  // letter O (outer)
  // letter O (inner)
  // letter W
}
```

UOW



```
// letter U
context.beginPath();
context.moveTo(0, 0);
context.lineTo(0, 350);
context.lineTo(50, 400);
context.lineTo(250, 400);
context.lineTo(300, 350);
context.lineTo(300, 0);
context.lineTo(200, 0);
context.lineTo(200, 280);
context.lineTo(180, 300);
context.lineTo(120, 300);
context.lineTo(100, 280);
context.lineTo(100, 0);
context.closePath();
```

UOW



```
// letter U
context.beginPath();
context.moveTo(0, 0);
...
context.lineTo(100, 0);
context.closePath();

context.fillStyle="black";
context.fill();


context.strokeStyle="blue";
context.lineWidth = "4";
context.stroke();
```

Drag and Drop

Need to specify 2 types of elements:

- ***Draggable elements****: elements that we can be dragged*
- ***Droppable elements****: elements that can be dropped on*

The user can select **draggable elements** with a mouse, drag the elements to a **droppable element**, and drop those elements by releasing the mouse button.

Drag and Drop

Need to specify 2 types of elements:

- ***Draggable elements***: *elements that we can be dragged*
- ***Droppable elements***: *elements that can be dropped on*

```
<element id="drag-id" draggable="true"
onDragStart="dragStart(event)" >draggable
element</element>

<element id="drop-id" onDrop="drop(event)"
onDragOver="dragOver(event)">droppable element</element>
```

Drag and Drop

***Draggable elements**: elements that we can be dragged*

```
<element id="drag-id" draggable="true"
onDragStart="dragStart(event)" >draggable
element</element>
```

dragStart event is fired when the user starts dragging an element

```
function dragStart(event){
  // get the dragged element ID
  var dragId = event.target.id;

  // store the dragged element ID into the
  //dataTransfer object
  event.dataTransfer.setData("dragId", dragId);
}
```

Drag and Drop

***Draggable elements**: elements that we can be dragged*

```
<element id="drag-id" draggable="true"
onDragStart="dragStart(event)" >draggable
element</element>
```

We need to know what object we are dragging

```
function dragStart(event){
   // get the dragged element ID
   var dragId = event.target.id;

   // store the dragged element ID into the dataTransfer object
   event.dataTransfer.setData("dragId", dragId);
}
```

The DataTransfer object is used to hold the data that is being dragged during a drag and drop operation.

Drag and Drop

***Droppable elements**: elements that can be dropped on*

```
<element id="drop-id" onDrop="drop(event)"
onDragOver="dragOver(event)">droppable element</element>
```

*The **drop** event is fired when an element is dropped on a valid drop target.*

```
function drop(event){
  // get the drop element ID
  var dropId = event.target.id;
  // retrieve the dragged element ID from the dataTransfer object
  var dragId = event.dataTransfer.getData("dragId");
  // do the dropping logic
}
```

Drag and Drop

***Droppable elements**: elements that can be dropped on*

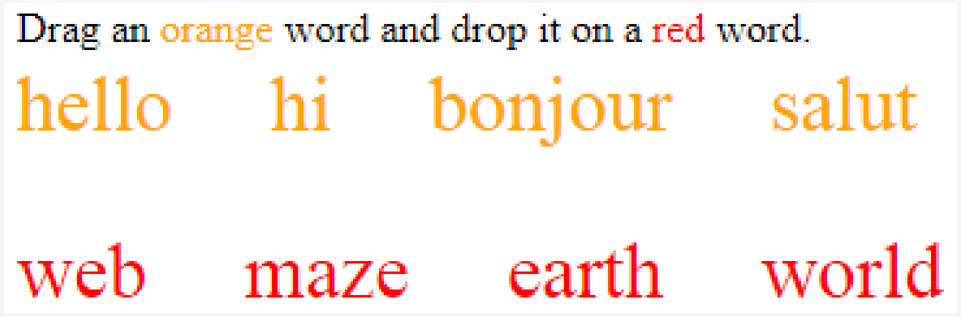
```
<element id="drop-id" onDrop="drop(event)"
onDragOver="dragOver(event)">droppable element</element>
```

*What is the **dragOver** event for?*

*Calling the preventDefault() method during a **dragOver** event will indicate that a drop is allowed at that location.*

```
function dragOver(event){

  event.preventDefault();

}
```

Drag and Drop: Hello World

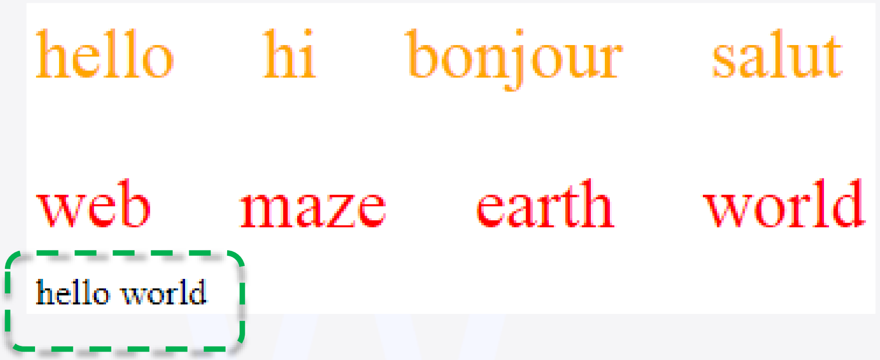


Drag an orange word and drop it on a red word.

hello hi bonjour salut

web maze earth world

When “hello” is dropped on “world”, the page displays “hello world”.



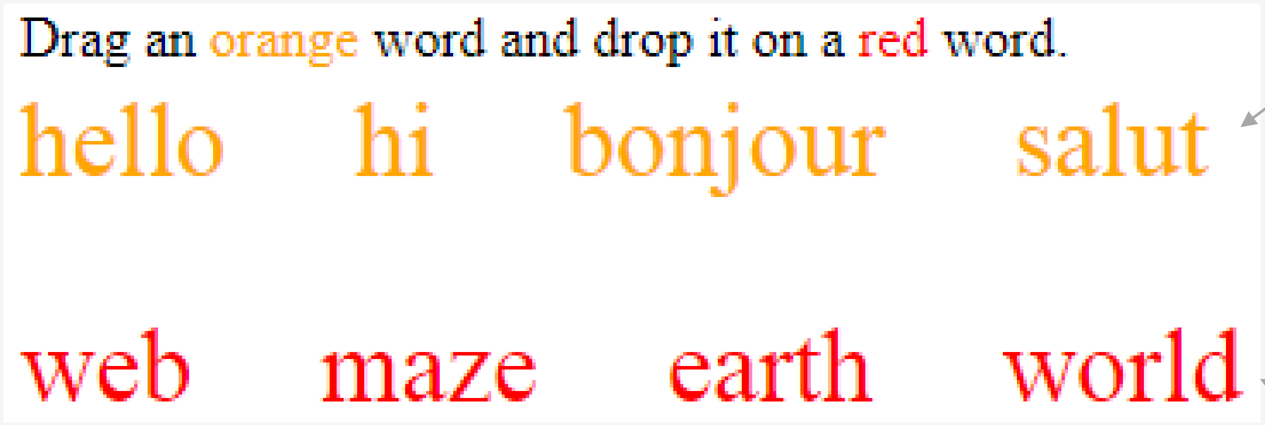
hello hi bonjour salut

web maze earth world

hello world

Drag and Drop: Hello World

***draggable elements**: elements that we can be dragged*



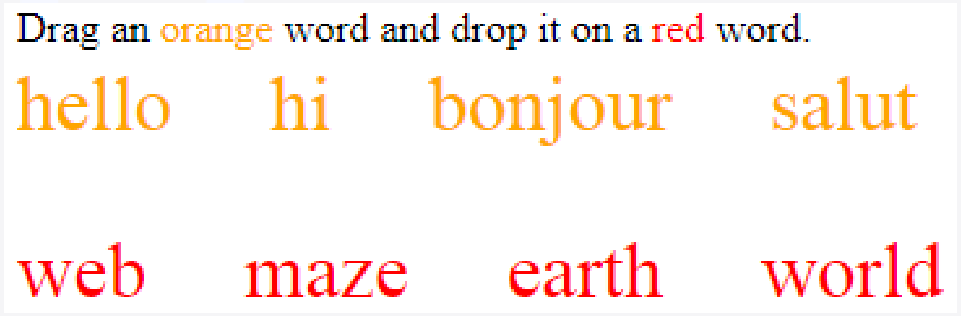
Drag an orange word and drop it on a red word.

hello hi bonjour salut

web maze earth world

***droppable elements**: elements that can be dropped on*

Drag and Drop: Hello World


Drag an orange word and drop it on a red word.

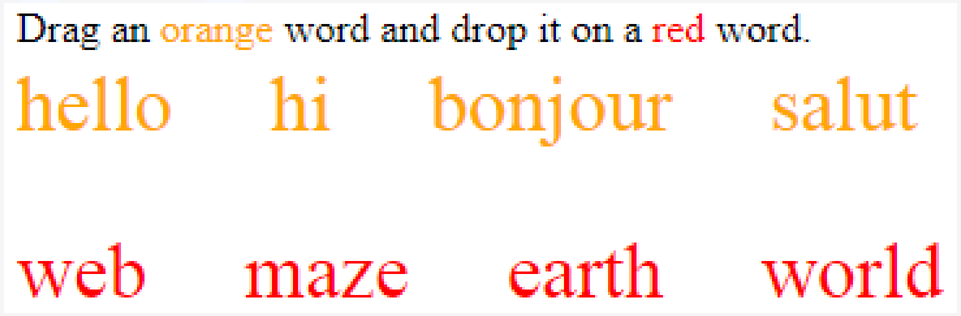
hello hi bonjour salut

web maze earth world

***draggable elements**:*
elements that we can drag

```
<span id="hello" draggable="true"
onDragStart="dragStart(event)" >hello</span>
<span id="hi" draggable="true"
onDragStart="dragStart(event)" >hi</span>
<span id="bonjour" draggable="true"
onDragStart="dragStart(event)" >bonjour</span>
<span id="salut" draggable="true"
onDragStart="dragStart(event)" >salut</span>
```

Drag and Drop: Hello World



Drag an orange word and drop it on a red word.

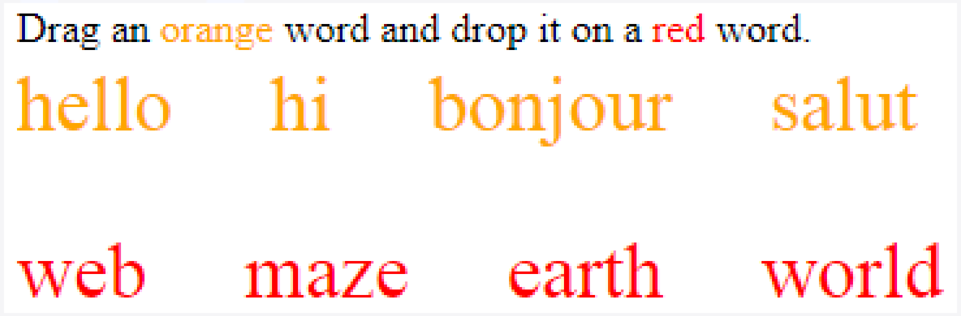
hello hi bonjour salut

web maze earth world

***droppable elements**: elements that can be dropped on*

```
<span id="web" onDrop="drop(event)"
onDragOver="dragOver(event)">web</span>

<span id="maze" onDrop="drop(event)"
onDragOver="dragOver(event)">maze</span>

<span id="earth" onDrop="drop(event)"
onDragOver="dragOver(event)">earth</span>

<span id="world" onDrop="drop(event)"
onDragOver="dragOver(event)">world</span>
```

Drag and Drop: Hello World



Drag an orange word and drop it on a red word.

hello hi bonjour salut

web maze earth world

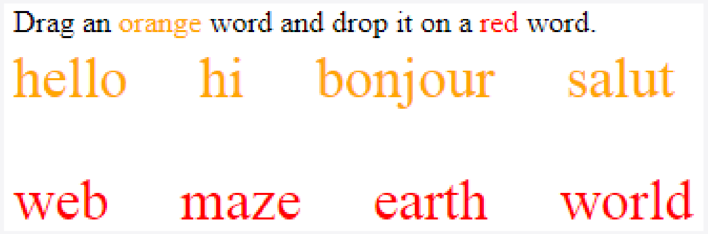
```
<span id="hello" draggable="true"
onDragStart="dragStart(event)" >hello</span>
```

dragStart event is fired when the user starts dragging an element

```
   function dragStart(event){
     // get the dragged element ID
     var dragId = event.target.id;
     // store the dragged element ID into the dataTransfer object
     event.dataTransfer.setData("dragId", dragId);
   }
```

Drag and Drop: Hello World

```
<span id="hello" draggable="true"
onDragStart="dragStart(event)" >hello</span>
```


Drag an orange word and drop it on a red word.

hello hi bonjour salut

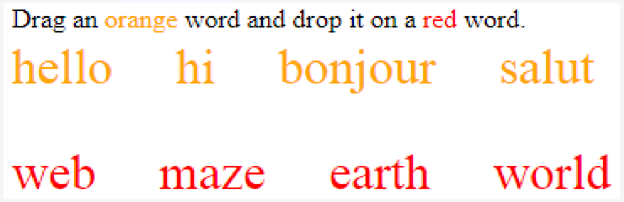
web maze earth world

If hello is dragged, then `event.target.id = "hello"` and we store `"hello"` into the dataTransfer object

```
function dragStart(event){
  // get the dragged element ID
  var dragId = event.target.id;

  // store the dragged element ID into the dataTransfer object
  event.dataTransfer.setData("dragId", dragId);
}
```

Drag and Drop: Hello World

```
<span id="world" onDrop="drop(event)"
onDragOver="dragOver(event)">world</span>
```



Drag an orange word and drop it on a red word.

hello hi bonjour salut

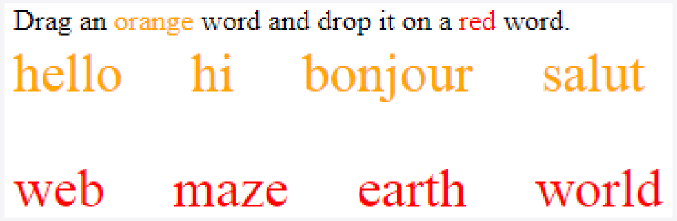
web maze earth world

```
function drop(event){

  // get the drop element ID

  var dropId = event.target.id;

  // retrieve the dragged element ID from the dataTransfer object

  var dragId = event.dataTransfer.getData("dragId");

  // display the message

  var messageSpan = document.getElementById("message");

  messageSpan.innerHTML = dragId + " " + dropId;

}
```

*The **drop** event is fired when an element is dropped on a valid drop target.*

Drag and Drop: Hello World

```
<span id="world" onDrop="drop(event)"
onDragOver="dragOver(event)">world</span>
```


Drag an orange word and drop it on a red word.

hello hi bonjour salut

web maze earth world

*What is the **dragOver** event for?*

*Calling the preventDefault() method during a **dragOver** event will indicate that a drop is allowed at that location.*

```
function dragOver(event){

  event.preventDefault();

}
```