Problem 1: Readings on D3 and SVG

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Questions

1. D3 can access and change the DOM using the methods `select` and `selectAll`. The method `select` can be used to select a single element that matches the selector, while the method `selectAll` can be used to select all the elements that match the selector.

   Assume you have the following html page:

```
<!DOCTYPE html>
<html>
<head>
    <title>Example</title>
    <script type="text/javascript" src="http://d3js.org/d3.v3.min.js"></script>
</head>
<body>
    <h1>Example</h1>
    <p>First paragraph.</p>
    <p>Second paragraph.</p>
    <p>Third paragraph.</p>
</body>
</html>
```

   The method `select` can be used to select the `<h1>` element:

```
d3.select("h1");
```

   If multiple elements match the selector in the `select` method (e.g., `d3.select("p");`), then the first element in the DOM that matches the selector will be returned (i.e., `<p>First paragraph.</p>`). The `select` method can also be used on specific elements, for example:

```
d3.select("body").select("h1") (selects the <h1> element from the <body> element)
```

The method `selectAll` can be used to select all the `<p>` elements at once:

```
d3.selectAll("p"); (or d3.select("body").selectAll("p");)
```

Besides selecting elements (i.e., accessing the DOM), the methods `select` and `selectAll` can also be used to change elements (i.e., change the DOM), for example, change the contents of the `<h1>` element:

```
d3.select("h1").html("Modified example);
```

Or change the color of all the `<p>` elements to red:

```
d3.selectAll("p").style("color", "red");
```

2. The `d` in `function(d){}` is an argument that points to a data point in the data that is bound to a selection. The data point that `d` points to, depends on the the 'position' of the element in the selection. As an example, let us assume the following data: `test = ["1", "2", "3"];`. This data can be bound to the three paragraphs in the example from question 1: `d3.selectAll("p").data(test);`. We can now change the contents of the paragraphs like so:

```
var test = ["1", "2", "3"];
d3.selectAll("p").data(test).html(function(d) {return d});
```

For the first paragraph in the selection, `d` will point to '1', for the second paragraph in the selection, `d` will point to '2', etc. Thus, the contents of the first paragraph will change to '1', the contents of the second paragraph will change to '2', etc.

The `i` in `function(d, i){}` is an argument that points to the index of an element in a selection.

3. The following line of JavaScript adds a `<div>` element with class `barChart1` to the body of an HTML document (assuming D3 is included):

```
d3.select("body").append("div")
    .attr("class", "barChart1");
```

The following line of JavaScript adds an `<svg>` element with class `barChart2` and with square dimensions to the body of an HTML document:

```
d3.select("body").append("svg")
    .attr("class", "barChart2")
    .attr("width", 100)
    .attr("height", 100);
```

4.
   - `append`: The method `append` can be used to append an element to a selection (i.e., insert an element into the DOM).
   - `update`: When joining data to elements, all the data that can be bound to elements are put in the update selection.
   - `enter`: When joining data to elements, any leftover data (i.e., data that cannot be bound to elements) are put in the enter selection. By appending to the the enter selection, new elements can be created for any leftover data.
   - `exit`: When joining data to elements, any leftover elements (i.e., elements for which there is no corresponding data) are put in the exit selection (i.e., the exit selection is the reflection of the enter selection).

   '`selectAll` + `data` + `enter` + `append`' is the pattern for joining data to elements (i.e., a selection), and creating new elements for data that cannot be bound to the selection. This construct is used when there are fewer elements than items in a dataset, and new elements have to be created in order to join all the data to elements (i.e., to prevent data loss).

5. The main difference between drawing a bar chart with HTML and SVG (instead of with D3), is that you have to (manually) add as many elements as data points to your document. When you use D3, you can use the '`selectAll` + `data` + `enter` + `append`' pattern to automatically add elements to your document (see the previous question).

6. In drawing the simple bar chart with D3 and SVG[1], `<g>` elements are appended to the `<svg>` element, and the data are bound to the `<g>` elements. Furthermore, to every `<g>` element, a `<rect>` element and a `<text>` element are appended. The `<rect>` element represents the actual bar, and the `<text>` element represents the label. The `<g>` element is the container for the `<rect>` element and the `<text>` element (i.e., the `<g>` element represents the whole bar).

[1] Source: `http://bost.ocks.org/mike/bar/2/#automatic`