Plot a course!

Creating accessible SVG charts in WordPress

Ahoy!

```
{
  "name":     "Joni Halabi",
  "role":     "Senior Web Developer @ Georgetown",
  "socials":  "@jonihalabi",
  "web":      "jhalabi.com"
}
```


Enough chit chat...
Time to get down to business.

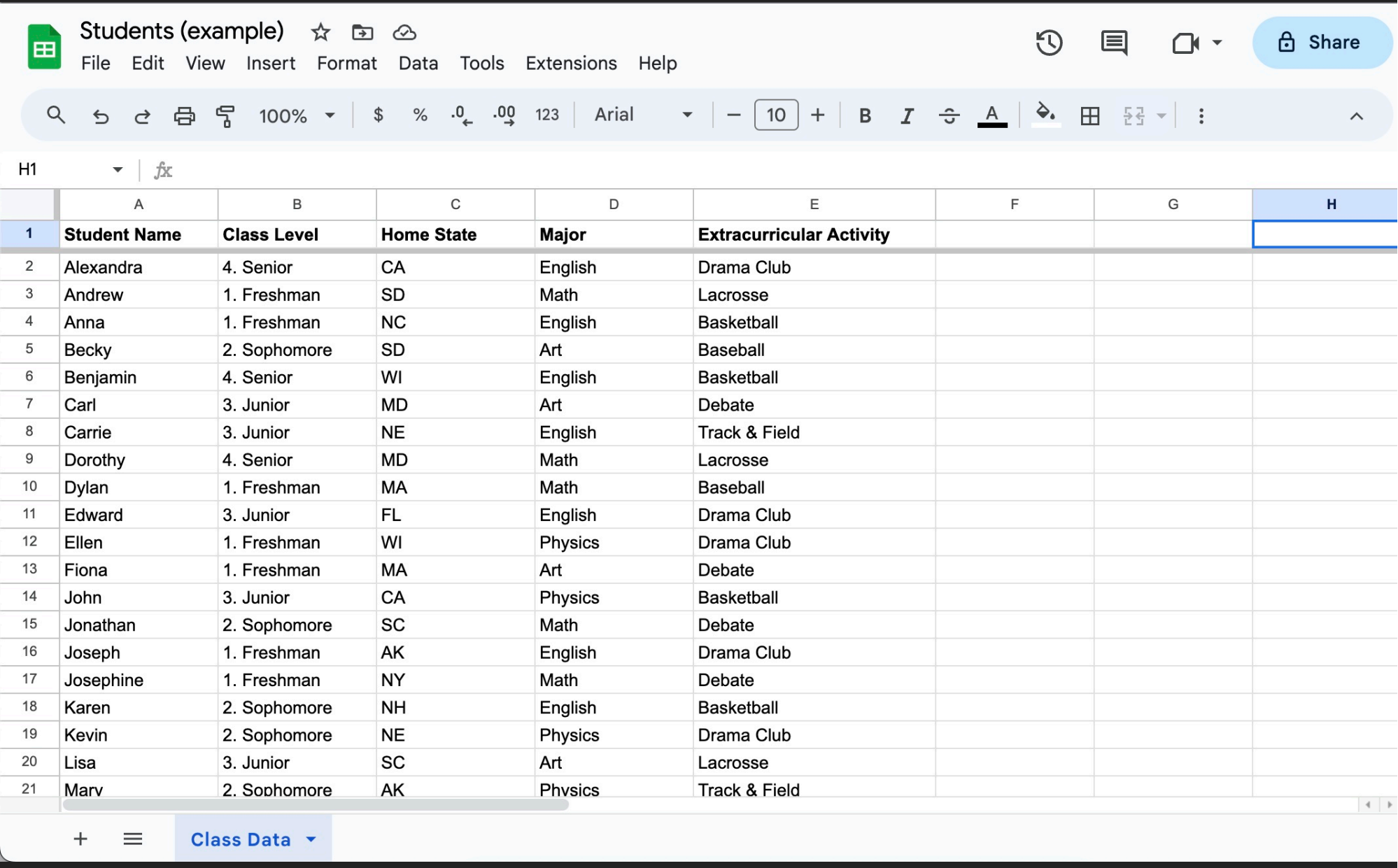
0

Today’s journey

University admissions wants:

A visualization on our website, displaying of how many students from each US state are returning to campus this fall.

University admissions has...



	A	B	C	D	E	F	G	H
1	**Student Name**	**Class Level**	**Home State**	**Major**	**Extracurricular Activity**			
2	Alexandra	4. Senior	CA	English	Drama Club			
3	Andrew	1. Freshman	SD	Math	Lacrosse			
4	Anna	1. Freshman	NC	English	Basketball			
5	Becky	2. Sophomore	SD	Art	Baseball			
6	Benjamin	4. Senior	WI	English	Basketball			
7	Carl	3. Junior	MD	Art	Debate			
8	Carrie	3. Junior	NE	English	Track & Field			
9	Dorothy	4. Senior	MD	Math	Lacrosse			
10	Dylan	1. Freshman	MA	Math	Baseball			
11	Edward	3. Junior	FL	English	Drama Club			
12	Ellen	1. Freshman	WI	Physics	Drama Club			
13	Fiona	1. Freshman	MA	Art	Debate			
14	John	3. Junior	CA	Physics	Basketball			
15	Jonathan	2. Sophomore	SC	Math	Debate			
16	Joseph	1. Freshman	AK	English	Drama Club			
17	Josephine	1. Freshman	NY	Math	Debate			
18	Karen	2. Sophomore	NH	English	Basketball			
19	Kevin	2. Sophomore	NE	Physics	Drama Club			
20	Lisa	3. Junior	SC	Art	Lacrosse			
21	Mary	2. Sophomore	AK	Physics	Track & Field			

Our mission

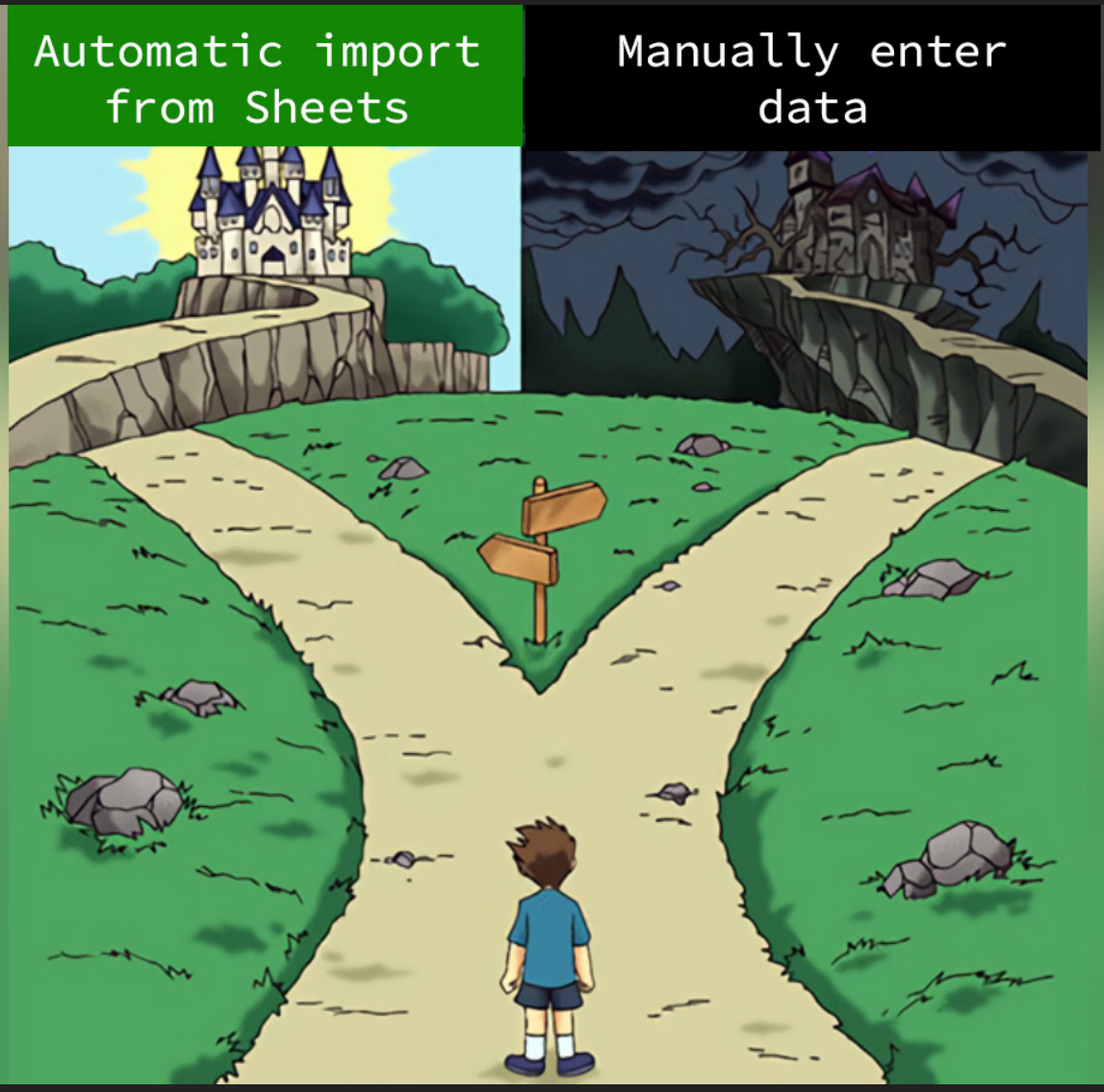
Write a custom Gutenberg block to interpret and chart this data.

Set a course!

1. Create a block to read the spreadsheet data
2. Process the data
3. Make an accessible and responsive visualization

1

Create a block


Automatic import from Sheets
Manually enter data

Automatic sounds so much better

- Data updates are automatically displayed on the page

However...

- Requires an API key
- Also means that the site has an external dependency

Block setup

- Dynamic block *(because dynamic data!)*
- `block.json`
- Attributes save:
  - Sheet URL
  - Column to chart
  - Title
  - Caption

index.js

```
import { default as Edit } from './edit.js';
import { default as Metadata } from './block.json';

( function() {

  const { registerBlockType } = wp.blocks;

  registerBlockType( Metadata, {
    edit: Edit,
    save: () => { return null; }
  } );

})();
```

block.json

```
{
  "name": "my/chart",
  "title": "Chart",

  "attributes": {
    "data": {
      "type": "string", "default": "" },
    "column": {
      "type": "string", "default": "A" },
    "title": {
      "type": "string", "default": "" }
    "caption": {
      "type": "string", "default": "" }
  }
}
```

edit.js

```
return (
  <div>
    ...

    <TextControl label='Google Sheets URL'
      value={ data }
      onChange={ onChangeData } />

    { /* Spreadsheet column. */ }
    <TextControl label='Column'
      value={ column }
      onChange={ onChangeColumn } />

    ...
  </div>
);
```

Update

lock test

The home US states of our students.

Page Block

Chart

Display a chart using data in a Google sheet.

Data source

Enter your Google Sheet URL and the letter of the column to be included in this chart. The Google Sheet *must* be publicly viewable.

GOOGLE SHEETS URL

https://docs.google.com/spreadsheets

COLUMN

C

2

Process the data

Strategy

- Server side processing in PHP
- Use `WP_Http` to read Google Sheet data

Get data from block attributes

```
// Get the API key from WP options.
$api_key = 'API_KEY';

// Get relevant attribute data.
$data = $attrs['data'];
$column = $attrs['column'];
```

Extract the Google Sheet ID

```
$sheet_id = preg_replace(
  '/(https:\/\/docs.google.com\/spreadsheets\/d\/)|\/edit.
  '', $data );
```

Calculate the data range

```
$range = $column . '2%3A' . $column . '1000';
```

Get the data from Google

```
$get_data = new WP_Http();
$data_url =
  'https://sheets.googleapis.com/v4/spreadsheets/'.
  $sheet_id . '/values/' . $range . '/?&key=' . $api_key;

$raw_data = $get_data->get( $data_url );

// Decode the raw (JSON string) data.
$data_body json_decode( $raw_data['body'], true );
```

Our data will look something like this:

```
Array(
  [range] => 'Class Data'!C2:C101
  [majorDimension] => ROWS
  [values] => Array(
    [0] => Array(
      [0] => CA
    )

    [1] => Array(
      [0] => SD
    )

    [2] => Array(
      [0] => NC
    )
    ...
)
```

Not done yet!

We need to count the number of students from each state.

Count all unique values in the data

```
$data = [];

foreach ( $data_body['values'] as $d ) {
  if ( array_key_exists( $d[0], $data ) ) {
    // If the value already exists, increment
    $data[ $d[0] ]++;

  } else {
    // Otherwise, create a new item.
    $data[ $d[0] ] = 1;
  }
}
```

Now we have an array that looks something like this:

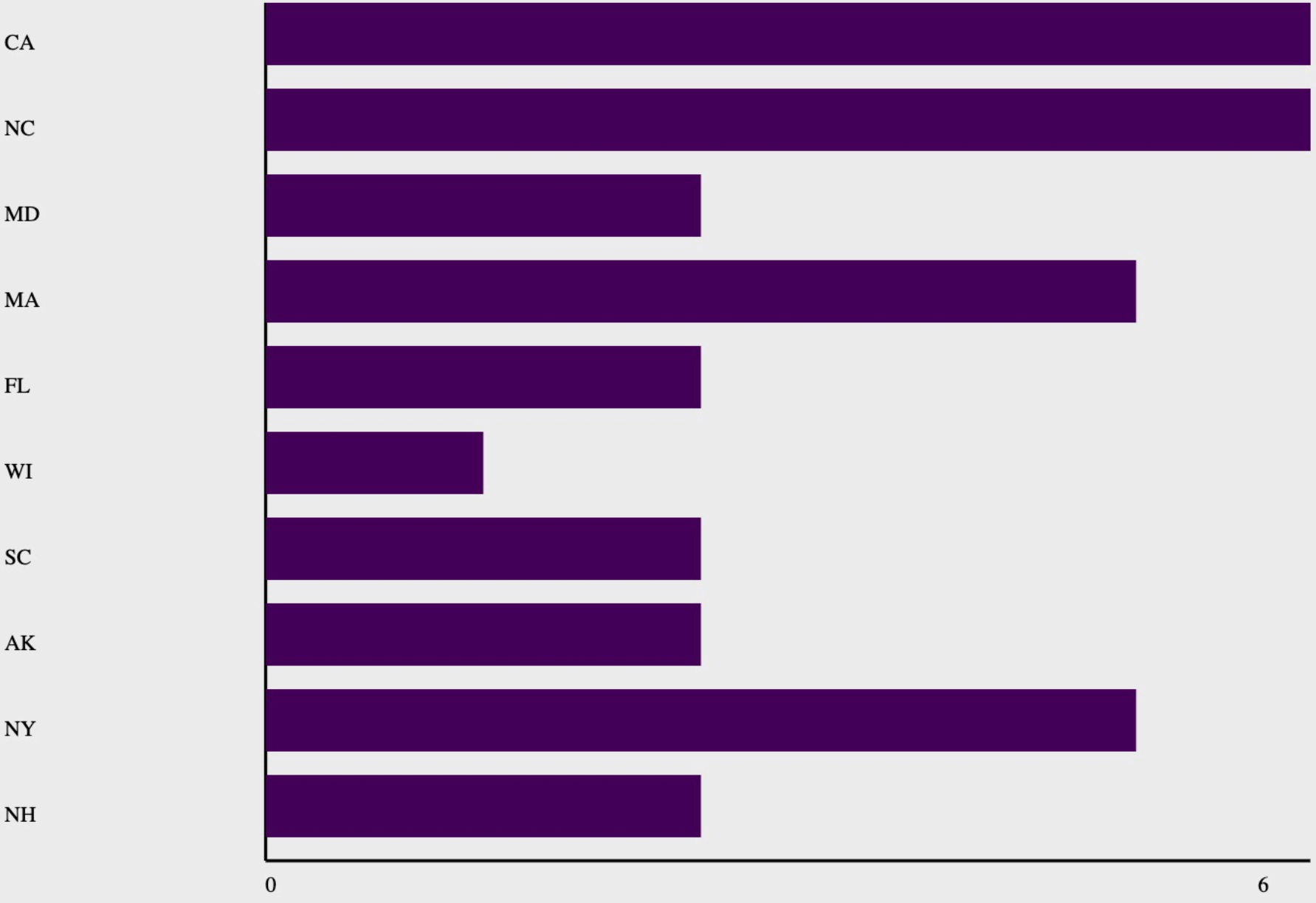
```
Array
(
  [CA] => 6
  [NC] => 6
  [MD] => 2
  [MA] => 4
  [WI] => 1
  [FL] => 2
  [SC] => 2
  [AK] => 2
  [NY] => 4
  [NH] => 2
)
```

3

Make a visualization!

Requirements

- Accessible
- Responsive
- Let's keep this simple: horizontal bar chart



At our university, students come from all over the United States. This fall, most of our students hail from CA, NC, MA, and NY.

Decision point!

Chart in SVG

SVG

Scalable Vector Graphic, a XML-based image format for 2-D graphics

- All code
- No image loss, because code scales
- Smaller file size
- Code is semantic; can add ARIA attributes

Let’s write some SVG code!

SVG overview

```
<svg xmlns="http://www.w3.org/2000/svg"
  aria-labelledby="my-chart"
  width="100%"
  height="...">

  <title id="my-chart">
    A horizontal bar chart depicting how many students are
    attending our university from each US state.
  </title>

  <!-- Shapes go here! -->
</svg>
```

SVG height

Need to account for the heights of the sum of the bars in the chart, plus space in between.

```
$chart_height =
  sizeof($data) * ( BAR_HEIGHT + BAR_GAP );

$svg_height = $chart_height + 40;
```

SVG declaration (with height)

```
'<svg xmlns="http://www.w3.org/2000/svg"
   aria-labelledby="my-chart"
   width="100%"
   height="' . $svg_height . '">'
```

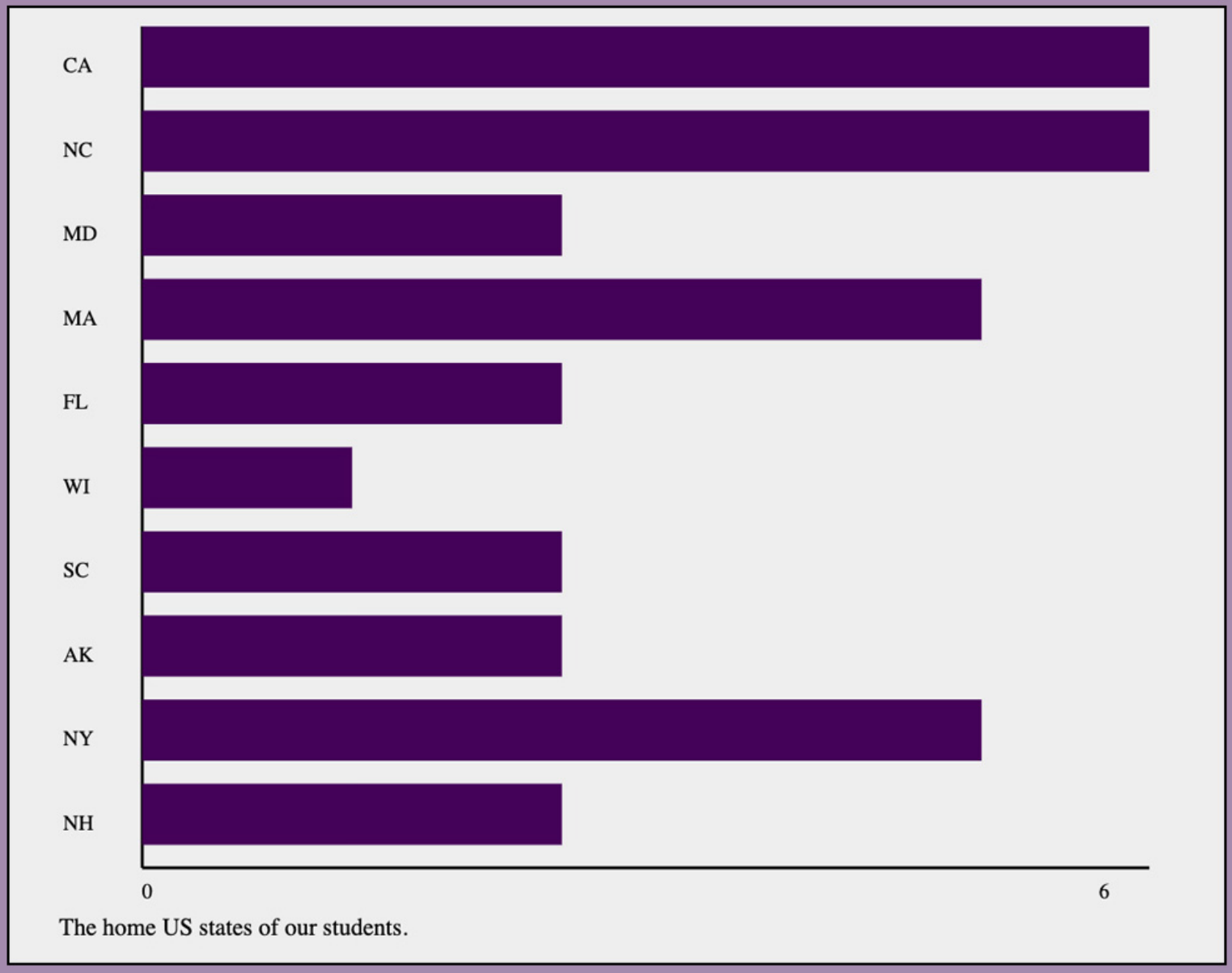
Next up

Create the X and Y axes

(Yup. Axes is the plural of "axis". Chop chop.)

0,0

max_x, 0



0, max_y

max_x, max_y

Y axis

```
<line
   role="presentation"
   x1="20%" y1="0"
   x2="20%" y2="CHART_HEIGHT"
   stroke="#000" stroke-width="2" />
```

X axis

```
<line
   role="presentation"
   x1="20%"  y1="CHART_HEIGHT"
   x2="100%" y2="CHART_HEIGHT"
   stroke="#000" stroke-width="2" />
```

Scale along X axis: min value

```
<text
  role="presentation"
  x="20%"
  y="CHART_HEIGHT + A_LITTLE_MORE"
  fill="#000" font-size="14">

  0

</text>
```

Scale along X axis: max value

```
<text
  role="presentation"
  x="96%"
  y="CHART_HEIGHT + A_LITTLE_MORE"
  fill="#000" font-size="14">

  MAX_VALUE

</text>
```

Group everything together

```
<g class="chart_axes">
  <line role="presentation" x1="20%" y1="0"
    x2="20%" y2="CHART_HEIGHT" stroke="#000"
    stroke-width="2" />

  <line role="presentation" x1="20%" y1="CHART_HEIGHT"
    x2="100%" y2="CHART_HEIGHT" stroke="#000"
    stroke-width="2" />

  <text role="presentation" x="20%" y="CHART_HEIGHT +
    A_LITTLE_MORE" fill="#000" font-size="14">0</text>

  <text role="presentation" x="96%" y="CHART_HEIGHT +
    A_LITTLE_MORE" fill="#000" font-size="14">
    MAX_VALUE</text>
</g>
```

The fun part!

Create the bars

Group all the bars

```
<g role="list" aria-label="Chart data">
  BARS GO HERE.
</g>
```

Bar creation

- Loop through your array of data.
- Create a group for each bar, containing
  - The bar itself
  - The text label for that bar
  - ARIA description, for screen reader agents

A group for bar elements

```
<g
  role="listitem"
  aria-label="There are ITEMS entries under LABEL"
  tabindex="0">
    BAR ELEMENT
    LABEL ELEMENT
</g>
```

The bar

```
<rect
  role="presentation"
  x="OFFSET%"
  y="NUMBER_OF_BARS_SO_FAR * (BAR_HEIGHT + GAP)"
  width="THIS_BARS_WIDTH%"
  height="BAR_HEIGHT"
  fill="#00f" />
```

Note about the bar width

The width of the current bar is the value of the bar (how many students from this state) as a **percentage**.

```
VALUE / MAX_VALUE * 100
```

Bar label

```
<text
  role="presentation"
  x="0"
  y="NUMBER_OF_BARS_SO_FAR * (BAR_HEIGHT + GAP)"
  fill="#000"
  font-size="16">

  LABEL

</text>
```

All together now

```
<g role="list" aria-label="Chart data">

  <g role="listitem" tabindex="0"
    aria-label="There are ITEMS entries under LABEL">

    <rect role="presentation" x="OFFSET%"
      y="NUMBER_OF_BARS_SO_FAR * (BAR_HEIGHT + GAP)"
      width="THIS_BARS_WIDTH%" height="BAR_HEIGHT"
      fill="#f0f" />
    <text role="presentation" x="0"
      y="NUMBER_OF_BARS_SO_FAR * (BAR_HEIGHT + GAP)"
      fill="#000" font-size="16">LABEL</text>
  </g>

  ...
</g>
```

Finally, a caption

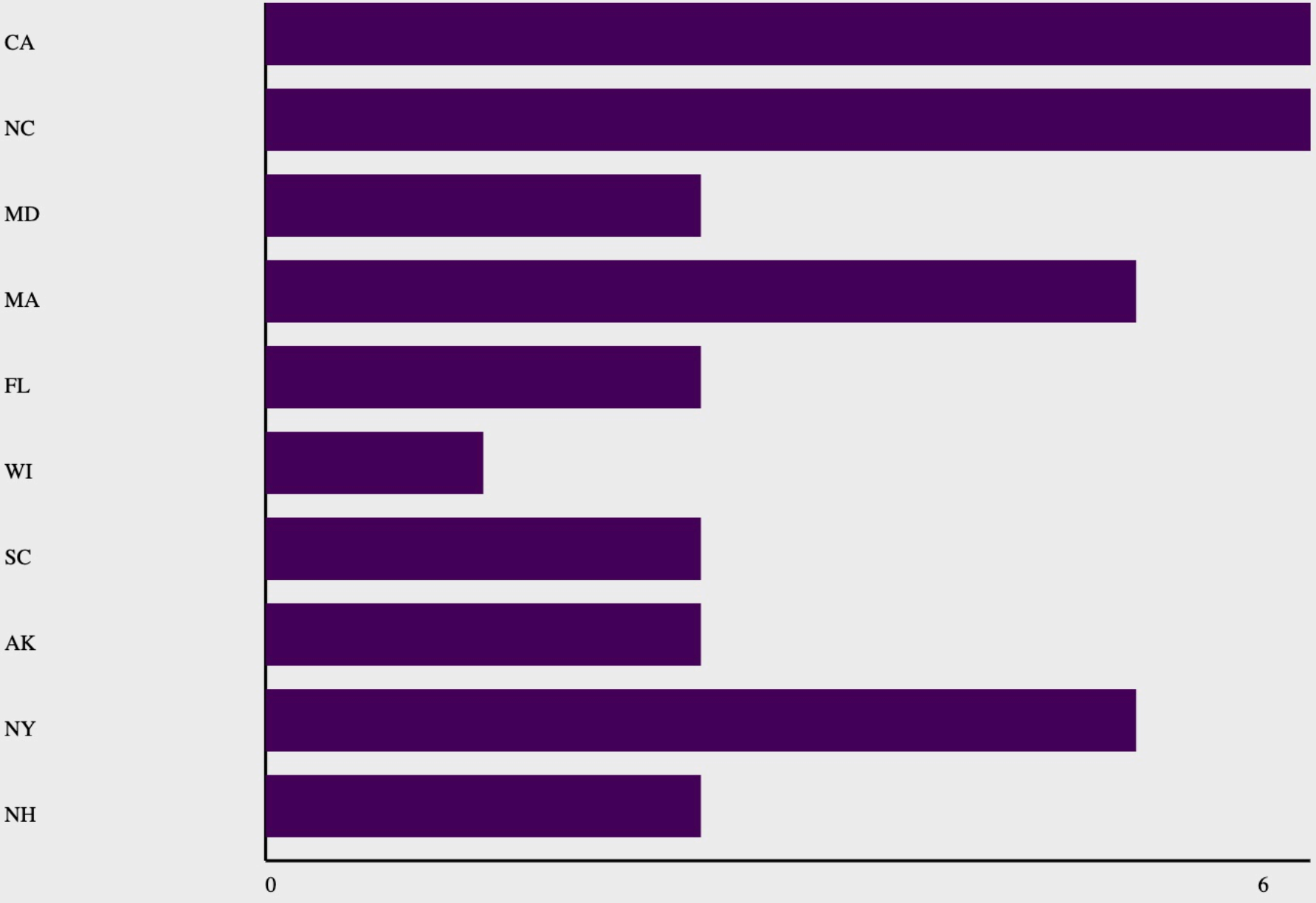
Wrap the chart in a figure

```
<figure>

  <svg>...</svg>

  <figcaption>
    At our university, students come from all over the
    United States. This fall, most of our students hail
    from CA, NC, MA, and NY.
  </figcaption>

</figure>
```



At our university, students come from all over the United States. This fall, most of our students hail from CA, NC, MA, and NY.

More a11y tips

- Pay attention to color contrast
- Limit animations
- Add bar values as text to each bar
- Include a `<table>` alternative
- Write meaningful labels
- Test, test, test!!


Hooray!!
Thank you everyone! ❤

See this in action

- Besan Block @ https://github.com/thatdevgirl/besan-block
- Example code is from this custom plugin
- **Also:** Writing a custom WordPress block - https://jhalabi.com/blog/writing-custom-wp-block

References

- SVG Tutorial - https://www.w3schools.com/graphics/svg_intro.asp
- Accessible SVG patterns - https://www.smashingmagazine.com/2021/05/accessible-svg-patterns-comparison/
- Carnegie Museum Web A11y Guidelines: SVG - https://web-accessibility.carnegiemuseums.org/code/svg/
- Make charts and graphs more accessible - https://blog.pope.tech/2023/08/31/how-to-make-charts-and-graphs-more-accessible/

Stay in touch!

- Find these slides @ talks.jhalabi.com/svg-in-wordpress
- Find me @ jhalabi.com
  - @jonihalabi
  - @thatdevgirl on GH

Credits

- Crossroads meme background image: https://knowyourmeme.com/memes/dramatic-crossroads