

Run `git pull` in the main branch to follow along today.

D3.js (Part 3)

DSC 106: Data Visualization

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Announcements

Lab 6 due Friday.

Project 3 due next week Tuesday.

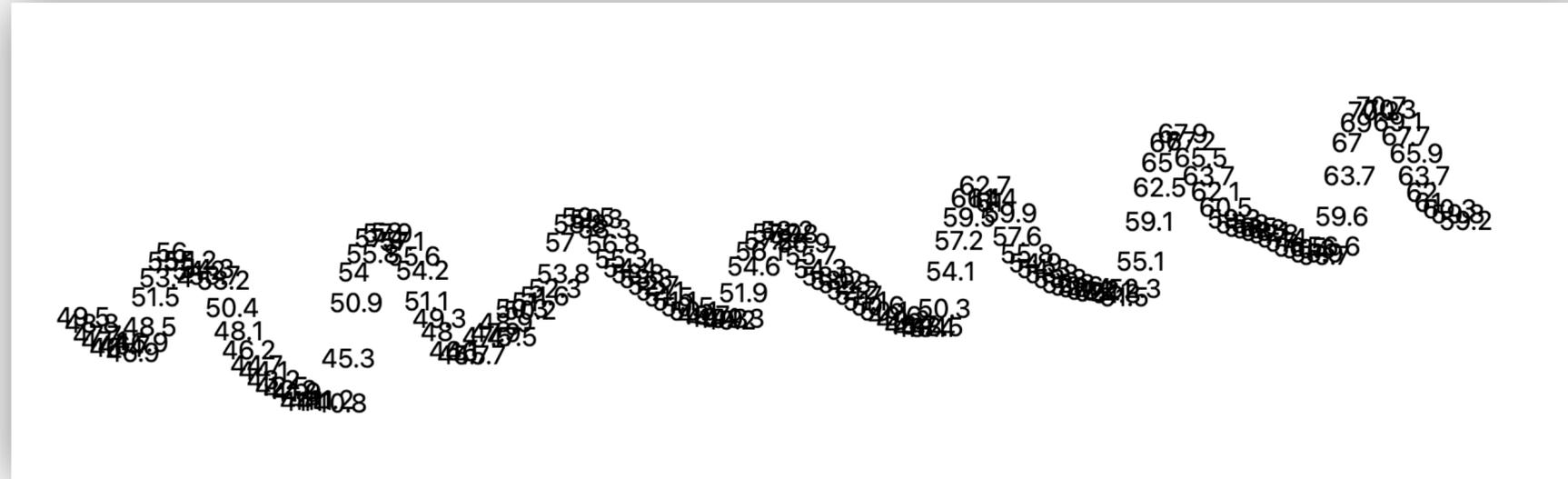
Project 2 peer grading coming out this week.

FAQs:

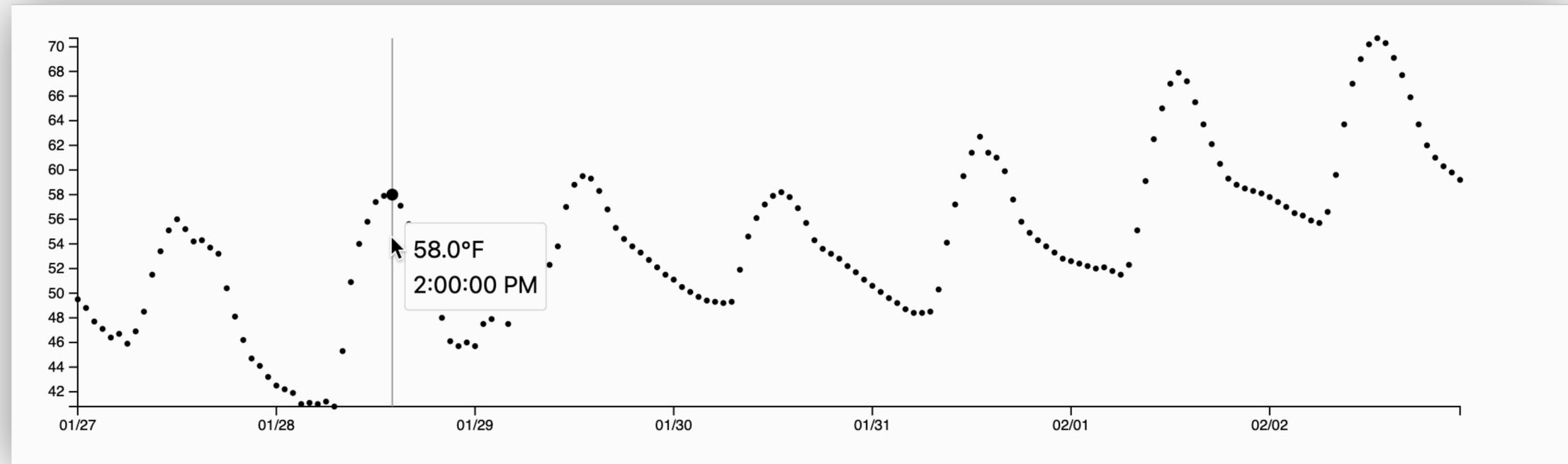
- 1.

Today: Making an interactive scatterplot

Before:

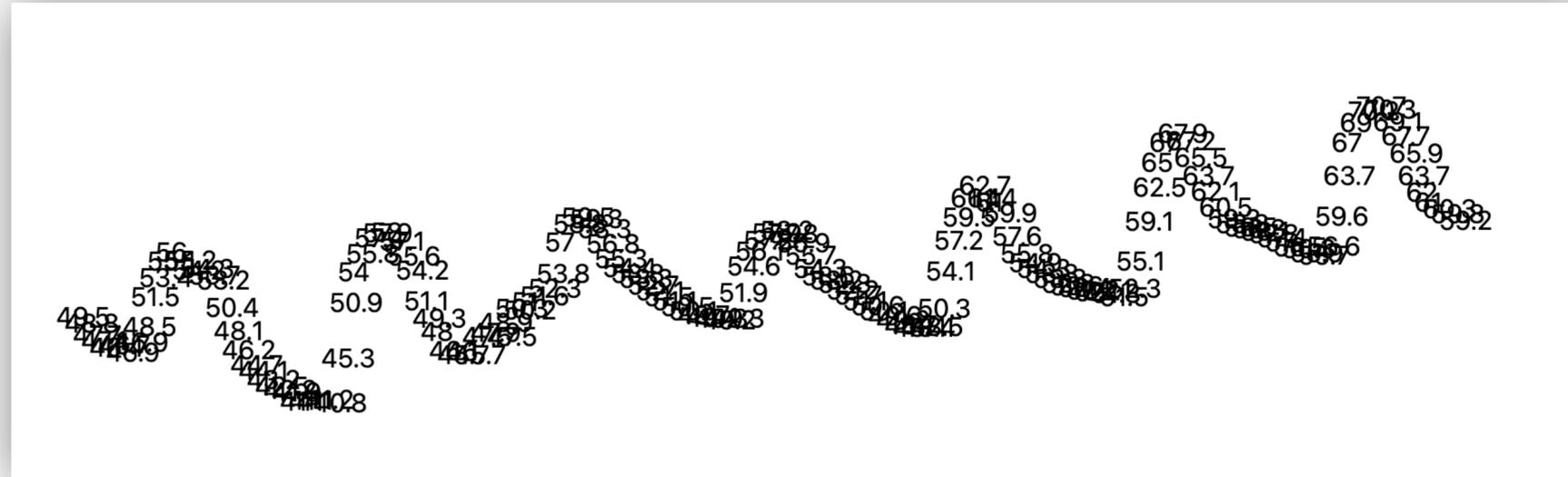


After:

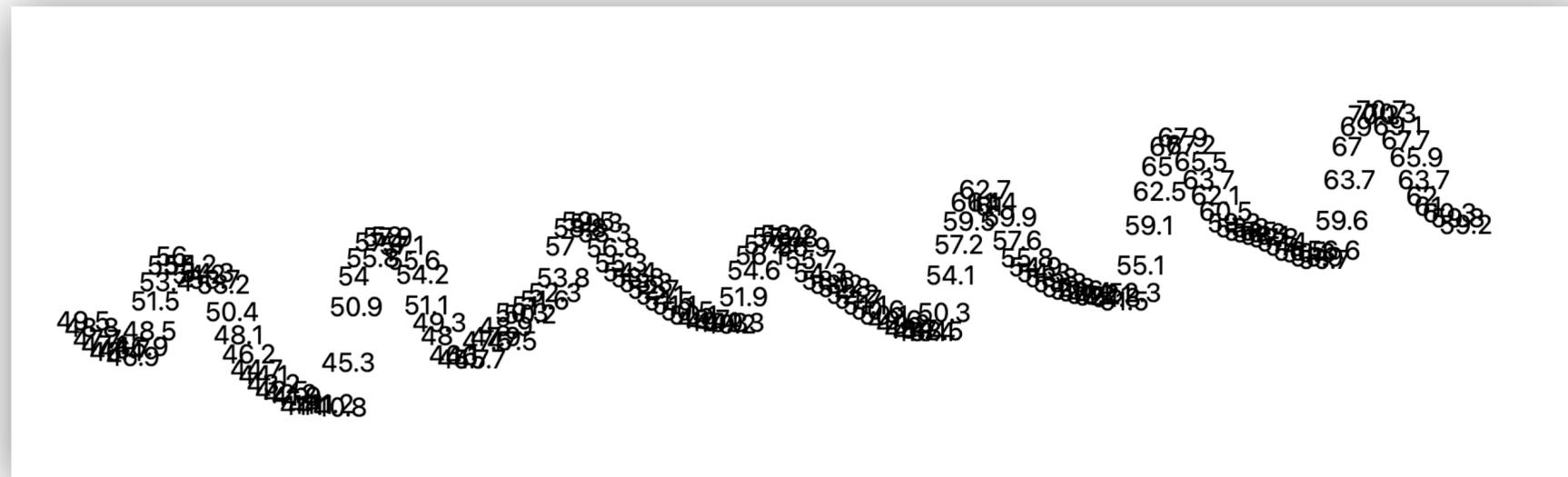


Step 1: Using D3 instead of plain JS

Before:



After:

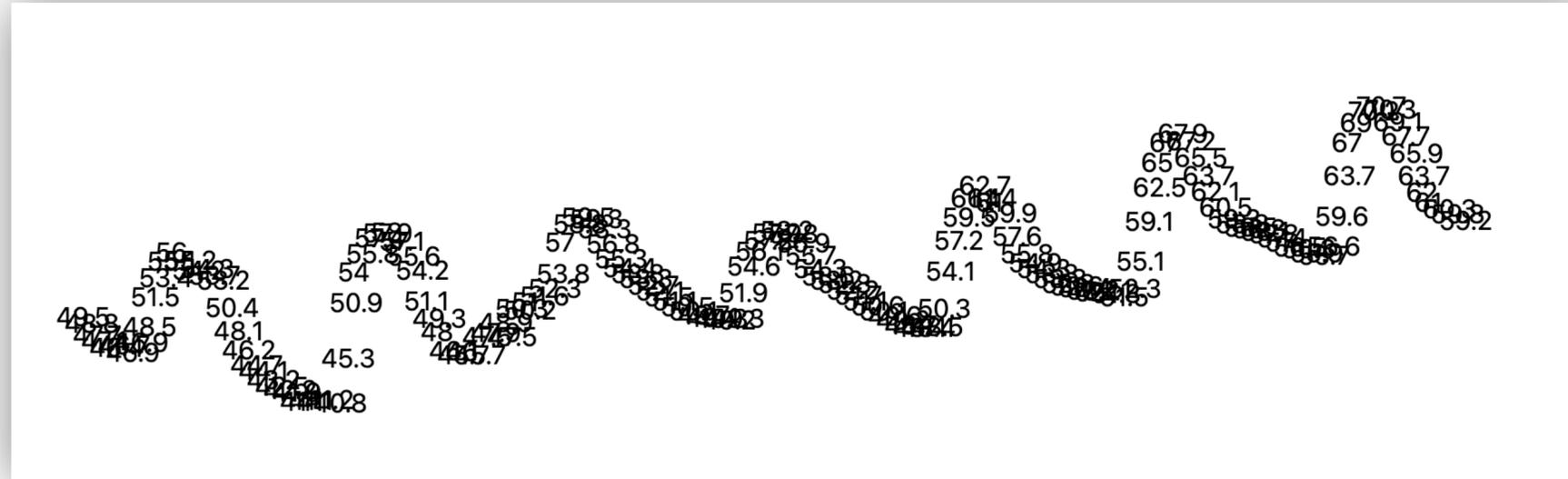


But in D3!

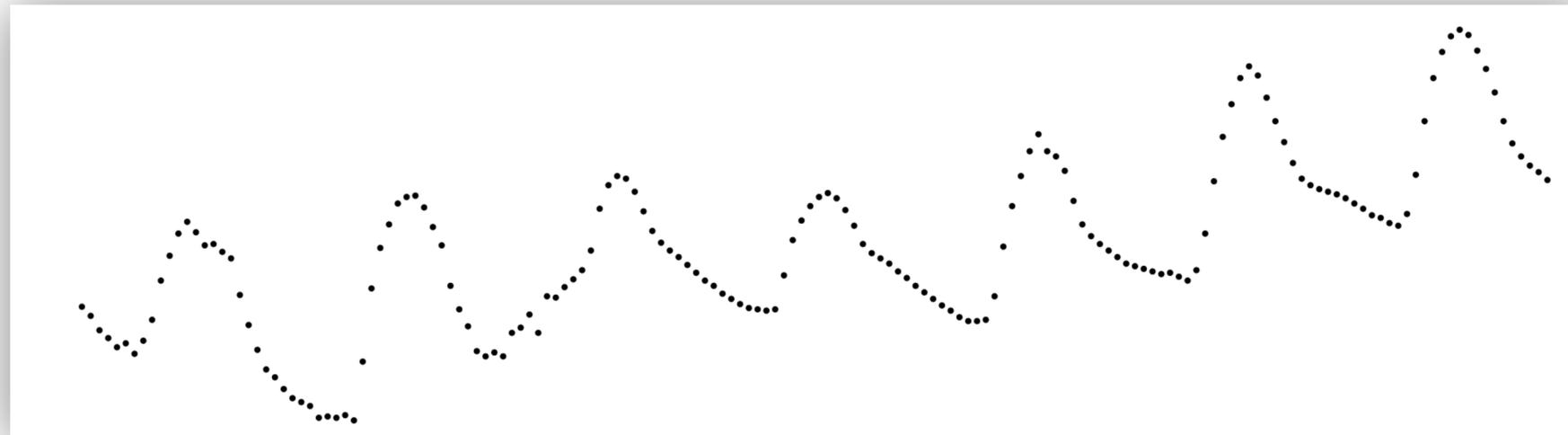
Demo: [d3-lecture/weather01](#)

Step 2: Making circles and using d3 scales

Before:



After:



Demo: [d3-lecture/weather02](https://d3js.org/lecture/weather02)

Making circles

Before:

```
svg
  .selectAll('text')
  .data(weatherData.hourly.temperature_2m)
  .join('text')
  .attr('x', (d, i) => i * 5)
  .attr('y', (d) => 500 - d * 6)
  .text((d) => d);
```

Just needed to swap out text with circle + set the right attributes.

After:

```
svg
  .selectAll('circle')
  .data(weatherData.hourly.temperature_2m)
  .join('circle')
  .attr('cx', (d, i) => xScale(i))
  .attr('cy', (d) => yScale(d))
  .attr('r', 2);
```

Circles only have cx and cy, not x and y

Scales

Before:

```
.attr('cx', (d, i) => i * 5)  
.attr('cy', (d) => 500 - d * 6)
```

Magic numbers!

After:

```
.attr('cx', (d, i) => xScale(i))  
.attr('cy', (d) => yScale(d))
```

D3 scales

```
const xScale = d3  
  .scaleLinear()  
  .domain([0, weatherData.hourly.temperature_2m.length - 1])  
  .range([margin.left, width - margin.right]);
```

Domain = possible inputs

Range = possible outputs

D3 scales will automatically make plot fit the space.

Scales

Let's work out how a scale works by hand.

	time	temperature_2m
0	2025-04-24T00:00	55.6
1	2025-04-24T01:00	55.6
2	2025-04-24T02:00	55.2
3	2025-04-24T03:00	55.9
4	2025-04-24T04:00	56.7
...
163	2025-04-30T19:00	63.4
164	2025-04-30T20:00	61.8
165	2025-04-30T21:00	61.0
166	2025-04-30T22:00	60.9
167	2025-04-30T23:00	60.7



1000px wide

Scales

Let's work out how a scale works by hand.

	time	temperature_2m
0	2025-04-24T00:00	55.6
1	2025-04-24T01:00	55.6
2	2025-04-24T02:00	55.2
3	2025-04-24T03:00	55.9
4	2025-04-24T04:00	56.7
...
163	2025-04-30T19:00	63.4
164	2025-04-30T20:00	61.8
165	2025-04-30T21:00	61.0
166	2025-04-30T22:00	60.9
167	2025-04-30T23:00	60.7



Index=0 → x=0

1000px wide

Scales

Let's work out how a scale works by hand.

	time	temperature_2m
0	2025-04-24T00:00	55.6
1	2025-04-24T01:00	55.6
2	2025-04-24T02:00	55.2
3	2025-04-24T03:00	55.9
4	2025-04-24T04:00	56.7
...
163	2025-04-30T19:00	63.4
164	2025-04-30T20:00	61.8
165	2025-04-30T21:00	61.0
166	2025-04-30T22:00	60.9
167	2025-04-30T23:00	60.7

Index=167 → x=1000

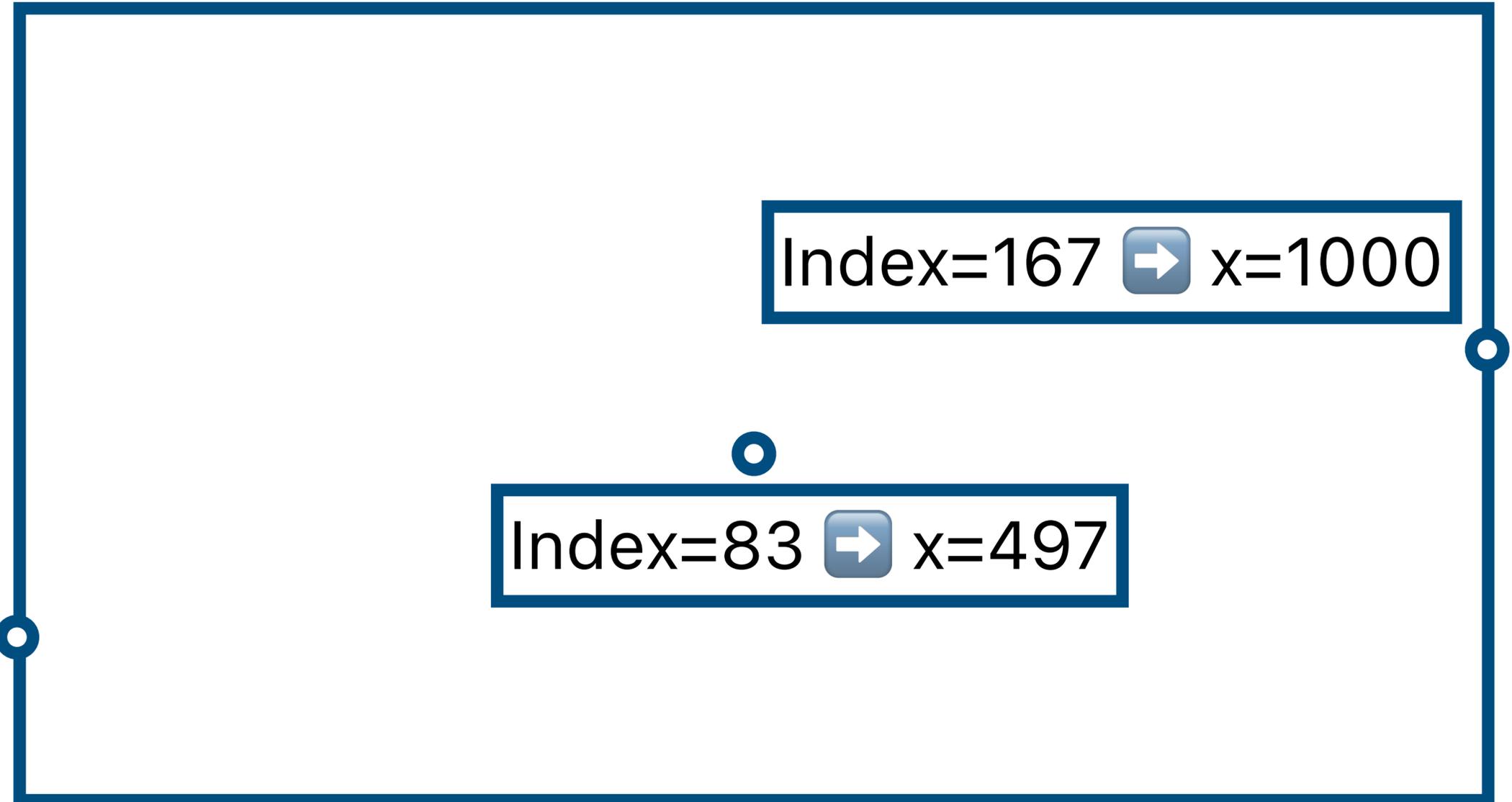
Index=0 → x=0

1000px wide

Scales

Let's work out how a scale works by hand.

	time	temperature_2m
0	2025-04-24T00:00	55.6
1	2025-04-24T01:00	55.6
2	2025-04-24T02:00	55.2
3	2025-04-24T03:00	55.9
4	2025-04-24T04:00	56.7
...
163	2025-04-30T19:00	63.4
164	2025-04-30T20:00	61.8
165	2025-04-30T21:00	61.0
166	2025-04-30T22:00	60.9
167	2025-04-30T23:00	60.7



Index=0 → x=0

Index=83 → x=497

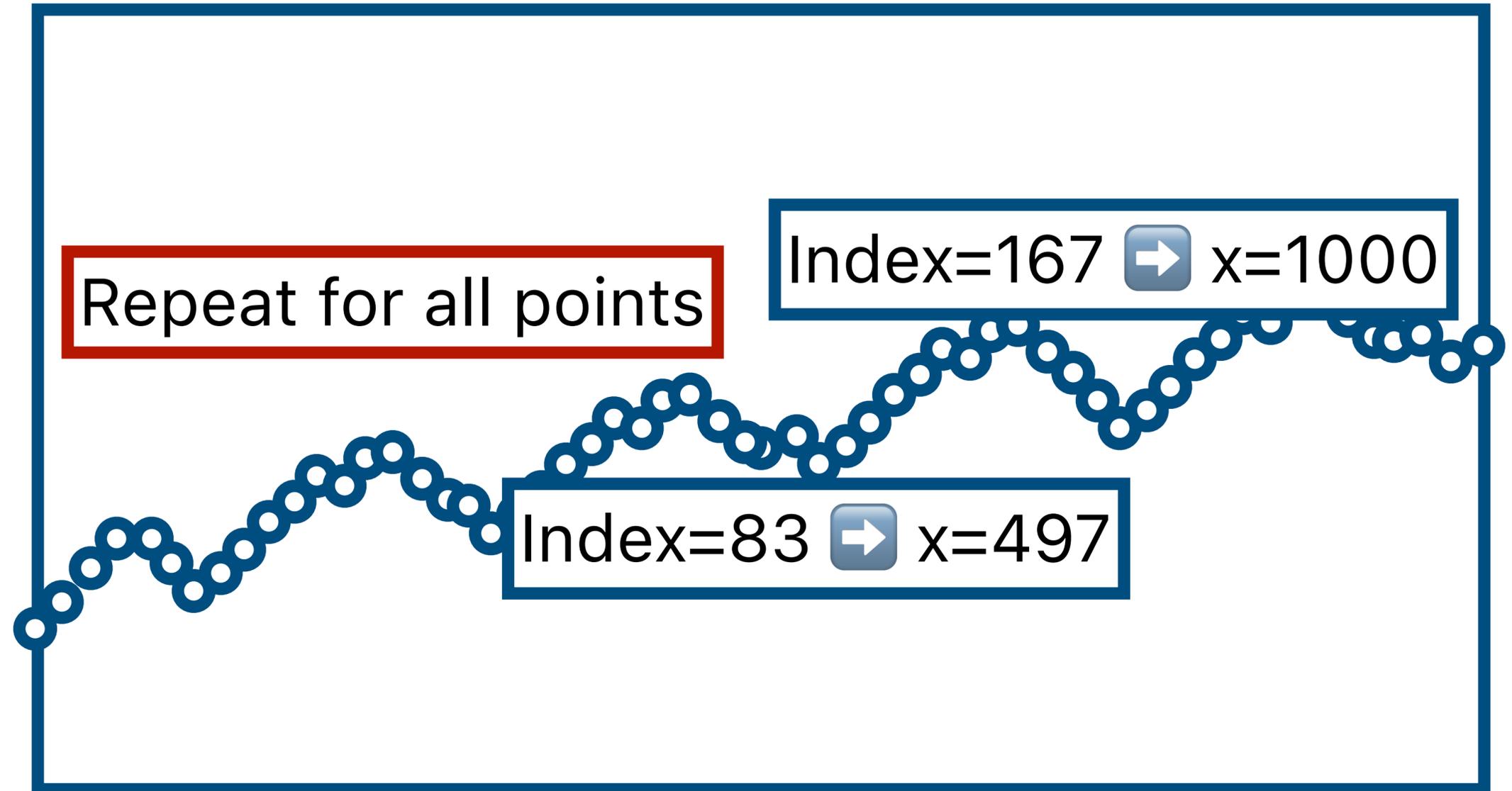
Index=167 → x=1000

1000px wide

Scales

Let's work out how a scale works by hand.

	time	temperature_2m
0	2025-04-24T00:00	55.6
1	2025-04-24T01:00	55.6
2	2025-04-24T02:00	55.2
3	2025-04-24T03:00	55.9
4	2025-04-24T04:00	56.7
...
163	2025-04-30T19:00	63.4
164	2025-04-30T20:00	61.8
165	2025-04-30T21:00	61.0
166	2025-04-30T22:00	60.9
167	2025-04-30T23:00	60.7



Index=0 → x=0

1000px wide

Scales

Let's work out how a scale works by hand.

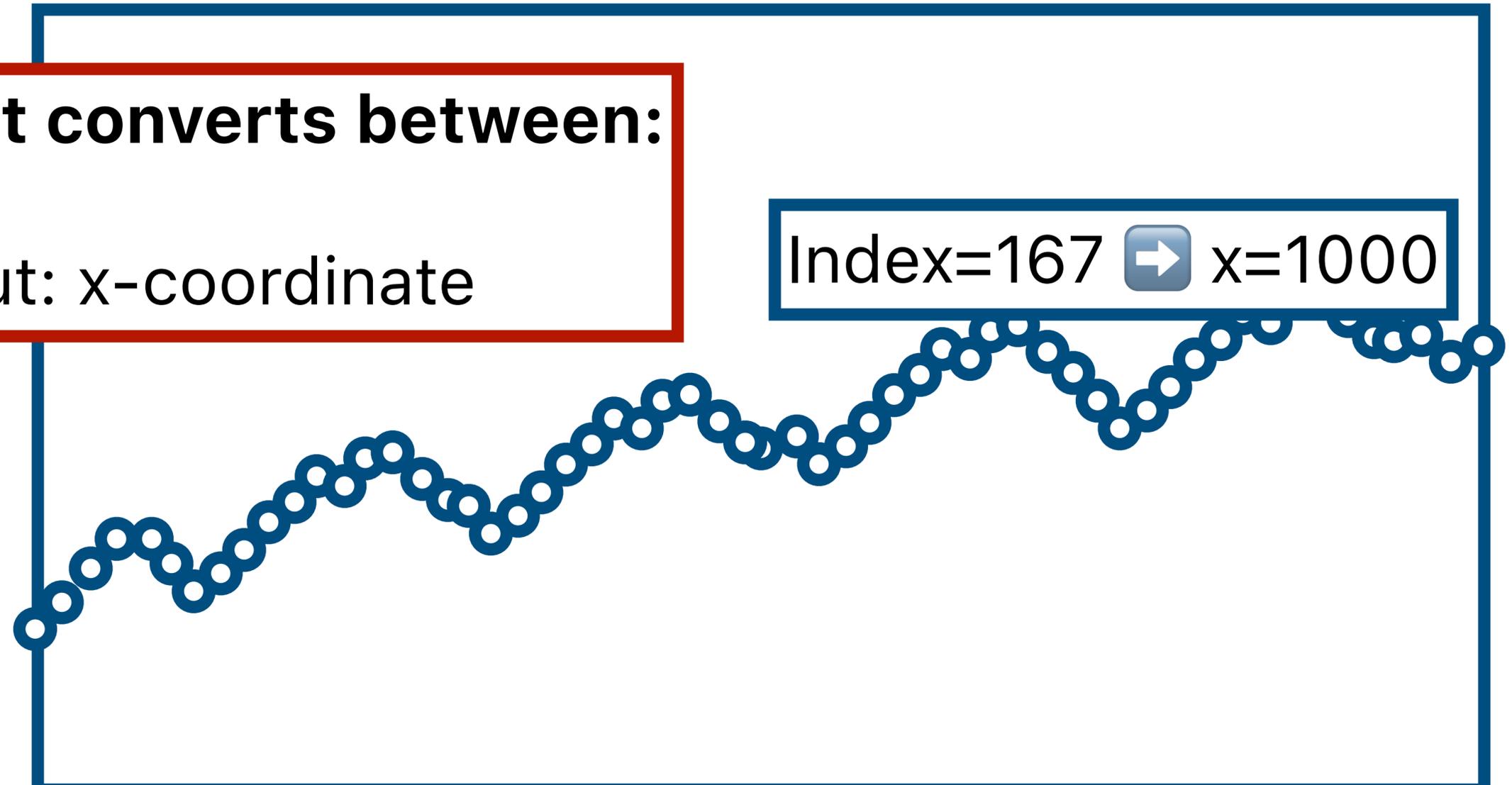
Want a function that converts between:

Input: index \rightarrow Output: x-coordinate

Index=167 \rightarrow x=1000

Index=0 \rightarrow x=0

1000px wide



Scales

Let's work out how a scale works by hand.

Want a function that converts between:

Input: index → Output: x-coordinate

Index=167 → x=1000

```
const xScale = d3
  .scaleLinear()
  .domain([0, weatherData.hourly.temperature_2m.length - 1])
  .range([margin.left, width - margin.right]);
```

Domain = possible inputs

Range = possible outputs

Include margin for axes

Index=0 → x=0

1000px wide

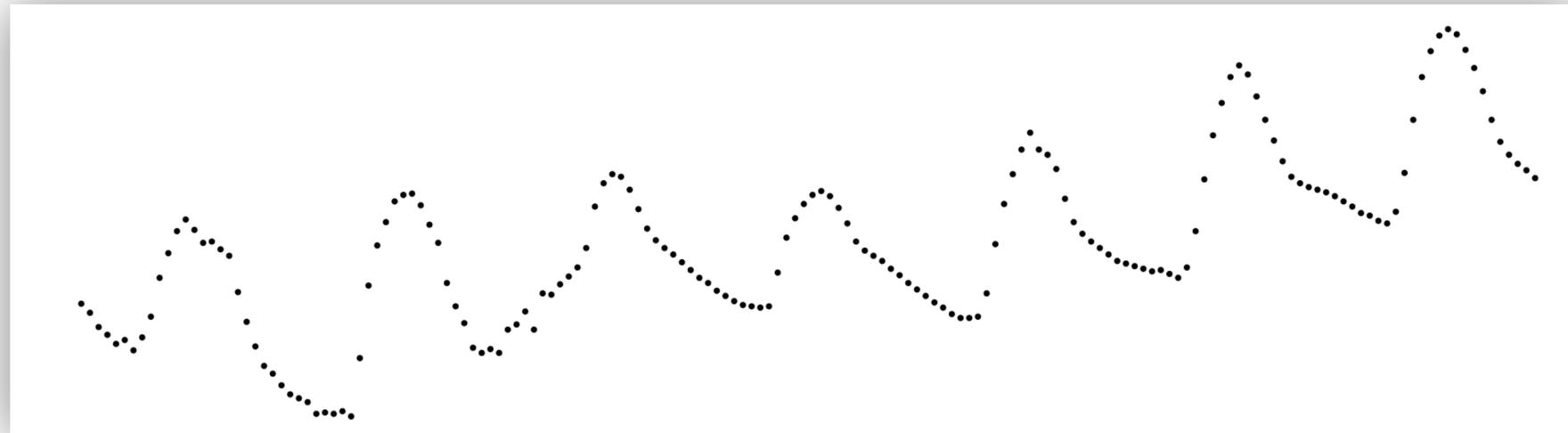
Submit a question about Step 2

tryclassbuzz.com

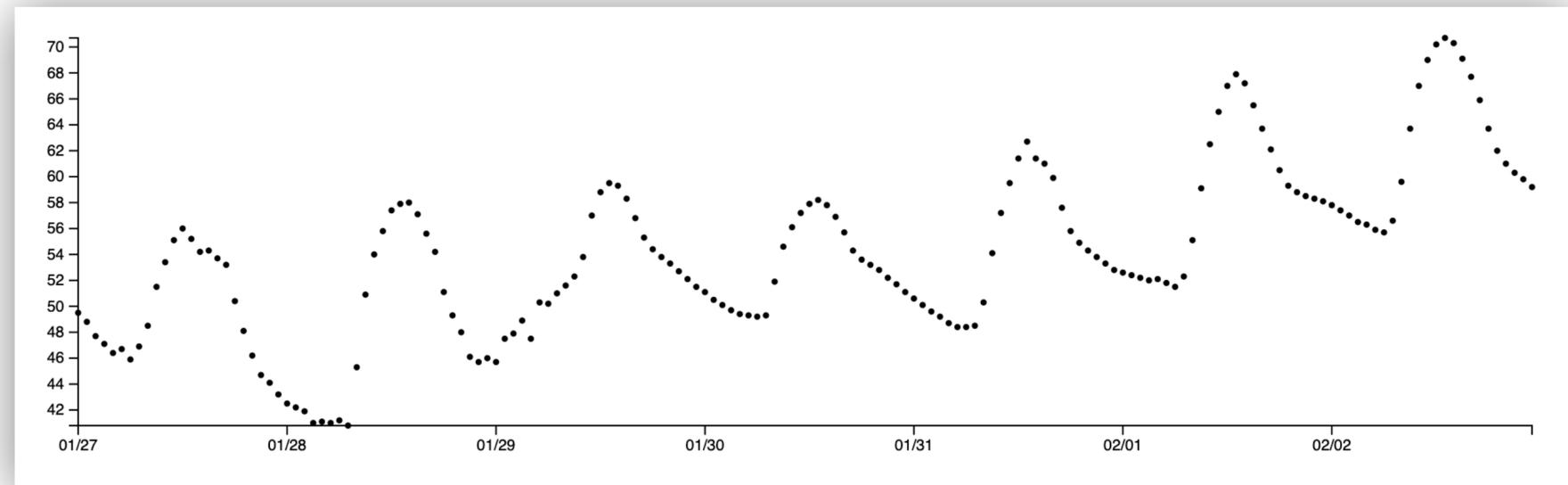
Code: **d3-2**

Step 3: Adding axes

Before:



After:



Demo: [d3-lecture/weather03](#)

Using a Time Scale

Old:

```
const xScale = d3
  .scaleLinear()
  .domain([0, weatherData.hourly.temperature_2m.length - 1])
  .range([margin.left, width - margin.right]);
```

scaleLinear: number input

New:

```
const xScale = d3
  .scaleTime()
  .domain([
    new Date(weatherData.hourly.time[0]),
    new Date(weatherData.hourly.time[weatherData.hourly.time.length - 1]),
  ])
  .range([margin.left, width - margin.right]);
```

scaleTime: Date() input

Using a scaleTime lets us get date labels on the x-axis for free!

Axes

```
const yAxis = d3.axisLeft(yScale);
```

Creates a D3 axis object

```
svg  
  .append('g')  
  .attr('class', 'y axis')  
  .attr('transform', `translate(${margin.left}, 0)`)  
  .call(yAxis);
```

Creates an SVG <g> object, then draws axis into it

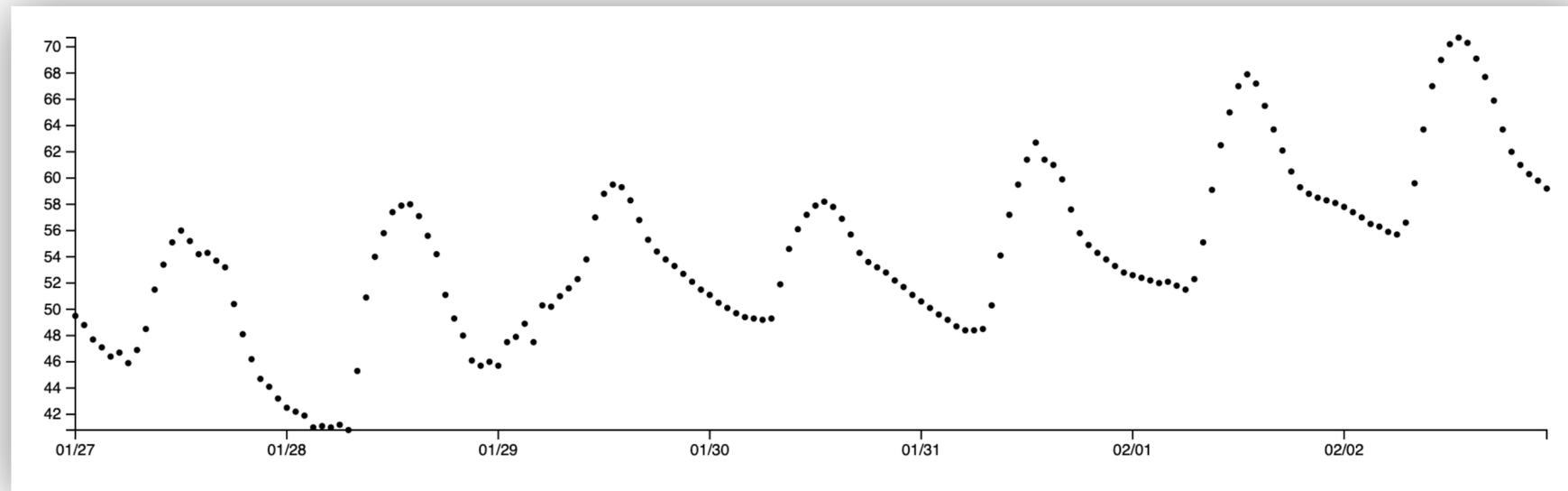
Submit a question about Step 3

tryclassbuzz.com

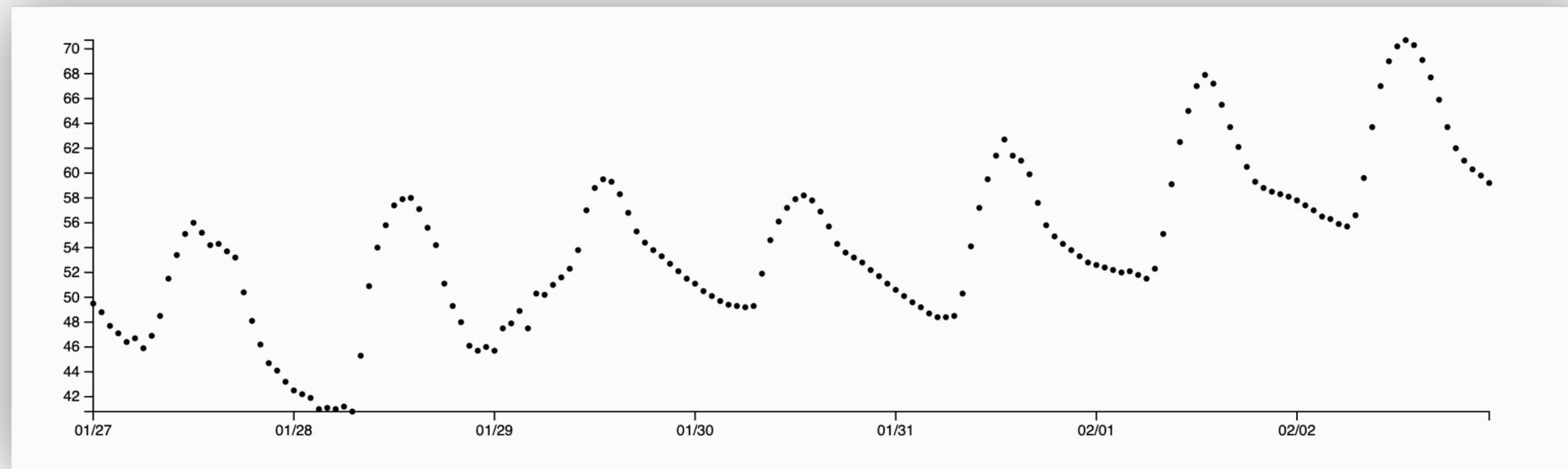
Code: **d3-3**

Step 4: Adding a basic tooltip

Before:



After:



Demo: [d3-lecture/weather04](#)

Making a tooltip

```
const tooltip = d3
  .select('body')
  .append('div')
  .attr('class', 'tooltip')
  .style('position', 'absolute')
  .style('visibility', 'hidden')
  .style('background-color', 'white')
  .style('border', '1px solid #ddd')
  .style('padding', '5px')
  .style('border-radius', '3px');
```

Creates a <div>, styles it, and hides it so that it'll only show up with interaction

Adding interaction

```
.on('mouseover', function (event, d) {  
  d3.select(this).attr('r', 4); // Increase circle size on hover  
  
  tooltip.style('visibility', 'visible').text(`${d.toFixed(1)}°F`);  
})
```

D3 version of event listener + handler

Adding interaction

```
.on('mouseover', function (event, d) {  
  When a circle is moused over... circle size on hover  
  tooltip.style('visibility', 'visible').text(`${d.toFixed(1)}°F`);  
})
```

D3 version of event listener + handler

Adding interaction

```
.on('mouseover', function (event, d) {  
  d3.select(this).attr('r', 4); // Increase circle size on hover  
  Make the circle's radius larger  
  ` ${d.toFixed(1)}°F` );  
})
```

D3 version of event listener + handler

Adding interaction

```
.on('mouseover', function (event, d) {  
  d3.select(this).attr('r', 4); // Increase circle size on hover  
  
  tooltip.style('visibility', 'visible').text(`${d.toFixed(1)}°F`);  
})
```

Make tooltip visible and set its text

D3 version of event listener + handler

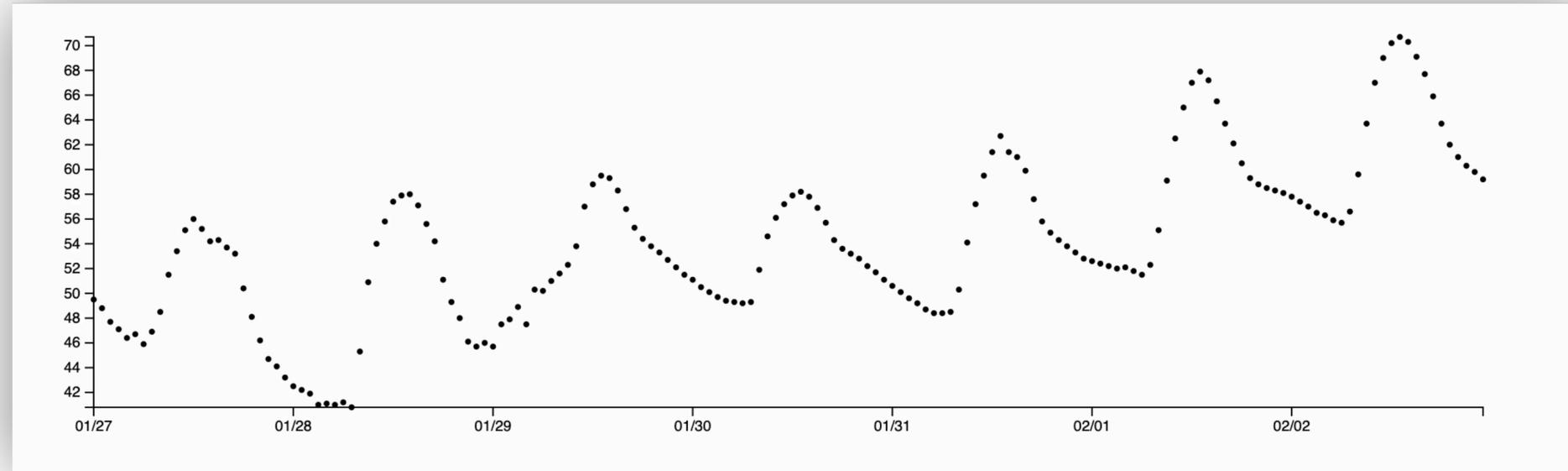
Submit a question about Step 4

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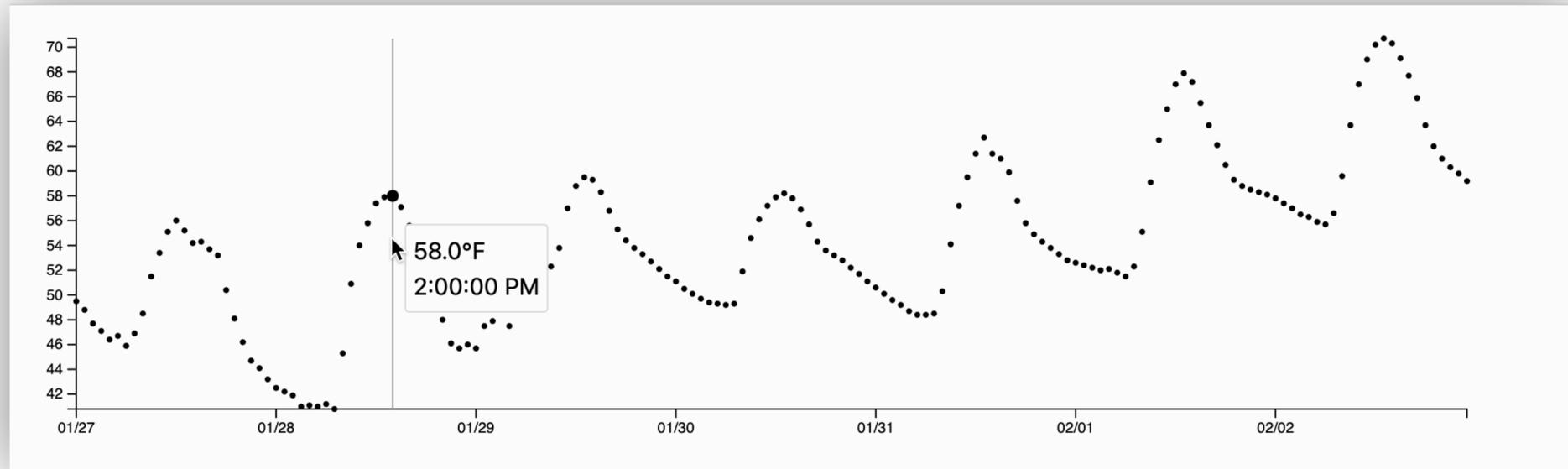
Code: **d3-4**

Step 5: Improving our tooltip

Before:



After:



Demo: [d3-lecture/weather05](#)

Interacting with the plot, not just points

```
// Create a rect overlay for mouse tracking  
const overlay = svg  
  .append('rect')  
  .attr('class', 'overlay')  
  .attr('x', margin.left)  
  .attr('y', margin.top)  
  .attr('width', width - margin.left - margin.right)  
  .attr('height', height - margin.top - margin.bottom)  
  .style('fill', 'none')  
  .style('pointer-events', 'all');
```

Interaction trick:
Add an invisible rectangle just
to capture mouse events

Listening for mouse events on
the parent <svg> tag also ok

Improving interaction

```
.on('mousemove', function (event) {  
  const mouseX = d3.pointer(event)[0];  
  const xDate = xScale.invert(mouseX);  
  
  // Find the closest data point  
  const bisect = d3.bisector((d) => new Date(d)).left;  
  const index = bisect(weatherData.hourly.time, xDate);  
  const temp = weatherData.hourly.temperature_2m[index];  
  const time = new Date(weatherData.hourly.time[index]);
```

Challenge: since we're not hovering directly over points, we have to use the mouse position to find nearest point

Submit a question about Step 5

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Code: **d3-5**

You Try: Explain D3 code

<https://observablehq.com/@d3/gallery>

D3
Bring your data to life.

Public 2 collections By Mike Bostock Edited Nov 23 Paused ISC 203 forks

Importers 951 stars

D3 gallery

Looking for a good D3 example? Here's a few (okay, 173...) to peruse.

Animation

D3's [data join](#), [interpolators](#), and [easings](#) enable flexible [animated transitions](#) between views while preserving [object constancy](#).

Animated treemap Temporal force-directed graph Connected scatterplot The wealth & health of nations

Scatterplot tour Bar chart race Stacked-to-grouped bars Streamgraph transitions

Smooth zooming Zoom to bounding box Orthographic to equirectangu... World tour

Pick a simple visualization (scatter plot, line plot, bar chart). Explain the code to your neighbor, then write a question about the code using this format:

URL: ...

Question: ...

tryclassbuzz.com
Code: **explain-d3**