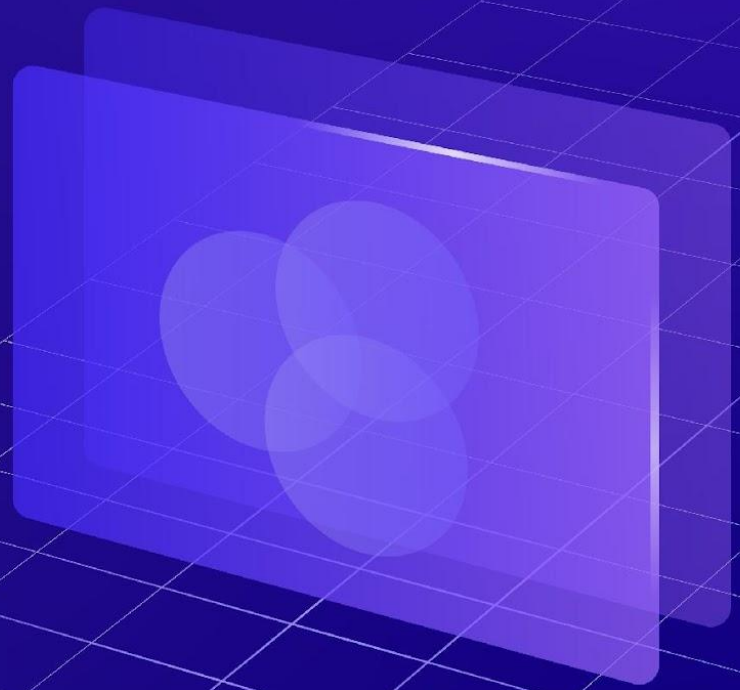
新興智慧顯示科技教育聯盟

課程領域｜新興智慧顯示科技應用

資料可視化

HW02 - 直方圖及長條圖



許加宜

國立臺北科技大學資訊工程系

01

目錄

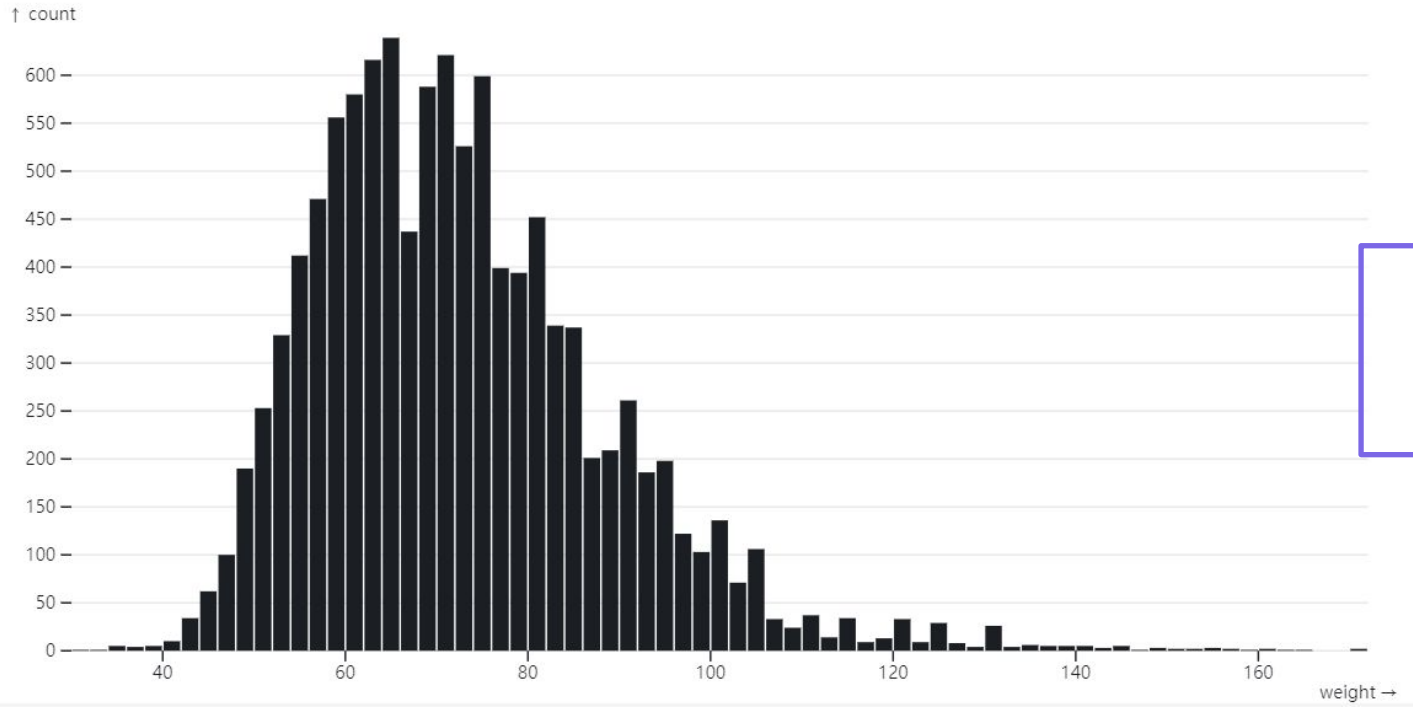
目錄

02

Histogram vs Bar chart

Observable Histogram 介紹

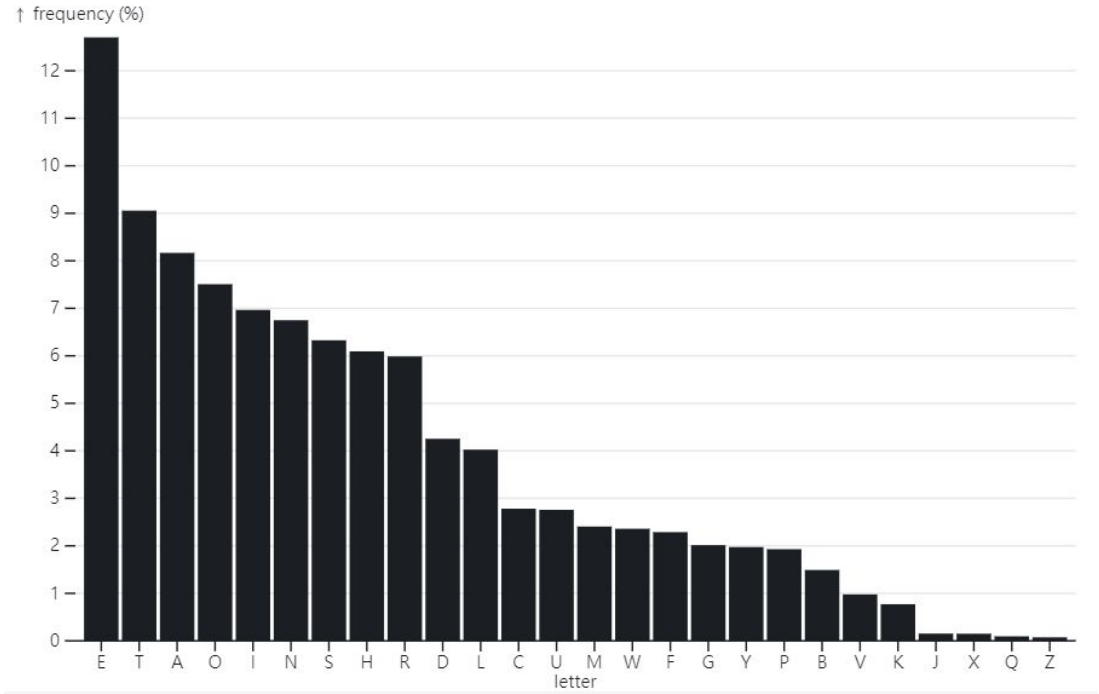
- 橫軸將連續的資料(例如體重、時間), 分成離散的區間, 縱軸為各組的統計
- 直方圖的組距之間, 有一定的排列順序



olympians dataset 中各個體重的人數
(x軸:體重(連續數字), Y軸:人數)

Observable Bar chart 介紹

- 橫軸為類別, 縱軸為各組的次數
- 長條圖的組距之間, 並未有一定的排列順序

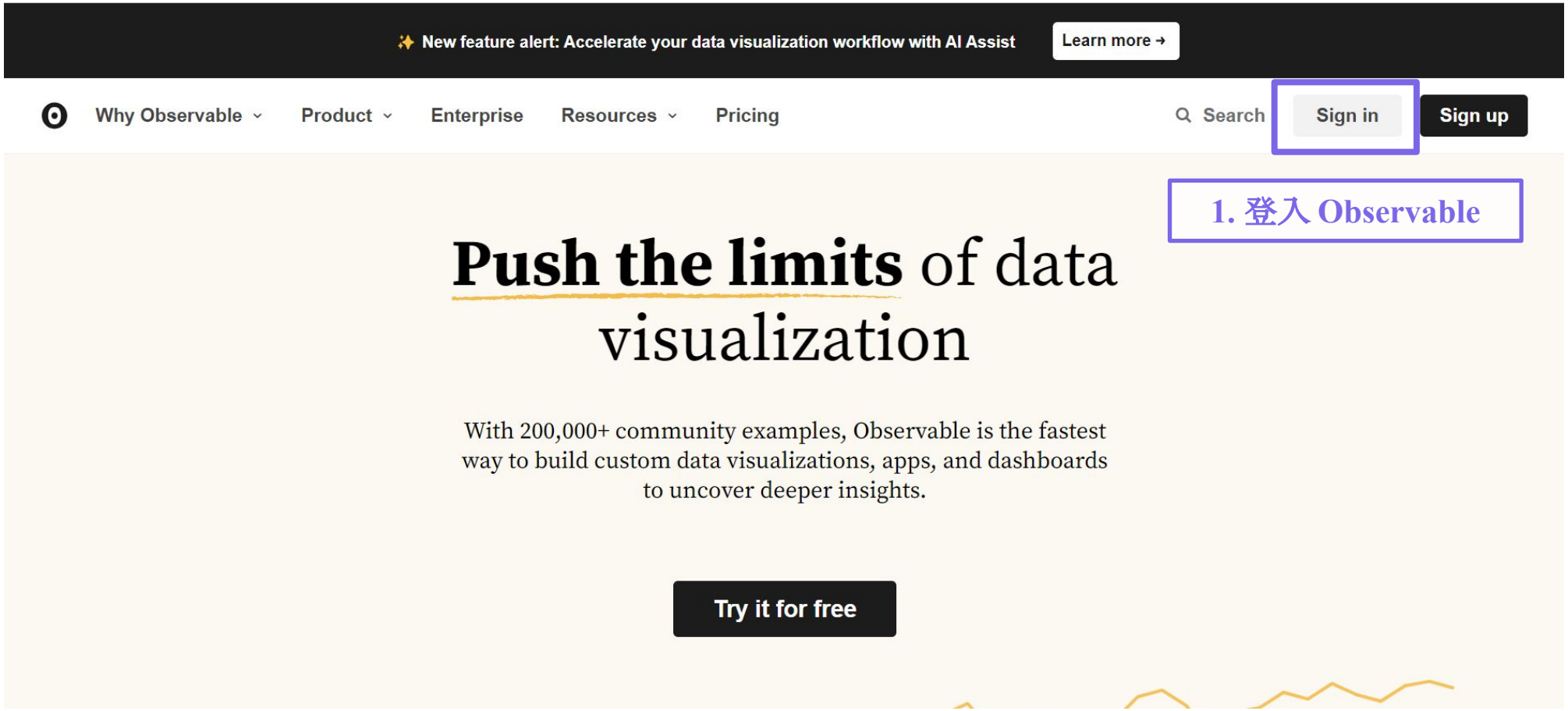


alphabet dataset 中各個字母的百分比
(x軸:不同字母(無順序), Y軸:百分比)

03

繪製 Histogram 和 Bar chart

Observable教學



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Create interactive charts from simple tabular data

Visualize time series data with smoothed line charts

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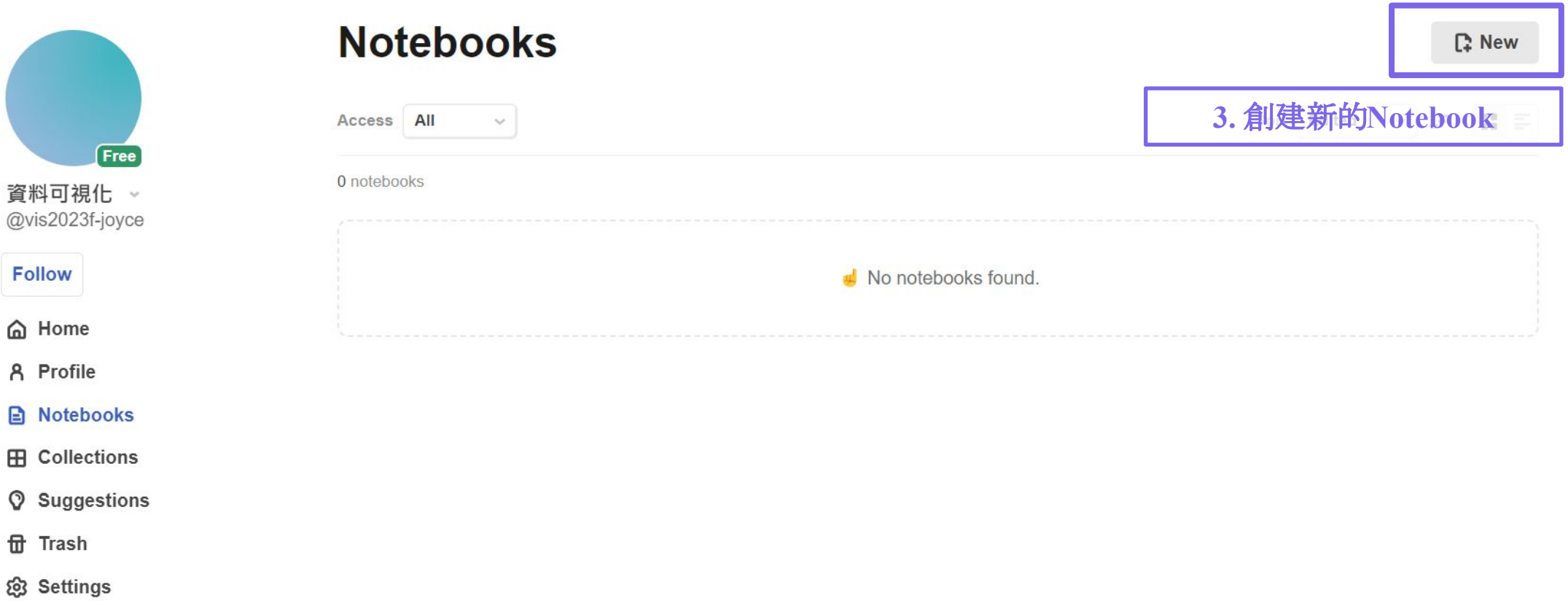
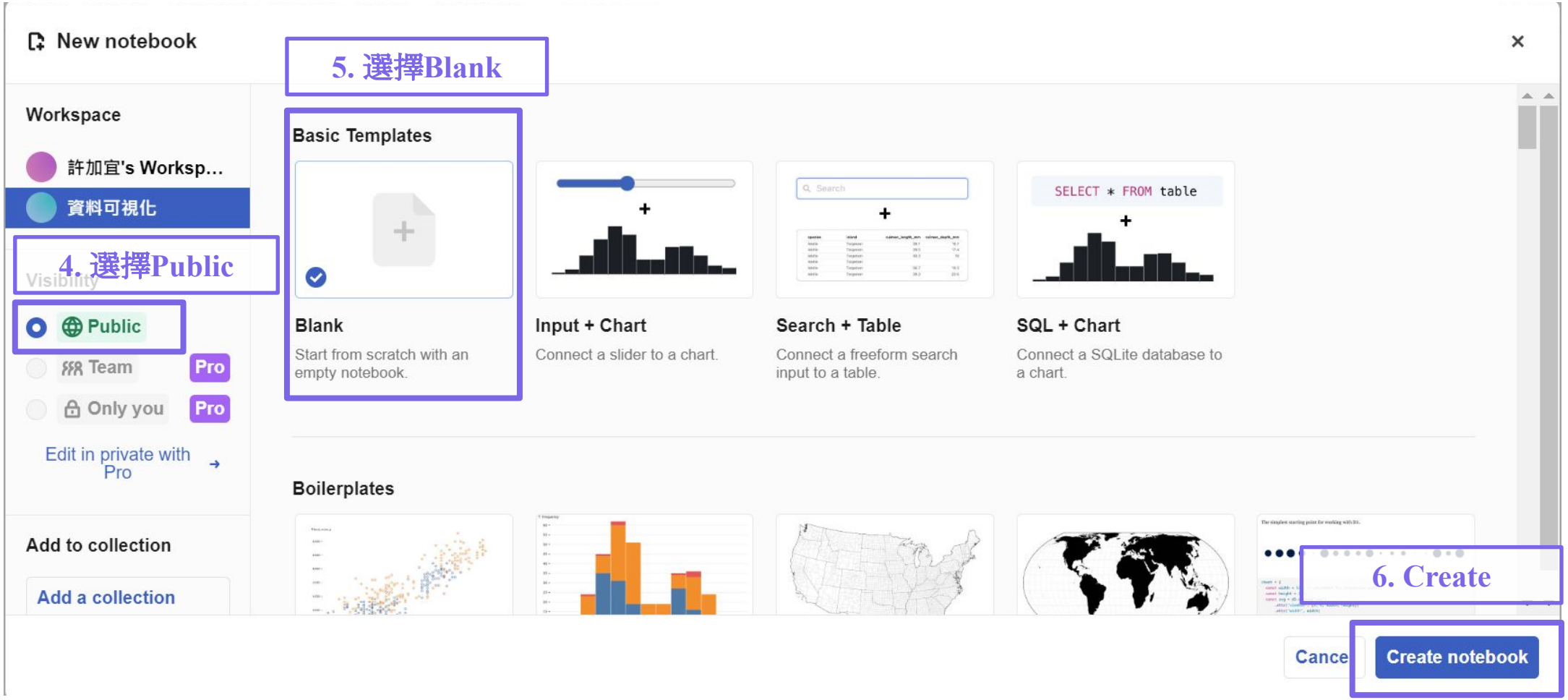


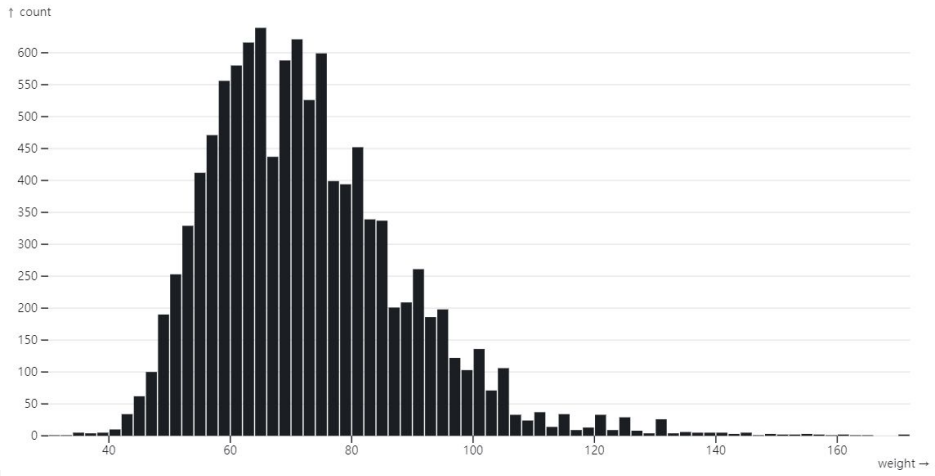
Observable教學



繪製Histogram

範例 1:將olympians 資料集繪製成直方圖 (X軸:體重, Y軸:人數)

```
Plot.plot({
  width:800, // 設定整個圖表的寬度=800
  y: {grid: true, label: "count"}, //呈現Y軸數值的網格，並將Y軸的標籤指定為"count"

  marks: [ //marks為用來定義視覺元素
    //使用 Plot.rectY 函數來繪製柱狀圖
    //並使用 Plot.binX 函數將數據按照 "weight" 欄位進行分組，並計算每個組別中的數量
    Plot.rectY(olympians, Plot.binX({y:"count"}, { x:"weight"})),
    //創建了Y軸的網格線
    //interval 設定網格線之間的間隔
    //stroke 設定網格線的顏色
    //strokeOpacity 設定網格線的透明度 (0:完全透明，1:完全不透明)
    Plot.gridY({ interval: 1, stroke: "white", strokeOpacity: 0 }),
  ]
})
```

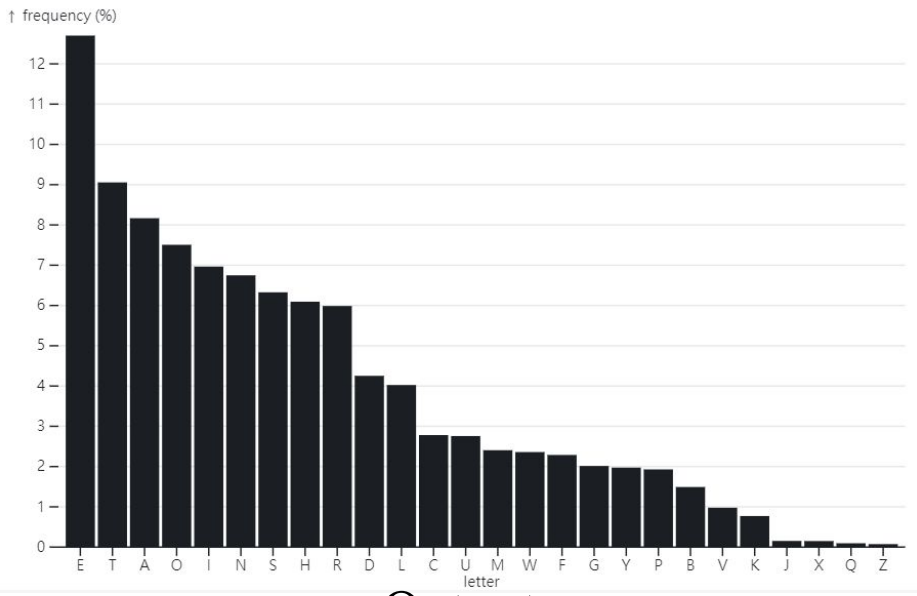


Output

繪製Bar chart

範例 2:將 alphabet 資料集繪製成長條圖 (X軸:字母, Y軸:百分比)

```
Plot.plot({
  y: {
    grid: true, //呈現Y軸數值的網格
    percent: true //將Y軸的值設為百分比
  },
  marks: [
    Plot.ruleY([0]), //在Y為0的地方(X軸)畫一條線
    //X軸按照 "letter" 欄位進行分組，Y軸標示各個字母的"frequency"值
    Plot.barY(alphabet,
              {x: "letter", y: "frequency",
               sort: {x: "y", reverse: true}//依照百分比進行由多至少的排序
              })
  ]
})
```



Output

04

評分標準

評分標準

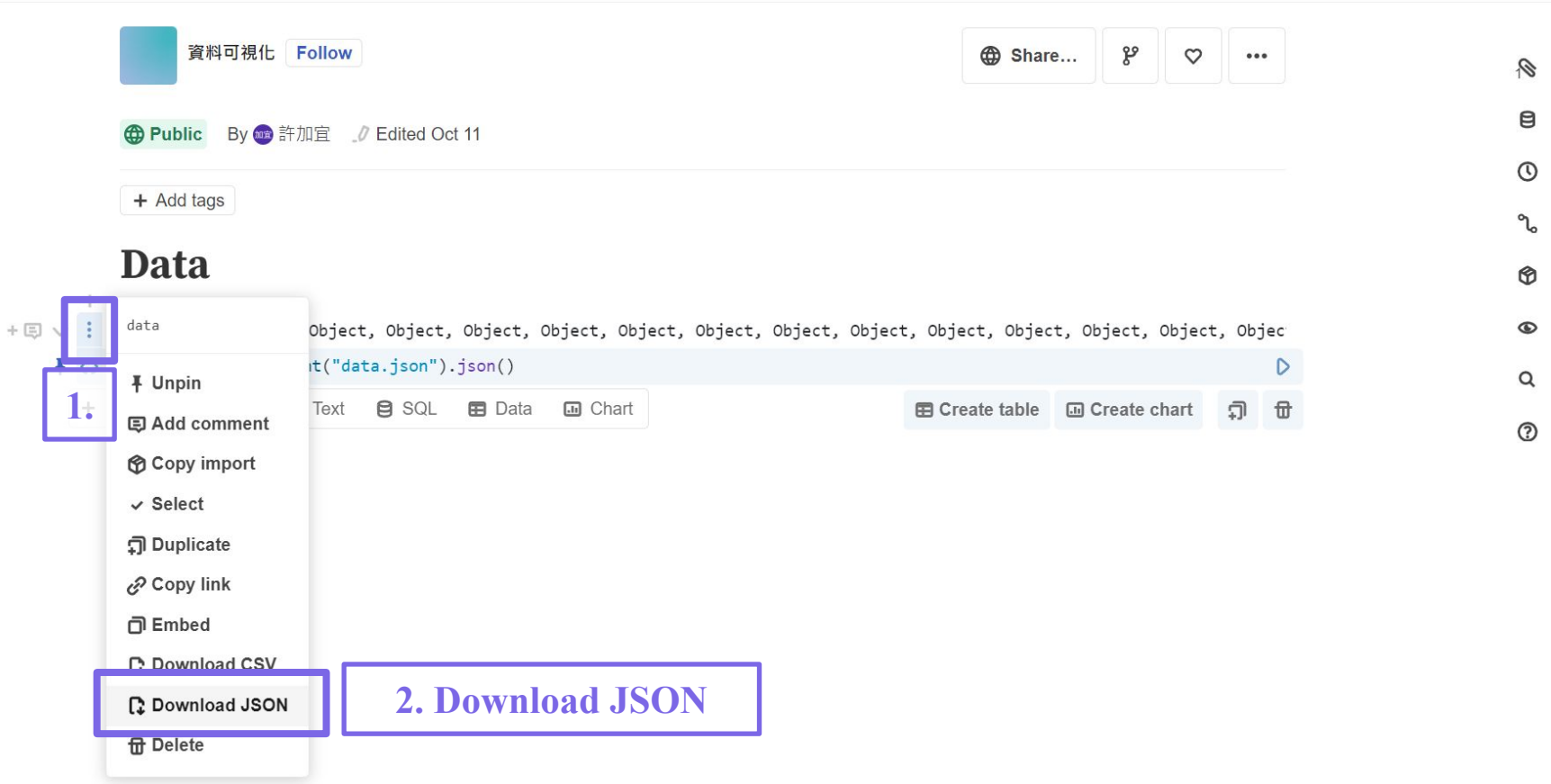
- Simple baseline (4pt)
  - 以 histogram 呈現每個年份出生的人數 (2pt)
  - 可調整margin, fill color, tip (2pt)
- Medium baseline (4pt)
  - 以 bar chart 呈現每個年份出生的人數 (2pt)
  - 可調整margin, fill color, tip (2pt)
- Strong baseline (2pt)
  - 以 bar chart 呈現每個星座的人數 (1pt)
  - 以 histogram 呈現每個星座的人數 (1pt)

05

作業說明

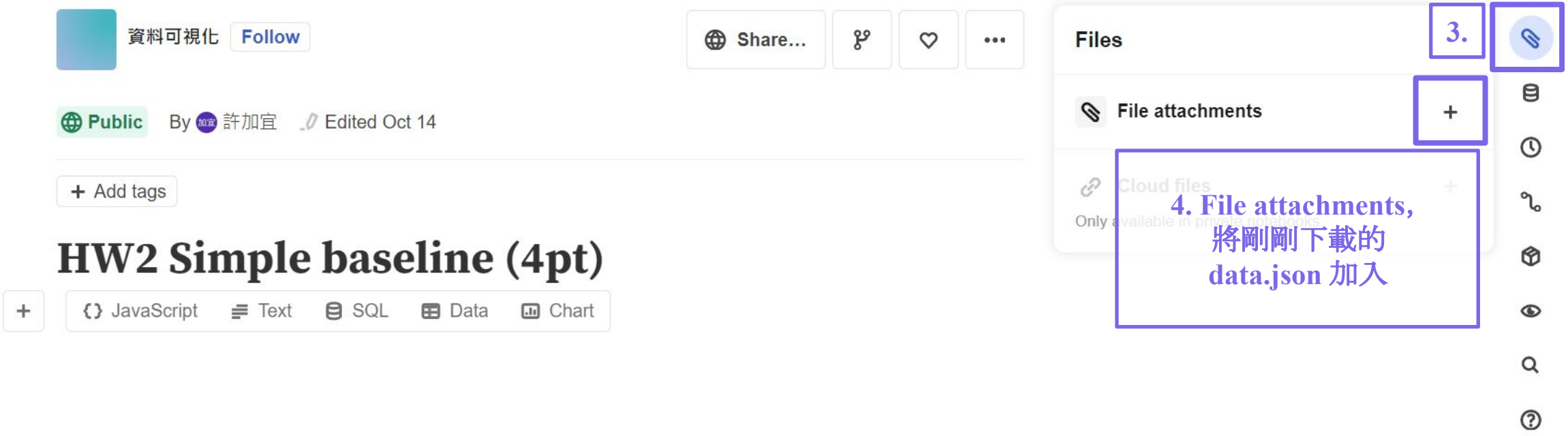
讀JSON檔

1. 至 https://observablehq.com/d/a0ddc2902ee948e3 這個Notebook下載要畫出的JSON檔案。



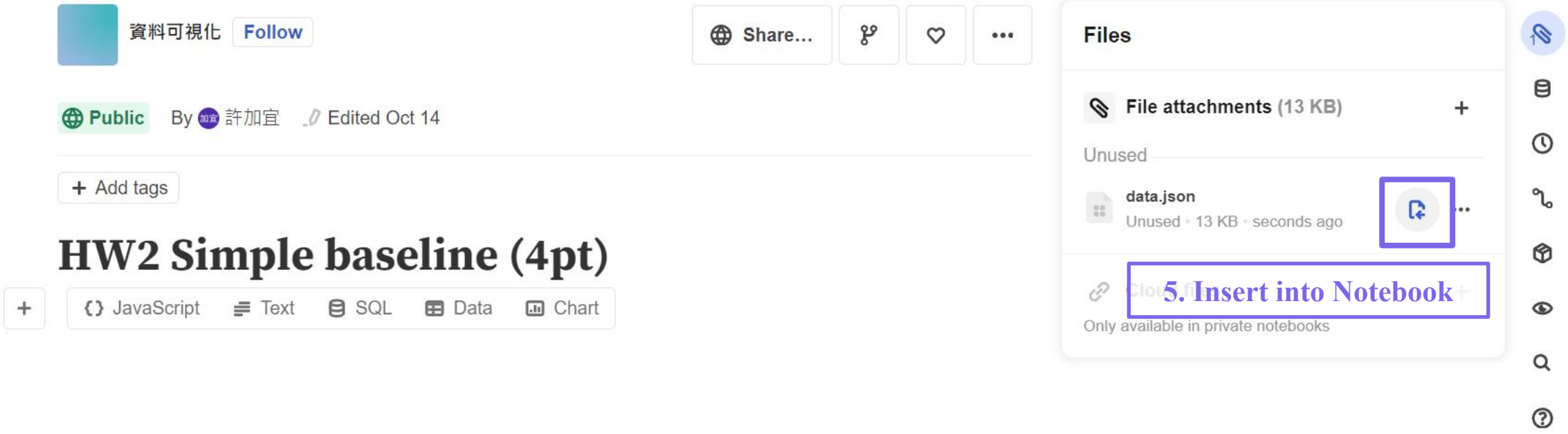
讀JSON檔

2. 將檔案加入自己的Notebook



讀JSON檔

2. 將檔案加入自己的Notebook



讀JSON檔

3. 即可在此Notebook使用 data 這個 Object Array。

HW2 Simple baseline (4pt)

```
data = ▼Array(84) [
  0: ▶Object {LivingPlaceFirst: "臺北市", Constellation: 11, LivingPlaceLast: "中山區", Year: "2001", Gender: "男", Email
  1: ▶Object {LivingPlaceFirst: "新北市", Constellation: 2, LivingPlaceLast: "中和區", Year: "1999", Gender: "男", Email:
  2: ▶Object {LivingPlaceFirst: "新北市", Constellation: 7, LivingPlaceLast: "汐止區", Year: "2002", Gender: "男", Email:
  3: ▶Object {LivingPlaceFirst: "新北市", Constellation: 11, LivingPlaceLast: "樹林區", Year: "1999", Gender: "女", Email
  4: ▶Object {LivingPlaceFirst: "新北市", Constellation: 8, LivingPlaceLast: "中和區", Year: "1998", Gender: "男", Email:
  5: ▶Object {LivingPlaceFirst: "臺北市", Constellation: 11, LivingPlaceLast: "中正區", Year: "1999", Gender: "男", Email
  6: ▶Object {LivingPlaceFirst: "高雄市", Constellation: 9, LivingPlaceLast: "鼓山區", Year: "1998", Gender: "女", Email:
  7: ▶Object {LivingPlaceFirst: "新北市", Constellation: 4, LivingPlaceLast: "土城區", Year: "2000", Gender: "男", Email:
  8: ▶Object {LivingPlaceFirst: "臺北市", Constellation: 9, LivingPlaceLast: "大安區", Year: "2000", Gender: "女", Email:
  9: ▶Object {LivingPlaceFirst: "新北市", Constellation: 9, LivingPlaceLast: "新莊區", Year: "2001", Gender: "男", Email:
  10: ▶Object {LivingPlaceFirst: "新北市", Constellation: 0, LivingPlaceLast: "中和區", Year: "1996", Gender: "男", Email
  11: ▶Object {LivingPlaceFirst: "新竹縣", Constellation: 8, LivingPlaceLast: "新豐鄉", Year: "2000", Gender: "女", Email
  12: ▶Object {LivingPlaceFirst: "臺中市", Constellation: 10, LivingPlaceLast: "北屯區", Year: "2001", Gender: "女", Emai
  13: ▶Object {LivingPlaceFirst: "桃園市", Constellation: 10, LivingPlaceLast: "桃園區", Year: "2001", Gender: "女", Emai
  14: ▶Object {LivingPlaceFirst: "桃園市", Constellation: 5, LivingPlaceLast: "八德區", Year: "2000", Gender: "男", Email
  15: ▶Object {LivingPlaceFirst: "新北市", Constellation: 9, LivingPlaceLast: "永和區", Year: "2000", Gender: "男", Email
  16: ▶Object {LivingPlaceFirst: "臺北市", Constellation: 1, LivingPlaceLast: "松山區", Year: "2000", Gender: "男", Email
  17: ▶Object {LivingPlaceFirst: "新北市", Constellation: 4, LivingPlaceLast: "新莊區", Year: "2002", Gender: "女", Email
  18: ▶Object {LivingPlaceFirst: "桃園市", Constellation: 5, LivingPlaceLast: "中壢區", Year: "2001", Gender: "男", Email
  19: ▶Object {LivingPlaceFirst: "臺北市", Constellation: 6, LivingPlaceLast: "中正區", Year: "2001", Gender: "男", Email
```

作業注意事項

此次作業的3個baseline請開三個不同Notebook，並分別命名為：

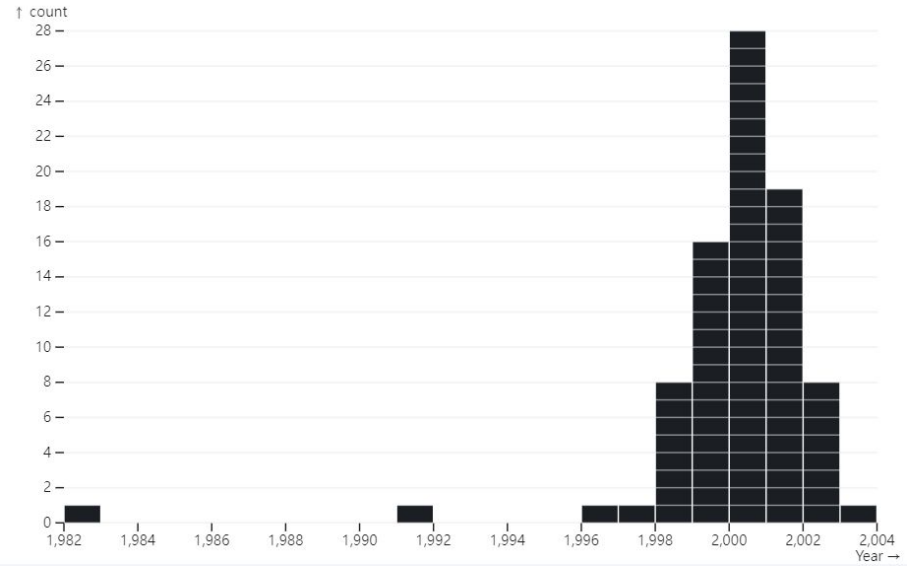
- **HW2 Simple baseline (4pt)**
- **HW2 Medium baseline (4pt)**
- **HW2 Strong baseline (2pt)**

請注意每個Notebook都要分別加入 data.json

Simple baseline (4pt)

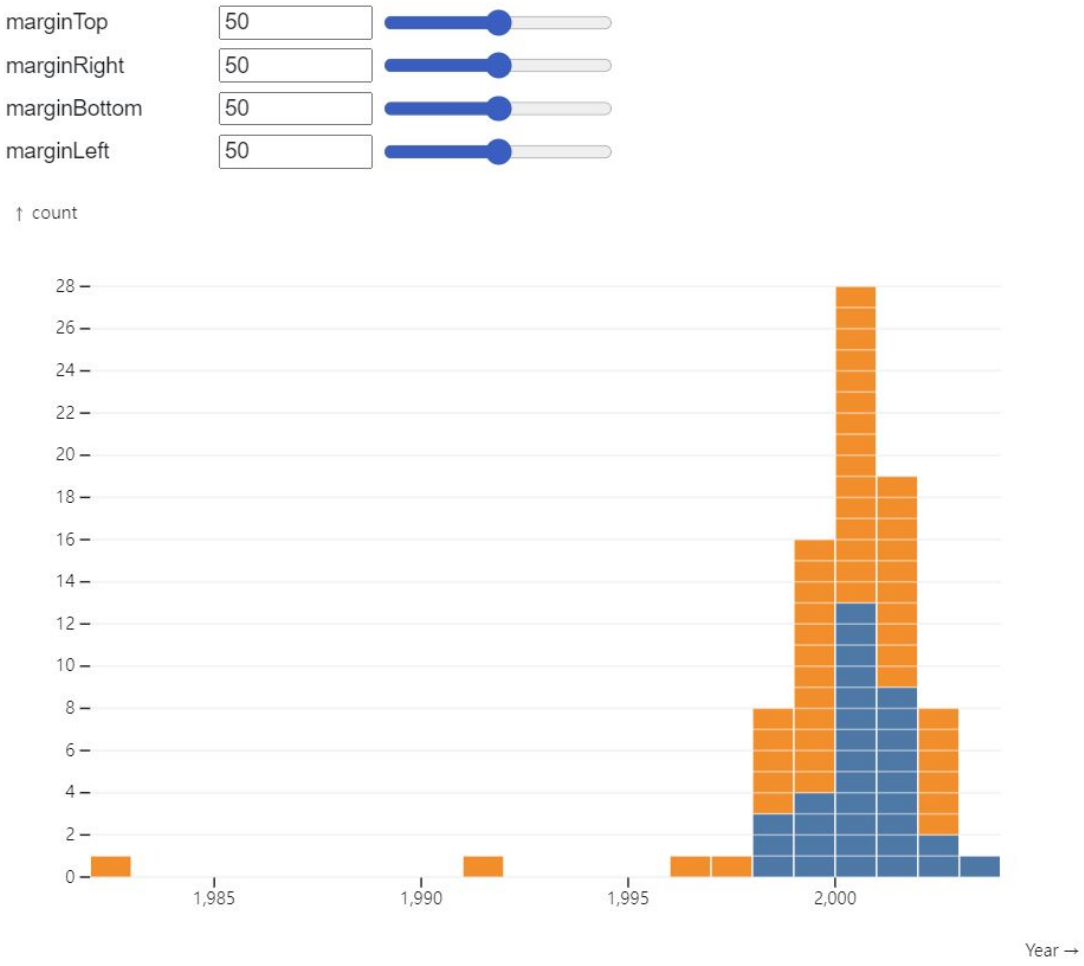
- 以histogram呈現每個年份出生的人數 (2pt)

```
Plot.plot({
    y: {grid: true, label: "count"},
    marks: [
        Plot.rectY(data, Plot.binX({y:"count"}, { x:"Year", interval: 1 })),
        Plot.gridY({ interval: 1, stroke:  "white", strokeOpacity: 0.5 })
    ]
})
```



Simple baseline (4pt)

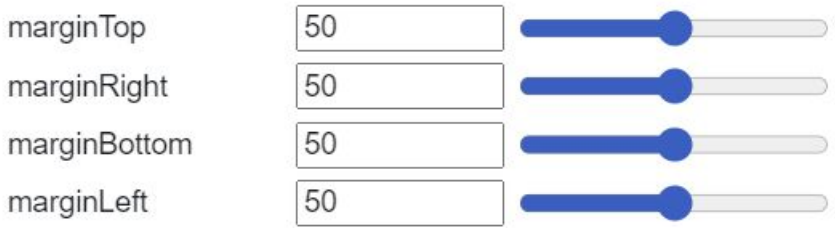
- 可調整margin, fill color, tip (2pt)
  - margin：圖表區域周圍的空間
  - fill color：填充矩形的顏色
  - tip：矩形額外顯示的資訊



Simple baseline (4pt)

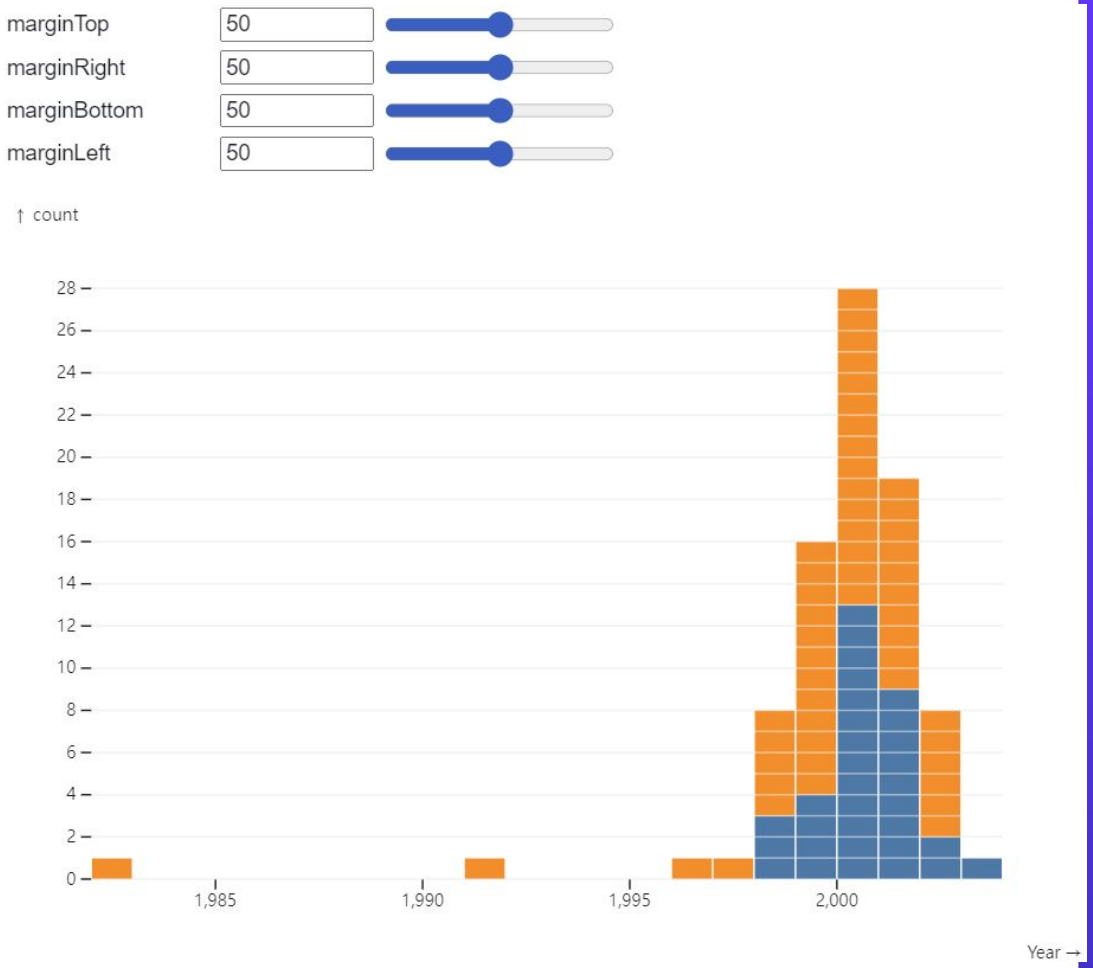
- 可調整margin, fill color, tip (2pt)

```
viewof plot1 = Inputs.form({
        mt:  Inputs.range([0, 100], {label: "marginTop", step: 1}),
        mr:  Inputs.range([0, 100], {label: "marginRight", step: 1}),
        mb:  Inputs.range([0, 100], {label: "marginBottom", step: 1}),
        ml:  Inputs.range([0, 100], {label: "marginLeft", step: 1}),
})
```



Simple baseline (4pt)

- 可調整margin, fill color, tip (2pt)




```
Plot.plot({

        marginTop: plot1.mt,
        marginRight: plot1.mr,
        marginBottom: plot1.mb,
        marginLeft: plot1.ml,
        y: {grid: true, label: "count"},
        marks: [
                Plot.rectY(data, Plot.binX({y:"count"}, { x:"Year", interval:1, fill:"Gender", tip: true })),
                Plot.gridY({ interval: 1, stroke: "white", strokeOpacity: 0.5 })
         ]
})
```

Medium baseline (4pt)

- 資料處理

```
yCounts = [];
//第一個cell, 建立空的Array, 存放要呈現在bar chart的資料
```

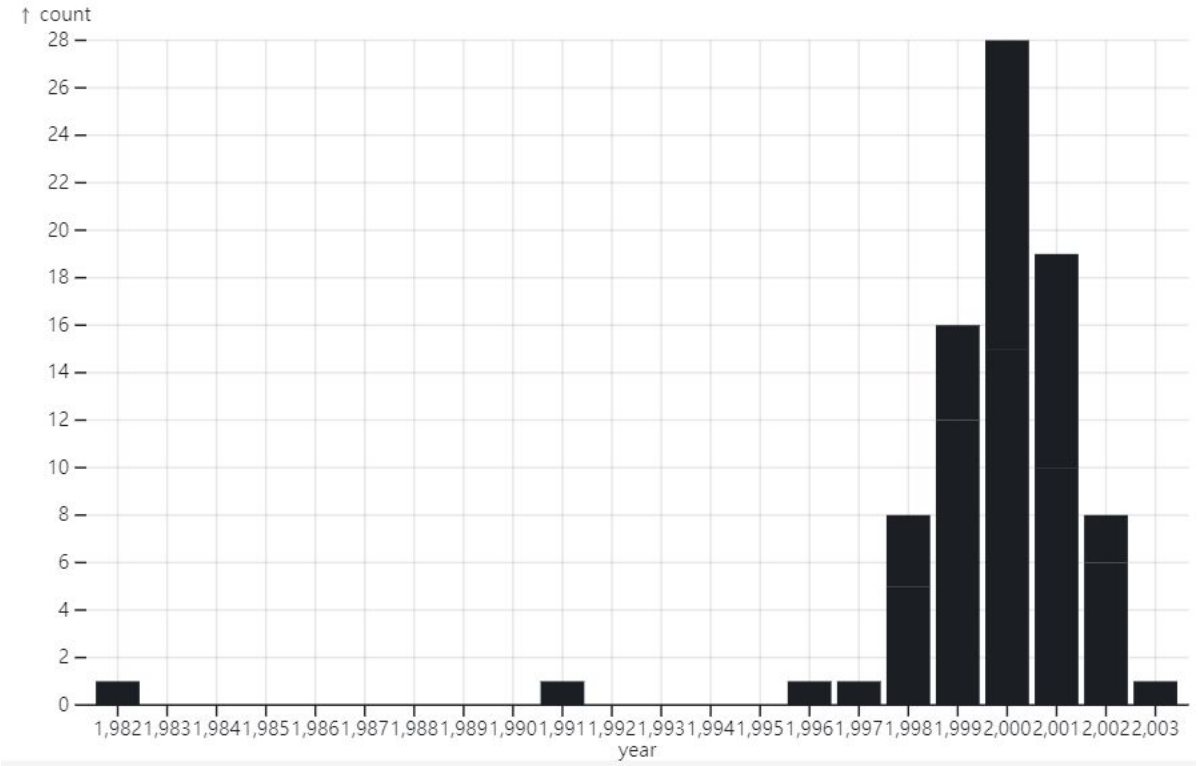
```
years = data.map(item => item.Year);
//第二個cell, 建立一個Map存放所有出生年份, 以便找到最早的
出生年和最晚出生年
```

```
//第三個cell
{
 yCounts.length = 0; //將yCounts清空
 var minYear = Math.min(...years); //最早出生年
 var maxYear = Math.max(...years); //最晚出生年
 for (var y=minYear; y<=maxYear; y++) {
  //所有年份都建立兩個 Object, 一個存放男性資料, 一個存放女性資料
  yCounts.push({year:y, gender:"male", count:0});
  //Object包含:1. 出生年, 2.男性, 3.人數(設為0)
  yCounts.push({year:y, gender:"female", count:0});
  //Object包含:1. 出生年, 2.女性, 3.人數(設為0)
 }
 data.forEach (x=> {
  var i = (x.Year-minYear)*2 + (x.Gender== "男" ? 0 : 1);
  yCounts[i].count++;
  //讀取data array, 加總每個年份出生的人
 })
 return yCounts
}
```

Medium baseline (4pt)

- 以 bar chart 呈現每個年份出生的人數 (2pt)

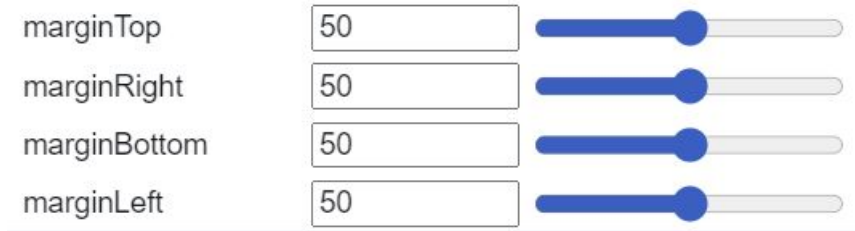
```
Plot.plot({

  grid: true,
  y: {label: "count"},

  marks: [
    Plot.ruleY([0]),
    Plot.barY(yCounts, {x: "year", y: "count"}),
  ]
});
```



Medium baseline (4pt)

- 可調整margin, fill color, tip (2pt)

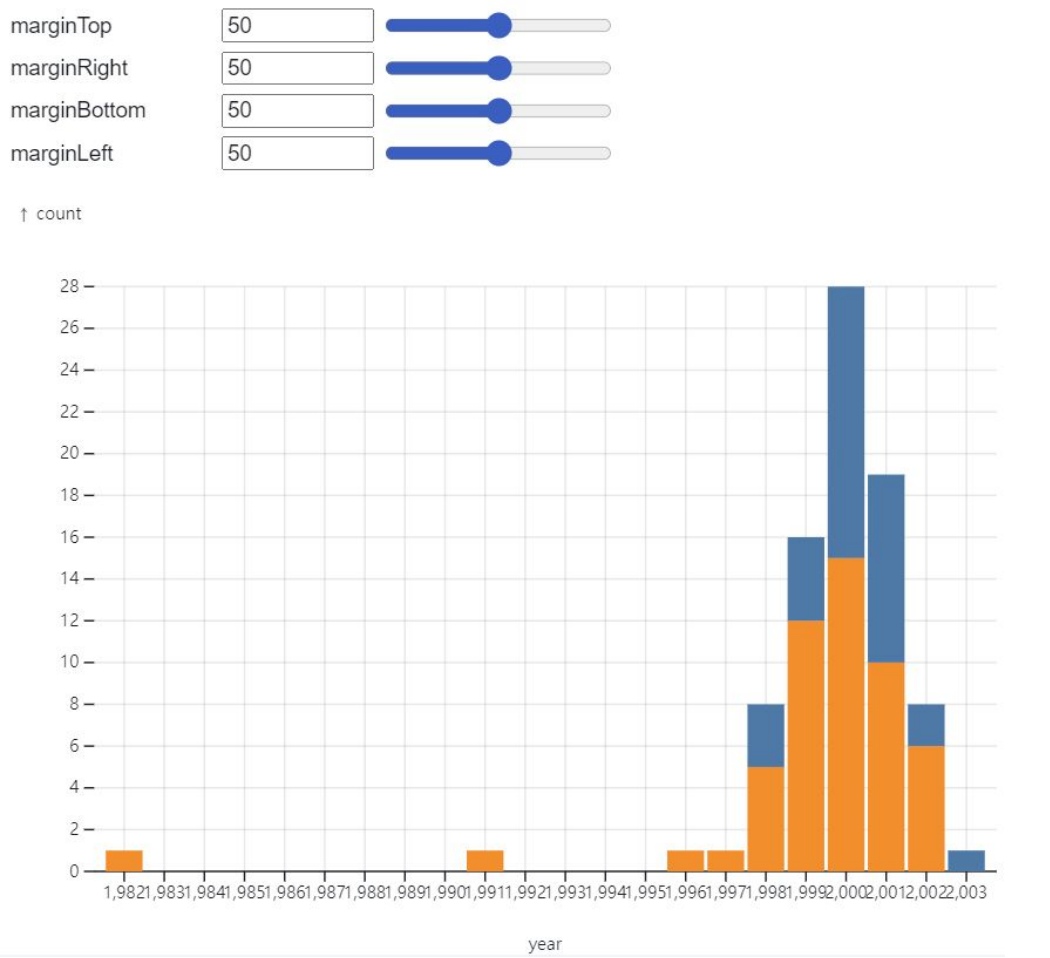
```
viewof plot2 = Inputs.form({
        mt:  Inputs.range([0, 100], {label: "marginTop", step: 1}),
        mr:  Inputs.range([0, 100], {label: "marginRight", step: 1}),
        mb:  Inputs.range([0, 100], {label: "marginBottom", step: 1}),
        ml:  Inputs.range([0, 100], {label: "marginLeft", step: 1}),
})
```



Medium baseline (4pt)

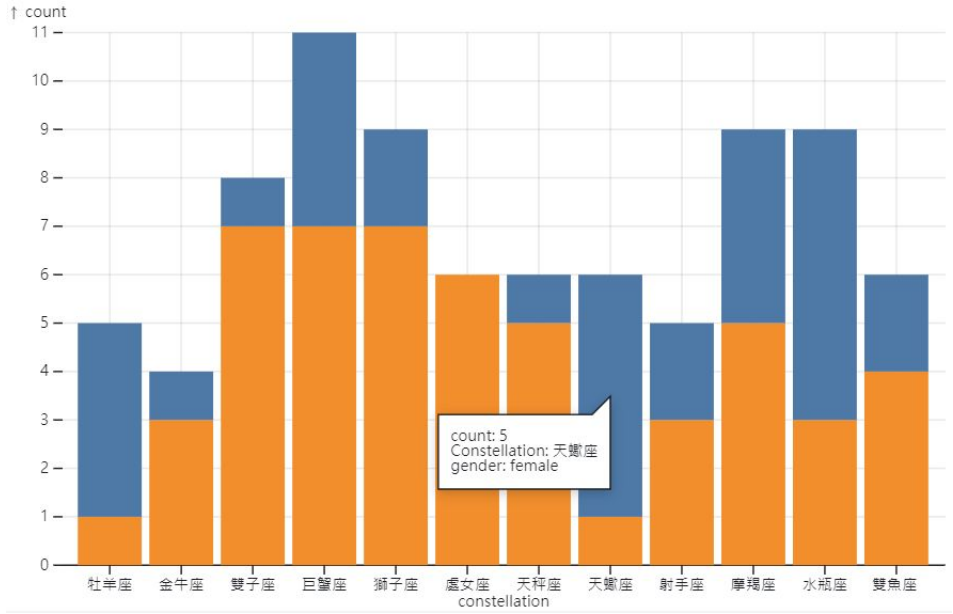
- 可調整margin, fill color, tip (2pt)

```
Plot.plot({
  marginTop: plot2.mt,
  marginRight: plot2.mr,
  marginBottom: plot2.mb,
  marginLeft: plot2.ml,

  grid: true,
  y: {label: "count"},
  marks: [
    Plot.ruleY([0]),
    Plot.barY(yCounts, {x: "year", y: "count", tip: true , fill:"gender"}),
  ]
});
```



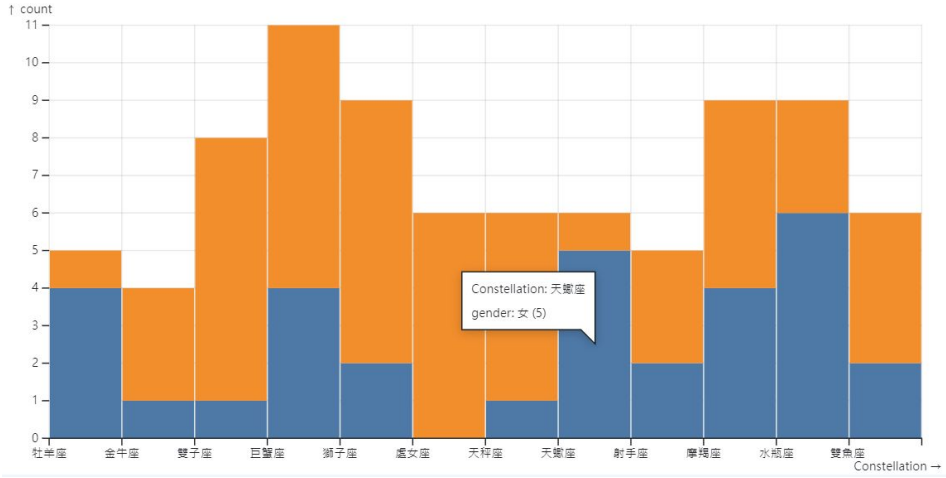
Strong baseline -1 (1pt)

- 以 bar chart 呈現每個星座的人數, 用顏色表示性別
- X軸為各個星座的名稱(須為中文), Y軸為人數
- 須包含tip, 須展示每個星座兩個性別的人數



Strong baseline -2 (1pt)

- 以 histogram 呈現每個星座的人數, 用顏色表示性別
- X軸為各個星座的名稱(須為中文), Y軸為人數
- 必須包含tip, 須展示每個星座兩個性別的人數



Strong baseline

星座和對應的數字(星座欄位為Constellation):

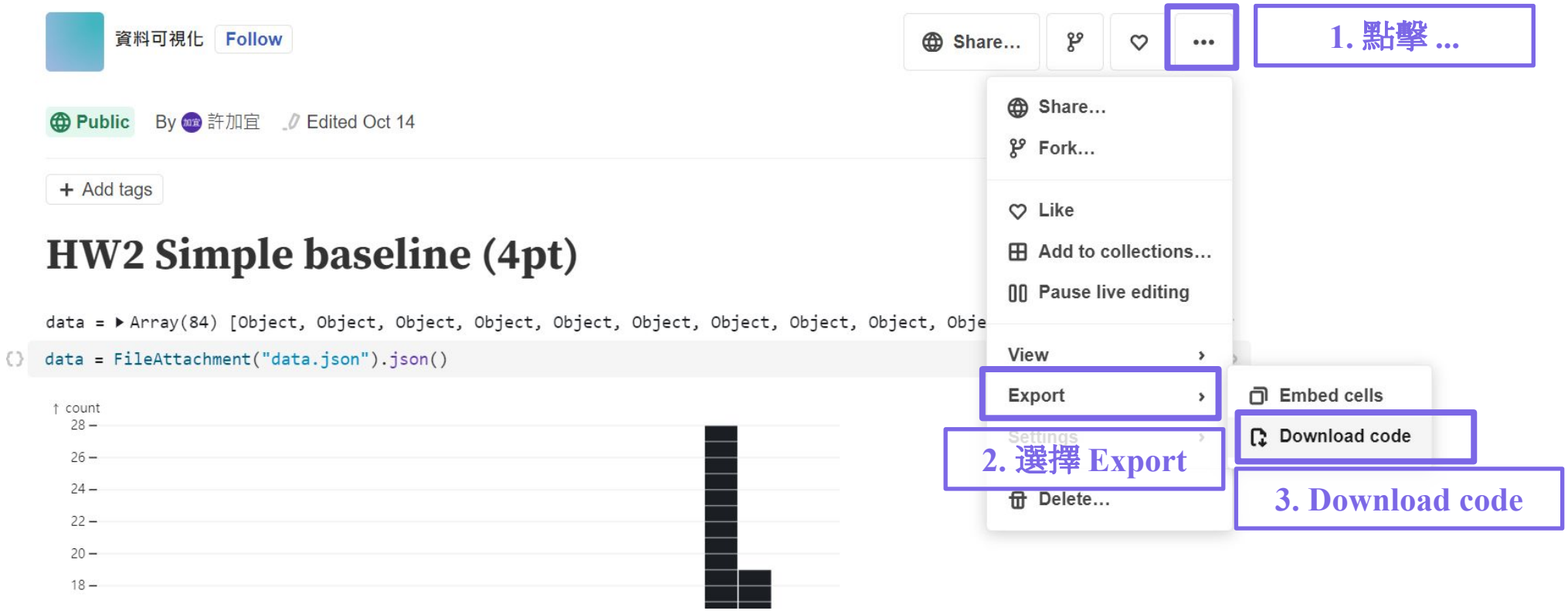
牡羊座	金牛座	雙子座	巨蟹座	獅子座	處女座	天秤座	天蠍座	射手座	摩羯座	水瓶座	雙魚座
0	1	2	3	4	5	6	7	8	9	10	11

06

繳交資訊

Export Observable code

1. 在匯出檔案前請確認所有cell都有run過、圖表皆有呈現。



Export Observable code

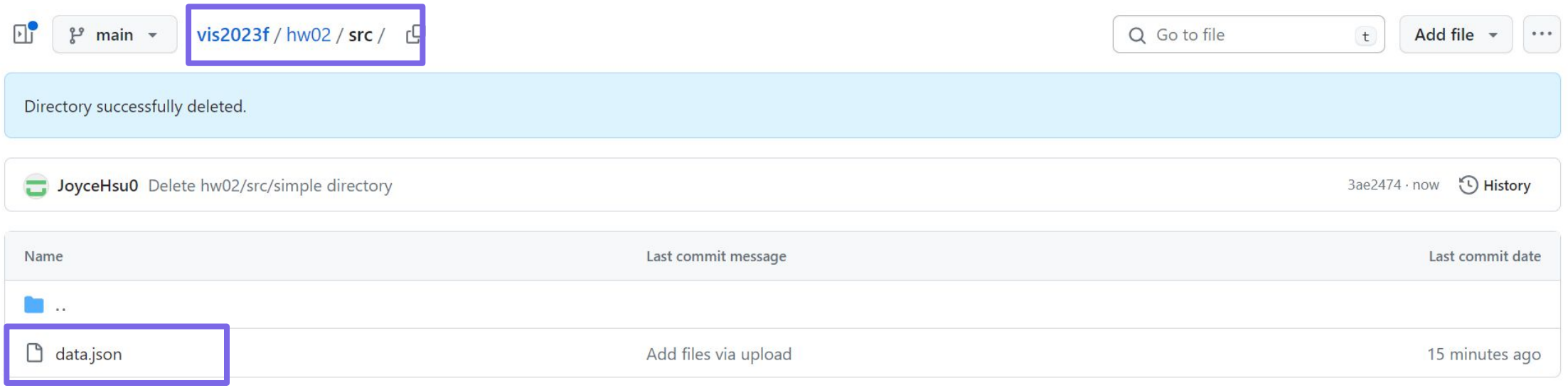
2. 將下載下來的檔案解壓縮，刪除裡面的files資料夾。並修改最主要的js檔案。

(名字是亂碼的那個，例如 ce913880495a6f30@76.js)，並將URL路徑改成 ../data.json

```
43
44  export default function define(runtime, observer) {
45    const main = runtime.module();
46    function toString() { return this.url; }
47    const fileAttachments = new Map([
48      ["data.json", {url: new URL("../data.json", import.meta.url), mimeType: "application/json", toString}]
49    ]);
50    main.builtin("FileAttachment", runtime.fileAttachments(name => fileAttachments.get(name)));
```

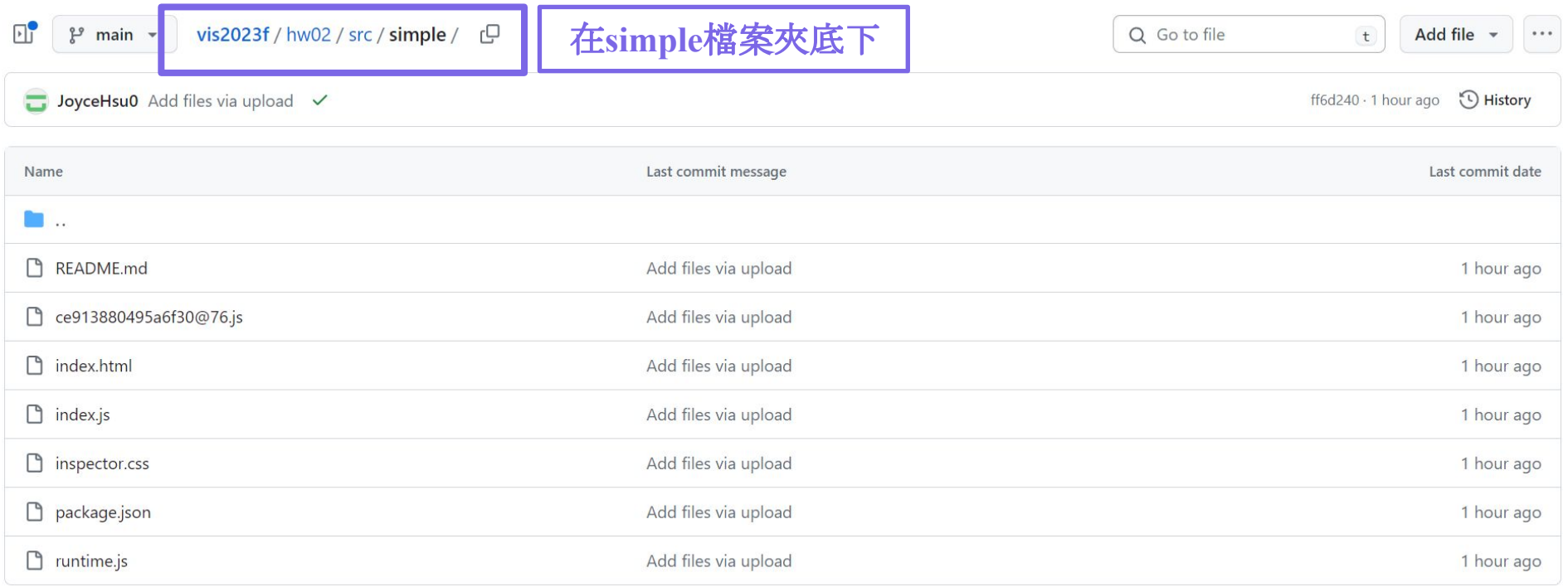
Github

3. 將data.json放到 src 檔案夾底下



Github

4. 在 src 檔案夾底下建立simple/medium/strong 檔案夾，並分別將修改過後的檔案放入。



Github

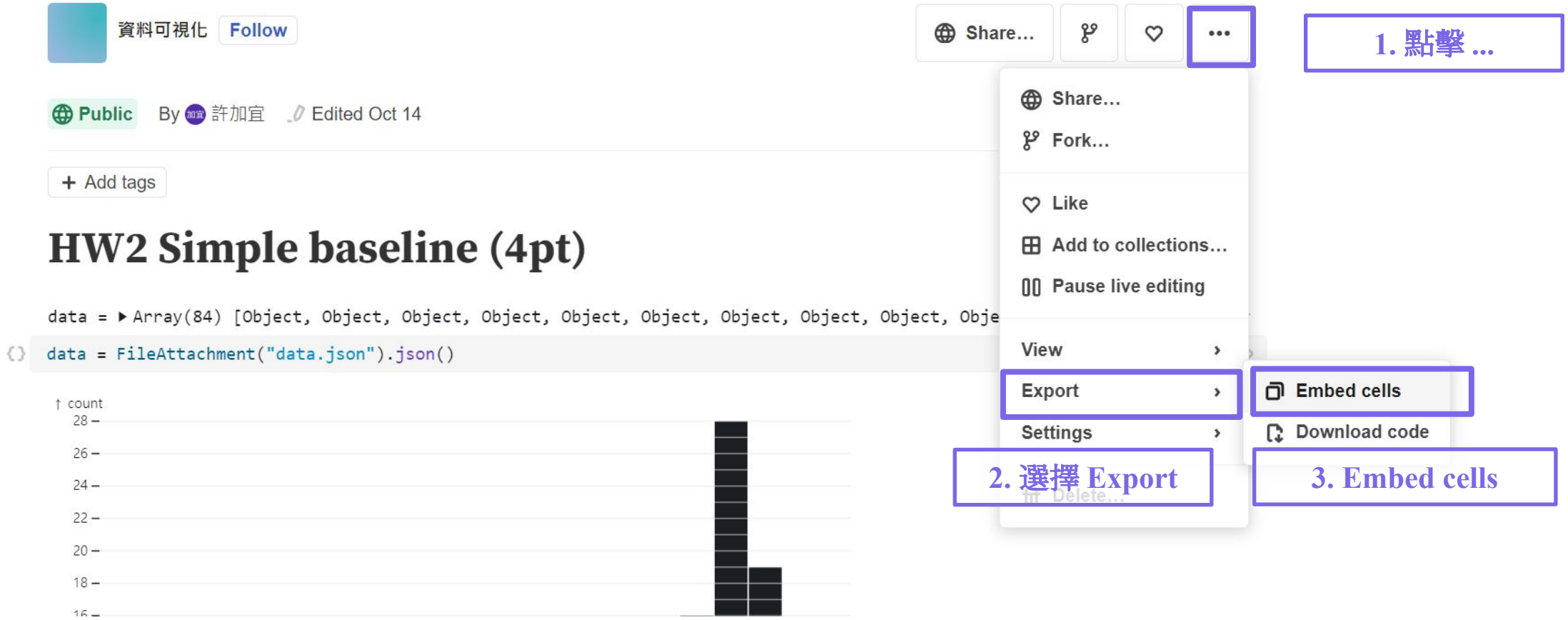
5. 更改 hw02/index.html 178~185行程式碼為 :

```
<!-- ---------------------------------------------->
  <div class="row hw12">
    <div class="col-md-12 twenty">
      Simple baseline 程式碼, 請放在https://github.com/
      <span style="color:red;">你的帳號</span>
      /vis2023f/hw
      <span style="color:red;">02</span>
      /src/simple 檔案夾。
      <br>

      <hr>
      Medium baseline 程式碼, 請放在https://github.com/
      <span style="color:red;">你的帳號</span>
      /vis2023f/hw
      <span style="color:red;">02</span>
      /src/medium 檔案夾。
      <br>

      <hr>
      Strong baseline 程式碼, 請放在https://github.com/
      <span style="color:red;">你的帳號</span>
      /vis2023f/hw
      <span style="color:red;">02</span>
      /src/strong 檔案夾。
      <br>
```

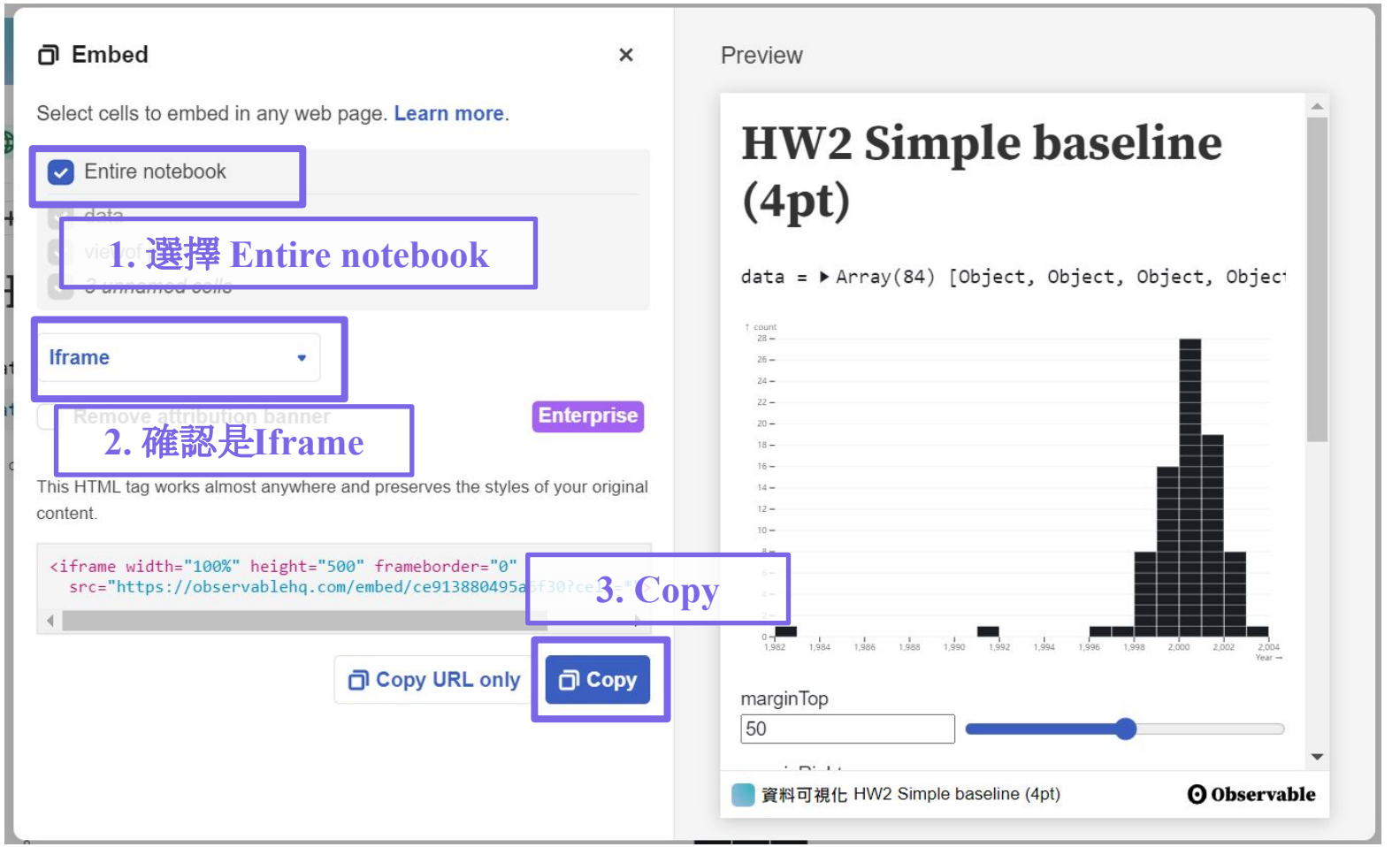


```
    </div>
  </div>

  <!-- ---------------------------------------------->
```

Export notebook



Export notebook



Iframe

在hw02/index.html中原本為影片的地方程式碼如下(第222行):

```
<!-- ------------------------------------------->
  <div class="row hw12">
    <div class="col-md-12 twenty">
      <video id="video1" style="width:100%;max-width:100%;"
controls="">
        <source src="https://www.w3schools.com/html/mov_bbb.mp4"
type="video/mp4">
      </video>
    </div>
  </div>

  <!-- ------------------------------------------->
```

Iframe

將其整段更改為以下程式碼，並將剛剛 Embed notebook 時copy的程式碼貼上(如下方**紅字**處)並新增下方**紫字**的程式碼，用來將Iframe背景顏色設為白色。

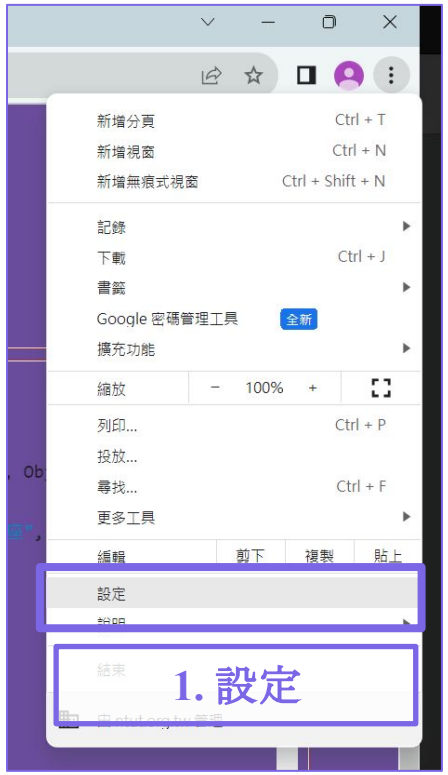
```
<!-- ---------------------------------------------->
 <div class="row hw12">
  <div class="col-md-12 twenty">
    <h4>Simple baseline - 以 histogram 呈現每個年份出生的人數，可調整margin, fill color, tip</h4>
  </div>
 </div>

 <div class="row hw12">
  <div class="col-md-12 twenty">
    <iframe width="100%" height="500" frameborder="0" style="background-color: #FFFFFF"
src="….."></iframe>
  </div>
 </div>

 <!-- ---------------------------------------------->
 <div class="row hw12">
  <div class="col-md-12 twenty">
    <h4>Medium baseline - 以 bar chart 呈現每個年份出生的人數，可調整margin, fill color, tip</h4>
  </div>
 </div>
```



```
 <div class="row hw12">
  <div class="col-md-12 twenty">
    <iframe width="100%" height="500" frameborder="0" style="background-color: #FFFFFF"
src="….."></iframe>
```

Iframe-圖表沒有跑出來的問題

Iframe-圖表沒有跑出來的問題



評分表

更改 hw02/index.html 中程式碼

總分	完成後打勾	配分	分項描述
10	完成	2	Simple baseline-1 - 以histogram呈現每個年份出生的人數
	完成	1	Simple baseline-2 - 可調整margin, fill color, tip
	完成	2	Medium baseline-1 - 以bar chart呈現每個年份出生的人數
	完成	1	Medium baseline-2 - 可調整margin, fill color, tip
	完成	2	Strong baseline-1 - 以bar chart呈現每個星座的人數
	完成	2	Strong baseline-2 - 以histogram呈現每個星座的人數

```
<table>
    <tr>
      <th>總分</th>
      <th>完成後打勾</th>
      <th>配分</th>
      <th>分項描述</th>
    </tr>

    <tr>
      <td rowspan="16" id="myTotal"></td>
      <td><input type="checkbox" class="flipswitch" id="myCheckbox1"
checked="checked"></td>
      <td id='m1'>2</td>
      <td>Simple baseline-1 - 以histogram呈現每個年份出生的人數</td>
    </tr>

     <tr>
      <td><input type="checkbox" class="flipswitch" id="myCheckbox2"
checked="checked"></td>
      <td id='m2'>2</td>
      <td>Simple baseline-2 - 可調整margin, fill color, tip</td>
    </tr>

    <tr>
      <td><input type="checkbox" class="flipswitch" id="myCheckbox3"
checked="checked"></td>
      <td id='m3'>2</td>
      <td>Medium baseline-1 - 以bar chart呈現每個年份出生的人數</td>
    </tr>

    <tr>
      <td><input type="checkbox" class="flipswitch" id="myCheckbox4"
checked="checked"></td>
```

評分表

更改 hw02/index.html 中程式碼

```
function update(){

  var score = 0;

  if (d3.select("#myCheckbox1").property("checked")){
    score += parseInt(d3.select('#m1').html());
  }

  if (d3.select("#myCheckbox2").property("checked")){
    score += parseInt(d3.select('#m2').html());
  }

  if (d3.select("#myCheckbox3").property("checked")){
    score += parseInt(d3.select('#m3').html());
  }

  if (d3.select("#myCheckbox4").property("checked")){
    score += parseInt(d3.select('#m4').html());
  }

  if (d3.select("#myCheckbox5").property("checked")){
    score += parseInt(d3.select('#m5').html());
  }

  if (d3.select("#myCheckbox6").property("checked")){
    score += parseInt(d3.select('#m6').html());
  }

  d3.select("#myTotal").html(score);
}
```

https://joycehsu0.github.io/vis2023f/hw02/index.html

作業 02

Simple baseline 程式碼，請放在 https://github.com/ 你的帳號 /vis2023f/hw 02 /src/simple 檔案夾。

Medium baseline 程式碼，請放在 https://github.com/ 你的帳號 /vis2023f/hw 02 /src/medium 檔案夾。

Strong baseline 程式碼，請放在 https://github.com/ 你的帳號 /vis2023f/hw 02 /src/strong 檔案夾。

前往你的 Demo 網頁

https://joycehsu0.github.io/vis2023f/hw02/src/simple/

https://joycehsu0.github.io/vis2023f/hw02/src/medium/

https://joycehsu0.github.io/vis2023f/hw02/src/strong/

心得

Regulations

- You should finish your homework on your own.
- Do not share your codes with any living creatures.
- Your HW will get 0 pt if you violate any of the above rules.
- Professor & TAs preserve the rights to change the rules & grades.

07

助教聯絡資訊

助教聯絡資訊

- TA Email
  - 許加宜 t112598016@ntut.org.tw
  - Email 標題請按照此格式(X為作業編號) : [vis2023f-hwX-學號]