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Cybercrime with Snap!

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The Basics of Snap!

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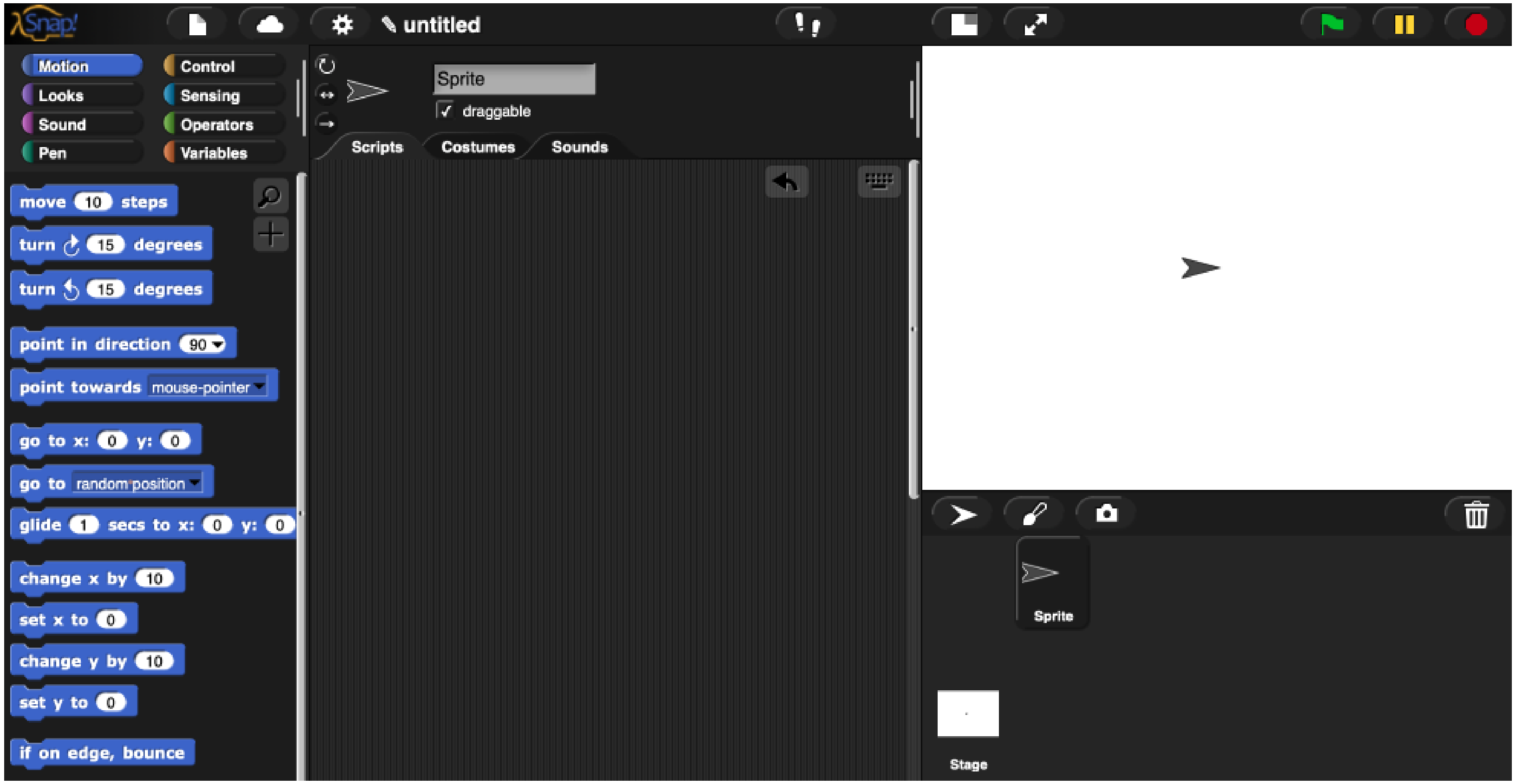
Snap!

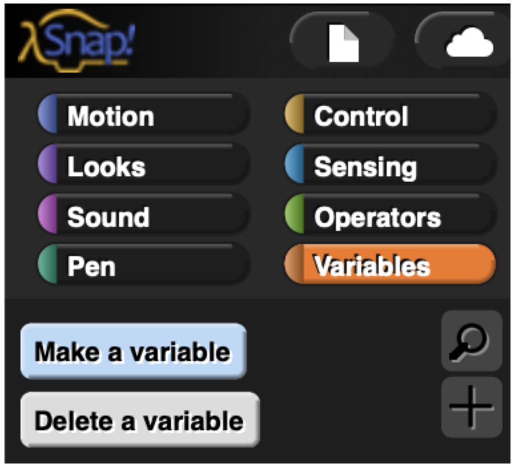
https://snap.berkeley.edu/snap/snap.html

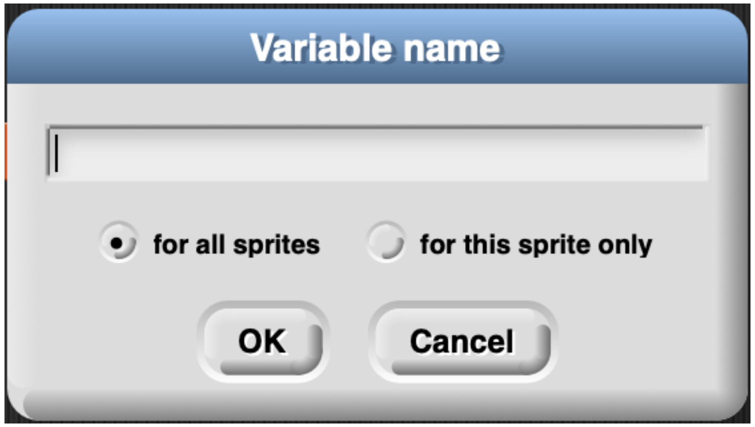


Make a Variable

A variable is a container that can hold some value for us, whether that value is a number, a string, a Boolean or even a list.

We're going to start by creating a new variable, naming it **time**.

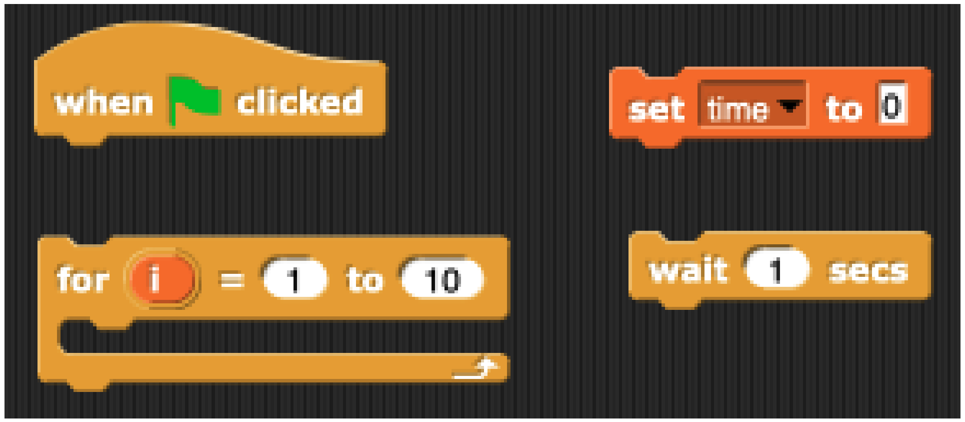




Make a Timer

Using our new variable, we're going to create a simple timer.

We will use a for loop to accomplish this, setting **time** to **i**; the counter variable of the loop.



Hint – we can drag the variable **i** from the loop!

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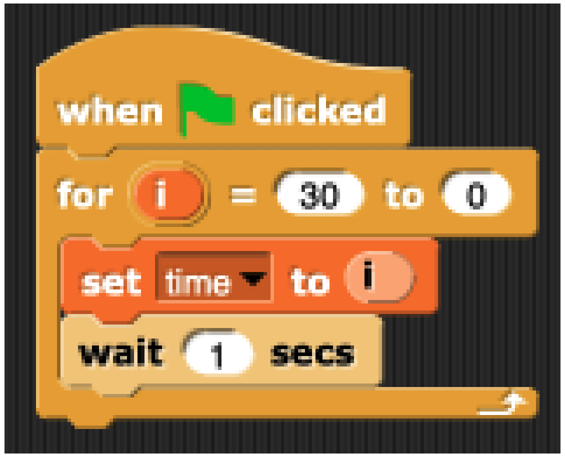

```
when [flag] clicked
for i = 30 to 0
    set time to i
    wait 1 secs
```

Hint – we can drag the variable **i** from the loop!

Using Data in Snap!

Download Data Here

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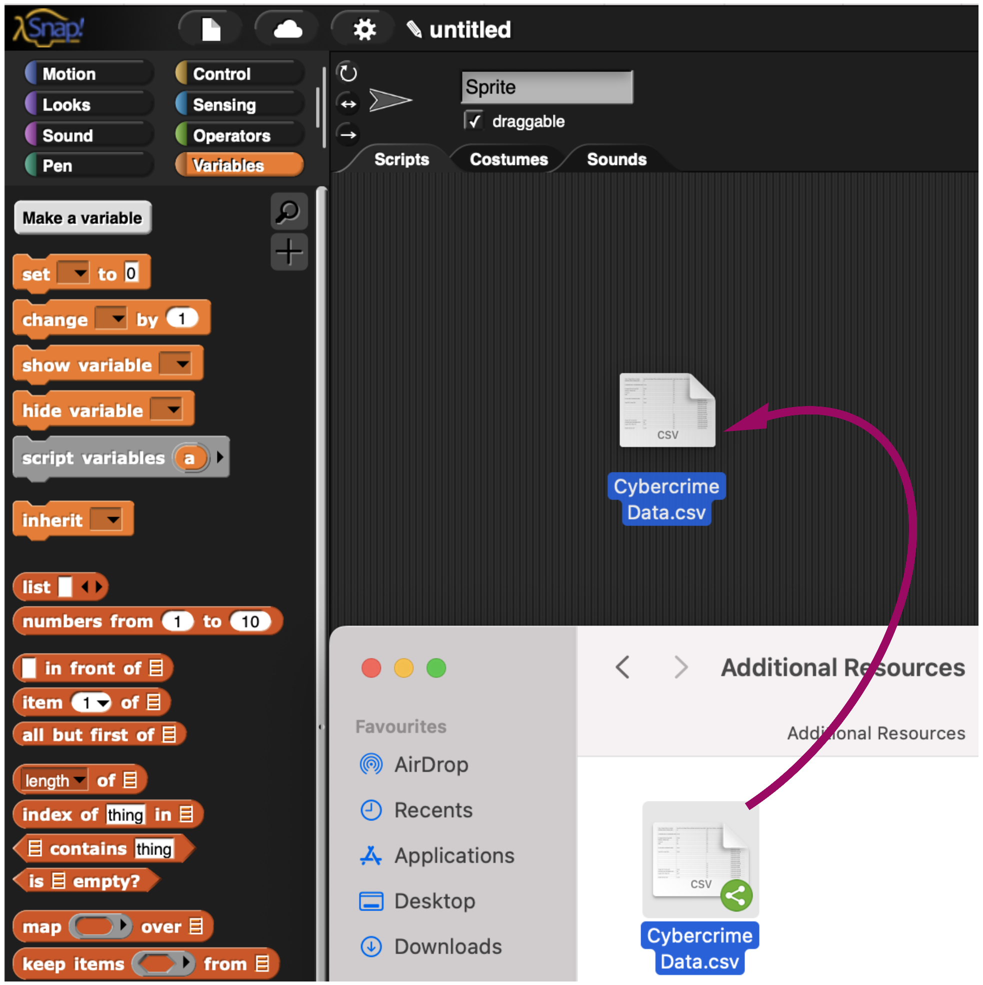
Drag and Drop

With *Snap!* we can drag and drop our data straight into the browser!

Use this method to import your downloaded data into *Snap!* so that we can begin analysing.



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Data as a Variable

Your data will open, appear as a new variable, and be shown on the stage.

Variable

(this can be unchecked to remove from the stage)

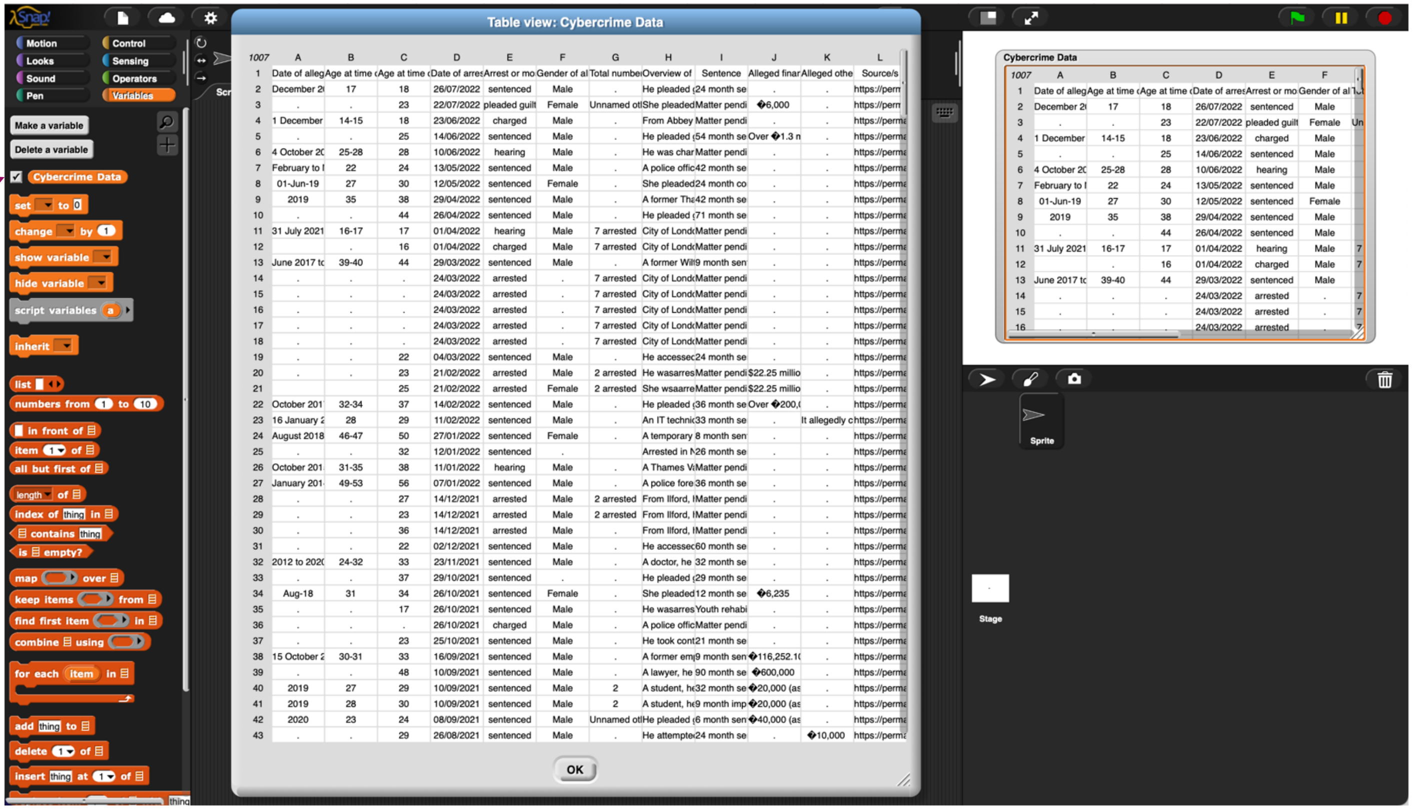


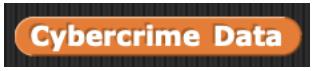
Table view: Cybercrime Data

1007	A	B	C	D	E	F	G	H	I	J	K	L
1	Date of alleg	Age at time c	Age at time c	Date of arres	Arrest or mo	Gender of al	Total numbe	Overview of	Sentence	Alleged finar	Alleged othe	Source/s
2	December 2(	17	18	26/07/2022	sentenced	Male	.	He pleaded (	24 month se	.	.	https://perm
3	.	.	23	22/07/2022	pleaded guilt	Female	Unnamed otl	She pleaded	Matter pendi	�6,000	.	https://perm
4	1 December	14-15	18	23/06/2022	charged	Male	.	From Abbey	Matter pendi	.	.	https://perma
5	.	.	25	14/06/2022	sentenced	Male	.	He pleaded (	54 month se	Over �1.3 n	.	https://perma
6	4 October 2(	25-28	28	10/06/2022	hearing	Male	.	He was char	Matter pendi	.	.	https://perma
7	February to I	22	24	13/05/2022	sentenced	Male	.	A police offic	42 month se	.	.	https://perma
8	01-Jun-19	27	30	12/05/2022	sentenced	Female	.	She pleaded	24 month co	.	.	https://perma
9	2019	35	38	29/04/2022	sentenced	Male	.	A former Tha	42 month se	.	.	https://perma
10	.	.	44	26/04/2022	sentenced	Male	.	He pleaded (	71 month se	.	.	https://perma
11	31 July 2021	16-17	17	01/04/2022	hearing	Male	7 arrested	City of Londc	Matter pendi	.	.	https://perma
12		.	16	01/04/2022	charged	Male	7 arrested	City of Londc	Matter pendi	.	.	https://perma
13	June 2017 tc	39-40	44	29/03/2022	sentenced	Male	.	A former Will	9 month sen	.	.	https://perma
14	.	.	.	24/03/2022	arrested	.	7 arrested	City of Londc	Matter pendi	.	.	https://perma
15	.	.	.	24/03/2022	arrested	.	7 arrested	City of Londc	Matter pendi	.	.	https://perma
16	.	.	.	24/03/2022	arrested	.	7 arrested	City of Londc	Matter pendi	.	.	https://perma
17	.	.	.	24/03/2022	arrested	.	7 arrested	City of Londc	Matter pendi	.	.	https://perma
18	.	.	.	24/03/2022	arrested	.	7 arrested	City of Londc	Matter pendi	.	.	https://perma
19	.	.	22	04/03/2022	sentenced	Male	.	He accessec	24 month se	.	.	https://perma
20	.	.	23	21/02/2022	arrested	Male	2 arrested	He wasarres	Matter pendi	$22.25 millio	.	https://perma
21			25	21/02/2022	arrested	Female	2 arrested	She wsaarre	Matter pendi	$22.25 millio	.	https://perma
22	October 201	32-34	37	14/02/2022	sentenced	Male	.	He pleaded (	36 month se	Over �200,(	.	https://perma
23	16 January 2	28	29	11/02/2022	sentenced	Male	.	An IT technic	33 month se	.	It allegedly c	https://perma
24	August 2018	46-47	50	27/01/2022	sentenced	Female	.	A temporary	8 month sen	.	.	https://perma
25	.	.	32	12/01/2022	sentenced	.		Arrested in N	26 month se	.	.	https://perma
26	October 201	31-35	38	11/01/2022	hearing	Male	.	A Thames V	Matter pendi	.	.	https://perma
27	January 201	49-53	56	07/01/2022	sentenced	Male	.	A police fore	36 month se	.	.	https://perma
28	.	.	27	14/12/2021	arrested	Male	2 arrested	From Ilford, I	Matter pendi	.	.	https://perma
29	.	.	23	14/12/2021	arrested	Male	2 arrested	From Ilford, I	Matter pendi	.	.	https://perma
30	.	.	36	14/12/2021	arrested	Male	.	From Ilford, I	Matter pendi	.	.	https://perma
31	.	.	22	02/12/2021	sentenced	Male	.	He accessec	60 month se	.	.	https://perma
32	2012 to 202(	24-32	33	23/11/2021	sentenced	Male	.	A doctor, he	32 month se	.	.	https://perma
33	.	.	37	29/10/2021	sentenced	.	.	He pleaded (	29 month se	.	.	https://perma
34	Aug-18	31	34	26/10/2021	sentenced	Female	.	She pleaded	12 month se	�6,235	.	https://perma
35	.	.	17	26/10/2021	sentenced	Male	.	He wasarres	Youth rehabi	.	.	https://perma
36	.	.	.	26/10/2021	charged	Male	.	A police offic	Matter pendi	.	.	https://perma
37	.	.	23	25/10/2021	sentenced	Male	.	He took cont	21 month se	.	.	https://perma
38	15 October 2	30-31	33	16/09/2021	sentenced	Male	.	A former em	9 month sen	�116,252.1(	.	https://perma
39	.	.	48	10/09/2021	sentenced	Male	.	A lawyer, he	90 month se	�600,000	.	https://perma
40	2019	27	29	10/09/2021	sentenced	Male	2	A student, he	32 month se	�20,000 (as	.	https://perma
41	2019	28	30	10/09/2021	sentenced	Male	2	A student, he	9 month imp	�20,000 (as	.	https://perma
42	2020	23	24	08/09/2021	sentenced	Male	Unnamed otl	He pleaded (	6 month sen	�40,000 (as	.	https://perma
43	.	.	29	26/08/2021	sentenced	Male	.	He attempte	24 month se	.	�10,000	https://perma

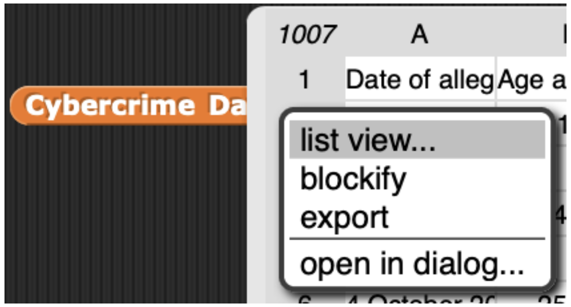
OK

List View and Table View

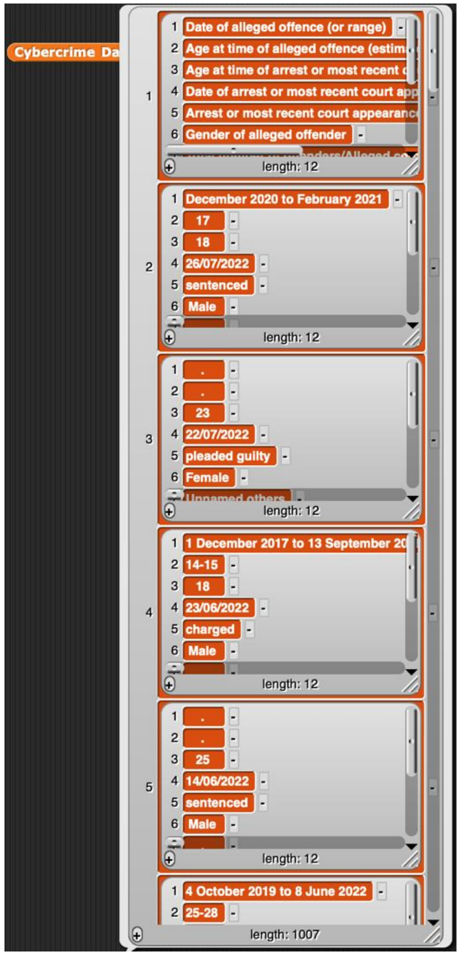
We can drag our variable into the scripting area to use it.



And by clicking it we can open our data to view its contents. A right click will give us the option to see it in list view.



This shows us that a table in *Snap!* is just a list of lists, where each row is stored as an inner list within a larger outer list.



```
1  1 Date of alleged offence (or range)
   2 Age at time of alleged offence (estim
   3 Age at time of arrest or most recent c
   4 Date of arrest or most recent court app
   5 Arrest or most recent court appearanc
   6 Gender of alleged offender
   length: 12
2  1 December 2020 to February 2021
   2 17
   3 18
   4 26/07/2022
   5 sentenced
   6 Male
   length: 12
3  1 .
   2 .
   3 23
   4 22/07/2022
   5 pleaded guilty
   6 Female
   length: 12
4  1 1 December 2017 to 13 September 20
   2 14-15
   3 18
   4 23/06/2022
   5 charged
   6 Male
   length: 12
5  1 .
   2 .
   3 25
   4 14/06/2022
   5 sentenced
   6 Male
   length: 12
   1 4 October 2019 to 8 June 2022
   2 25-28
length: 1007
```

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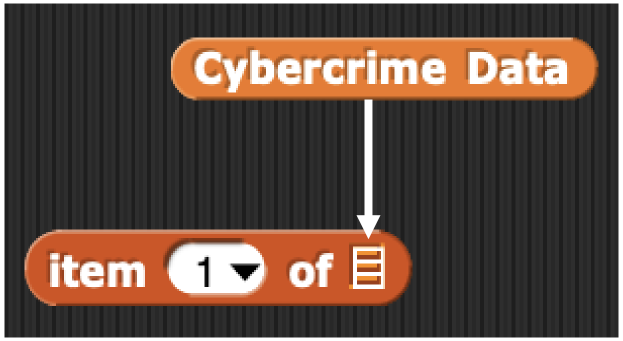
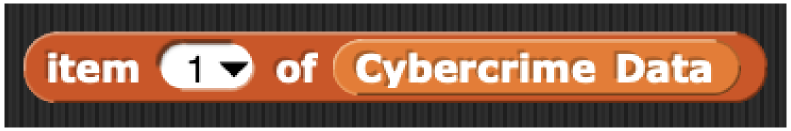
Opening Rows

As each row is just an item (a list of values) within our larger list of data, it is very simple to open each row of data.





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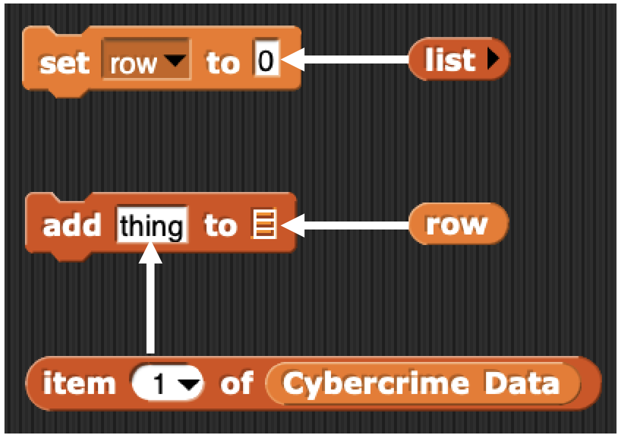
Storing Rows

To store a row so that it can be used freely in other functions we will need to assign it to a new variable.

Create a variable called **row**, and add a row from our data set.



Note: we will have to set our new variable to have a list value!

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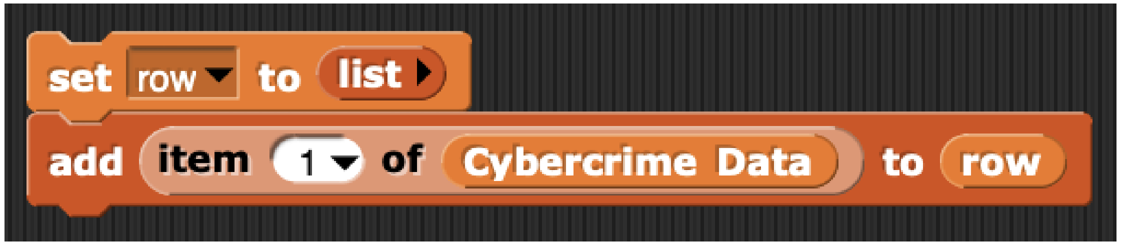

```
set row to list
add item 1 of Cybercrime Data to row
```

Note: we will have to set our new variable to have a list value!

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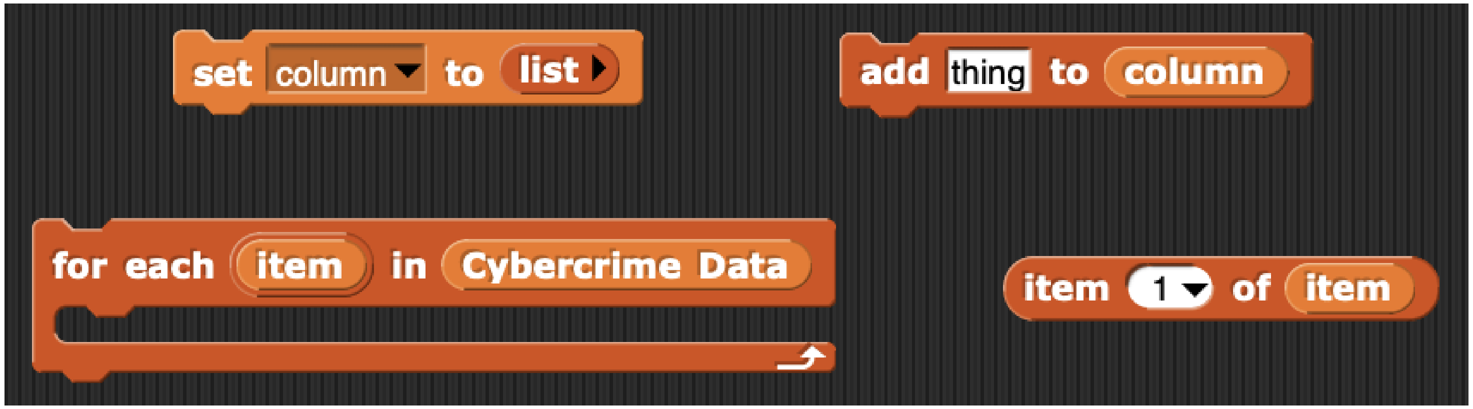
Storing Columns

Storing columns is much the same as rows, however we need to go through each of our lists (rows) one at a time and add the same item (column) from each to our **new** variable.

This requires us to use a for loop.



Hint: As before we can drag the variable **item** from the loop!

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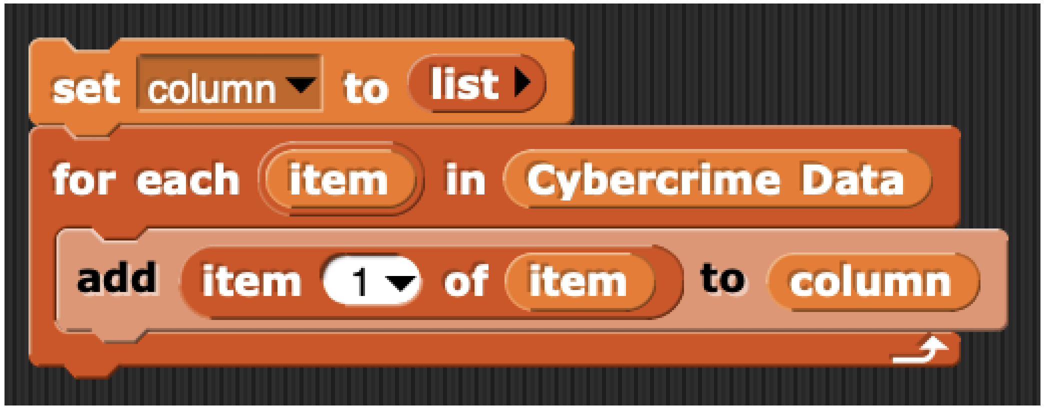


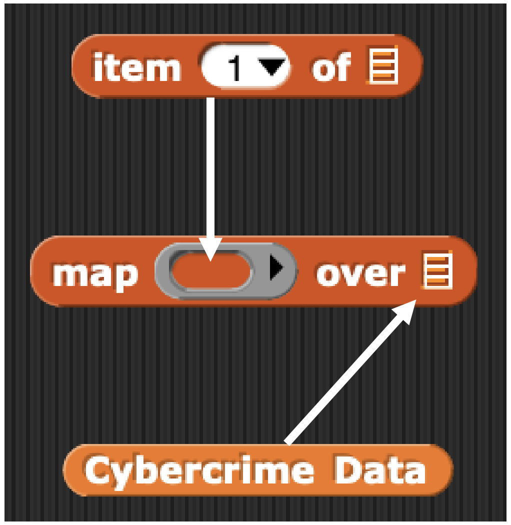
```
set column to list
for each item in Cybercrime Data
    add item 1 of item to column
```

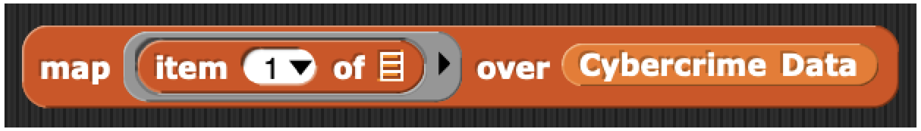
Hint: As before we can drag the variable **item** from the loop!

Map Function

Using loops is a slow process as our program will run through each row individually. *Snap!* instead has a higher order function that can pull columns from our data.

Using **map** will allow us to pull the same item from each inner list (row), as it maps the index of that item over the whole outer list.





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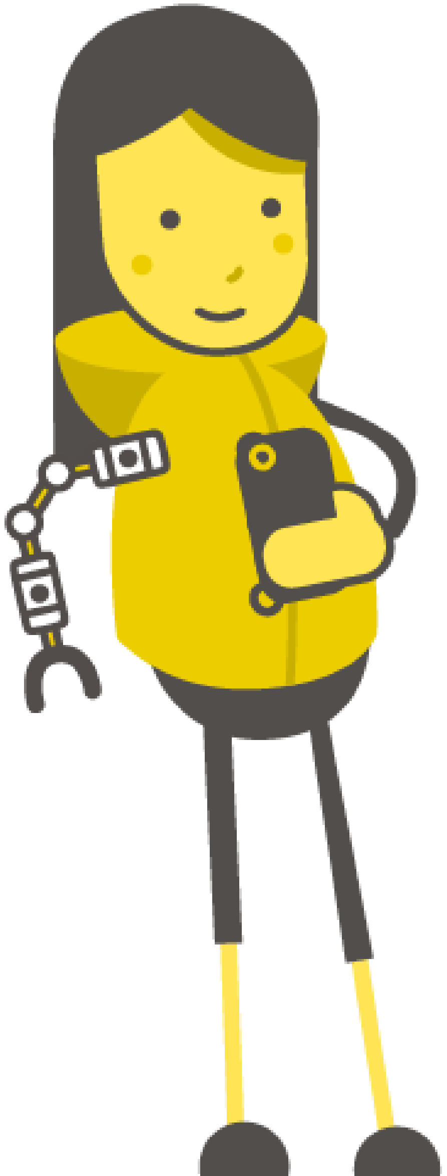
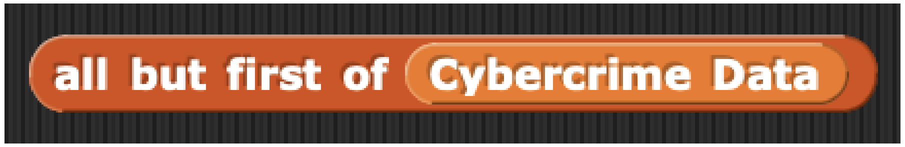


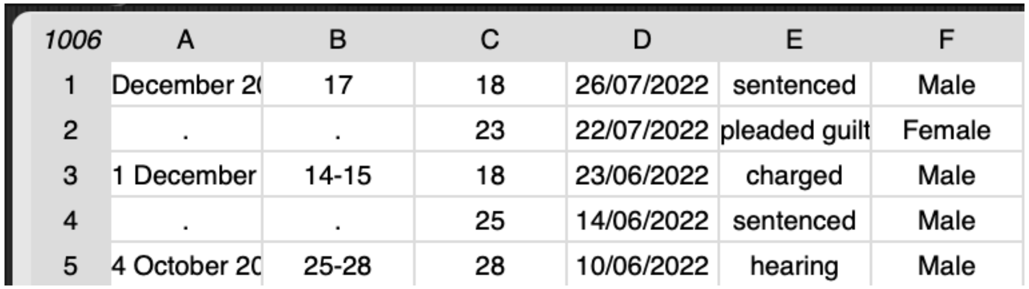
Analysing Data in Snap!

All But First

The **all but first** function will remove the first item from our data.

This is beneficial as we can easily remove the first row which contains the headers for each column



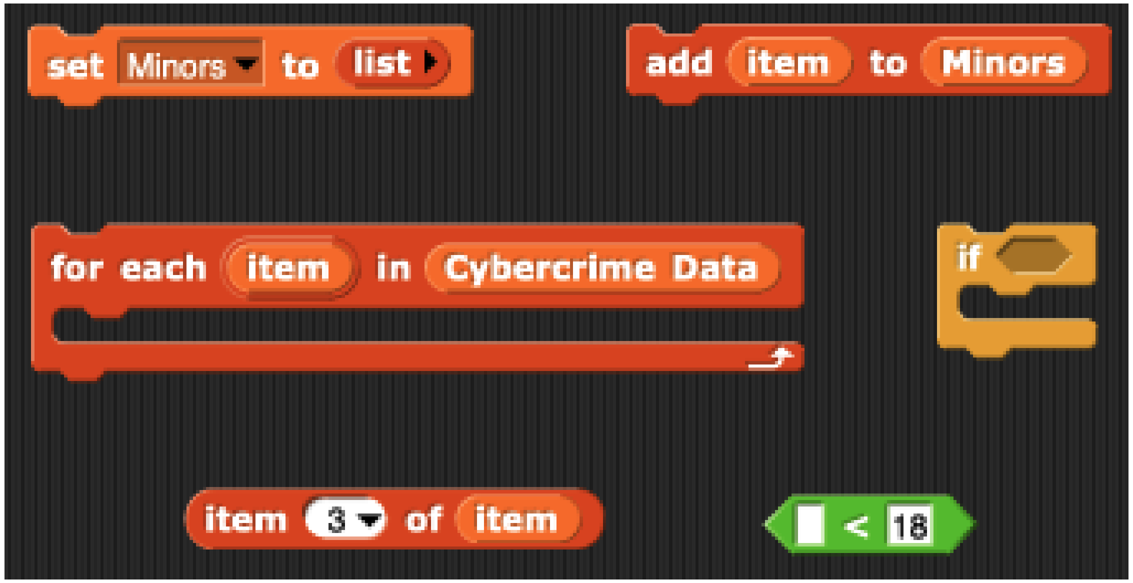


1006	A	B	C	D	E	F
1	December 2(	17	18	26/07/2022	sentenced	Male
2	.	.	23	22/07/2022	pleaded guilt	Female
3	1 December	14-15	18	23/06/2022	charged	Male
4	.	.	25	14/06/2022	sentenced	Male
5	4 October 2(	25-28	28	10/06/2022	hearing	Male

Using Operators

We can begin filtering our data by using operators.

Using the less than block, we can filter our results for entries of crimes committed by minors.



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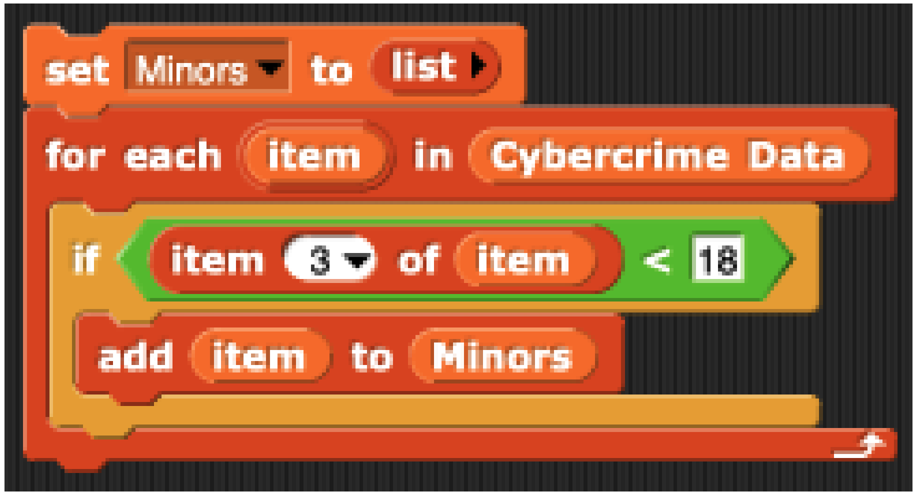

```
set Minors to list
for each item in Cybercrime Data
    if item 3 of item < 18
        add item to Minors
```

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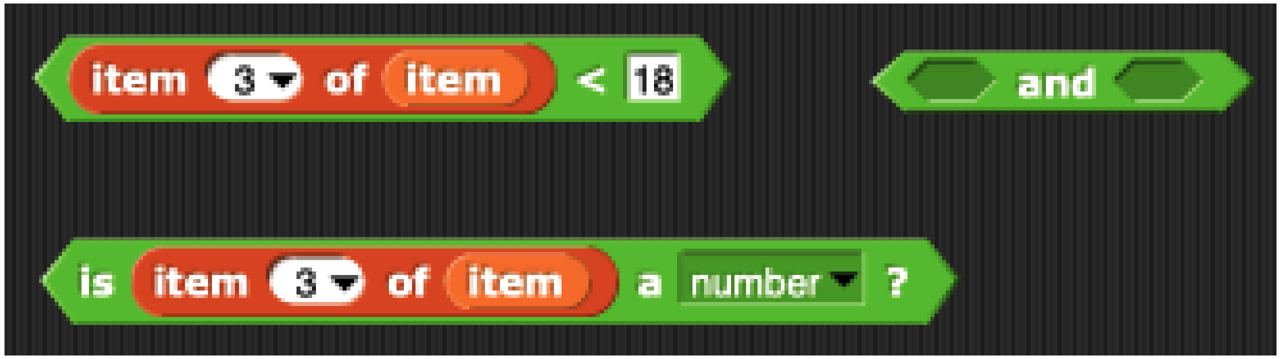
Improving Our Filter

Unfortunately this data isn't very clean, so many of the suspects ages are missing.

We can improve our search by also checking if the item is indeed a number.



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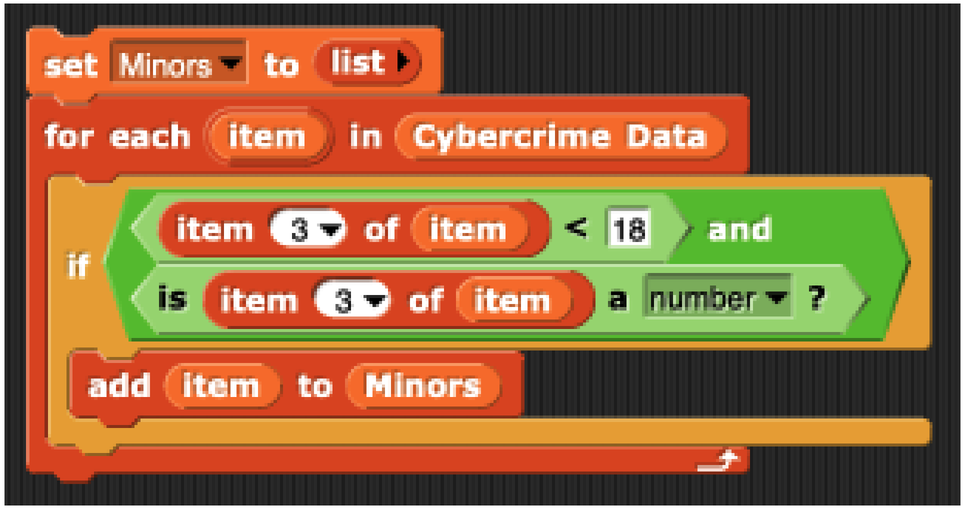

```
set Minors to list
for each item in Cybercrime Data
    if item 3 of item < 18 and is item 3 of item a number ?
        add item to Minors
```

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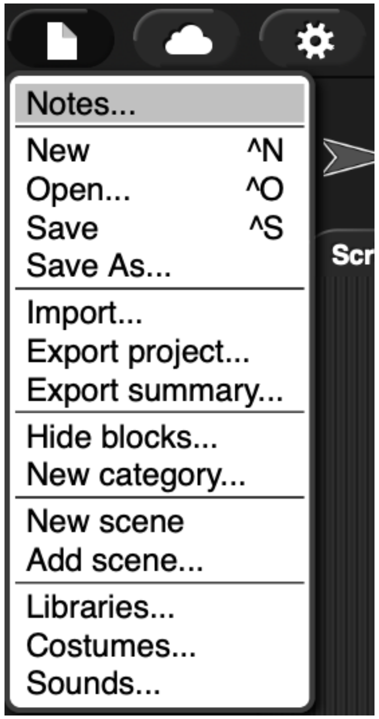
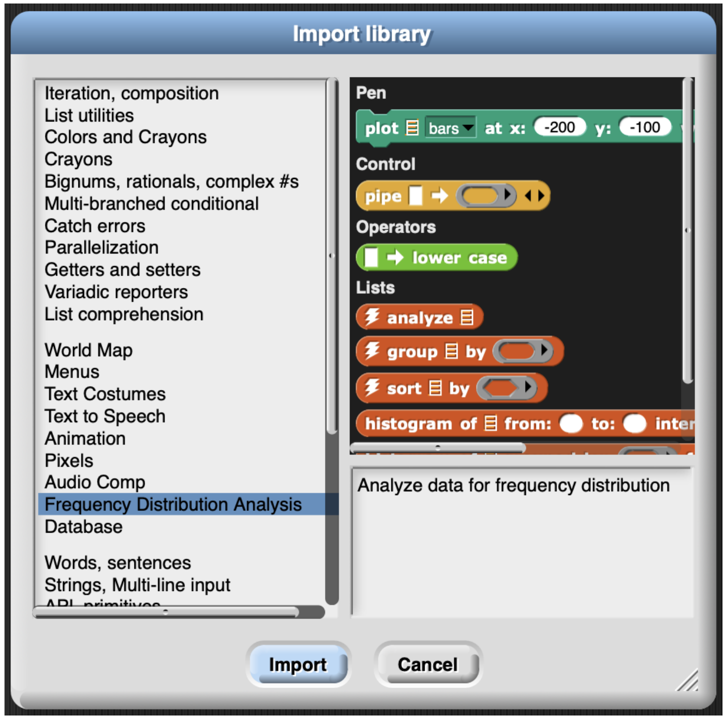
Adding Additional Libraries

In *Snap!* we can add additional functions by importing libraries.

These can be found in the menu at the top of the page.

Add the Frequency Distribution Analysis library.





Iteration, composition
List utilities
Colors and Crayons
Crayons
Bignums, rationals, complex #s
Multi-branched conditional
Catch errors
Parallelization
Getters and setters
Variadic reporters
List comprehension

World Map
Menus
Text Costumes
Text to Speech
Animation
Pixels
Audio Comp
Frequency Distribution Analysis
Database

Words, sentences
Strings, Multi-line input

Analyze data for frequency distribution

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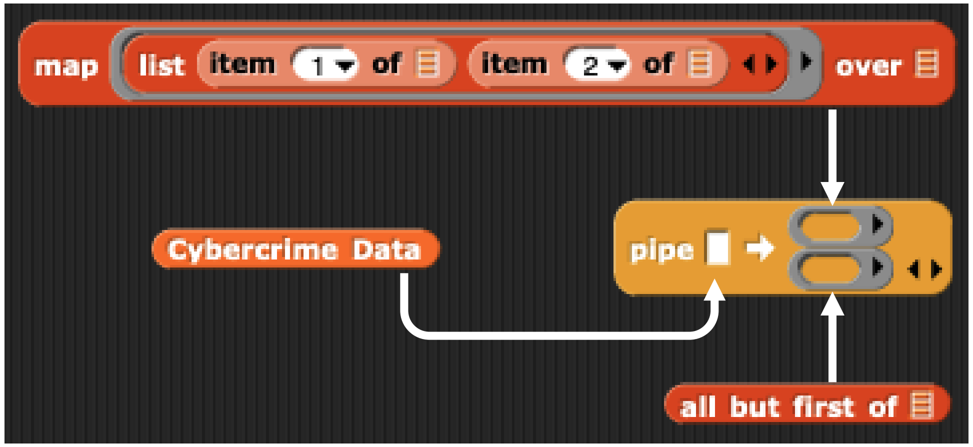
Pipe Function

The pipe function makes it easier to see how we're manipulating the data step by step.

The result of each function is passed to the next, chaining them together and avoiding the confusion of one large nested expression.



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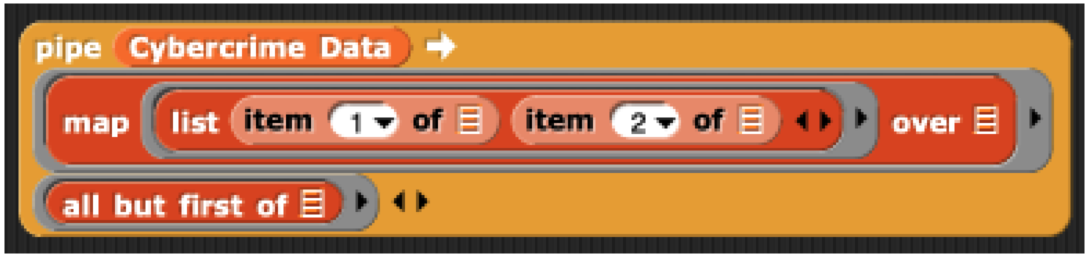
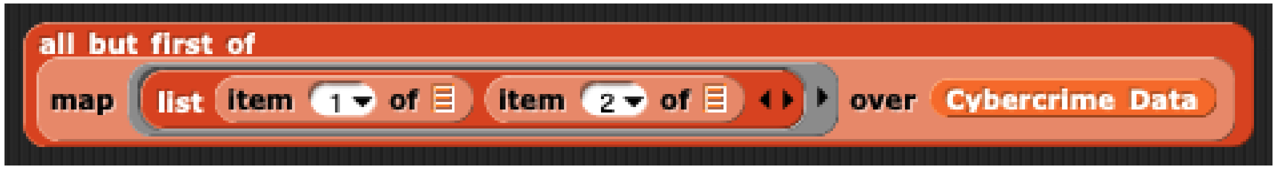


```
pipe (Cybercrime Data) →
    map (list (item 1 of ☰) (item 2 of ☰)) over ☰
    all but first of ☰
```



```
all but first of
    map (list (item 1 of ☰) (item 2 of ☰)) over (Cybercrime Data)
```

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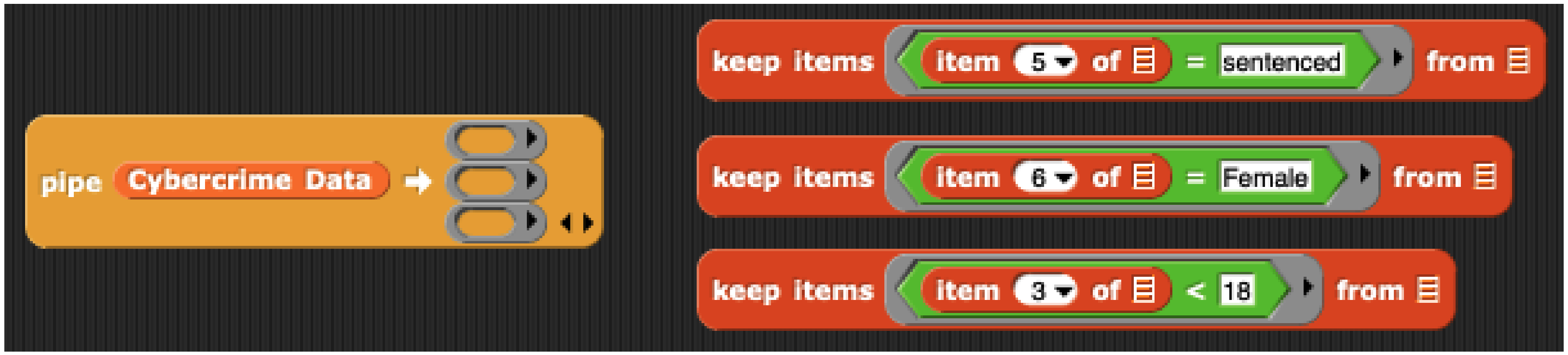
Keep Items

The **keep items** block performs the same function as the **if statement** filter we built earlier.

Using an operator to specify a condition will only return the data that fits that condition.



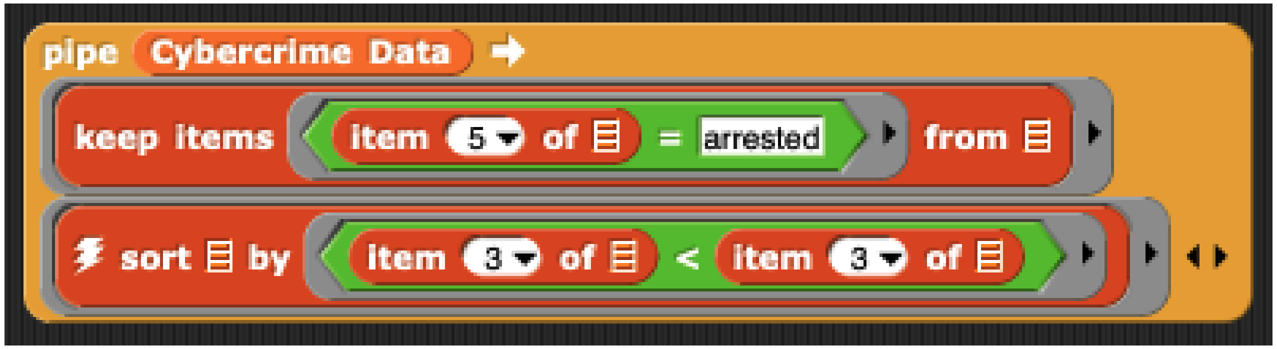
```
pipe (Cybercrime Data) →

keep items (item (5) of ☰ = sentenced) from ☰
keep items (item (6) of ☰ = Female) from ☰
keep items (item (3) of ☰ < 18) from ☰
```

Sort Function

The **sort** function will arrange our data in any way we like.

Using the **less than (<)** operator we can arrange our data by a number value from lowest to highest.



```
pipe (Cybercrime Data) ➜
  keep items (item (5) of ☰ = arrested) from ☰
  sort ☰ by (item (3) of ☰ < item (3) of ☰)
```

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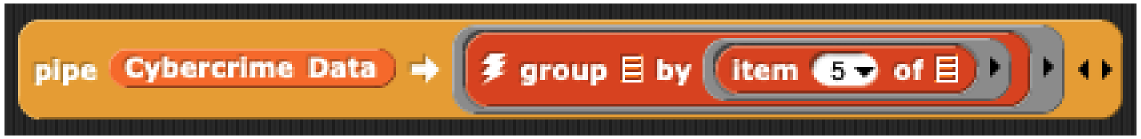
Group Function

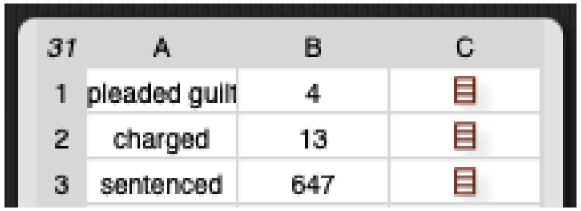
The **group** function will group our data by each unique entry (column A) and give us the number of uses of that entry in our data (column B).

In column C is a list containing each corresponding entry.

This is functionally a histogram of our data.



```
pipe Cybercrime Data → group ☰ by item 5 of ☰
```

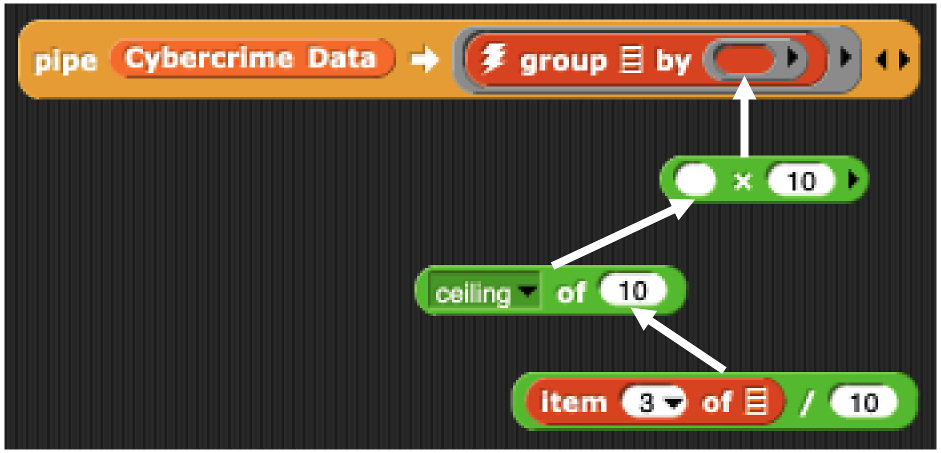


31	A	B	C
1	pleaded guilt	4	☰
2	charged	13	☰
3	sentenced	647	☰

Group Function

We can include more complex expressions in any of these functions to **filter**, **sort** or **group** our data in specific ways.

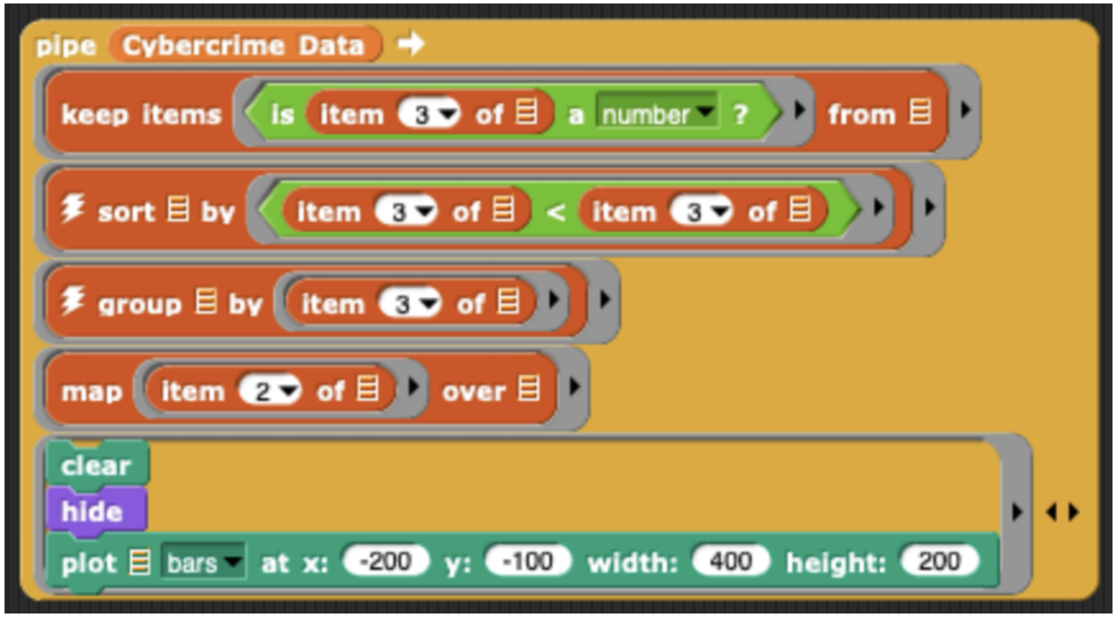
Below is an expression that will group our data by whether the suspect was in their teens, twenties, thirties etc.



Plot

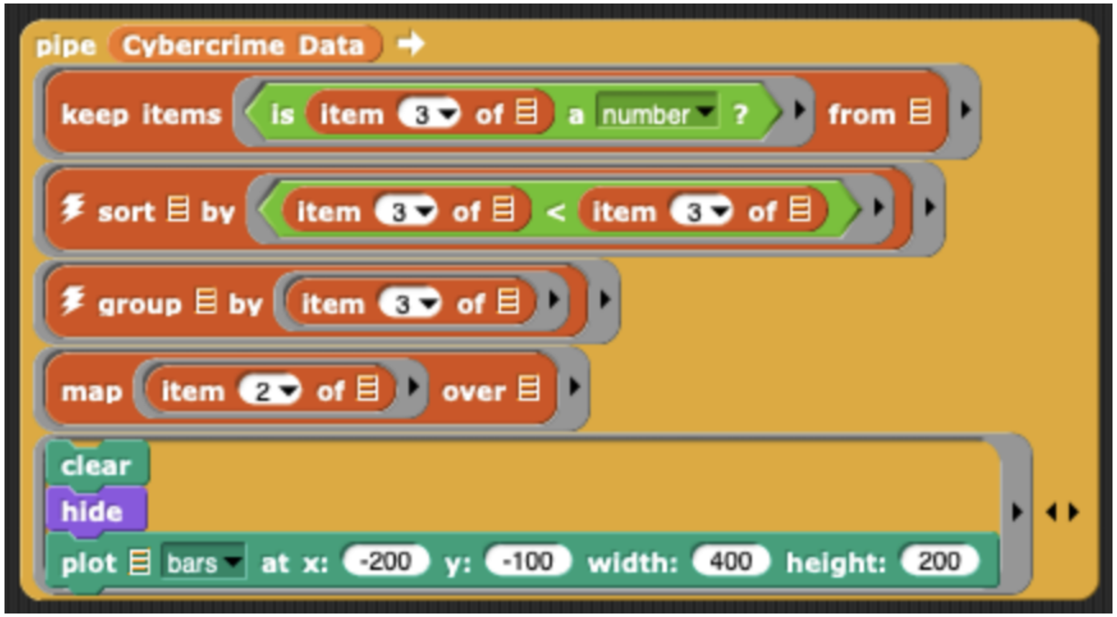
Using all that we've learned we can now use the **plot** function to plot a histogram of age, sorted from young to old.

We need to use the **map** function as only one list of data (the age column) can be inputted to plot a bar chart.



```
pipe (Cybercrime Data) →
    keep items (is (item 3 of ☰) a number ?) from ☰
    sort ☰ by (item 3 of ☰ < item 3 of ☰)
    group ☰ by (item 3 of ☰)
    map (item 2 of ☰) over ☰
    clear
    hide
    plot ☰ bars at x: -200 y: -100 width: 400 height: 200
```

Plot



```
pipe Cybercrime Data →
  keep items (is item 3 of ⌸ a number ?) from ⌸
  sort ⌸ by (item 3 of ⌸ < item 3 of ⌸)
  group ⌸ by (item 3 of ⌸)
  map (item 2 of ⌸) over ⌸
  clear
  hide
  plot ⌸ bars at x: -200 y: -100 width: 400 height: 200
```

Can anyone spot the problem with the way we've grouped this data?

Hint: Look at the output of the group function.

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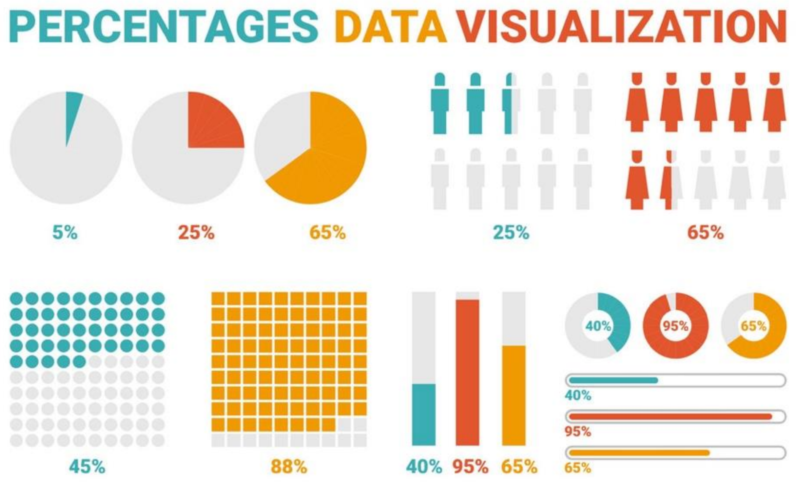
Visualising Data in Snap!

Data Visualisation

Now we're going to attempt visualising our data in more creative ways, without the use of traditional plots.



As you've had an opportunity to get used to *Snap!*, from here on the full code will not be shown on screen. Be sure to drag in all the blocks you see as they will be useful in building your code.

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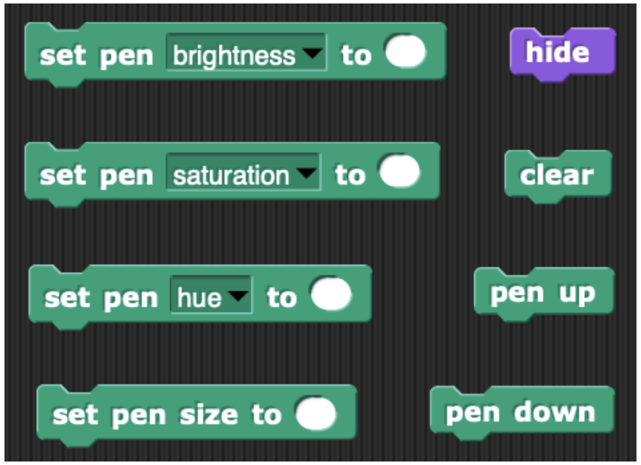
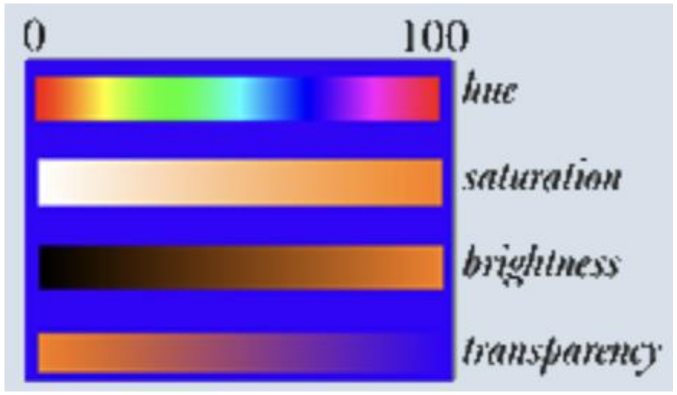
Pen Tool

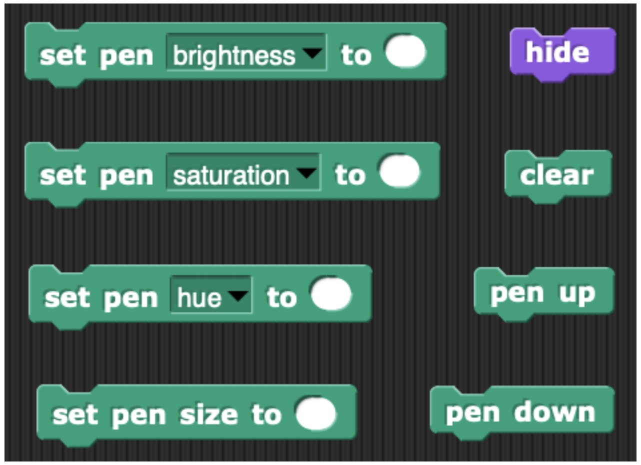
To make the most of the data visualisation capabilities of *Snap!*, we will be using the pen tool.

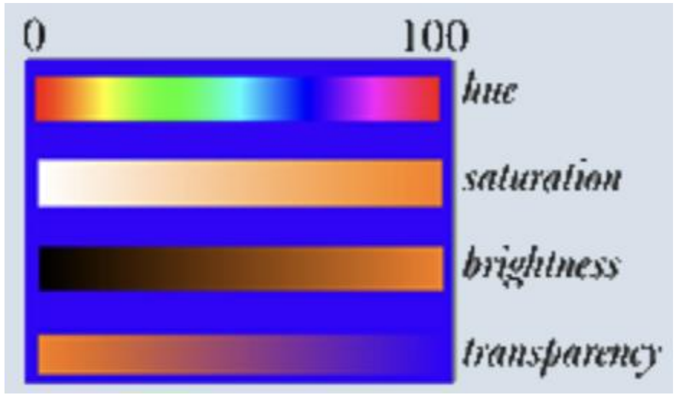
These are the blocks that we will primarily be using while using the pen tool.





Pen Tool





All the pen values range from 0 - 100, the pen size is the pens' diameter in pixels.

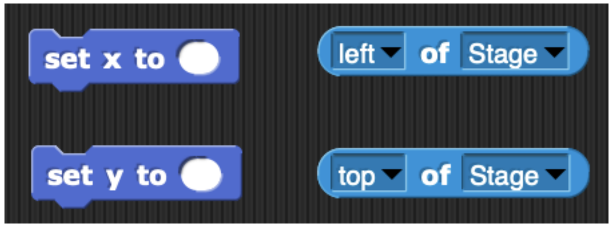
The pen will draw across the stage while down, so **pen up** is required to lift the pen and stop drawing temporarily.

The **hide** block will hide the sprite (not the pen) and **clear** will wipe the stage clean.

Starting Conditions

We don't have to worry about the dimensions of our stage in *Snap!* as there is a block that defines each border of our stage for us!

This means that we can easily set our staring location using these.

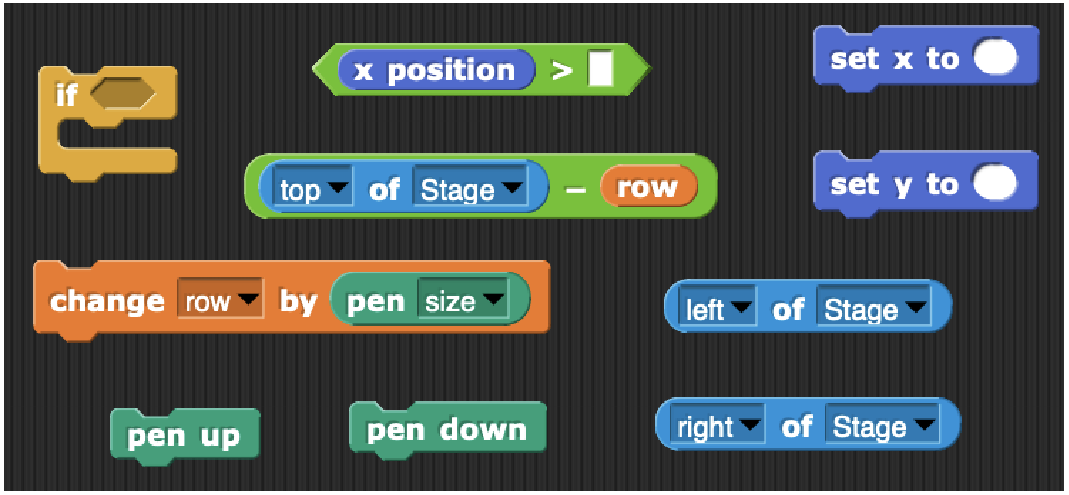


As we're going to want to draw across multiple rows, it will also be beneficial to create a row variable and set it to 0.

Move to Next Line

When the pen goes off the right of the screen, we are going to need to bring it back to its starting position on the left, but also drop it down a row.

These are the blocks you will need to advance to the next line.

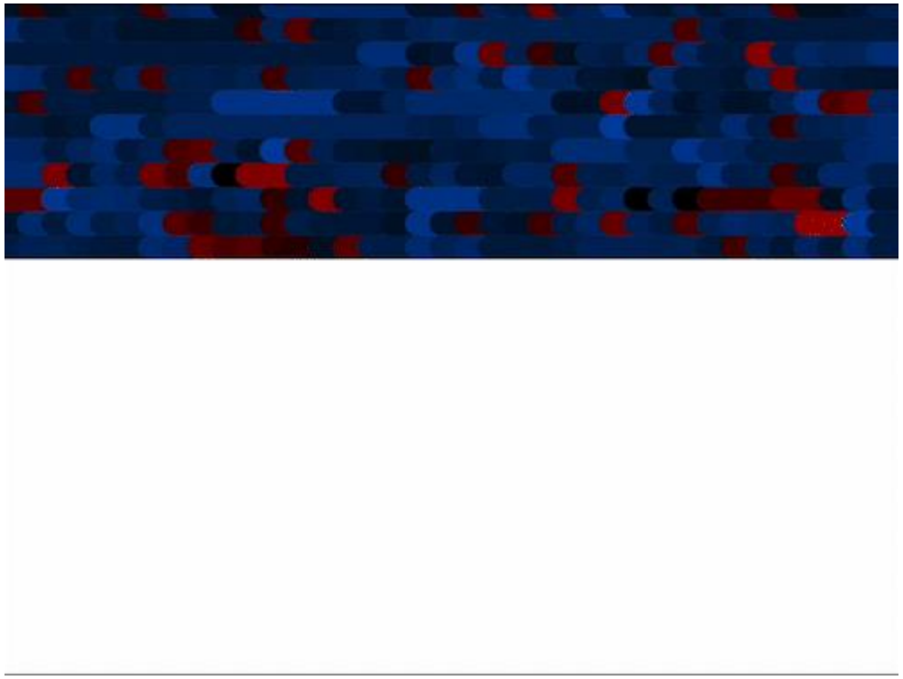


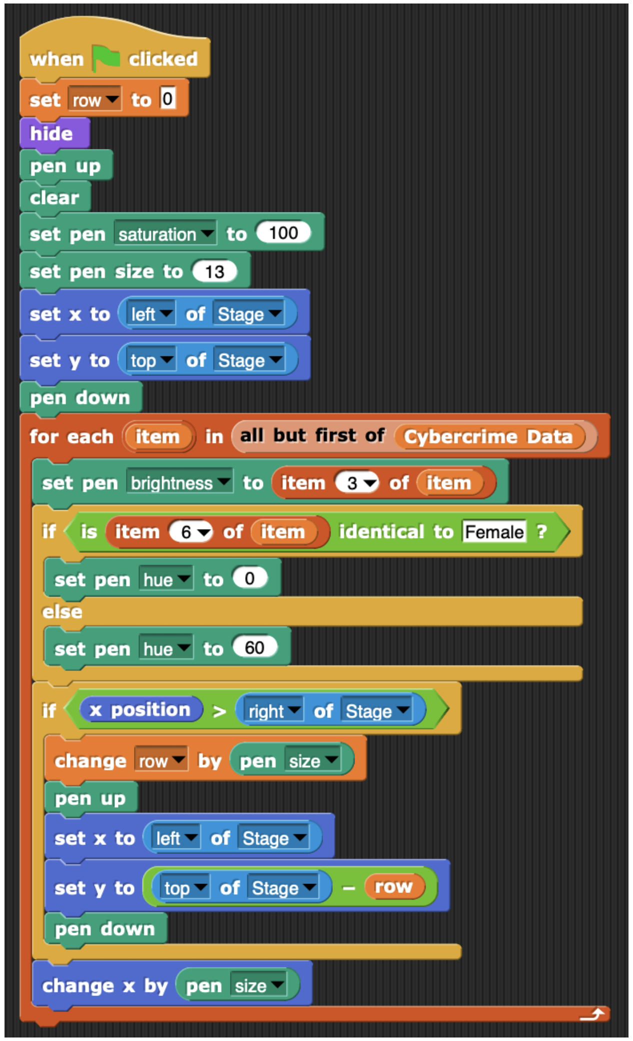
Our Program

- Set the starting conditions, pen attributes, clear the screen, lift the pen
- For each item:
    - Check whether the suspect was Male/Female and set the colour (hue)
    - Set the brightness to the suspect's age
    - Check whether the pen has gone off the right of the stage, if so, go to the next row
    - Move the pen across by the pen size to draw

Full Program

Your completed program should look something like this.





```
when [flag] clicked
set row to 0
hide
pen up
clear
set pen saturation to 100
set pen size to 13
set x to (left of Stage)
set y to (top of Stage)
pen down
for each item in (all but first of Cybercrime Data)
    set pen brightness to (item 3 of item)
    if <is (item 6 of item) identical to Female ?>
        set pen hue to 0
    else
        set pen hue to 60
    if <(x position) > (right of Stage)>
        change row by (pen size)
        pen up
        set x to (left of Stage)
        set y to ((top of Stage) − row)
        pen down
    change x by (pen size)
```

IDEAS

Plot histogram of age – group and sort data, delete empty rows from data

Sort by sentence length

Group by sex

Colour visualtisation of age and sex

Circles visualization of sentences

Keep only earnings over x amount