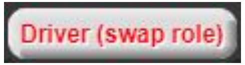
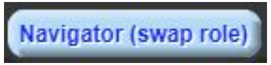
Pair Programming!

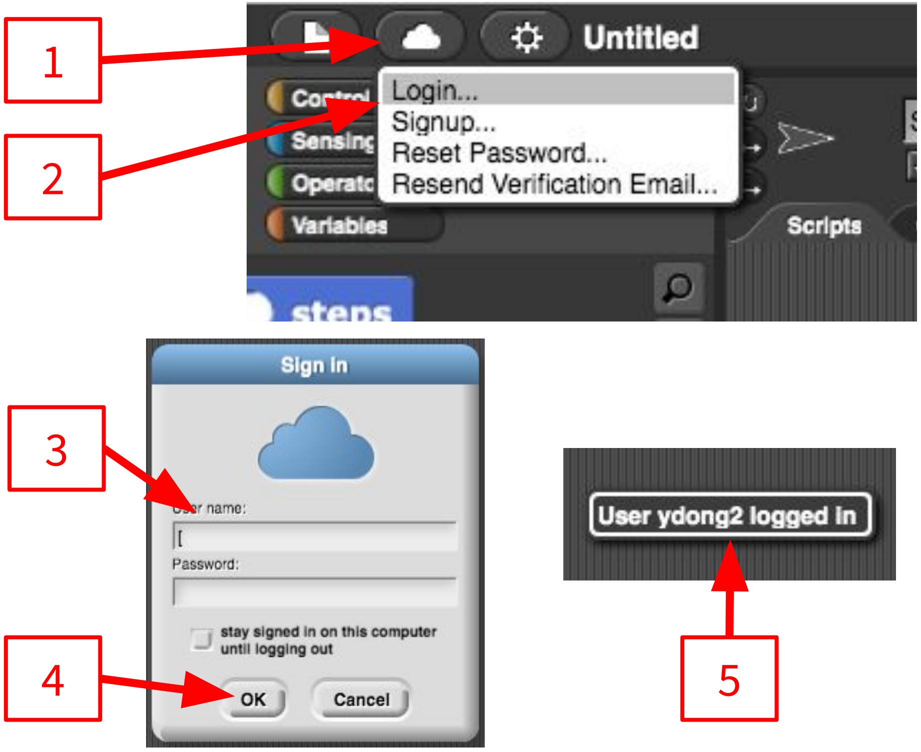
Teacher A: Drive!
Teacher B: Navigate!

1. **Teacher A** should see the  Driver (swap role) button
2. **Teacher B** should see the  Navigator (swap role) button
3. **Teacher A** should **share screen** and **perform all the coding actions**

Login to Snap Cloud

1. Click on the "**Cloud**" Icon
2. Select "**Login...**"
3. Input **Teacher A**'s login information in the pop up window
4. Click on **Okay** button
5. Look for confirmation information

(If neither partner has a Snap! account, click here)



User name:

Password:

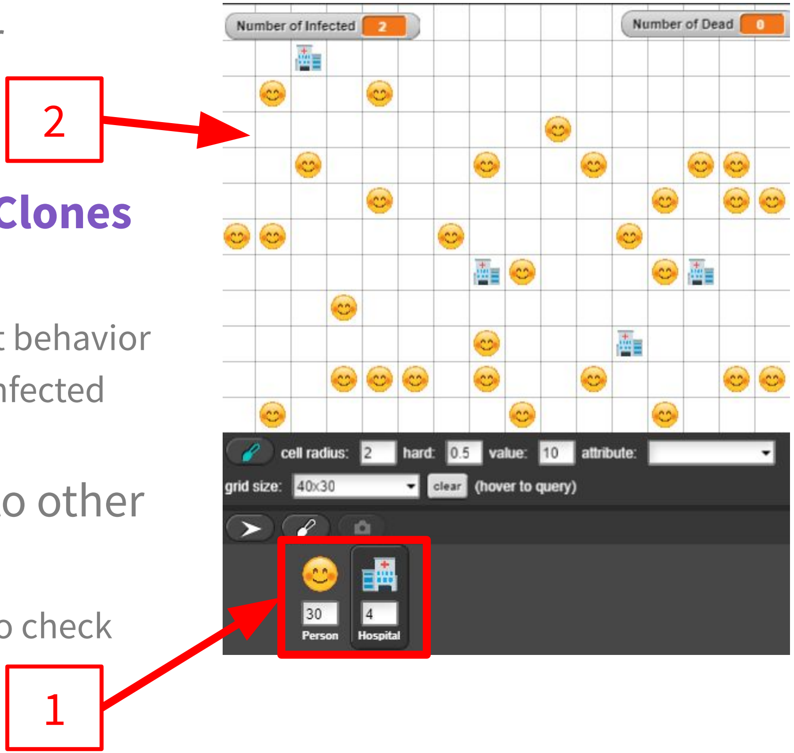
□ stay signed in on this computer until logging out

User ydong2 logged in

Step 1: Learn the Cellular Environment

Cellular: is a version of Snap*!* With a couple minor changes:

1. For each sprite, there can be multiple sprite **Clones** in the world (similar to the weight clones).
   a. These clones are permanent and can have different behavior depending on their current state - e.g. one can be infected while the other is not!
2. These objects exist on a **Grid** and can move to other cells in the grid
   a. You can also use the grid to direct movement and to check whether certain objects are near it



Number of Infected 2

Number of Dead 0

cell radius: 2 hard: 0.5 value: 10 attribute:

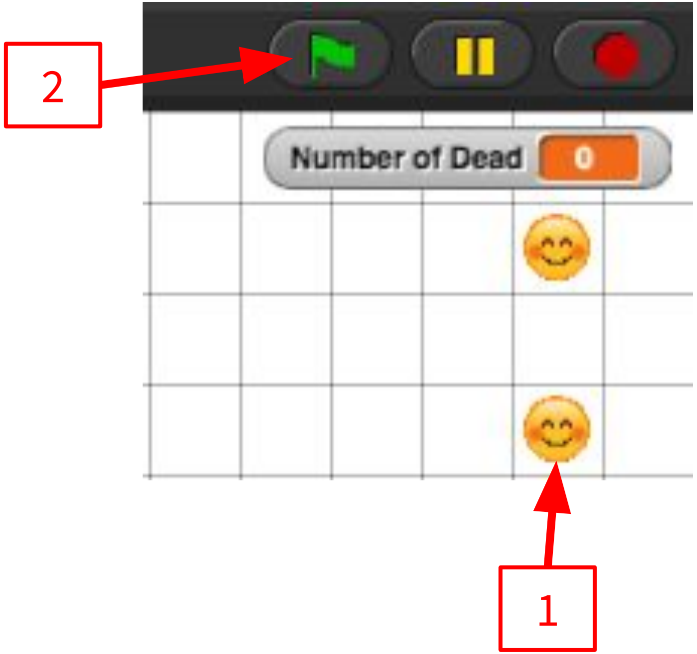
grid size: 40x30

30 Person

4 Hospital

Step 1: Learn the Cellular Environment

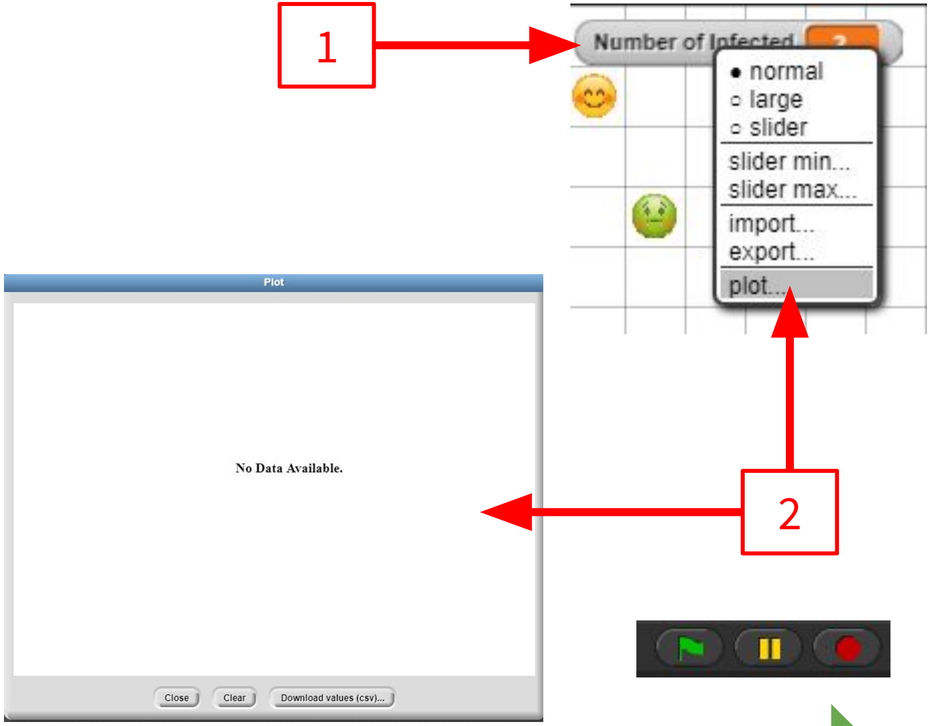
1. Click on one of the "**Person**" sprites on the **Stage** to change them from Healthy to Infected.
   What happens to the "Number of Infected" variable?
2. Run Your Code by clicking the Green Flag.
   What happens to the number of infected variable?
3. You can "**Reset**" the stage (put everyone back to healthy) by clicking the **space key** on the keyboard.



Step 1: Learn the Cellular Environment

Cellular allows us to be able to **graph variables** in the environment.

1. Right Click on the Number of Infected variable in the stage.
2. Select the **Plot…** option from the drop down. You should see a Plot window come up.
3. Now click the **Green Flag** to Run.



No Data Available.

Check your answer

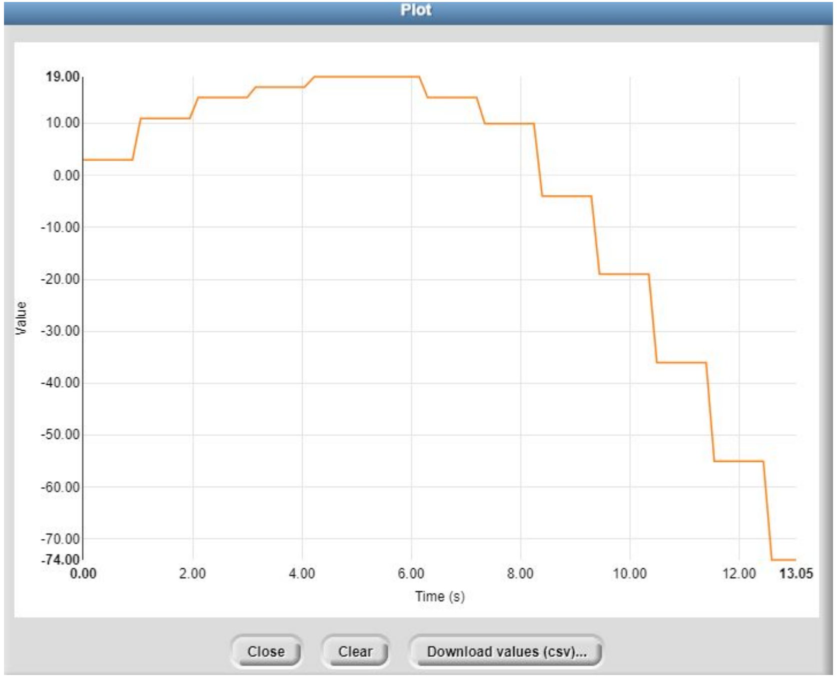
Step 1: Learn the Cellular Environment

When we run the program with our graph, we notice several bugs:

- The number of infected might rise, but eventually it will **dip down into the negative numbers**.
- **Hospitals are moving around** in our environment. We don't want that!

Clearly, our code needs to be debugged!

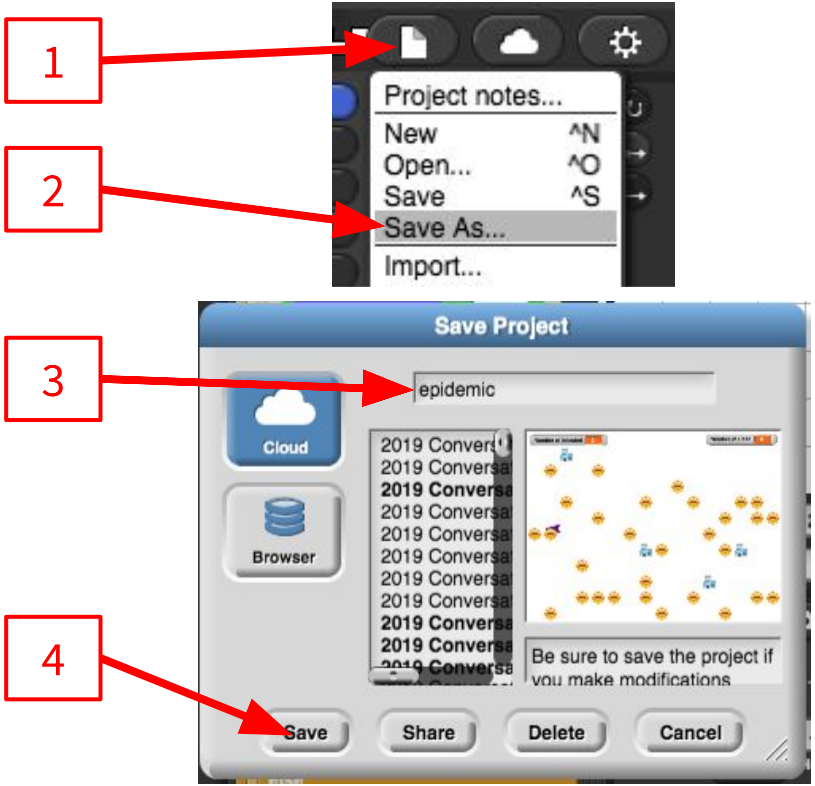
Close the Plot window using the **Close button**.



Save Your Code

It's a good practice to Save your code every time you finish something!

1. Click the **File Icon**
2. Click "**Save as...**"
3. Type in "**epidemic**"
4. Click on the **Save** button



epidemic

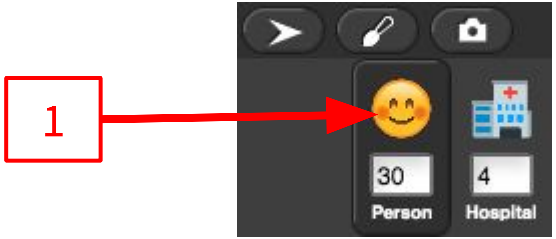
Be sure to save the project if you make modifications

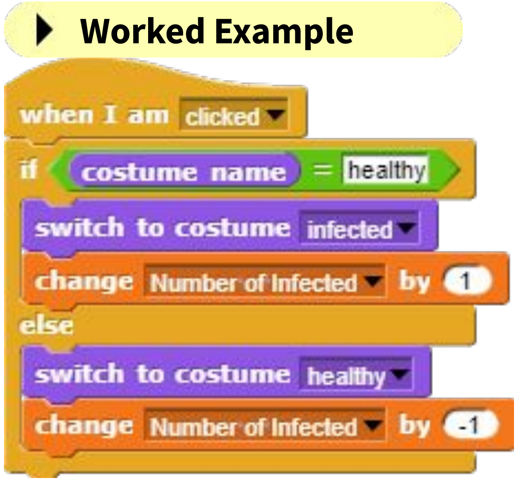
Step 2: Making the Hospital Switch

Now, we're making it so the **Hospital switches to Ambulance when clicked**.

Let's first begin by looking at this section of code in the **Person** sprite.

1. Click on the **Person** sprite
2. Find the script on the right
3. Discuss with your partner what this script does?



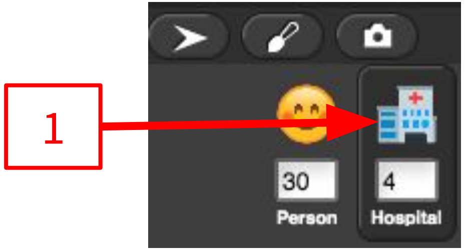


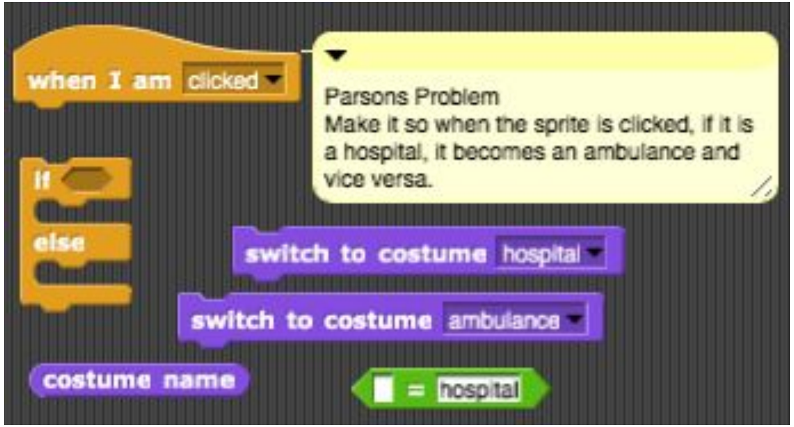
```
Worked Example
when I am clicked
if costume name = healthy
    switch to costume infected
    change Number of Infected by 1
else
    switch to costume healthy
    change Number of Infected by -1
```

Step 2: Making the Hospital Switch

The Hospital sprite should have similar behavior as the Person sprite when clicked.

1. Click on the **Hospital** sprite
2. Find the **parson's problem**
3. Follow the **patterns** in the Person's code, solve the person's problem to **make the hospital switch to an ambulance when clicked** (and vice versa)





```
when I am clicked
if
else
switch to costume hospital
switch to costume ambulance
costume name
= hospital
```

Parsons Problem
Make it so when the sprite is clicked, if it is a hospital, it becomes an ambulance and vice versa.

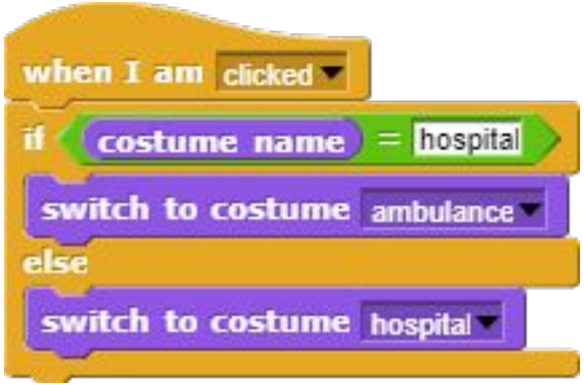
Check your answer

Step 2: How does your code compare?

Is this what your code looks like?.

If your code **looks different and still works**, that doesn't mean it is wrong.

There is **more than one** way you could have changed your code.

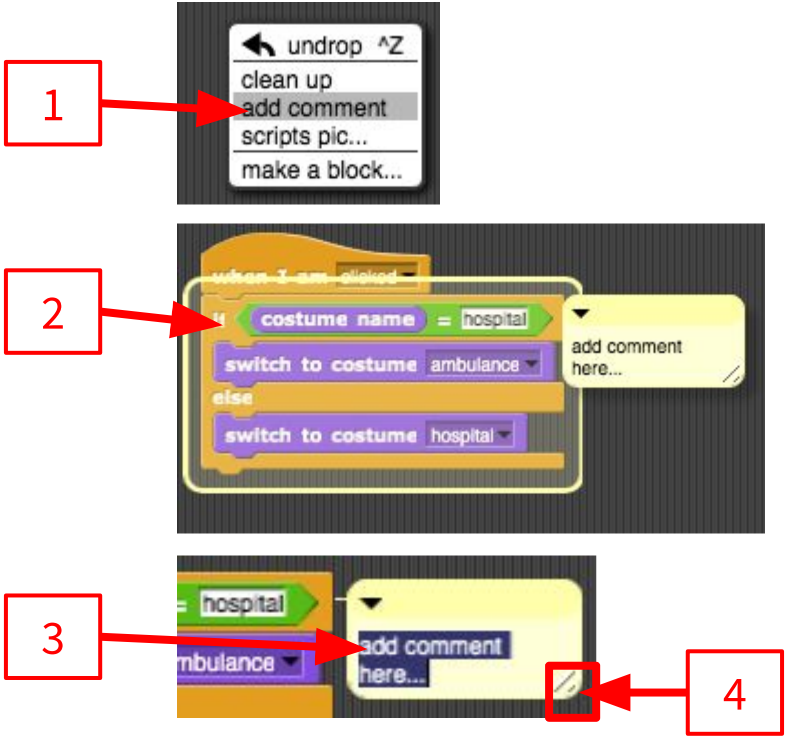


```
when I am clicked
if costume name = hospital
    switch to costume ambulance
else
    switch to costume hospital
```

Step 2: How does your code compare?

Let's add a comment to the script about the Computational Thinking that you found in this script.

1. Right click anywhere in the **script** area.
2. Choose "**add comment**" option
3. Replace the text of the comment with an **explanation of the Decomposition** that you found in this code.
4. Hold the **right bottom corner** of the comment to **resize** the comment

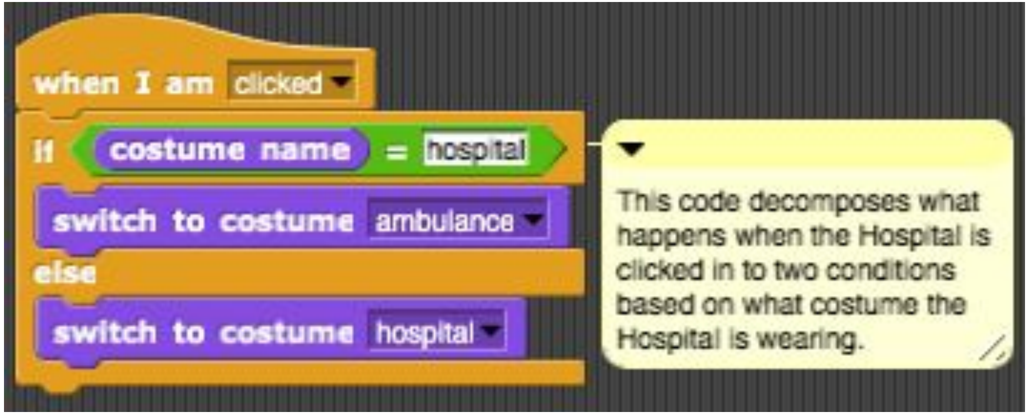


```
when I am clicked
if costume name = hospital
    switch to costume ambulance
else
    switch to costume hospital
```

Step 2: How does your code compare?

Here is an explanation that we came up with.

How does yours compare?



```
when I am clicked
if costume name = hospital
    switch to costume ambulance
else
    switch to costume hospital
```

This code decomposes what happens when the Hospital is clicked in to two conditions based on what costume the Hospital is wearing.

Decomposition

How did you explain **Decomposition** in the code?

Save your code!

Switch for the next activity!

Teacher A: Navigate!
Teacher B: Drive!

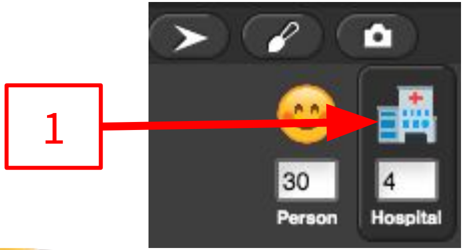
1. **Teacher A** Click on the Driver (swap role) button to switch to Navigator
2. **After** Teacher A switched to Navigator, **teacher B** click on the Navigator (swap role) to switch to Driver
3. **Teacher B** should **share screen** and **perform all the coding actions**

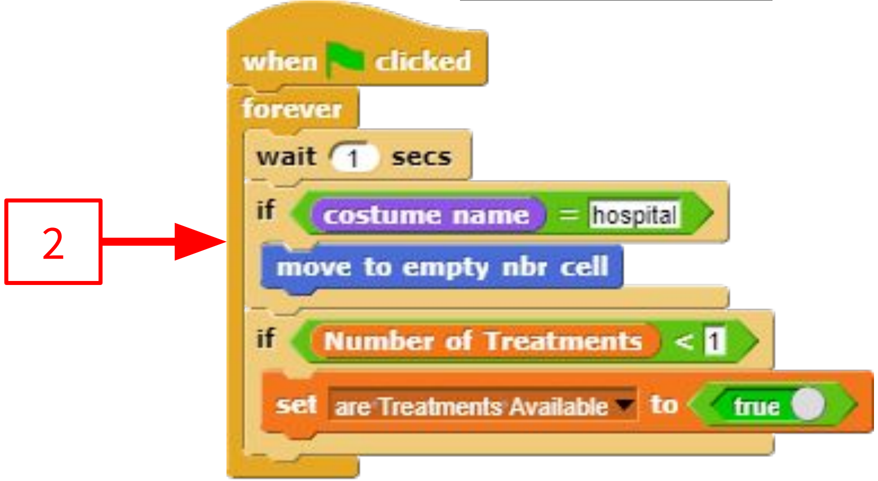
Step 3: Fix the Moving Hospital

Hospital does not move. Ambulance does.

Let's **fix the bug** where the Hospital moves around like an ambulance.

1. Make sure you're in the **Hospital** Sprite.
2. Find this **script**.





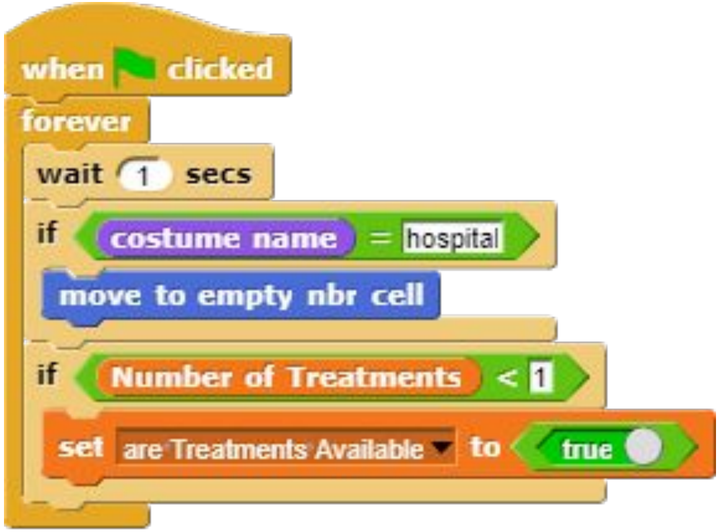
```
when ⚑ clicked
forever
    wait (1) secs
    if <(costume name) = [hospital]>
        move to empty nbr cell
    if <(Number of Treatments) < [1]>
        set [are Treatments Available ▾] to <true>
```

Step 3: Fix the Moving Hospital

The code **SHOULD** make it so that the Hospital only moves **IF** it the sprite *looks like* an **ambulance**. It should also make the variable "are treatments available" **FALSE IF** "number of treatments" is less than 1.

1. Work with your partner to **fix the bug in this buggy code**.

▶ **Buggy Code**



```
when clicked
forever
  wait 1 secs
  if costume name = hospital
    move to empty nbr cell
  if Number of Treatments < 1
    set are Treatments Available to true
```

Check your answer

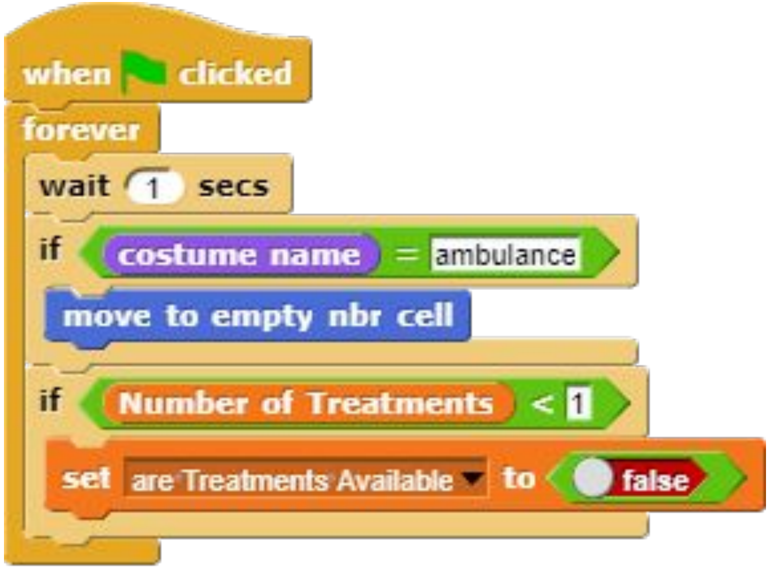
Step 3: How does your code compare?

Is this what your code looks like?

1. Run your code again to see if the **Hospital stands still while the Ambulance moves**

This is awesome! Great Job!

2. Attach a **comment** to the script describing **all** the **Computational Thinking elements** that you see in this script



```
when ⚑ clicked
forever
  wait (1) secs
  if <(costume name) = [ambulance]>
    move to empty nbr cell
  if <(Number of Treatments) < [1]>
    set [are Treatments Available ▾] to <false>
```

Save your code!

Step 4: Understand Person's Code

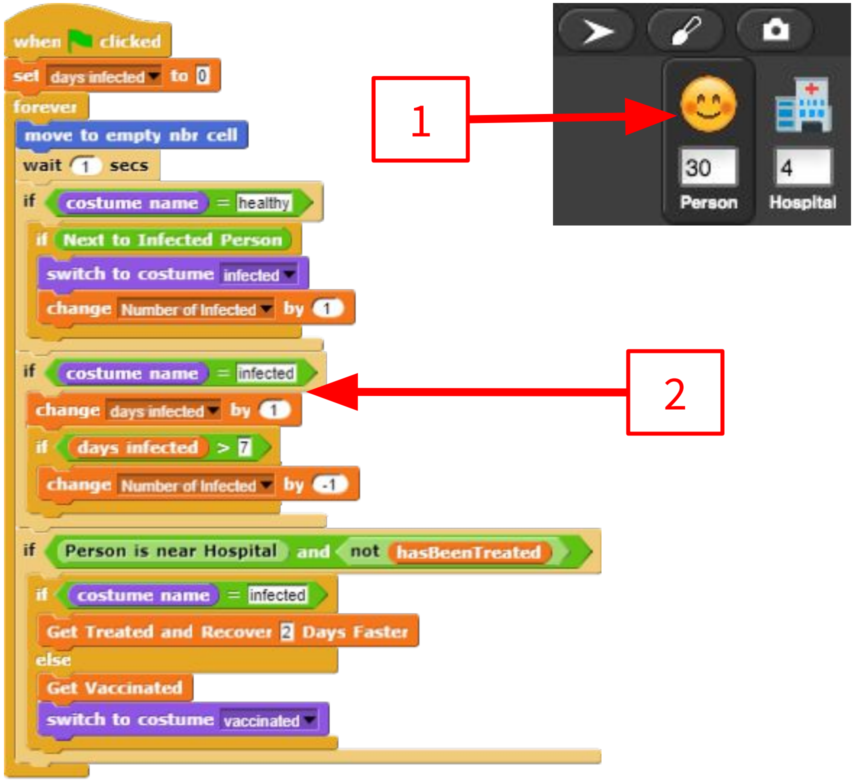
Now, let's try to understand what the largest code in the **Person** sprite does.

Don't worry, we will use **Decomposition** to break down the code into cases to make it easier to understand!

1. Switch back to the **Person** sprite
2. Find this **script**

Decomposition

In this simulation, cases are **decomposed** by **health status**.



```
when ⚑ clicked
set days infected to 0
forever
    move to empty nbr cell
    wait 1 secs
    if costume name = healthy
        if Next to Infected Person
            switch to costume infected
            change Number of Infected by 1
    if costume name = infected
        change days infected by 1
        if days infected > 7
            change Number of Infected by -1
    if Person is near Hospital and not hasBeenTreated
        if costume name = infected
            Get Treated and Recover 2 Days Faster
        else
            Get Vaccinated
            switch to costume vaccinated
```

Step 4: Understand Person's Code

Look at the code inside the forever loop. It will move to empty neighbor cell each time.

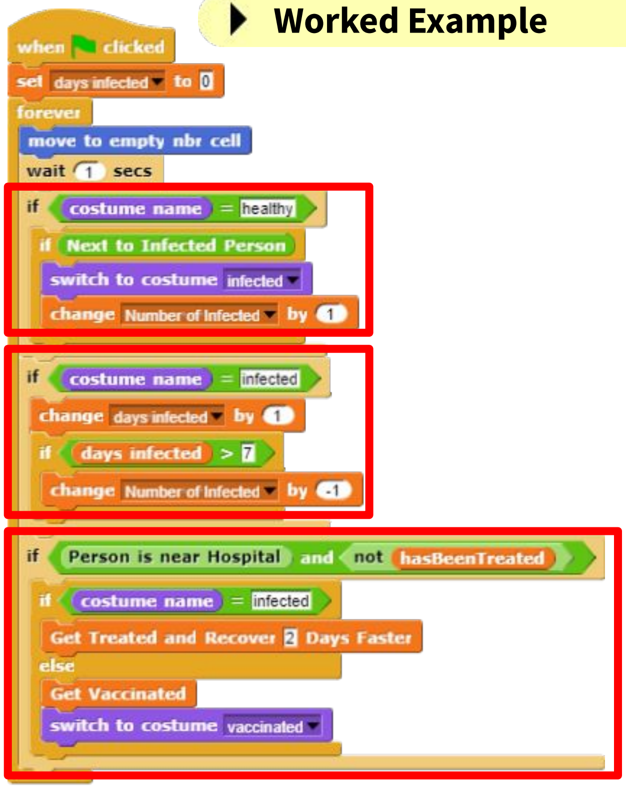
You can think of the code as having 3 "Cases".

1. Case when the sprite is "Healthy"
2. Case when the sprite is "Infected"
3. Case when the sprite is near a hospital and has not been treated yet.

Decomposition

Coding a simulation naturally requires programmers to use **Decomposition** to **break** the **problem** into different **situations** using **if** blocks to tackle each situation accordingly.

▶ **Worked Example**



```
when ⚑ clicked
set days infected ▾ to 0
forever
  move to empty nbr cell
  wait 1 secs
  if costume name = healthy
    if Next to Infected Person
      switch to costume infected ▾
      change Number of Infected ▾ by 1
  if costume name = infected
    change days infected ▾ by 1
    if days infected > 7
      change Number of Infected ▾ by -1
  if Person is near Hospital and not hasBeenTreated
    if costume name = infected
      Get Treated and Recover 2 Days Faster
    else
      Get Vaccinated
      switch to costume vaccinated ▾
```

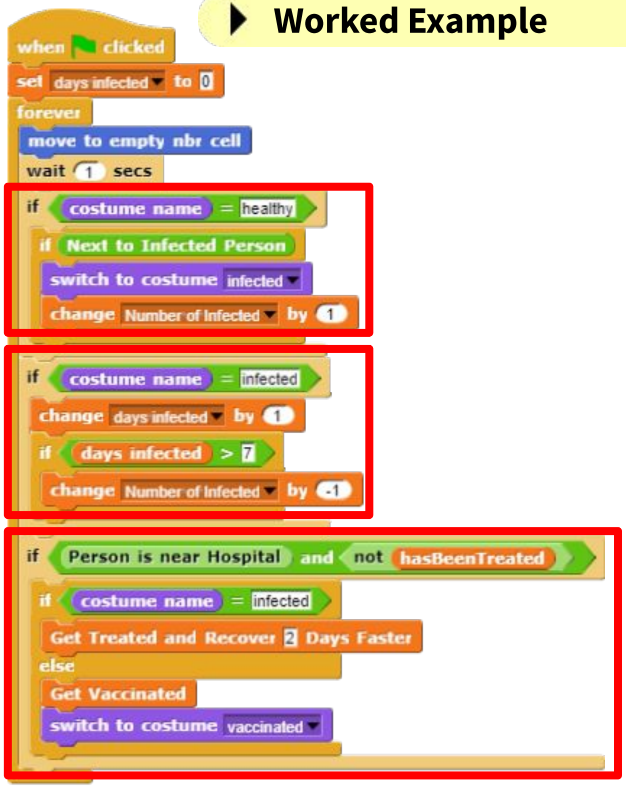
Step 4: Understand Person's Code

1. For each of the three **if** blocks, discuss with you partner:
   a. What does the **if** condition check for?
   b. What does the code **do if** the condition is true?
2. Add a **comment** to each if block with **your answers** to the above questions.

Decomposition

Decomposition skill makes things more **manageable** when reading a complex code, or **solving a complex problem in the real world**!

▶ **Worked Example**

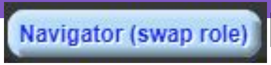
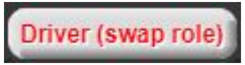


```
when 🏁 clicked
set days infected ▾ to 0
forever
  move to empty nbr cell
  wait 1 secs
  if costume name = healthy
    if Next to Infected Person
      switch to costume infected ▾
      change Number of Infected ▾ by 1
  if costume name = infected
    change days infected ▾ by 1
    if days infected > 7
      change Number of Infected ▾ by -1
  if Person is near Hospital and not hasBeenTreated
    if costume name = infected
      Get Treated and Recover 2 Days Faster
    else
      Get Vaccinated
      switch to costume vaccinated ▾
```

Save your code!

Switch for the next activity!

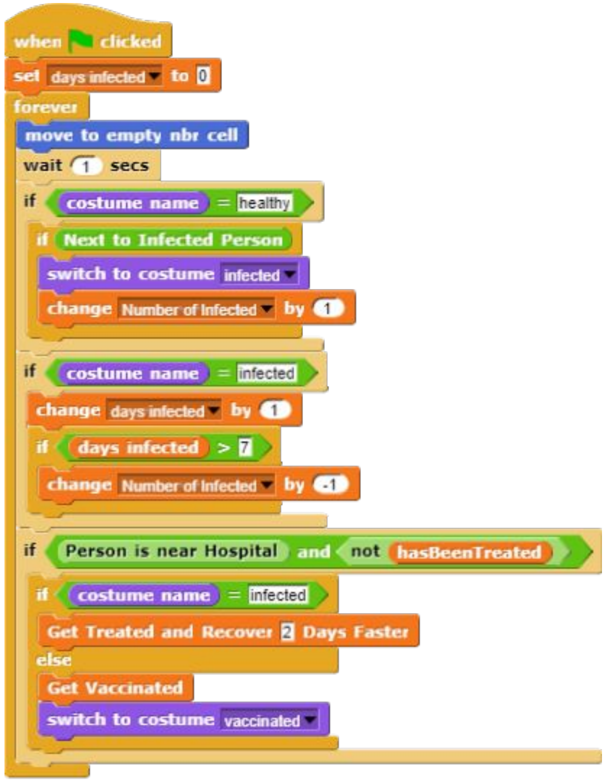
Teacher A: Drive!
Teacher B: Navigate!

1. **Teacher A** Click on the  button to switch to Driver
2. **After** Teacher A switched to Navigator, **teacher B** click on the  to switch to Navigator
3. **Teacher A** should **share screen** and **perform all the coding actions**

Step 5: Extend Person's Behavior

Now that you have a better understanding of the Person's code, let's modify it to extend the Person's behavior.

Just like some diseases in real life, the Person should die if the person is infected and hasn't been treated in 7 days.

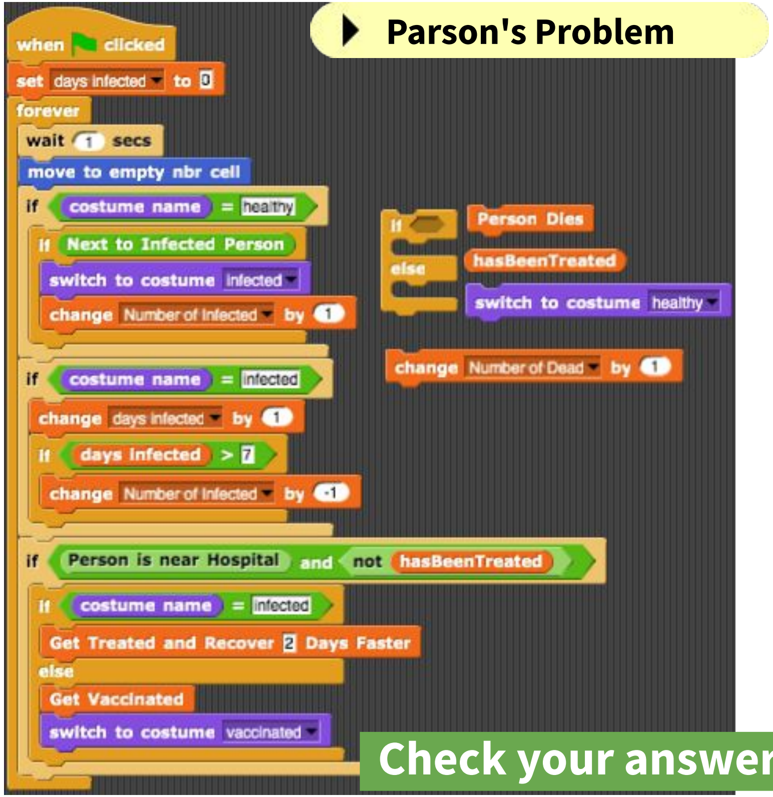


```
when ⚑ clicked
set days infected to 0
forever
  move to empty nbr cell
  wait 1 secs
  if costume name = healthy
    if Next to Infected Person
      switch to costume infected
      change Number of Infected by 1
  if costume name = infected
    change days infected by 1
    if days infected > 7
      change Number of Infected by -1
  if Person is near Hospital and not hasBeenTreated
    if costume name = infected
      Get Treated and Recover 2 Days Faster
    else
      Get Vaccinated
      switch to costume vaccinated
```

Step 5: Extend Person's Behavior

We'd like to modify the person script so that **IF** a person is infected and **IF** the number of days infected is greater than 7, we check to see if they have been treated. **IF** they have, we switch them back to being healthy. **ELSE**, they **DIE**.

1. Using the **blocks provided**, figure out **how to snap** the blocks together and **where to put** the **if-else** block to make this behavior work properly.



▶ Parson's Problem

```
when ⚑ clicked
set days infected to 0
forever
  wait 1 secs
  move to empty nbr cell
  if costume name = healthy
    if Next to Infected Person
      switch to costume infected
      change Number of Infected by 1
  if costume name = infected
    change days infected by 1
    if days infected > 7
      change Number of Infected by -1
  if Person is near Hospital and not hasBeenTreated
    if costume name = infected
      Get Treated and Recover 2 Days Faster
    else
      Get Vaccinated
      switch to costume vaccinated
```

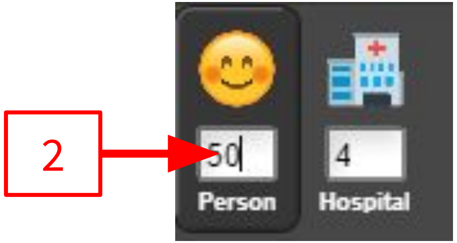
```
if
else

Person Dies
hasBeenTreated
switch to costume healthy

change Number of Dead by 1
```

Check your answer

Step 5: Extend Person's Behavior

How does your code compare?

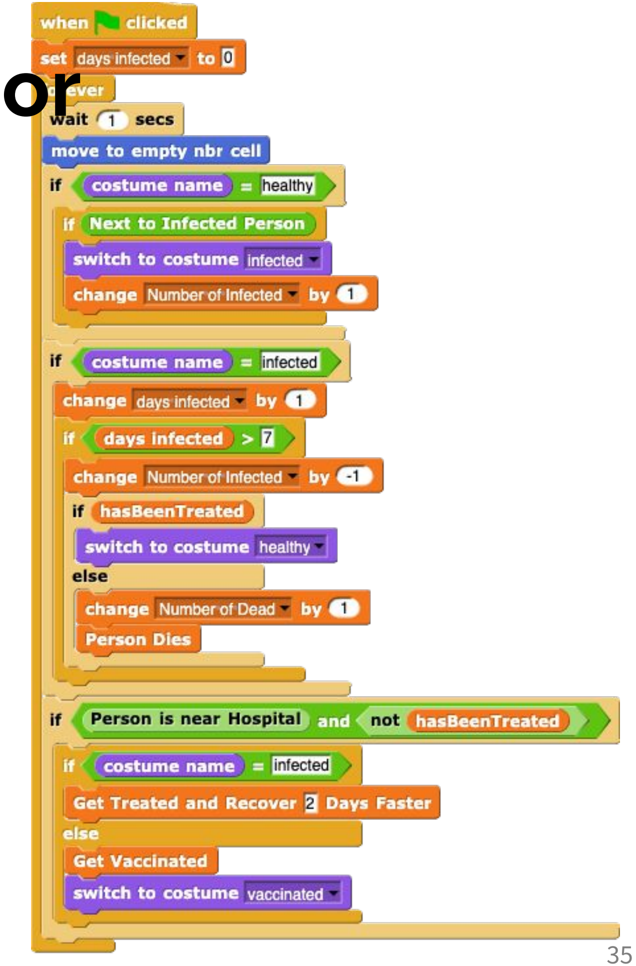
1. Run the simulation and see if **persons** are **dying of the disease**.
2. If you lose too many people, make sure to **re-add** them by **typing** in 50 into the **Person** tab.
3. Add a **comment** to the code explaining what it does.



2

Person: 50

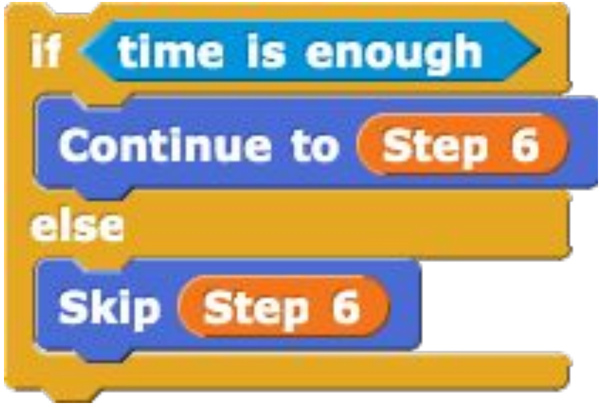
Hospital: 4



```
when clicked
set days infected to 0
forever
    wait 1 secs
    move to empty nbr cell
    if costume name = healthy
        if Next to Infected Person
            switch to costume infected
            change Number of Infected by 1
    if costume name = infected
        change days infected by 1
        if days infected > 7
            change Number of Infected by -1
            if hasBeenTreated
                switch to costume healthy
            else
                change Number of Dead by 1
                Person Dies
    if Person is near Hospital and not hasBeenTreated
        if costume name = infected
            Get Treated and Recover 2 Days Faster
        else
            Get Vaccinated
            switch to costume vaccinated
```

Save your code!

If there is time……



```
if time is enough
    Continue to Step 6
else
    Skip Step 6
```

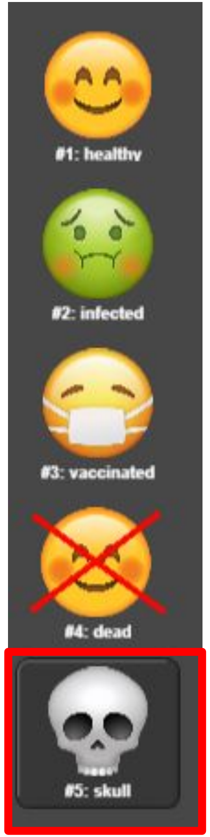
Do you see any **Computational Thinking** PRADA elements in the above sequence?

Step 6: Add Costume for Dead

Now, we don't have a good costume for the dead in this project. We are going to add a dead costume.

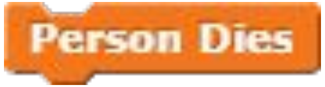
1. Download the **image** from Google Drive using this link.
2. Drag and drop the downloaded image in to the **script area** of the **Person** sprite

You should now see the Skull costume



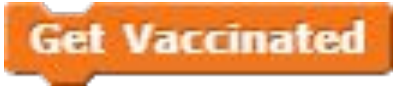
Step 6: Add Costume for Dead

We'd like to change the code such that when the person dies, it changes to the Skull costume.

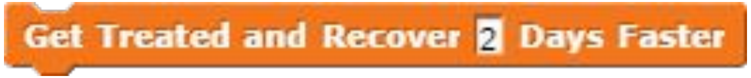


Person Dies

There are several custom blocks that **ABSTRACT** code away.



Get Vaccinated



Get Treated and Recover 2 Days Faster

1. Based on the **name of the custom blocks**, decide **which block** we should edit the change costume action?

Abstractions

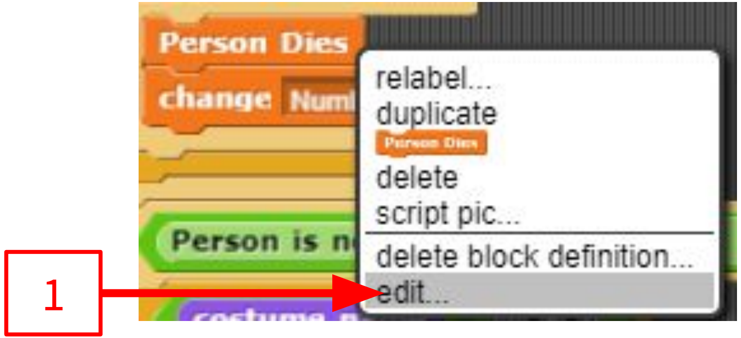
Giving a **meaningful name** to the code you **Abstract** away in custom blocks make the code more **readable** and **manageable**.

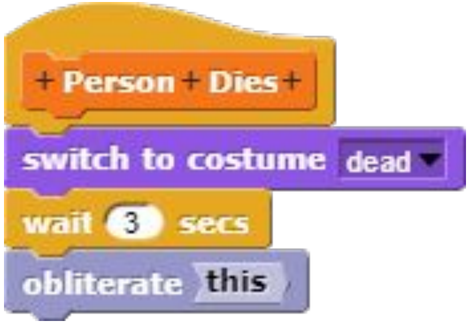
Check your answer

Step 6: Add Costume for Dead

We should be changing the **Person Dies** custom block.

1. Right click and edit the **Person Dies** custom block to **change to the newly added costume** when a person dies.





```
+ Person + Dies +
switch to costume dead
wait 3 secs
obliterate this
```

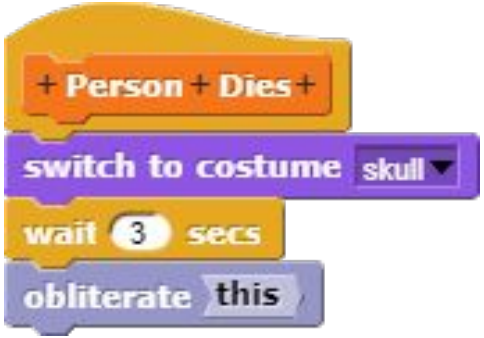
Check your answer

Step 6: Add Costume for Dead

Is this what your code looks like?

1. Run the simulation and see if the person **changes to the dead costume** when they die.

Yay, you did it! Awesome!



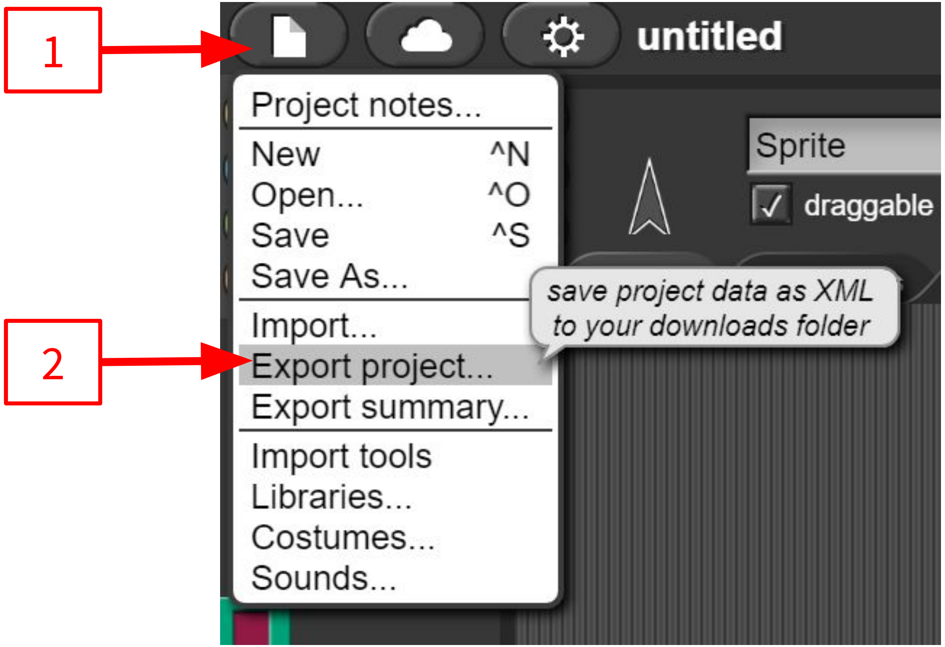
```
+ Person + Dies +
switch to costume skull
wait 3 secs
obliterate this
```

Save your code!

You've Completed Activity 1!

If you want to export and download the project to your computer, here is how:

1. Click on the File Menu
2. Select Export project
3. Choose where you want to save the project file and click save



save project data as XML to your downloads folder