

MIT AI2 204

IoT with MIT App Inventor

Fundamental

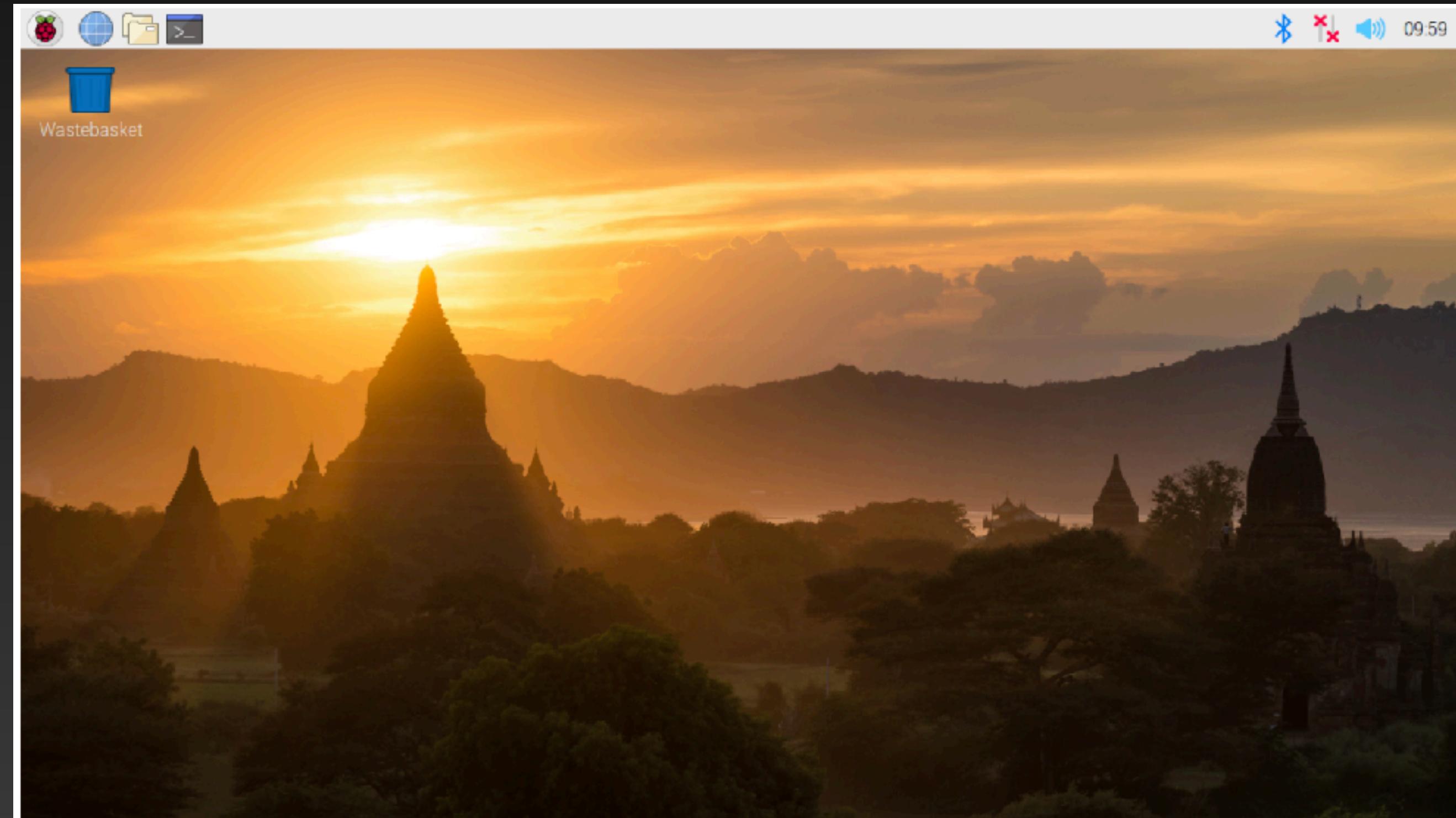
Xincheng Tang

Using your Raspberry Pi

Raspberry Pi Desktop

Your Raspberry Pi runs Raspberry Pi OS, a version of an operating system (OS) called Linux.
(Windows and macOS are other common operating systems.)

After Raspberry Pi OS starts up, you will see the Desktop appear.

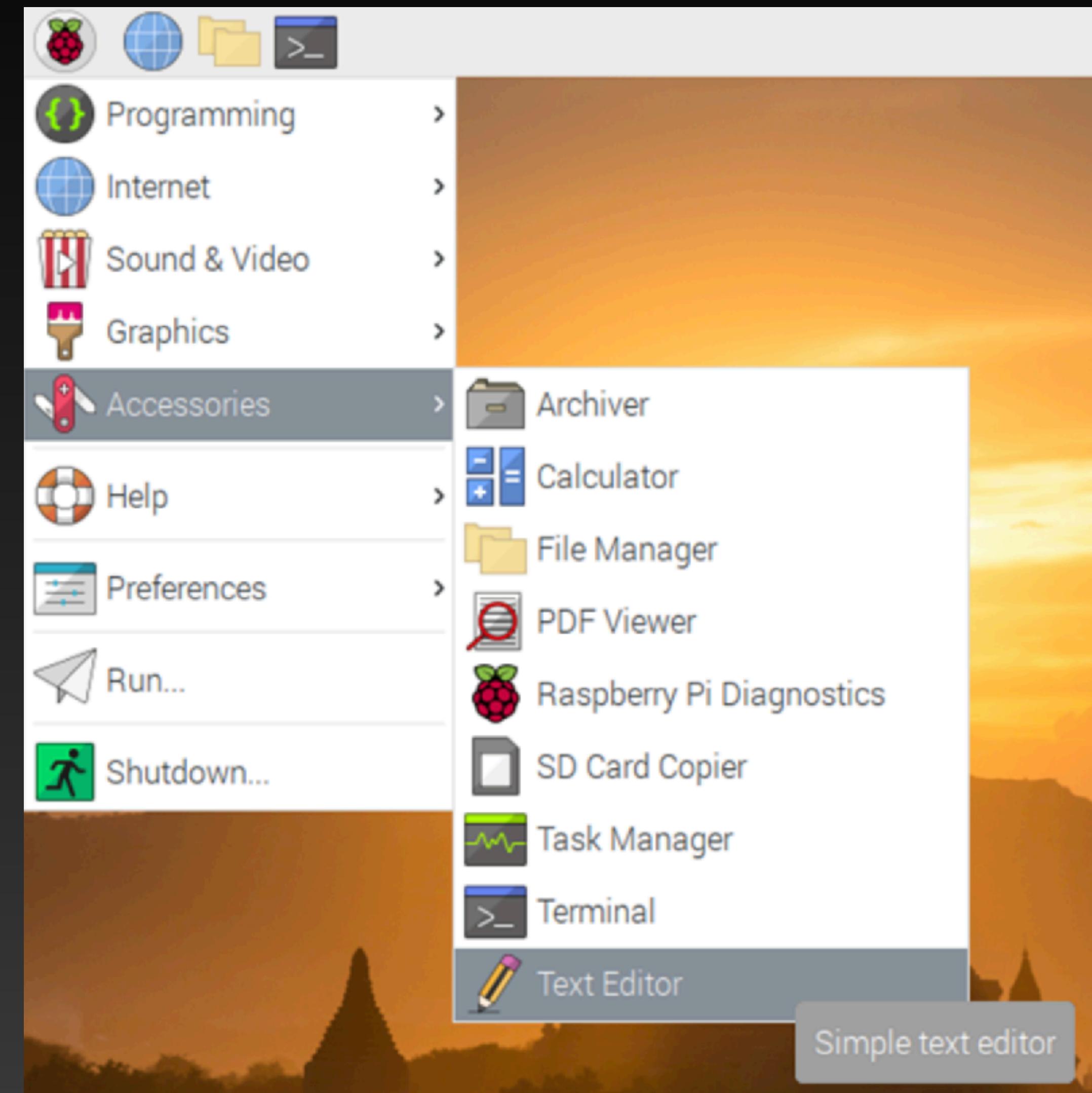


Using your Raspberry Pi

The Raspberry Pi icon in the top left-hand corner is where you access the menu.

Click on it to find lots of applications, including Programming applications.

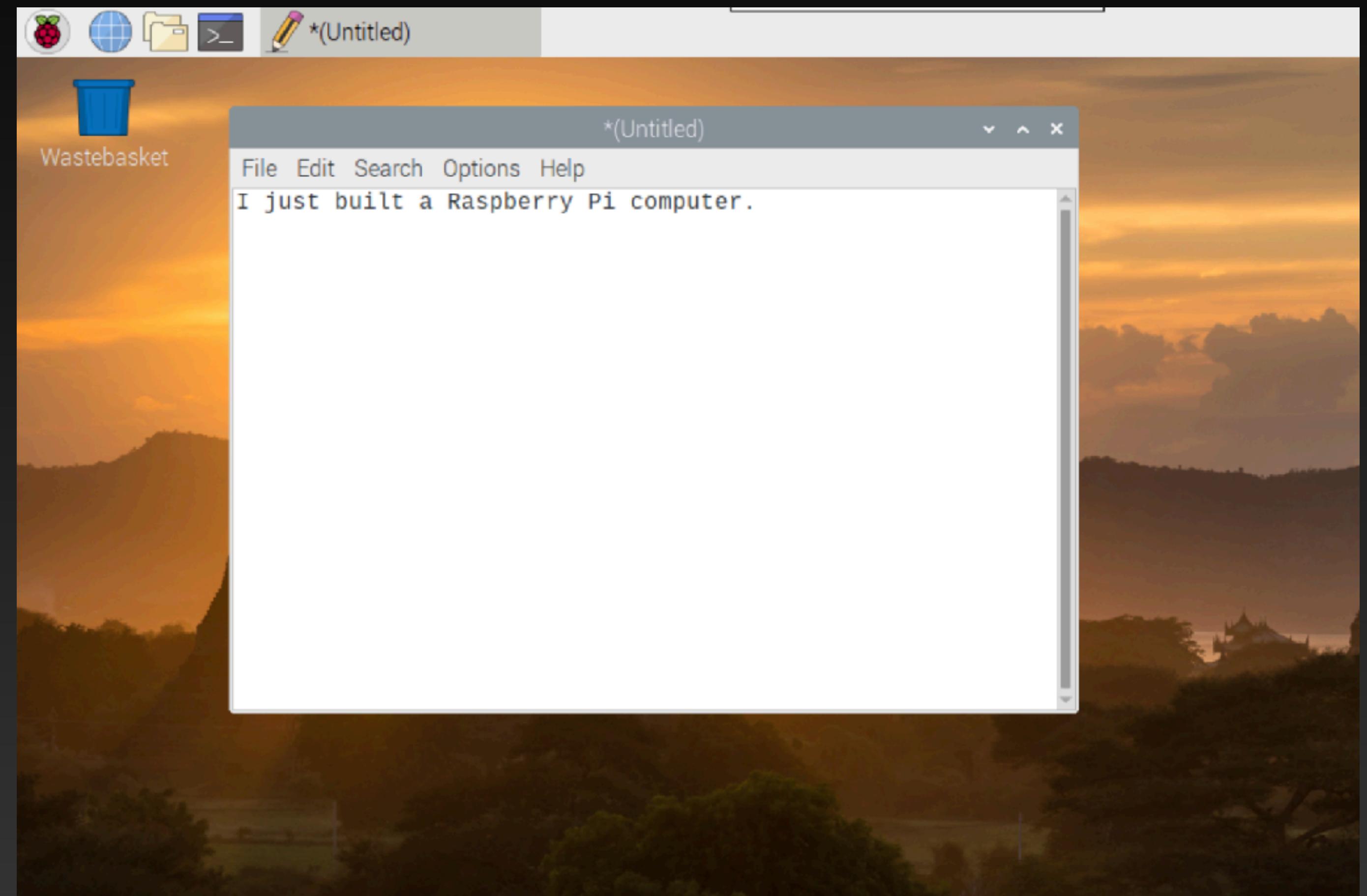
To open a text editor, click on Accessories and choose Text Editor.



Using your Raspberry Pi

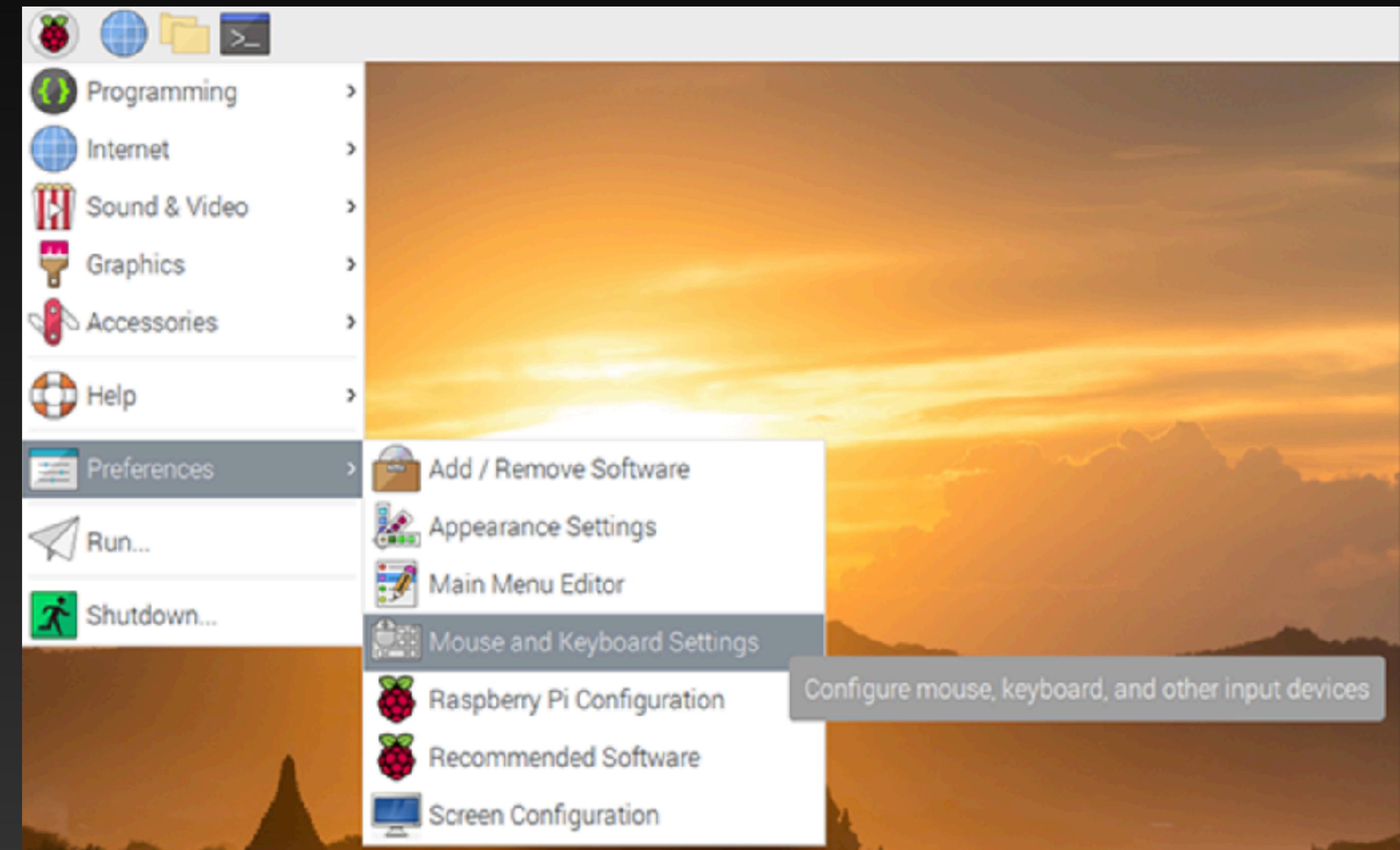
Close the text editor by clicking the x in the top right-hand corner of the window.

Explore what other applications are currently available in the menu.



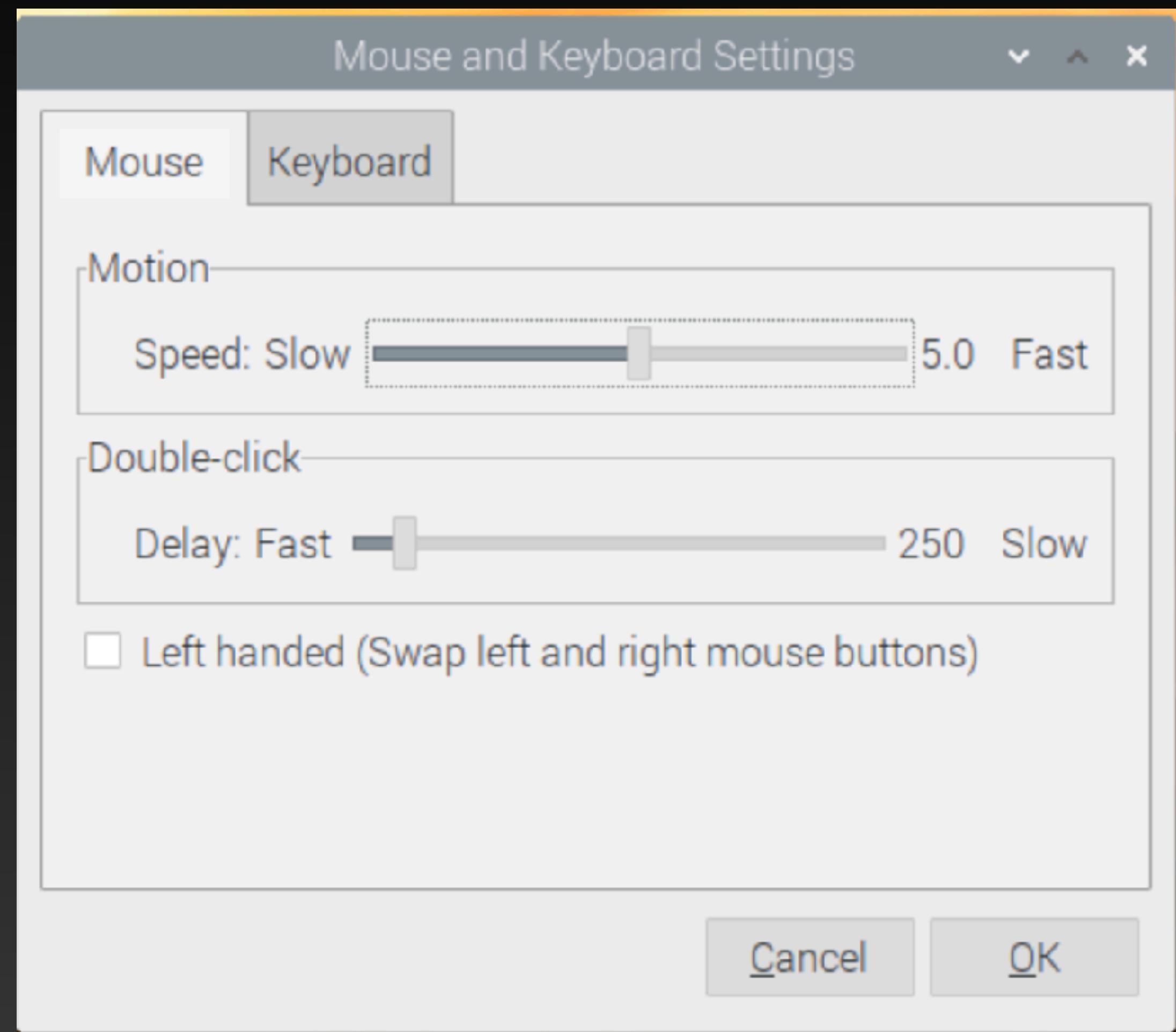
Using your Raspberry Pi

To set up your mouse and keyboard, select Preferences and then Mouse and Keyboard Settings from the menu.



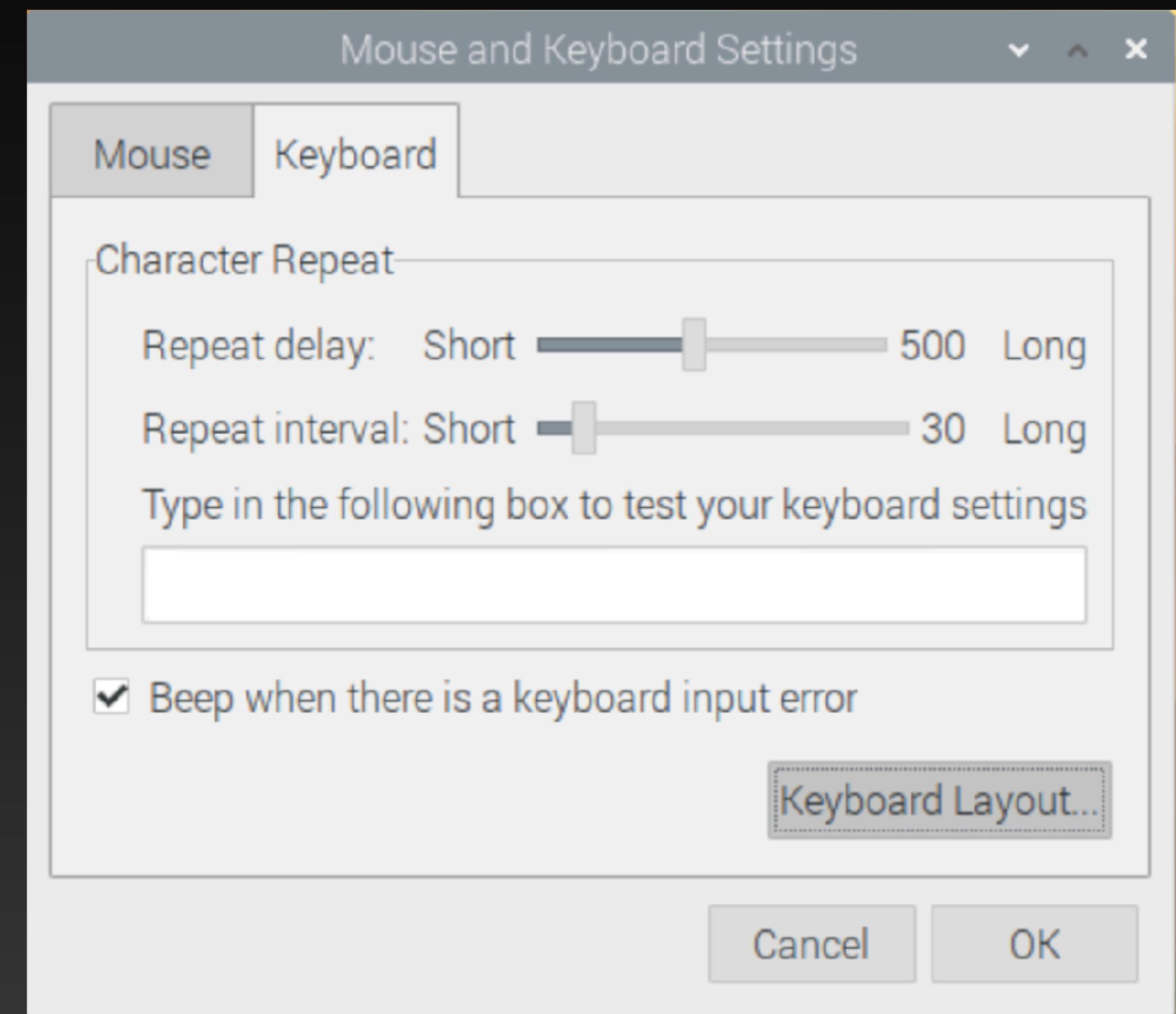
Using your Raspberry Pi

You can change the mouse speed and double-click time here, and swap the buttons if you are left-handed.



Using your Raspberry Pi

You can adjust the key repeat delay and interval values here.

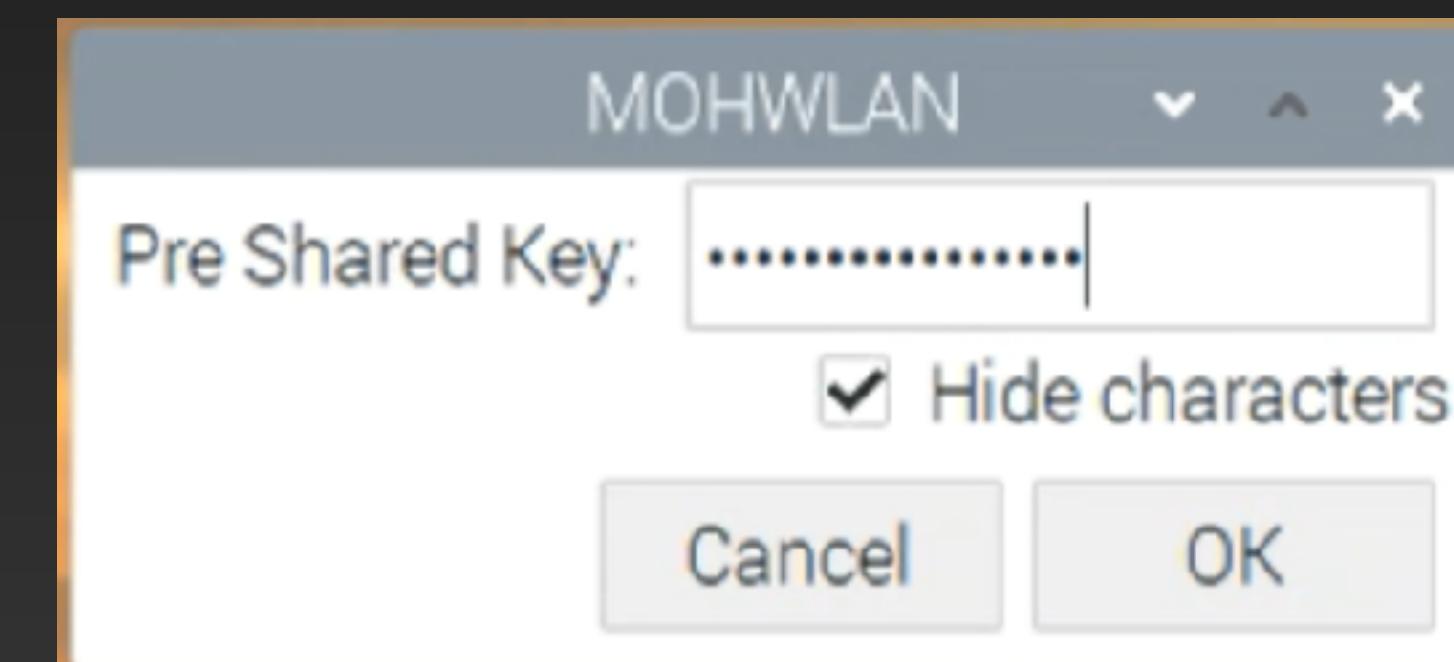
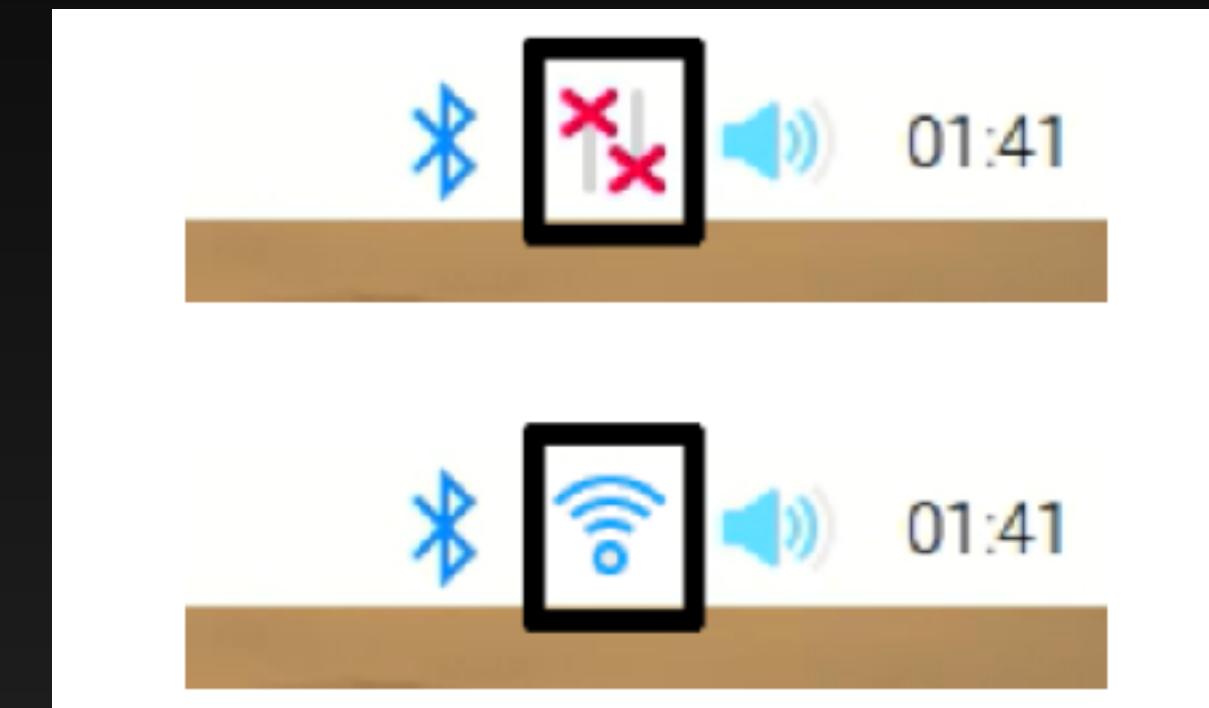


Using your Raspberry Pi

Connecting to a wireless network

Click on the wireless network icon in the top right-hand corner of the screen, and select your network from the drop-down menu.

Type in the password for your wireless network, then click on OK.

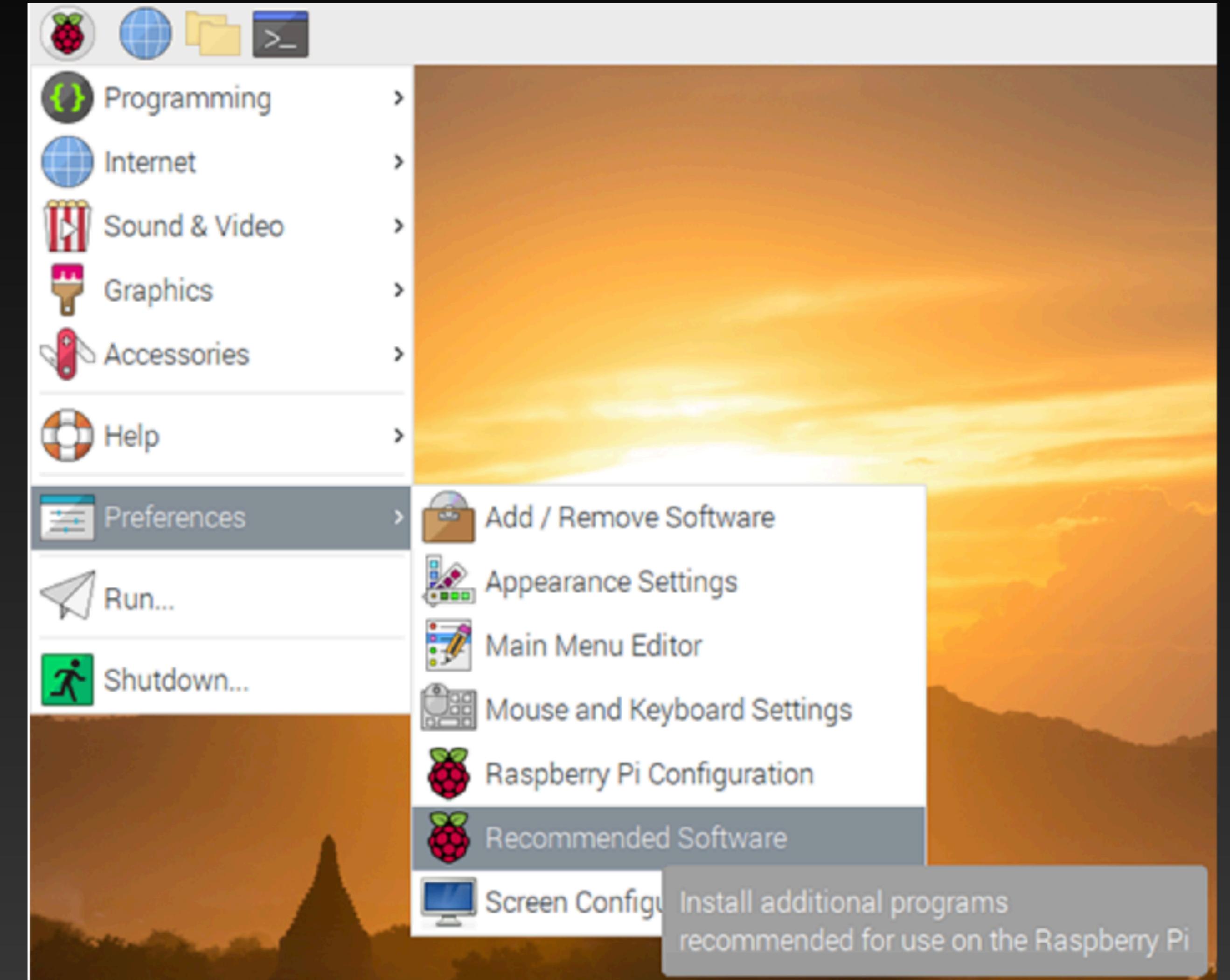


Using your Raspberry Pi

There are many, many software programs and applications you can download and install on Raspberry Pi.

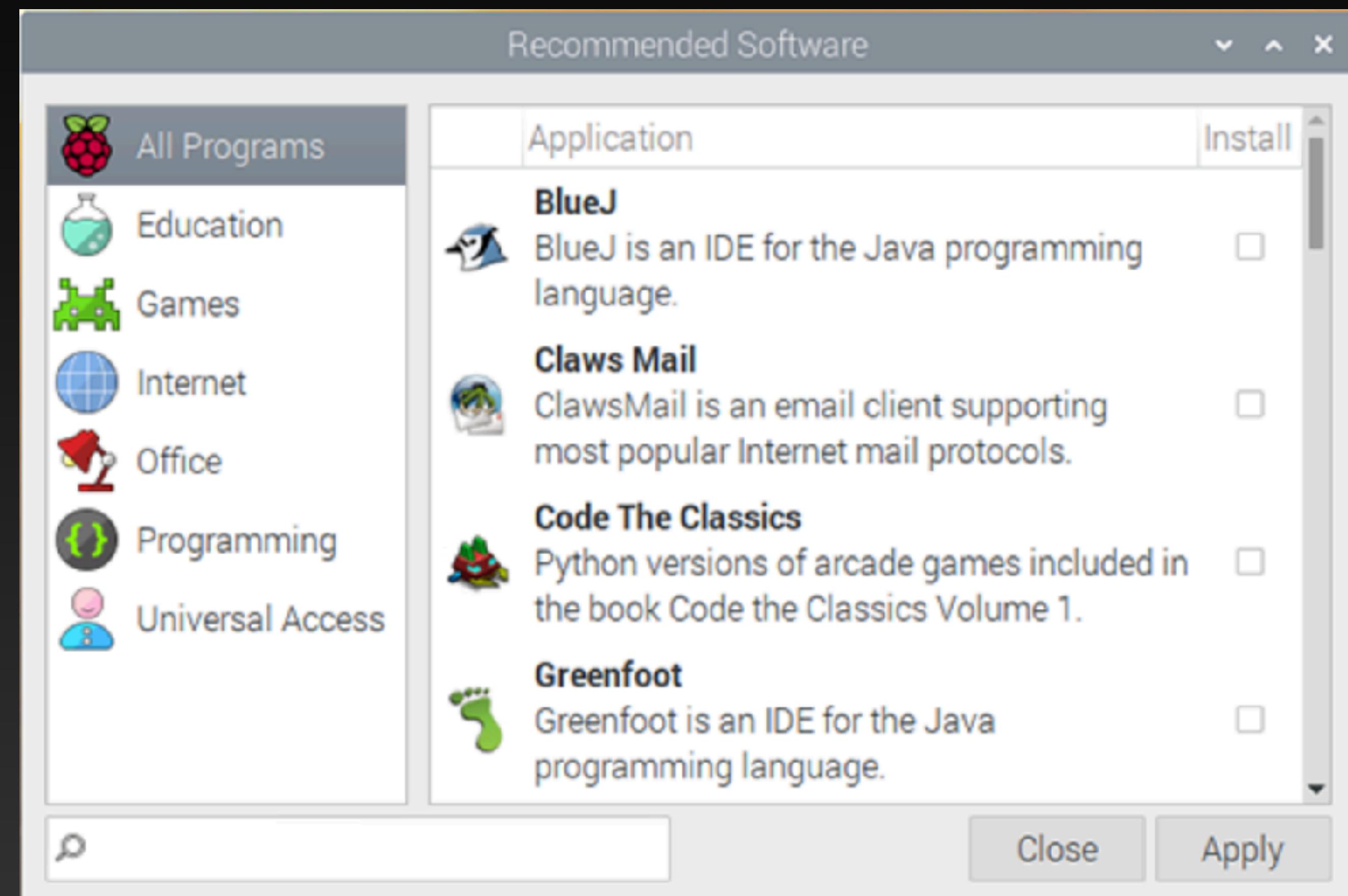
Note: Your Raspberry Pi has to be connected to the internet before you can install software.

In the menu, click on Preferences and then on Recommended Software.



Using your Raspberry Pi

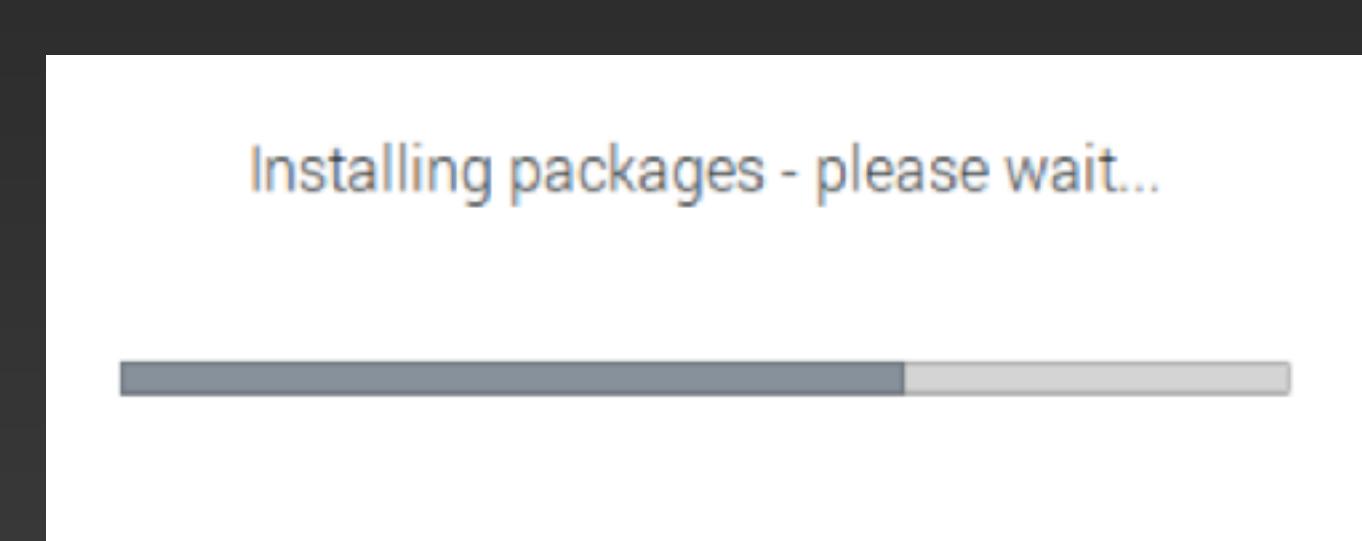
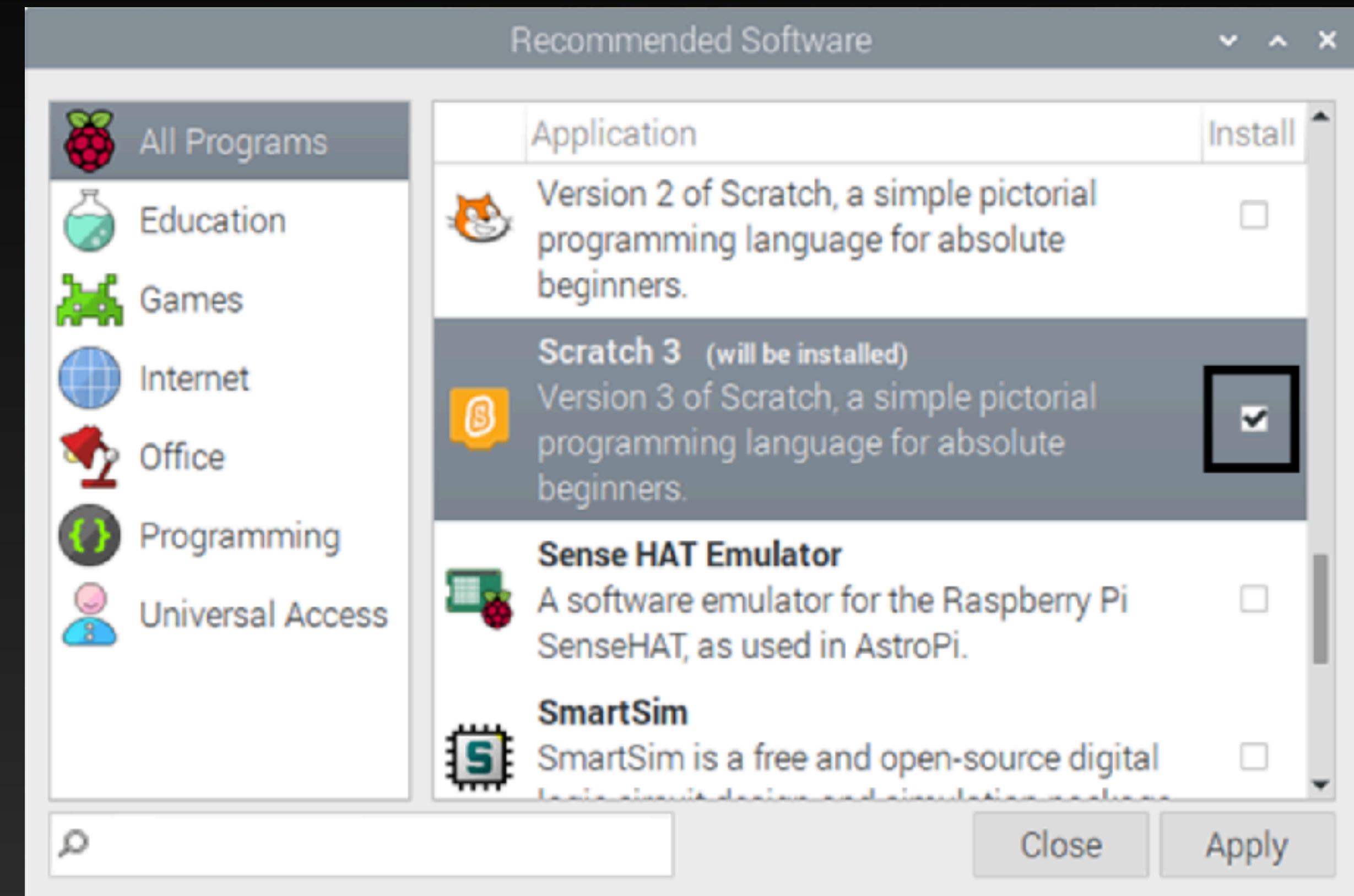
You can browse all the recommended software, or filter it by category.



Using your Raspberry Pi

To install a piece of software, click to mark the checkbox to its right.

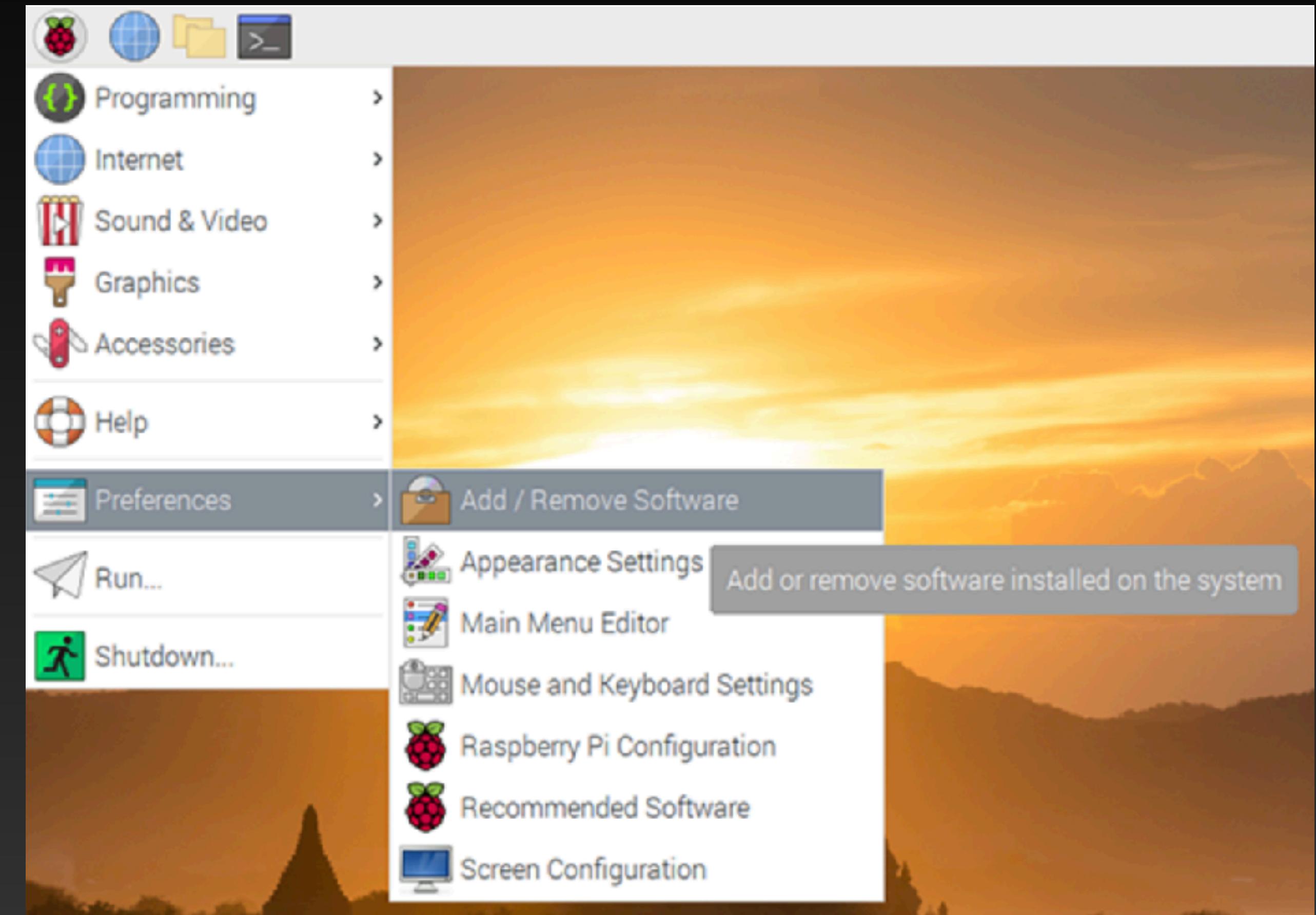
Then click on OK to install the selected software.



Updating your Raspberry Pi

It's a good idea to regularly update the software on your Raspberry Pi with the latest features and fixes.

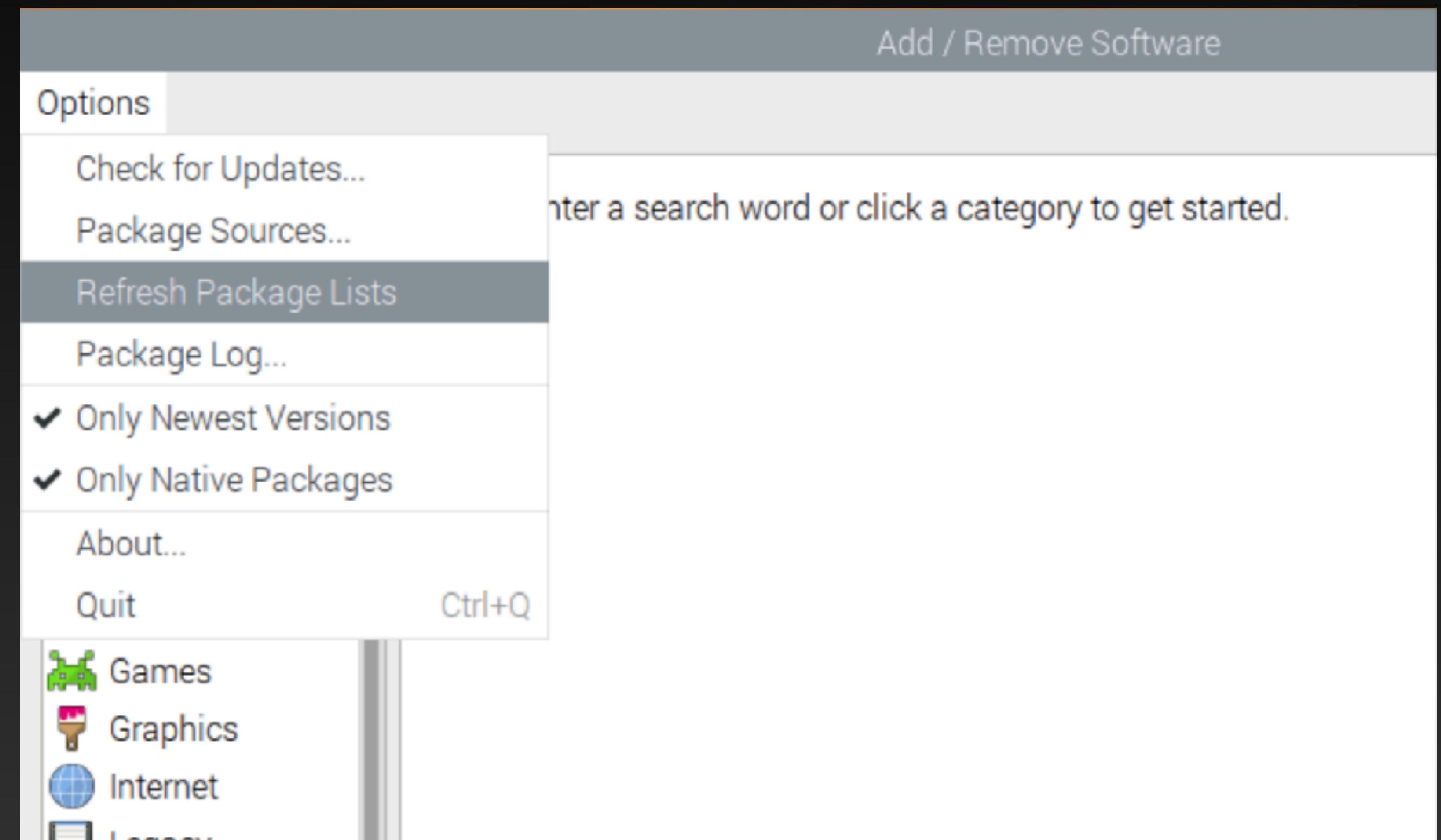
You can update your Raspberry Pi using the Add / Remove Software application: open it by selecting it from the Preferences section of the menu.



Updating your Raspberry Pi

Before you check and install any updates, you should refresh the software package lists on your Raspberry Pi.

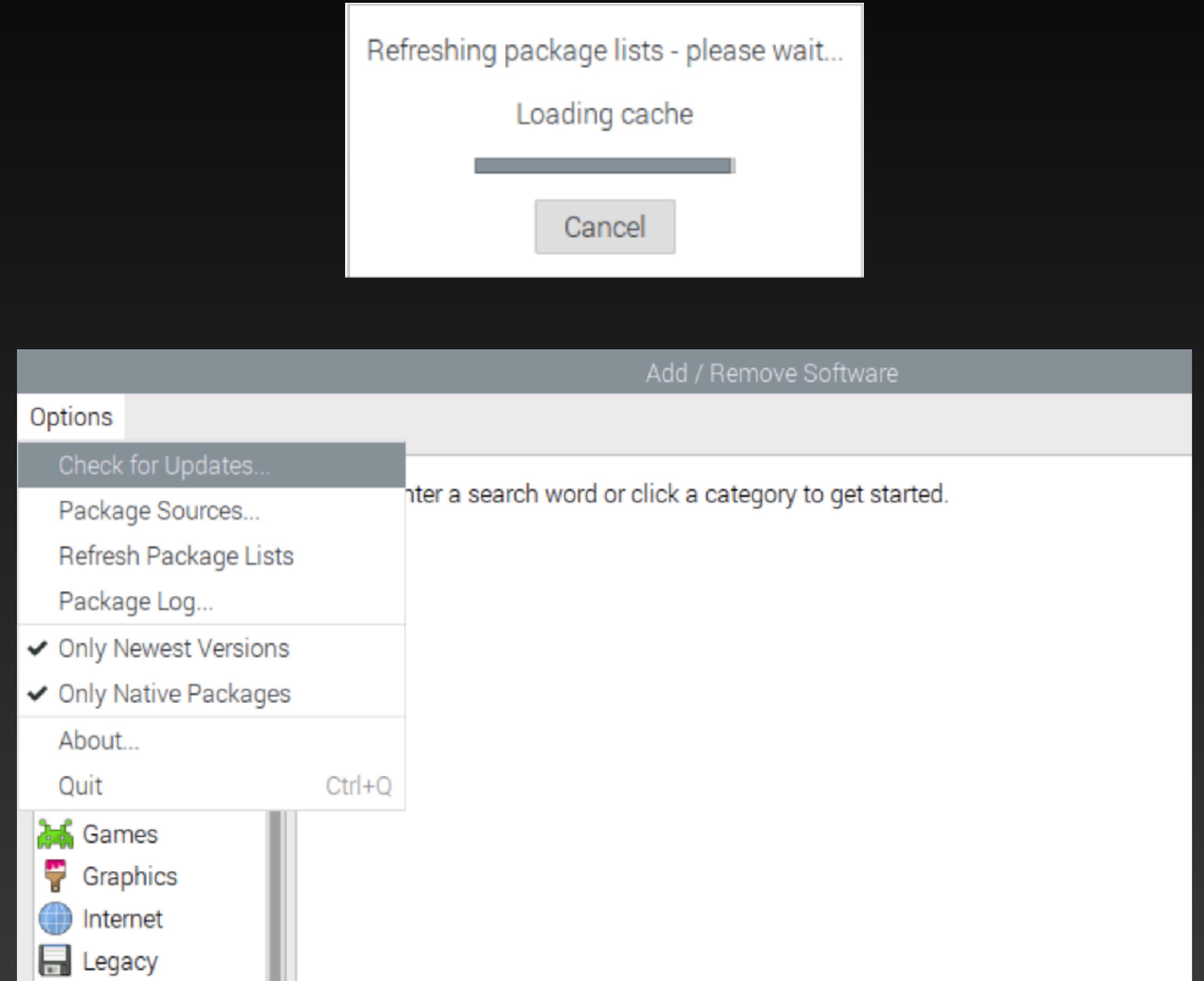
Click on Options in the top left-hand corner, and select Refresh Package Lists.



Updating your Raspberry Pi

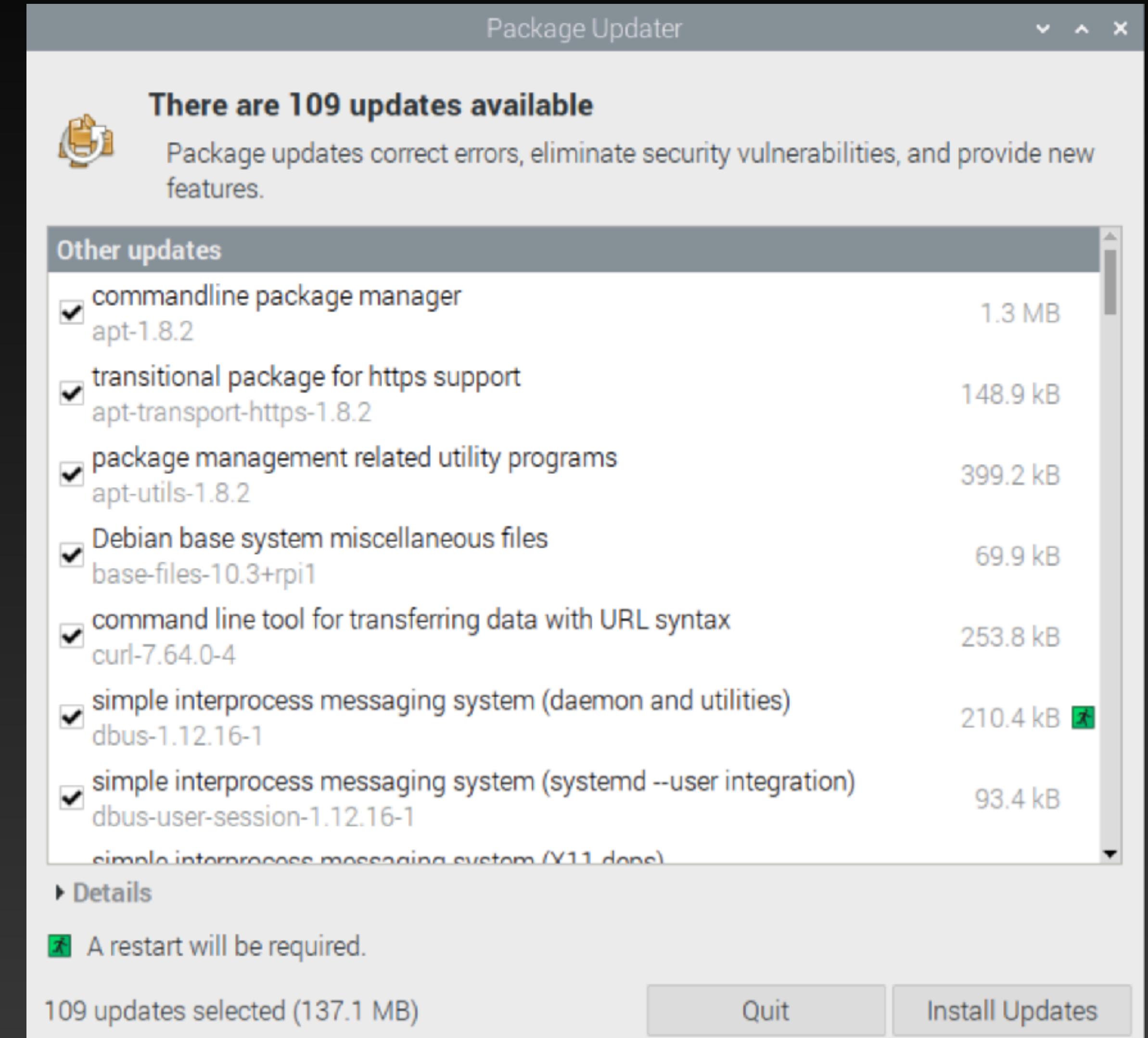
Your Raspberry Pi will then update all lists of packages.

When this is done, click on Options and select Check for Updates.



Updating your Raspberry Pi

The Package Updater will open and automatically check whether updates are available. It will display anything it finds in a list.

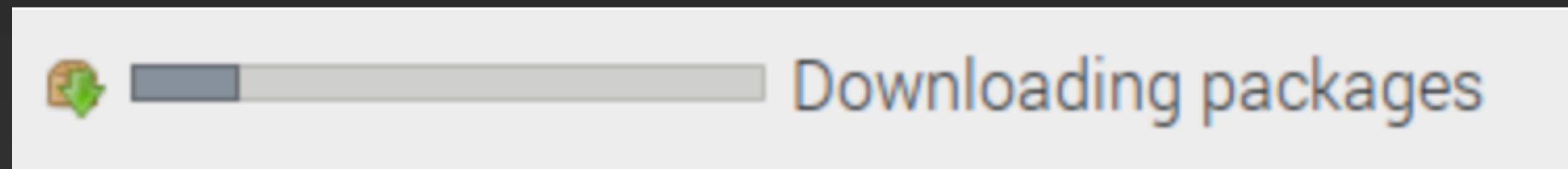
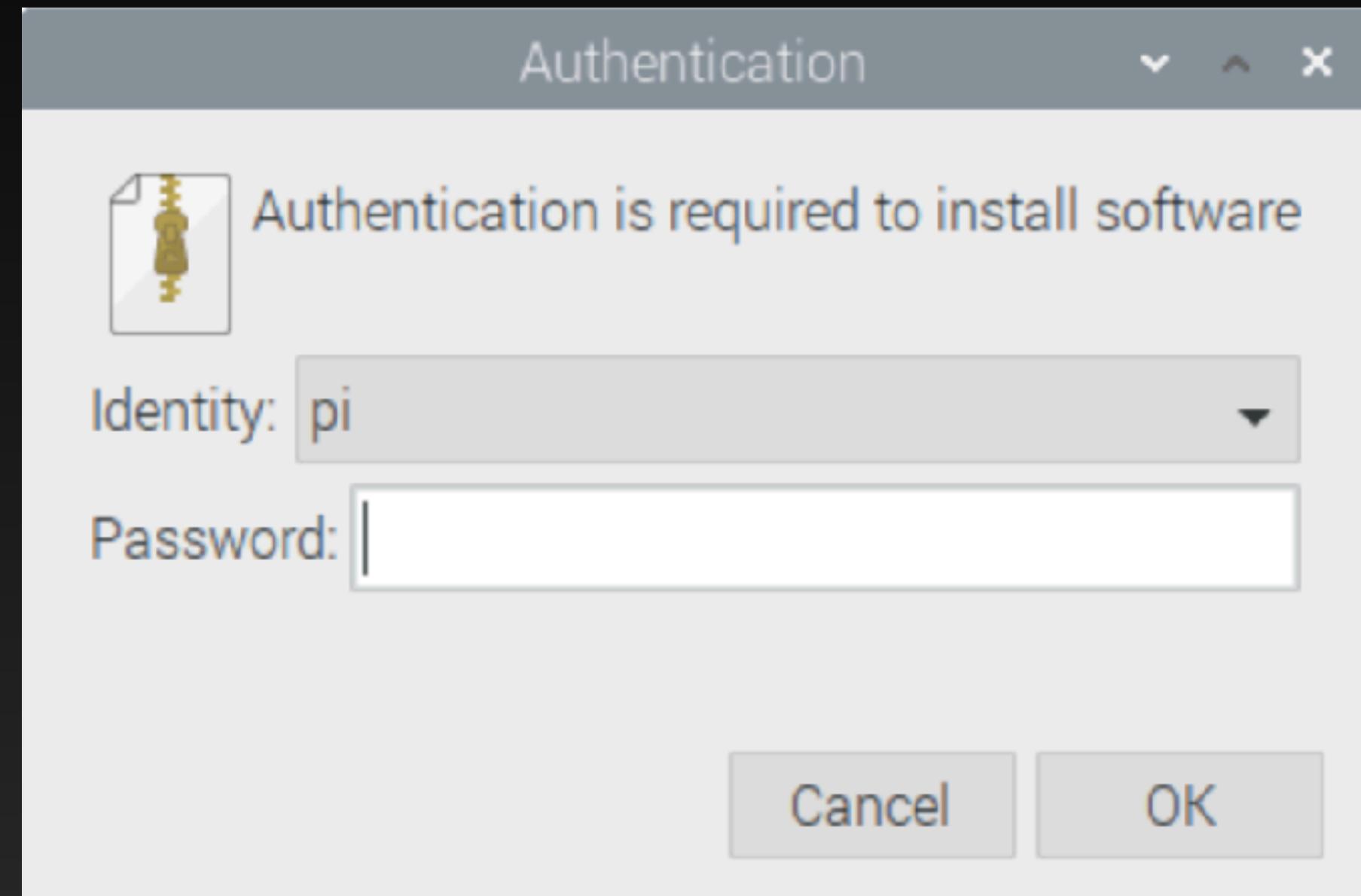


Updating your Raspberry Pi

Click on Install Updates to install all the available updates.

When prompted, enter your password; if you haven't changed the password, it will be 'raspberry'.

The updates will then be downloaded and installed. You can see the installation by checking the progress bar in the bottom left-hand corner.



Test your circuit! An LED Game

Introduction

In this project, you'll take your first step in using the Raspberry Pi's GPIO pins to make machines! You'll be connecting wires and lights to your Pi to create simple electrical circuits, then linking it up to a computer game so that you can find the hidden hedgehog!

What you will make

View a 'virtual' version of the finished Physical Computing Project. Move your character around the screen using the arrow keys. When you are close to the hedgehog, the LED will appear.

Test your circuit! An LED Game

Hardware

- A Raspberry Pi computer
- 3x F-F jumper cables
- an LED
- a resistor (the lower resistance, the better!)

Software

Scratch 3 Desktop - This project can not be completed using the online Scratch editor, and must be completed using a Raspberry Pi with the desktop version installed.

What you will learn?

Connecting a simple circuit to your Raspberry Pi

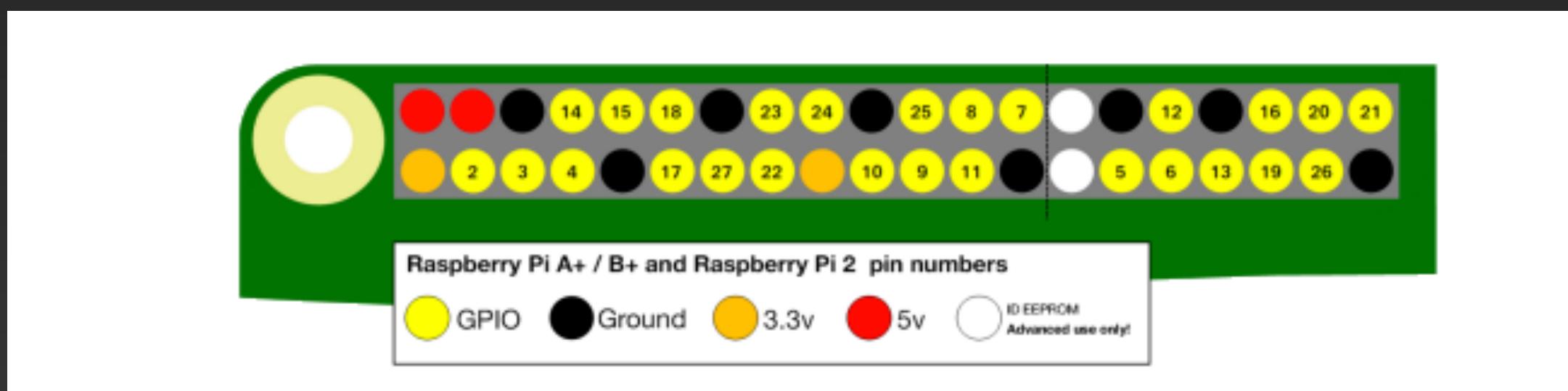
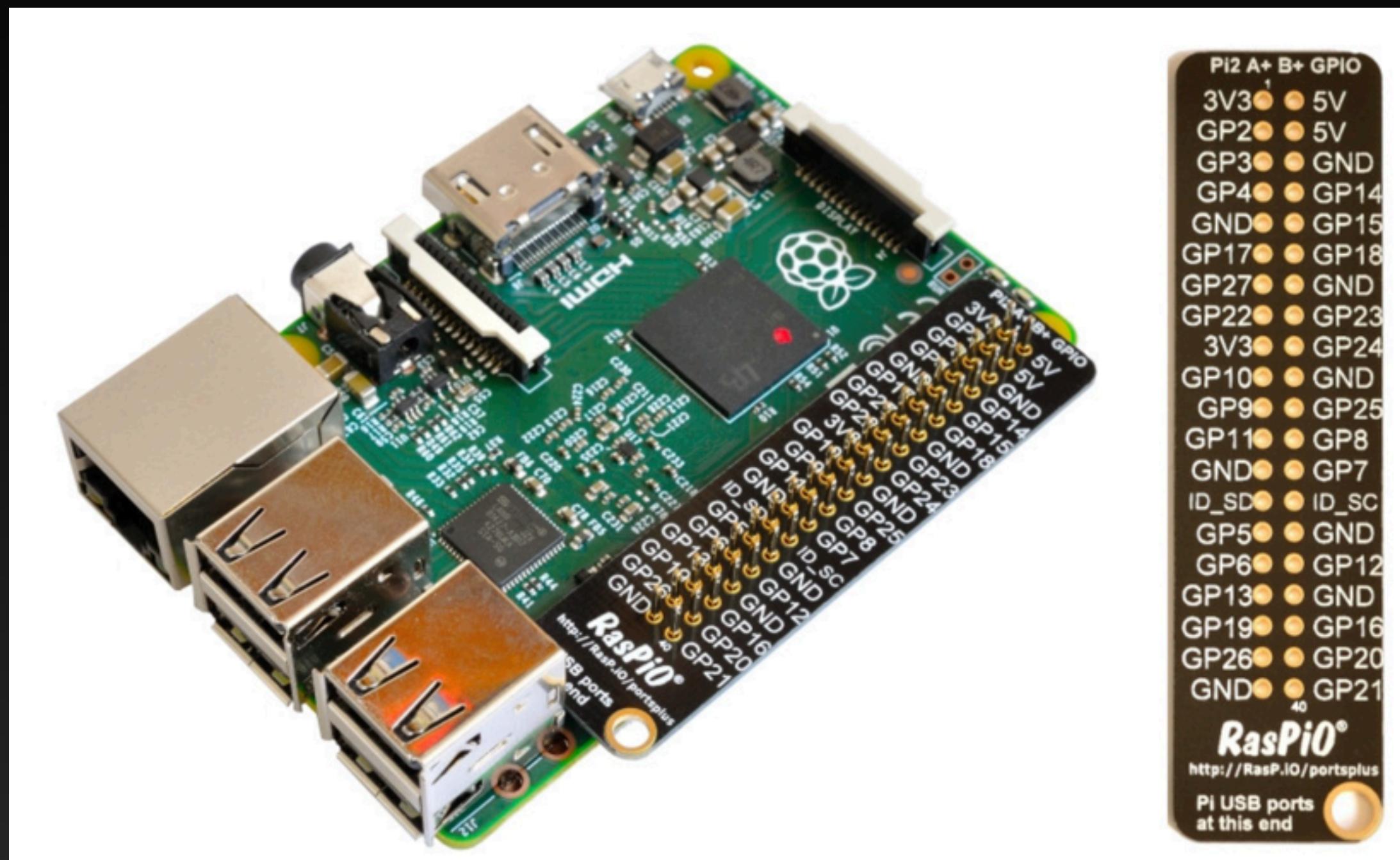
How to use an LED with the Raspberry Pi and Scratch

Test your circuit! An LED Game

In this step, you will connect an LED and resistor to the Raspberry Pi's GPIO pins to test your circuit.

GPIO stands for General Purpose Input/Output. GPIO pins allow you to create simple machines by sending a small electrical signal out of a pin, down a wire, through an output or input, and back into a ground pin on the Raspberry Pi to create a circuit. The circuits you make can be programmed and controlled by you, through programs written using Scratch!

GPIO Basic on Raspberry Pi

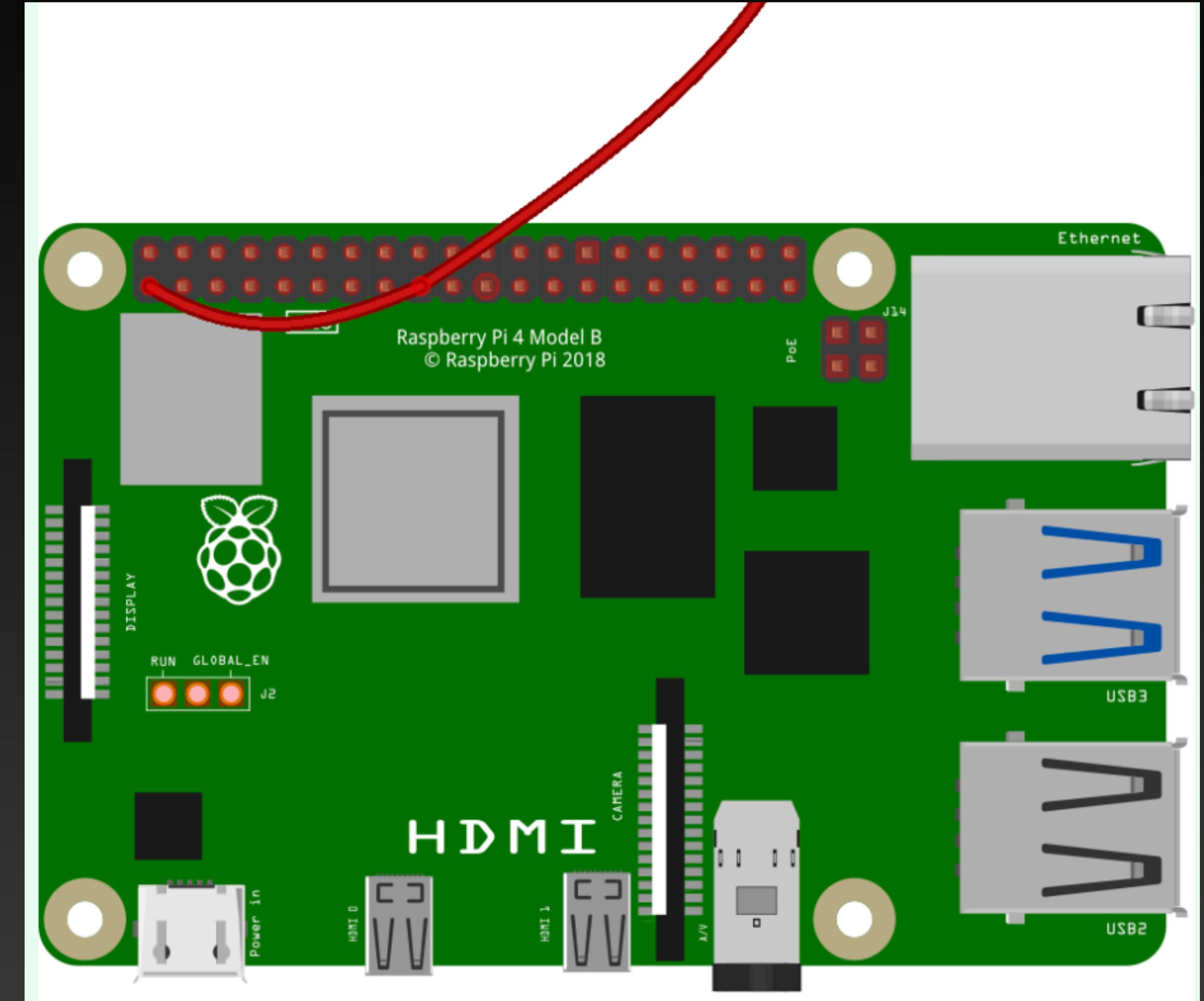


3V3	3.3 volts	Anything connected to these pins will always get 3.3V of power
5V	5 volts	Anything connected to these pins will always get 5V of power
GND	ground	Zero volts, used to complete a circuit
GP2	GPIO pin 2	These pins are for general-purpose use and can be configured as input or output pins
ID_SD/ ID_SD/ DNC	Special purpose pins	

Test your circuit! An LED Game

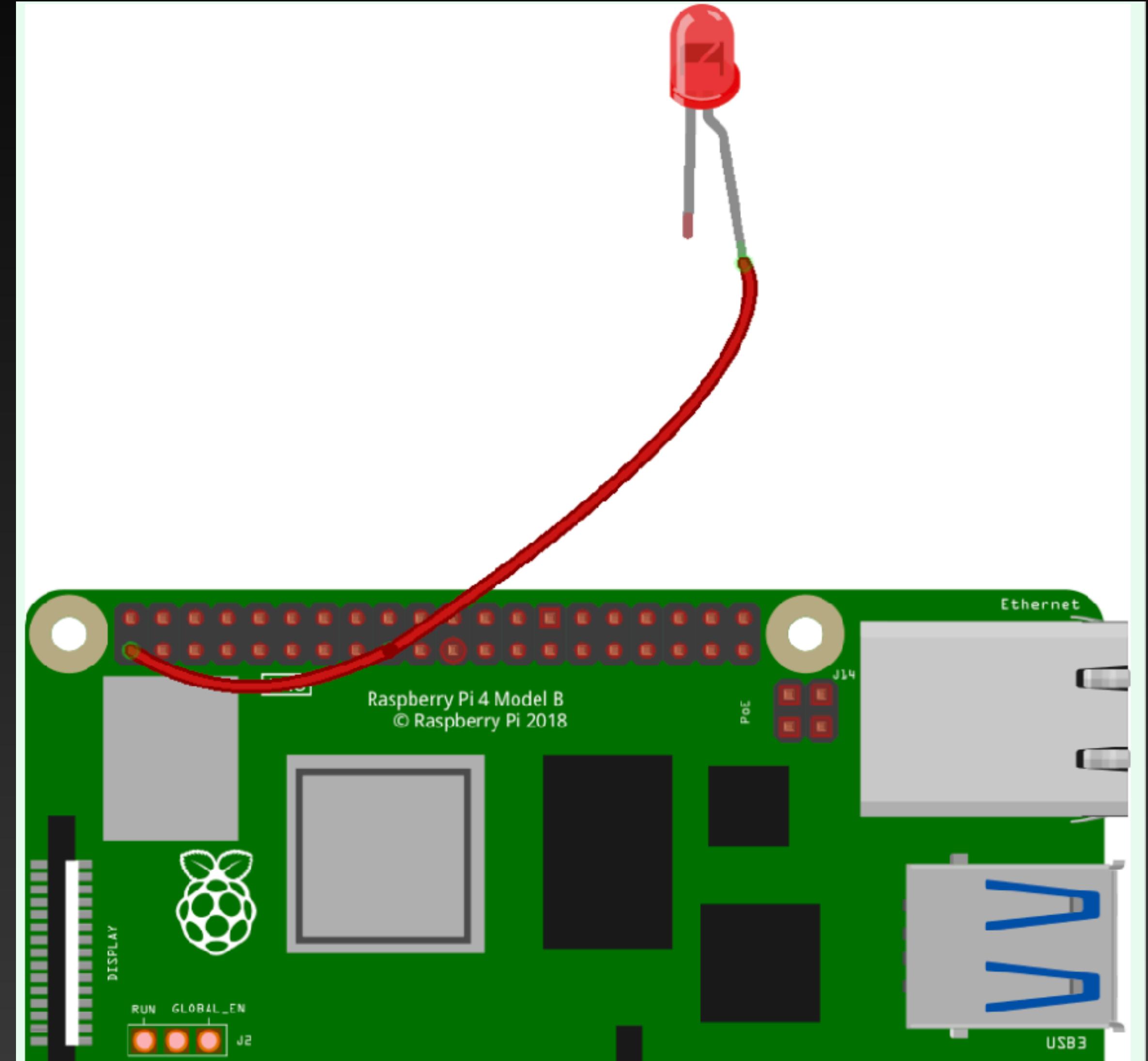
Your jumper wires should all have hollow 'F' ends that fit over the pins.

Connect a jumper wire to Pin 1 (make sure it's an F-F wire). Pin 1 is always on and provides 3 V of power to whatever you connect to it.



Test your circuit! An LED Game

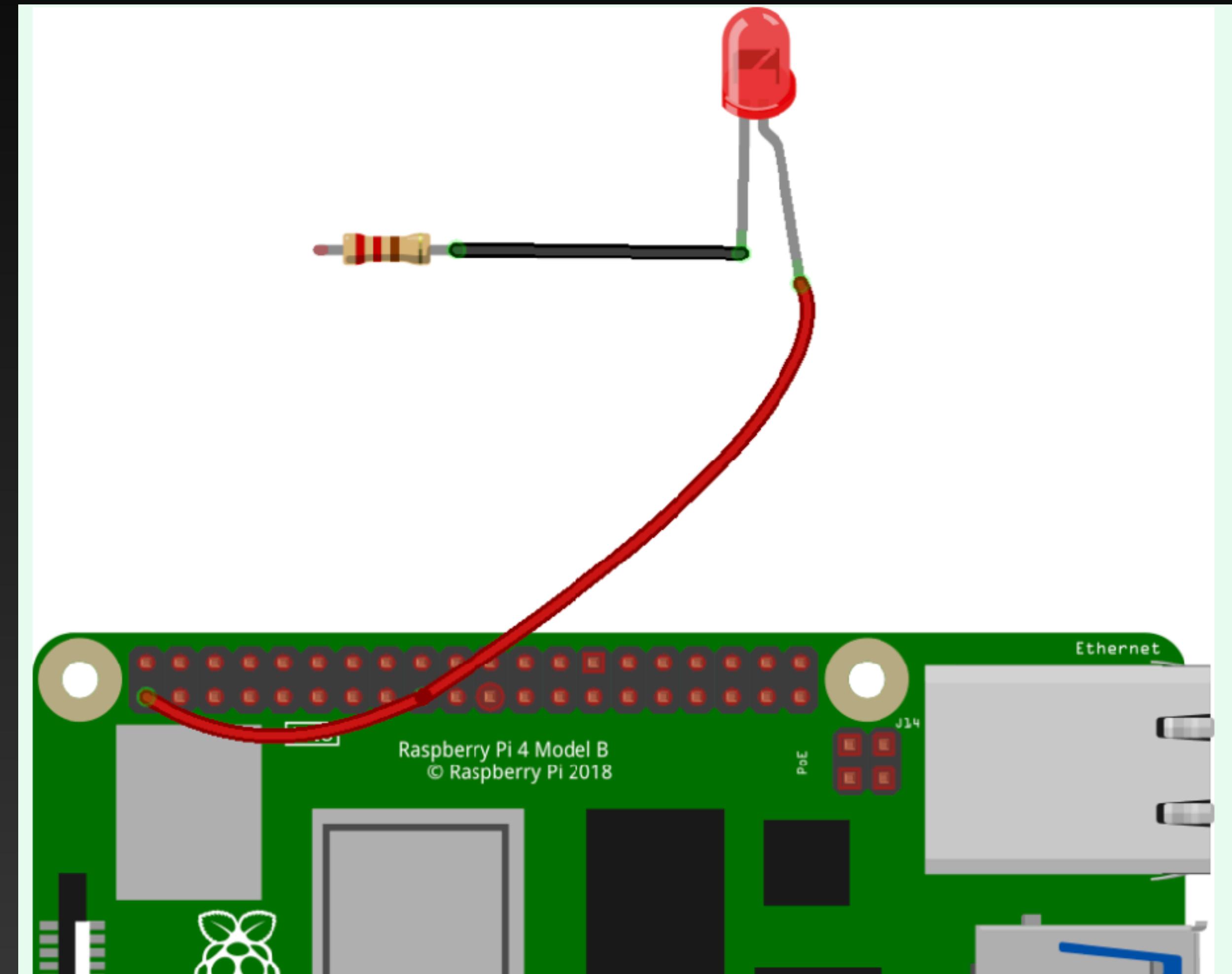
Insert the long leg of your LED into the other end of this jumper wire. Take a second F-F jumper wire and attach it to the short leg of your LED.



Test your circuit! An LED Game

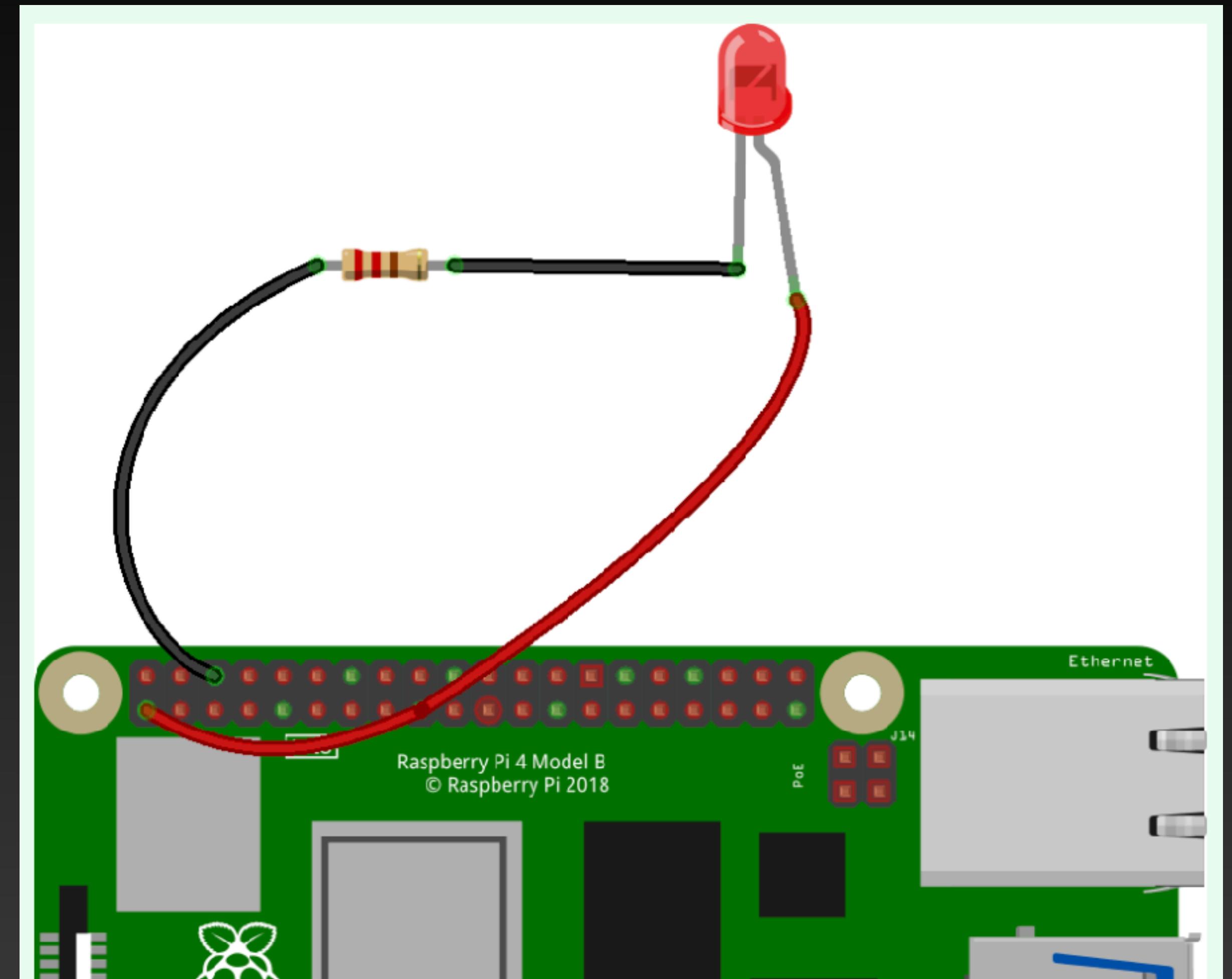
Take a resistor and insert one of its legs into the free end of the second jumper wire. Insert the other leg into another F-F jumper wire.

Adding the resistor to your circuit controls the electrical current passing through the circuit; this will protect the LED from burning out.



Test your circuit! An LED Game

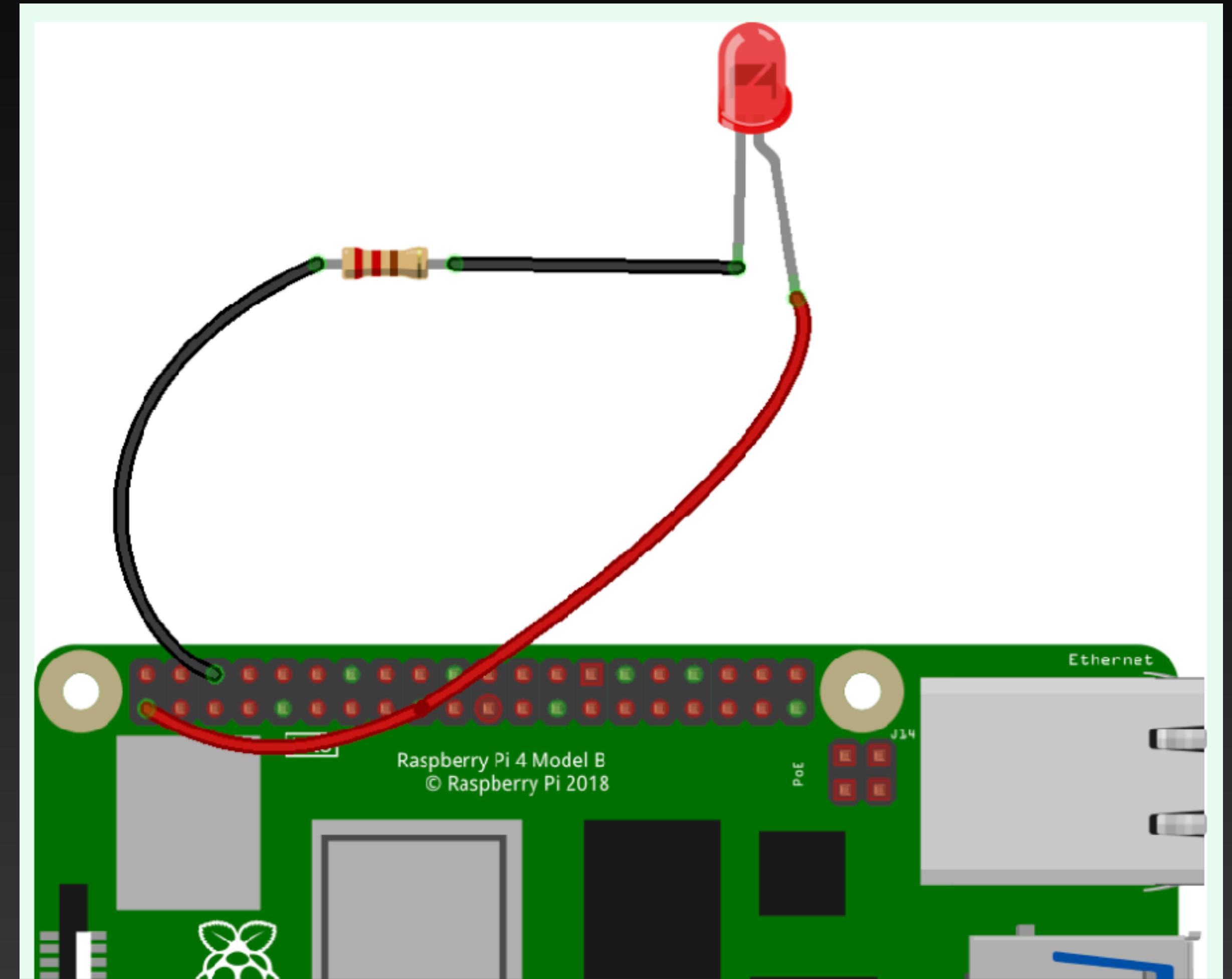
Now, connect your circuit back to Pin 6 using the loose end of the F-F jumper wire. As soon as you close the circuit by connecting it back to your ground pin, your LED should light up!



Test your circuit! An LED Game

If your LED isn't lighting up, make sure you have the long leg connected to the output pin (Pin 1) and the short leg connected to the ground pin (Pin 6). LEDs only work one way round!

If your LED still isn't lighting up, check all your connections are secure and fit properly, then swap your LED for another one if it still won't work (this one might be broken).



Test your circuit! An LED Game

Code your circuit

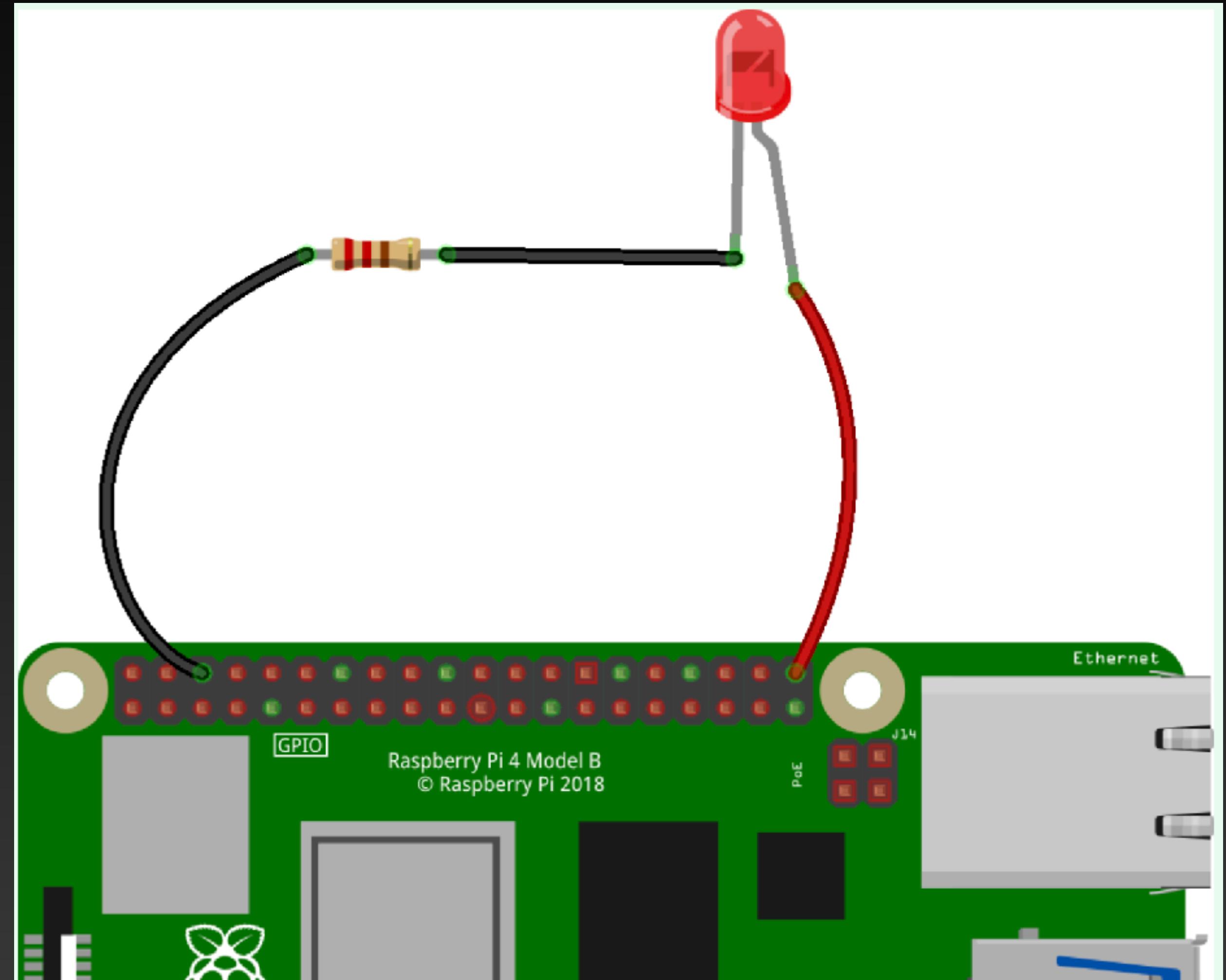
In this step, you will connect your completed circuit to an output pin on the Raspberry Pi and control it using the [Simple Electronics](#) extension.

Currently, your circuit is tested and working, and your LED is on; but you want it to light up when something happens in your Scratch program.

To do that, you need to connect your LED circuit to an output pin on the Raspberry Pi.

Test your circuit! An LED Game

Take the jumper wire off of Pin 1 and attach it to any other numbered pin. In this example, I've used Pin 21 (because it's easy to get to) but you can use any numbered general purpose (GP) pin on your Raspberry Pi.

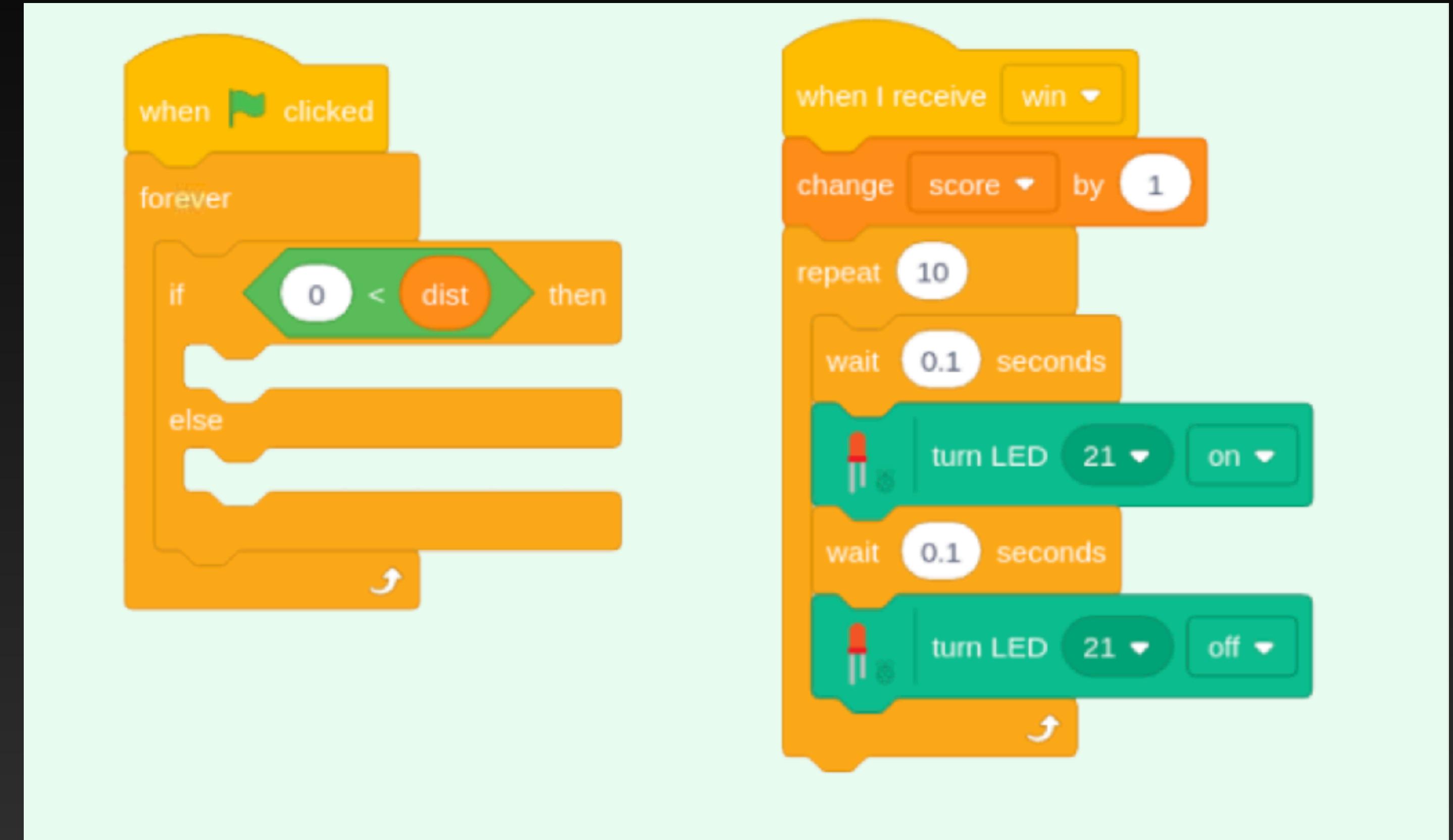


Test your circuit! An LED Game

Download and open the starter project [available here](#).

<https://rpf.io/p/en/scratch-led-game-get>

Make sure you have the Stage selected and you can see the following scripts:



Test your circuit! An LED Game

Once you have downloaded the zip file from the link above, open your file manager and navigate to the Downloads folder.

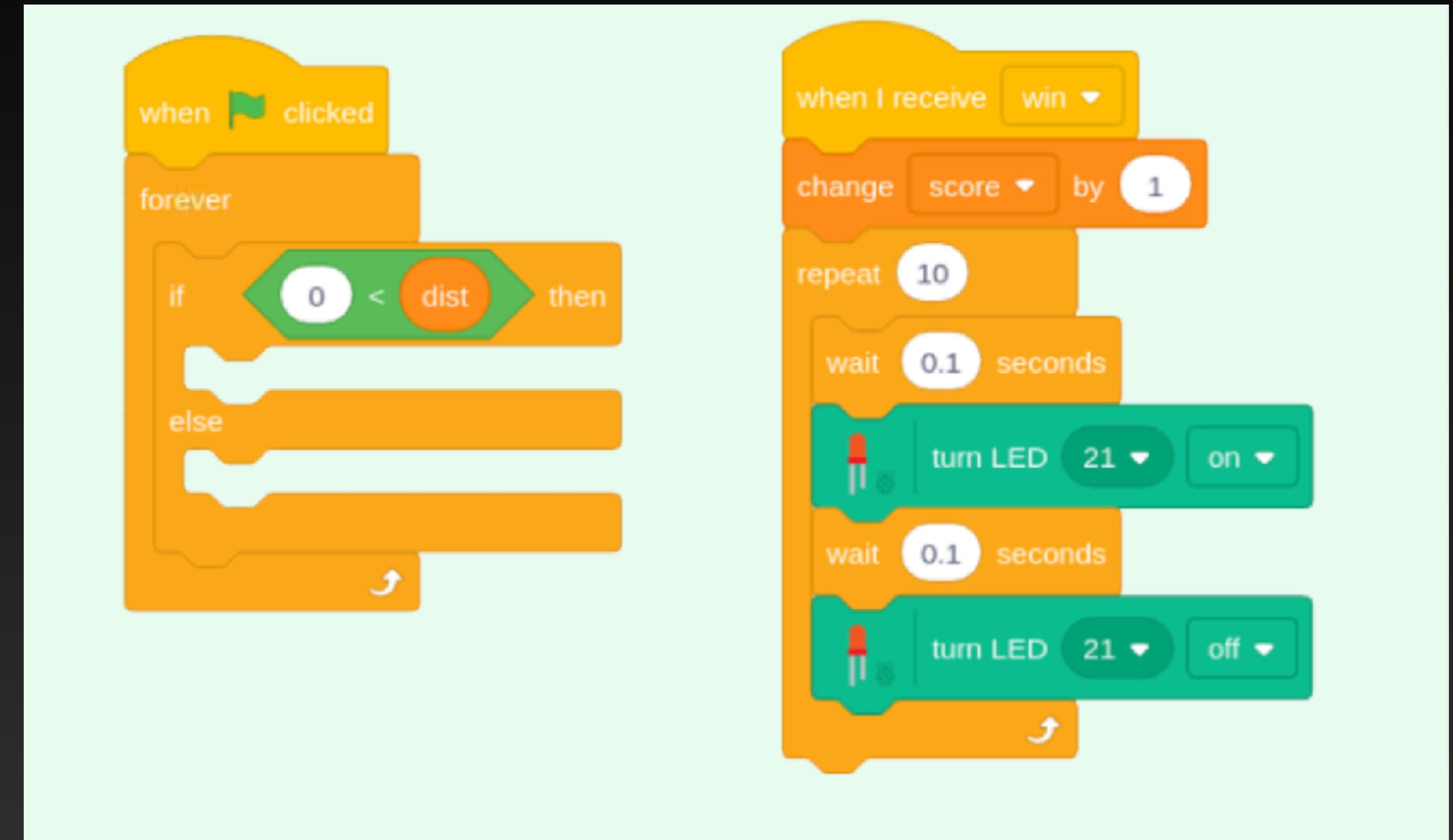
Find the file you just downloaded. It will end in **.zip**.

Right click on the file and choose 'Extract files'. Extract them to your downloads folder.

In Scratch 3 Desktop, click the **File** menu and choose **Load from your computer**.

Navigate to your downloads folder again and select the file **scratch-physcomp1.sb3**.

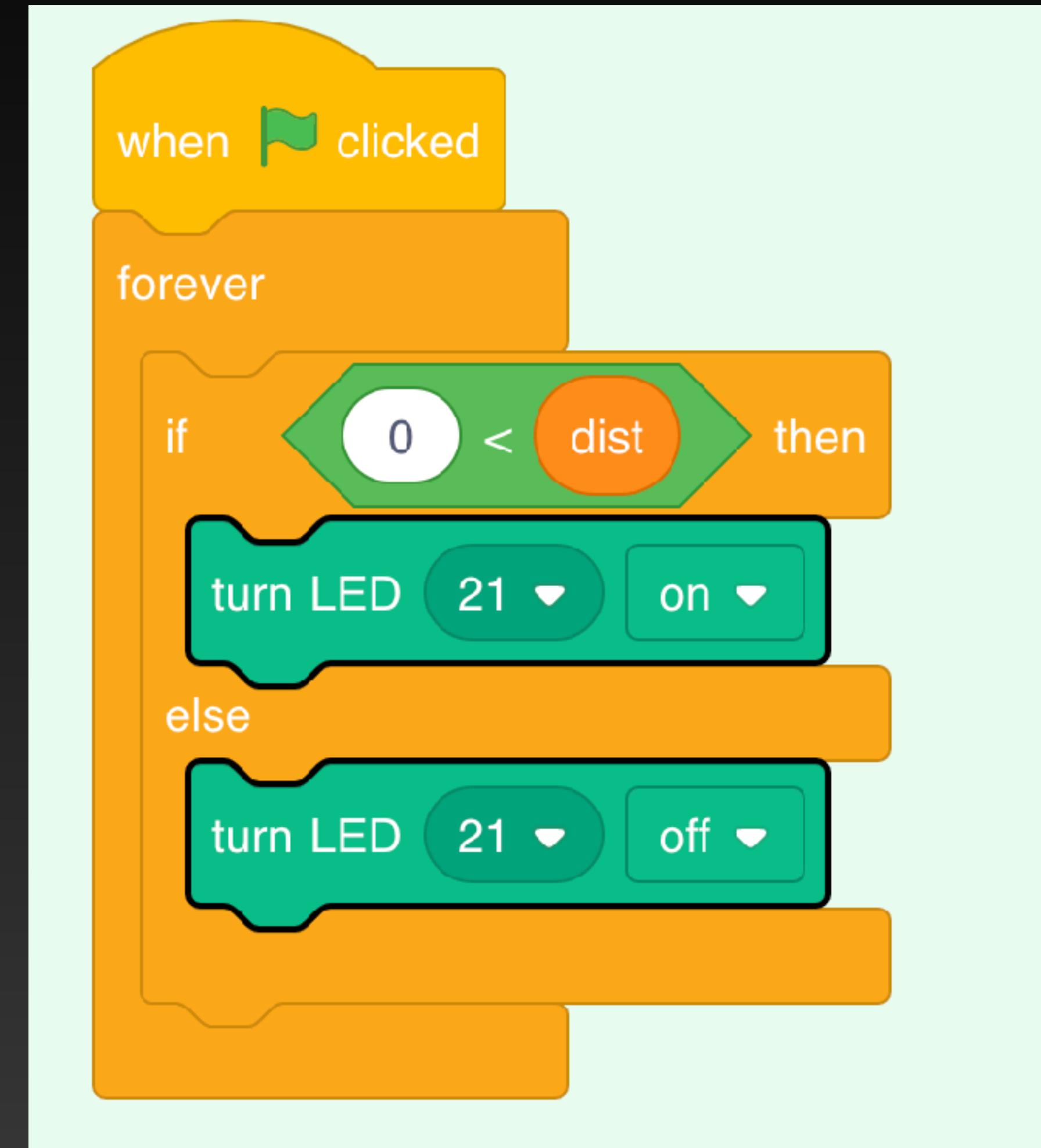
Click **OK** or press **Enter**.



Test your circuit! An LED Game

Using the **Simple Electronics** extension, add the following blocks into the **if** block so that if **distance** is less than **10**, the LED comes on — **else** it turns off.

Now click on the green flag, and see if you can hunt the hedgehog!



Test your circuit! An LED Game

QUIZ

Homework

Upgrade your class project by adding another LED to show when you are moving in the wrong direction.

You will need to connect another LED bulb to your Raspberry Pi using a different numbered pin and another ground pin.

IoT with MIT App Inventor

Office hour