



Make a Spirograph

https://www.sciencebuddies.org/science-fair-projects/project-ideas/CompSci_p060/computer-science/make-a-spirograph (http://www.sciencebuddies.org/science-fair-projects/project-ideas/CompSci_p060/computer-science/make-a-spirograph)

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Experimental Procedure

Frequently Asked Questions (FAQ)

If you have questions about how to use your Raspberry Pi Projects Kit, please start by reading the following FAQ. You may find your answer there. If the FAQ does not answer your question, please contact the kit vendor or post the question in the [Ask an Expert](http://www.sciencebuddies.org/science-fair-projects/ask-an-expert-intro) (<http://www.sciencebuddies.org/science-fair-projects/ask-an-expert-intro>) forum. Note that the forum is staffed by volunteers, and you may need to wait a day or two for your answer. In order to post a question in the forum, you will need to create (and activate) an [Ask an Expert](http://www.sciencebuddies.org/science-fair-projects/ask-an-expert-intro) (<http://www.sciencebuddies.org/science-fair-projects/ask-an-expert-intro>) account.

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- **How can I connect my Raspberry Pi to the Internet?** (#question10)

Kit General Answers

Q: Who is the kit appropriate for?

A: The kit is meant for anyone (ages 8 and up) who wants to learn some basic programming and electronics skills while having fun. Students up to age 10, or older if their reading skills are behind grade level, may need adult assistance in reading and following the on-screen instructions. The projects included in the kit were beta tested and approved by students ages 8 to 16.

Q: Are the kit parts reusable?

A: Yes, all the electronics components in the kit can be used over and over to do new projects or to repeat the kit activities.

Q: Aren't there other Raspberry Pi kits on the market? How is yours different?

A: Yes, there are other Raspberry Pi kits, and some of them are quite good! The Raspberry Pi Projects Kit has been designed to contain the specific materials needed to do the accompanying Science Buddies Raspberry Pi Projects Kit activities. Our kit is specifically meant for people who have no prior experience programming or connecting circuits. It is 100% beginner friendly with clear on-screen instructions, videos, and screenshots and diagrams. And we, humbly, think it's one of the most fun kits out there! But, if you are already an ace programmer or electronics guru, you may not find this the best fit for your own personal use. It may, however, be a fun way for you to introduce others to programming and electronics.

Q: What programming language does the kit use?



A: The kit uses a version of Scratch (a language developed by the MIT Media Lab) called ScratchGPIO5 (created by Simon Walters of simplesi.net). Scratch is a graphical coding language in which you snap pre-made blocks of code together to make programs. It allows beginners to focus on the logic steps needed to write a good program without getting caught up in worrying about the right syntax. Scratch was originally developed as an entry-level programming language for students ages 8-16. ScratchGPIO has the added advantage of allowing users to control the GPIO pins found on the Raspberry Pi so that programs can interact with the physical world.



Setting Up and Using Your Raspberry Pi Projects Kit Answers

Q: How do I connect my Raspberry Pi to my TV or computer monitor?

A: Follow this table to help connect your Raspberry Pi:

If your TV or monitor has a port that looks like...	It is called...	Does it carry sound?	To connect to it, you need...	Which looks like...
	<p>HDMI (best)</p> <p>which stands for...</p> <p>High-Definition Multimedia Interface (http://en.wikipedia.org/wiki/HDMI)</p>	<p>Yes, if TV or monitor has built-in speakers</p>	<p>An HDMI cable, included in your Raspberry Pi kit!</p>	
	<p>DVI (second best)</p> <p>which stands for...</p> <p>Digital Visual Interface (http://en.wikipedia.org/wiki/Digital_Visual_Interface)</p>	<p>No (requires separate headphones or speakers)</p>	<p>An HDMI to DVI cable, available from Amazon.com (http://www.amazon.com/gp/product/B001TH7T2U/ref=as_li_ss_tl?ie=UTF8&tag=sciencebuddie-20&linkCode=as2&camp=1789&creative=390957&creativeASIN=B001TH7T2U)</p>	

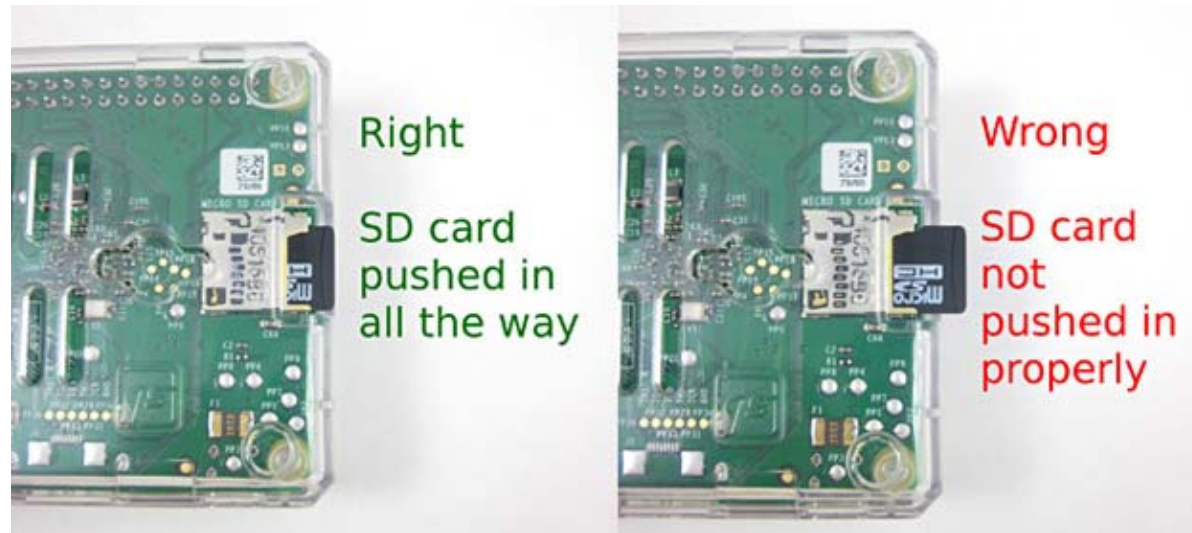
If your TV or monitor has a port that looks like...	It is called...	Does it carry sound?	To connect to it, you need...	Which looks like...
	<p>VGA (avoid if possible) which stands for... Video Graphics Array (http://en.wikipedia.org/wiki/VGA_connector)</p>	<p>No (requires separate headphones or speakers)</p>	<p>An HDMI to VGA adapter available from Adafruit.com (http://www.adafruit.com/product/1151), and a VGA cable, available from Adafruit.com (http://www.adafruit.com/products/1301) and Amazon.com (http://www.amazon.com/gp/product/B0087OV77G/ref=as_li_ss_tl?ie=UTF8&tag=sciencebuddie-20&linkCode=as2&camp=1789&creative=390957&creativeASIN=B0087OV77G)</p>	
		<p>Note: Science Buddies tested an HDMI to VGA adapter from Amazon.com and it did not work (even though the product reviews mentioned it working with the Raspberry Pi), so we recommend the adapter from Adafruit.com.</p>		

If your TV or monitor has a port that looks like...	It is called...	Does it carry sound?	To connect to it, you need...	Which looks like...
	<p>RCA (avoid if possible) which stands for...</p> <p>Radio Corporation of America (http://en.wikipedia.org/wiki/RCA_connector)</p>	<p>Yes, if TV or monitor has built-in speakers</p>	<p>A 4-pole 3.5 mm to RCA A/V cable, available from Amazon.com</p> <p>(http://www.amazon.com/gp/product/B0007V6JCK/ref=as_li_ss_tl?ie=UTF8&tag=sciencebuddie-20&linkCode=as2&camp=1789&creative=390957&creativeASIN=B0007V6JCK)</p>	

Q: Why won't my Raspberry Pi turn on?

A: If your Raspberry Pi will not turn on, go through this checklist to make sure everything is set up properly.

1. Make sure your SD card is pushed in all the way. You should hear an audible "click" when it is pushed into the slot.

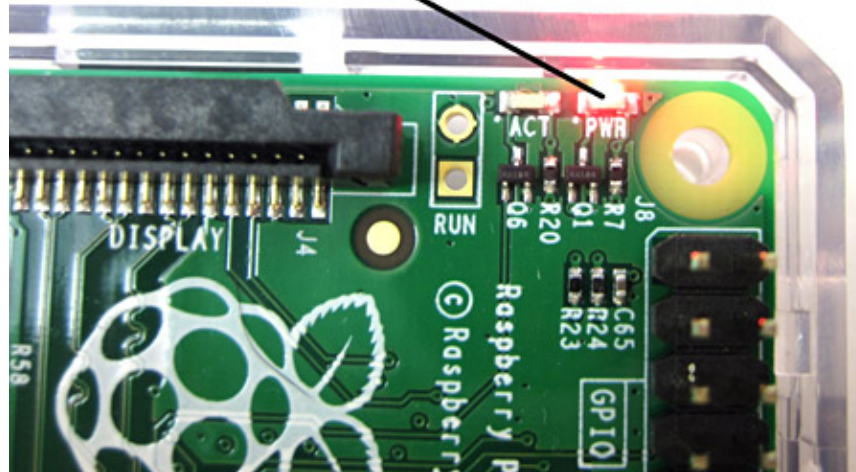


2. Make sure the green LED on your micro-USB power adapter is lit up. This means the adapter is receiving power from the wall outlet. If the LED is not on, make sure the wall outlet is not controlled by a light switch. Try plugging a lamp or other appliance into the outlet to make sure the outlet works.



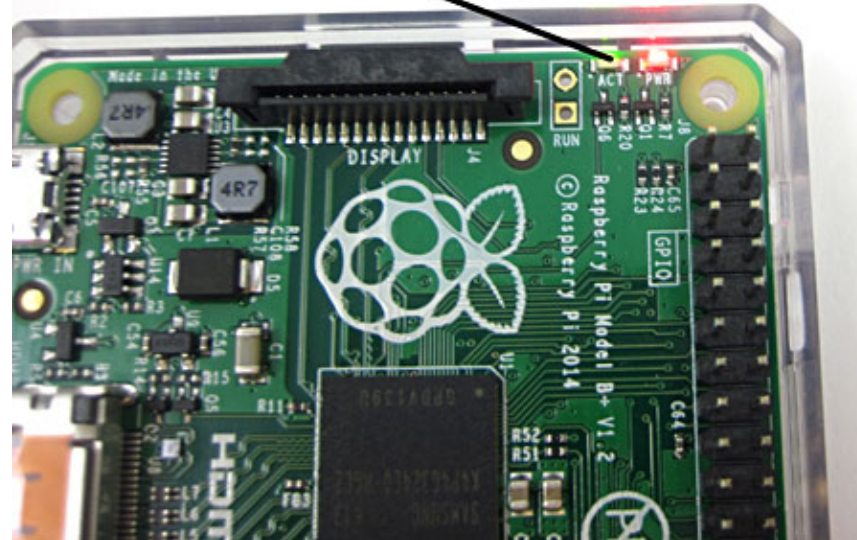
3. Make sure the red power LED (labeled "PWR") on your Raspberry Pi is on. This means the Raspberry Pi is receiving power from the micro-USB port. If the LED is not on, make sure you pushed the micro-USB connector into the micro-USB port all the way.

This LED lights up when the Raspberry Pi is receiving power



4. When you first plug the micro-USB cable in, the green LED (labeled "ACT") should flash several times. This LED lights up when the Raspberry Pi reads data from the SD card. If it does not light up, your SD card might not be inserted properly. Go back to step 1.

The green LED flashes to indicate SD card activity



5. Make sure your display (television or monitor) is turned on. If your display is turned off, you will not see anything on the screen, even if the Raspberry Pi is on.
6. Make sure your display is set to the correct input. Many modern televisions have more than one HDMI input, and some computer monitors have DVI or VGA inputs in addition to HDMI. Most displays have an "input" button that will let you cycle through different inputs.

Q: My Raspberry Pi starts to boot up, but then it freezes or the screen goes blank. What is wrong?

A: There may be a problem with your Raspberry Pi or SD card. Please contact the kit vendor for assistance.

Q: Can I use a laptop as a display and/or keyboard?

A: The short answer is "no." Many newer laptops have HDMI ports, but they only function as HDMI *out*, to send a video signal from the laptop to a television or projector. They do not work as HDMI *in* to display an external signal on the laptop's screen. The laptop's keyboard is only designed to work with the laptop itself, not as a standalone keyboard for an external device like the Raspberry Pi.

Q: My screen is not displaying at the proper resolution. How can I adjust the Raspberry Pi's display resolution?

A: The Raspberry Pi should auto-detect the proper resolution for your monitor or TV. If this does not work at first, try rebooting your Raspberry Pi. If the resolution is still wrong, you will need to edit settings in a "configuration file" called `config.txt`. You can find more information about this process [here](http://elinux.org/RPi_config#Video_mode_options) (http://elinux.org/RPi_config#Video_mode_options), but we recommend having someone familiar with the Linux operating system help you do this.

Q: Why is there a black border around the edge of my screen?

A: If there is a black border around the edge of your screen, you can fix it by following these steps:

- Click the [Menu](#) button in the lower left corner of your screen. This opens a menu similar to the Windows start menu. Hover your mouse over [Accessories](#), then click on [Terminal](#). This opens a window where you can type in commands.
- At the command prompt, type `sudo raspi-config` and press "Enter."
- In the menu that pops up, use the down arrow to scroll down to [Advanced Options](#) and press "Enter."
- Press "Enter" to select [Overscan](#).
- Press "Enter" to select [Disable](#).
- Use the *right* arrow to scroll to [Finish](#) and press "Enter."
- When prompted to reboot, press "Enter" to select [Yes](#).
- Your Raspberry Pi should reboot, and the black borders around the edge of your screen should be gone.

Q: Why are the edges of my screen cut off?

A: If the edges of your screen are cut off, you can fix it by following these steps:

- Click the [Menu](#) button in the lower left corner of your screen. This opens a menu similar to the Windows start menu. Hover your mouse over [Accessories](#), then click on [Terminal](#). This opens a window where you can type in commands.
- At the command prompt, type `sudo raspi-config` and press "Enter."
- In the menu that pops up, use the down arrow to scroll down to [Advanced Options](#) and press "Enter."
- Press "Enter" to select [Overscan](#).
- Use the *right* arrow to select [Enable](#) and press "Enter."
- Use the *right* arrow to scroll to [Finish](#) and press "Enter."
- When prompted to reboot, press "Enter" to select [Yes](#).
- Your Raspberry Pi should reboot, and your desktop should properly fill the monitor without spilling over the edges.

Q: My computer monitor does not have built-in speakers. How can I get sound?

A: If your computer monitor does not have built-in speakers, you can use any type of regular external computer speakers or headphones that have a 3.5 mm stereo plug with your Raspberry Pi. 3.5 mm stereo plugs look like this (the color of the cable might vary, for example iPod® headphones are usually white):



Plug the speakers or headphones into your Raspberry Pi's 3.5 mm jack, which is next to the HDMI port.

Q: I have everything connected properly, why can't I hear any sound?

A: Sometimes the Raspberry Pi does not automatically detect the proper sound source, so you need to tell it to do this manually. If you have video working on your display, but no sound, follow these steps:

- Click the [Menu](#) button in the lower left corner of your screen. This opens a menu similar to the Windows start menu. Hover your mouse over [Accessories](#), then click on [Terminal](#). This opens a window where you can type in commands.
- At the command prompt, type `sudo raspi-config` and press "Enter."
- In the menu that pops up, use the down arrow to scroll down to [Advanced Options](#) and press "Enter."
- Use the down arrow to scroll down to [Audio](#) and press "Enter."
- Use the down arrow to scroll down and select either [Force HDMI](#) or [Force 3.5mm \('headphone'\) jack](#), depending on which type of sound you have connected, and press "Enter."
- Use the *right* arrow to scroll to [Finish](#) and press "Enter."

Try to avoid other simple mistakes:

- If you are using external speakers, make sure they are powered on.
- If you are using a television or monitor with built-in speakers, make sure they are not muted and that the volume is turned up.
- Make sure that you are running a Scratch program that will actually play sounds. The simplest program you can write to test if your sound is working is:



Q: How do I adjust the volume on my Raspberry Pi?

A: The best way to adjust the volume is to use external volume controls on your TV, computer monitor, or speakers. If this is not an option (for example, if you are using headphones), then:

- Open a command terminal by selecting [Menu](#)→[Accessories](#)→[Terminal](#)
- Type `alsamixer` and press "Enter"
- Use the up and down arrows to adjust the volume
- Press "Esc" to exit the volume control application.

Q: How can I change the system time on my Raspberry Pi?

A: Similar to Windows computers, your Raspberry Pi displays the time in the lower-right corner of the desktop. By default, the SD card in your Science Buddies kit is set to United States, Pacific Time. To change the time zone, follow these steps:

- Click the [Menu](#) button in the lower left corner of your screen. This opens a menu similar to the Windows start menu. Hover your mouse over [Accessories](#), then click on [Terminal](#). This opens a window where you can type in commands.
- At the command prompt, type `sudo raspi-config` and press "Enter."
- Use the down arrow to scroll down to [Internationalisation Options](#) and press "Enter."
- Use the down arrow to select [Change Timezone](#) and press "Enter."
- Use the arrow keys to select your geographic region (such as "US") and press "Enter."

- Use the arrow keys to select your time zone (such as "Central") and press "Enter."

Q: I accidentally deleted a desktop icon! How do I launch the programs?

A: The Raspberry Pi has a menu in the lower-left corner of the screen that you can access by clicking the [Menu](#) button in the lower left corner of your screen. This brings up an interface very similar to the Windows start menu. You can use this to access all the different programs that come installed on the Raspberry Pi. You can find the Science Buddies programs under the [Science Buddies](#) folder. To add a desktop shortcut for a program, right-click it and select [Add to desktop](#).

Q: My Raspberry Pi froze and is not responding to mouse or keyboard input. What should I do?

A: First, be patient and give the Raspberry Pi a few minutes to try and process whatever it was doing. If you click on a whole bunch of things in rapid succession, or run a really complicated Scratch program, the Raspberry Pi might just slow down or freeze temporarily.

Next, if you are using a wireless keyboard and mouse, make sure they have fresh batteries.

Finally, *as a last resort*, if your Raspberry Pi is not responding, unplug the micro-USB cable and plug it back in. In general, you want to avoid doing this, because suddenly cutting power to the Raspberry Pi without properly shutting it down first can corrupt the SD card, and prevent the Raspberry Pi from working properly.

Q: My Raspberry Pi is acting strangely (it suddenly will not boot up properly, certain programs do not work, etcetera). What is wrong?

A: If your Raspberry Pi is not "dead," but seems to be behaving strangely, there is a chance that your SD card has become corrupted. This can happen if you unplug the Raspberry Pi's power cord without properly shutting it down first. See the next question.

Q: I think I corrupted my Raspberry Pi's SD card. What should I do?

A: Please contact the kit vendor. Make sure to include a detailed description of the problem you are having. They will work with you to resolve the issue.

Q: How can I connect my Raspberry Pi to the Internet?

A: There are two ways to connect your Raspberry Pi to the Internet. You can plug it directly into your internet router with an Ethernet cable, available at electronics stores or [Amazon.com](#) (http://www.amazon.com/mn/search/?_encoding=UTF8&tag=sciencebuddie-20&linkCode=ur2&camp=1789&creative=390957&field-keywords=ethernet+cable&url=search-alias%3Daps).

You will need to shut down your Raspberry Pi, plug in the Ethernet cable, then turn it back on in order for it to connect to the Internet.

You can also purchase a USB WiFi adapter, available at electronics stores or [Amazon.com](#) (http://www.amazon.com/gp/product/B003MTTJOY/ref=as_li_ss_tl?ie=UTF8&tag=sciencebuddie-20&linkCode=as2&camp=1789&creative=390957&creativeASIN=B003MTTJOY). Again, you will need to shut down your Raspberry Pi, plug in the WiFi adapter, then turn the Raspberry Pi back on. After booting up, you will need to connect to your wireless network. Do this by clicking on the [Menu](#) icon in the lower-left corner of your desktop, which launches a menu similar to the Windows Start Menu. Hover your mouse over [Preferences](#), and then select [WiFi Configuration](#). This will launch a window where you can select from available wireless networks and enter the password, similar to what you would do on a Windows or Macintosh® computer.

Once you have connected to the Internet, you can use a web browser to browse, just like you would on a regular computer. To launch the web browser, click on the [Menu](#) icon, then select [Internet](#) and [Web Browser](#).