YTP - Module YTP01

Arduino & Micro-Controllers

Teachers Handbook
LESSON 3
Breadboards?

Goals & Success Factors

Lesson Goal

- To understand what a breadboard is
- To understand how breadboards work
- To build the blink circuit with a breadboard

Lesson Success Factor(s)

- Answer questions about the workings of a breadboard
- Complete a working circuit on a breadboard

Runsheet (Guideline)

00:00 Introduction
00:05 Goals & Success Factors
00:10 What is Breadboard?
00:20 The Breadboard test
00:30 Build Blink Circuit
00:45 Code & Test Blink Circuit
01:00 Finish

Extension(s)
Add another LED and resistor
Code the second LED to work

Students Pre-work

Watch the following video:
What is a breadboard: bit.ly/ytp01-breadboards

Teachers Pre-work

Watch the following video:
What is a breadboard: bit.ly/ytp01-breadboards

Read the following on Breadboards:
https://learn.sparkfun.com/tutorials/how-to-use-a-breadboard

Student Homework

Watch the following videos:
The Learning Circuit – Circuit basics – a great reinforcer on basic circuits, something you could do in class or at home.
bit.ly/ytp01-basic-circuits

Handouts (optional)

breadboard.jpg (Breadboard Image)
blink-sketch.png (Circuit diagram of Blink project)
Crossword

Please download from: https://github.com/nexgencodecamp/ytp/tree/master/modules/arduino/03-breadboards/handouts

Materials Needed

Components for Blink Sketch (enough for 1 between 2):

- Arduino UNOs
- LEDs (5mm)
- Jumper wires (4 per group)
- 2 x resistor (100 – 200 Ohm is fine)
- Breadboards
- 1 x Switch

How you run this is entirely up to you. It really depends on class numbers, experience in the room, time limit and so on. You could for example:

1. Write/laminate some instructions for each student
2. Pair up students
3. Arrange the components into boxes and hand them out with instructions
4. Alternatively – do the exercise together from the projector and build it live
5. Use a set of photos/slides – one for each step and progress these as a class together
6. Show them how to assemble it then ask them to try it without instruction/photos

There are many ways to run this exercise !!

Extension: Add another LED or a switch (the switch could be tricky as we haven't covered this yet but gives students an opportunity to at least do some research on how a switch works and how it should be wired up.

Handbook

Definitions

A thin plastic board used to hold electronic components (transistors, resistors, chips, etc.) that are wired together. Used to develop prototypes of electronic circuits, the boards can be reused for future jobs. Breadboards can also be used to create one-of-a-kind systems, although commercial products placed on printed circuit boards are typically much more robust and can handle greater frequencies.

The breadboard contains spring clip contacts typically arranged in matrices with certain blocks of clips already wired together. The components and jump wires (assorted wire lengths with pins at both ends) are plugged into the clips to create the circuit patterns. The boards also typically include metal strips along the side that are used for common power rails and signal buses.

PC Encyclopedia – (https://www.pcmag.com/encyclopedia/term/38905/breadboard)

What does it look like?
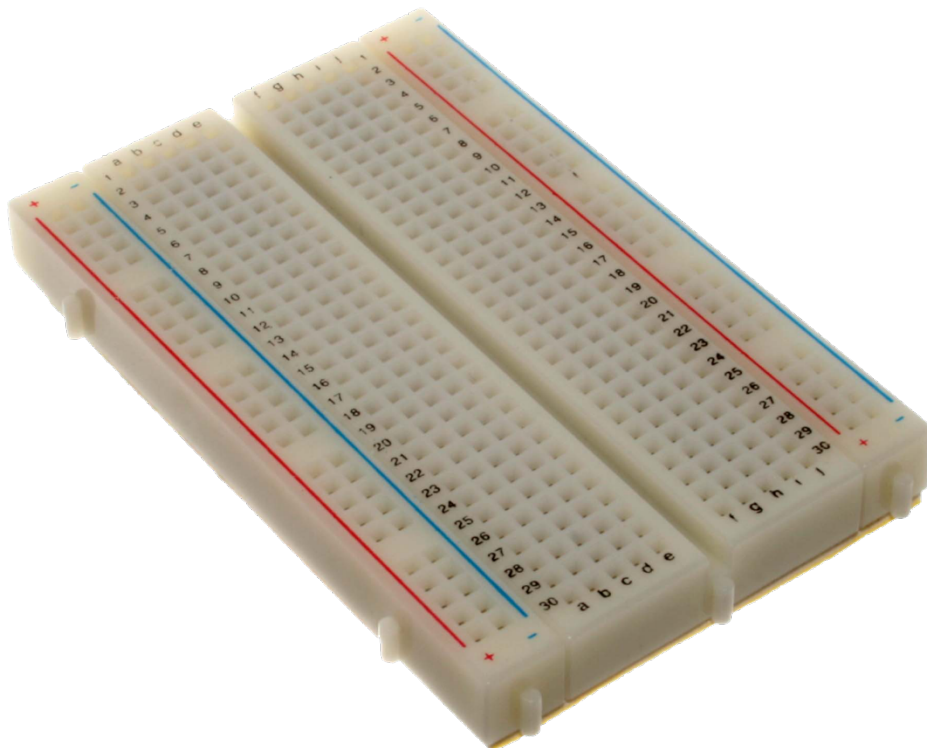
A set of columns (a-j above) and rows (1-30 above) of holes that are internally connected to metal strips. Has positive & negative rails – also internally connected. Typically used for prototyping circuits or more simply creating circuits quickly.

How do we use breadboard?

A breadboard is typically used to build simple or not-so-simple circuits. It is most useful for prototyping before building a production quality circuit/system. Component leads are inserted into the holes in the breadboard and then jumper leads are using to connect them. The jumper leads are also inserted into the holes.

The rails at the sides, generally marked with red and blue lines are positive and negative rails. The lines indicate that all the holes are (electrically) connected together internally via metal strips. To give the power to the breadboard, we would wire up the positive terminal of a battery to the positive rail with a jumper lead inserted into a hole in the positive rail. The same would be done with the negative rail, but from the negative terminal of the battery.
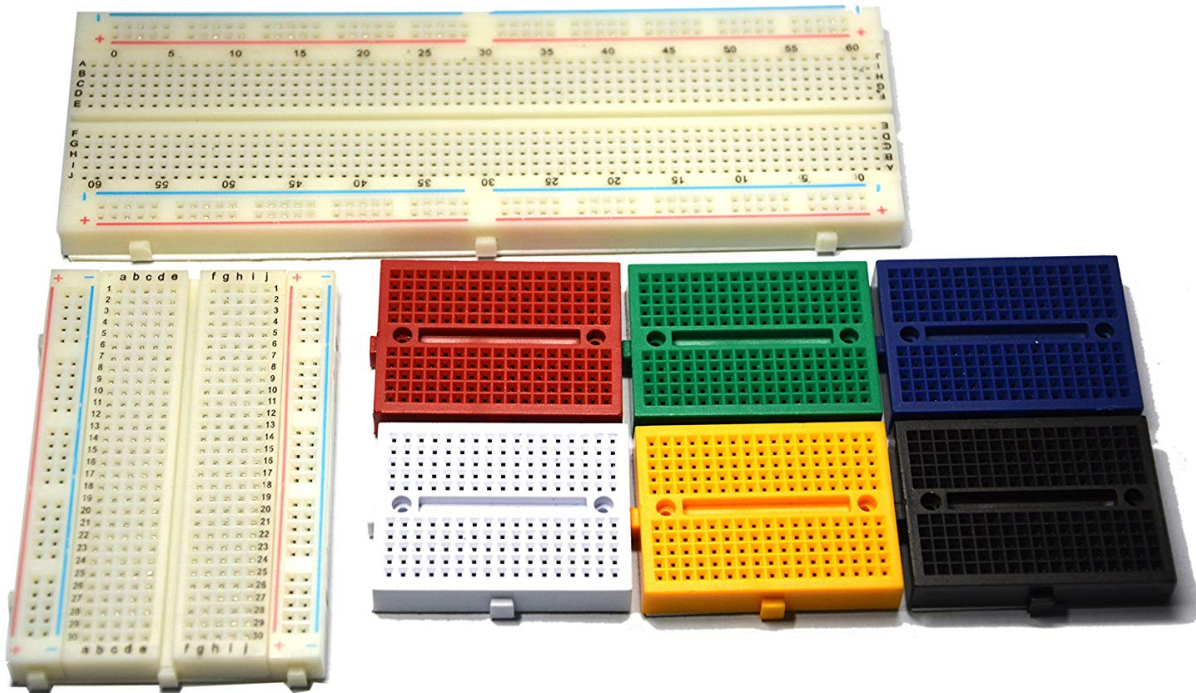
Once the circuit is 'closed' – in other words there are no breaks in the circuit, current flows. If the circuit is open, current will not flow which is equivalent to having an open switch.

A very simple example of a circuit built with a breadboard is shown below:
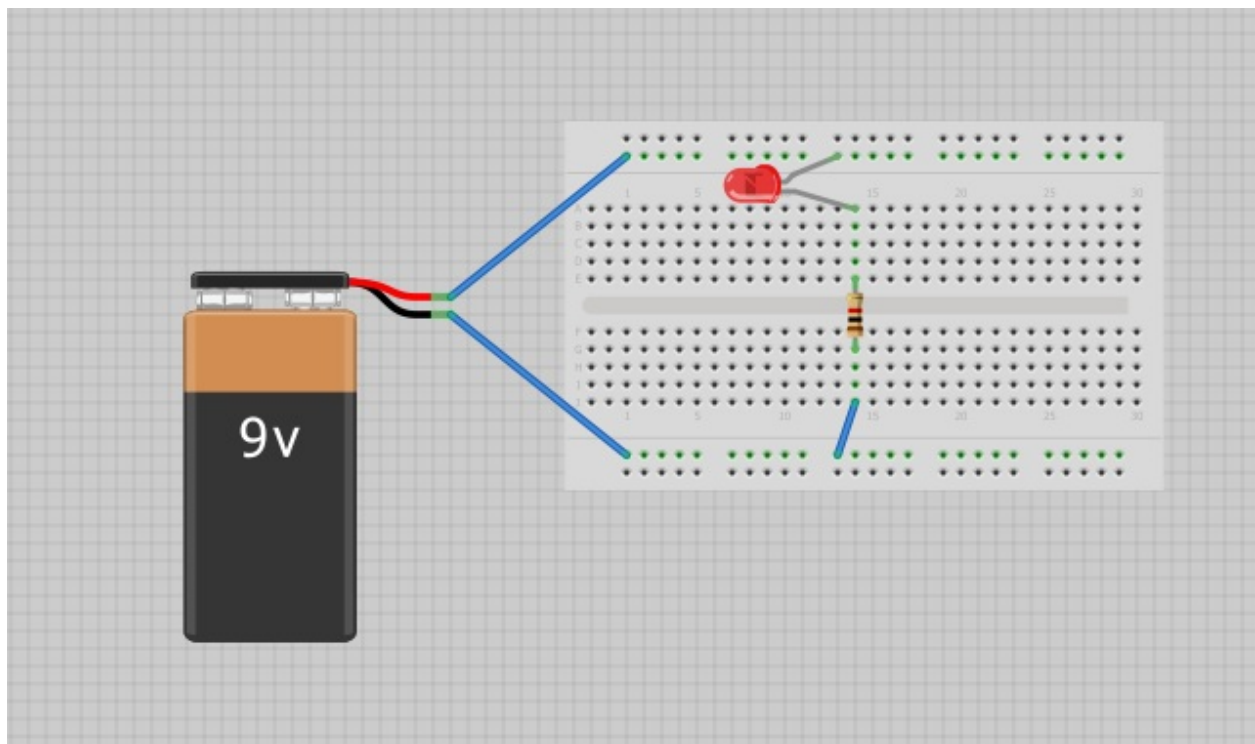
Can you trace the flow of current around the closed circuit starting from the positive (red)
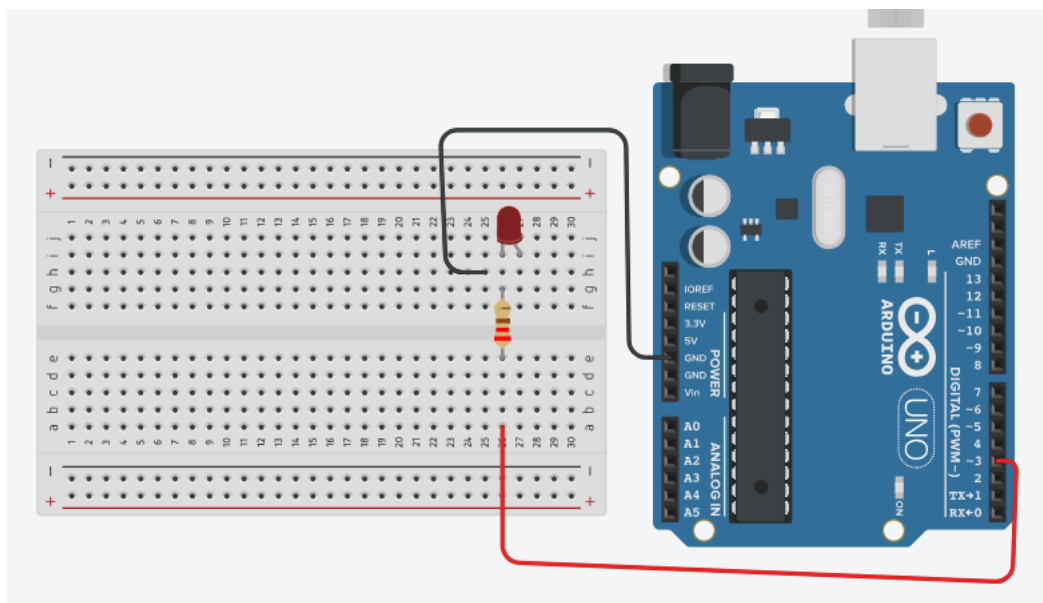
Breadboard Sizes

Breadboards come in different sizes so that you can choose the appropriate one for your project. Note that the small ones (the coloured ones) do not have side rails.

Using a Breadboard Incorrectly

This circuit is wired up correctly as shown by the direction of the arrows
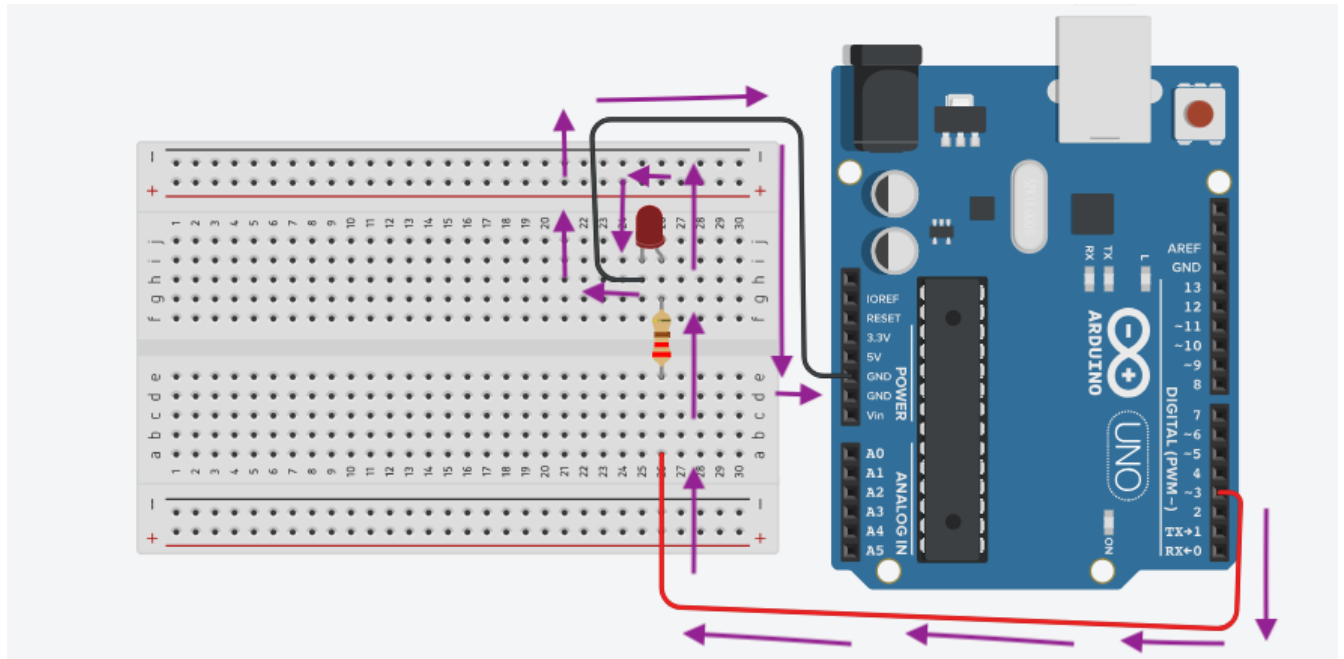
This circuit is not! What is the problem here?

Handouts

Handouts are optional but encouraged. They are normally useful for homework but in some cases you may deem them useful for pre-work depending on the upcoming session content. The handouts are shown here but are alternatively available for download at:

https://github.com/nexgencodecamp/ytp/tree/master/modules/arduino/03-breadboards/handouts

Resources

How to use a Breadboard
https://learn.sparkfun.com/tutorials/how-to-use-a-breadboard

What is a Breadboard
https://youtu.be/QJPImfNpPrU