Welcome to the first month of *A Kit A Month Soldering Subscription!* Each month (with the exception of June) you'll get a parcel containing a newsletter and a kit to solder. Some months there will be extra components, too, for you to experiment with. This newsletter might be a bit brief in places so please also look at the website where I will put extra information and some videos: *www.pocketmoneytronics.co.uk*

Whilst this isn't intended to be a course to teach you electronics, I hope you'll learn a bit on the way. If you want to get straight on with the soldering, feel free to skip the theory and go straight to the kit instructions. However, there are some things you *will* have to learn such as how to insert LEDs correctly — otherwise your circuit won't work!

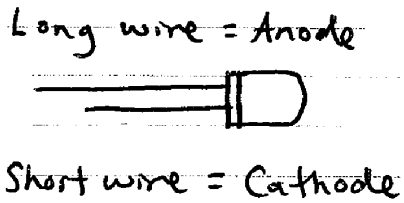
OK, enough of the introduction, let's get on with things. Remember, if you need help, you can always email me at andrew@gale.org.uk or message me on Twitter @pocketmoneytron

Month 1: This month's kit is Nellie The Nine Volt robot and there's also a pack of LEDs for you to experiment with. Nellie will work with a 9v battery but you can also use the enclosed battery holder with four AA batteries which will give you 6v (please keep the battery holder for use with future kits). A quick word about batteries: you can often get two cheap 9v batteries for 99p or £1 and these are fine for most of our kits. However, the audio amplifier in parcel three really requires the more expensive alkaline batteries to avoid disappointment.

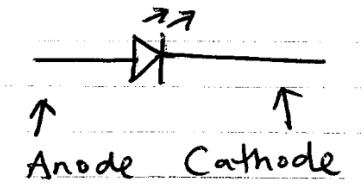
Also in the pack is a small piece of sandpaper that you can use to tidy up the edges of the PCBs that you'll be receiving*. You may decide it's not necessary to do so but, if you do, please be careful because PCBs are made from fibreglass and the dust is an irritant, so avoiding getting it on your skin / in your eyes / breathing it in. However, please keep the sandpaper handy because you'll need it in future months.

LEDs: LEDs are *cool….* and I mean that literally: they give out far less heat than old-fashioned light bulbs. They are also smaller, easier to control and tons of fun. But there's one rule you need to learn when using LEDs in your circuits: always use a resistor in series with it. Why? Well, if you omit the resistor, you'll let too much current flow through the LED and break it (it's unlikely to do anything as exciting as blow-up, so don't be tempted to give it a go… you'll just end up ruining a nice LED!).

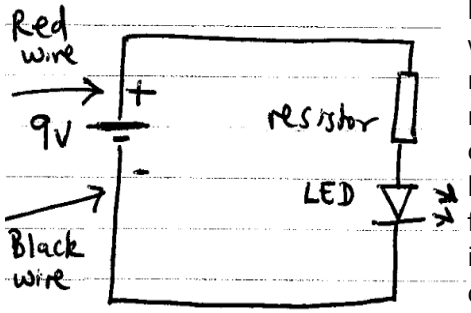
There's another thing you need to know: LEDs *must* be connected the correct way around, otherwise they won't work. That's because an LED is a Light-Emitting Diode and diodes only carry current in one direction. If you look at an LED you'll see that it has one long wire (called the 'anode') and one the short wire (called the 'cathode'):



And this is the circuit symbol for an LED:



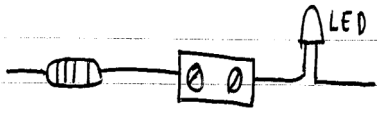
The LED will only work if the anode is more positive than the cathode and here's a circuit we could build that would work:



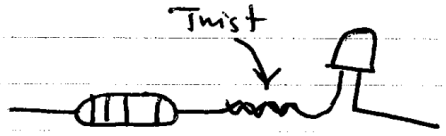
(The red and black wires are the wires of the 9v battery connector).

As you may know, resistors come in different values. Which should we use? Well, it depends on your supply voltage: if you are using a 9v battery or 6v then I'd recommend using the 1kΩ resistor (colour code: brown, black, red) or you could use a 470Ω resistor (yellow, violet, brown) to make the LED brighter. You'll find both values in you experimenter kit along with some 270Ω resistors (red, violet, brown) which are intended for use when linking your LEDs to a Raspberry Pi or Arduino (don't be tempted to use the 270Ω resistor with a 6v or 9v battery as you'll get too much current flowing).

So how can you build-up this circuit? You can make connections by using the terminal blocks such as here:



Or, less ideally, you could twist the wires:

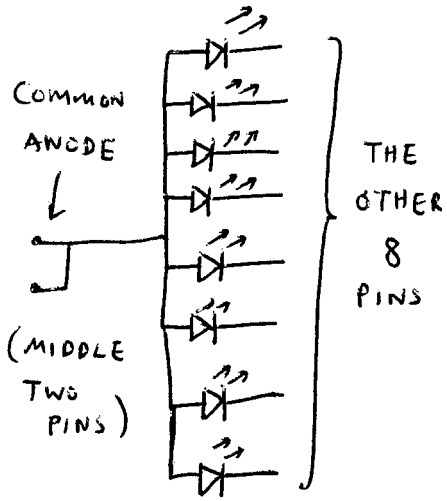


However, I'd recommend going to the website and you'll see that I've put together a video showing you how to experiment with LEDs and build a simple LED tester using the terminal block.

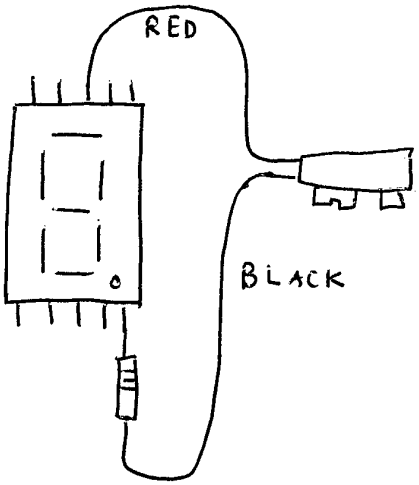
Bi-colour LEDs are even more exciting than normal LEDs and there's one in your experimenter's pack (it's the one with a colourless body). Normally an LED doesn't light-up when it's connected the wrong way round *but this one does*. One way round it gives out *red* light and the other way round it gives out *green* light. How does it achieve this crazy feat? It actually contains *two* LEDs inside the body, one pointing in each direction.

** PCB = Printed Circuit Board*

7-segment displays use LEDs to display numbers and there's one in your pack. Have a look and you'll see that on the back are ten 'pins' that we can make connections to. Your display actually contains *eight* LEDs, one for each 'segment' and one for the decimal point. This particular display is of the 'common-anode' variety which means that the anodes of the 8 LEDs all connected together to one pin. Actually, in this case, *two* pins (the middle ones of each row):



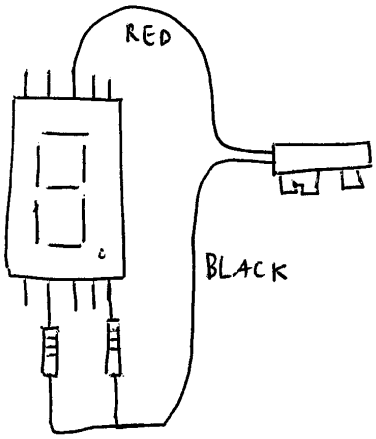
So how can you light up one of the segments? You connect the common anodes to the battery's positive terminal and then connect one of the other 8 pins to the battery's negative terminal via a resistor:



In this case the decimal point should illuminate.

I recommend using the 1KΩ resistors when experimenting (colour code brown, black, red .... note that you can ignore the gold coloured band on all our resistors).

What about illuminating *two* segments? You'll need another resistor:



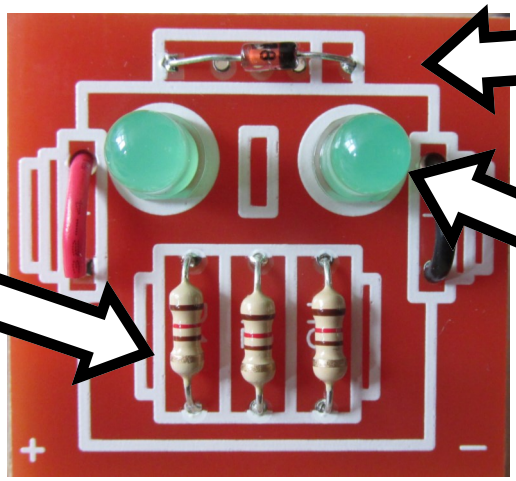
I'll put a video on my website in a few weeks' time showing you how to experiment with this seven-segment LED and I'll also show you how you can connect it to a Raspberry Pi to display numbers.

That's it for this month. Let me know how you get on and keep checking the website for news!

How to build....***Nellie the nine volt robot***

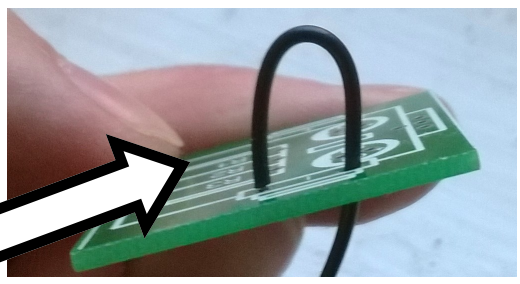
You can also watch a video at www.pocketmoneytronics.co.uk

1. Solder the three resis-tors in place. It doesn't matter which way round they go.



2. Solder the diode across the top 5 holes. IMPORTANT: the end with the black band must be on the right hand side.

3. Now the LEDs. IMPORTANT: the longer wire must go in the hole marked with a '+' symbol.



4. Finally the battery connector: the red wire goes to the '+' hole and the black wire to the '-' hole. Feed the wire up from behind—through the larger hole and then push the stripped end of the wire down into the lower hole for soldering. After soldering, pull the wire flat.