

MAKER GUIDE

PAPER CIRCUITS CARD MAKING

BEGINNER



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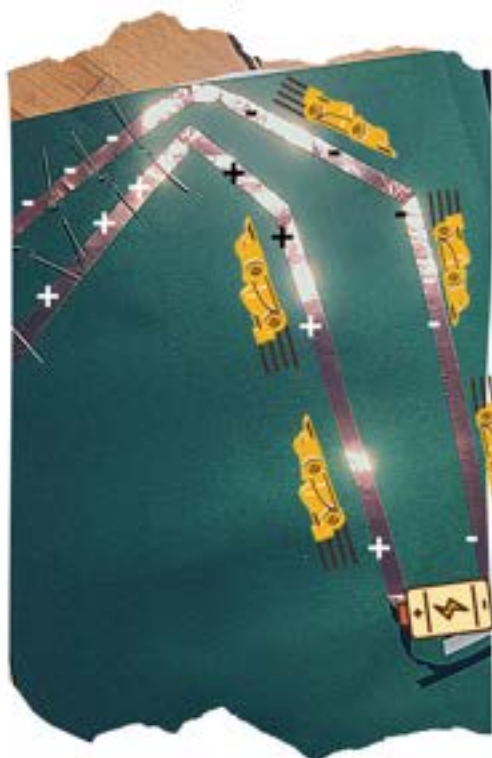
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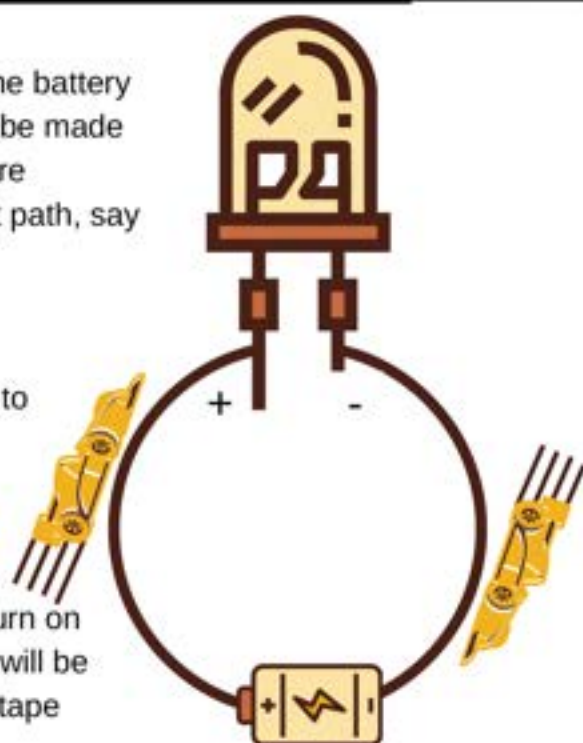
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WHAT IS A CIRCUIT?

A circuit is a path through which electrical current flows. The battery pushes electrical current through the path. This path must be made up of conductive material connected to the battery, the more conductive, the easier the path. If we put something in that path, say an LED, the current will run through that and light it up!

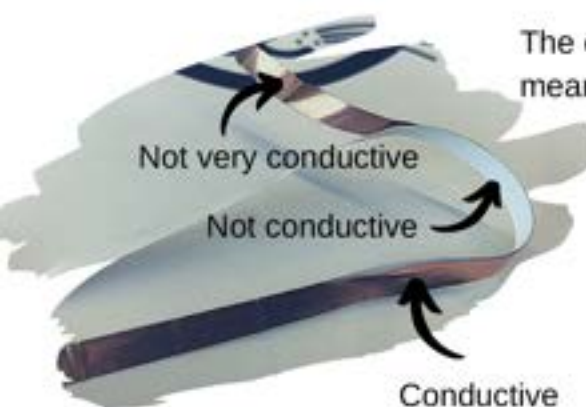


Electrical current wants to get to through the circuit as fast as possible, so if you give it a shortcut it will take it. If the two lines of your copper tape touch, your LEDs won't turn on because the electrical current will be speeding through that copper tape bridge instead.



When placing down your copper tape, fold it, don't cut it! Cutting the copper tape is like cutting up the racetrack, if the road is cut up the car can't get through!

What is a conductive?



The copper tape is conductive, this means it will carry the power from the battery to the LED. The plastic the copper tape comes stuck to, and sticky tape, are not conductive. The bottom side of the copper tape is a little conductive. That makes it a bit better for sticking down the legs of your LEDs then sticky tape.

Pro Tip

Don't stick the copper tape on top of your LED legs, the sticky side isn't conductive enough to carry the power the circuit needs

YOUR FIRST PAPER CIRCUIT

1



Pro Tip

Don't use all the copper tape at this stage, save some for your card!

Before you start, gather up the sheets, the copper tape, the lights, and the battery. You should decide now if you want to do the cat design or the skull design. You may also want to colour your chosen design now, since it'll be much harder once you put the lights in!

2



Next stick your LEDs into the eyes of the design. Make sure you line up the short legs on one side and the long legs on the other side.



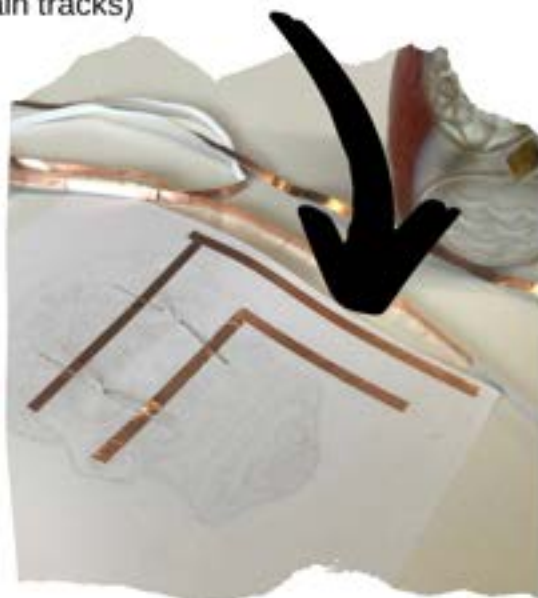
YOUR FIRST PAPER CIRCUIT

3



Now place the copper tape down next to the LED legs.

The aim is to get a shape like this (Sort of like train tracks)

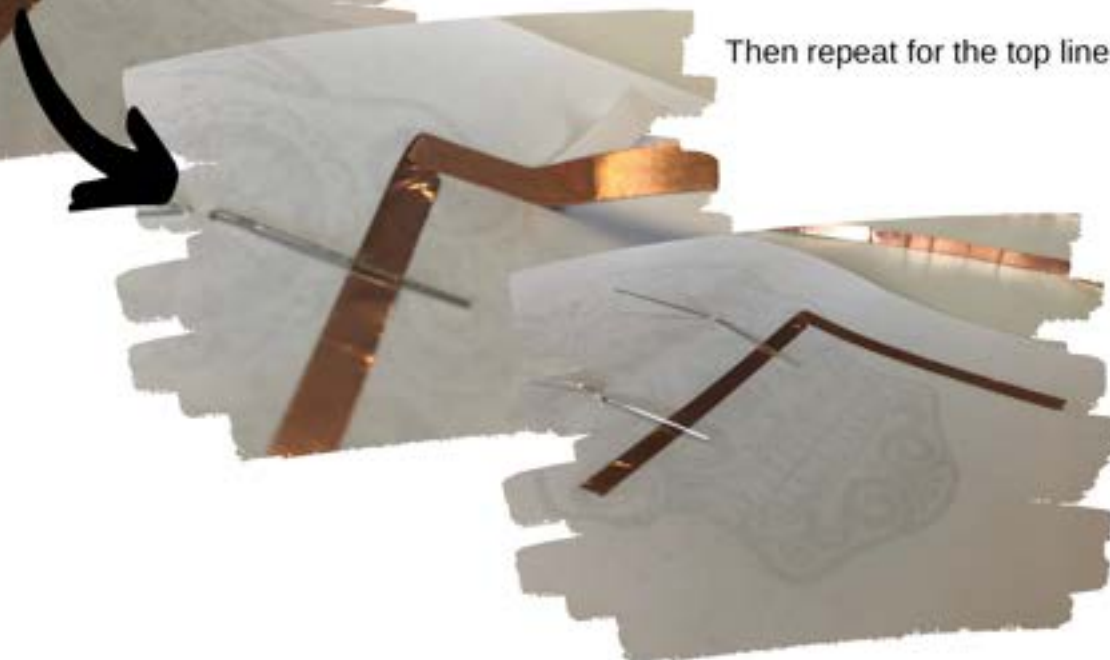


If you find it hard to put the copper tape down with the LEDs on the other side of the paper, take the LEDs out and then place the copper tape.



Don't cut the copper tape, fold it!
Fold the copper tape up, then down.

Then repeat for the top line!

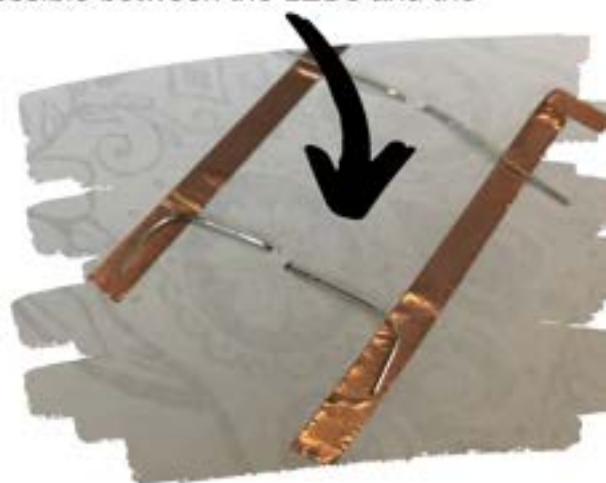


YOUR FIRST PAPER CIRCUIT

4



Once you've got the copper tape down you'll want to test the circuit. Bend the LED legs to try and get as much contact as possible between the LEDs and the copper tape!



5



Next place the battery and test your circuit, holding down the legs of each LED as you go along to ensure the legs are on the right way around.

Pro Tip

Always test your circuit before sticking it down.



YOUR FIRST PAPER CIRCUIT

6



After that, stick the LED legs down with the left over bits of copper tape.

The sticky side of the copper tape is a little conductive

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What if my circuit doesn't work?

Here are some common problems and fixes:

If none of your lights turn on then you've got the battery around the wrong way!

If some of your lights turn on then the other lights are having connection issues. You may need to hold their legs down until you find the perfect position for them to sit in.

MAKE A LIGHT UP CARD

1



It's always good practice to gather everything you need in one spot before you start. Make sure you've got your card design, your copper tape, your lights, your battery and anything else you need to make this card.

Don't glue anything down yet! First line up all your elements and think about where you want the lights to go.

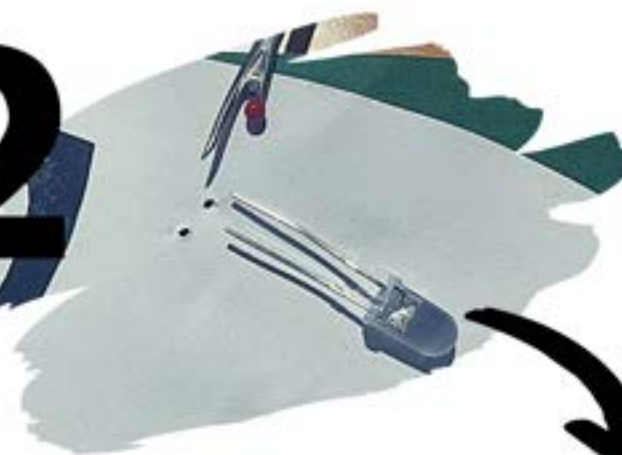
Pro Tip

Some colours don't work together. Use the same colour LEDs for the best results

Pro Tip

Use less lights!
More LEDs =
dimmer lights

2



Once you're sure of where you want to place your lights, grab a needle or something sharp to poke two holes close together for your LED legs to go through. Repeat until you have enough holes for all your LEDs.

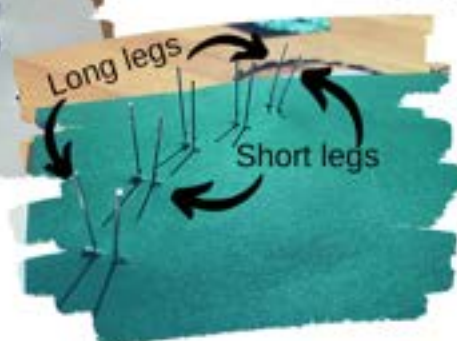
Plan carefully as you can't erase holes.



MAKE A LIGHT UP CARD

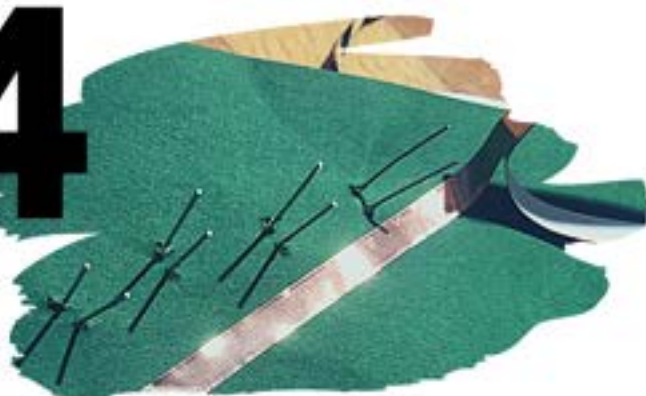
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Now stick your LEDs into the holes you've made. Make sure you line up all the short legs on one side and all the long legs on the other side.



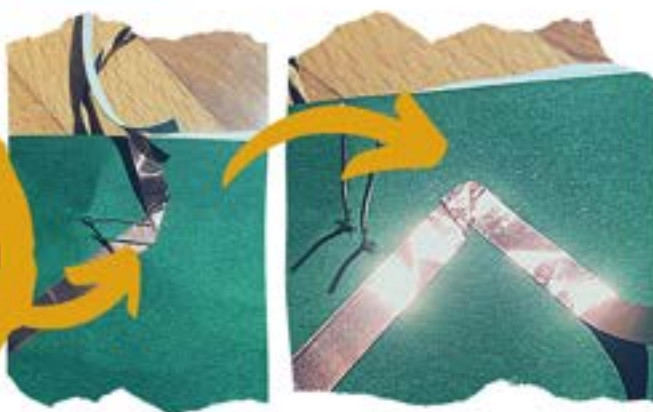
4

Now place the copper tape down next to the LED legs. If you find it hard to put the copper tape down with the LEDs on the other side of the paper, you can take the LEDs out and then place the copper tape.



Pro Tip

Don't cut or cross the copper tape, fold it! Fold the copper tape up then down.



MAKE A LIGHT UP CARD

SIMPLE WAY TO POWER YOUR CARD



This is a simple powered card design, if you're not used to making paper circuits this will be the easiest option to get started. If you want a challenge, skip this page and head to the next one for a more complicated circuit design.



This line is a little too long!

In this design the circuit goes from the bottom left of the card to the top right. The top right is a super easy place to put your battery, simply fold of the top right corner and secure with a paper clip or binder clip. Be careful to not extend the bottom line too far otherwise it might touch the top line and short circuit your card!

Pro Tip

Hide the circuit by making your card double layered. Simply add a folded piece of paper in the inside of your card and secure it with string or glue. Fancy and practical!



MAKE A LIGHT UP CARD

COMPLEX WAY TO POWER YOUR CARD

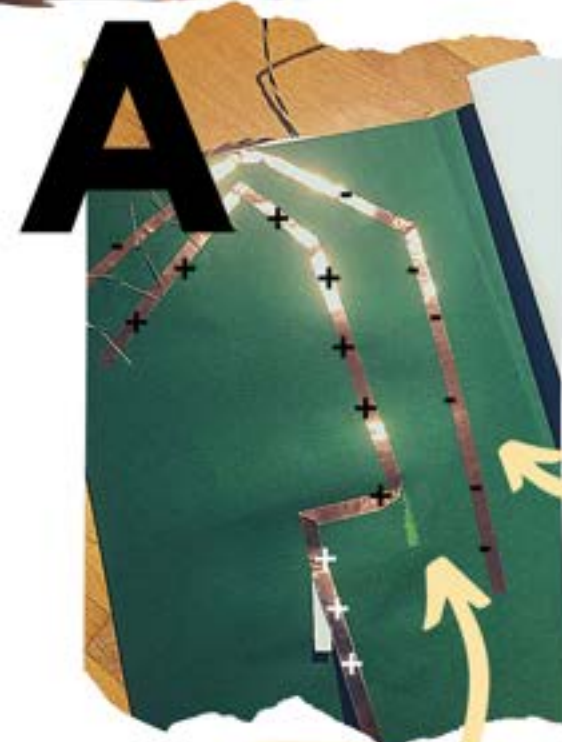


Paper Circuits don't need to be two dimensional, try this design if you want to start thinking about circuits in the third dimension.

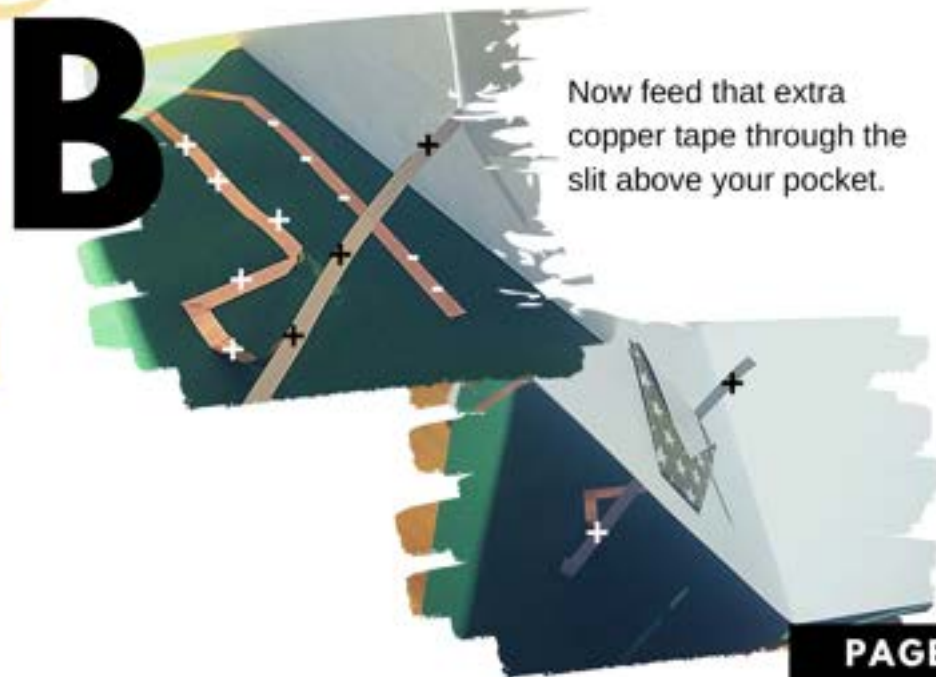
The aim of this design is to make a neat battery holder on the paper insert of the card. This will allow the battery to be easily accessible and still hide the messy circuit underneath.

First, create a pocket that the battery can sit in. This design uses an origami cup. Glue this pocket to the paper insert and cut a small hole just above it's opening.

Then layout the circuit design to finish where the slit will be. Make sure there's room between the two lines of copper tape so they won't touch. Leave one line of tape with excess tape still attached.



Don't worry, everyone makes mistakes!



Now feed that extra copper tape through the slit above your pocket.

MAKE A LIGHT UP CARD

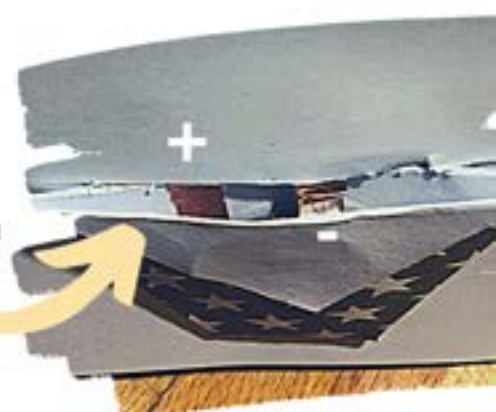
COMPLEX WAY TO POWER YOUR CARD



Next remove the backing and fold that copper tape so that it lines the inside of the pocket.

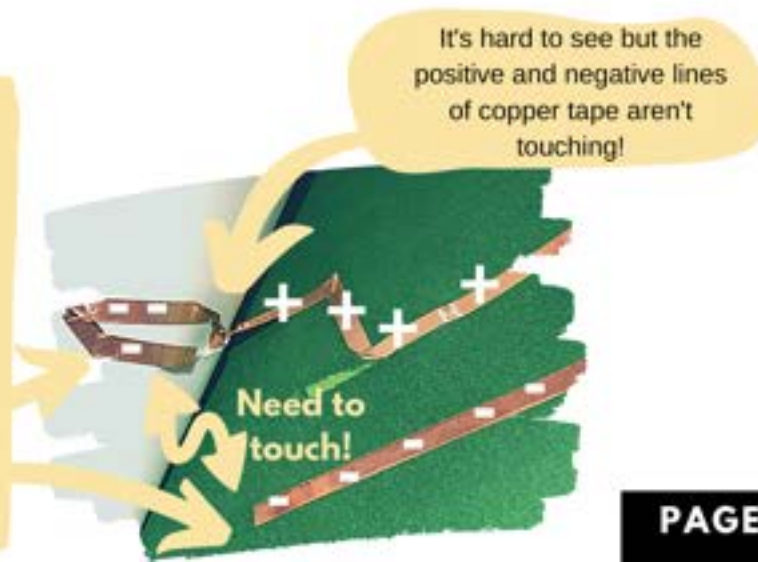


Now get another piece of copper tape and stick it on the other side of the pocket. Make sure the lines don't touch each other but are close enough to touch a battery.



Then feed the rest of the copper tape through the slit.

E This is a particularly tricky part! Now make sure the copper tape you just fed through touches the right copper tape line. For this example this copper tape is carrying the negative charge and should touch the negative line. The copper tape has been folded to offer the biggest connection area between the lines.



MAKE A LIGHT UP CARD

5

Pro Tip

Always test your circuit before sticking stuff down!

Next place the battery and test your circuit, holding down the legs of each LED as you go along to make sure the legs are on the right way around.

6

After that stick the LEDs legs down with the left over bits of copper tape. If none of your lights turn on then you've got the battery around the wrong way! If some of your lights turn on then the others are having connection issues. You may need to hold their legs down until you find the perfect position for them to sit in.

Pro Tip

You might want to bend the LED legs to get as much contact as possible between the LED and the copper tape!

This card has a lot of lights making it hard to keep them all lit up!



WHAT'S NEXT?



Pu Gong Ying Tu (Dandelion Painting)
by Jie Qi

Paper circuits can be simple but they don't need to be. Check out the work of the amazing people at **High-Low Tech** for some further examples of paper circuits with interesting switches: highlowtech.org/?p=2505
You might also want to look at **Sparkfun's** page, **The Great Big Guide to Paper Circuits**, found here: learn.sparkfun.com/tutorials/the-great-big-guide-to-paper-circuits/all



What if you've run out of materials?
Where can you get more?

Copper Tape can actually be used to repel snails and slugs and can be picked up at most hardware stores (though you may need to cut it to the desired size).

Copper Tape and LEDs can also be found at any electronics store.

Finally there are a ton of places that sell these sort of electronics online so if you can't get out you can still stock up!