45 Projects w/Templates

Paper Circuits

For Makerspaces

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Andrew Miller

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By Andrew Miller
Makerspaces.com

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Author: Andrew Miller
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To my daughter Lilly -

May you love to make things as much as your dad does.

About the Author

Andrew Miller is the Founder and CEO of Makerspaces.com which he started in 2014 to help schools and libraries learn more about starting and running a makerspace. He is a strong believer in maker education and hands-on learning as a way to help students acquire the skills needed to succeed in the 21st century. He comes from a long line of teachers and is committed to helping improve the educational system through Maker Ed. Andrew has been a maker since he was 8 years old and hopes to inspire others to find the joy in making.

Contents

"If we teach today as we taught yesterday, we rob our children of tomorrow"

- John Dewey

Introduction

At Makerspaces.com, we help schools and libraries learn about maker education so they can start their own educational makerspace. Figuring out how to build the space is often not the main concern of the teachers and librarians. They are more interested in what type of projects and activities to do inside the makerspace. This is where paper circuits come in.

We have been talking about maker projects for years on Twitter (@Makerspaces_com) and the one project we are most fond of, is making circuits with copper tape and LEDs. It's not only fun to do but it's educational and really easy to learn. Creating these circuits are great for all ages and we've had everyone from elementary school students to senior citizens do these projects.

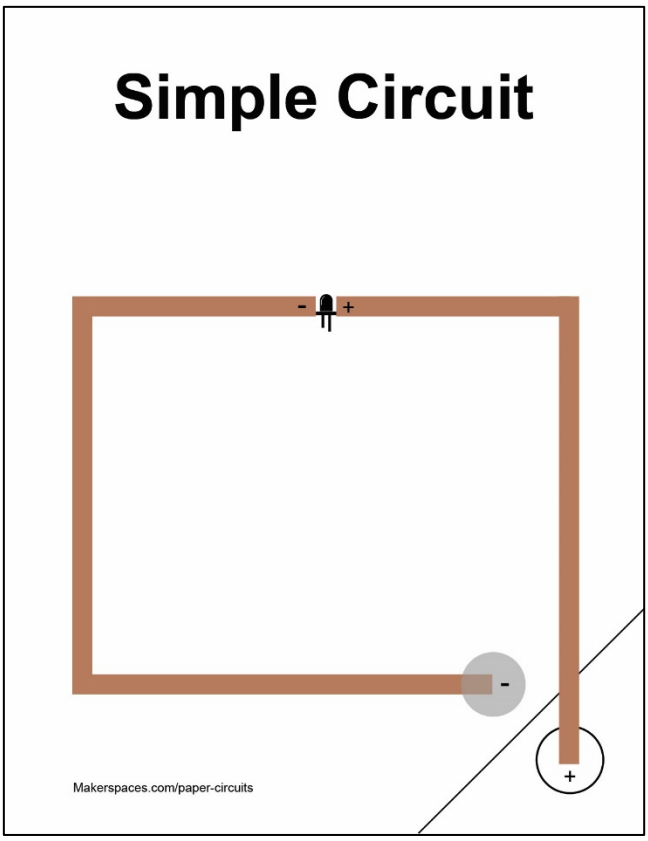
So what is a paper circuit? A paper circuit is a low-voltage electric circuit that is created on paper or cardboard using conductive copper tape, LEDs and a power supply such as a coin-cell battery. In addition to LEDs, you can also add switches, buzzers and motors to make your circuit more interactive. This project is a great way to learn about electricity or just make a light-up greeting card for your mom.

Now it's time to learn by doing and create a paper circuit.

"Tell me and I forget. Teach me and I may remember. Involve me and I learn."

- Benjamin Franklin

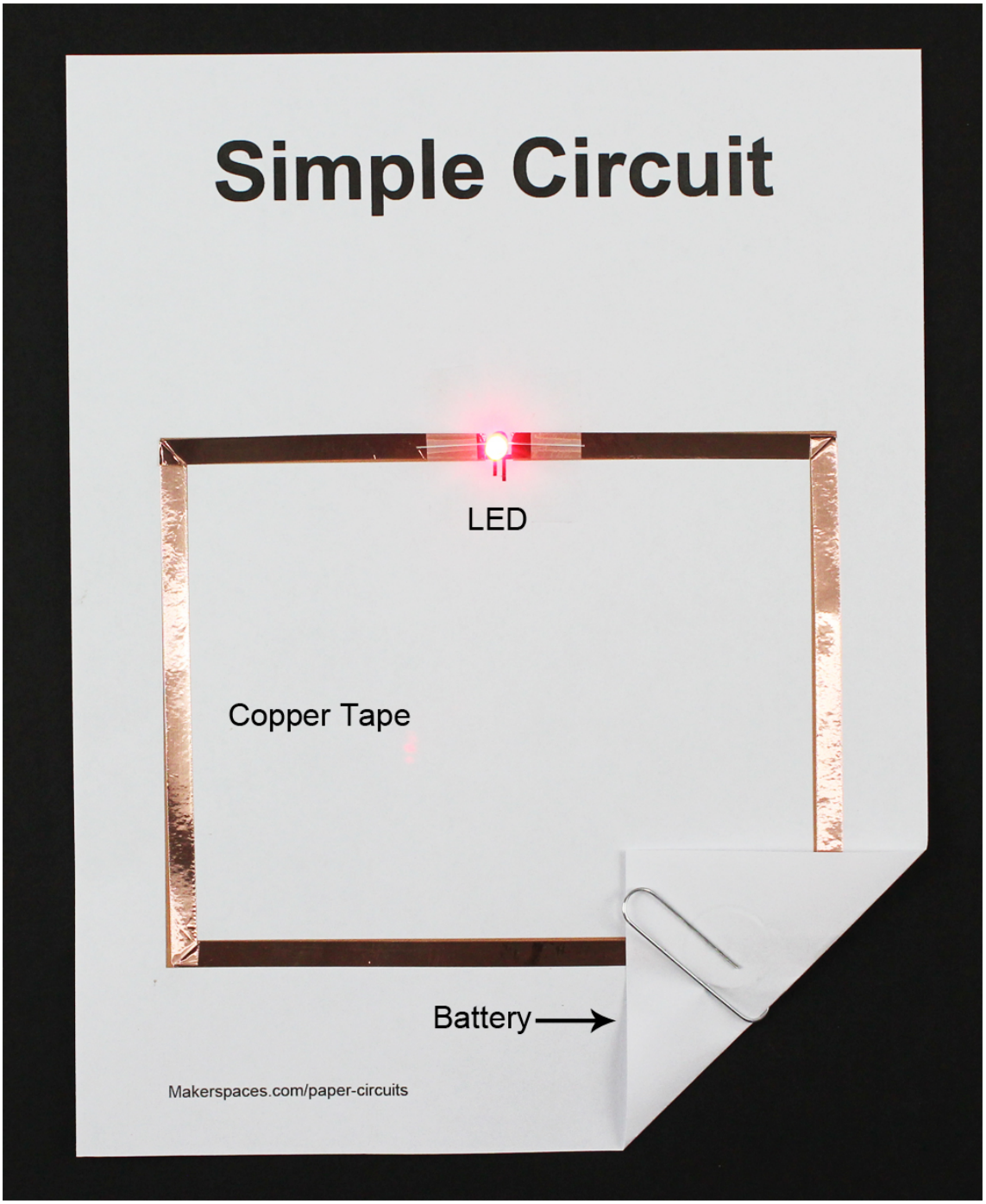
How to Make a Paper Circuit



One of the best ways to learn something is to get hands-on with it. Learning by doing is a top reason why makerspaces are becoming so popular in schools and libraries today. This book was designed with that principal in mind and includes over 45 hands-on paper circuit projects.

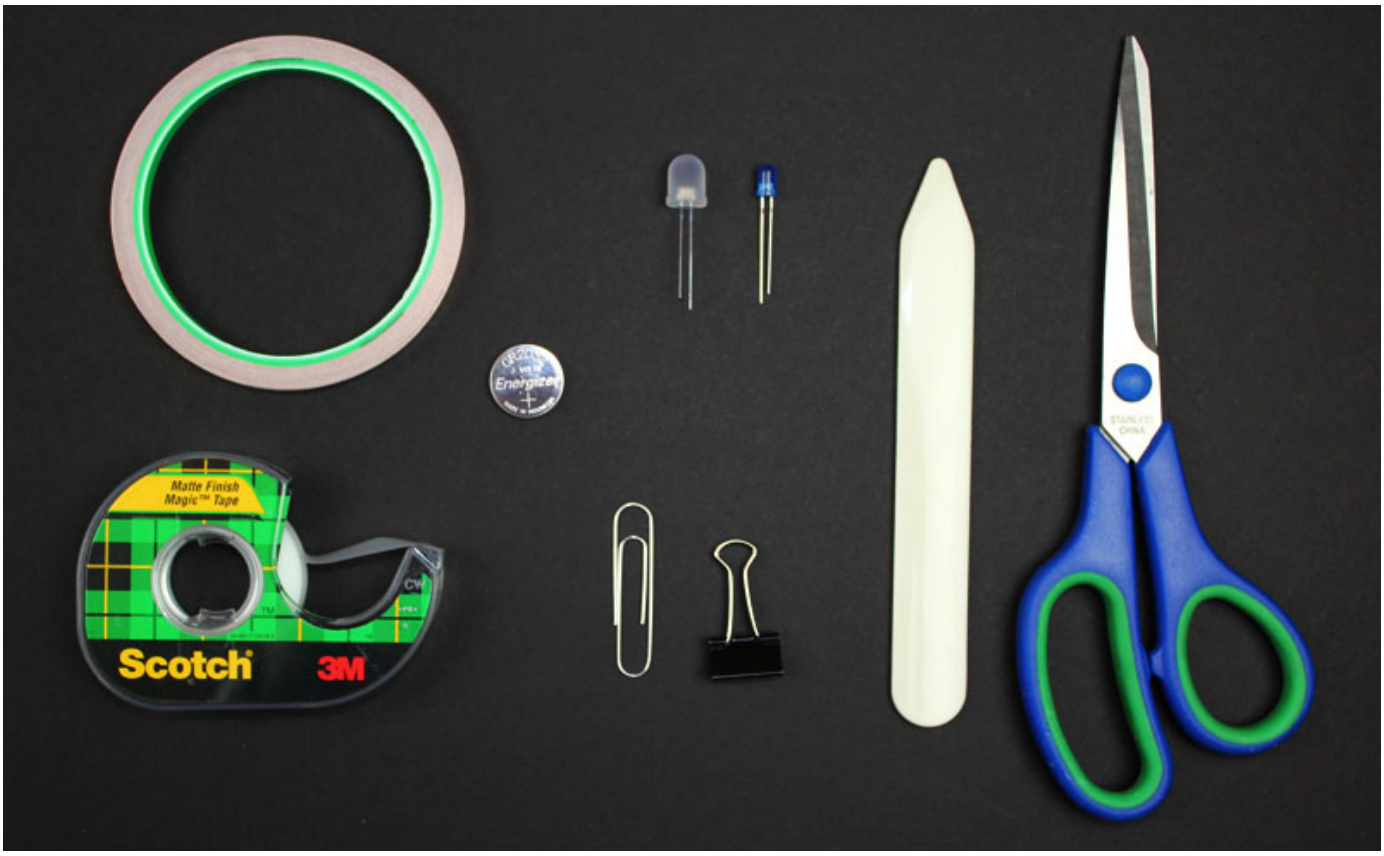
Hopefully you will create most of these projects and then use this knowledge to design your own.

In order to give you a solid foundation on creating a paper circuit, we need to start with the most basic which is a simple circuit.



Paper Circuit Example

Materials & Tools Needed

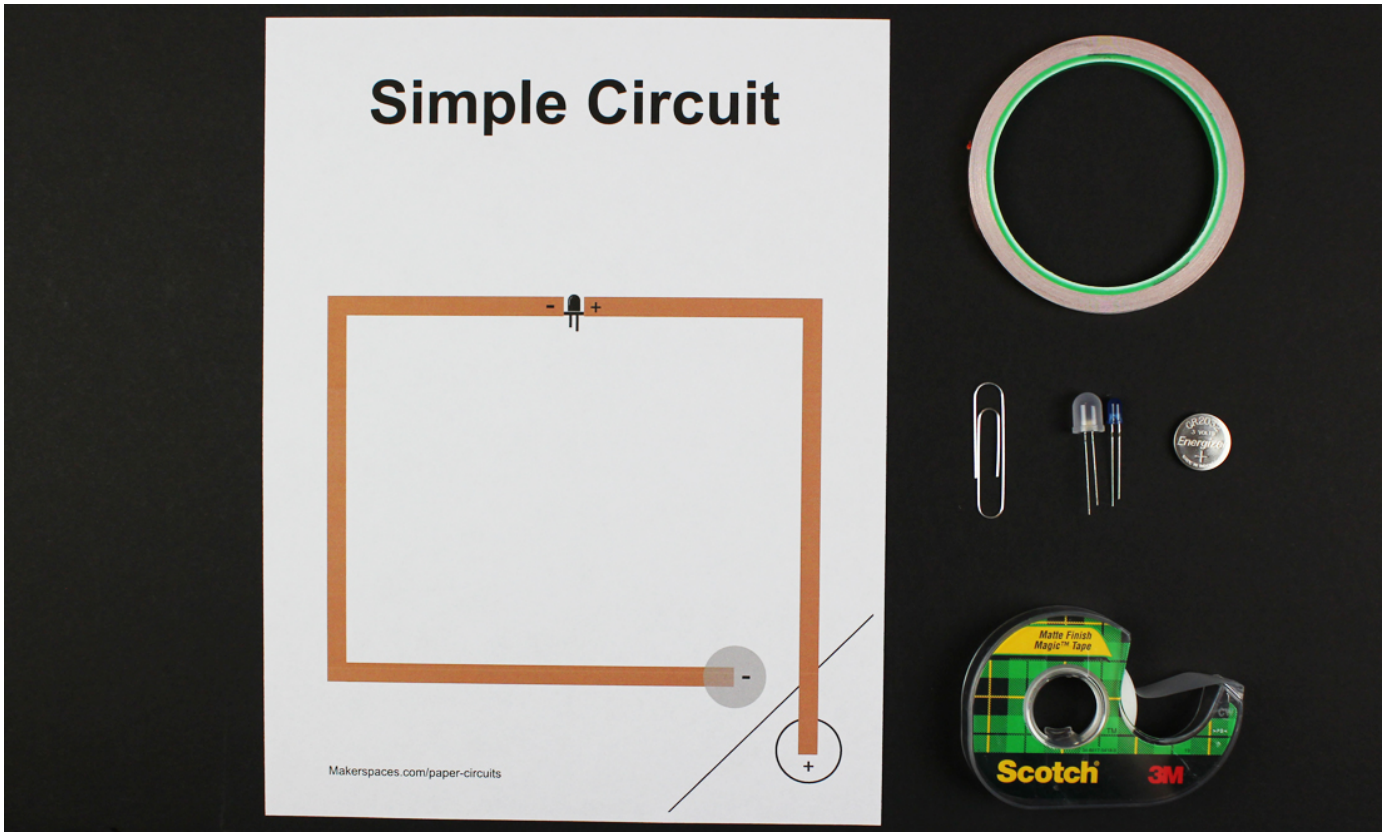


The materials & tools listed below are the items needed to complete this simple circuit project.

<u>Materials:</u>
Copper tape (1/4”) with conductive adhesive
Transparent tape
Coin cell battery (3v) CR2032
LED – 5mm or 10mm
Paper clip or binder clip

<u>Tools:</u>
Scoring tool
Scissors

Simple Circuit: Step-by-Step

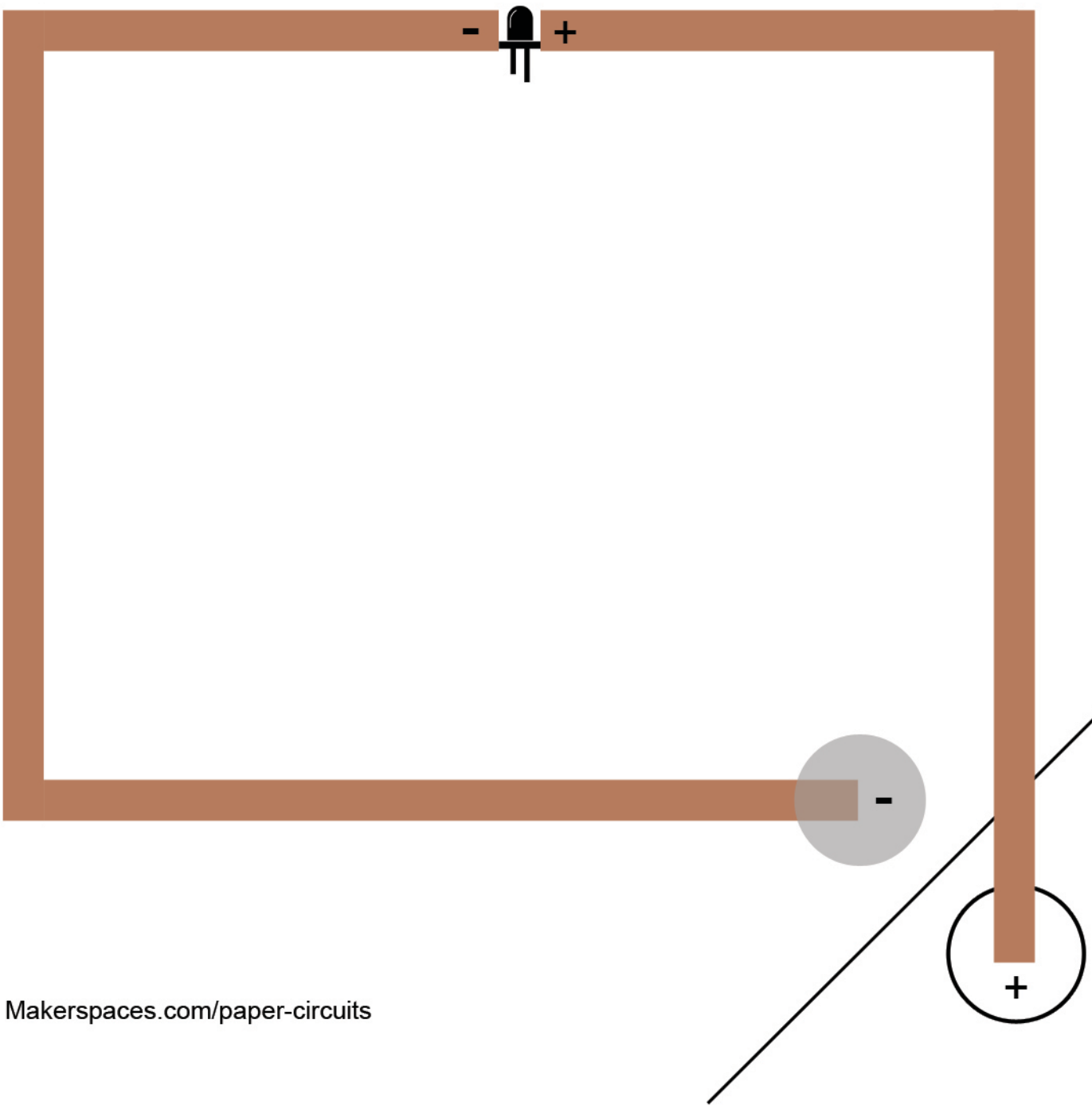


WARNINGS – Copper tape can have very sharp edges and is able to cut skin like a paper cut. Be careful when handling or cutting the copper tape. Also, this project is low voltage (3V DC) and is NOT intended to be used with 120v. Do not use any power source other than a battery. There are small parts used in this and future projects and can be a possible choking hazard to young children. Do not put any of these materials or parts in your mouth. If you choose to use an X-Acto hobby knife, use extreme caution as the blade is very sharp and dangerous.

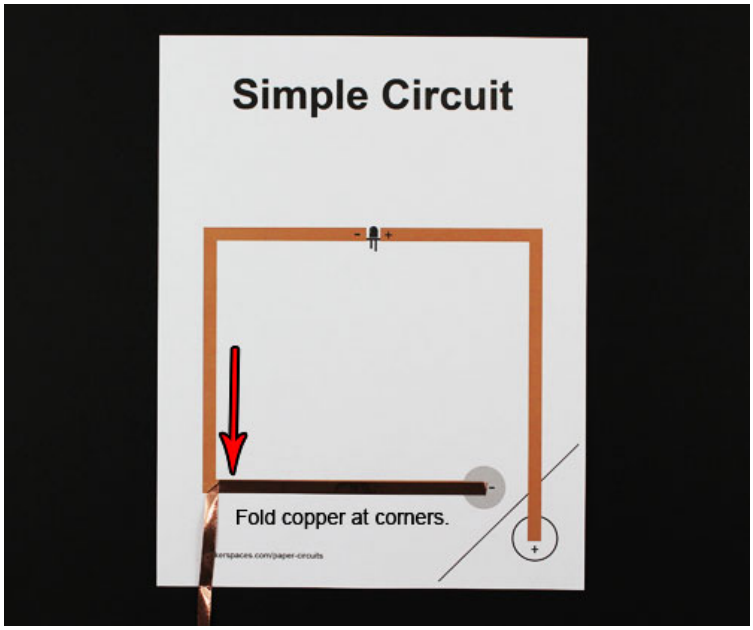
Print Template

To begin this project, you will need to print out the simple circuit template that is provided on the next page.

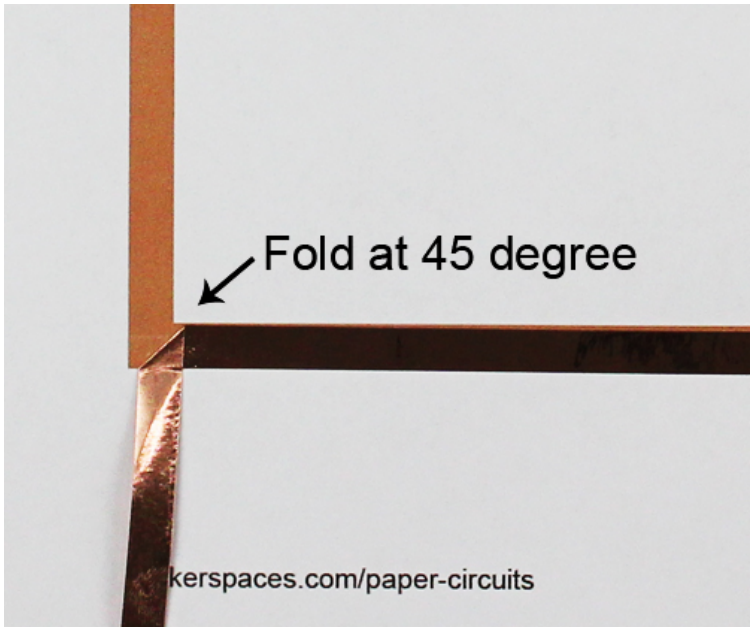
Simple Circuit



Step 1 – Apply Copper Tape

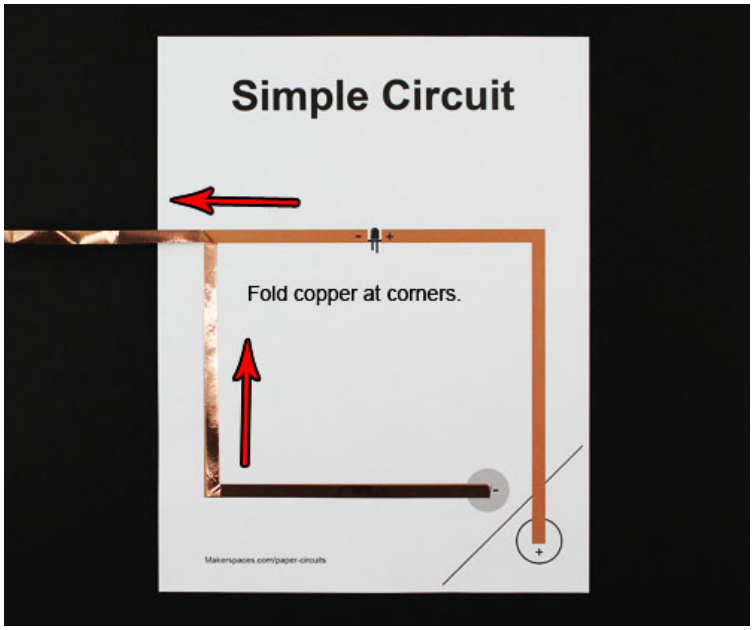


Apply the copper tape to all of the trace lines marked in brown on the template. It is best to maintain a continuous strip of copper tape versus cutting it.

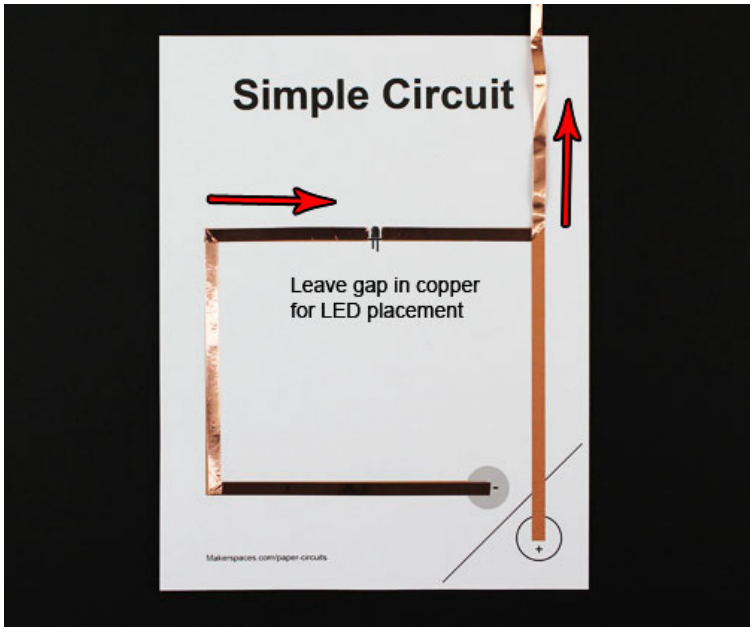


When you come to the corners, fold the copper at a 45’ angle in the opposite direction of where you are going. Then with your finger make a crease and then fold it back at a 180’ angle and continue to apply to the template.

Step 1 – Apply Copper Tape (cont.)

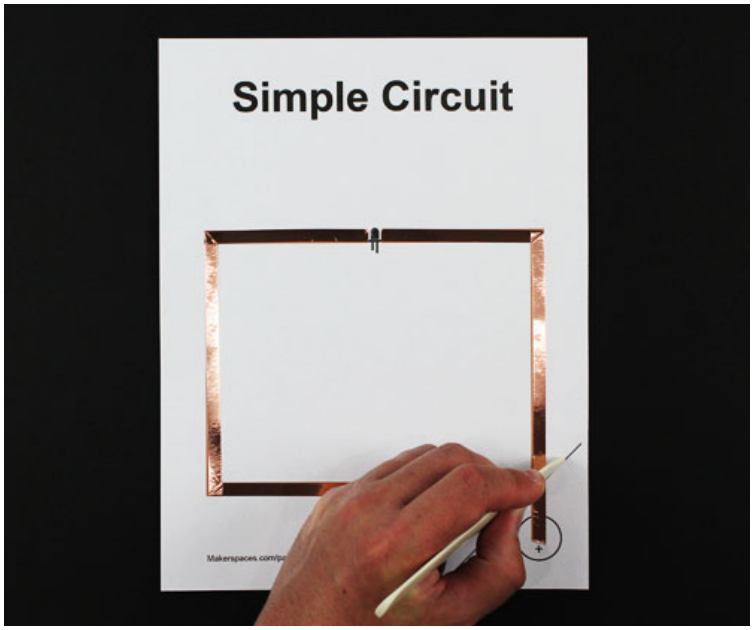


Continue to apply the copper tape to all of the trace lines marked in brown on the template

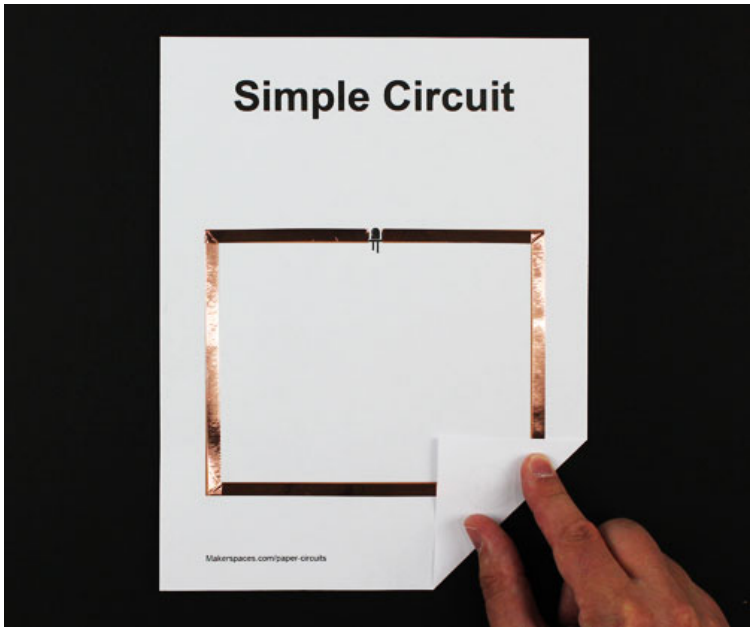


Make sure to leave a gap in the copper tape where the LED is to be mounted.

Step 2 – Score and Fold Corner

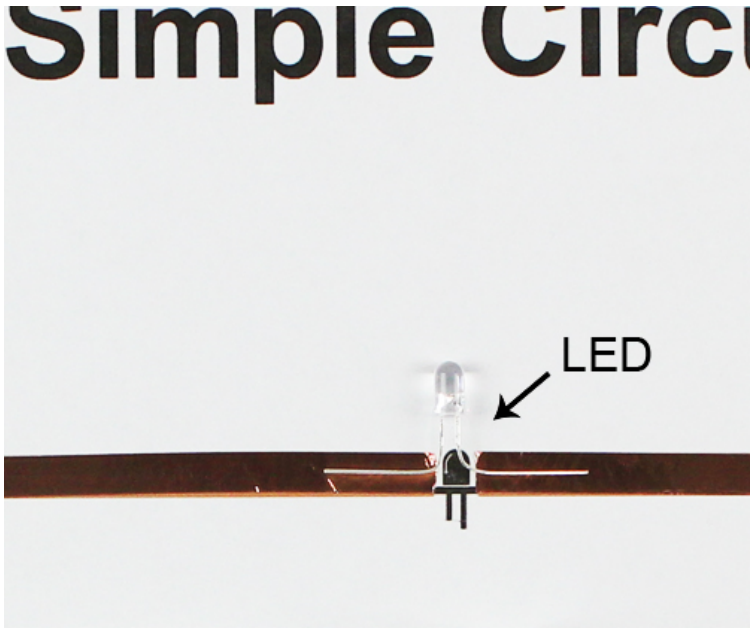


Use a scoring tool to make folding the corner more accurate. It's important that the two circles line up.

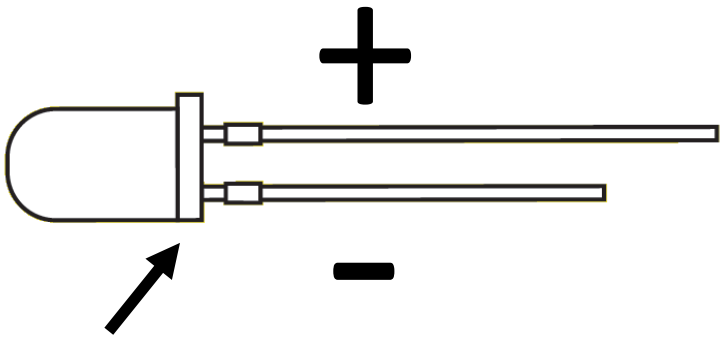


Once the corner is creased, fold it at a 45' angle.

Step 3 – Mount LED to Copper Tape



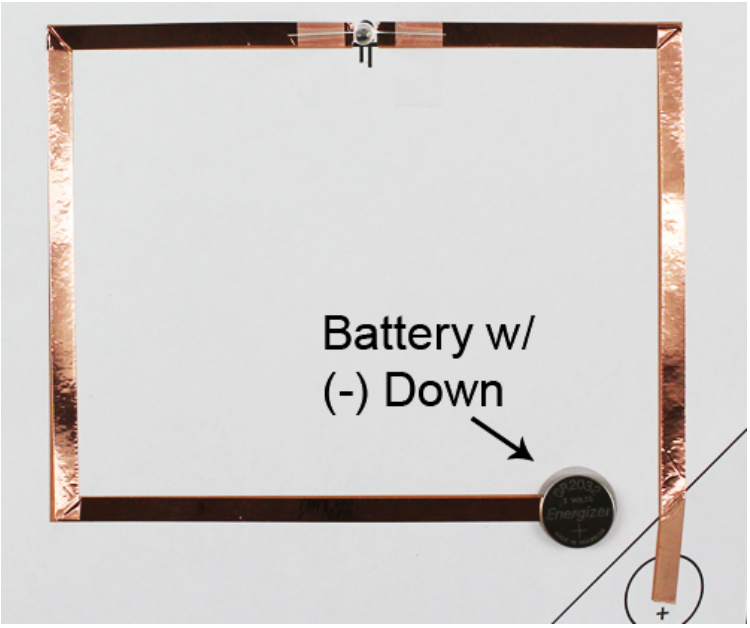
Mount the LED to the copper trace using clear tape. To do this, bend both legs of the LED at a 90’ angle and then tape the legs down securely. Make sure that the long leg of the LED goes to the positive (+) side of the copper tape.



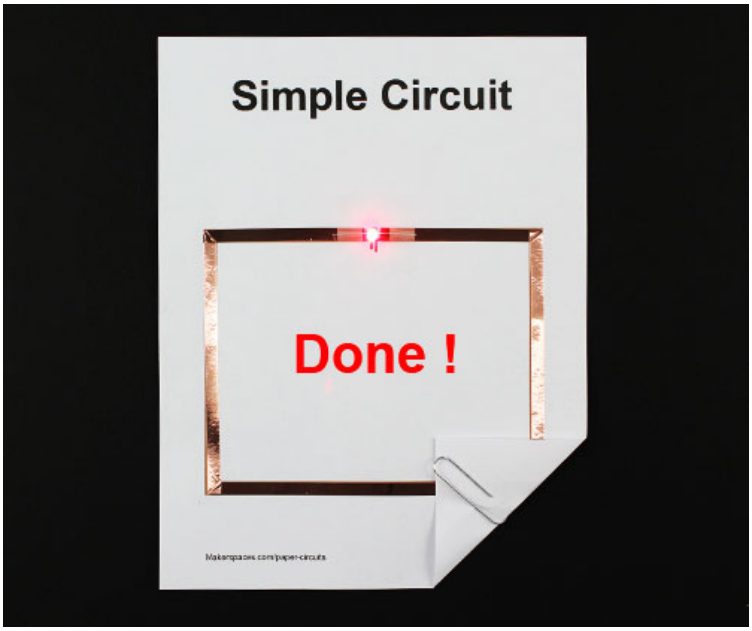
Flat Side = Negative

This image shows how to tell which leg of the LED is positive (+). If the legs have been cut, you can determine which is negative by looking for the flat side of the LED casing.

Step 4 – Attach Battery to Circuit



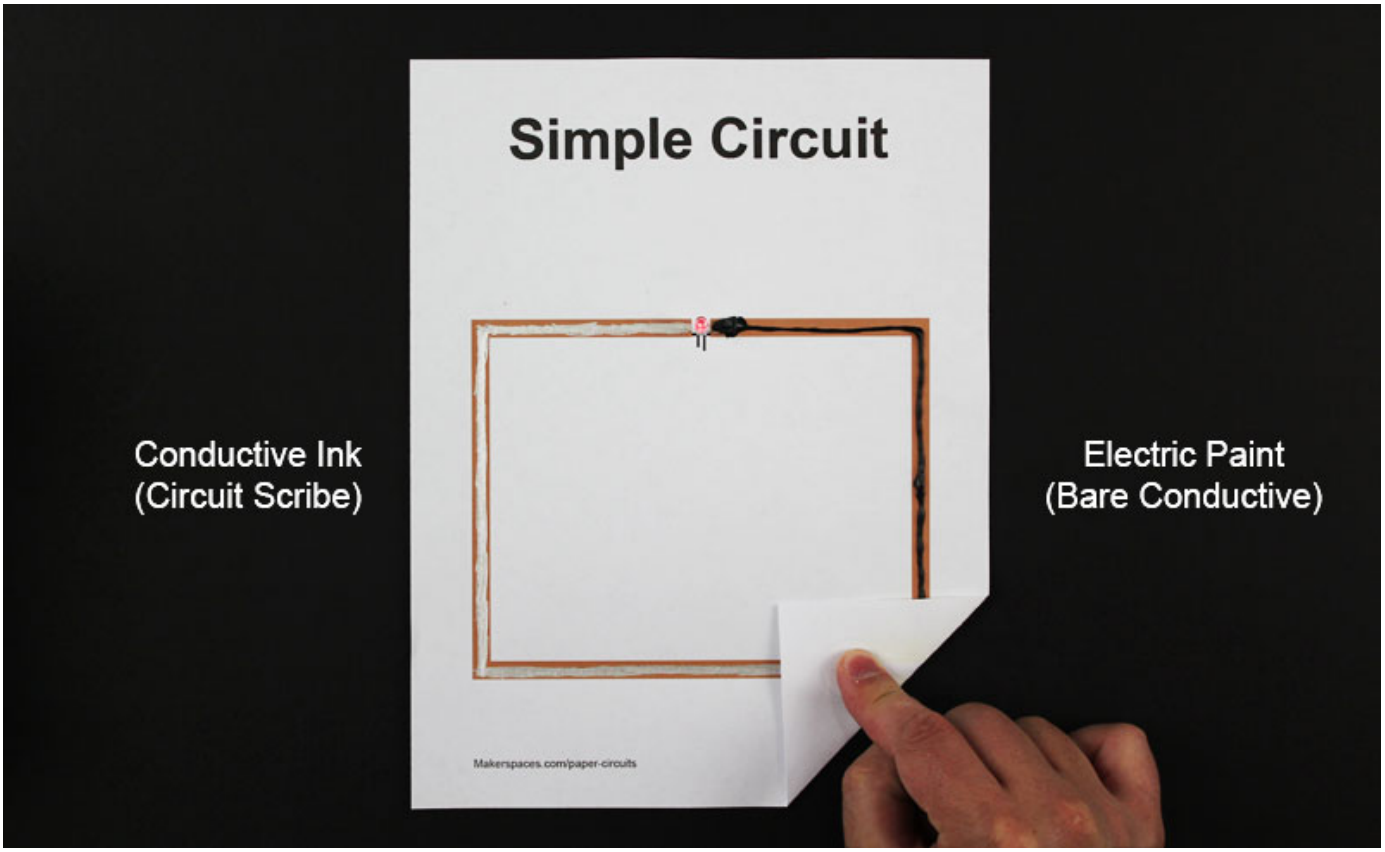
The last step is to place the coin-cell battery on top of the copper. Make sure the battery (-) is facing down. The corner flap which is (+) should then be able to contact the battery (+) when folded.



Optional – Secure the corner flap using a paper clip or binder clip.

Conductive Ink & Paint

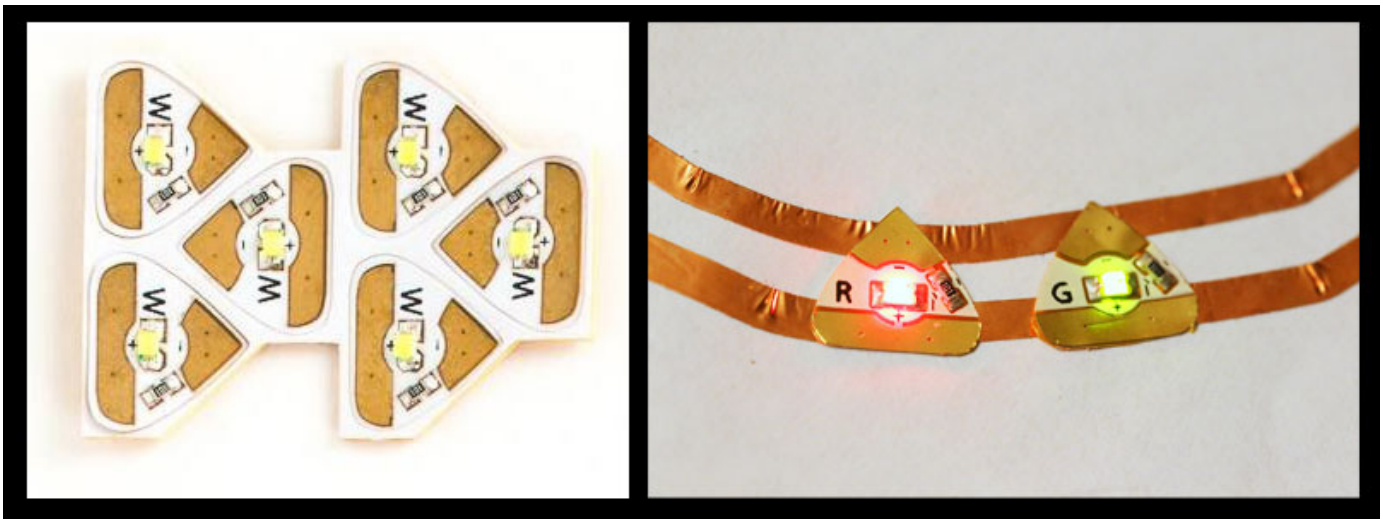
You don’t always need copper tape to help form a circuit. Using conductive ink or electric paint works really well too. One advantage of these materials is the ability to make unique shapes & designs that you wouldn’t be able to with copper tape.



Circuit Scribe

Electric Paint

Chibitronics Circuit Stickers



Another alternative to using the standard LED is to use a circuit sticker by Chibitronics. These peel-and-stick LEDs are great for greeting cards and other craft projects because they can be stuck to almost any surface such as paper, plastic, fabric etc. They work seamless with copper tape, conductive ink or electric paint.

One great advantage of circuit stickers is their low power consumption. You can light up more per (1) 3v battery than you could using standard LEDs.

If you do choose to utilize this product, make sure to stick the narrow side of the circuit sticker to the negative of the circuit.

Troubleshooting

Is your LED not lighting? Most of the time it's a very simple fix. Here is a list of the common ways we found to get the circuit operational.

1. Make sure that the LONG leg of the LED is secured to the positive (+) side of the circuit because this is easy to mix up.

2. Ensure the LED legs are contacting the copper tape firmly. Rub the clear tape that secures the LED for a solid connection.

3. Inspect the battery. The negative of the battery needs to be touching the negative side of the copper. Furthermore, verify there is a good connection between battery and copper. You may need to tape the battery down.

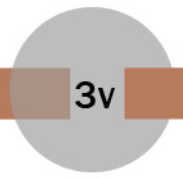
4. It's highly recommended that you maintain a continuous strip of copper foil versus cutting it. If you do need to make a cut, make sure the two pieces of copper are taped together securely.

5. Smooth any wrinkles down in the copper using your finger. Look for any cuts or breaks in the copper tape.

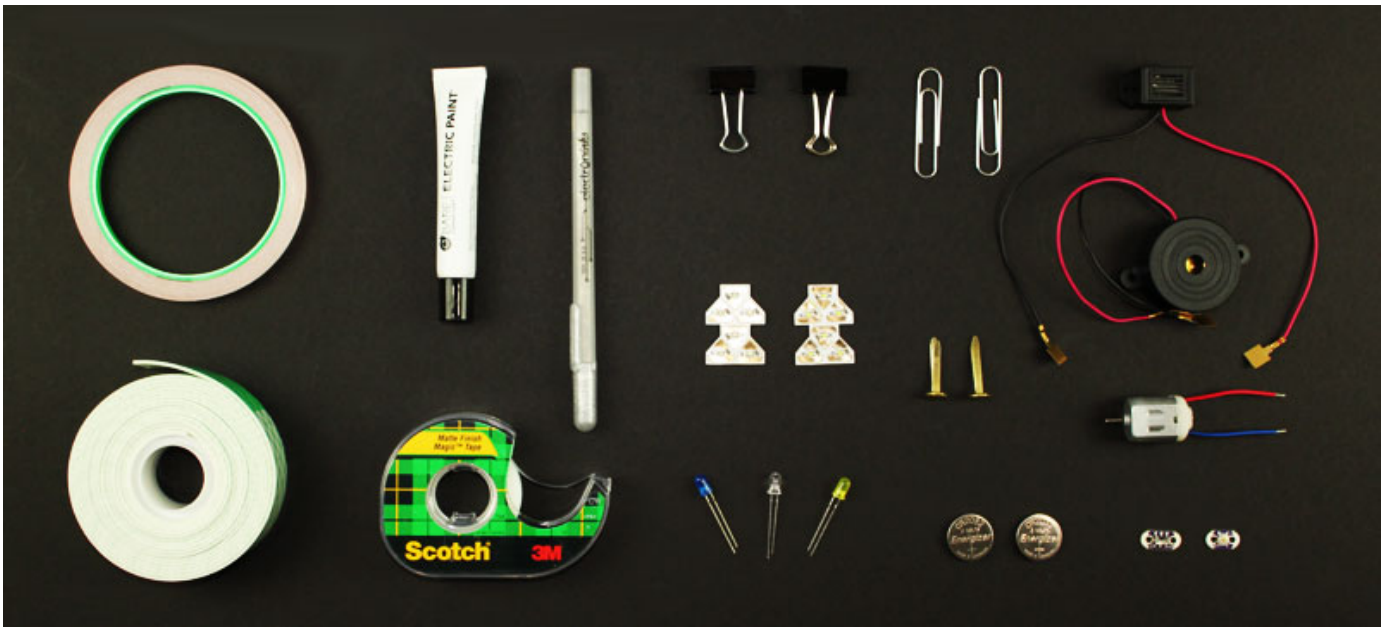
6. Is there a short in the circuit? A short can happen anytime the positive and negative touch. This can happen with the copper, the LED legs or anywhere. Inspect all areas.

7. Test to make sure your LED and battery are actually working in the first place. The easiest way to test is to place the LED directly onto the battery. Make sure long leg is touching the positive of battery.

Projects



Materials Needed



The materials listed below are the items needed to complete the rest of the projects in this book. You won't however need all of them for every project.

Copper tape (1/4") with conductive adhesive
Double-sided mounting tape
Transparent tape
Coin-cell battery (3v) CR2032
LED – 5mm or 10mm
Paper clip or binder clip
Circuit Scribe – conductive ink pen
Electric Paint - conductive paint
DC hobby motor – 130 size
Brass brads
LilyPad button switch (sparkfun.com)
Circuit sticker LED from Chibitronics
Card stock paper – 65-110 lb. weight
Buzzer – mechanical or piezo (3v)

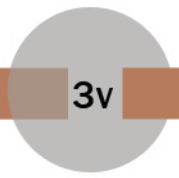
Tools Needed

The tools listed below are needed to complete the rest of the projects in this book. You won't however need all of them for every project.

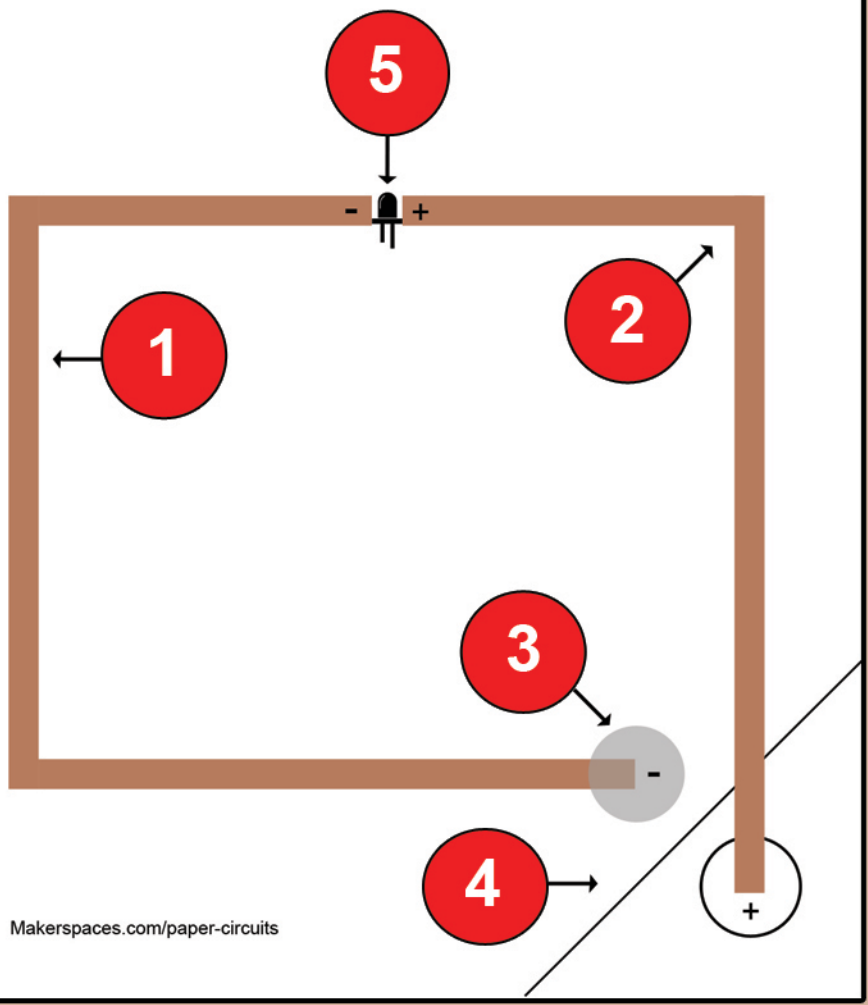
Scissors
Wire snippers
X-Acto hobby knife
Paper scoring tool
Tweezers
Ruler
Cutting mat

Optional – paper trimmer
Optional – soldering iron

Simple Circuit



Simple Circuit



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
Paperclip / Binder Clip
Circuit Stickers (optional)
Buzzer (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

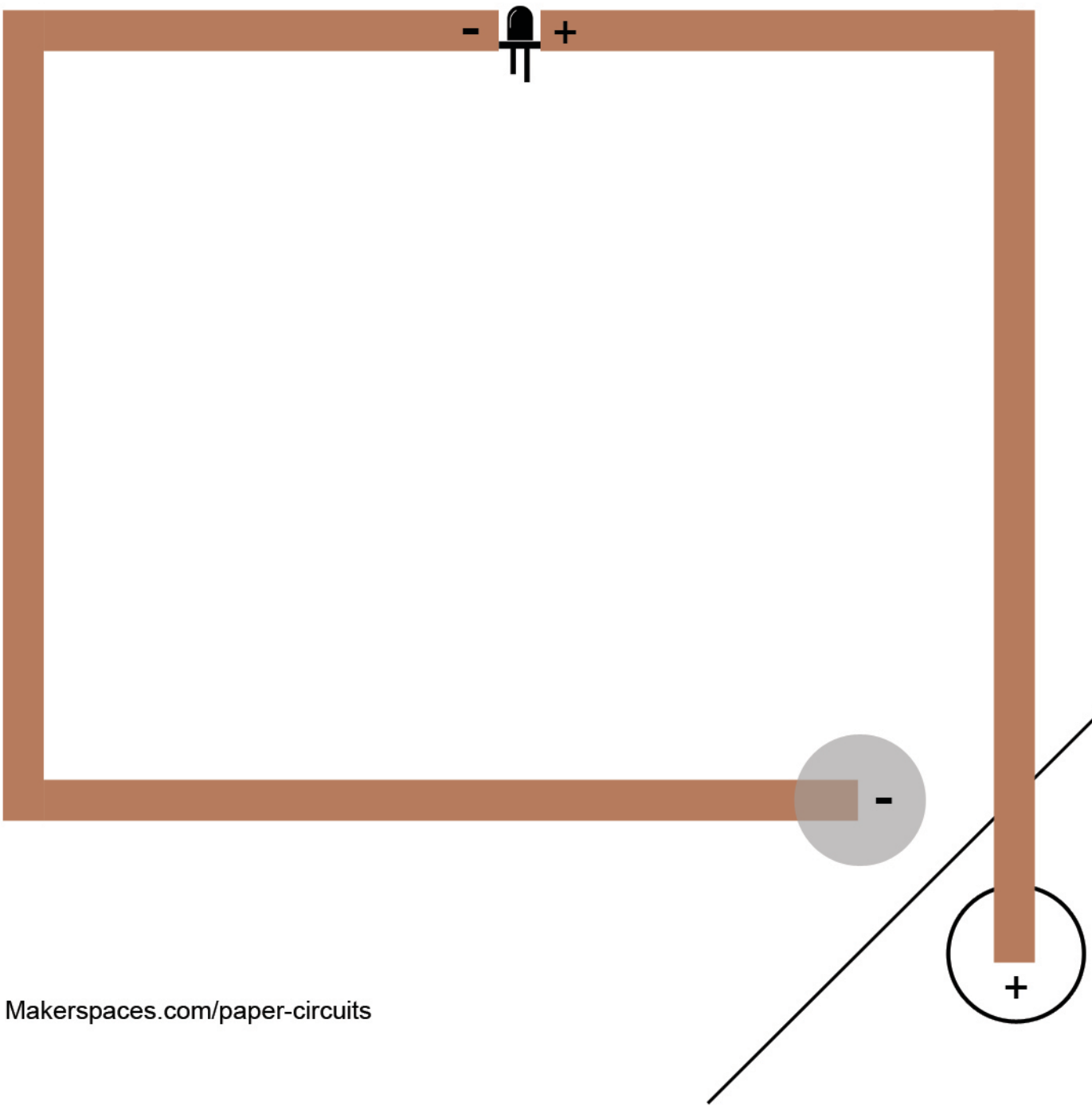
Time Required:

30 minutes

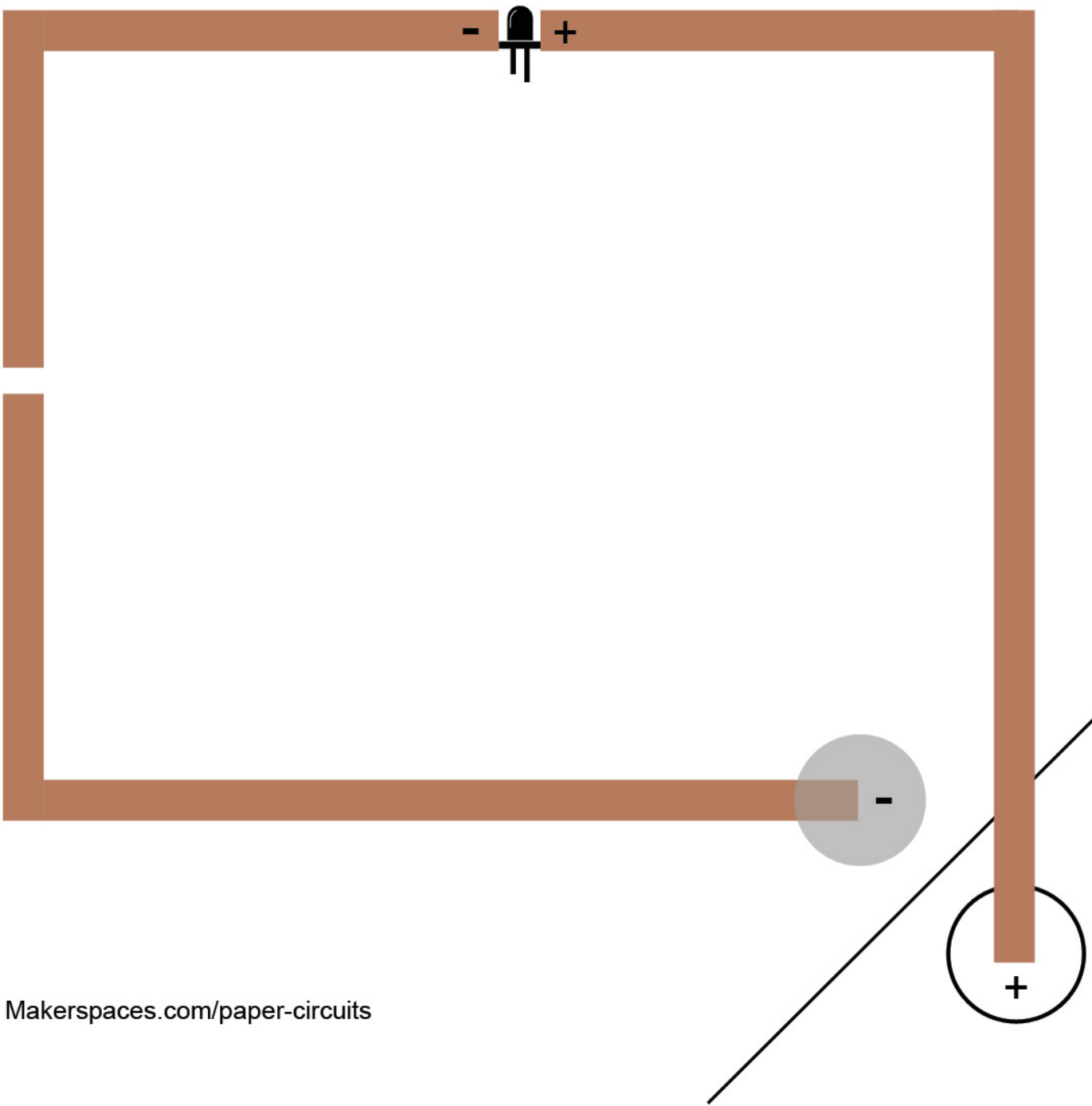
Steps:

1. Apply copper tape to trace line on template. Smooth with finger. Allow a gap for LED.
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape with negative (-) facing down.
4. Fold corner of template along the line. Using a scoring tool helps with this process. Use paperclip to secure corner.
5. Bend legs of LED at a 90’ angle. Use clear tape to secure LED to copper tape. Long leg of LED goes on positive.

Simple Circuit

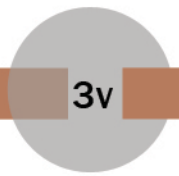


Simple Circuit
with switch

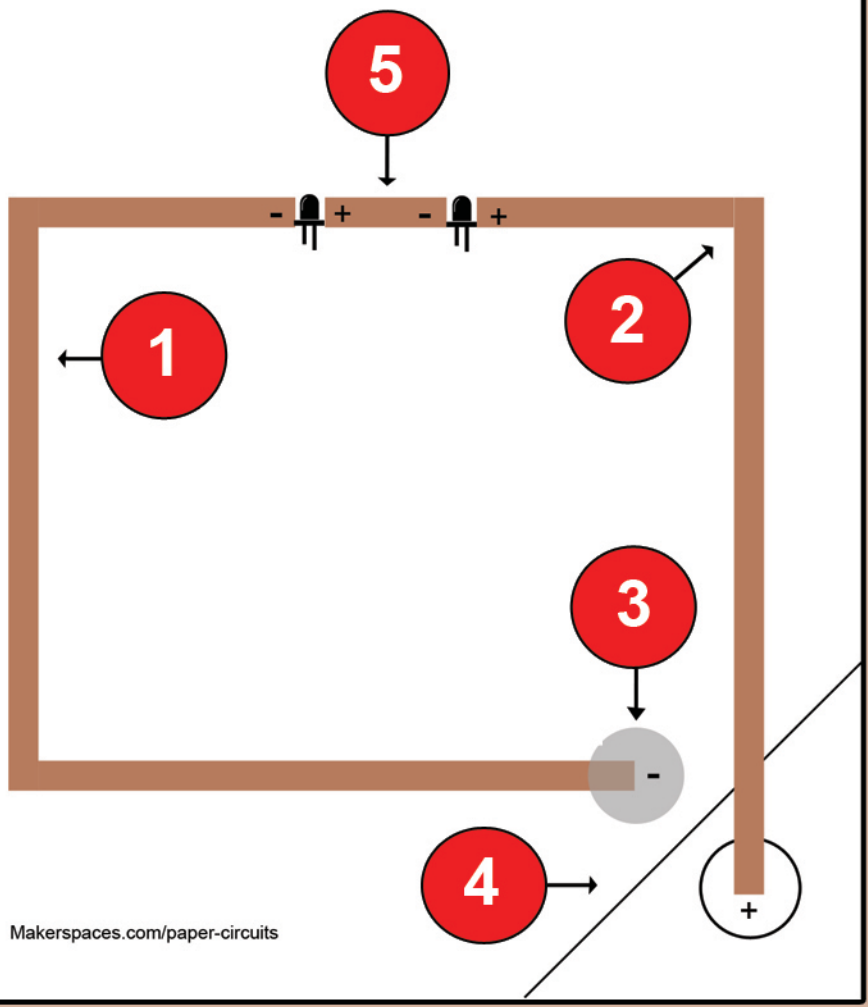


Makerspaces.com/paper-circuits

Series Circuit



Series Circuit



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
Paperclip / Binder Clip
Circuit Stickers (optional)
Buzzer (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

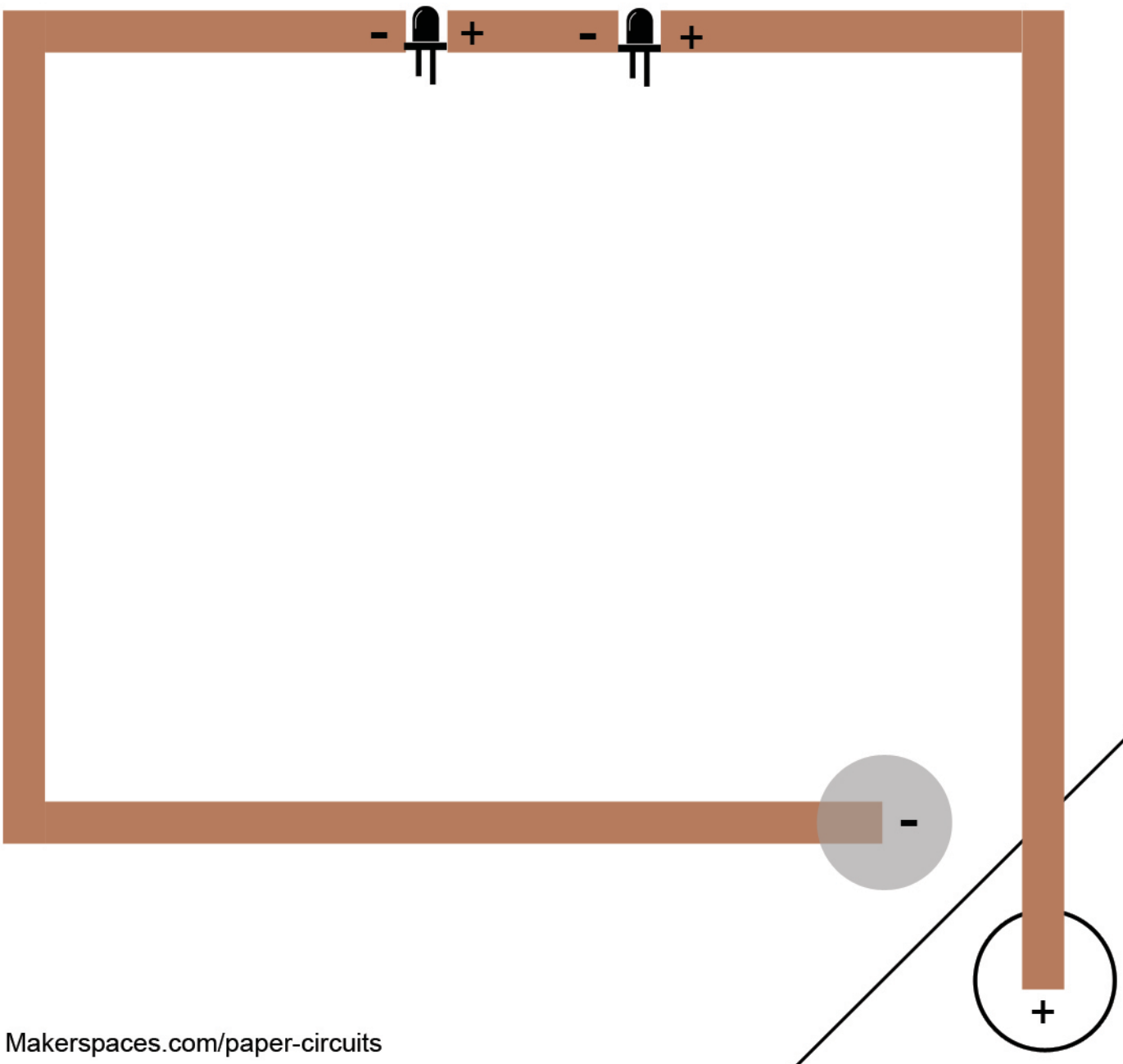
Time Required:

30 minutes

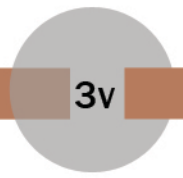
Steps:

1. Apply copper tape to trace line on template. Smooth with finger. Allow gaps for LEDs.
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place (2) batteries on top of copper tape w/ negative (-) facing down.
4. Fold corner of template along the line. Using a scoring tool helps with this process. Use paperclip to secure corner.
5. Bend legs of LEDs at a 90’ angle. Use clear tape to secure LED to copper tape. Long leg of LED goes on positive.

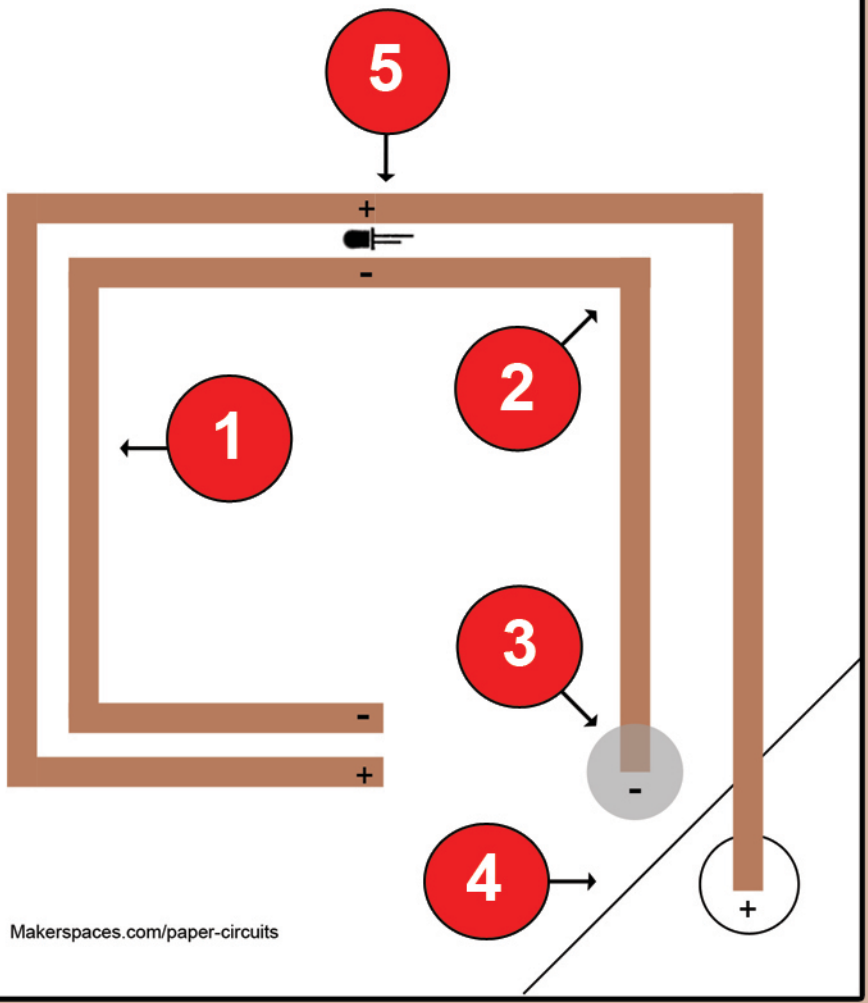
Series Circuit



Parallel Circuits



Parallel Circuit



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
Paperclip / Binder Clip
Circuit Stickers (optional)
Buzzer (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

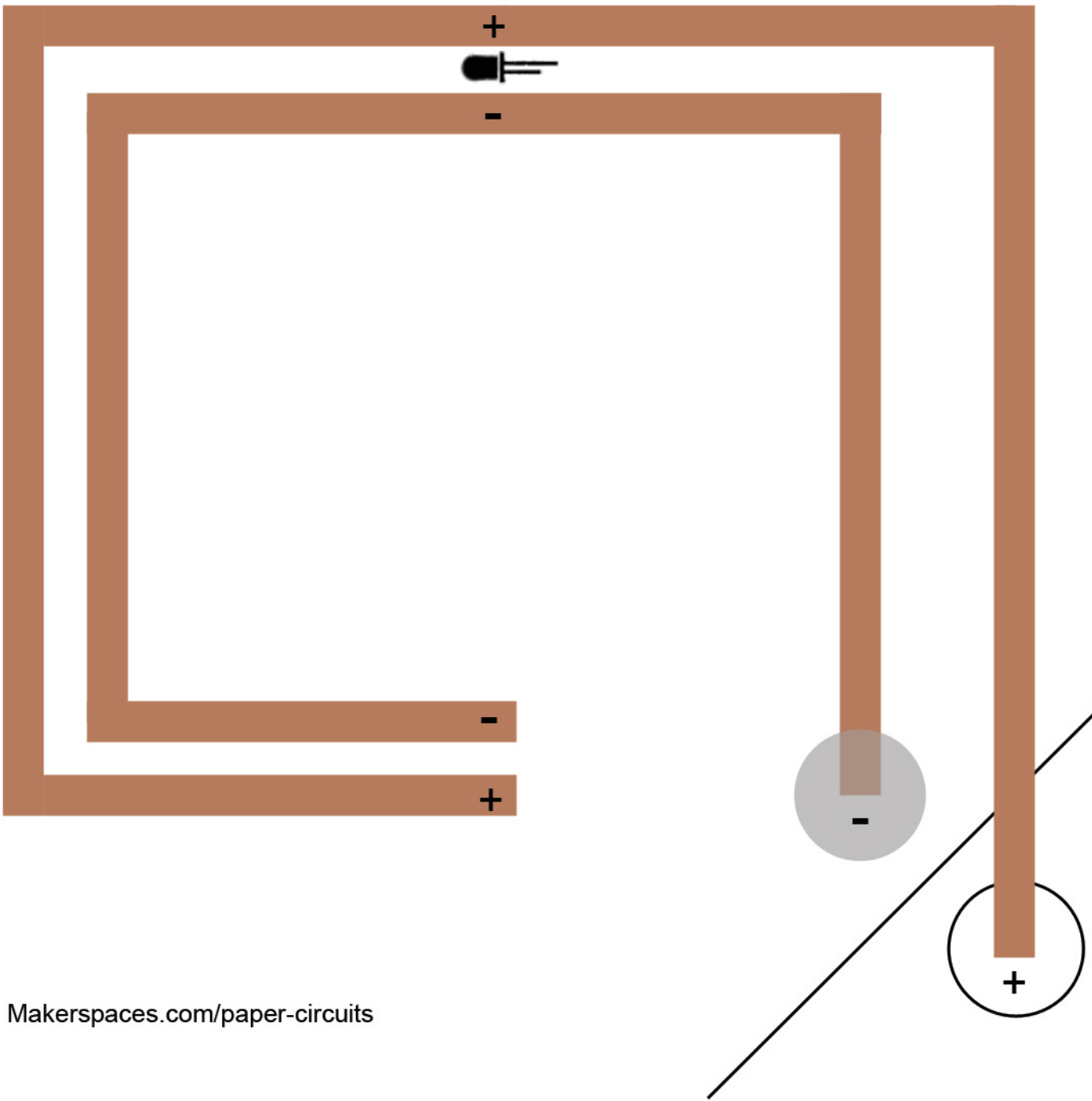
Time Required:

30 minutes

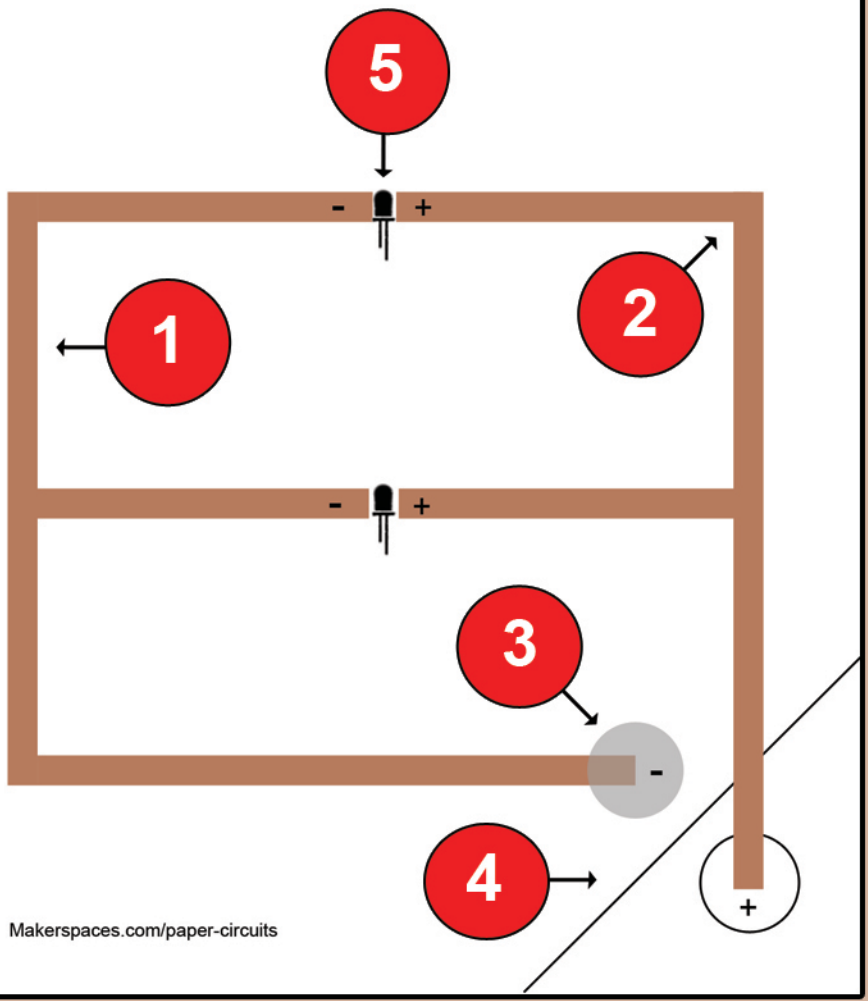
Steps:

1. Apply copper tape to trace line on template. Smooth with finger. Allow gaps for LED.
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape w/ negative (-) facing down.
4. Fold corner of template along the line. Using a scoring tool helps with this process. Use paperclip to secure corner.
5. Bend legs of LED at a 90’ angle. Use clear tape to secure LED to copper tape. Long leg of LED goes on positive.

Parallel Circuit



Parallel Circuit



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
Paperclip / Binder Clip
Circuit Stickers (optional)
Buzzer (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

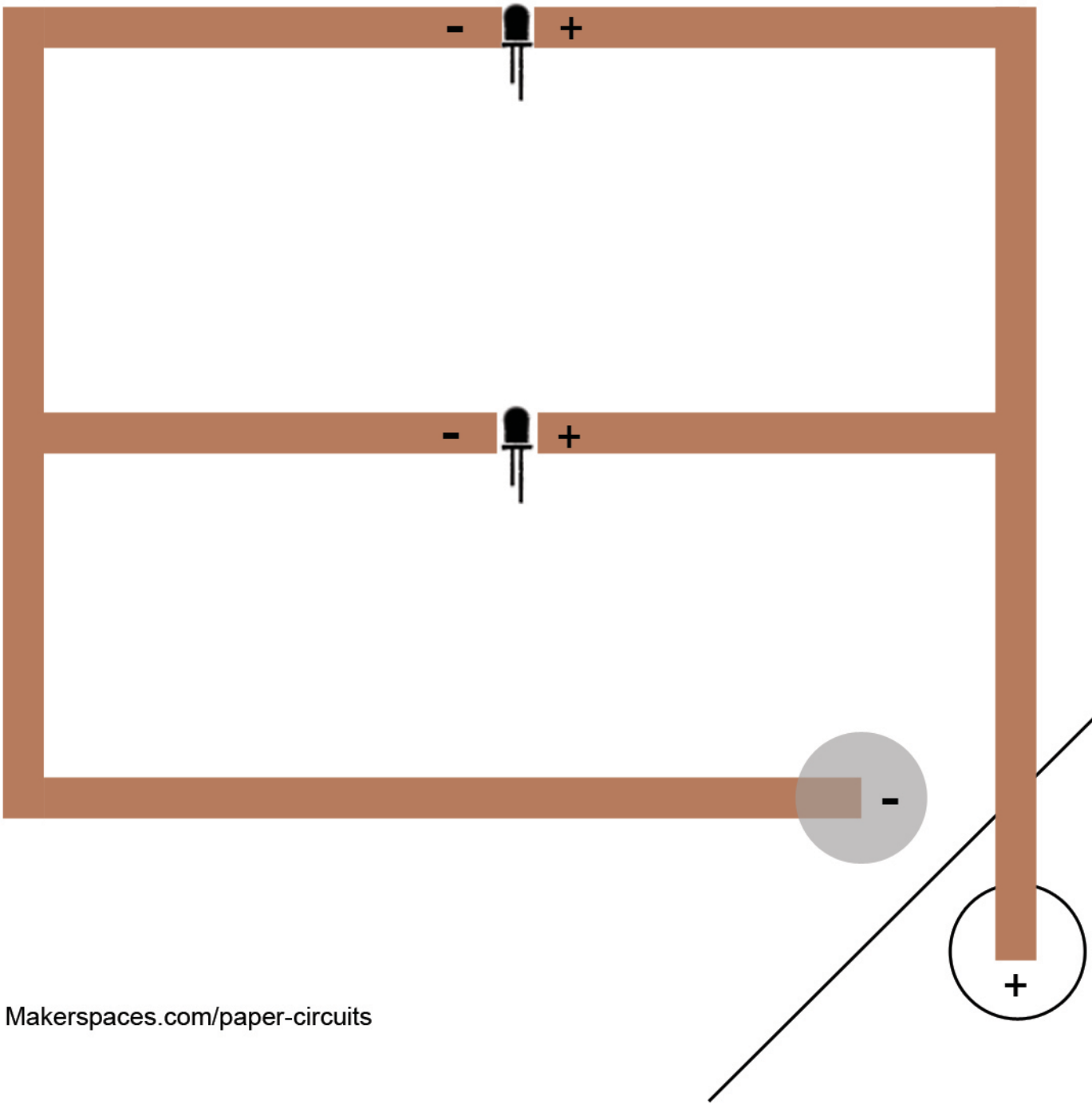
Time Required:

30 minutes

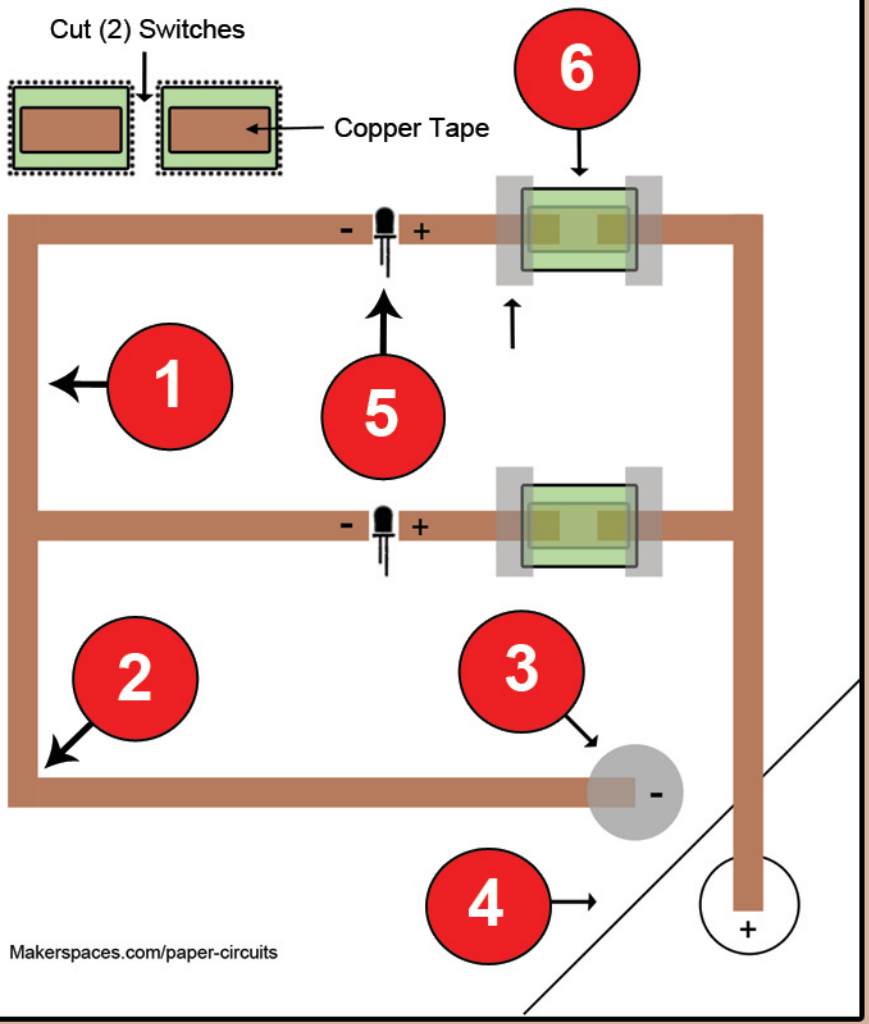
Steps:

1. Apply copper tape to trace line on template. Smooth with finger. Allow gaps for LEDs.
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape w/ negative (-) facing down.
4. Fold corner of template along the line. Using a scoring tool helps with this process. Use paperclip to secure corner.
5. Bend legs of LED at a 90’ angle. Use clear tape to secure LED to copper tape. Long leg of LED goes on positive.

Parallel Circuit



Parallel w/ Switches



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
Paperclip / Binder Clip
Circuit Stickers (optional)
Buzzer (optional)
Double-sided foam tape (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

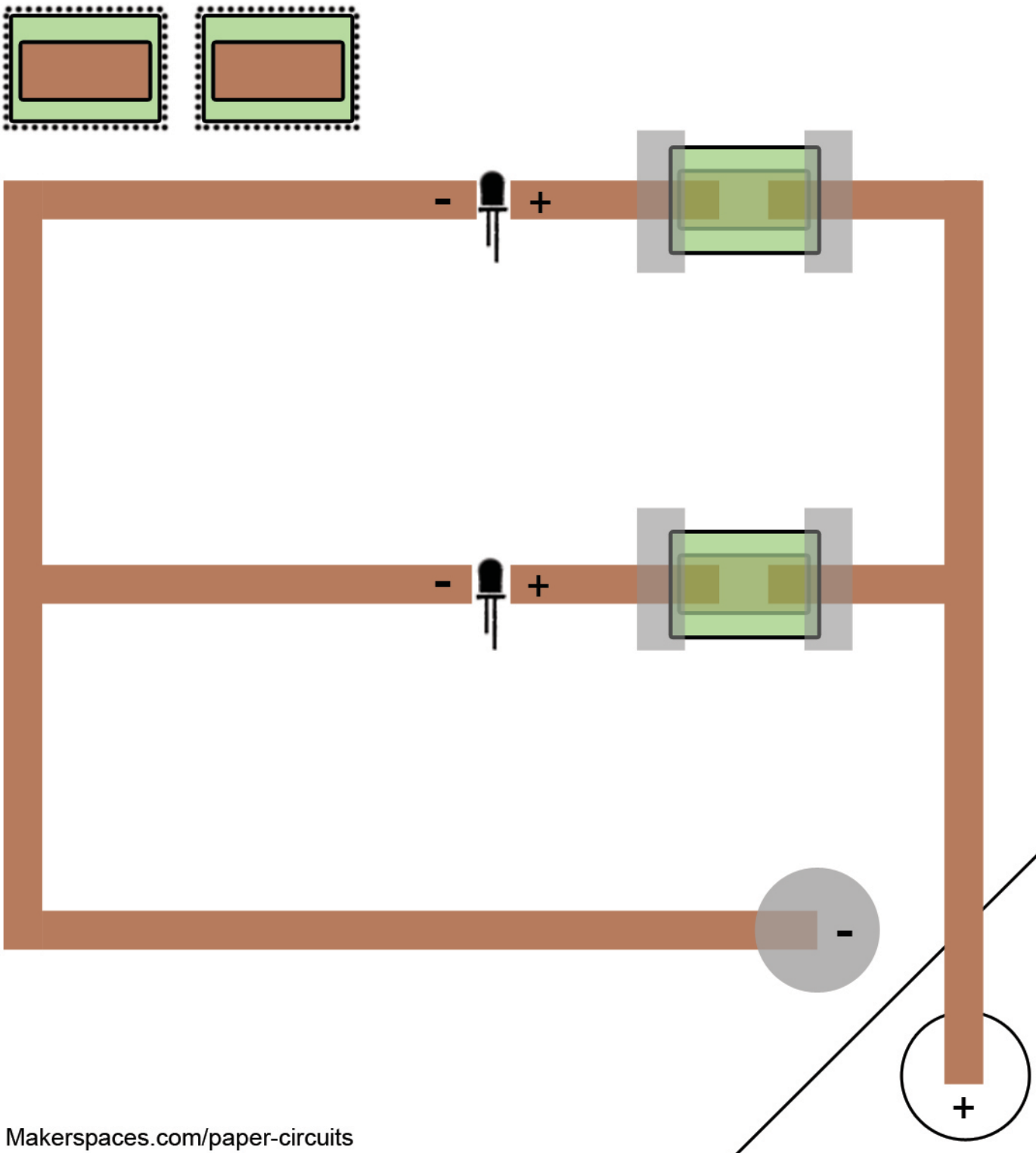
Time Required:

30 minutes

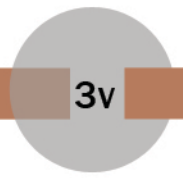
Steps:

1. Apply copper tape to trace line on template. Smooth with finger. Allow gaps for LEDs.
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape w/ negative (-) facing down.
4. Fold corner of template along the line. Using a scoring tool helps with this process. Use paperclip to secure corner.
5. Bend legs of LED at a 90’ angle. Use clear tape to secure LED to copper tape. Long leg of LED goes on positive.
6. Tape switches w/ copper down. (Optional) -Use double sided foam tape for added elevation.

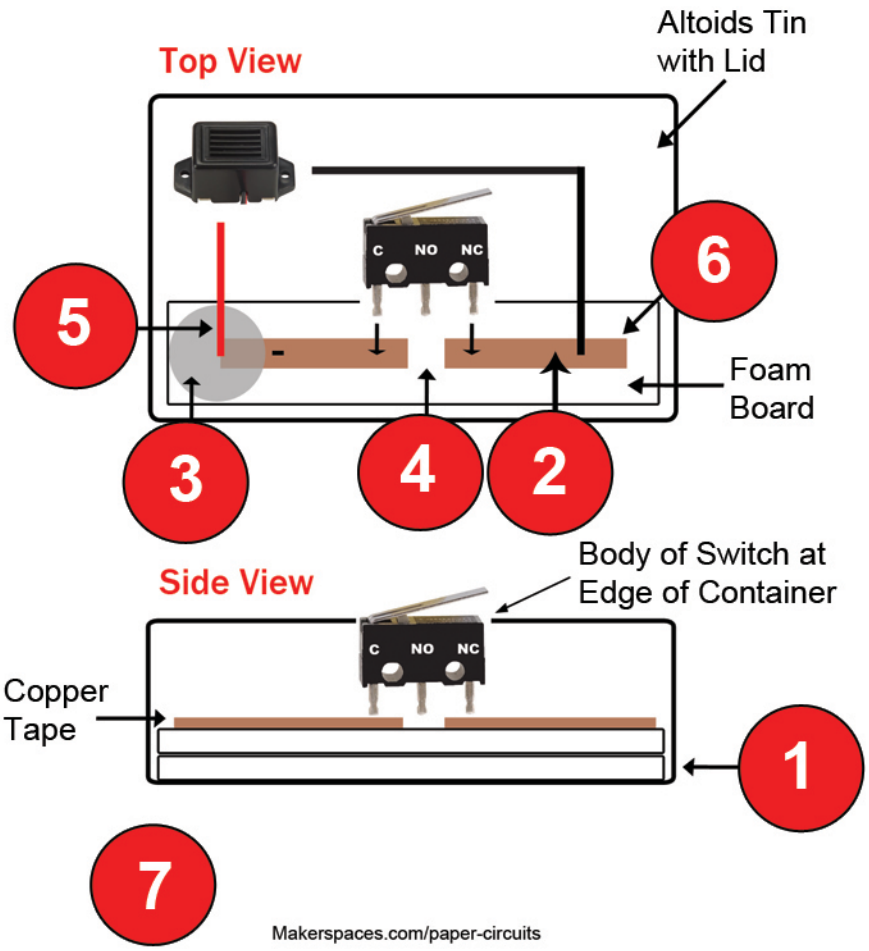
Parallel w/ Switches



Altoids Alarm



Altoids Alarm



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
Limit Switch
Buzzer
Altoids Tin (or similiar)
Foam board

Tools:

Scissors
Scoring Tool
X-Acto Knife

Time Required:

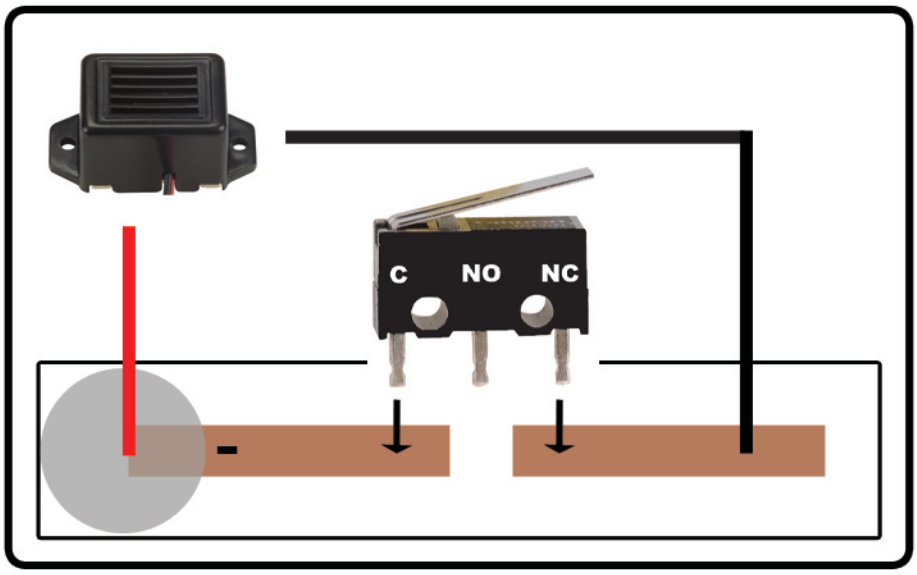
30 minutes

Steps:

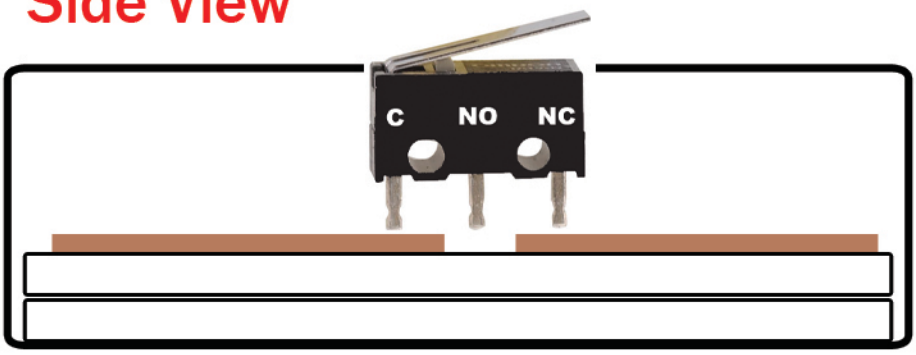
1. Cut 2-3 pieces of foam board so limit switch will be pushed down when lid is closed.
2. Apply copper tape to middle of foam board. Allow a gap for switch.
3. Place battery on top of copper tape with negative (-) facing down.
4. Push limit switch thru copper into foam board.
5. Tape red wire from buzzer to top of battery (+)
6. Tape black wire from buzzer to copper tape
7. NOTE- buzzer will sound until lid is closed.or switch is pushed.

Altoids Alarm

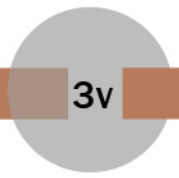
Top View



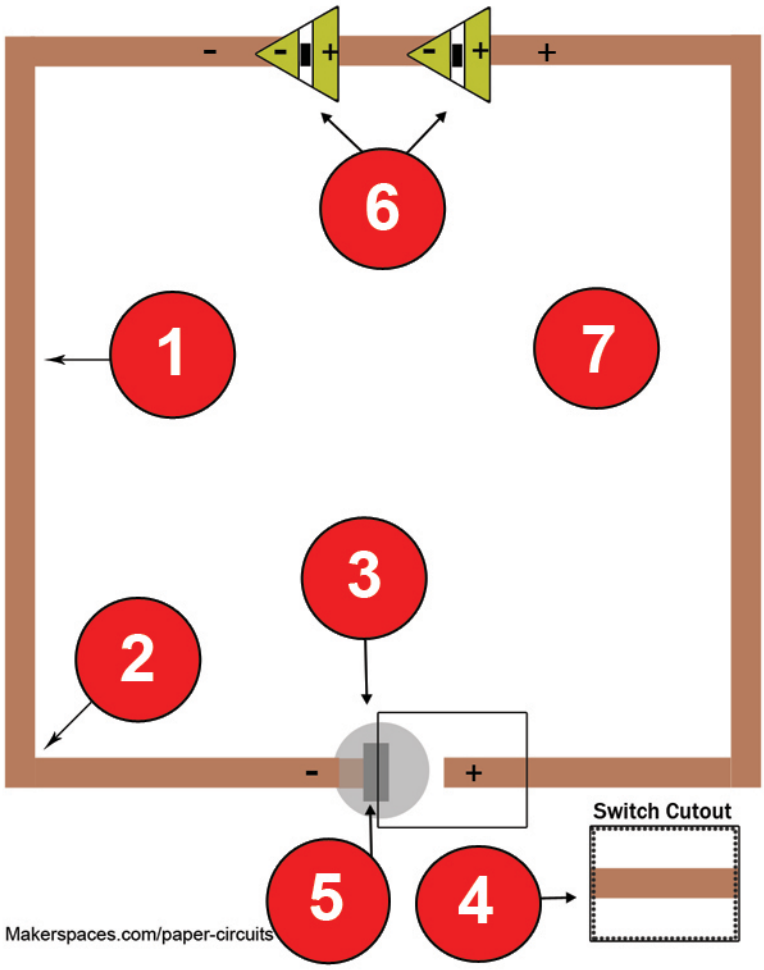
Side View



Battery Switch



Battery Switch



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
Circuit Stickers

Tools:

Scissors
Scoring Tool
X-Acto Knife

Time Required:

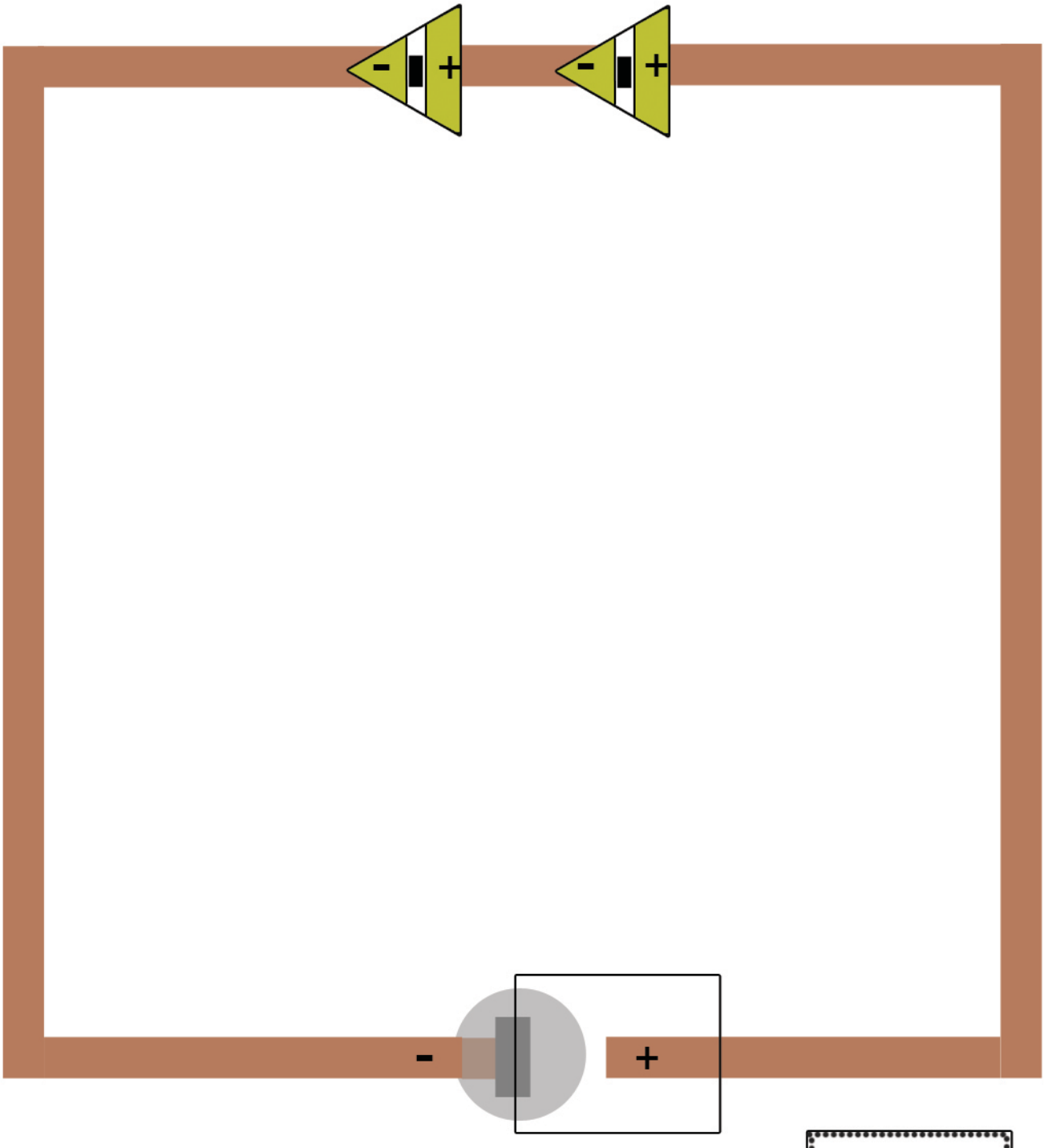
30 minutes

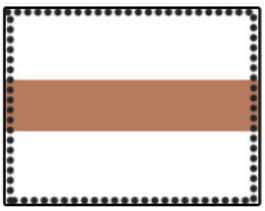
Steps:

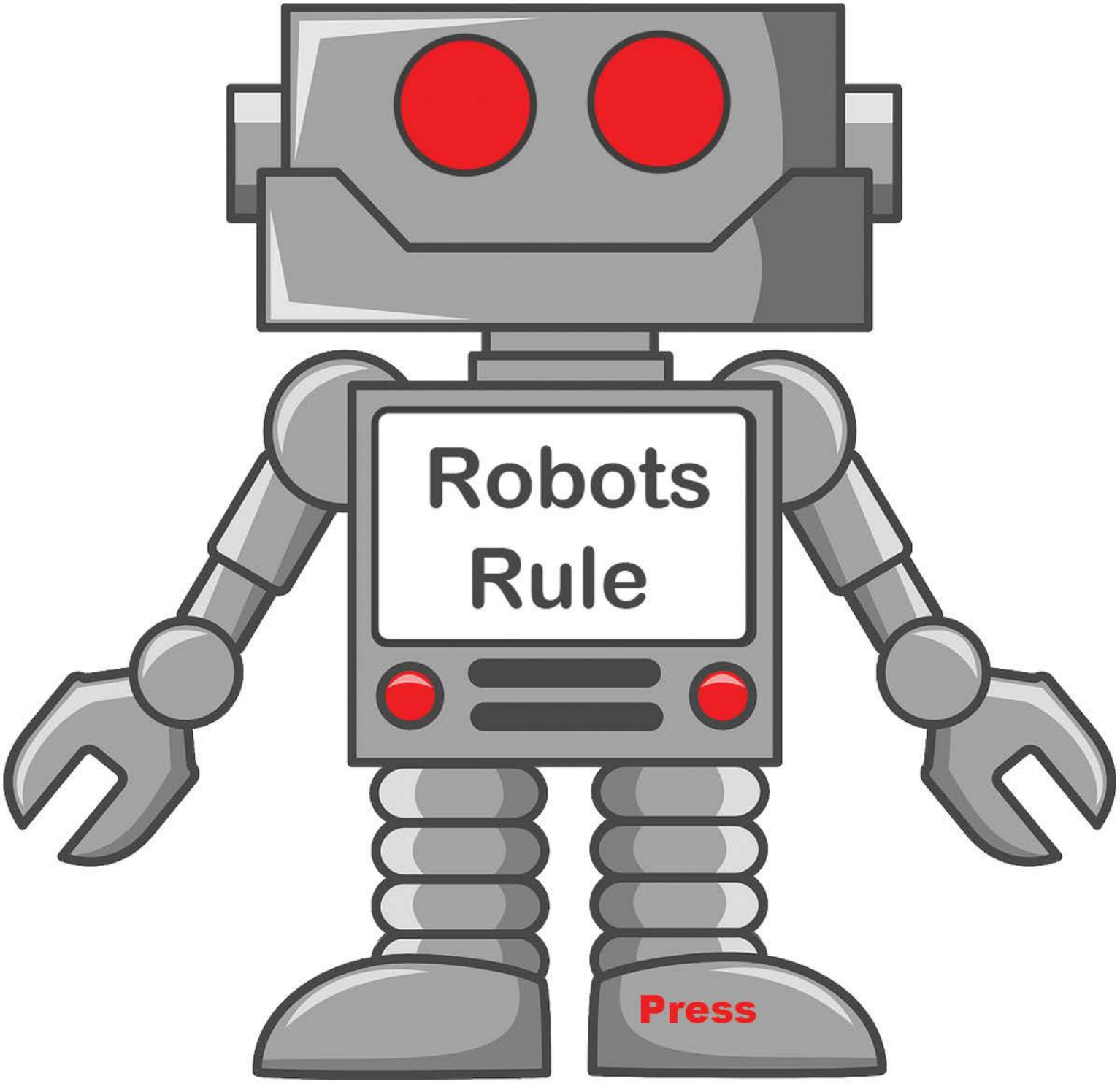
1. Apply copper tape to trace line on template. Smooth with finger. Allow gaps for LED.
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape w/ negative (-) facing down.
4. Cut out switch flap and apply copper to middle.
5. Apply tape to one side of the switch flap and tape to battery positive (+)
6. Stick Chibitronics circuit stickers to copper tape. Pay attention to the direction. Big side is positive (+).

   You can use LEDs instead but you will need (2) batteries stacked for 6v.
7. Optional -Put robot overlay template on top of circuit.

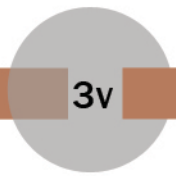
Battery Switch



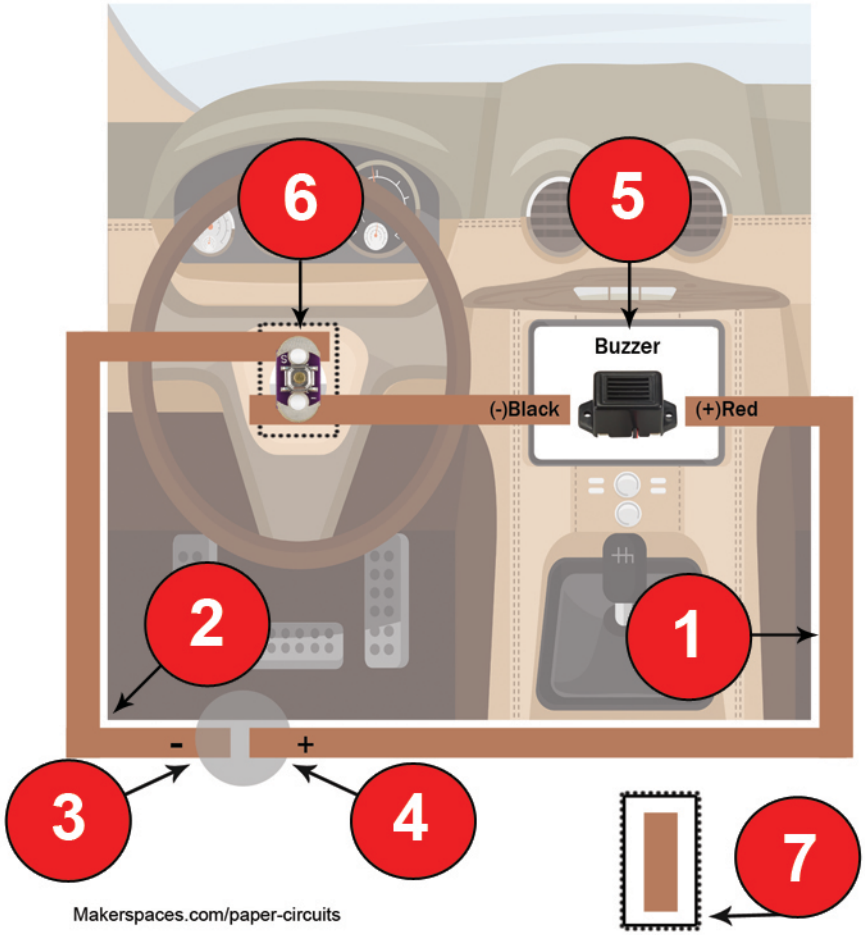



Robots
Rule
Press

Car Horn



Car Horn Circuit



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
Buzzer
LilyPad Button Switch

Tools:

Scissors
Scoring Tool
X-Acto Knife

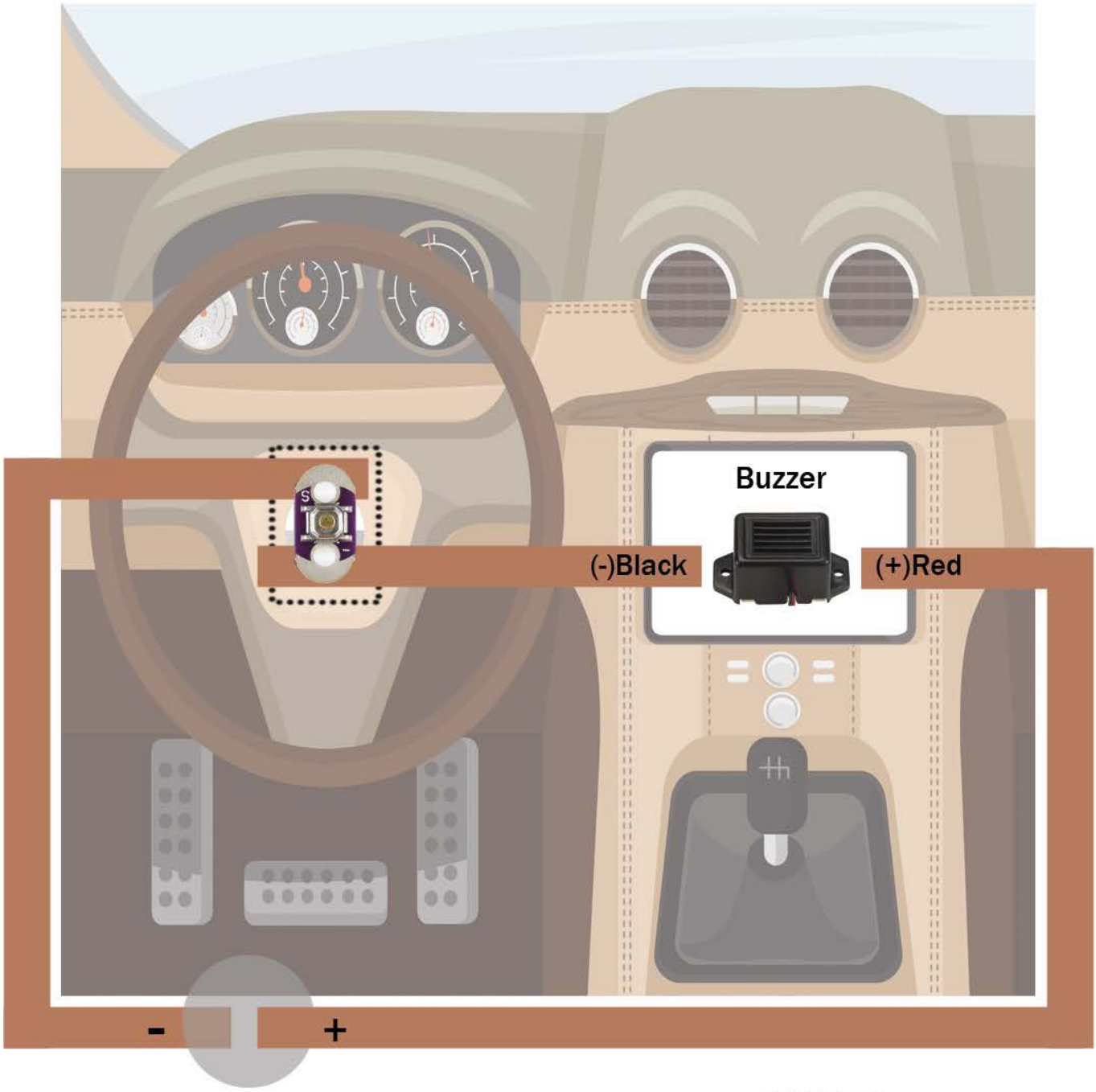
Time Required:

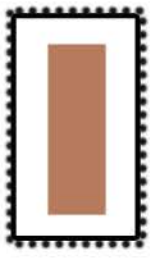
30 minutes

Steps:

1. Apply copper tape to trace line. Smooth with finger. Allow a gap for buzzer and switch
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape with negative (-) facing down.
4. Stick the end of the copper tape on top of battery (+)
5. Secure buzzer to template. Tape black wire from buzzer to (-) of copper. Tape red wire to (+) of copper tape.
6. Mount LilyPad switch using clear tape. Make sure there is a gap in the copper tape below switch.
7. Optional - Use paper switch in place of LilyPad.

Car Horn Circuit





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Christmas Tree

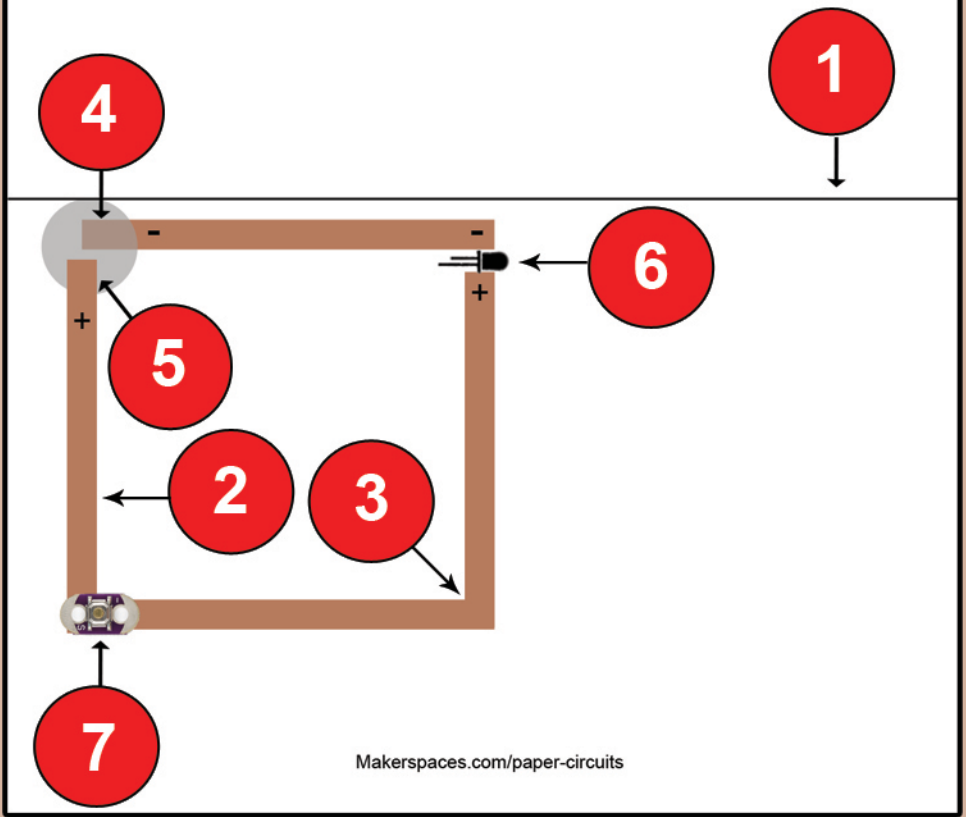
-

3v

+

Makerspaces.com/paper-circuits

Christmas Tree



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Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
LilyPad Button Switch
Circuit Stickers (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

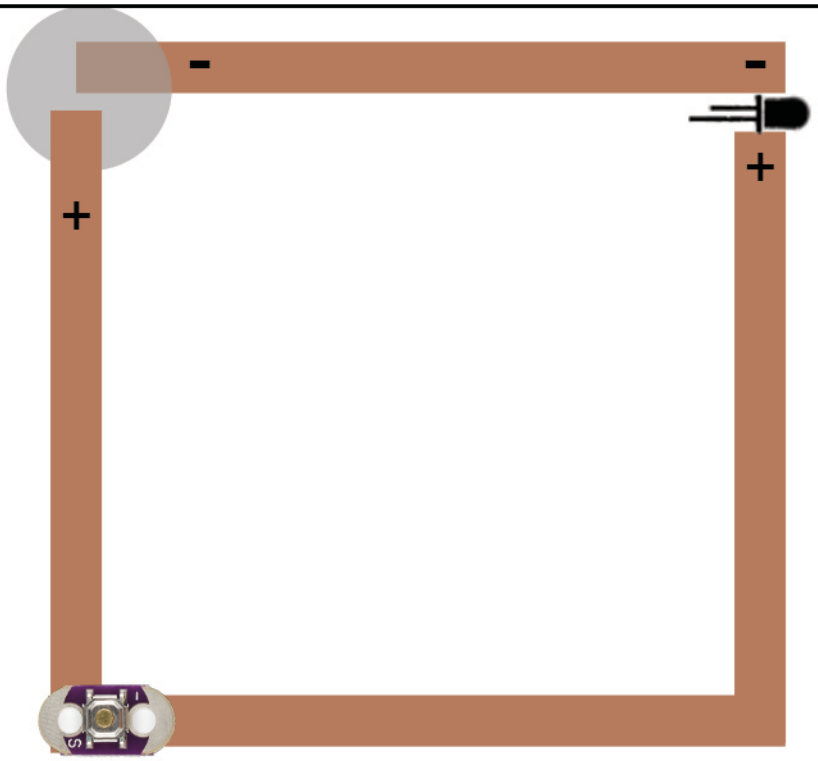
Time Required:

30 minutes

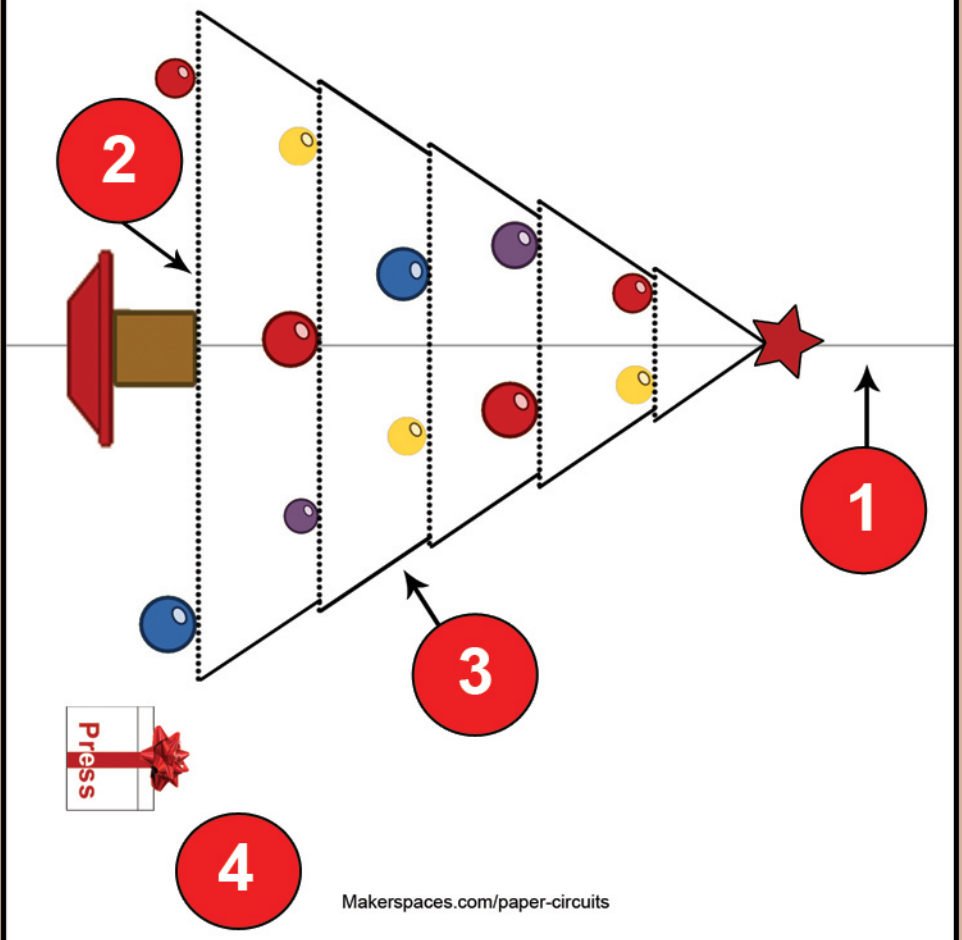
Steps:

1. Fold template along line. Using a scoring tool can help.
2. Apply copper tape to trace line. Smooth with finger. Allow a gap for LED and switch
3. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
4. Place battery on top of copper tape with negative (-) facing down.
5. Stick end of copper tape to the top of battery (+)
6. Bend legs of LED at a 90’ angle. Use clear tape to secure LED to copper tape. Long leg of LED goes on positive.
7. Mount LilyPad switch using clear tape. Make sure there is a gap in the copper tape below switch.

Christmas Tree



Christmas Tree Overlay



Steps:

1. Fold center line of template. A scoring tool is helpful for folds.
2. Cut all DOTTED lines on template.
3. Fold all SOLID lines on both sides of tree.
4. Place overlay directly over the circuit template. The box marked PRESS should line up with the LilyPad switch below.

Materials:

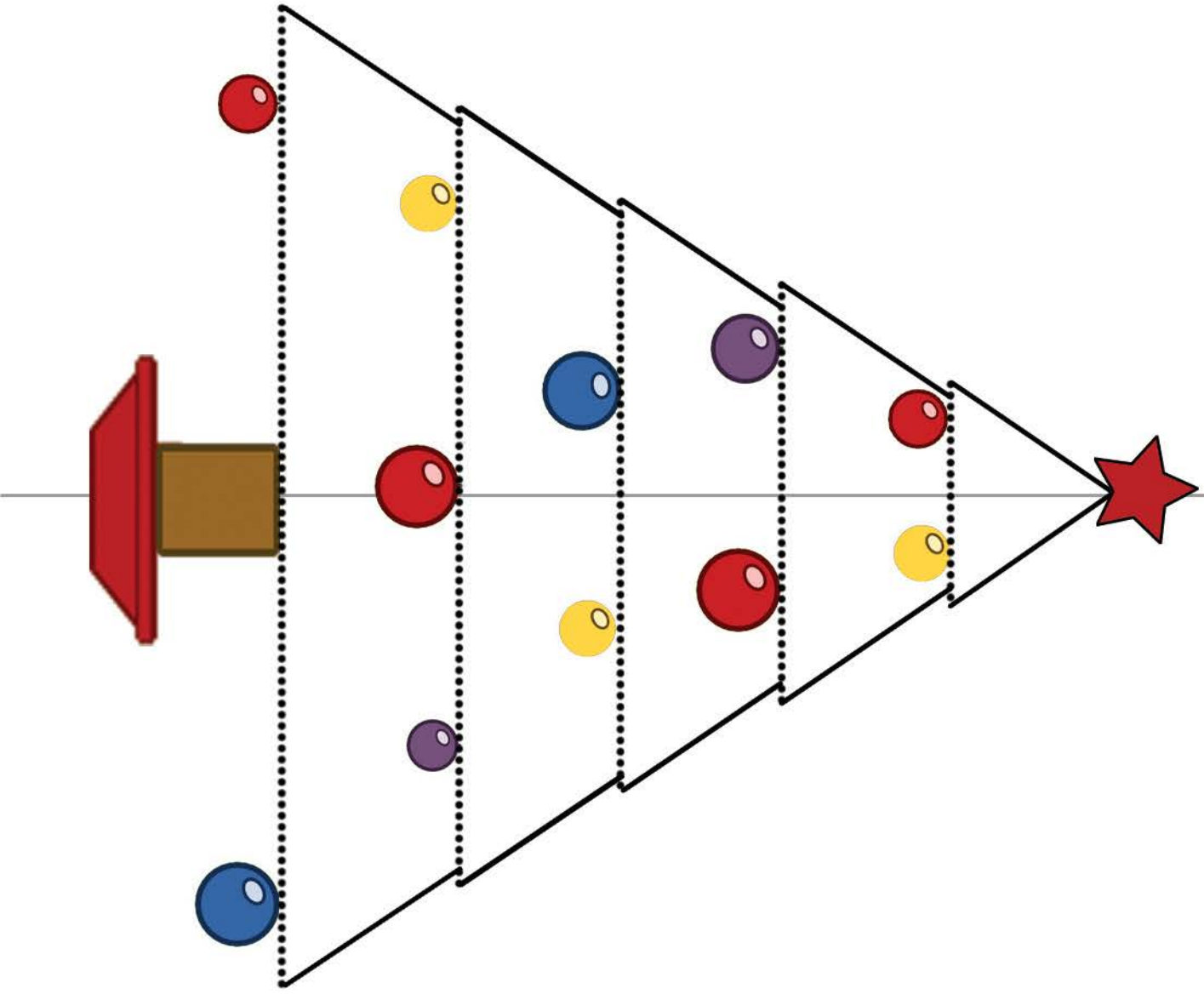
Template

Tools:

Scissors
Scoring Tool
X-Acto Knife

Time Required:

30 minutes




Press

Corner Switch

-

3v

+

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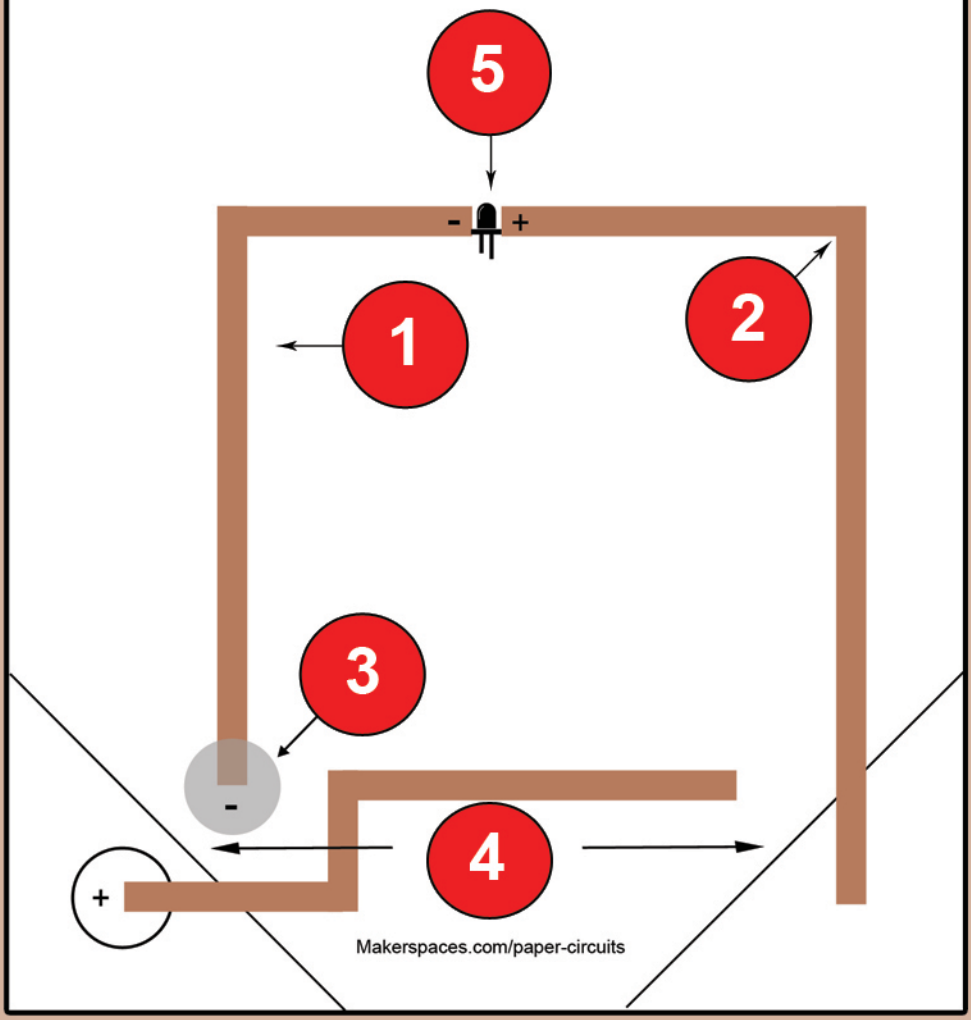
Corner Fold Switch



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
Paperclip / Binder Clip
Circuit Stickers (optional)
Buzzer (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

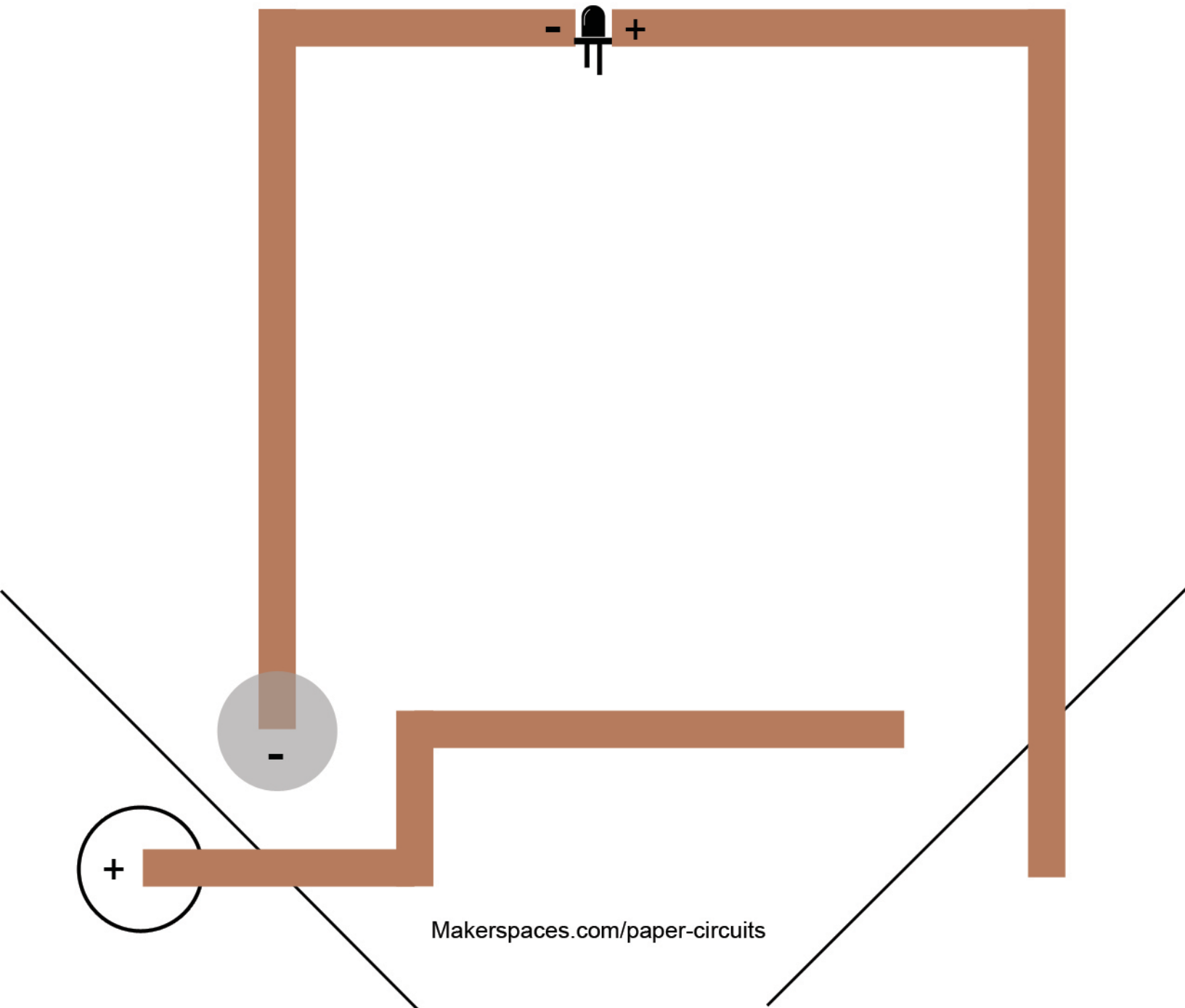
Time Required:

30 minutes

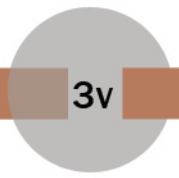
Steps:

1. Apply copper tape to trace line on template. Smooth with finger. Allow gaps for LED.
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape w/ negative (-) facing down.
4. Fold template along line. Using a scoring tool helps with this process. Use paperclip over battery/fold.
5. Bend legs of LED at a 90’ angle. Use clear tape to secure LED to copper tape. Long leg of LED goes on positive.

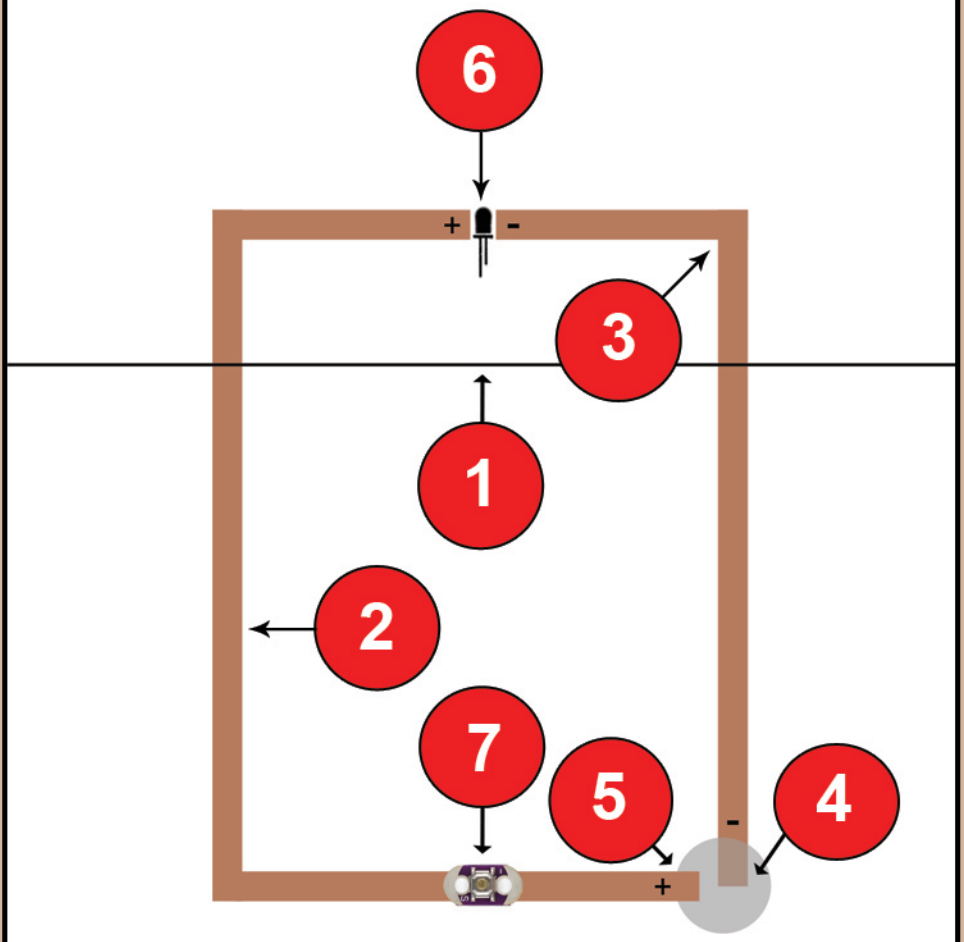
Corner Fold Switch



Dad Popup Card



Dad Popup Circuit



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
LilyPad Button Switch
Circuit Stickers (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

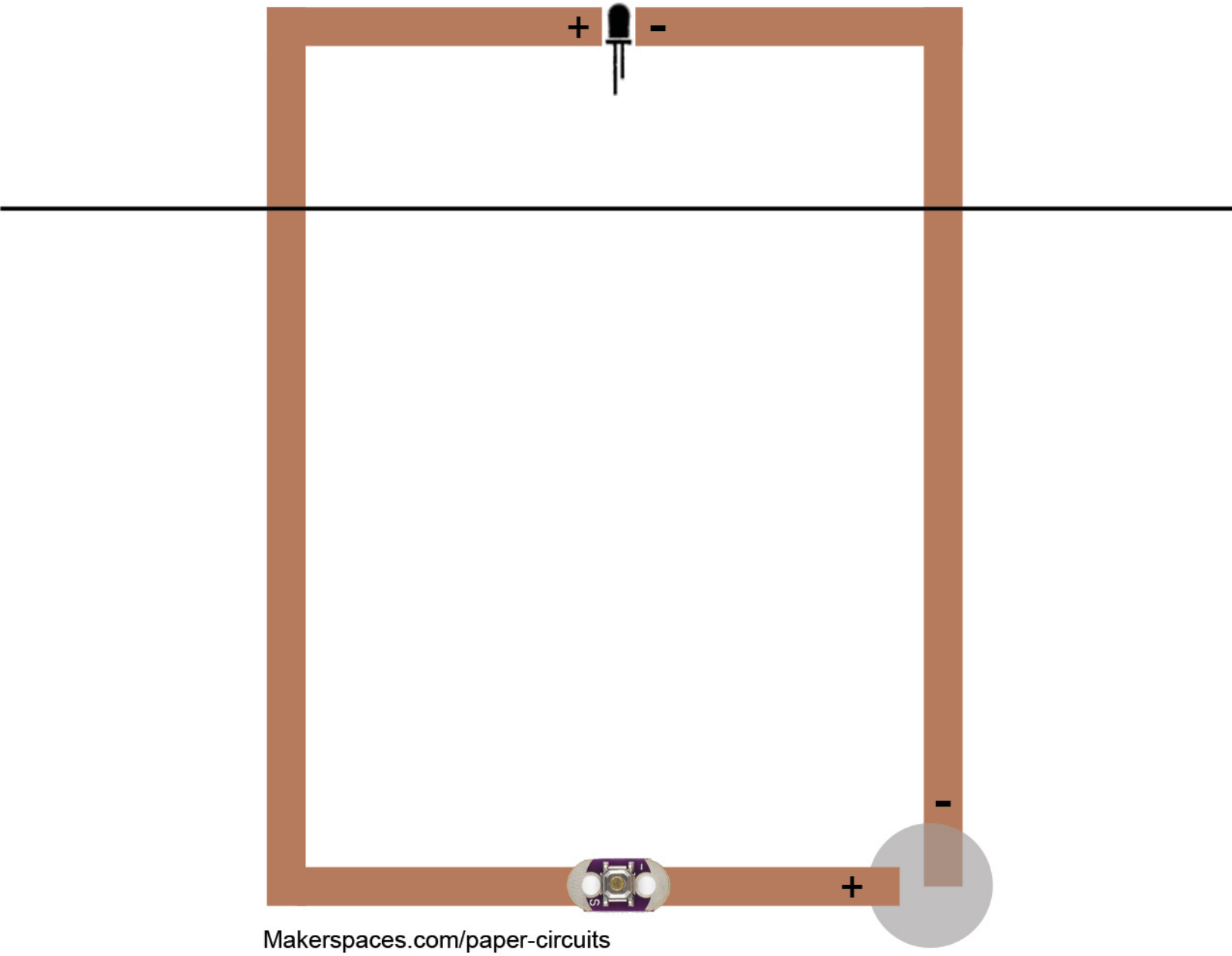
Time Required:

30 minutes

Steps:

1. Fold template along line. Using a scoring tool can help.
2. Apply copper tape to trace line. Smooth with finger. Allow a gap for LED and switch
3. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
4. Place battery on top of copper tape with negative (-) facing down.
5. Stick end of copper tape to the top of battery (+)
6. Bend legs of LED at a 90’ angle. Use clear tape to secure LED to copper tape. Long leg of LED goes on positive.
7. Mount LilyPad switch using clear tape. Make sure there is a gap in the copper tape below switch.

Dad Popup Circuit



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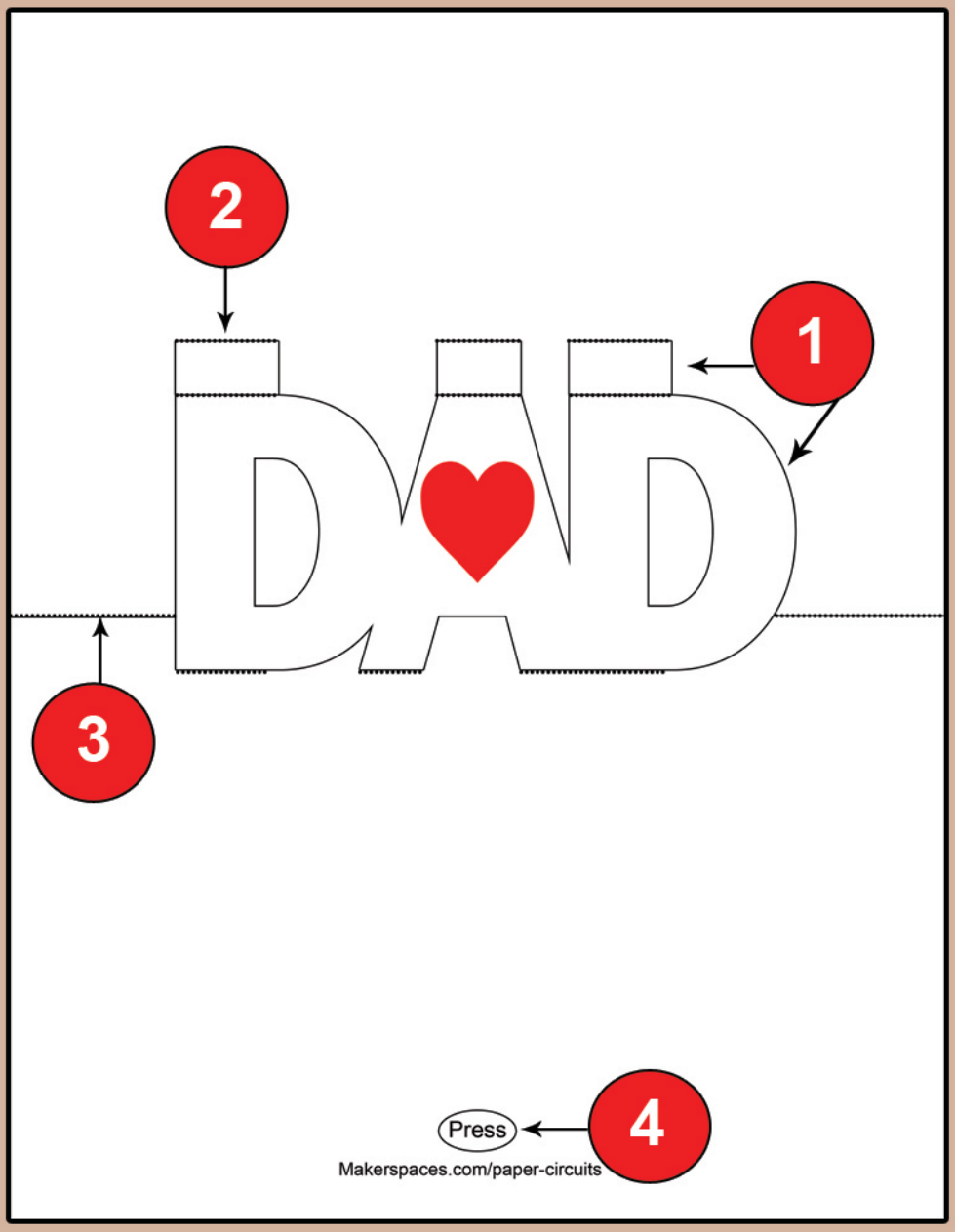


Steps:

1. Cut all of the SOLID lines along the word DAD.
2. Fold all DOTTED lines on top and bottom of popup.
3. Fold DOTTED lines on both sides of the popup. Don't fold the middle.
4. Place overlay directly over the circuit template. The button marked PRESS should line up with the LilyPad switch on template below.

Materials:

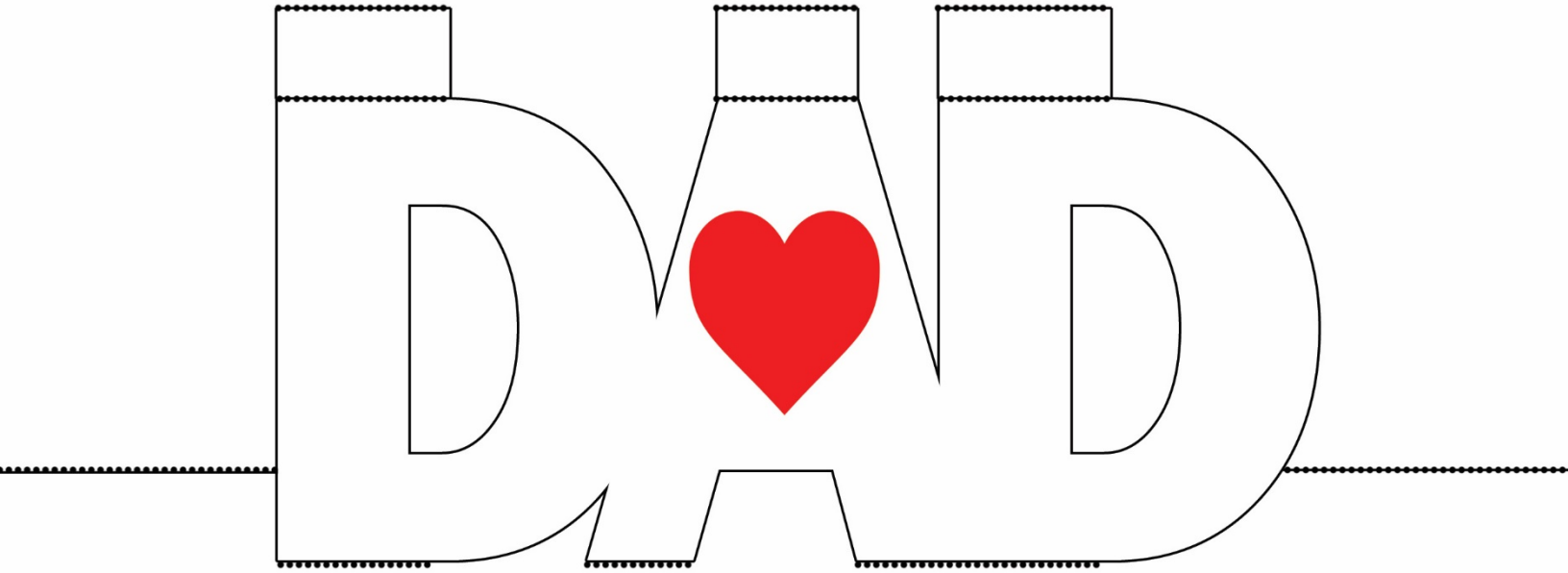
Template

Tools:

Scissors
Scoring Tool
X-Acto Knife

Time Required:

30 minutes



Press

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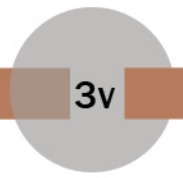
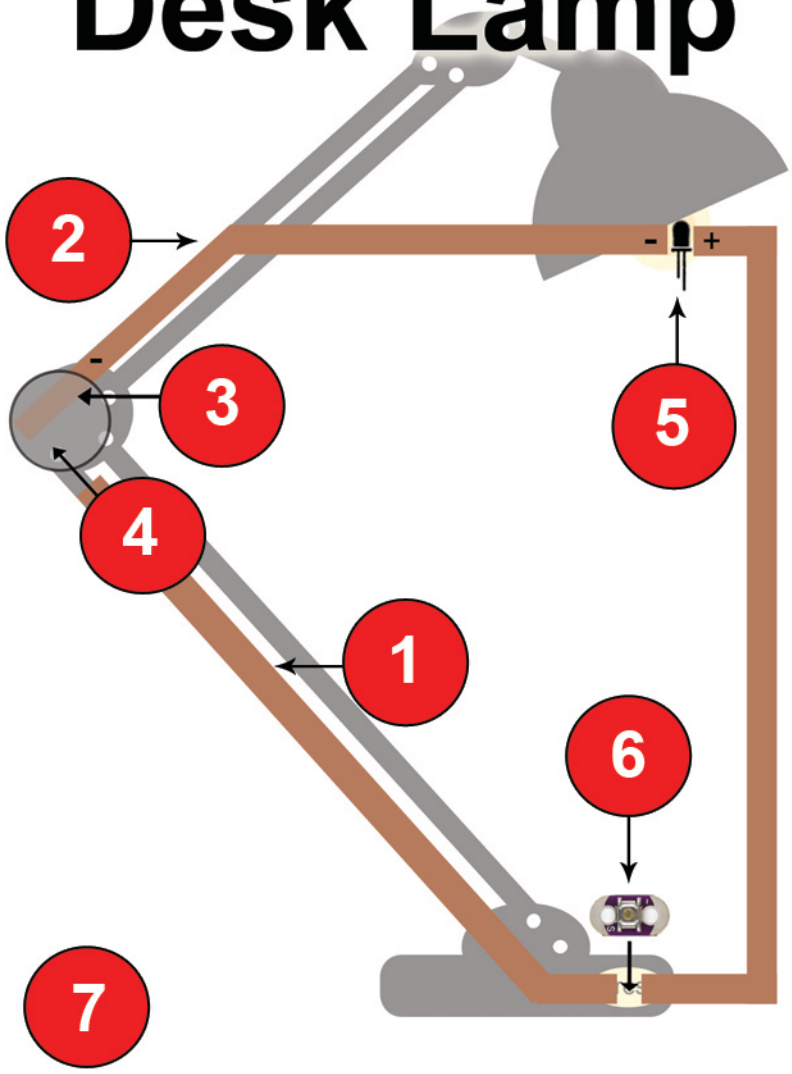
Desk Lamp



Desk Lamp



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
LilyPad Button Switch
Circuit Stickers (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

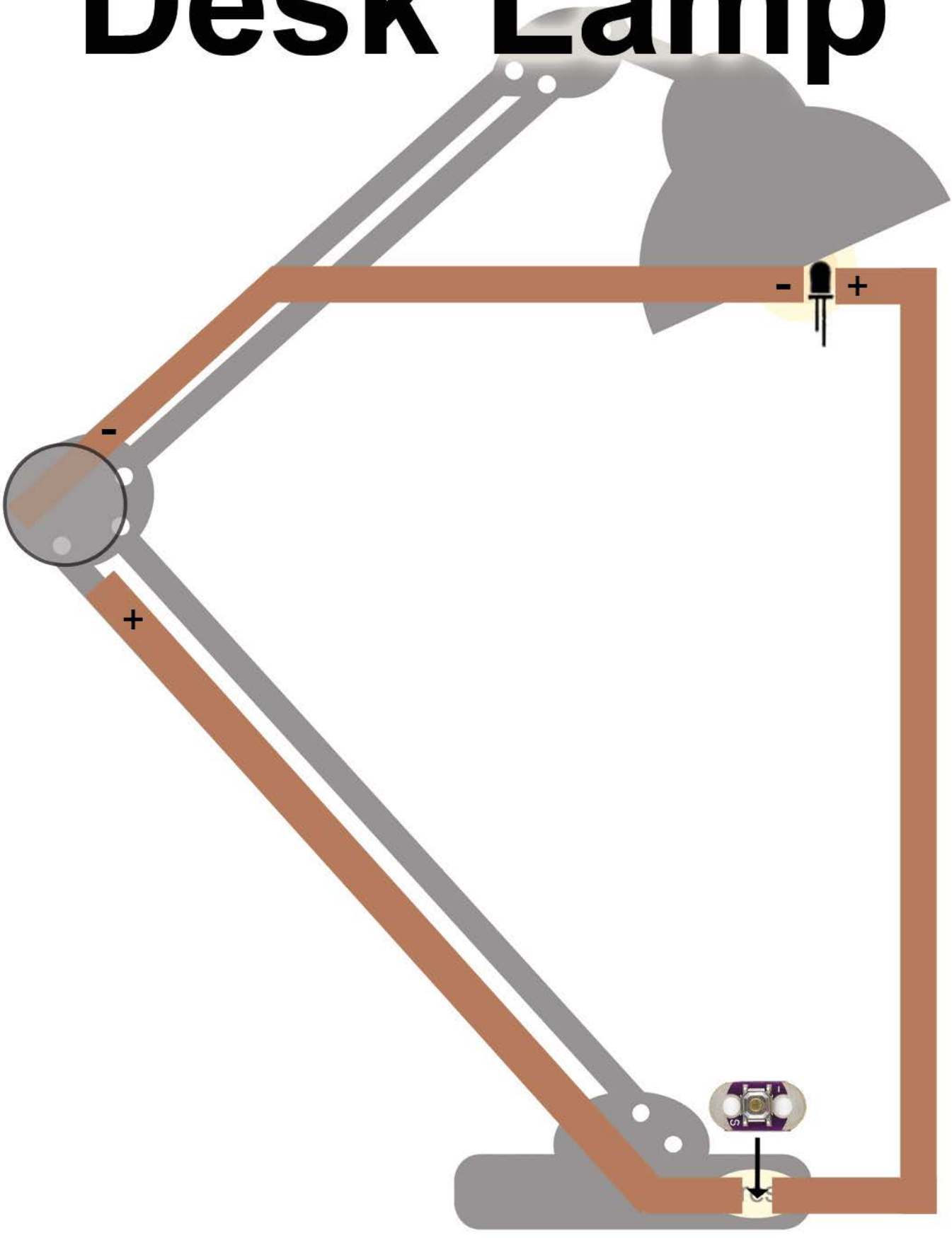
Time Required:

30 minutes

Steps:

1. Apply copper tape to trace line. Smooth with finger. Allow a gap for LED and switch
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape with negative (-) facing down.
4. Stick end of the copper tape to the top of battery (+)
5. Bend legs of LED at a 90’ angle. Use clear tape to secure LED to copper tape. Long leg of LED goes on positive.
6. Mount LilyPad switch using clear tape. Make sure there is a gap in the copper tape below switch.
7. Optional - put the desk lamp overlay on top of circuit. The words PRESS should align with LilyPad switch.

Desk Lamp



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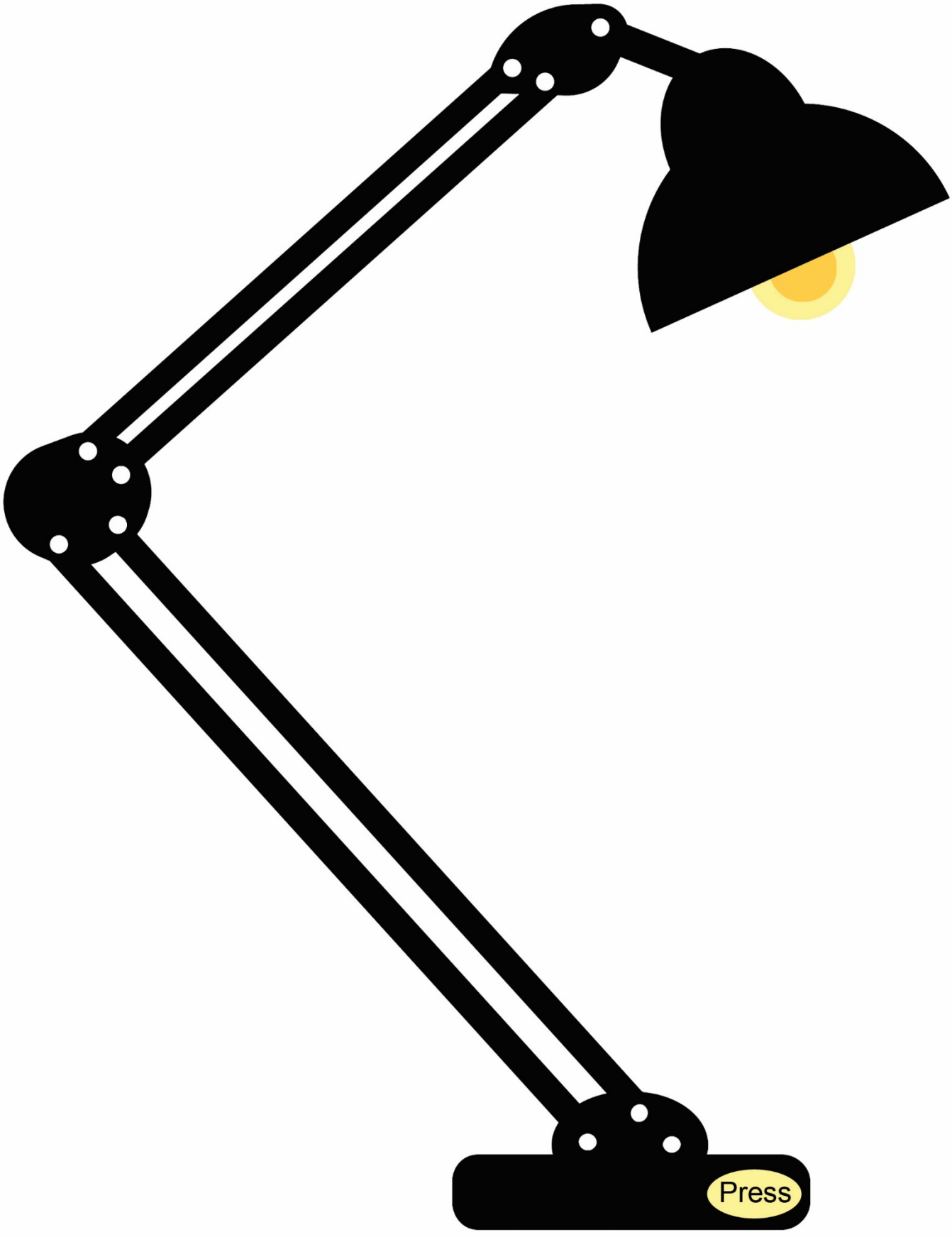
Press

Doorbell

-

3v

+

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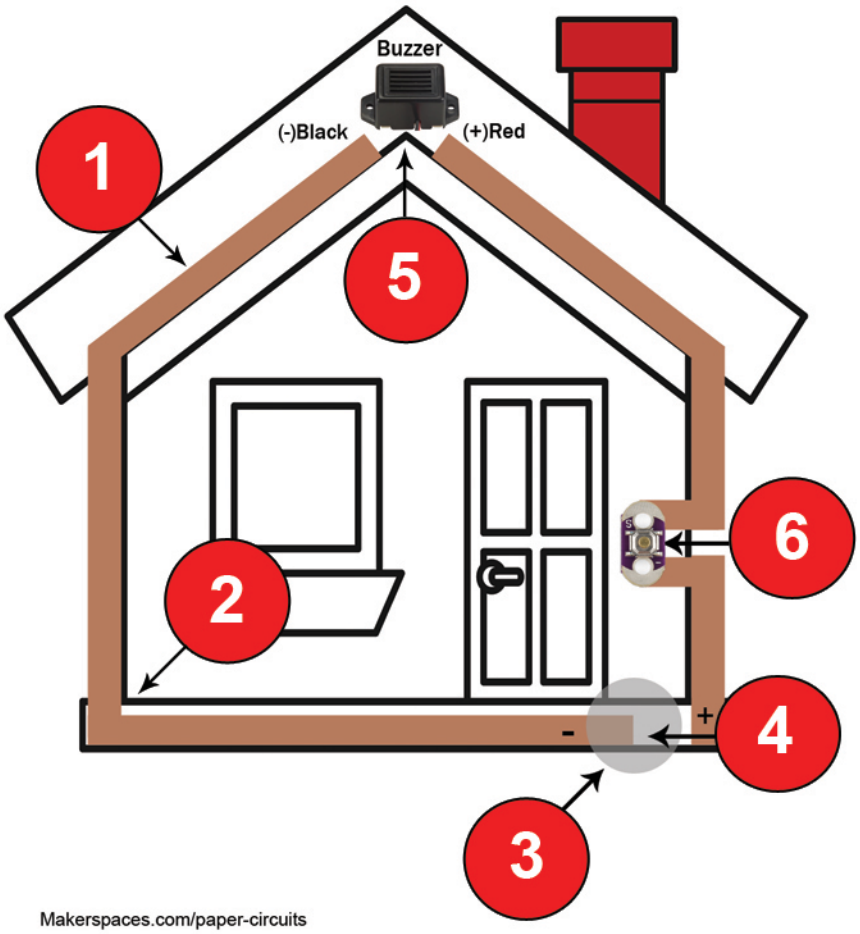
Doorbell Circuit



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Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
Buzzer
LilyPad Button Switch

Tools:

Scissors
Scoring Tool
X-Acto Knife

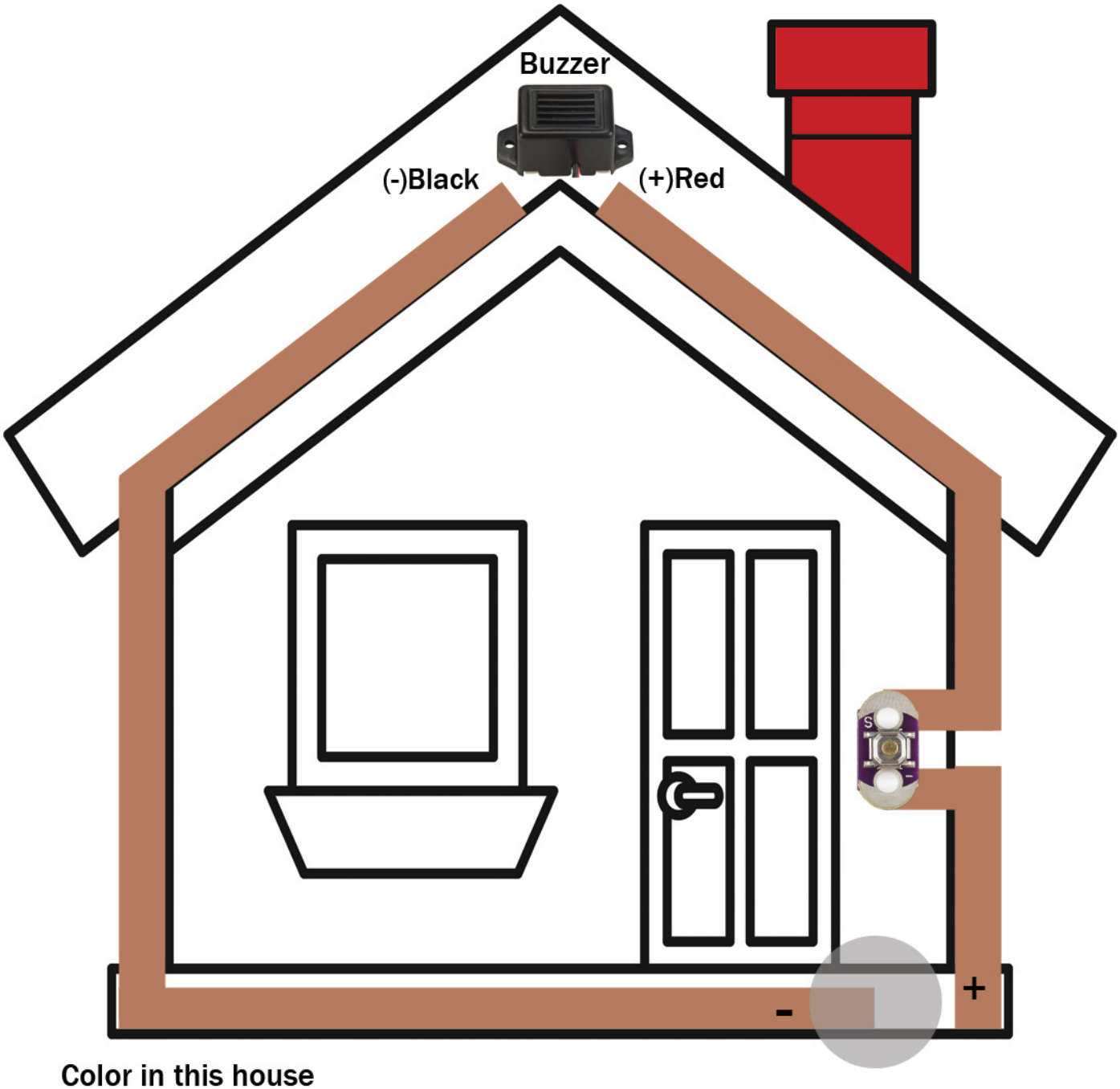
Time Required:

30 minutes

Steps:

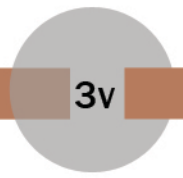
1. Apply copper tape to trace line. Smooth with finger. Allow a gap for buzzer and switch
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape with negative (-) facing down.
4. Copper tape on top of battery (+)
5. Secure buzzer to template. Tape black wire from buzzer to (-) of copper. Tape red wire to (+) of copper tape.
6. Mount LilyPad switch using clear tape. Make sure there is a gap in the copper tape below switch.

Doorbell Circuit

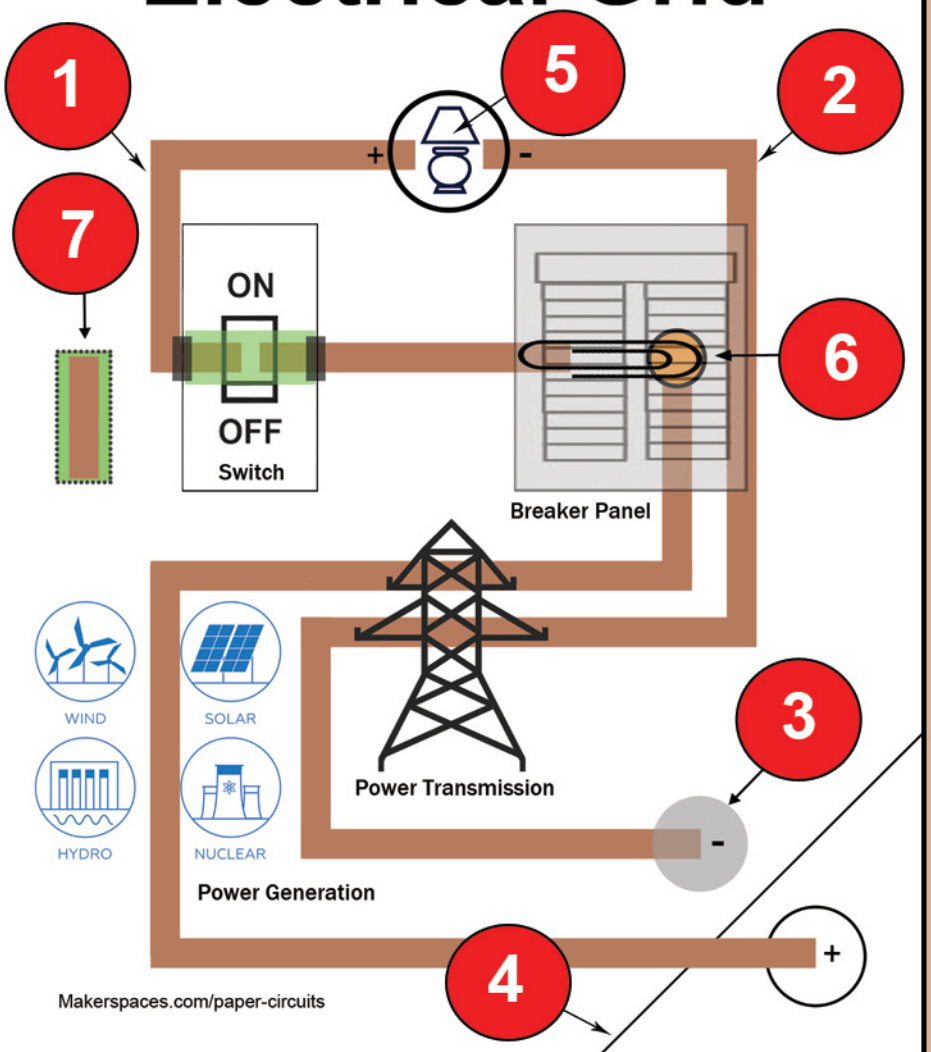


Color in this house
to make it a home.

Electrical Grid



Electrical Grid



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
Paperclip / Binder Clip
Brass Brad
Buzzer (optional)
Circuit Stickers (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

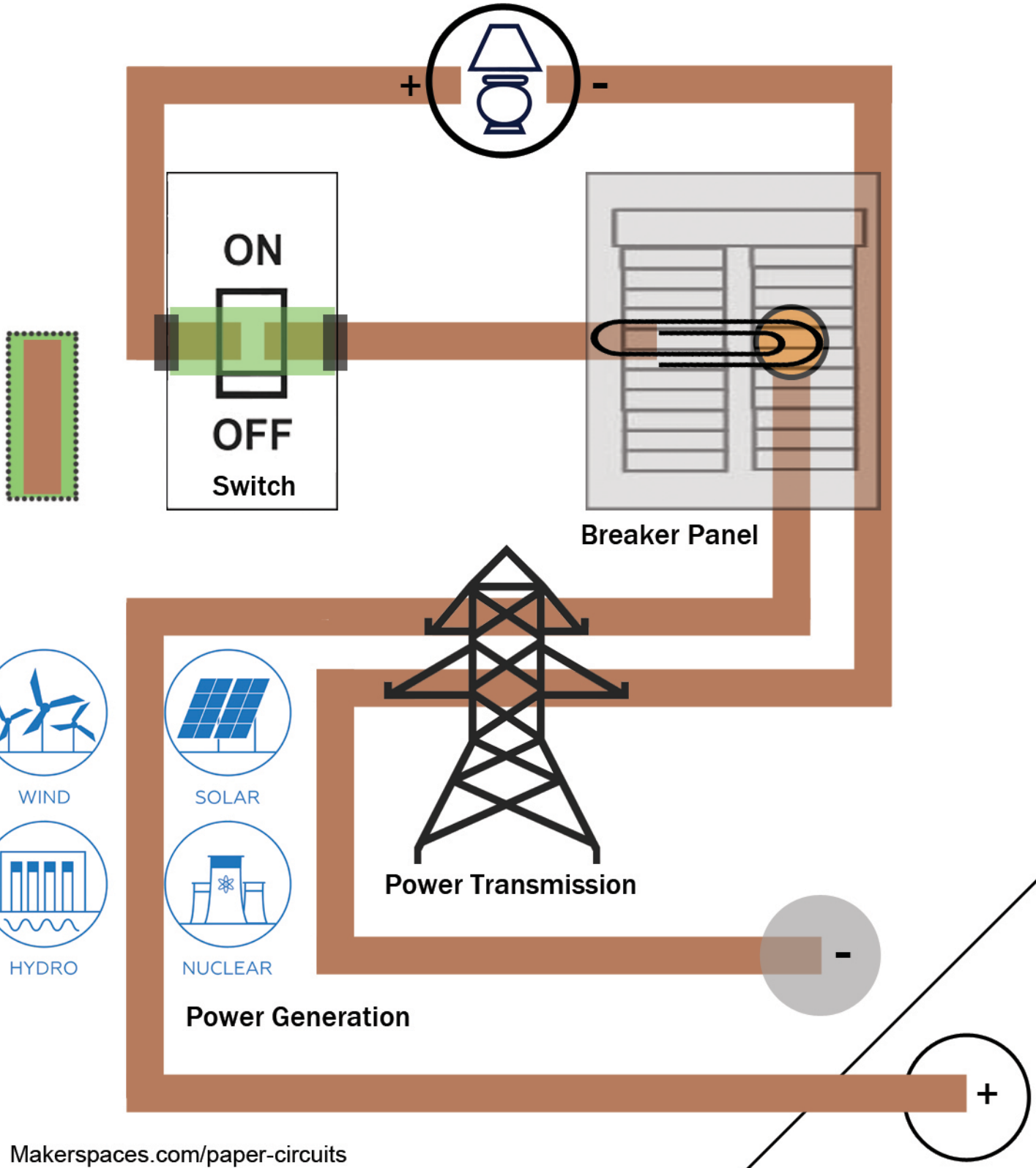
Time Required:

30 minutes

Steps:

1. Apply copper tape to trace line. Smooth with finger. Allow gaps for LED & switch.
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape w/ negative (-) facing down.
4. Fold template along line. Using a scoring tool helps with this process. Use paperclip over battery/fold.
5. LED goes here. Fold legs at a 90’ angle and tape to copper. Long leg goes to (+).
6. Push brass brad thru paperclip & copper tape. Secure back.
7. Cut out switch and tape it to switch icon with copper down.

Electrical Grid



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Firefly Jar

- 3v +

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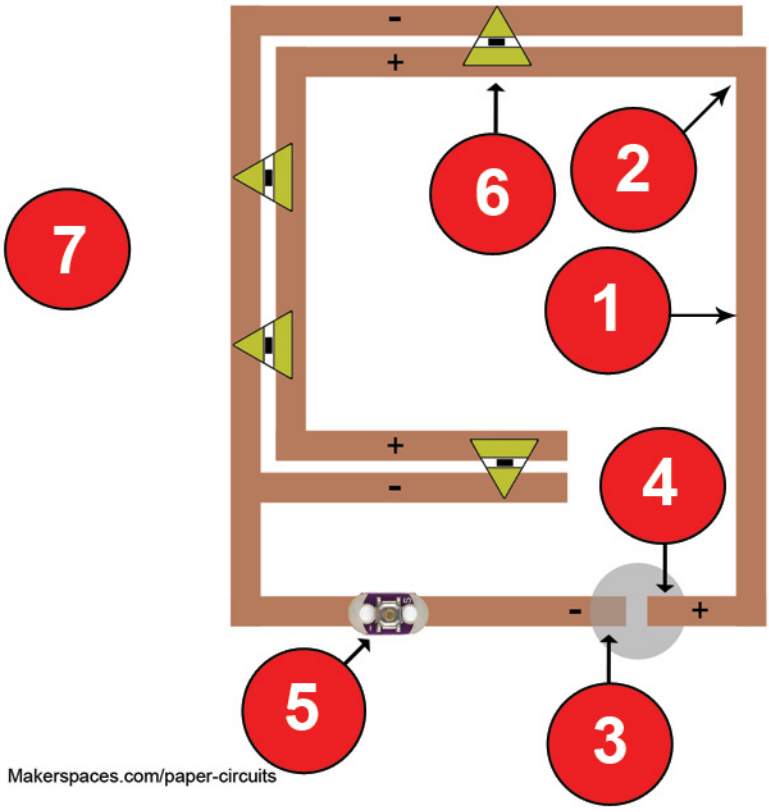
Firefly Circuit



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LilyPad Button Switch
Circuit Stickers - yellow

Tools:

Scissors
Scoring Tool
X-Acto Knife

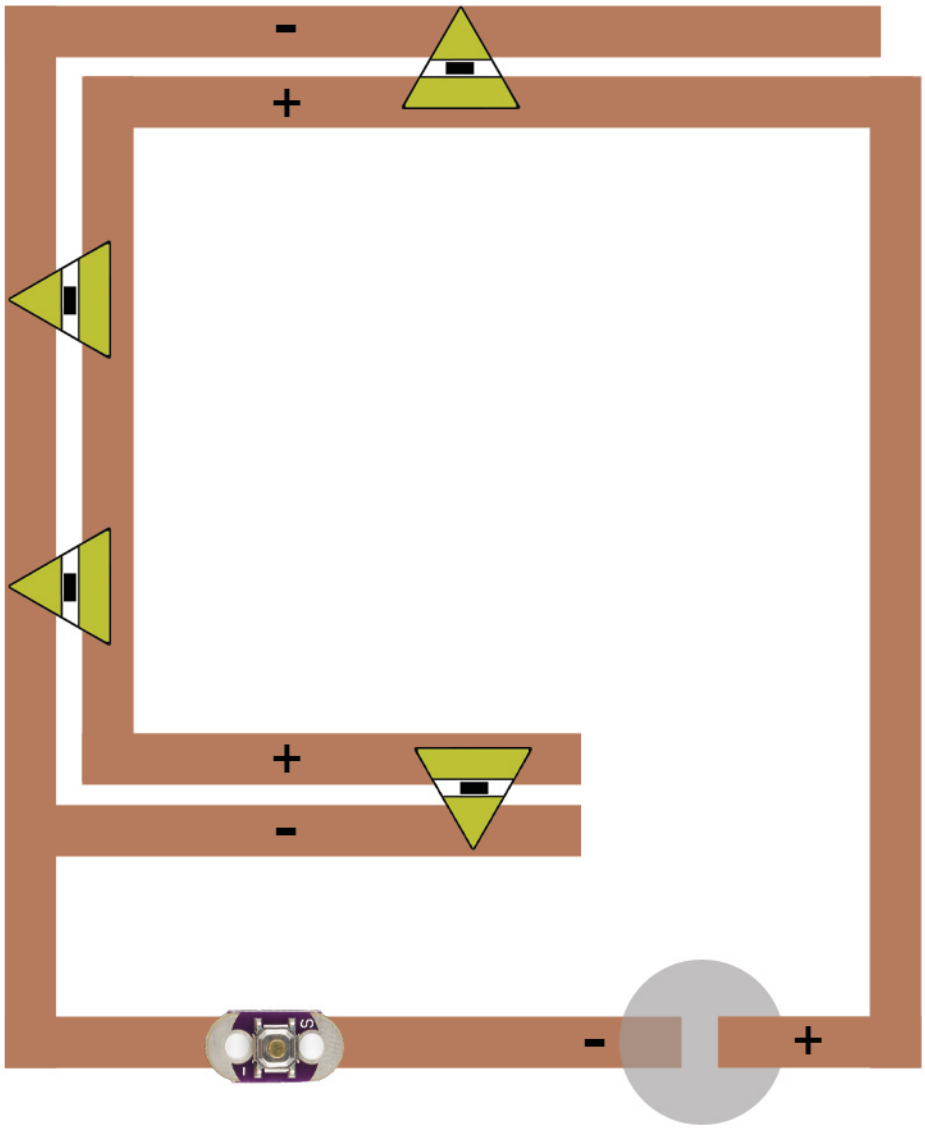
Time Required:

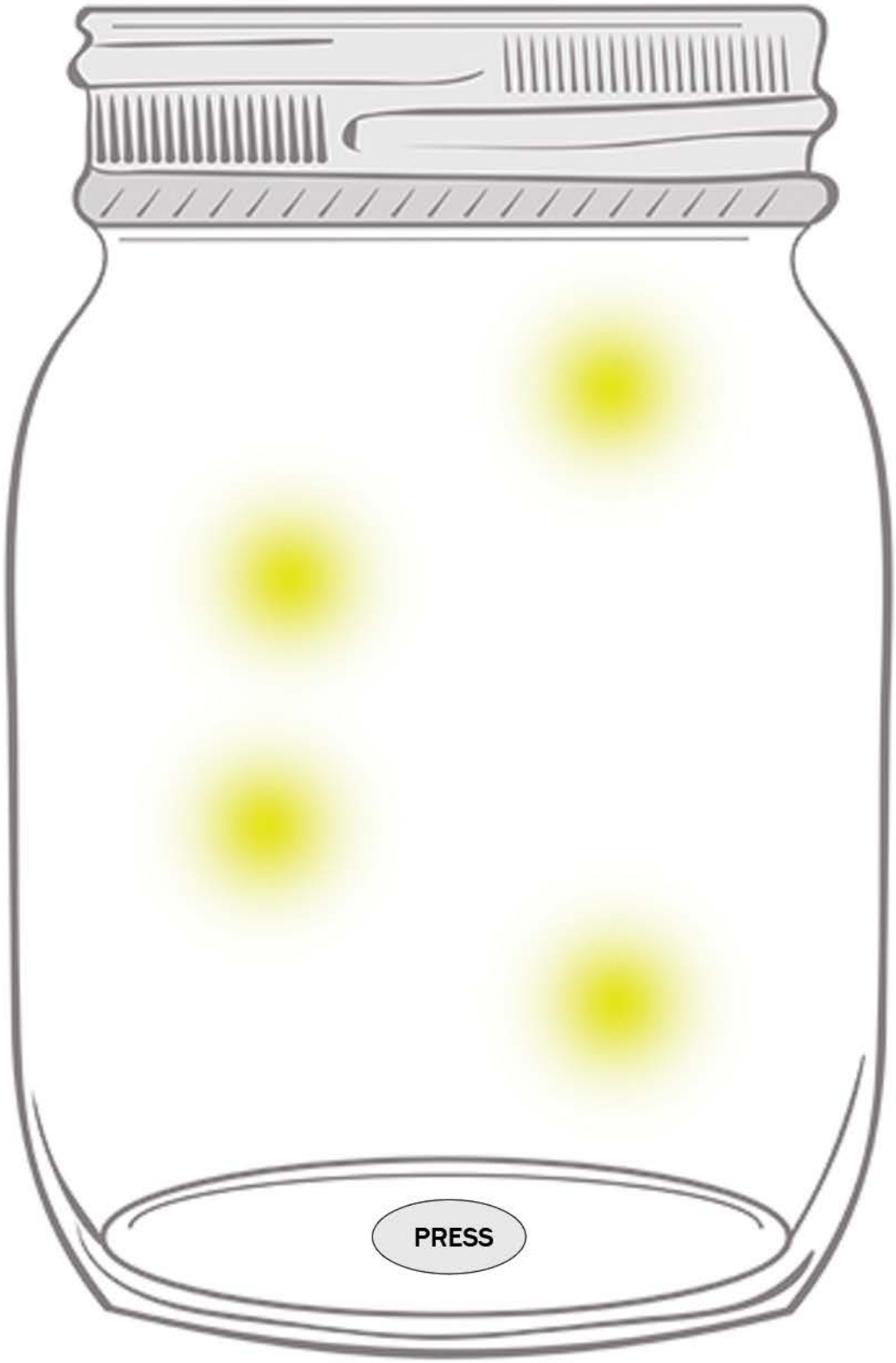
30 minutes

Steps:

1. Apply copper tape to trace line. Smooth with finger. Allow a gap for switch and circuit stickers.
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape with negative (-) facing down.
4. Stick end of copper tape to the top of battery (+)
5. Mount LilyPad switch using clear tape. Make sure there is a gap in the copper tape below switch.
6. Stick Circuit Stickers to copper tape. Wide side goes on (+) of copper tape.
7. Place firefly overlay directly over this circuit template.

Firefly Circuit




PRESS

Flap Switch

-

3v

+

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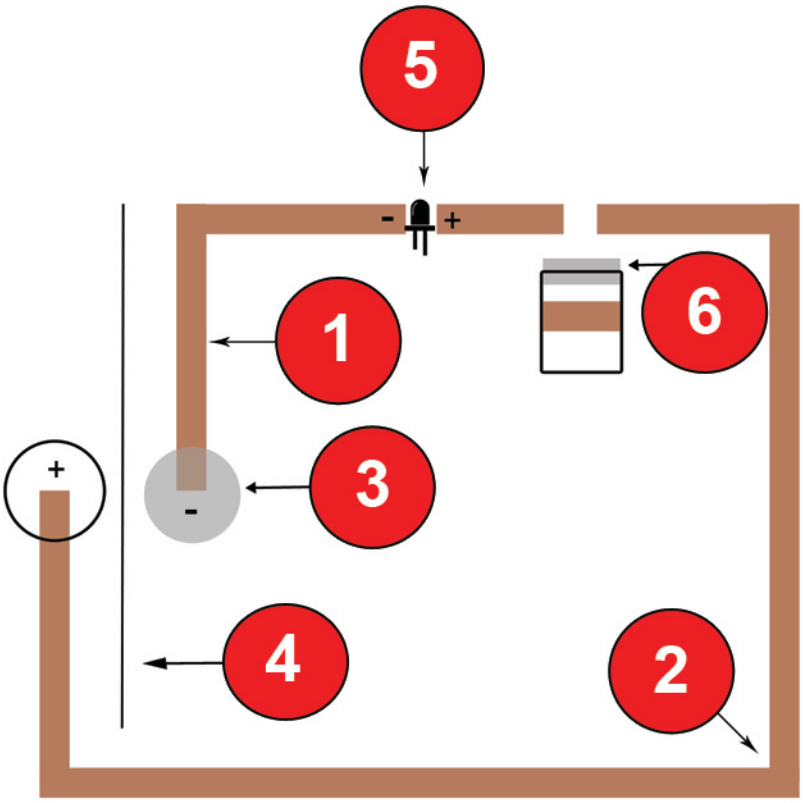
Flap/Tab Switch



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Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
Paperclip / Binder Clip
Circuit Stickers (optional)
Buzzer (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

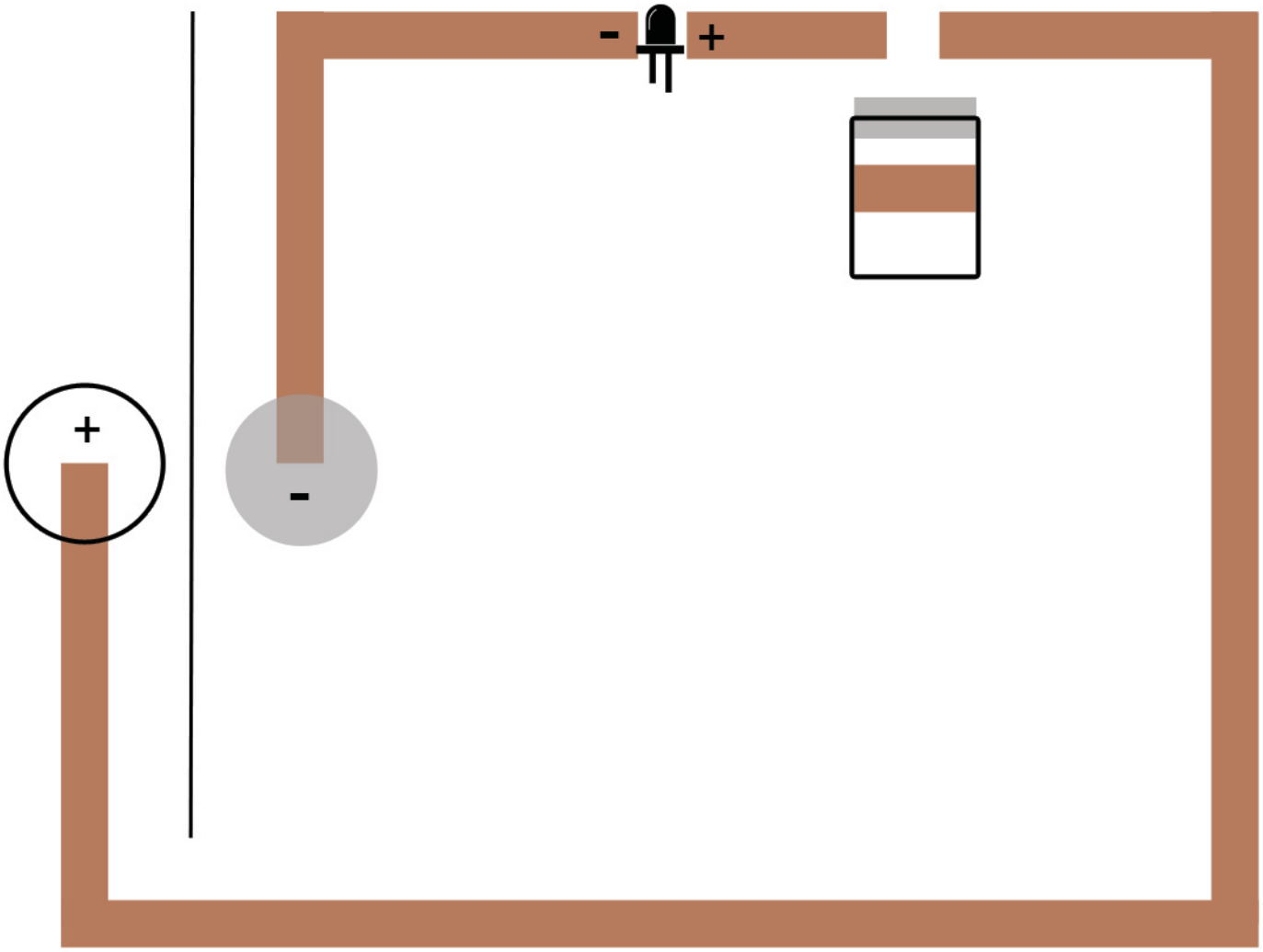
Time Required:

30 minutes

Steps:

1. Apply copper tape to trace line on template. Smooth with finger. Allow gaps for LED and switch.
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape w/ negative (-) facing down.
4. Fold template along line. Using a scoring tool helps with this process. Use paperclip over battery/fold.
5. Bend legs of LED at a 90’ angle. Use clear tape to secure LED to copper tape. Long leg of LED goes on positive.
6. Tape piece of paper w/ copper facing up. Tape on one side acts as hinge.

Flap/Tab Switch



Happy Birthday

-

3v

+

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Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
LilyPad Button Switch
Circuit Stickers (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

Time Required:

30 minutes

Steps:

1. Apply copper tape to trace line. Smooth with finger. Allow a gap for LED and switch.
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape with negative (-) facing down.
4. Stick end of the copper tape to the top of the battery (+)
5. Bend legs of LED at a 90’ angle. Use clear tape to secure LED to copper tape. Long leg of LED goes on positive.
6. Mount LilyPad switch using clear tape. Make sure there is a gap in the copper tape below switch.
7. Cut all DOTTED lines.
8. Fold all SOLID lines.

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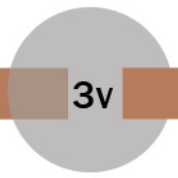
Press

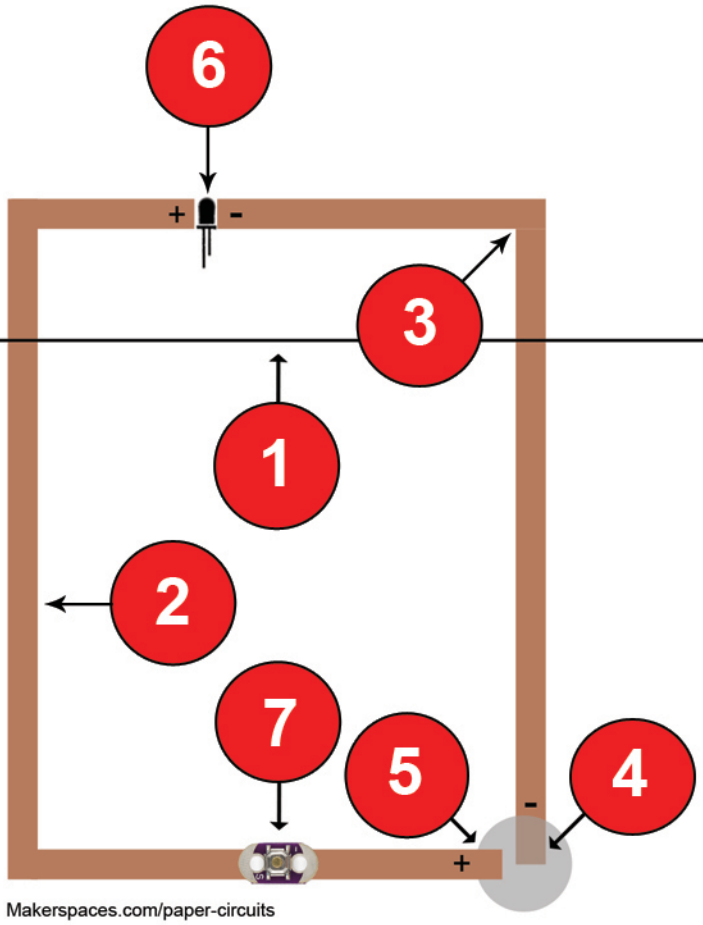
I Love You

-



+

I Love You Popup



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Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
LilyPad Button Switch
Circuit Stickers (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

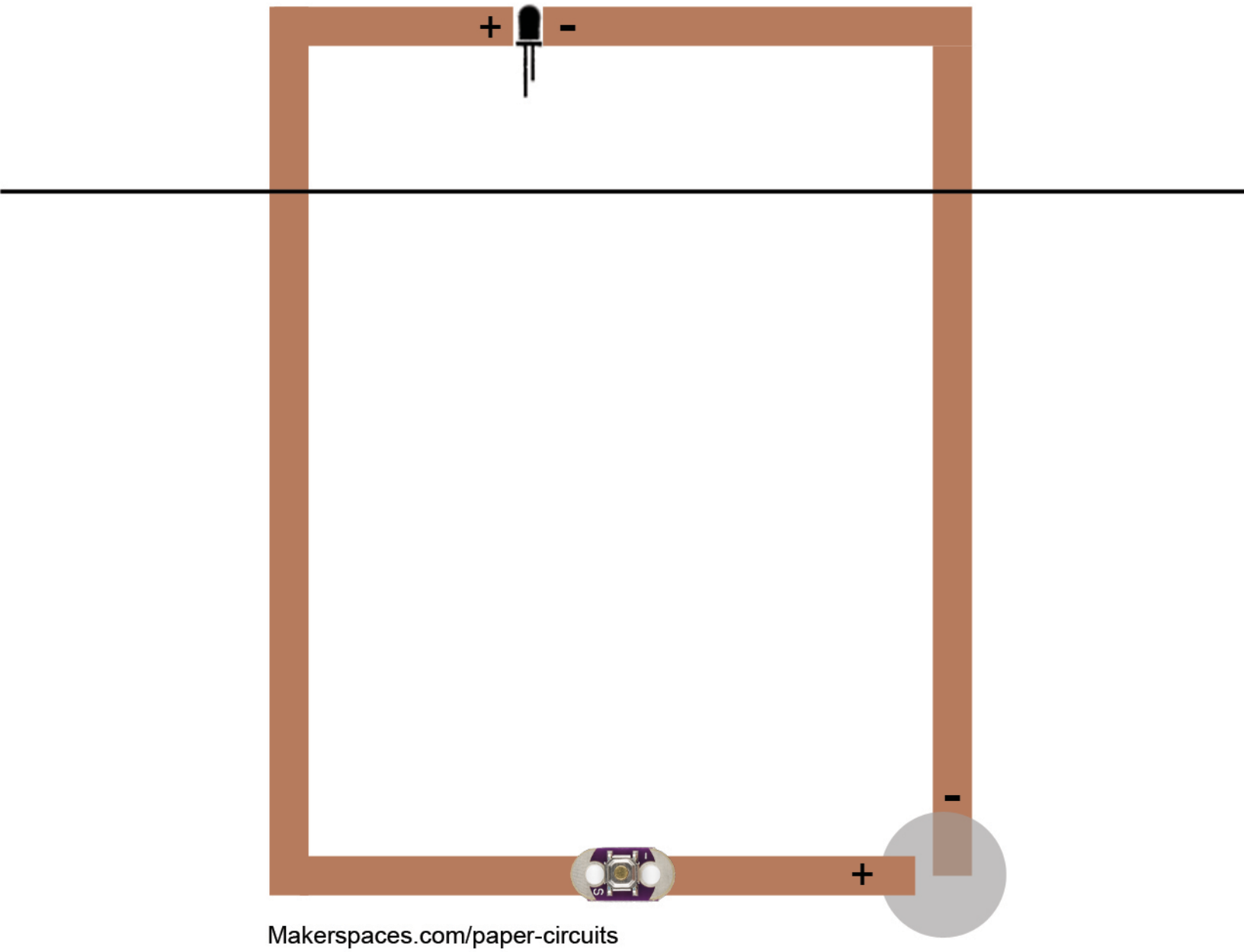
Time Required:

30 minutes

Steps:

1. Fold template along line. Using a scoring tool can help.
2. Apply copper tape to trace line. Smooth with finger. Allow a gap for LED and switch
3. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
4. Place battery on top of copper tape with negative (-) facing down.
5. Stick end of copper tape to the top of battery (+)
6. Bend legs of LED at a 90’ angle. Use clear tape to secure LED to copper tape. Long leg of LED goes on positive.
7. Mount LilyPad switch using clear tape. Make sure there is a gap in the copper tape below switch.

I Love You Popup



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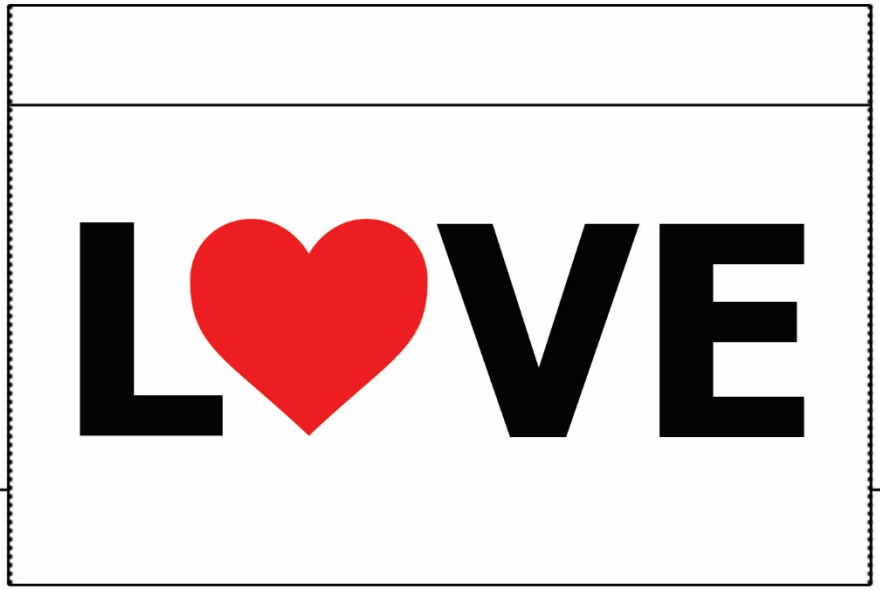
I



You

Press

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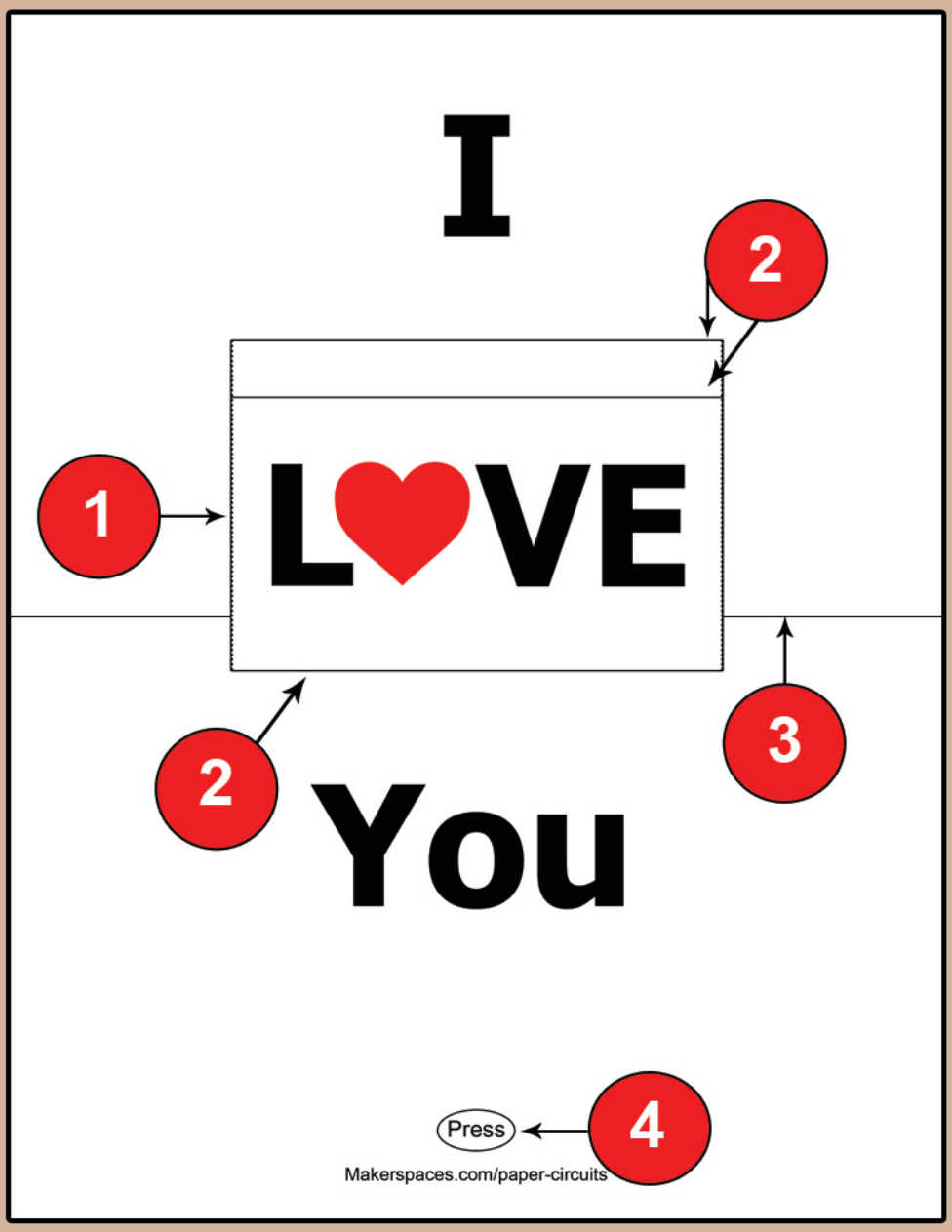


Steps:

1. Cut dotted lines on both sides of the word LOVE
2. Fold all solid lines on top and bottom of popup
3. Fold solid lines on both sides of the popup. Don't fold middle.
4. Place overlay directly over the circuit template. The button marked PRESS should line up with the LilyPad switch below.

Materials:

Template

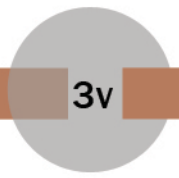
Tools:

Scissors
Scoring Tool
X-Acto Knife

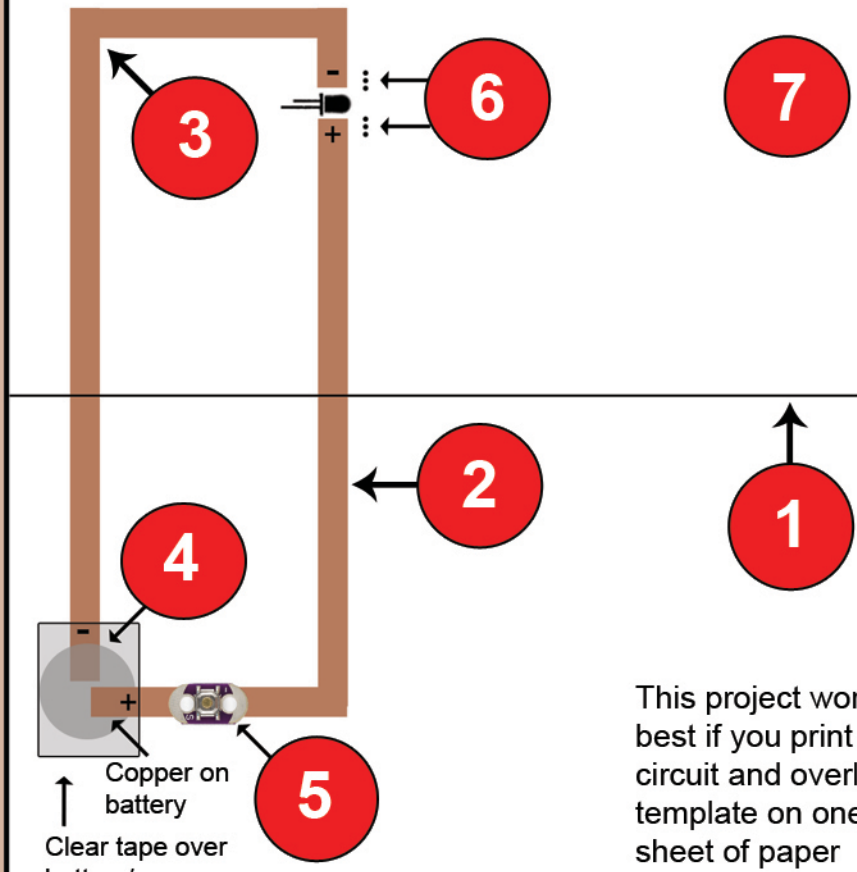
Time Required:

30 minutes

Light Saber



Light Saber Card



This project works best if you print circuit and overlay template on one sheet of paper (2 sided copy)

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Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
Colored straw
LilyPad Button Switch
LED - 5mm or 10mm

Tools:

Scissors
Scoring Tool
X-Acto Knife

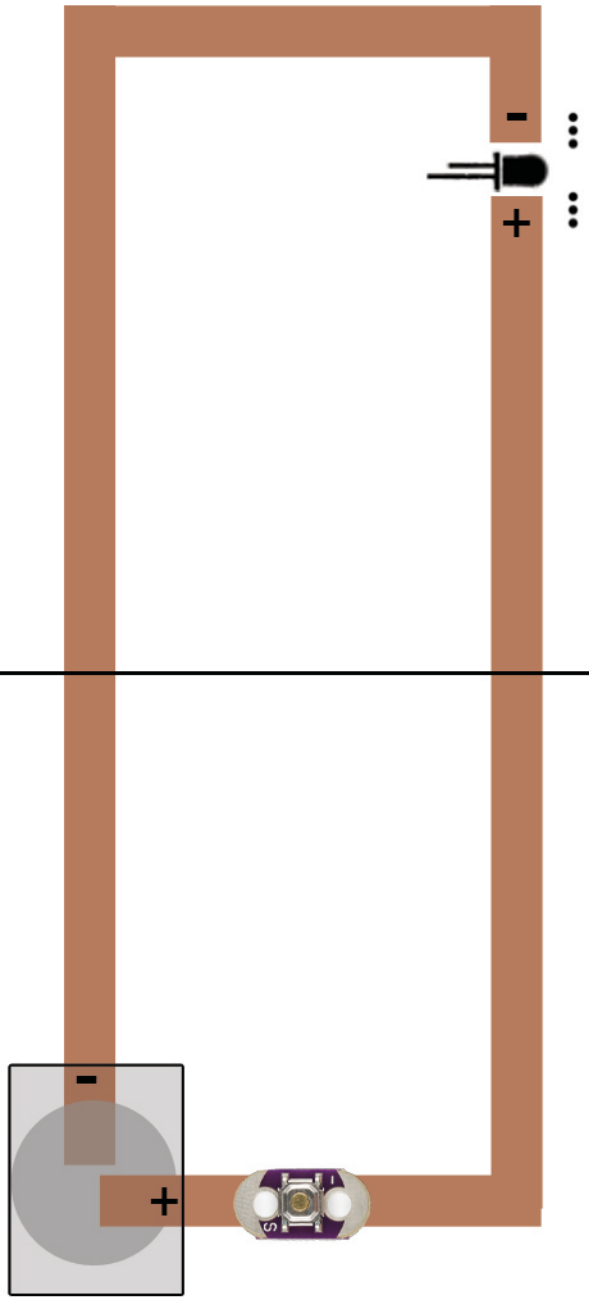
Time Required:

30 minutes

Steps:

1. Fold line on template. Use a scoring tool to assist.
2. Apply copper tape to trace line. Allow a gap for LED & LilyPad switch. Note - leave a flap of copper tape up by (+) battery area. This copper will go on TOP of battery.
3. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
4. Place battery on top of copper tape with negative (-) facing down.
5. Tape LilyPad switch to copper.
6. Make tiny cuts on dotted lines for LED legs to slide thru. Tape legs to copper. Long leg goes to positive (+)
7. On front of card tape straw to area above light saber handle. LED head goes in bottom of straw shining up towards words.

Light Saber Card



MAY THE FORCE BE WITH YOU

MAY THE FOURTH BE WITH YOU

Light Up My Life

-

3v

+

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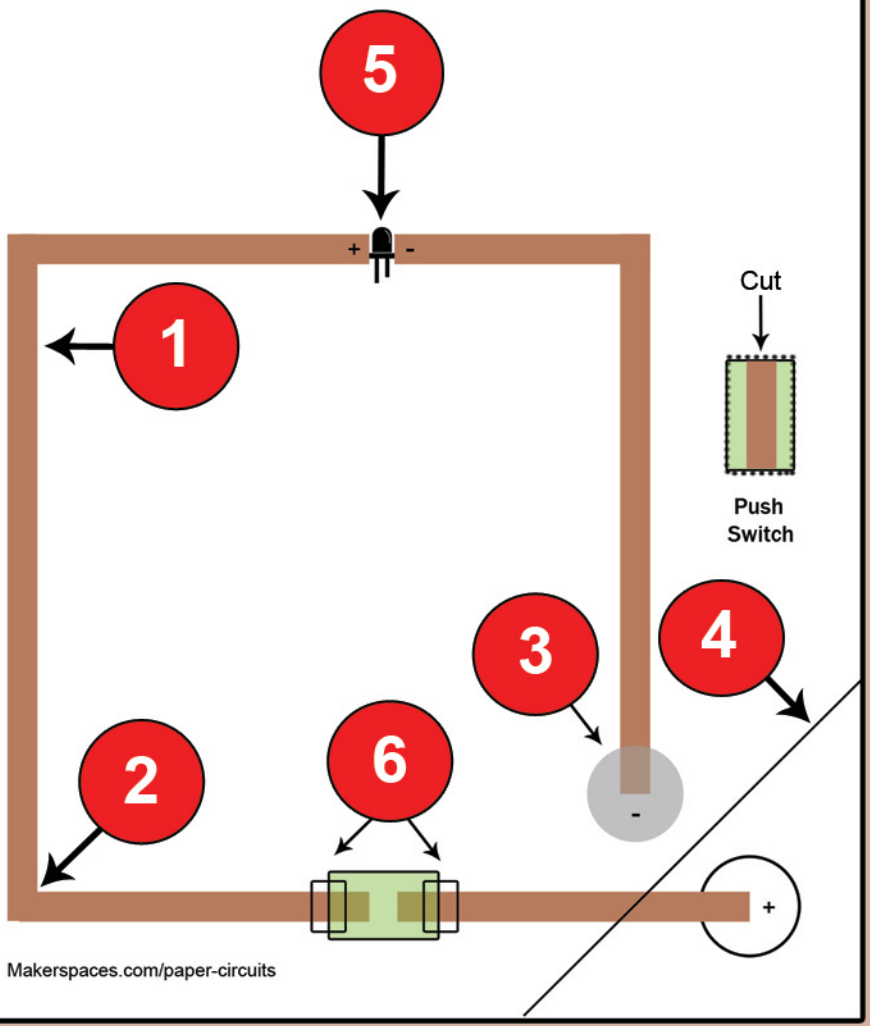
Light Up My Life



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
Paperclip / Binder Clip
Circuit Stickers (optional)
Buzzer (optional)
Double-sided foam tape (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

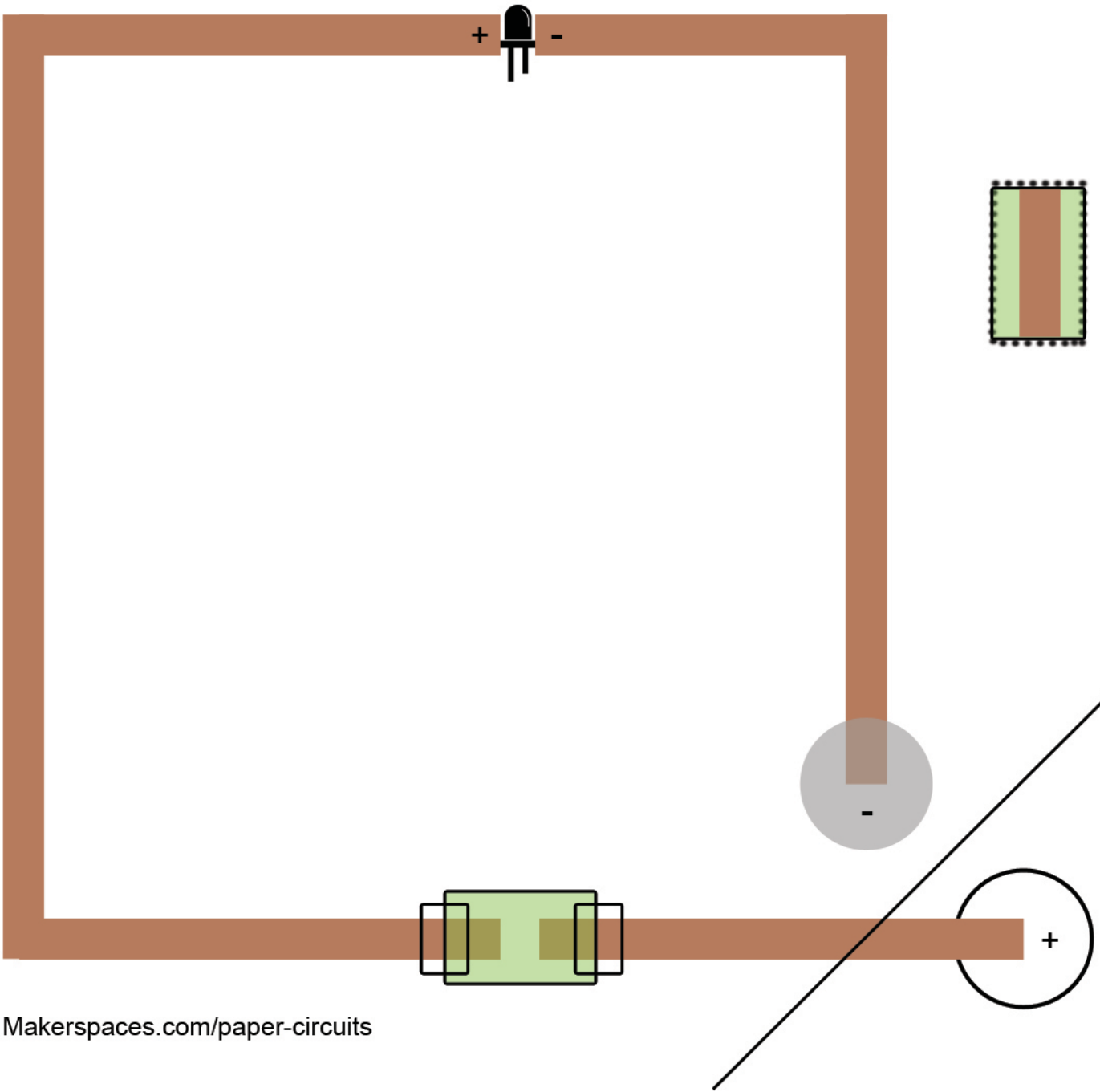
Time Required:

30 minutes

Steps:

1. Apply copper tape to trace line on template. Smooth with finger. Allow gap for LED.
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape w/ negative (-) facing down.
4. Fold corner of template along the line. Using a scoring tool helps with this process. Use paperclip to secure corner.
5. Bend legs of LED at a 90’ angle. Use clear tape to secure LED to copper tape. Long leg of LED goes on positive.
6. Tape switch w/ copper down. (Optional) -Use double sided foam tape for added elevation.

Light Up My Life



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You Light Up My Life !

Press

Makerspaces.com/paper-circuits

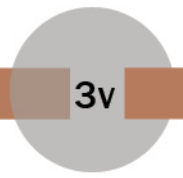
Fold

Fold

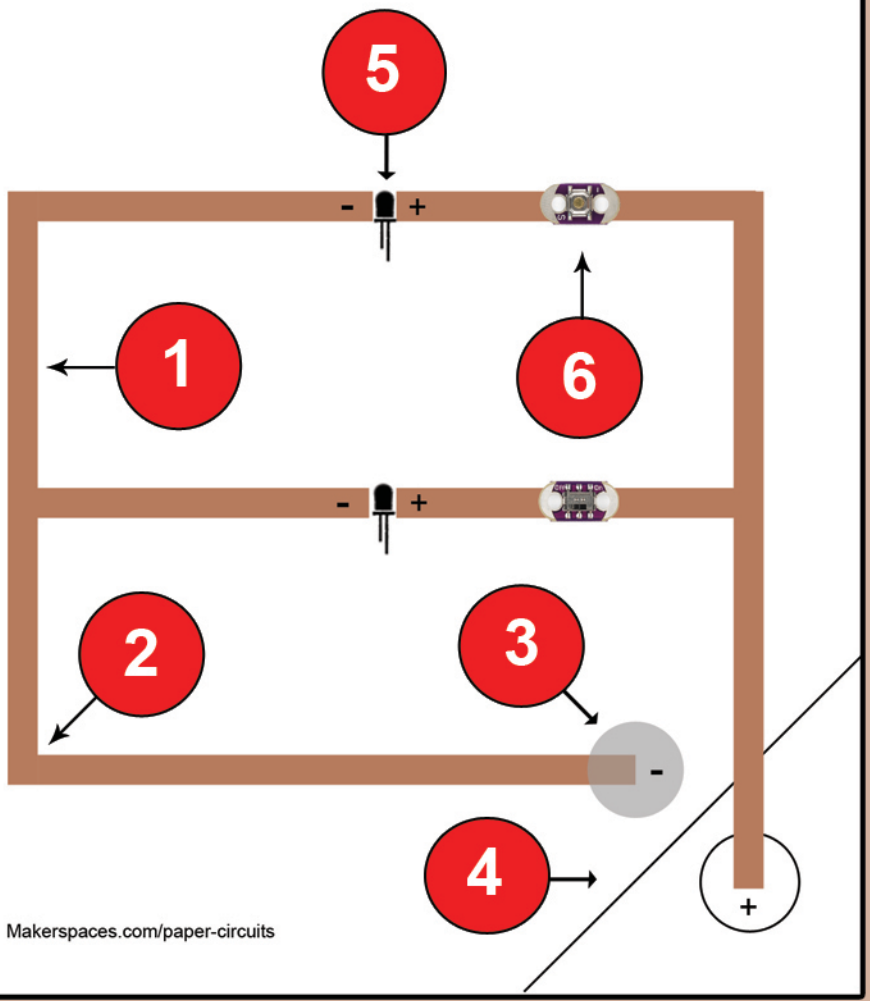
Fold

Fold

LilyPad Switches



LilyPad Switches



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
Paperclip
LilyPad Slide Switch
LilyPad Button Switch
LED - 5mm or 10mm
Circuit Stickers (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

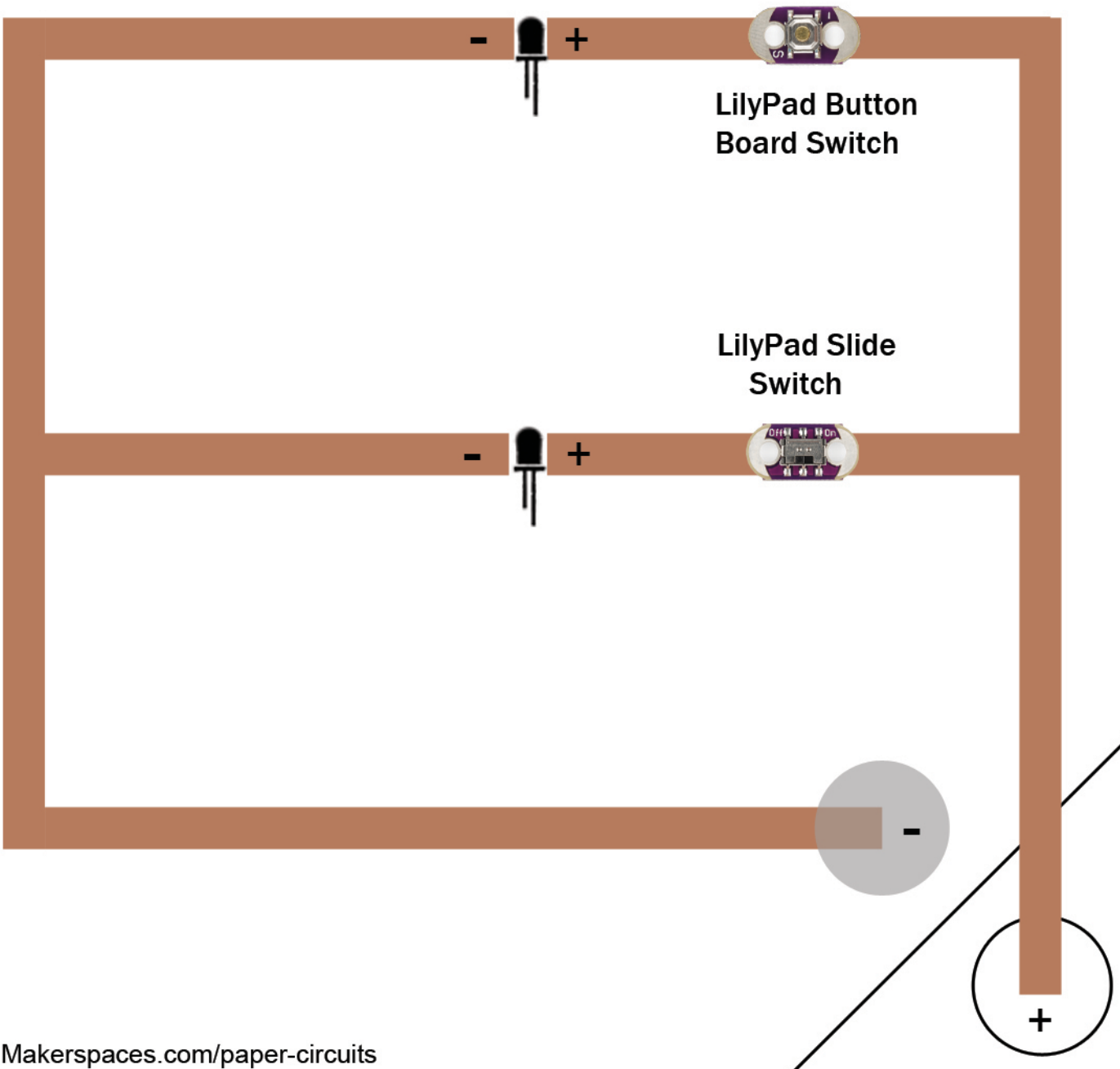
Time Required:

30 minutes

Steps:

1. Apply copper tape to trace line. Smooth with finger. Allow a gap for LED and switch
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape with negative (-) facing down.
4. Fold corner along line. Use a scoring tool to assist. Secure battery/fold with a paperclip
5. Bend legs of LED at a 90’ angle. Use clear tape to secure LED to copper tape. Long leg of LED goes on positive.
6. Mount LilyPad button board and slide switch using clear tape. Make sure there is a gap in the copper tape below switch.

LilyPad Switches



Love Card

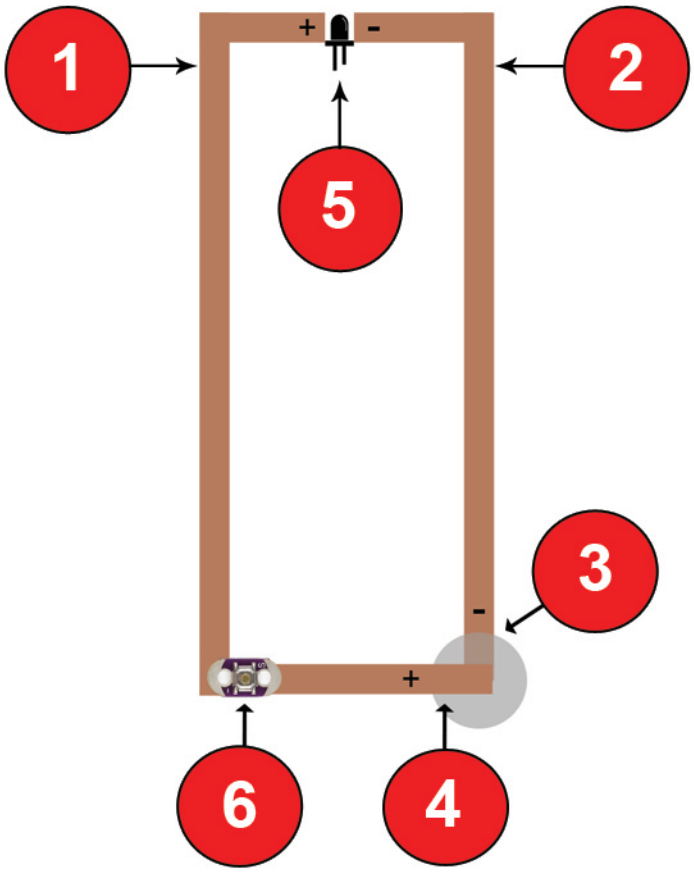
-

3v

+

Makerspaces.com/paper-circuits

Love Card



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Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
LilyPad Button Switch
Circuit Stickers (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

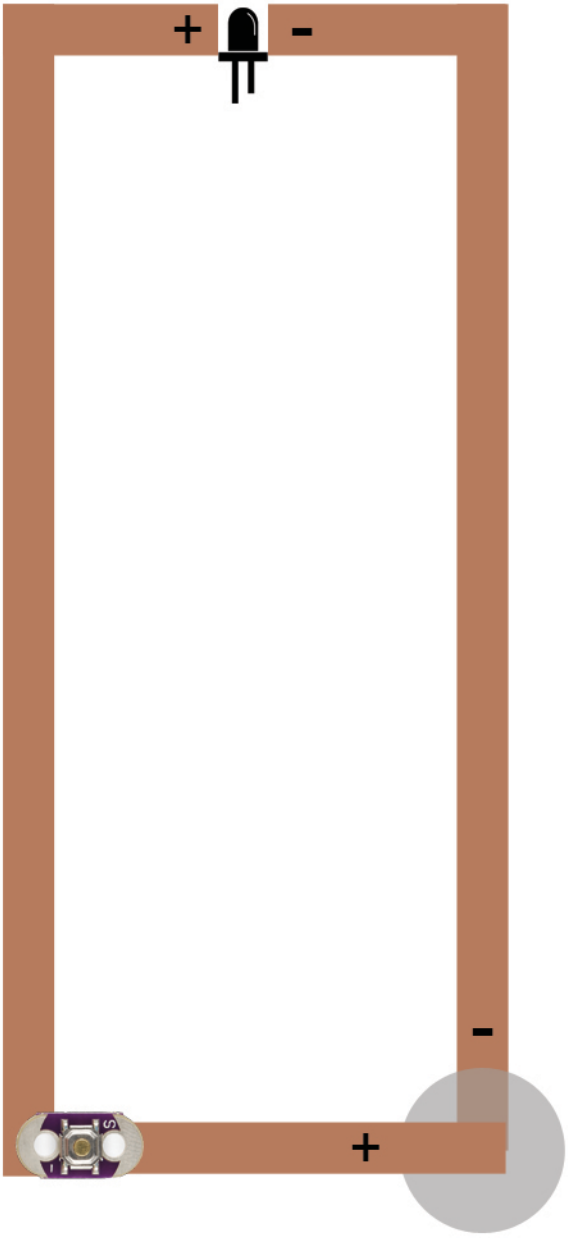
Time Required:

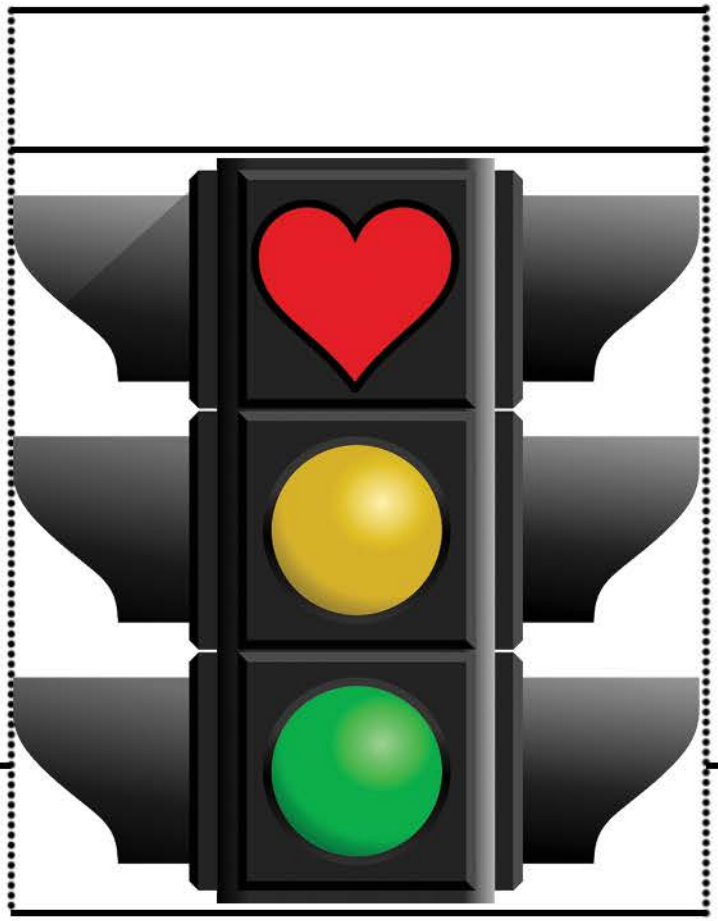
30 minutes

Steps:

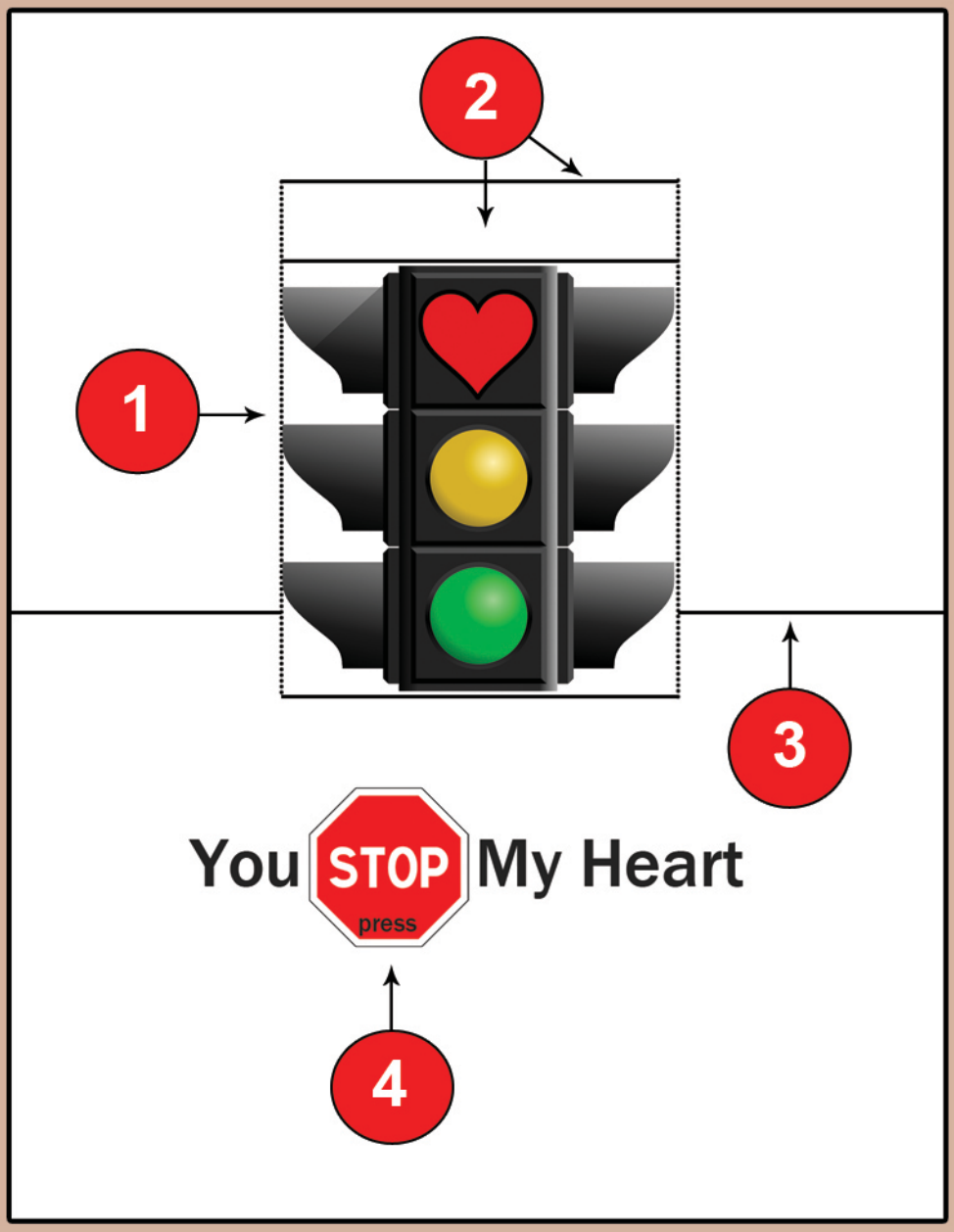
1. Apply copper tape to trace line. Smooth with finger. Allow a gap for LED and switch
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape with negative (-) facing down.
4. Copper tape on top of battery (+)
5. Bend legs of LED at a 90’ angle. Use clear tape to secure LED to copper tape. Long leg of LED goes on positive.
6. Mount LilyPad switch using clear tape. Make sure there is a gap in the copper tape below switch.

Love Card





You STOP press My Heart



Steps:

1. Cut dotted lines on both sides of traffic light.
2. Fold all solid lines on top and bottom of traffic light.
3. Fold solid lines on both sides of the traffic light. Don't fold middle.
4. Place stop sign directly over the LilyPad switch of bottom template.

Materials:

Template

Tools:

Scissors
Scoring Tool
X-Acto Knife

Time Required:

30 minutes

Mom Popup Card

- 3v +

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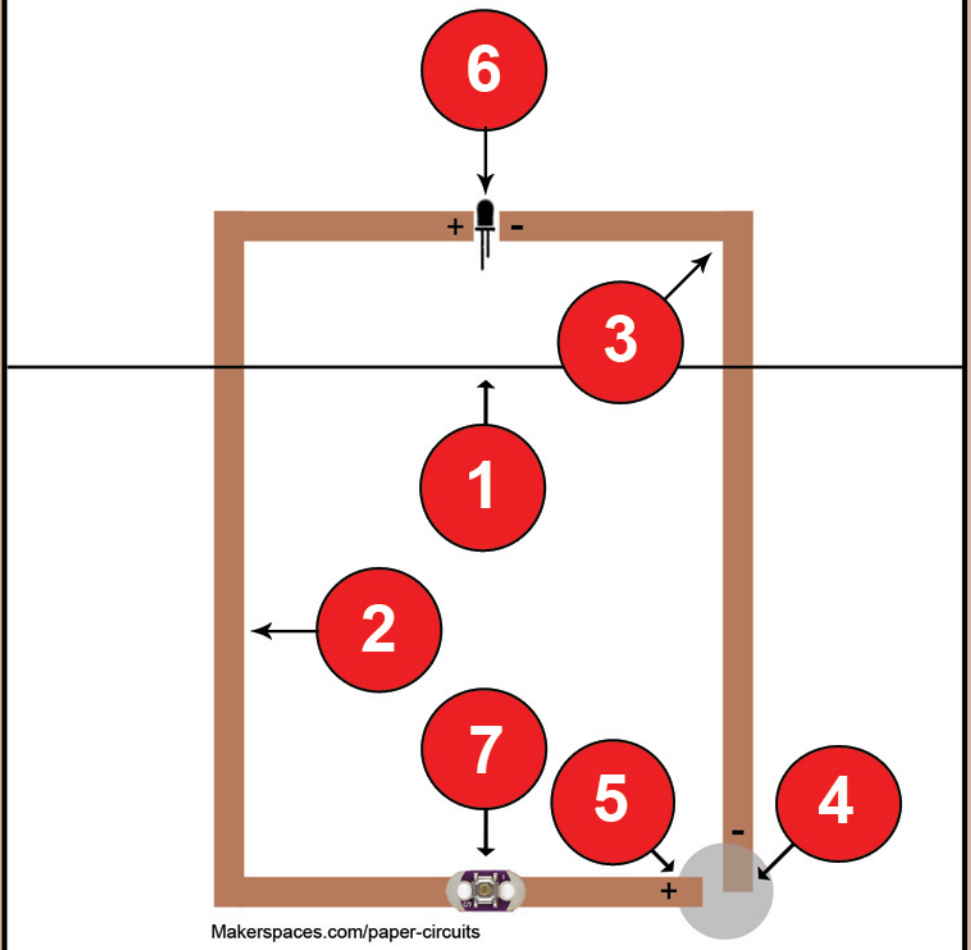
Mom Popup Circuit



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
LilyPad Button Switch
Circuit Stickers (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

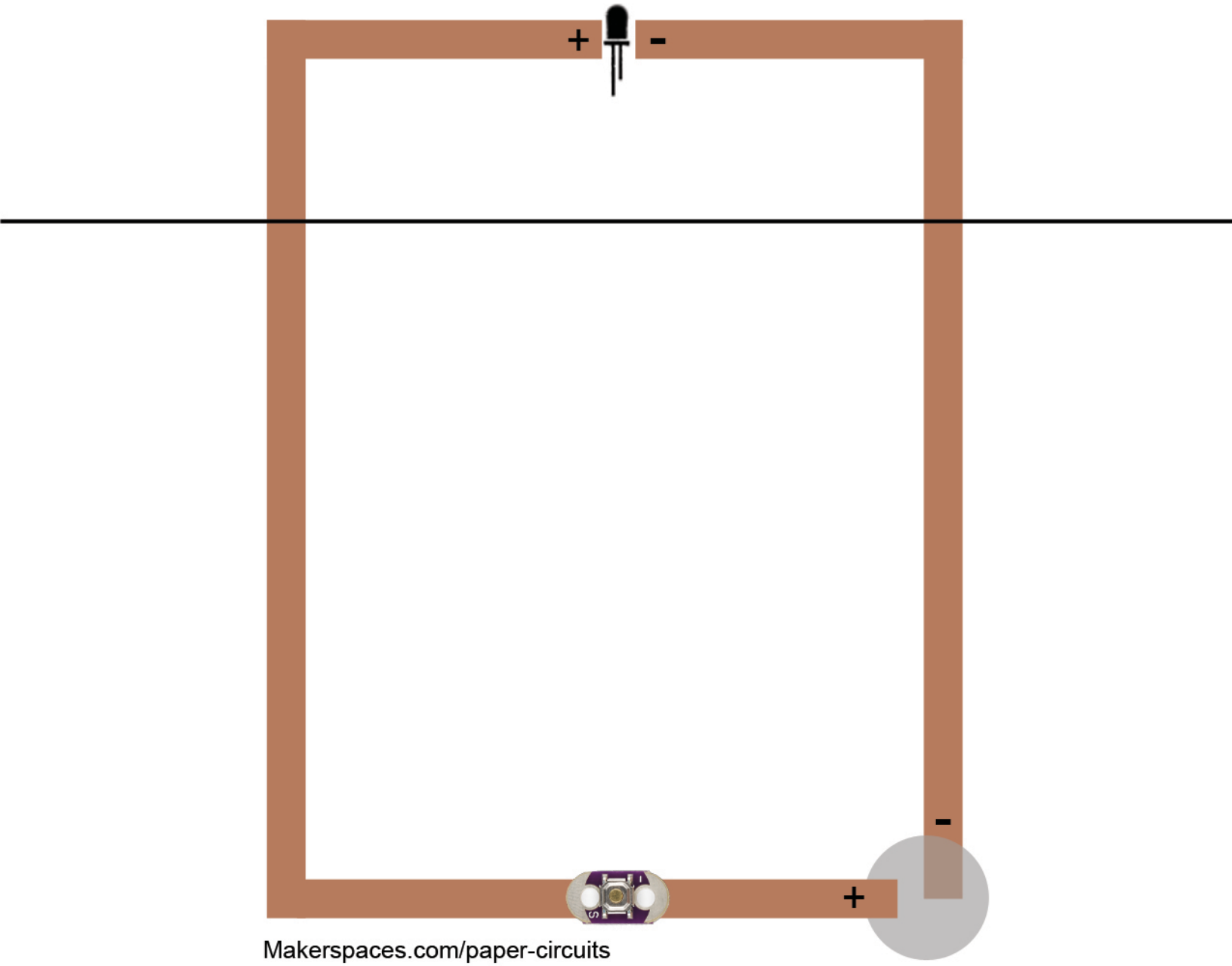
Time Required:

30 minutes

Steps:

1. Fold template along line. Using a scoring tool can help.
2. Apply copper tape to trace line. Smooth with finger. Allow a gap for LED and switch
3. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
4. Place battery on top of copper tape with negative (-) facing down.
5. Stick end of copper tape to the top of battery (+)
6. Bend legs of LED at a 90’ angle. Use clear tape to secure LED to copper tape. Long leg of LED goes on positive.
7. Mount LilyPad switch using clear tape. Make sure there is a gap in the copper tape below switch.

Mom Popup Circuit



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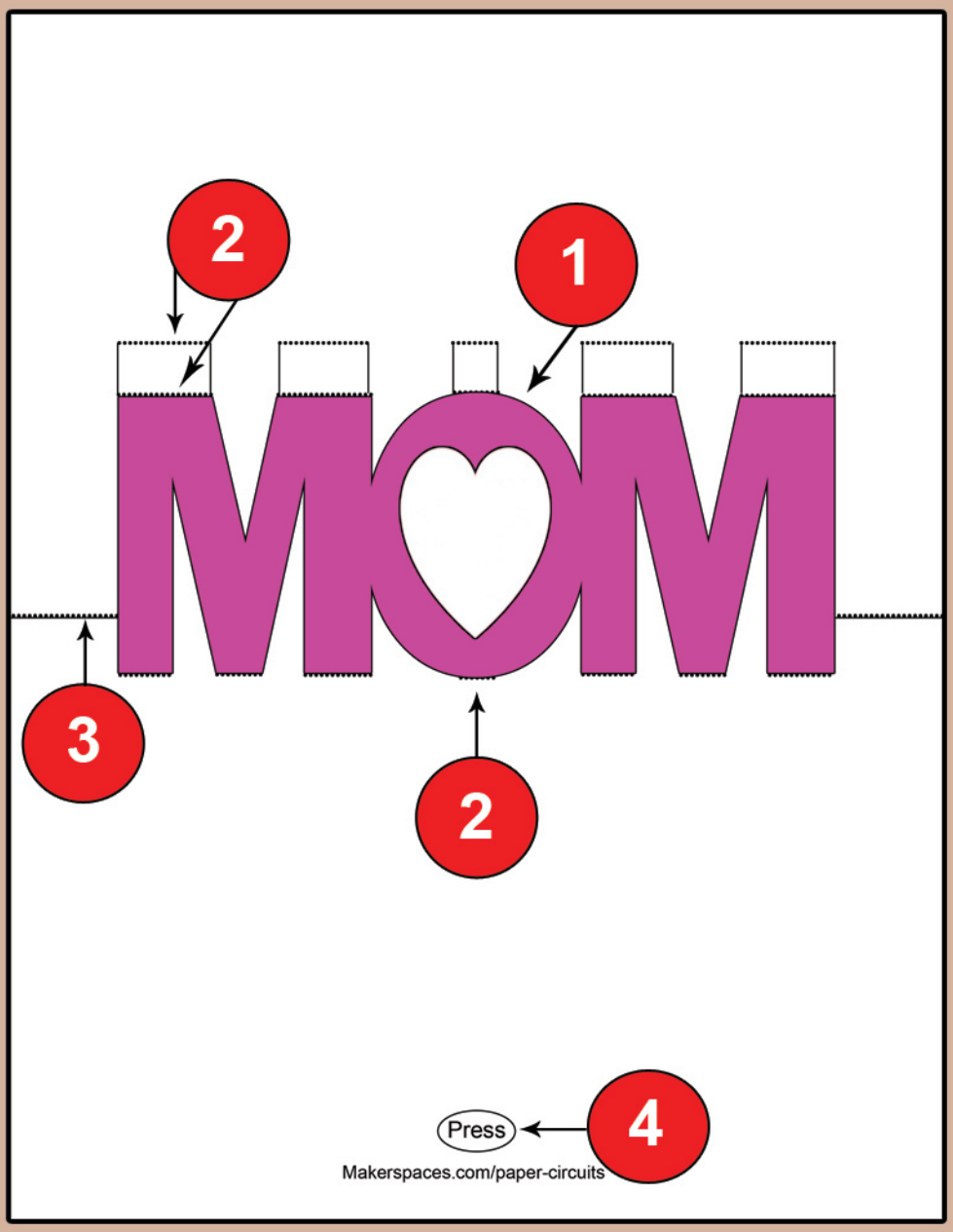


Steps:

1. Cut all of the SOLID lines along the word MOM.
2. Fold all DOTTED lines on top and bottom of popup.
3. Fold DOTTED lines on both sides of the popup. Don't fold the middle.
4. Place overlay directly over the circuit template. The button marked PRESS should line up with the LilyPad switch on template below.

Materials:

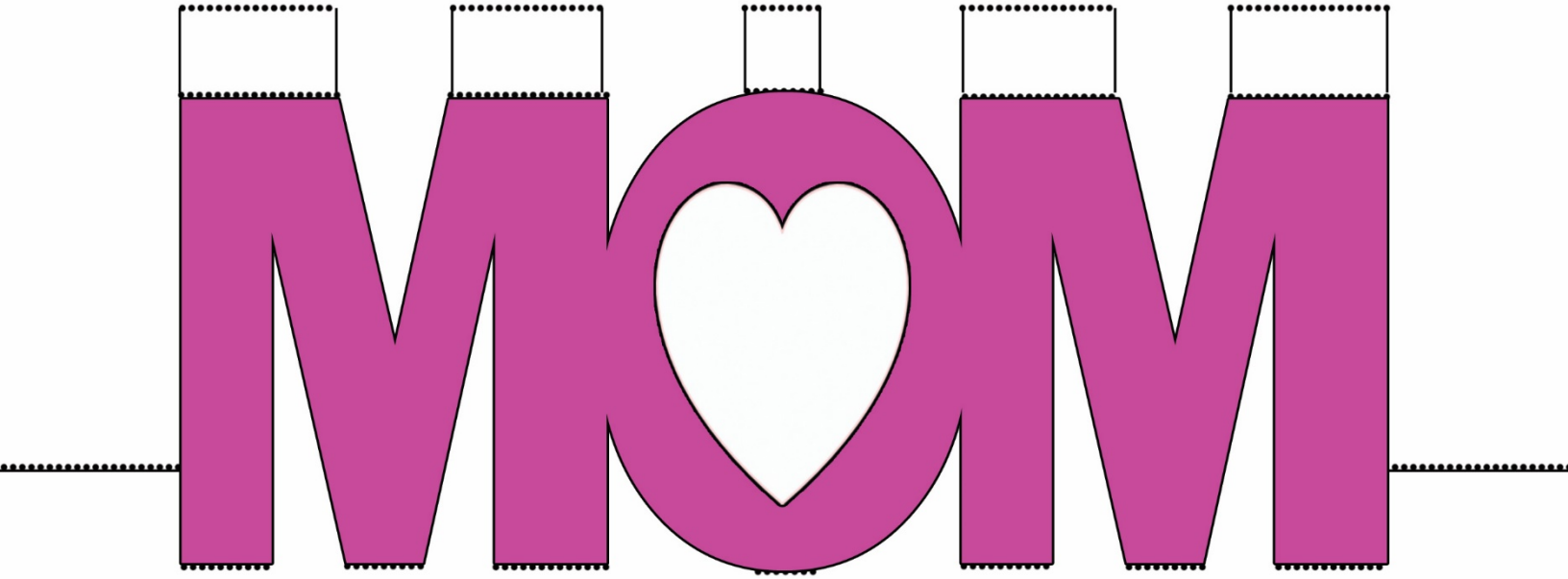
Template

Tools:

Scissors
Scoring Tool
X-Acto Knife

Time Required:

30 minutes



Press

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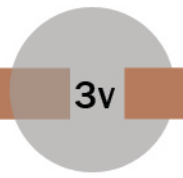
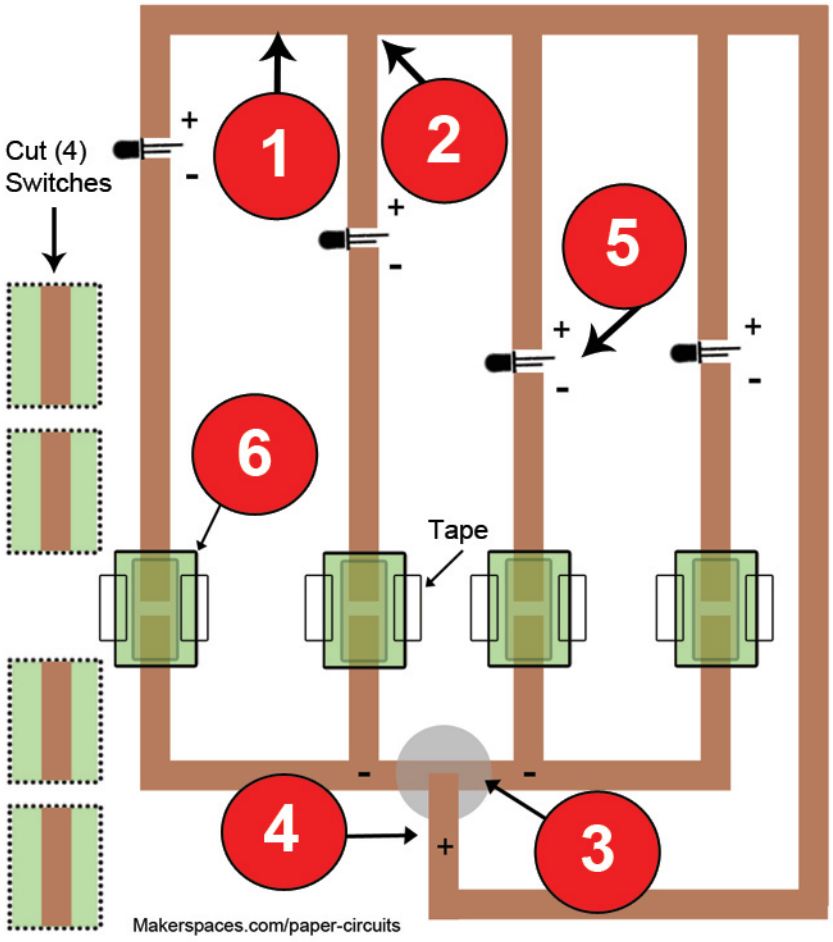
Mount Rushmore



Mt. Rushmore Circuit



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
Circuit Stickers (optional)
Buzzer (optional)
Double-sided foam tape (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

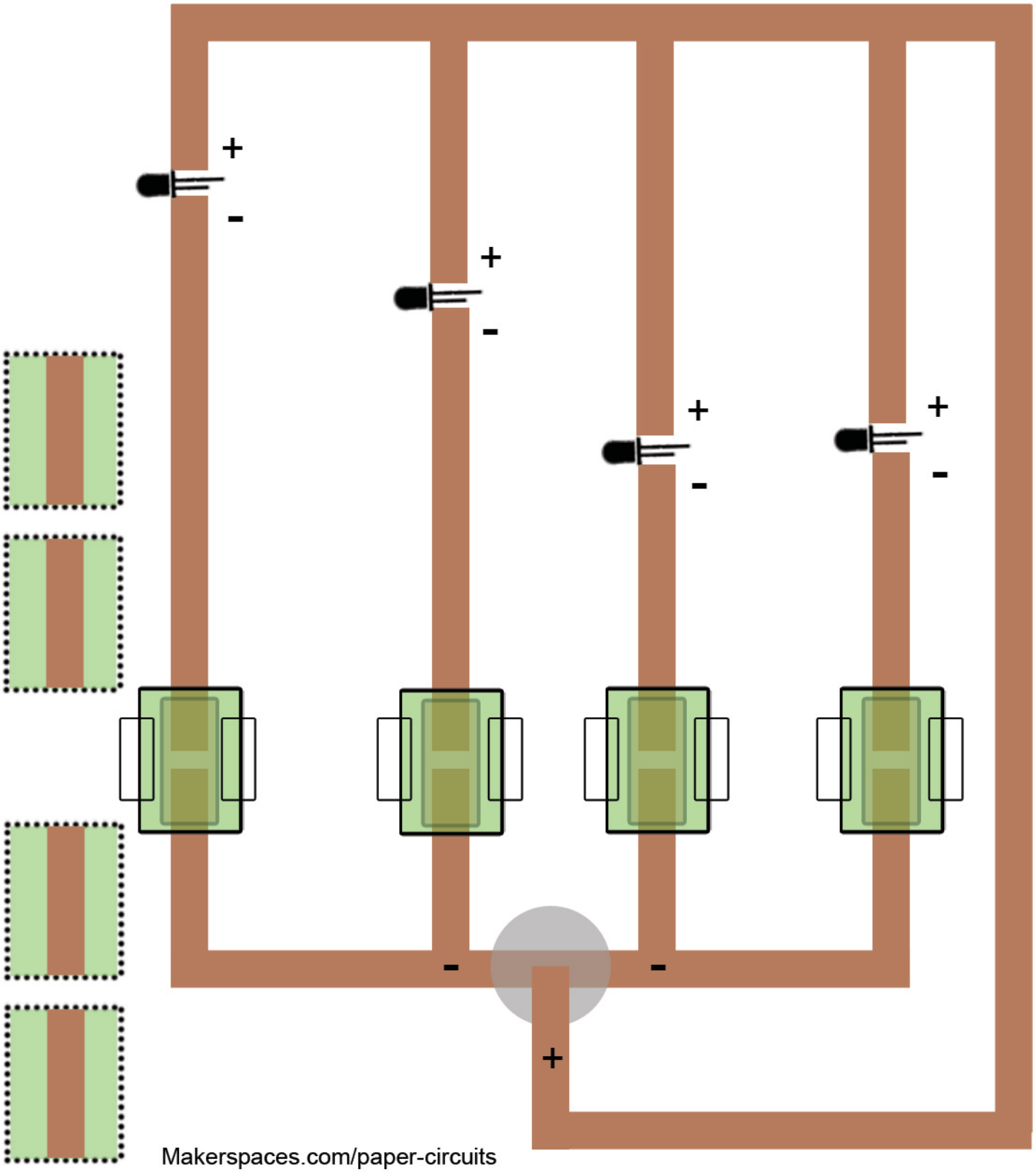
Time Required:

30 minutes

Steps:

1. Apply copper tape to trace line on template. Smooth with finger. Allow gaps for LEDs and switches.
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape w/ negative (-) facing down.
4. Stick the end of the copper tape to the top of the battery (+)
5. Bend legs of LED at a 90’ angle. Use clear tape to secure LED to copper tape. Long leg of LED goes on positive.
6. Cut (4) switches and apply copper to middle. Tape switches w/ copper down. (Optional) -Use double sided foam tape for added elevation.

Mt. Rushmore Circuit



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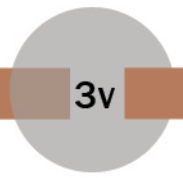
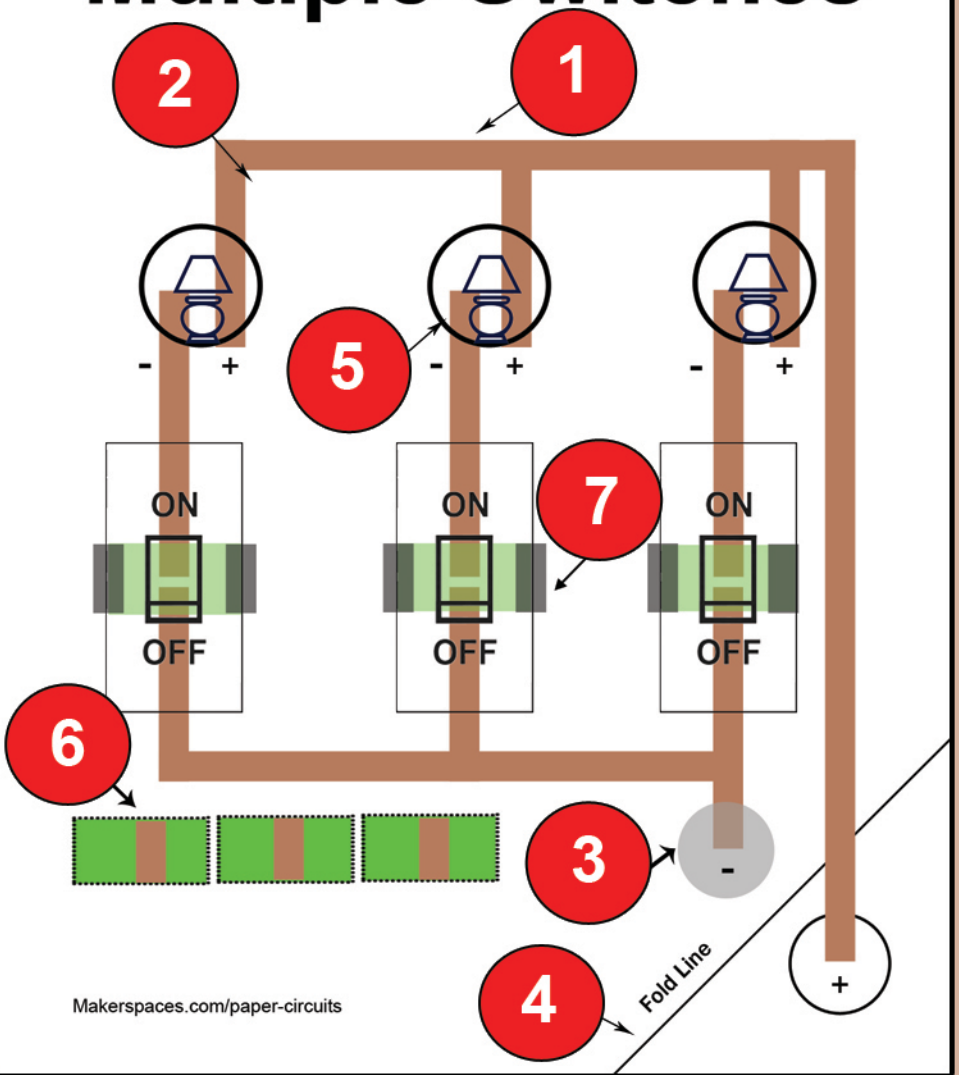
Mount Rushmore

George Washington	Thomas Jefferson	Theodore Roosevelt	Abraham Lincoln

Multiple Switches



Multiple Switches



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
Paperclip / Binder Clip
Buzzer (optional)
Circuit Stickers (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

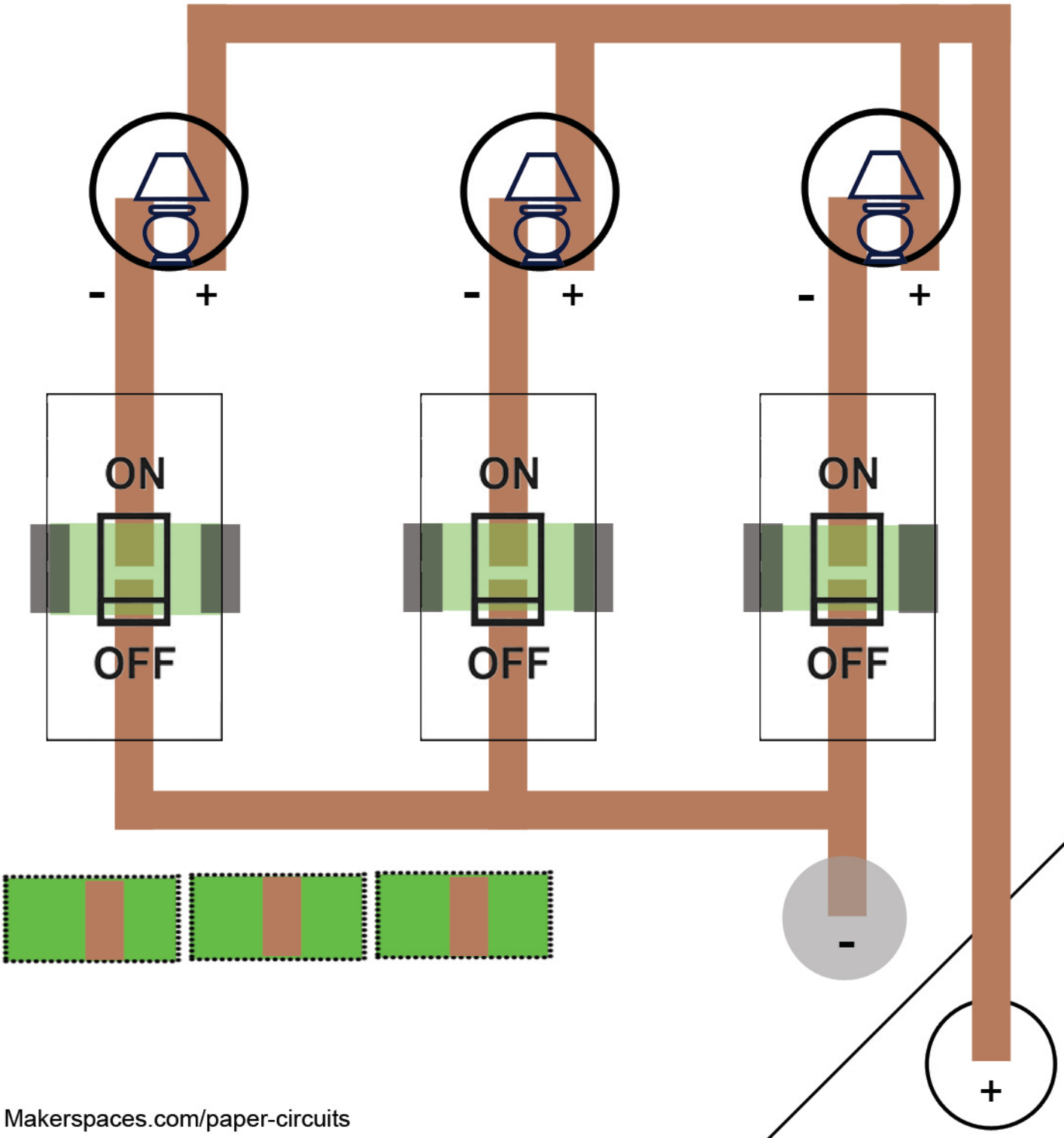
Time Required:

30 minutes

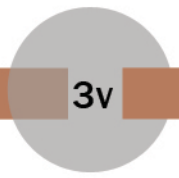
Steps:

1. Apply copper tape to trace line. Smooth with finger. Allow gaps for LED & switch.
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape w/ negative (-) facing down.
4. Fold template along line. Using a scoring tool helps with this process. Use paperclip over battery/fold.
5. LED goes here. Fold legs at a 90’ angle and tape to copper. Long leg goes to (+).
6. Cut out 3 switches and apply copper to center.
7. Tape switches to switch icon. You can also use double-side foam tape for elevation.

Multiple Switches

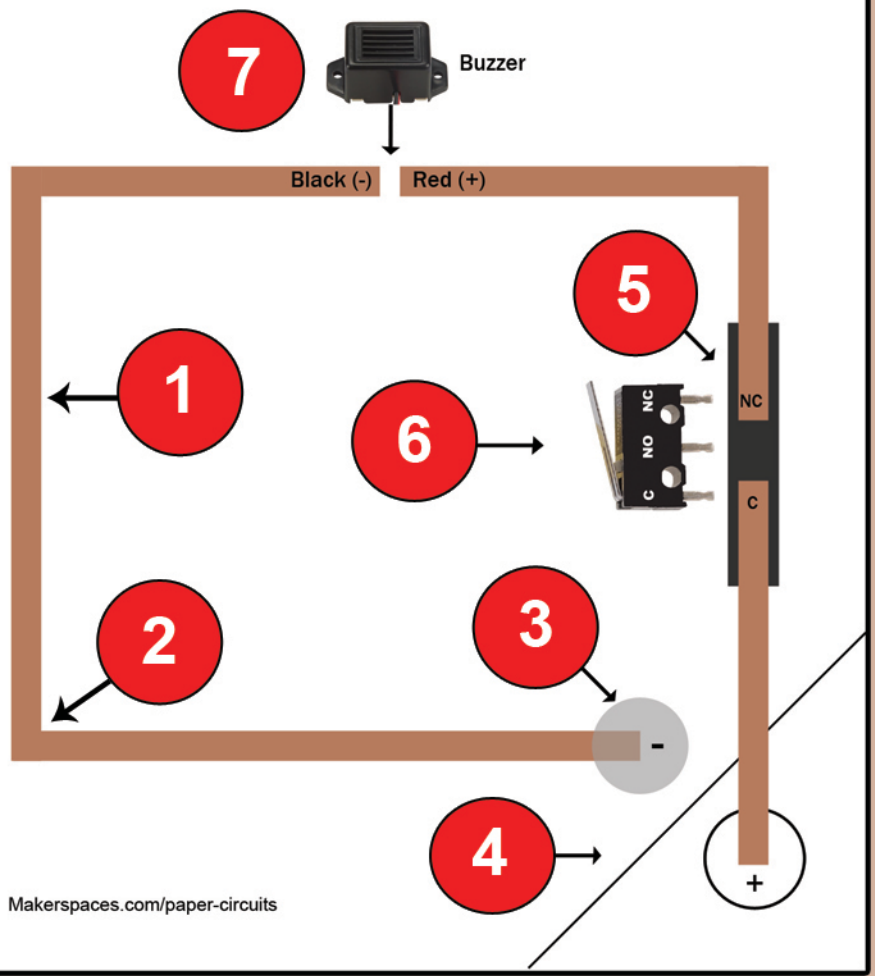


NC Switch



NC Circuit

Normally Closed



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
Limit Switch
Buzzer
Paperclip
Circuit Stickers (optional)
LED - 5mm or 10mm (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

Time Required:

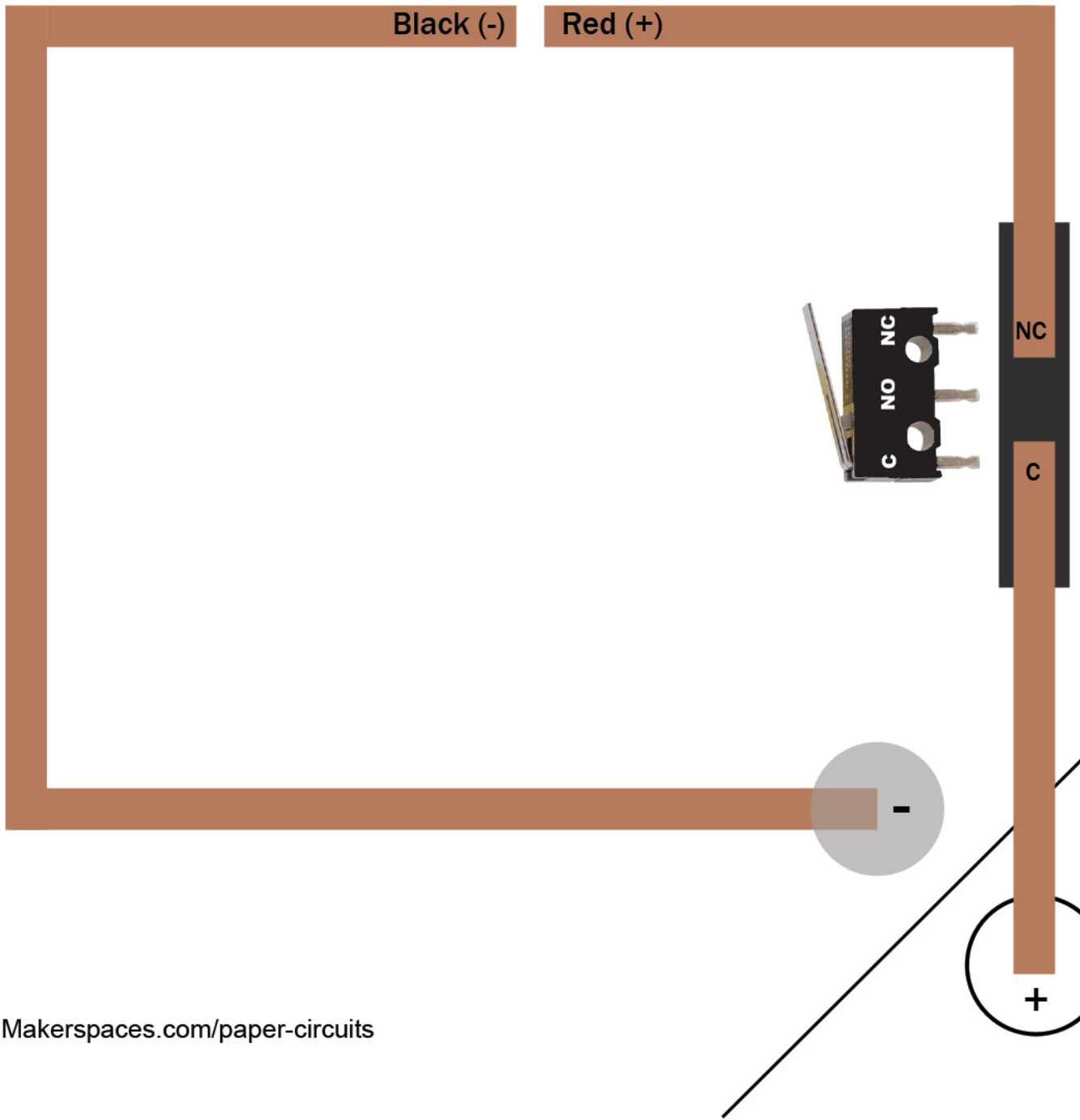
30 minutes

Steps:

1. Apply copper tape to trace line on template. Smooth with finger. Allow a gap for buzzer.
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape with negative (-) facing down.
4. Fold corner of template along the line. Using a scoring tool helps with this process. Use paperclip to secure corner.
5. Copper tape goes over small piece of foam board as shown in black.
6. Push limit switch thru copper into foam board.
7. Secure buzzer to template. Tape red wire to (+) & black to (-)

NC Circuit

Normally Closed



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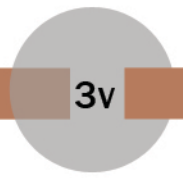
Open To Activate



Greeting Card w/ Sound - Interior Section

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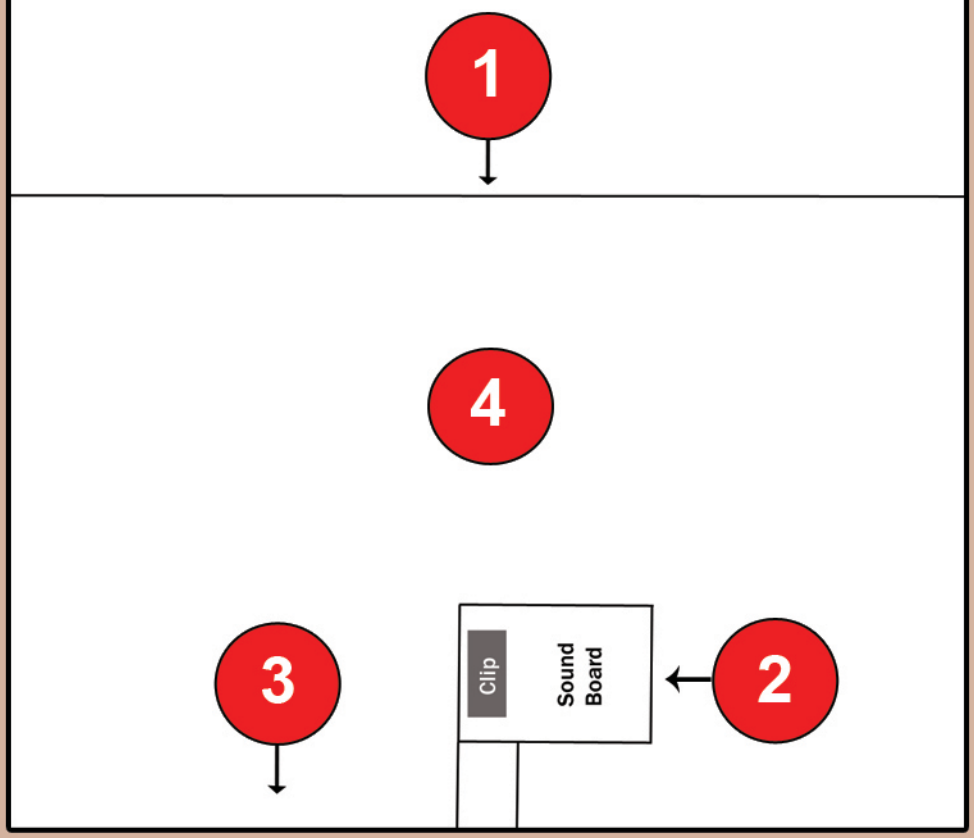

Materials:

Sound Board from Greeting Card

Transparent Tape

Tools:

Scissors
Scoring Tool
X-Acto Knife

Time Required:

30 minutes

Steps:

1. Fold middle of interior section along line.
2. Remove sound board/speaker from a greeting card. Tape it here. Make sure the opening of clip faces edge.
3. Tape edge of interior section to the middle fold of the exterior section.
4. NOTE: All sections need to be printed on thick cardstock paper

Greeting Card w/ Sound - Interior Section

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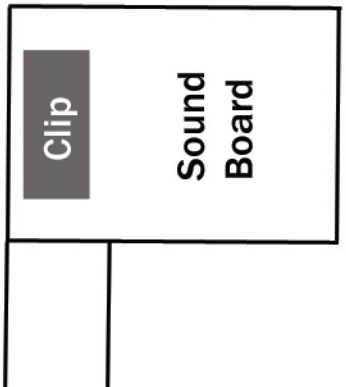

Greeting Card w/ Sound - Exterior Section

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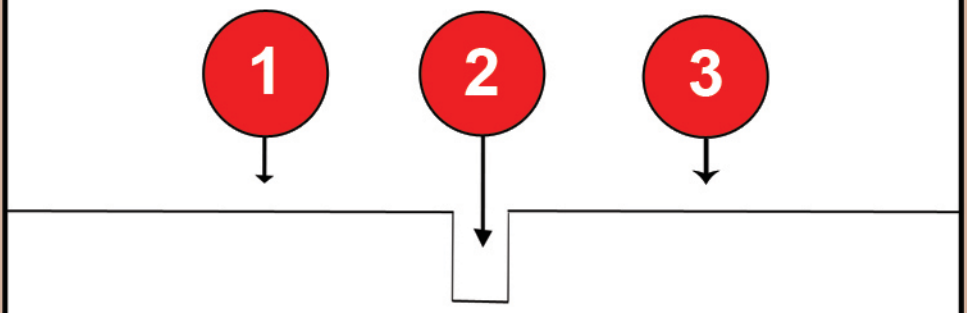

Materials:

Sound Board from Greeting Card

Transparent Tape

Tools:

Scissors
Scoring Tool
X-Acto Knife

Time Required:

30 minutes

Steps:

1. Fold middle of exterior section along line.
2. Tape slider piece to this area. The folded part of the slider goes in the rectangle area.
3. Tape edge of interior section to this line
4. NOTE: All sections need to be printed on thick cardstock paper.

Greeting Card w/ Sound - Exterior Section

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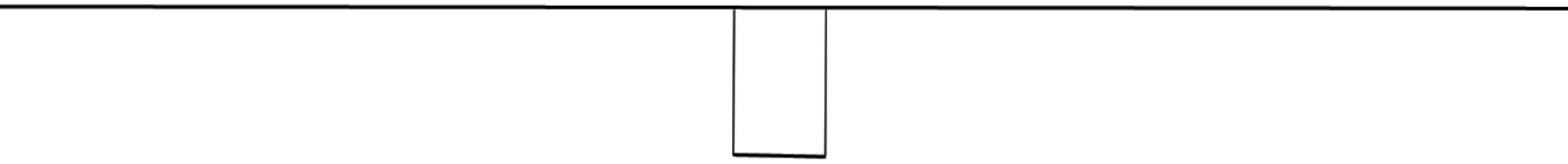

Greeting Card w/ Sound - Slider

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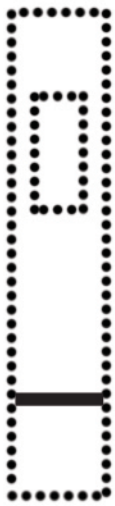
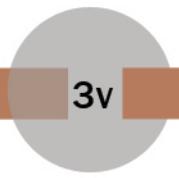
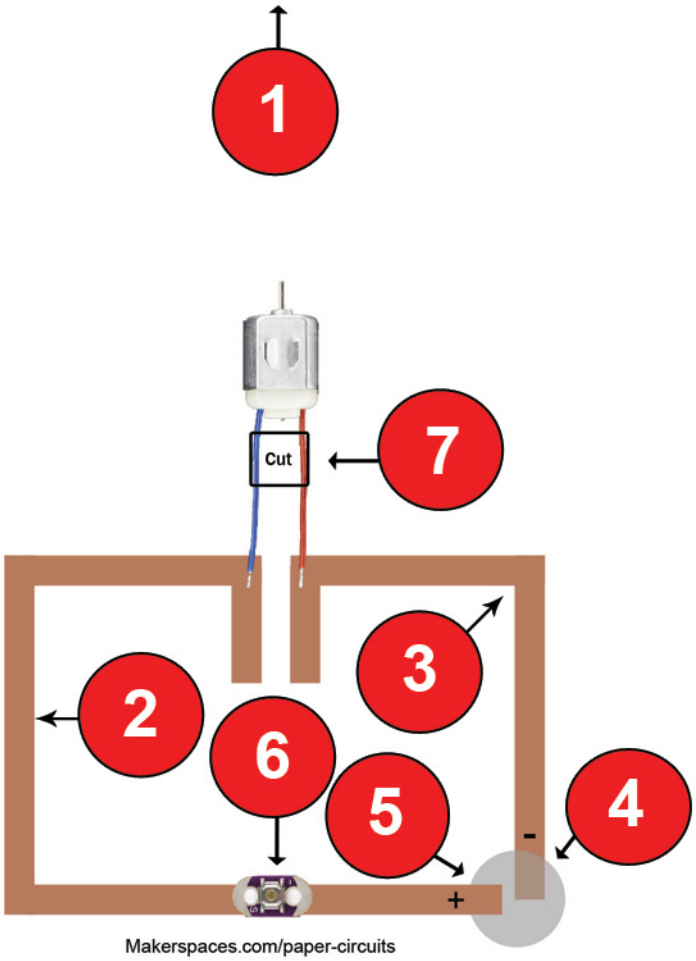


Paper Airplane



Paper Airplane



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
DC Hobby Motor - 130 size
LilyPad Button Switch
Foam Board or Cardboard
Glue Stick

Tools:

Scissors
Scoring Tool
X-Acto Knife

Time Required:

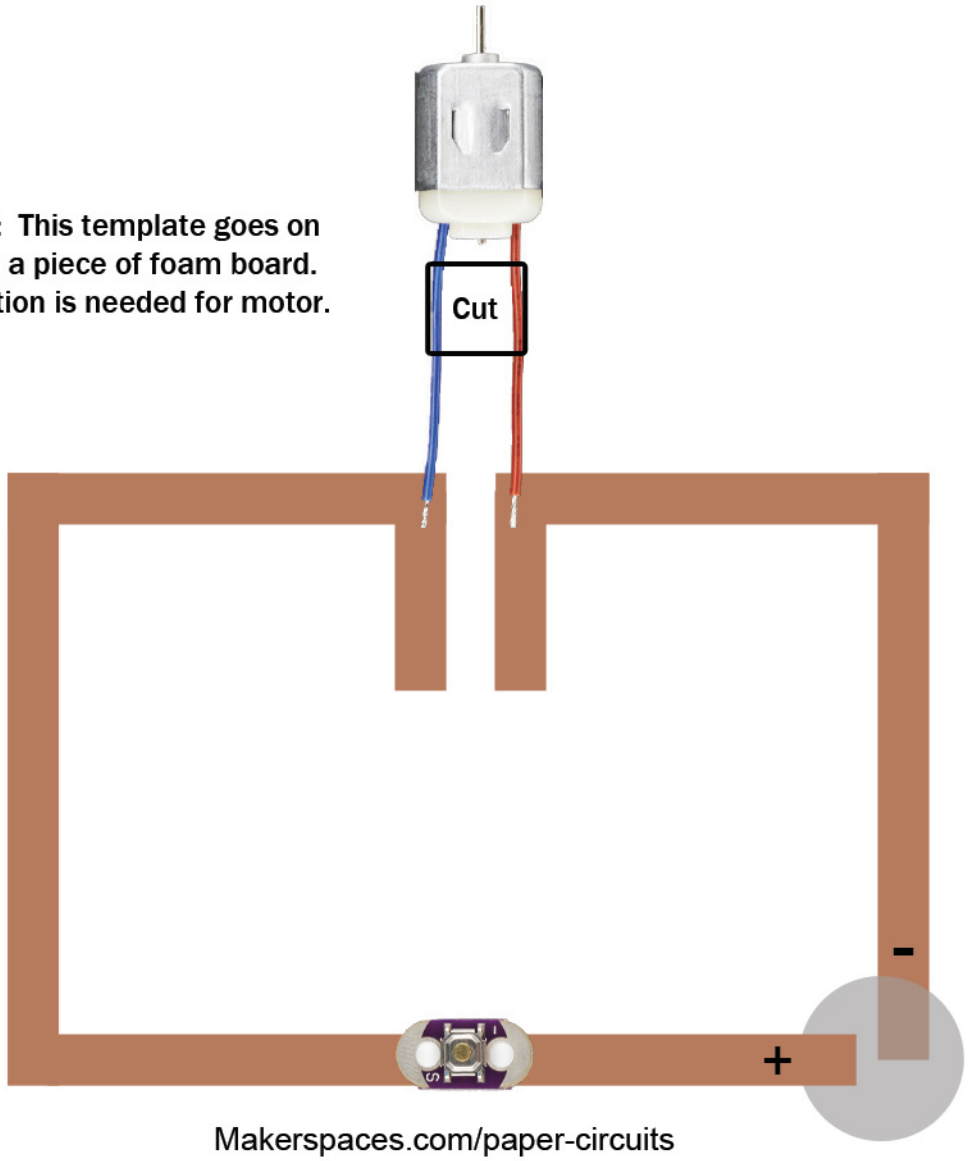
30 minutes

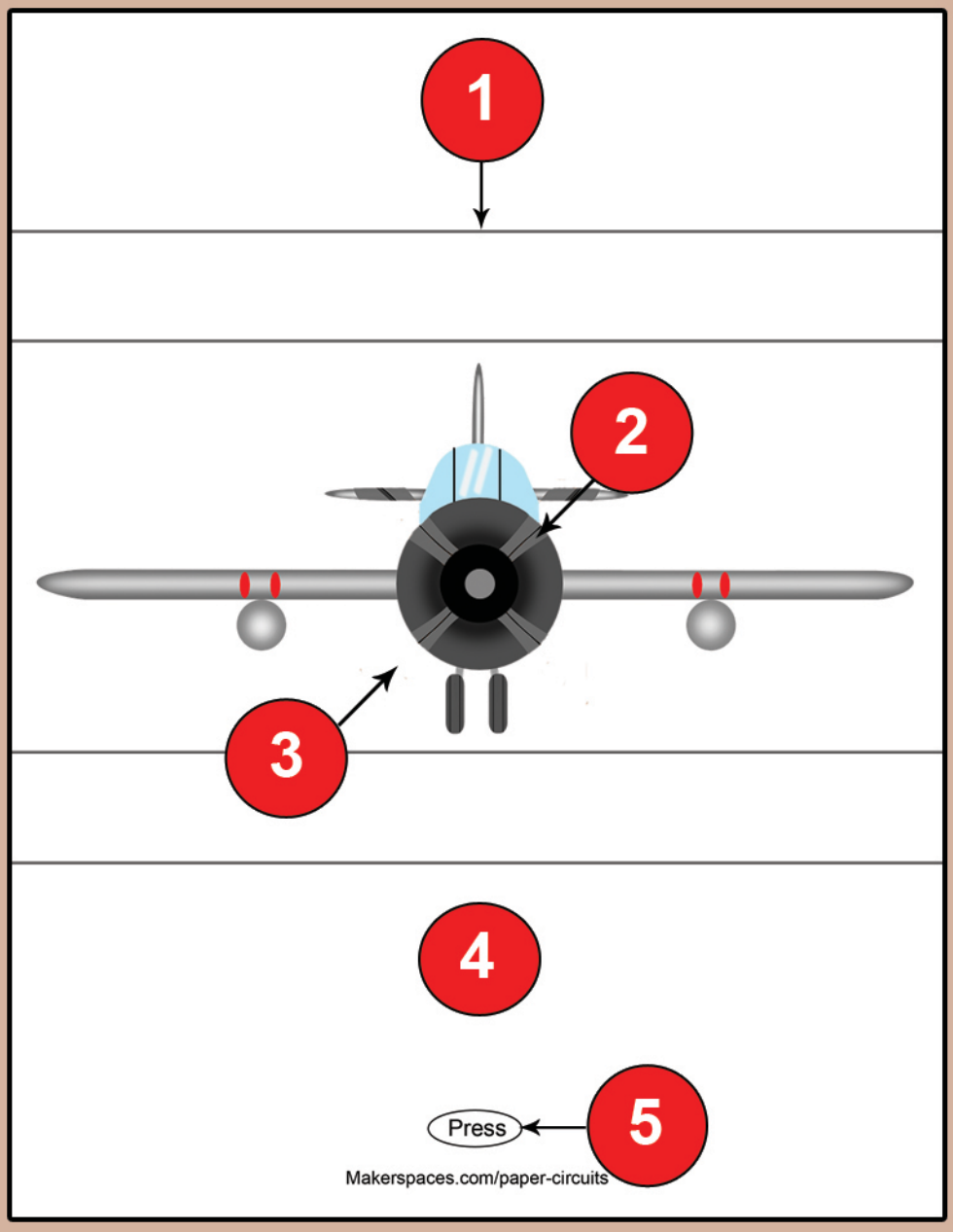
Steps:

1. Glue template on top of foam board or cardboard. Cut along dotted line.
2. Apply copper tape to trace line. Smooth with finger. Allow a gap for LilyPad switch
3. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
4. Place battery on top of copper tape with negative (-) facing down.
5. Stick end of copper tape to the top of battery (+)
6. Mount LilyPad switch using clear tape. Make sure there is a gap in the copper tape below switch.
7. Cut square and mount motor vertically. Strip the ends of wires and tape them to copper foil.

Paper Airplane

NOTE: This template goes on top of a piece of foam board. Elevation is needed for motor.





Materials:

Template

Tools:

Scissors
Scoring Tool
X-Acto Knife

Time Required:

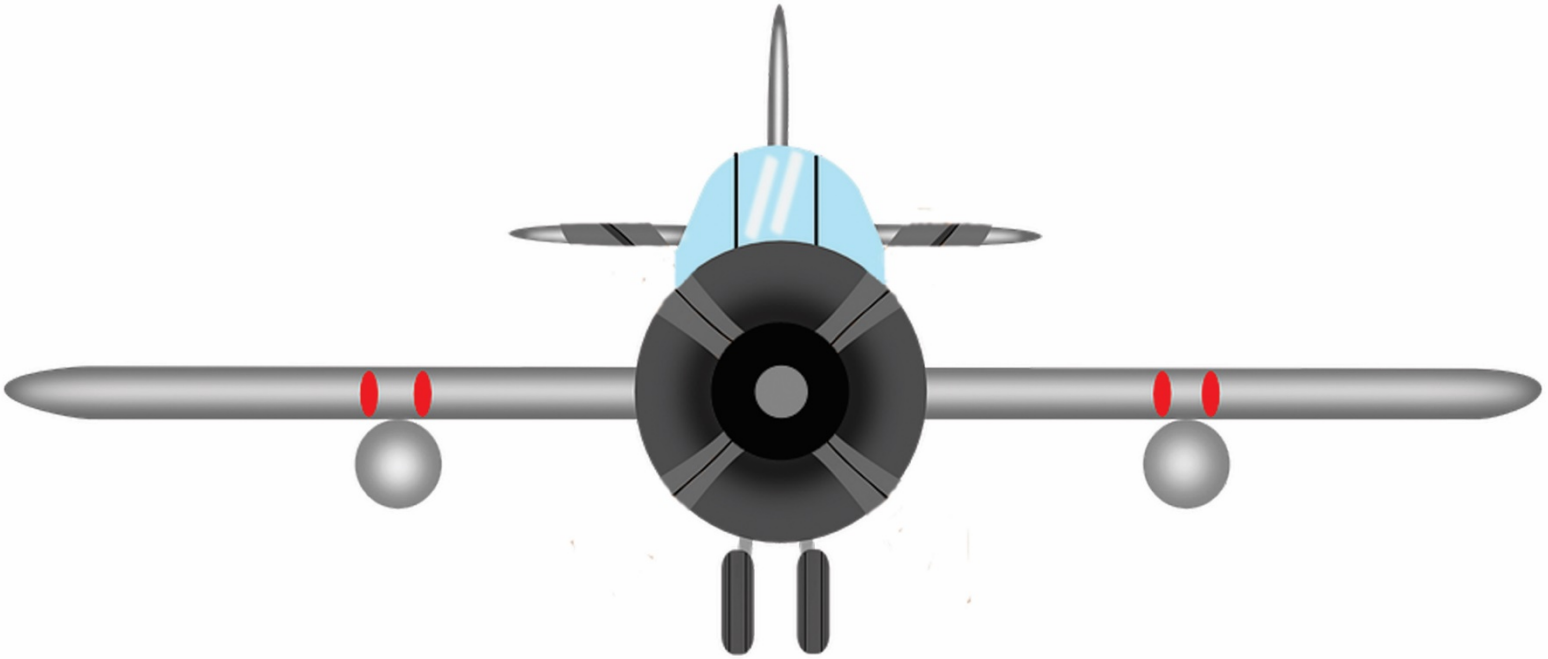
30 minutes

Steps:

1. Fold all (4) of the SOLID lines on template. This will give the plane elevation over the motor.
2. Cut tiny hole at tip of plane for the motor shaft to fit thru.
3. Glue propeller template to a piece of foam board. Cut out propeller with foam board.
4. Place plane overlay directly over the circuit template. Make sure the motor shaft goes thru tip of the plane overlay. Attach the propeller to the shaft with glue or double sided tape.
5. The button marked PRESS should line up with the LilyPad switch on template below

Fold

Fold



Fold

Fold

Press

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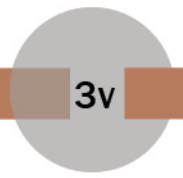
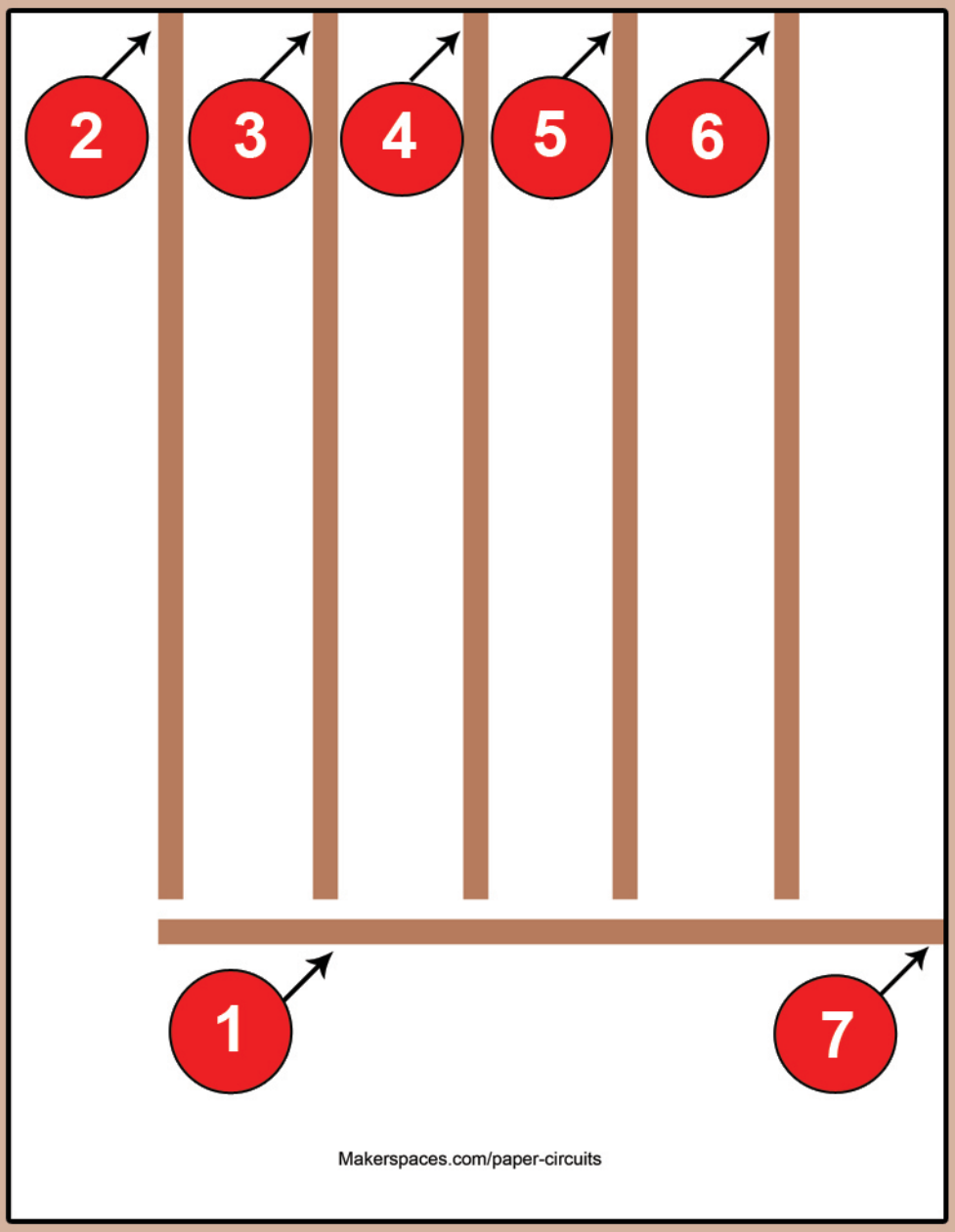
Cut

Paper Piano





Materials:

Copper Tape - 1/4”
Makey Makey Board
Alligator Clips

Tools:

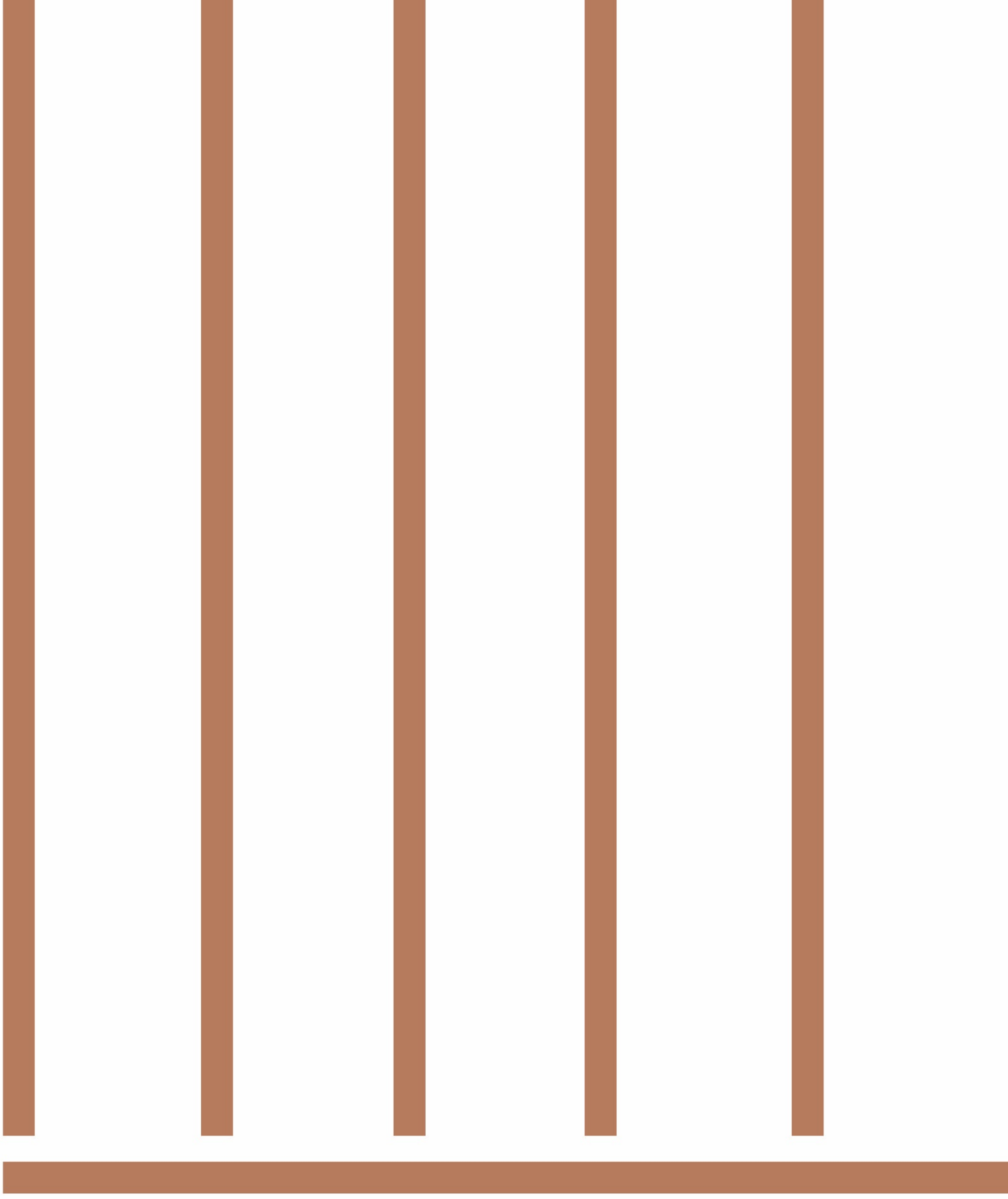
Scissors
Scoring Tool
X-Acto Knife

Time Required:

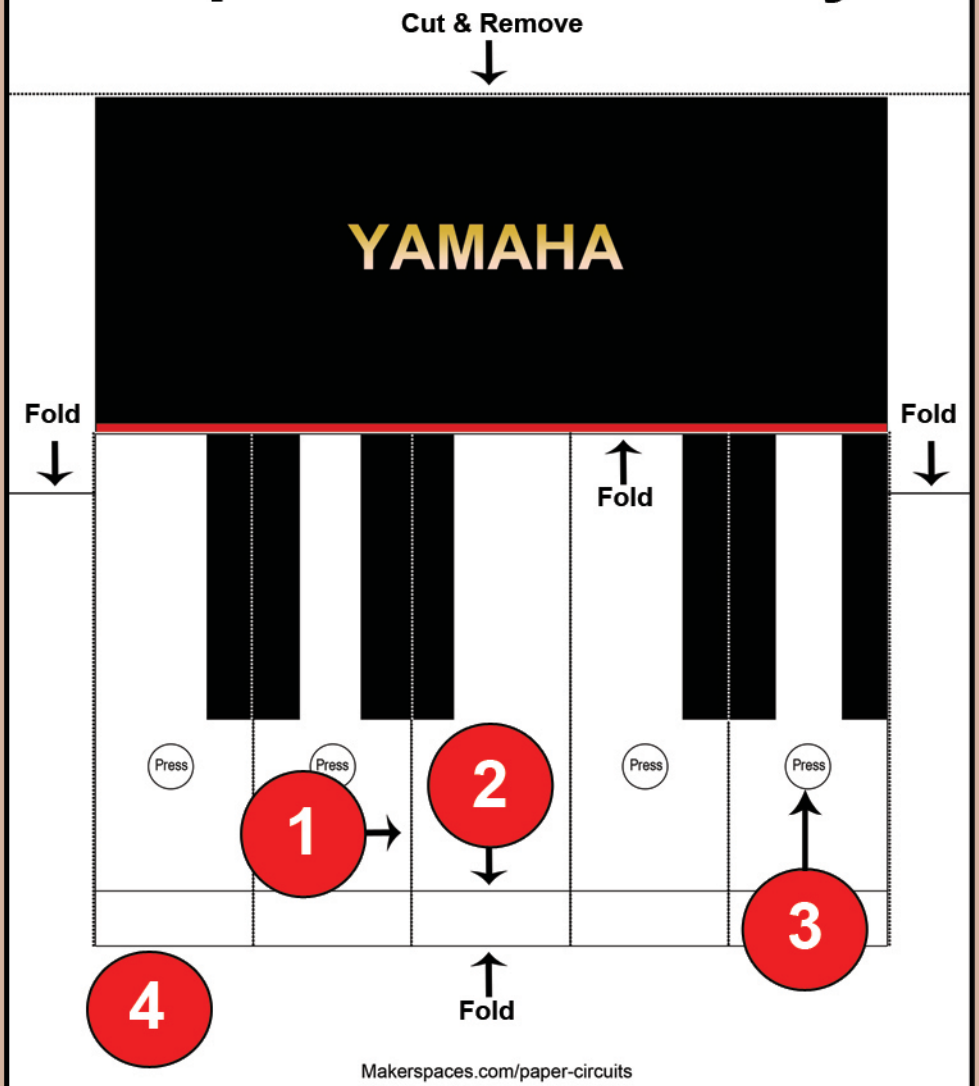
30 minutes

Steps:

1. Apply copper tape to (6) trace lines on template. Smooth with finger.
2. Attach alligator clip to copper tape. Other end of alligator goes to LEFT ARROW on Makey Makey.
3. Attach alligator clip to copper tape. Other end of alligator goes to UP ARROW on Makey Makey.
4. Attach alligator clip to copper tape. Other end of alligator goes to RIGHT ARROW on Makey Makey.
5. Attach alligator clip to copper tape. Other end of alligator goes to DOWN ARROW on Makey Makey.
6. Attach alligator clip to copper tape. Other end of alligator goes to SPACE BAR on Makey Makey.
7. Attach alligator clip to copper tape. Other end of alligator goes to EARTH on Makey Makey.



Paper Piano Overlay



Steps:

1. Cut all DOTTED lines on template.
2. Fold all SOLID lines on template.
3. Apply copper tape to underside of template where it says PRESS. Do this for all keys.
4. Place overlay directly over the circuit template. The circles marked PRESS should line up with the gaps in the copper below. When you press the key the copper located on underside of key will complete circuit.

Materials:

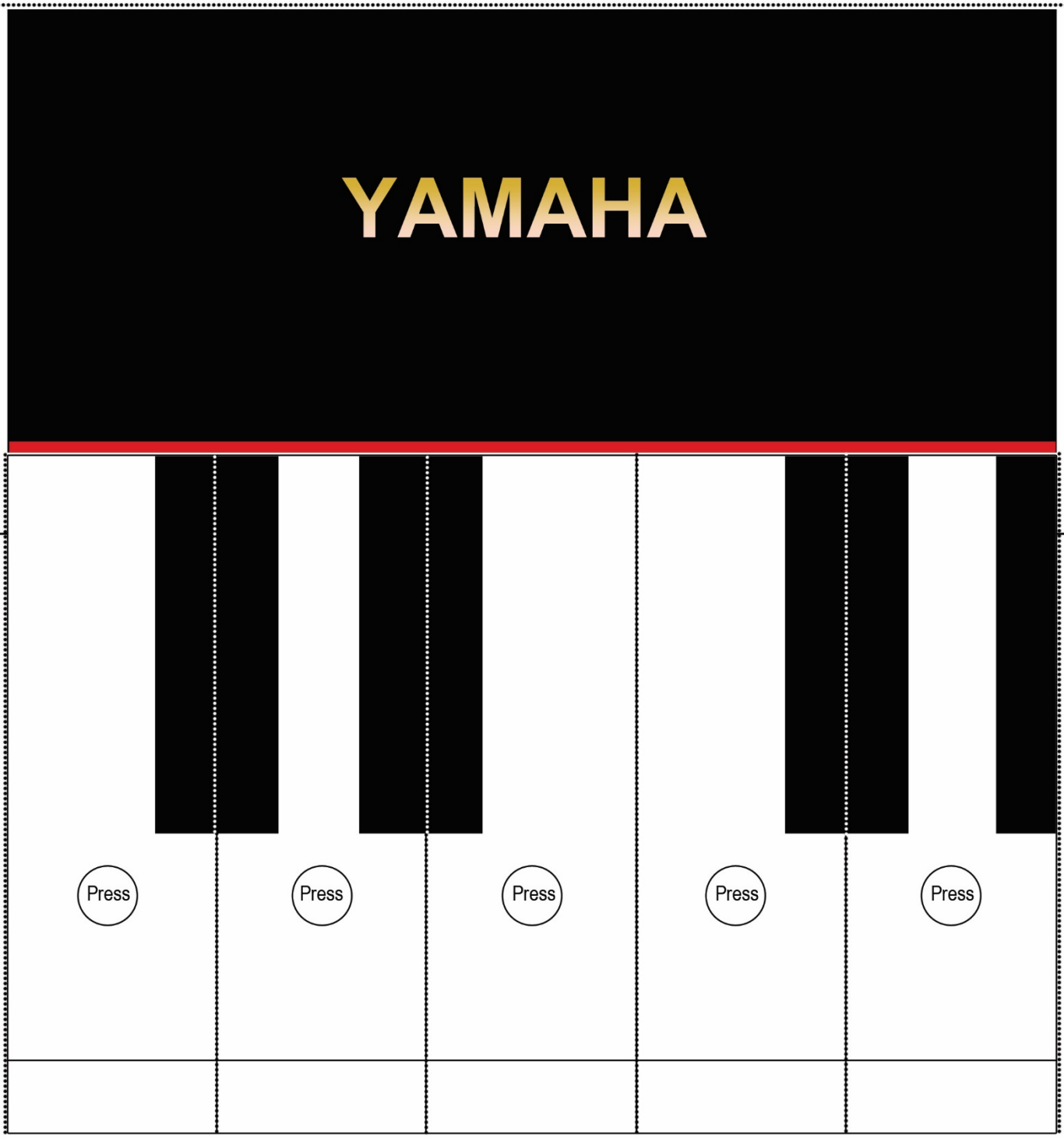
Template
Copper Tape - 1/4”

Tools:

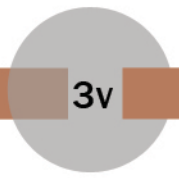
Scissors
Scoring Tool
X-Acto Knife

Time Required:

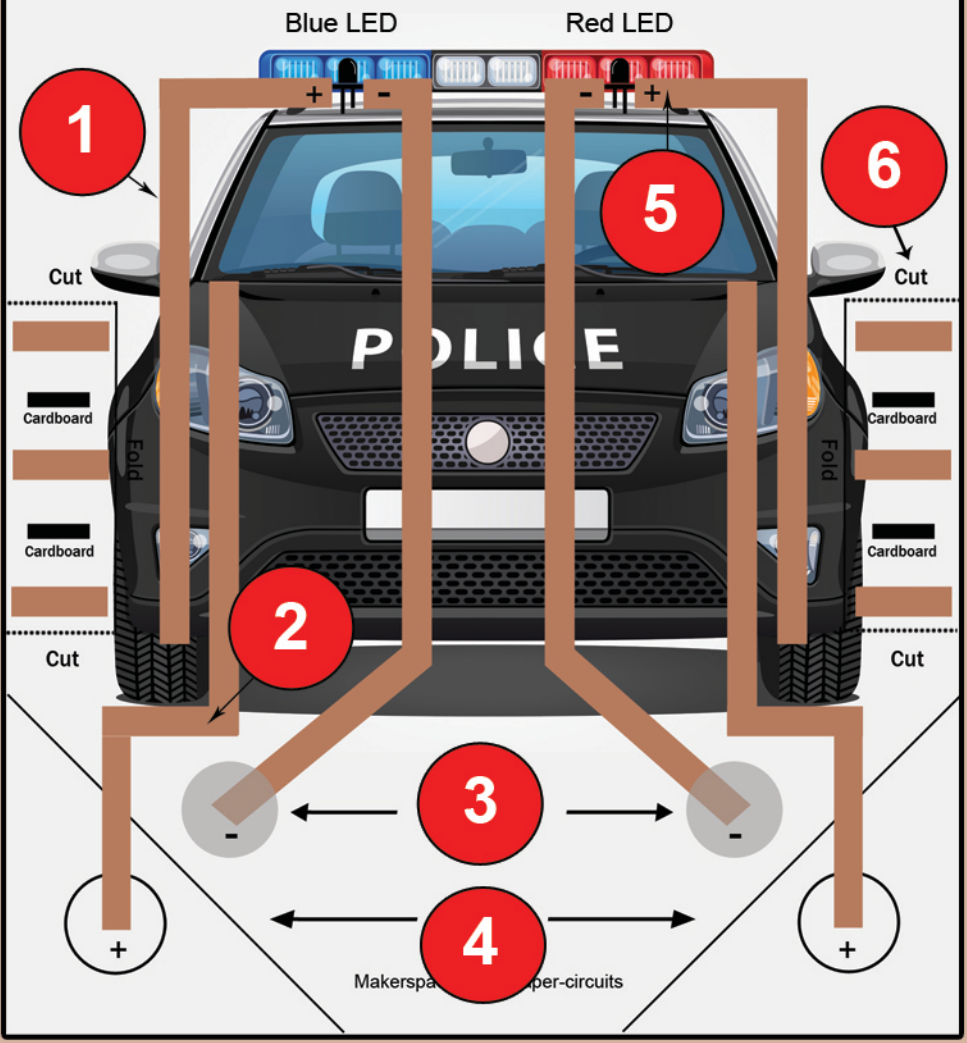
30 minutes


YAMAHA
Press
Press
Press
Press
Press

Police Lights



Flashing Police Lights



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
Paperclip / Binder Clip
Cardboard
Circuit Stickers (optional)
Buzzer (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

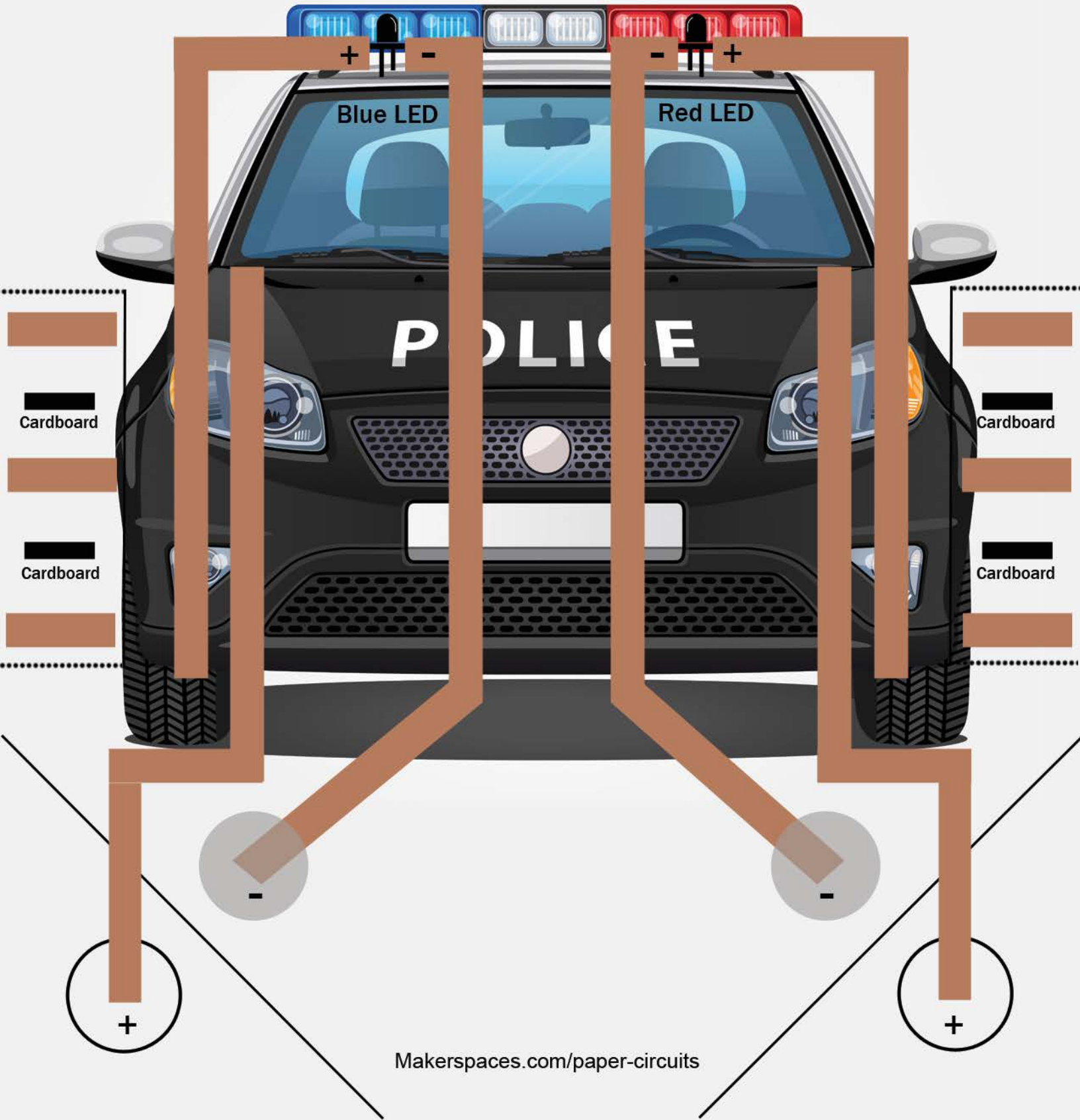
Time Required:

30 minutes

Steps:

1. Apply copper tape to trace line on template. Smooth with finger. Allow gaps for LED and switch.
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape w/ negative (-) facing down.
4. Fold template along line. Using a scoring tool helps with this process. Use paperclip over battery/fold.
5. Bend legs of LED at a 90’ angle. Use clear tape to secure LED to copper tape. Long leg of LED goes on positive.
6. Cut switch on dotted lines and fold on solid line. Tape cardboard for elevation between copper. Slide finger up & down along switch

Flashing Police Lights



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Pull Switch

-

3v

+

Pull Switch

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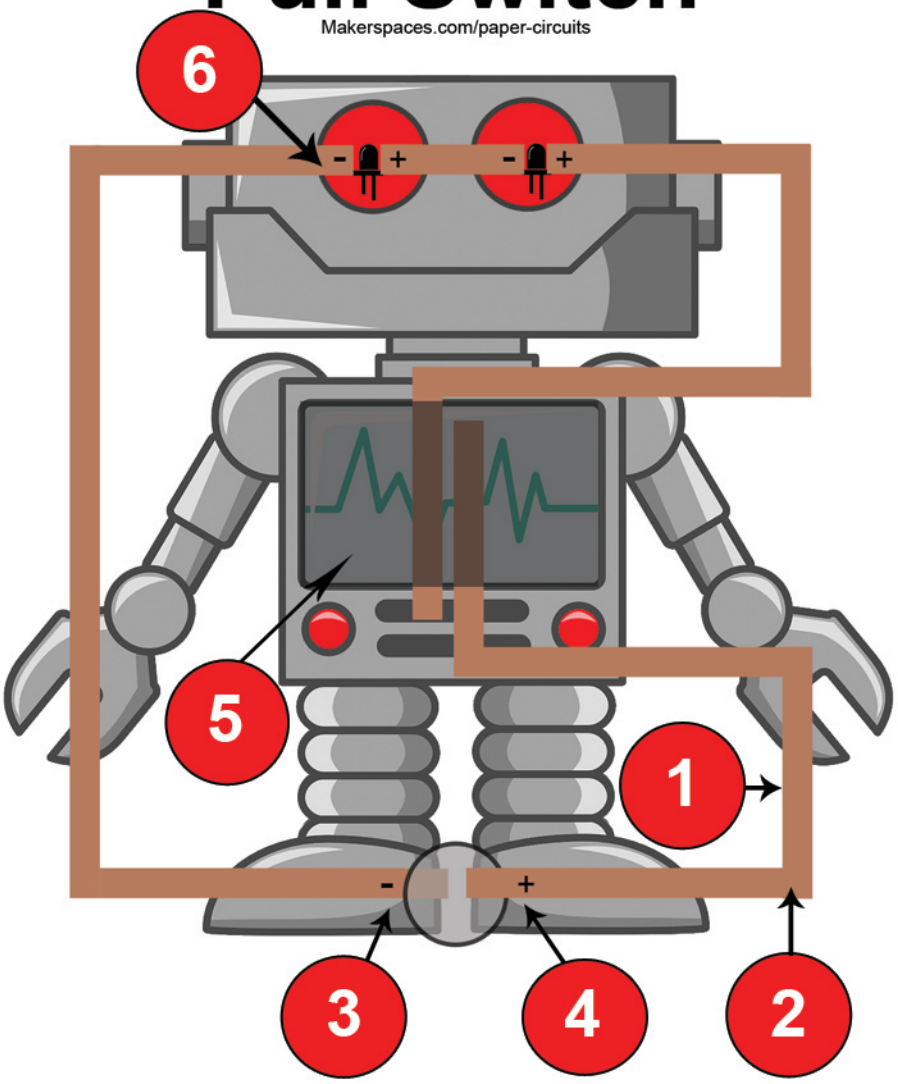

Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
Circuit Stickers (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

Time Required:

30 minutes

Steps:

1. Apply copper tape to trace line on template. Smooth with finger. Allow gaps for LEDs
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place (2) batteries on top of copper tape with negative (-) facing down.
4. Stick the end of the copper tape to the top of the battery (+)
5. Cut out switch on other template and tape the switch holder here. Do not tape far right side as this is where the switch slides in.
6. Bend legs of LEDs at a 90’ angle. Use clear tape to secure LEDs to copper tape. Long leg of LED goes on positive.

   Circuit sticker LEDs may also be used.

Pull Switch

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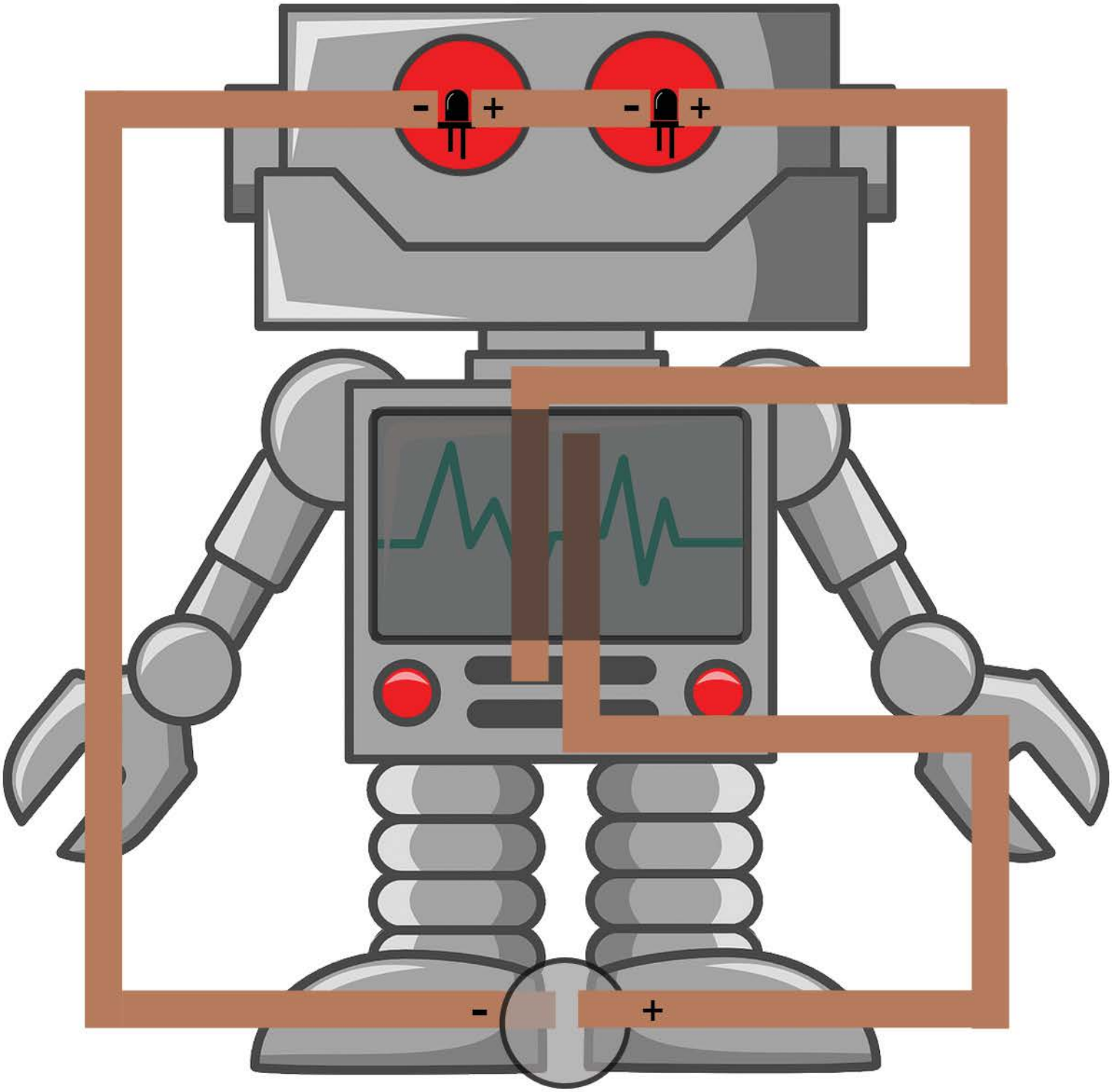
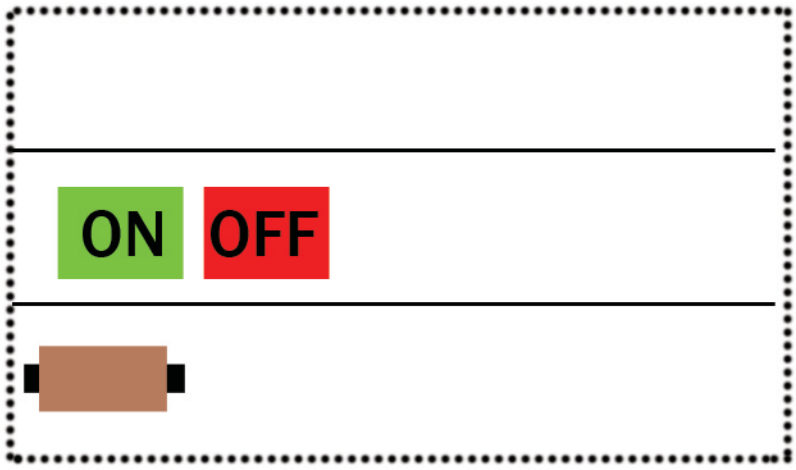
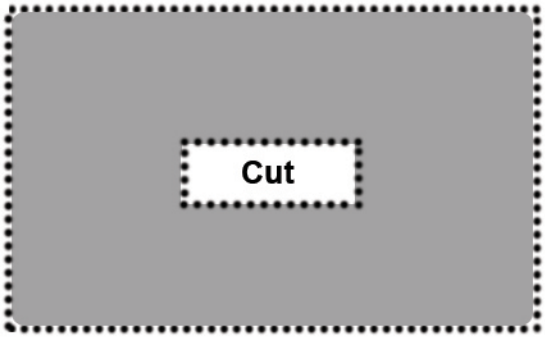


Pull Switch Parts





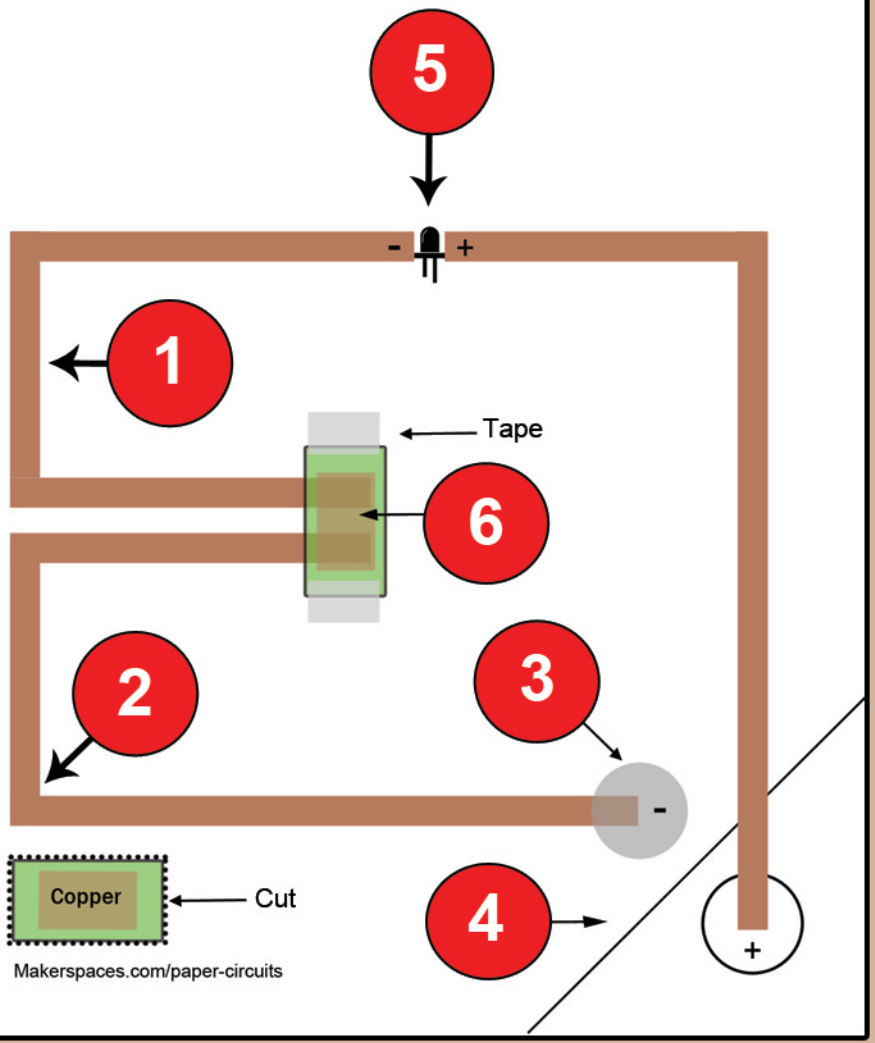
Push Switch

-

3v

+

Push Switch



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
Paperclip / Binder Clip
Circuit Stickers (optional)
Buzzer (optional)
Double-sided foam tape (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

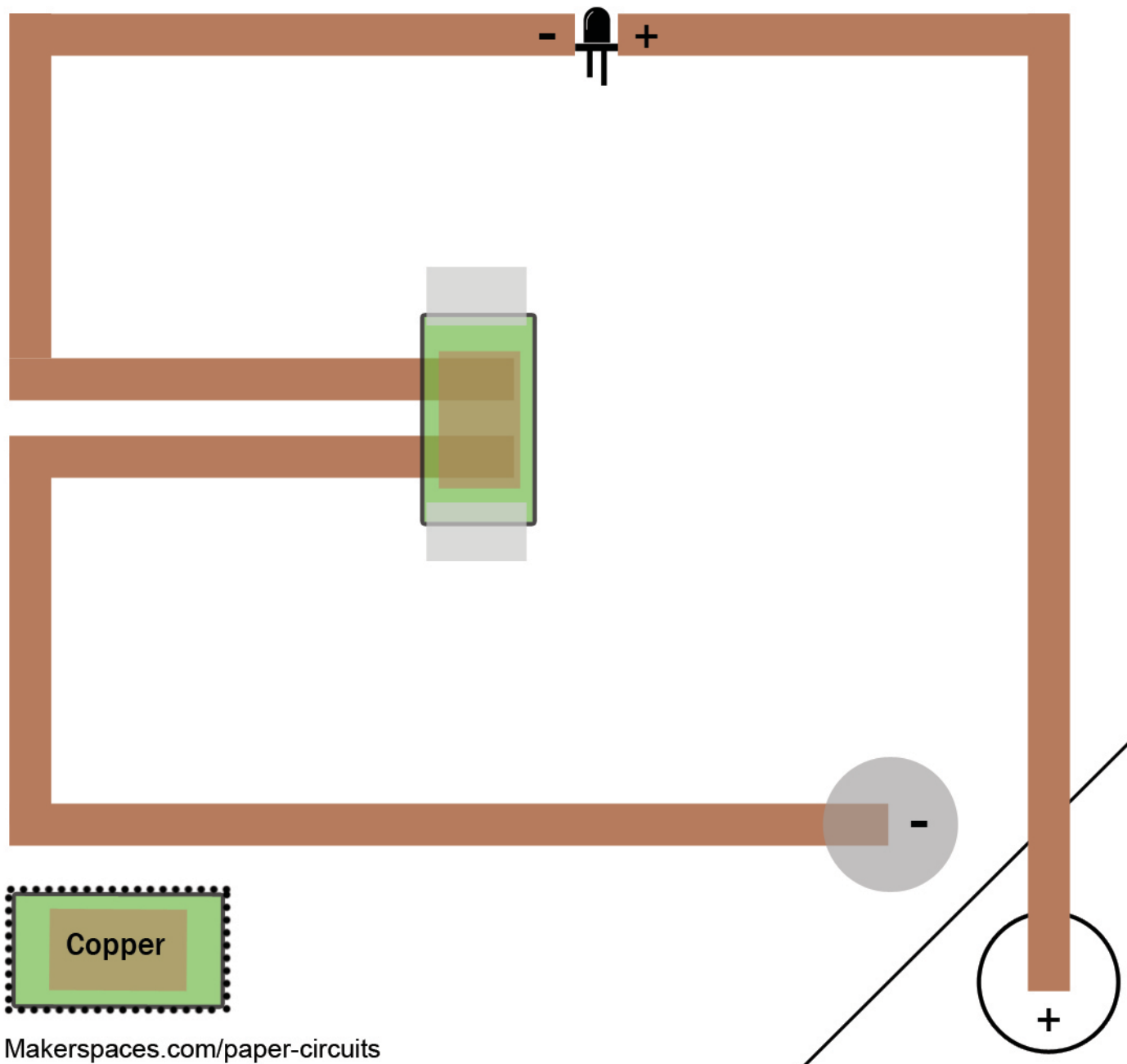
Time Required:

30 minutes

Steps:

1. Apply copper tape to trace line on template. Smooth with finger. Allow gap for LED.
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape w/ negative (-) facing down.
4. Fold corner of template along the line. Using a scoring tool helps with this process. Use paperclip to secure corner.
5. Bend legs of LED at a 90’ angle. Use clear tape to secure LED to copper tape. Long leg of LED goes on positive.
6. Tape switch w/ copper down. (Optional) -Use double sided foam tape for added elevation.

Push Switch



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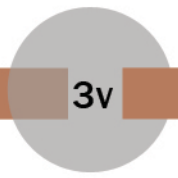
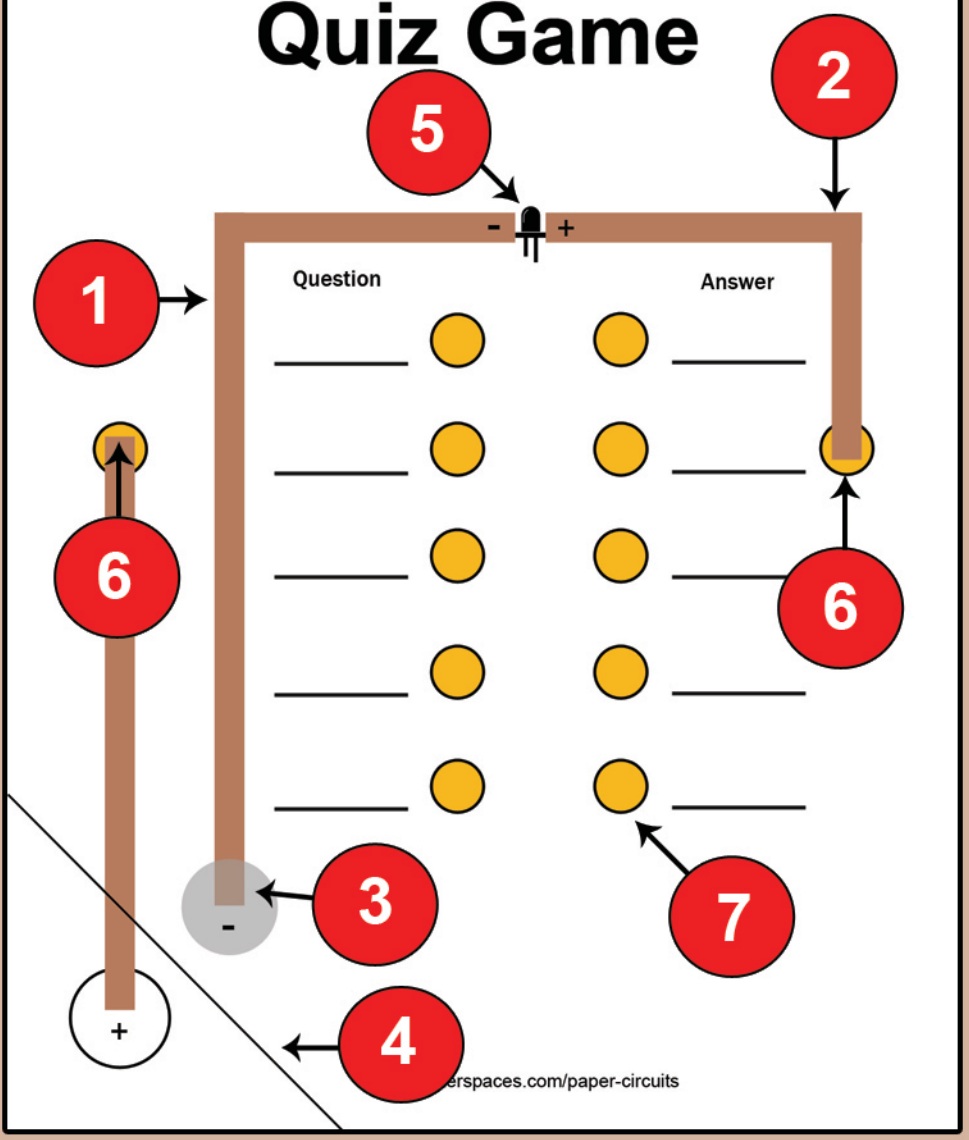
Quiz Game



Quiz Game



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
Paperclip / Binder Clip
Brass Brad
Alligator Clips/Leads
Circuit Stickers (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

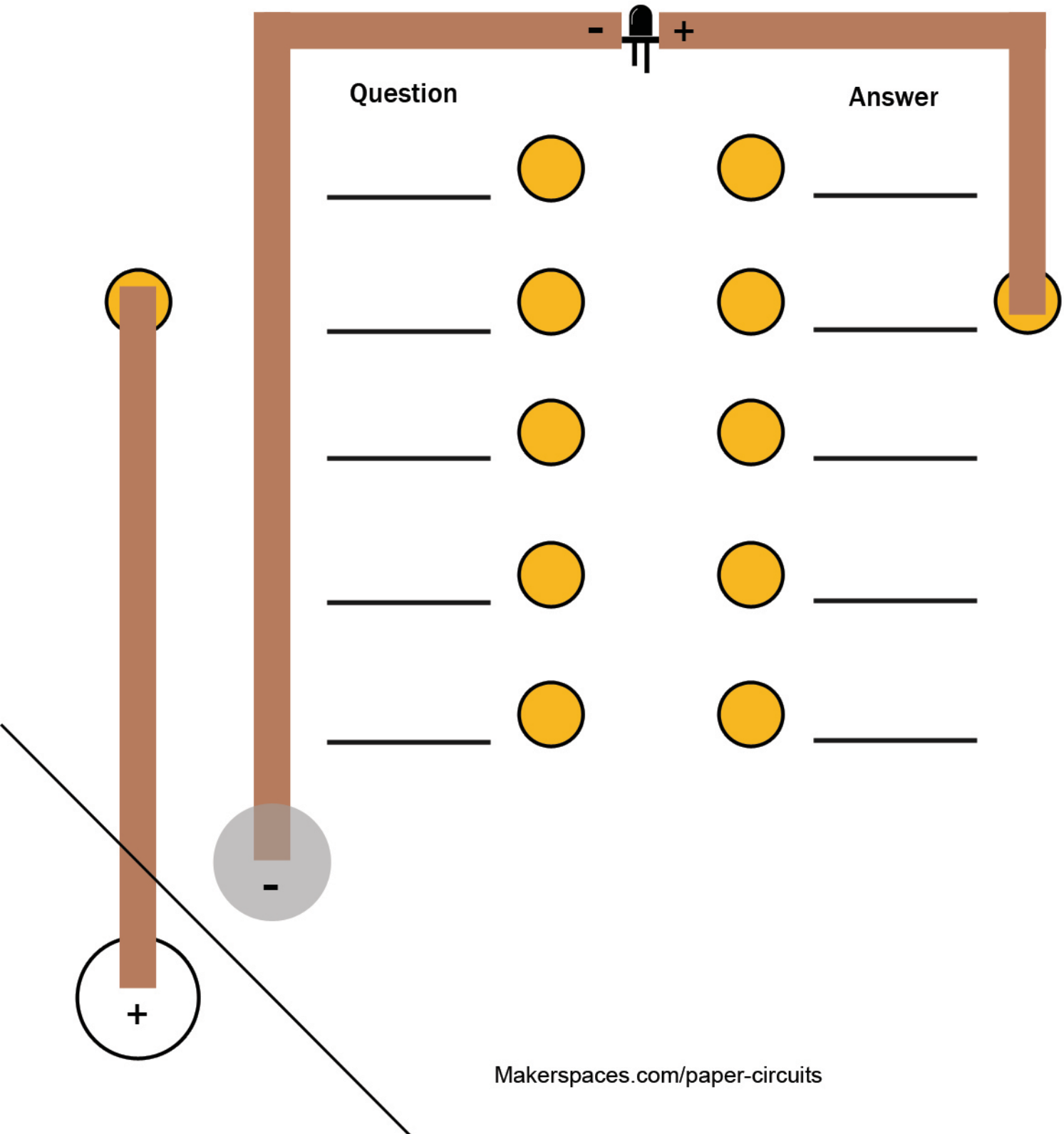
Time Required:

30 minutes

Steps:

1. Apply copper tape to trace line on template. Smooth with finger. Allow a gap for LED.
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape with negative (-) facing down.
4. Fold corner of template along the line. Using a scoring tool helps with this process. Use paperclip to secure corner.
5. Bend legs of LED at a 90’ angle. Use clear tape to secure LED to copper tape. Long leg of LED goes on positive.
6. Push brad thru template & copper from the backside. Attach alligator clip to legs of the brad.
7. Push brads from front to back. Connect question to correct answer on back w/ copper. Put clear tape over each path so they don’t touch.

Quiz Game



Reed Switch

-

3v

+

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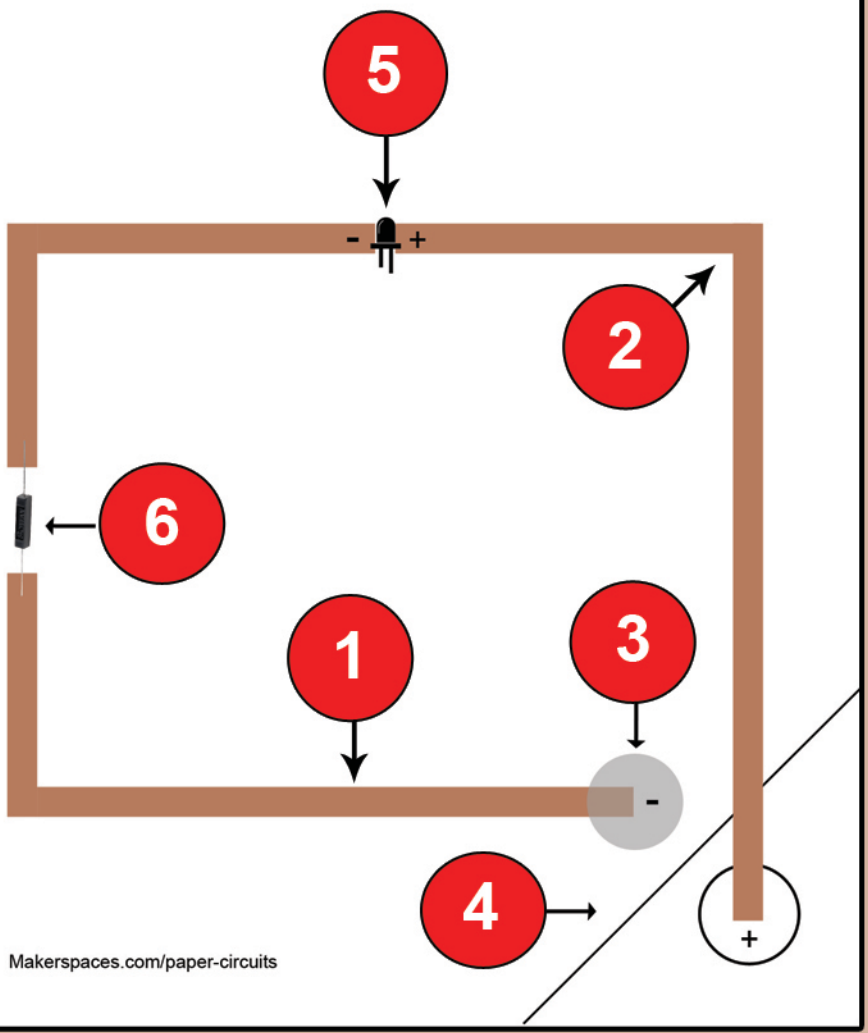
Reed Switch



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
Paperclip / Binder Clip
Reed Switch
Circuit Stickers (optional)
Buzzer (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

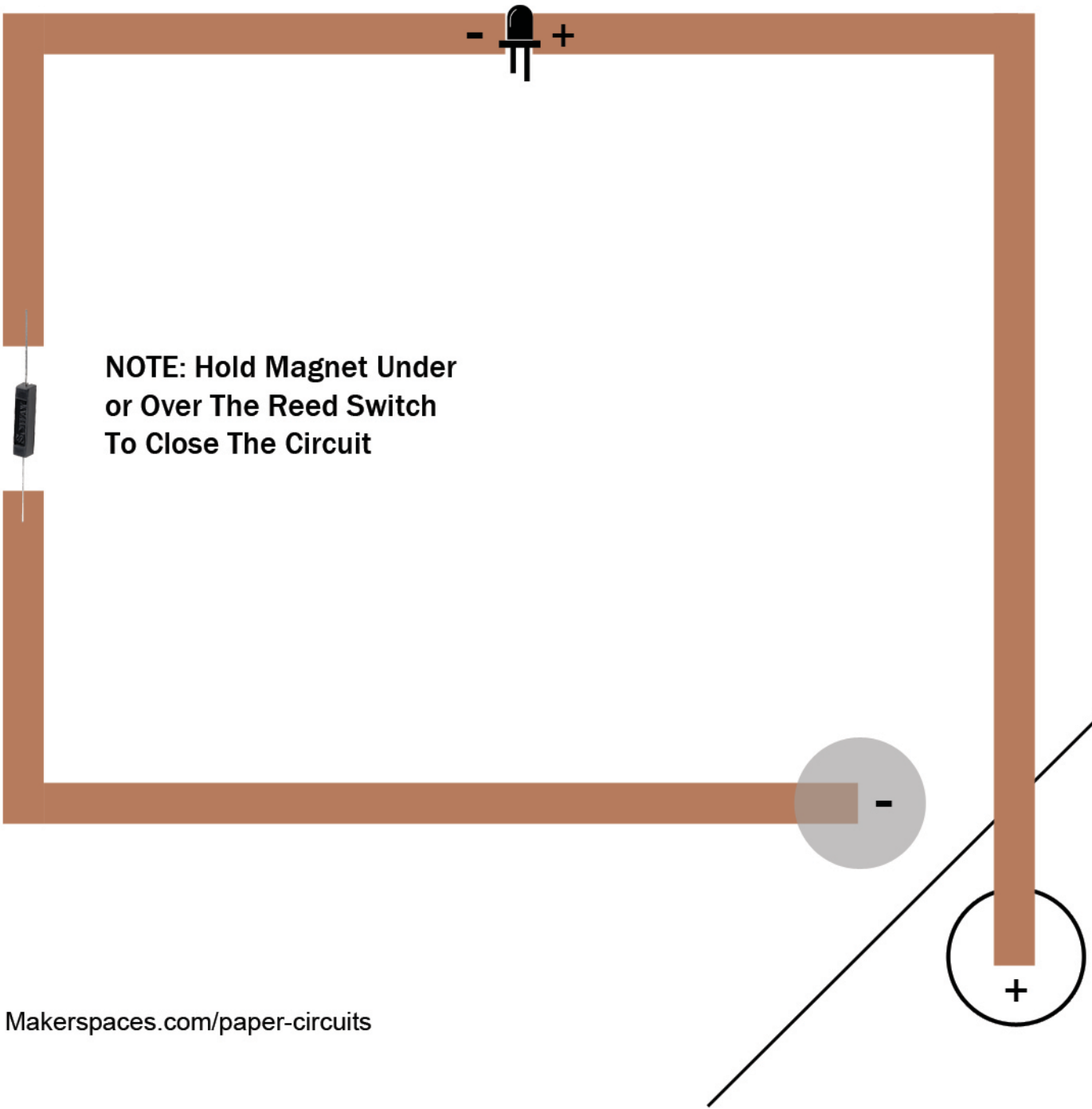
Time Required:

30 minutes

Steps:

1. Apply copper tape to trace line on template. Smooth with finger. Allow gap for LED/switch
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape with negative (-) facing down.
4. Fold corner of template along the line. Using a scoring tool helps with this process. Use paperclip to secure corner.
5. Bend legs of LED at a 90’ angle. Use clear tape to secure LED to copper tape. Long leg of LED goes on positive.
6. Tape reed switch to copper tape. To turn on switch hold magnet over or under the switch.

Reed Switch


-
+
NOTE: Hold Magnet Under
or Over The Reed Switch
To Close The Circuit
-
+

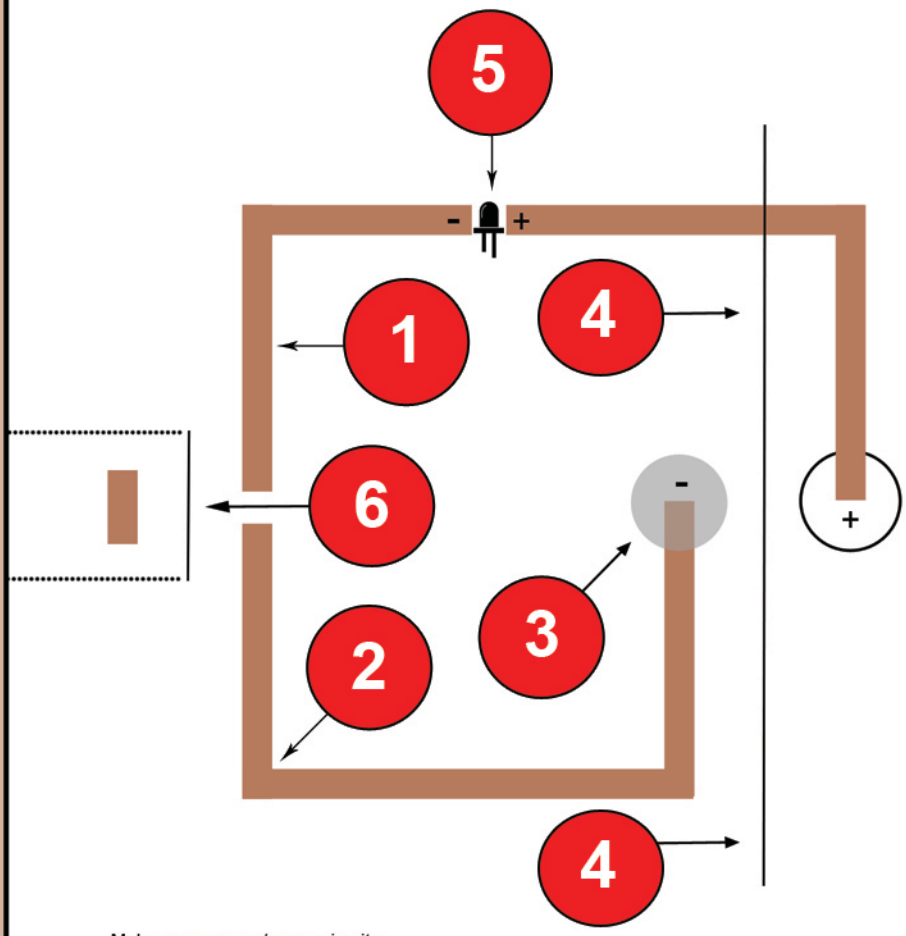
Side Fold Switch

-

3v

+

Side Fold Switch



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Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
Paperclip / Binder Clip
Circuit Stickers (optional)
Buzzer (optional)
Double-sided foam tape (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

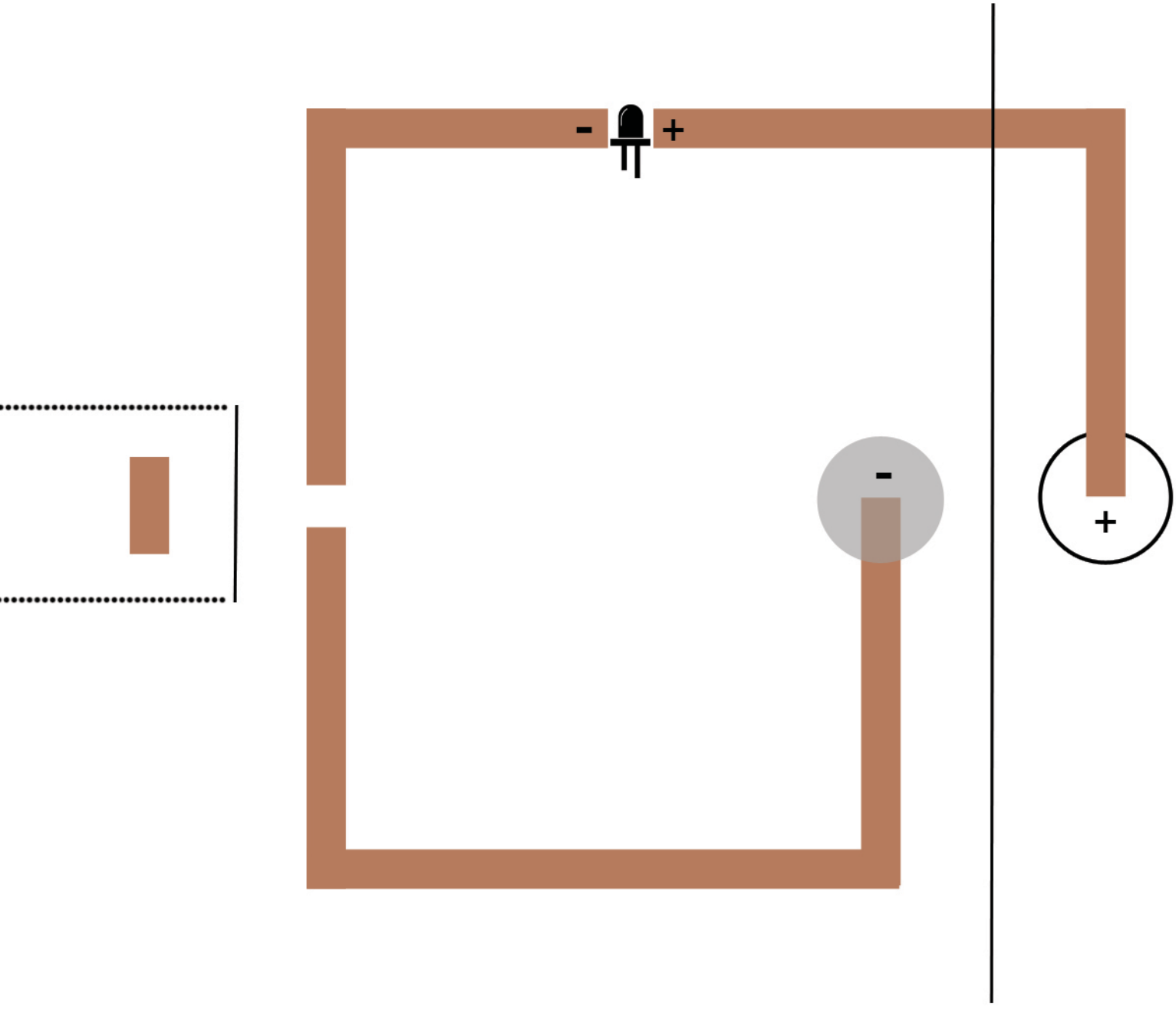
Time Required:

30 minutes

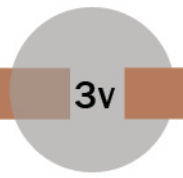
Steps:

1. Apply copper tape to trace line on template. Smooth with finger. Allow gaps for LED.
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape w/ negative (-) facing down.
4. Fold template along line. Using a scoring tool helps with this process. Use paperclip over battery/fold.
5. Bend legs of LED at a 90’ angle. Use clear tape to secure LED to copper tape. Long leg of LED goes on positive.
6. Cut along dotted lines. Fold switch at solid line. Press over copper to activate LED.

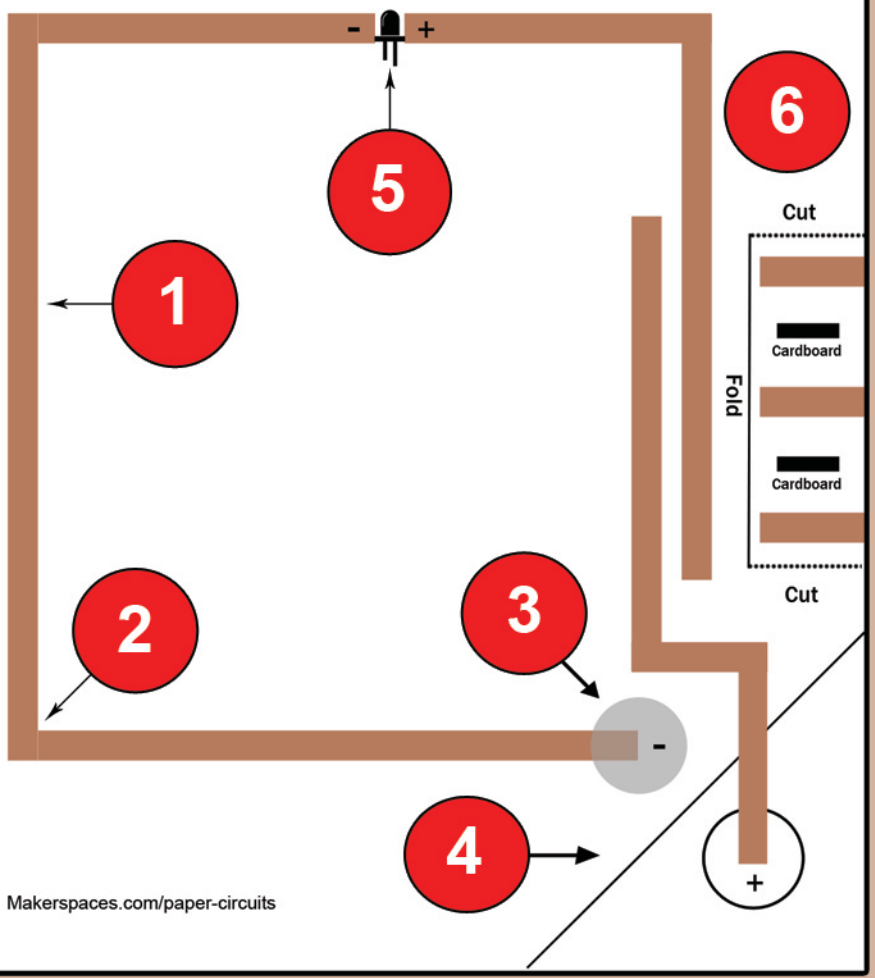
Side Fold Switch



Slide Switch



Blinking Slide Switch



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
Paperclip / Binder Clip
Cardboard
Circuit Stickers (optional)
Buzzer (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

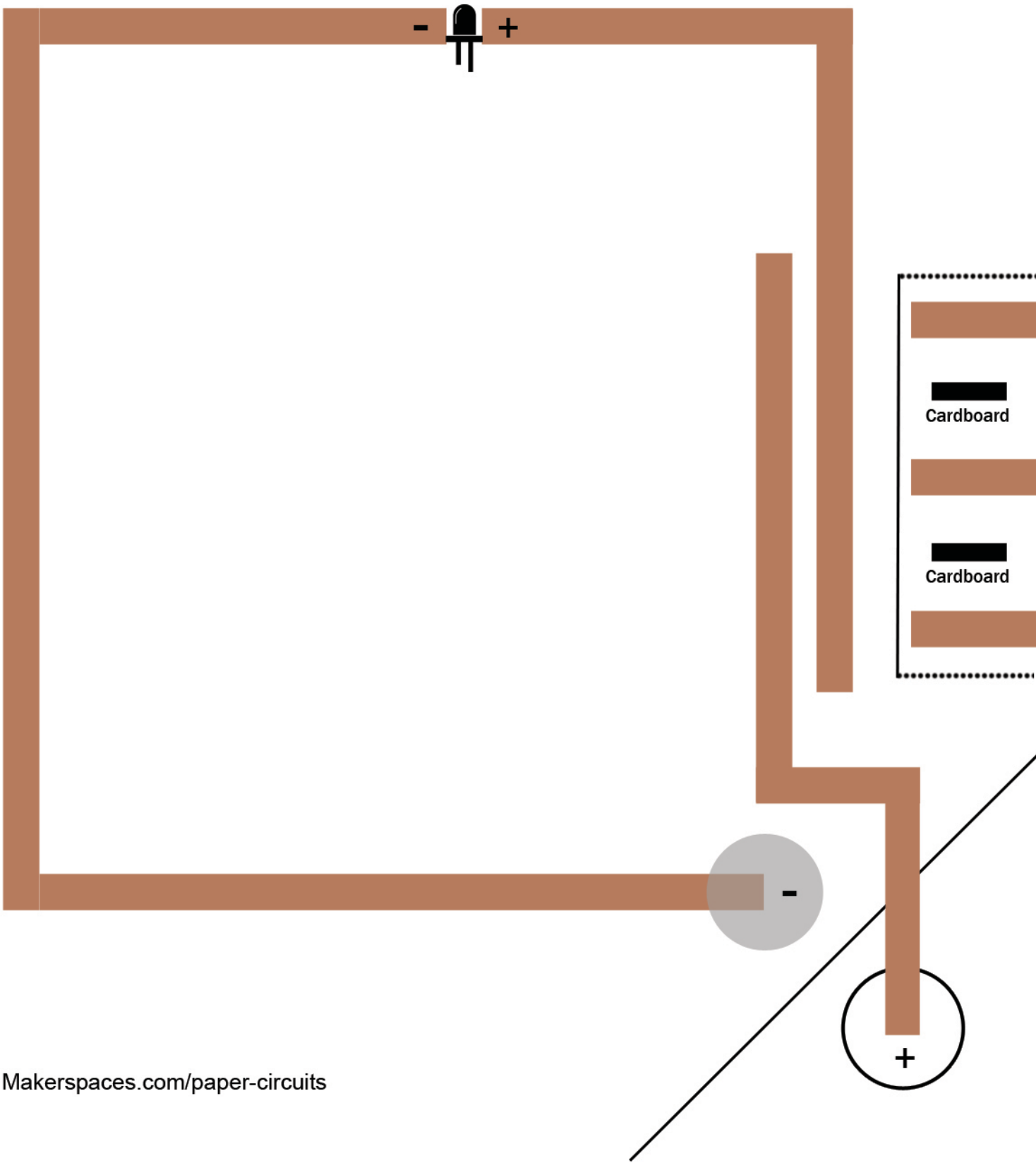
Time Required:

30 minutes

Steps:

1. Apply copper tape to trace line on template. Smooth with finger. Allow gaps for LED and switch.
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape w/ negative (-) facing down.
4. Fold template along line. Using a scoring tool helps with this process. Use paperclip over battery/fold.
5. Bend legs of LED at a 90’ angle. Use clear tape to secure LED to copper tape. Long leg of LED goes on positive.
6. Cut switch on dotted lines and fold on solid line. Tape cardboard for elevation between copper. Slide finger up & down along switch

Blinking Slide Switch



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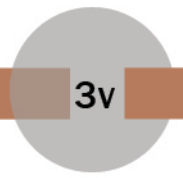
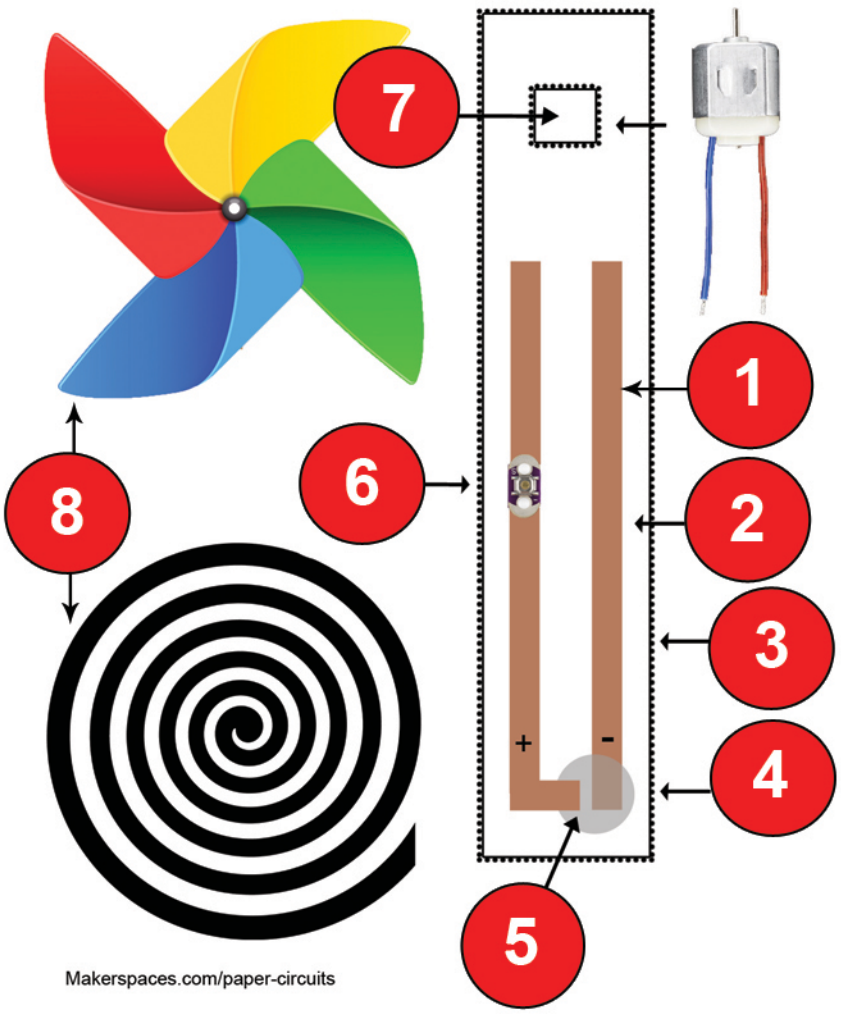
Spinner Circuit



Spinner Circuit



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LilyPad Button Switch
DC Hobby Motor - 130 size
Foam Board or Cardboard
Glue Stick
Double-sided Tape

Tools:

Scissors
Scoring Tool
X-Acto Knife

Time Required:

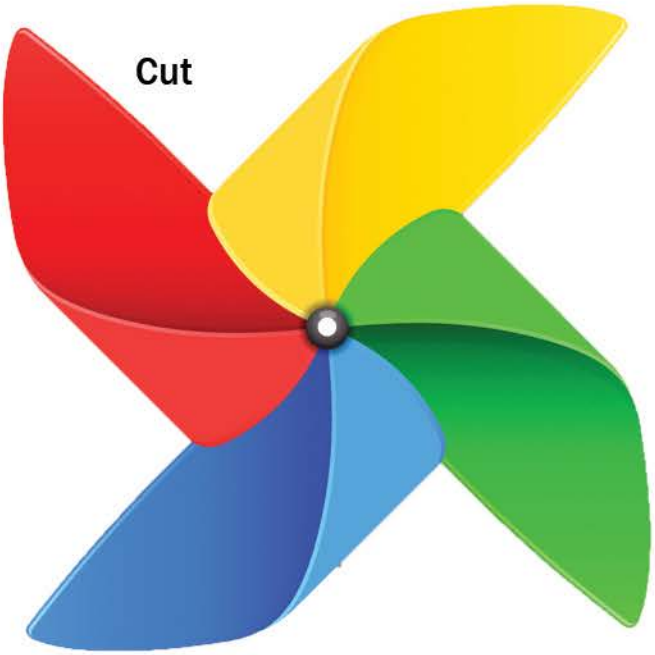
30 minutes

Steps:

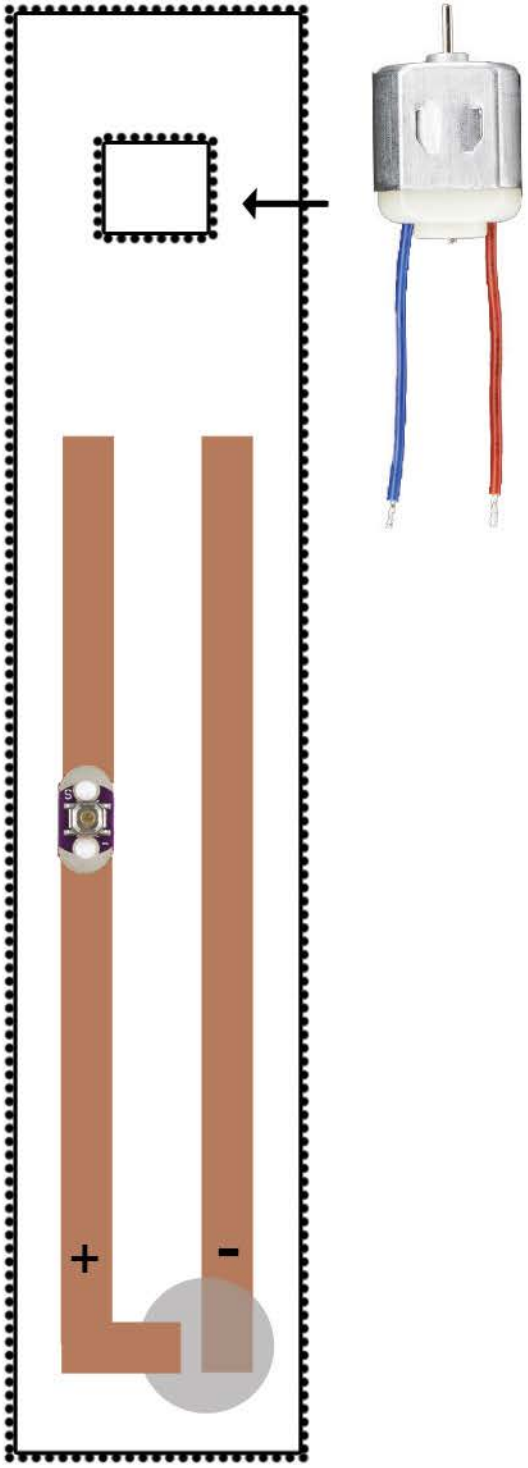
1. Apply copper tape to trace line. Smooth with finger. Allow a gap for switch
2. Place template on top of foam board which is needed for motor.
3. Cut all DOTTED lines thru paper and foam board. Glue template to foam board.
4. Place battery on top of copper tape with negative (-) facing down.
5. Stick the end of the copper tape to the top of the battery (+)
6. Mount LilyPad switch using clear tape. Make sure there is a gap in the copper tape below switch.
7. Cut out motor mount section. Place motor in vertically & tape wires to secure.
8. Cut out desired spinner and mount to the tip of motor shaft.

Spinner Circuit

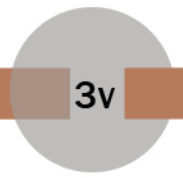
Cut



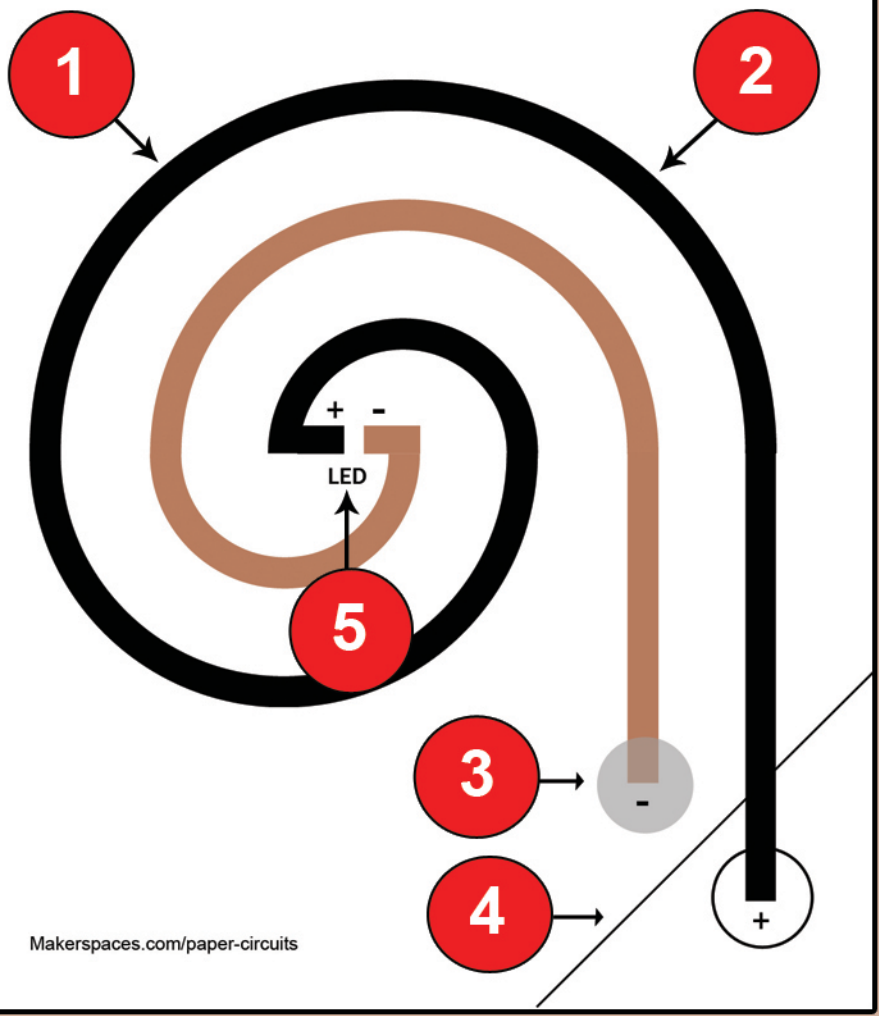
Cut



Spiral Circuit



Spiral Circuit



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
Paperclip / Binder Clip
Circuit Stickers (optional)
Buzzer (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

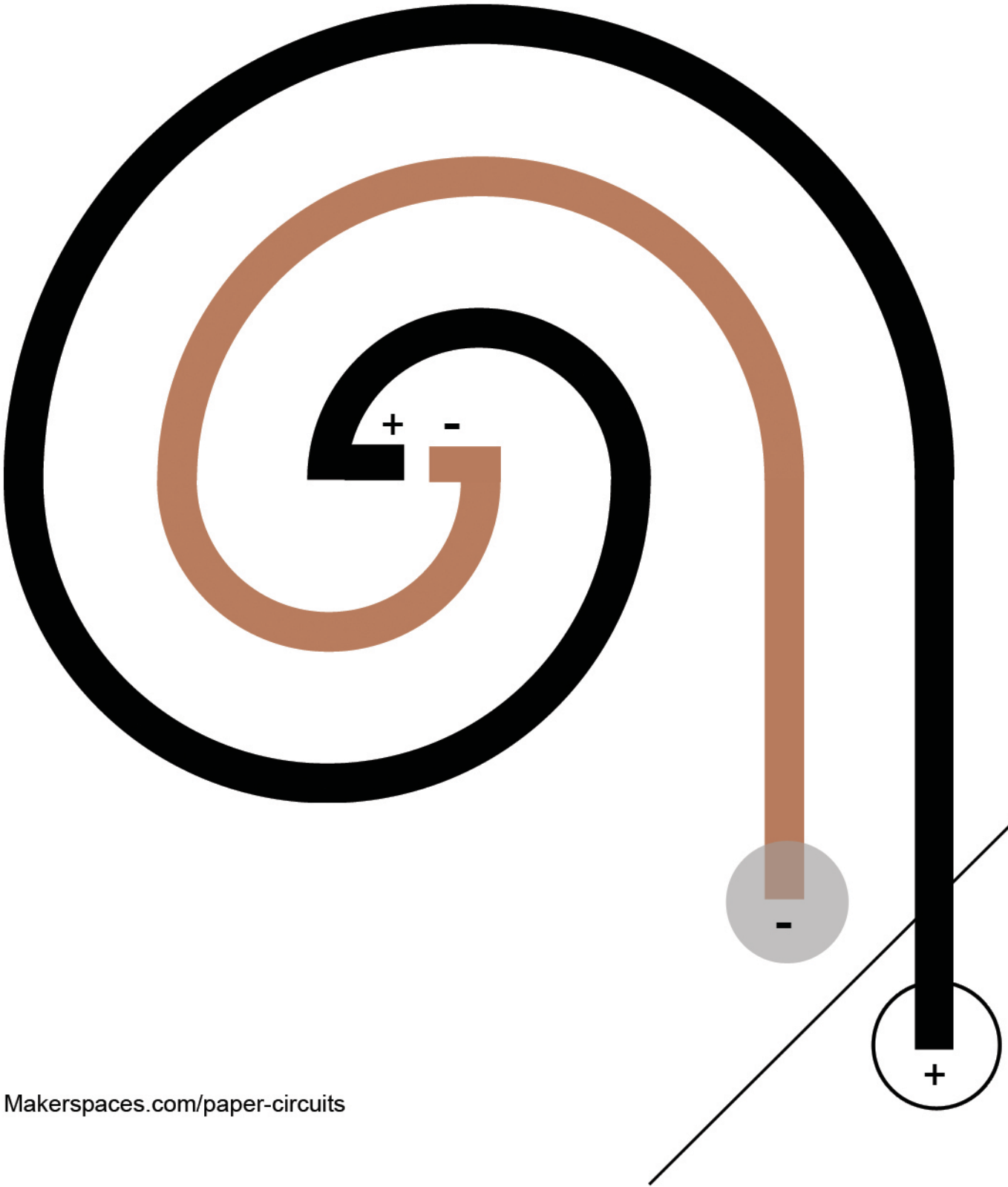
Time Required:

30 minutes

Steps:

1. Apply copper tape to black & brown trace line. Smooth with finger. Allow a gap for LED.
2. Fold copper tape around radius of spiral. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape with negative (-) facing down.
4. Fold corner of template along the line. Using a scoring tool helps with this process. Use paperclip to secure corner.
5. Bend legs of LED at a 90’ angle. Use clear tape to secure LED to copper tape. Long leg of LED goes on positive.

Spiral Circuit



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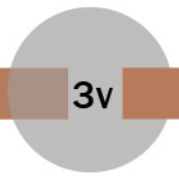
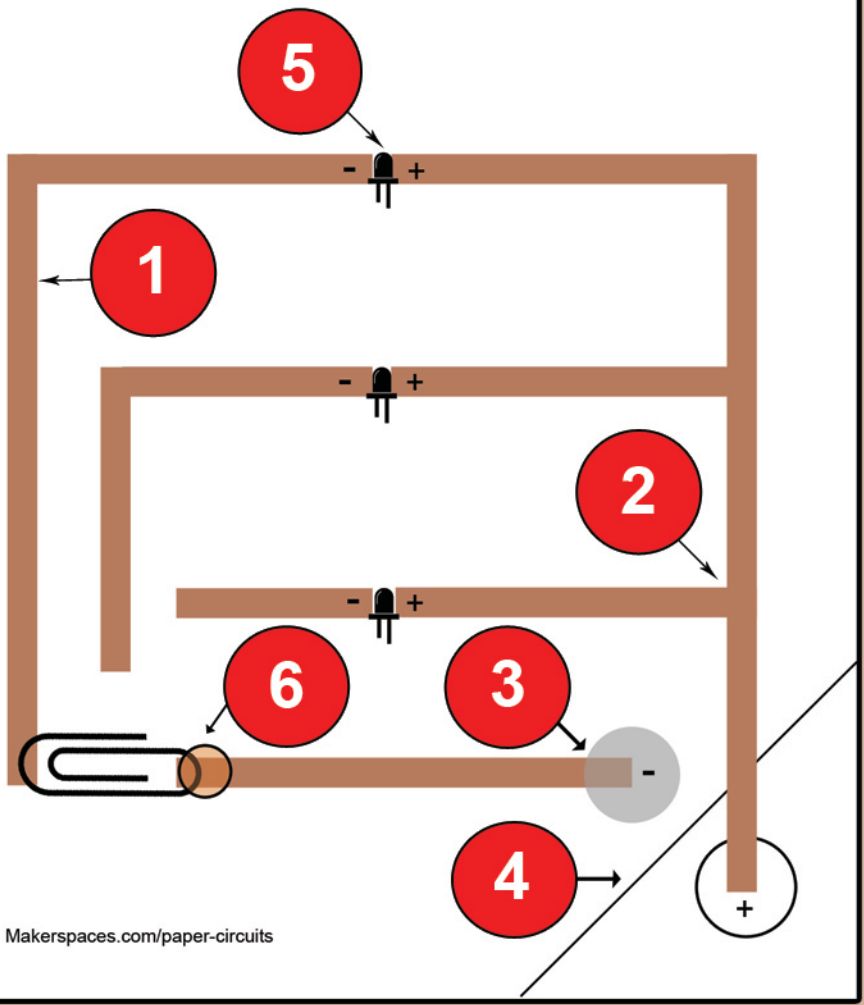
SPTT Switch



SPTT Switch

(Single Pole Triple Throw)



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
Paperclip / Binder Clip
Brass Brad
Circuit Stickers (optional)
Buzzer (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

Time Required:

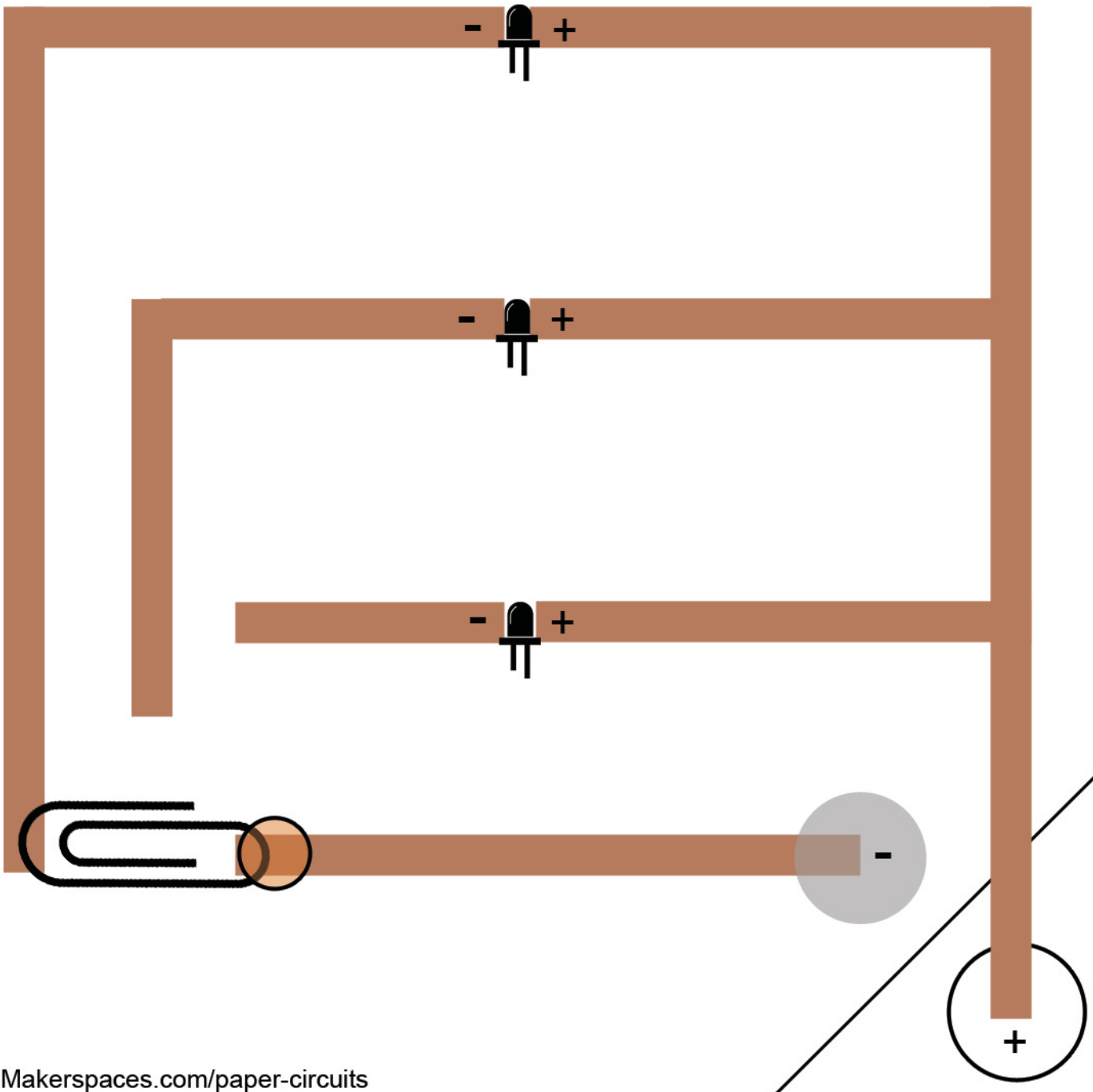
30 minutes

Steps:

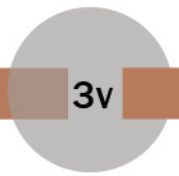
1. Apply copper tape to trace line on template. Smooth with finger. Allow gaps for LED and switch.
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape w/ negative (-) facing down.
4. Fold template along line. Using a scoring tool helps with this process. Use paperclip over battery/fold.
5. Bend legs of LED at a 90’ angle. Use clear tape to secure LED to copper tape. Long leg of LED goes on positive.
6. Push brass brad thru paperclip & then thru copper tape. Secure brad on back.

SPTT Switch

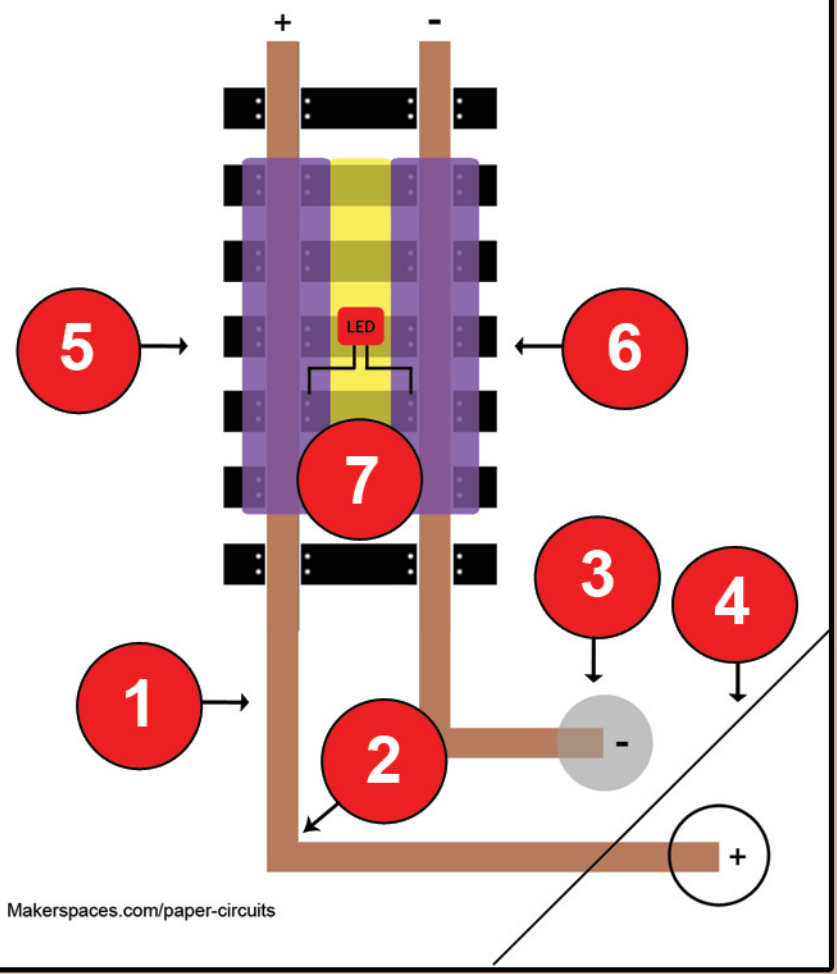
(Single Pole Triple Throw)



Squishy Railroad



Squishy Circuit



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
LED - 5mm or 10mm
Paperclip / Binder Clip
Conductive Dough (Playdoh)
Non-Conductive Dough
Non-Conductive Material

Tools:

Scissors
Scoring Tool
X-Acto Knife

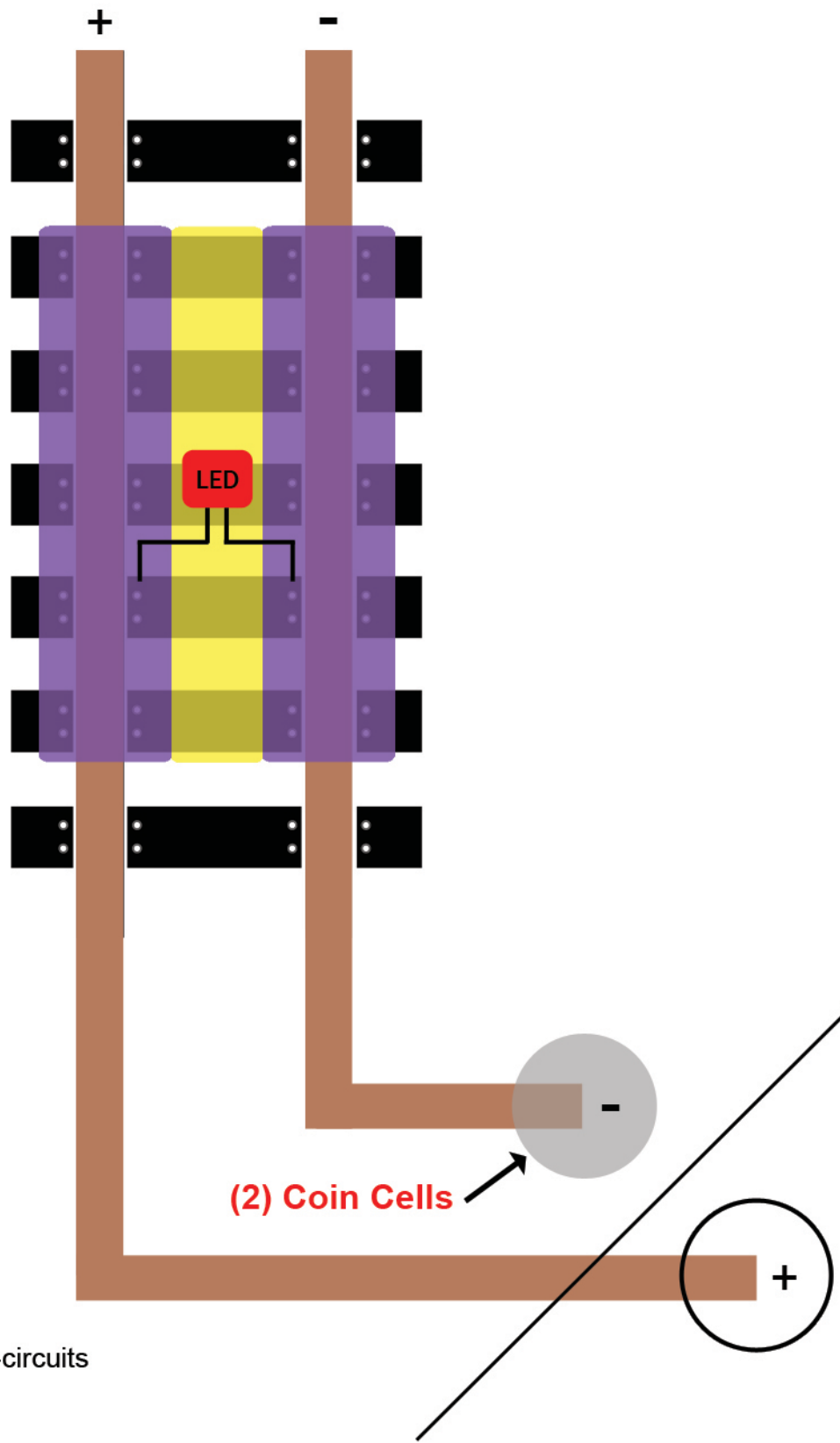
Time Required:

30 minutes

Steps:

1. Apply copper tape to trace line on template. Smooth with finger.
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place (2) batteries on top of copper tape with negative facing down.
4. Fold corner of template along the line. Using a scoring tool helps with this process. Use paperclip to secure corner.
5. Use conductive dough or Playdoh to make body of “train” as seen in purple. Yellow is non-conductive dough or popsicle stick etc. The goal is to keep the two purple sections from touching each other (short circuit).
6. Place “train” on copper tape track.
7. Insert LED into dough. Long leg of LED is positive (+)

Squishy Circuit



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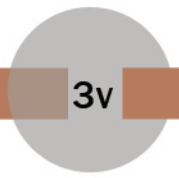
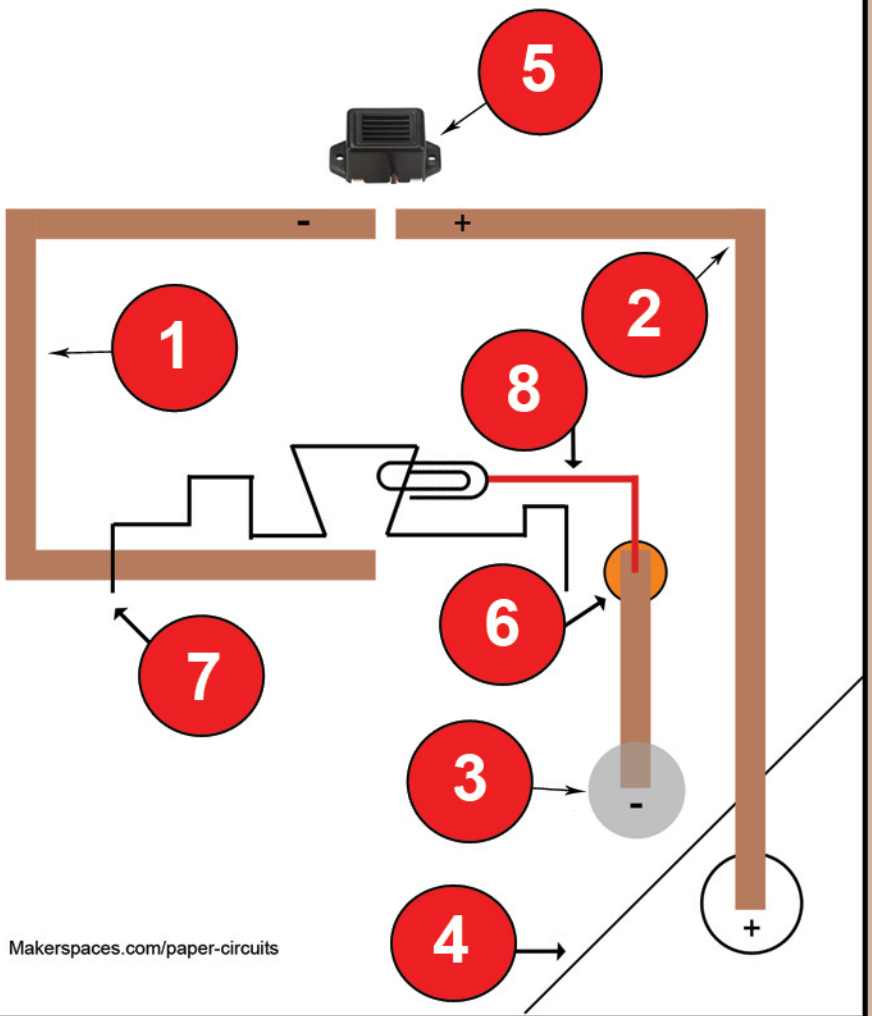
Steady Hand



Steady Hand Game



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm (optional)
Paperclip / Binder Clip
Brass Brad
Buzzer
Alligator Clip

Tools:

Scissors
Scoring Tool
X-Acto Knife

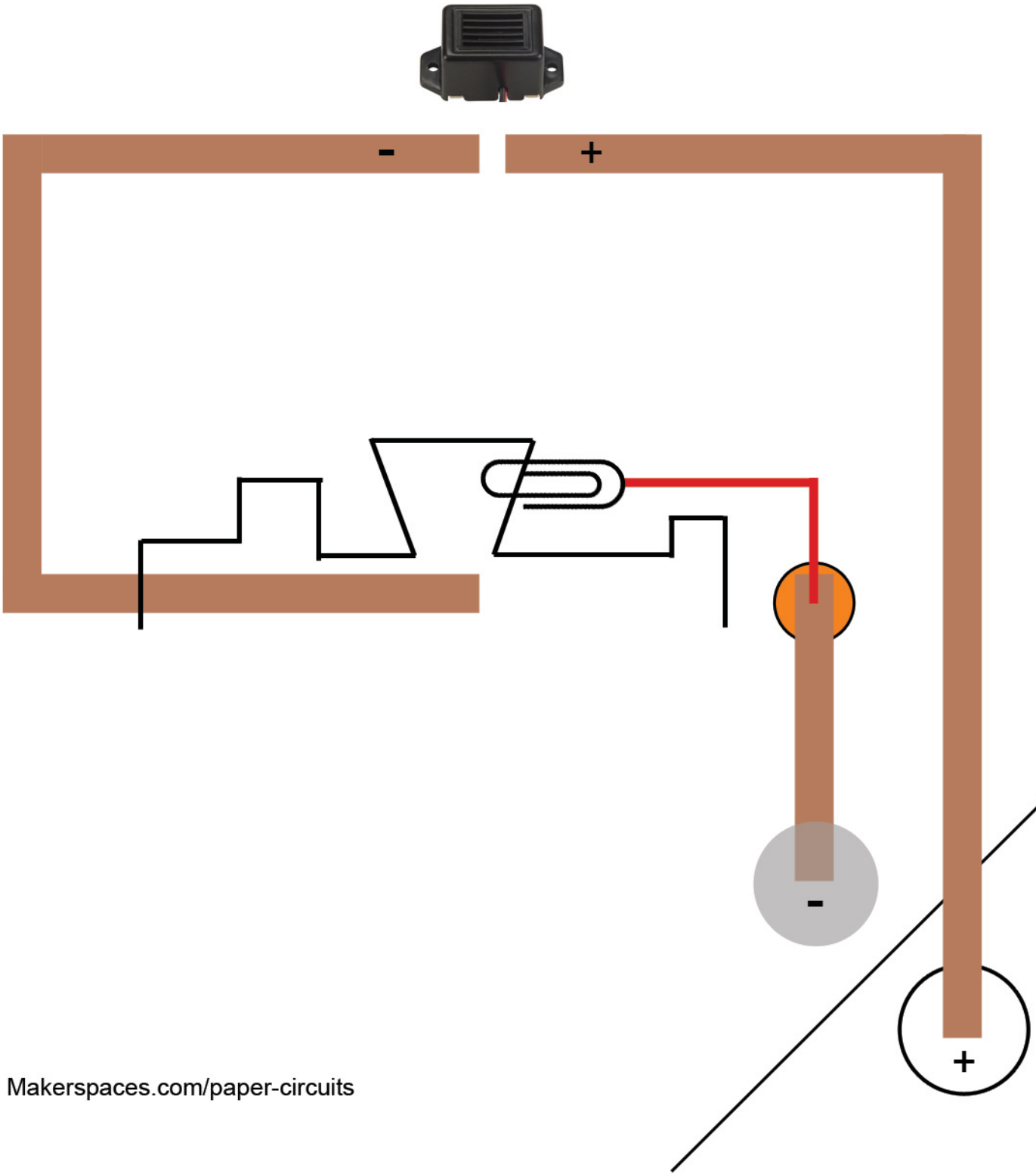
Time Required:

30 minutes

Steps:

1. Apply copper tape to trace line on template. Smooth with finger. Allow gaps for buzzer.
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape w/ negative (-) facing down.
4. Fold template along line. Using a scoring tool helps with this process. Use paperclip over battery/fold.
5. Secure buzzer to template. Tape wires from buzzer to copper tape. Black goes to (-) & Red to (+).
6. Push brass brad from back of template thru copper tape.
7. Paperclip or other conductive material bent in any shape. Tape one end to copper.
8. Alligator clip connected to brad and paperclip.

Steady Hand Game



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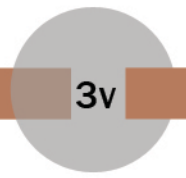
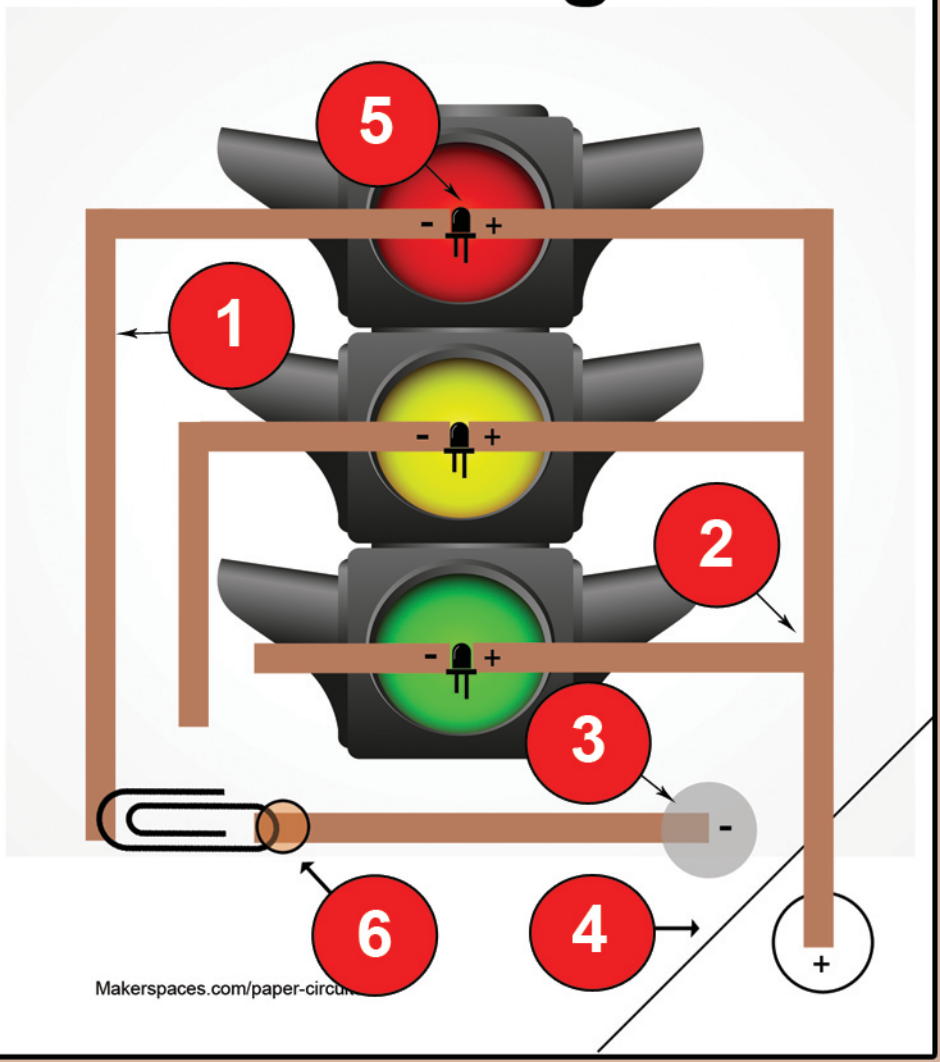
Traffic Lights



Traffic Lights



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
Paperclip / Binder Clip
Brass Brad
Circuit Stickers (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

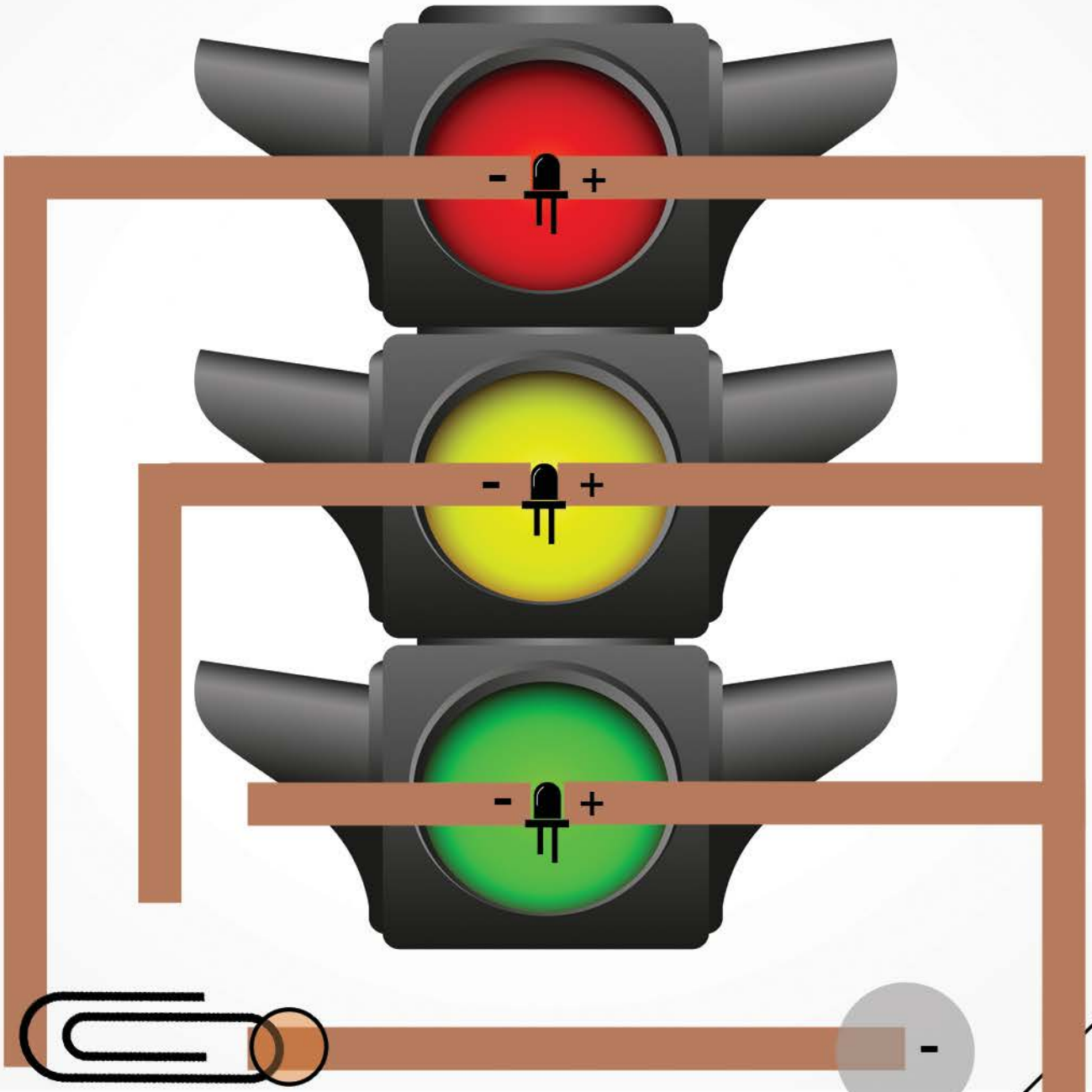
Time Required:

30 minutes

Steps:

1. Apply copper tape to trace line on template. Smooth with finger. Allow gaps for LED and switch.
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape w/ negative (-) facing down.
4. Fold template along line. Using a scoring tool helps with this process. Use paperclip over battery/fold.
5. Bend legs of LED at a 90’ angle. Use clear tape to secure LED to copper tape. Long leg of LED goes on positive.
6. Push brass brad thru paperclip & then thru copper tape. Secure brad on back.

Traffic Lights



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Water Switch

-

3v

+

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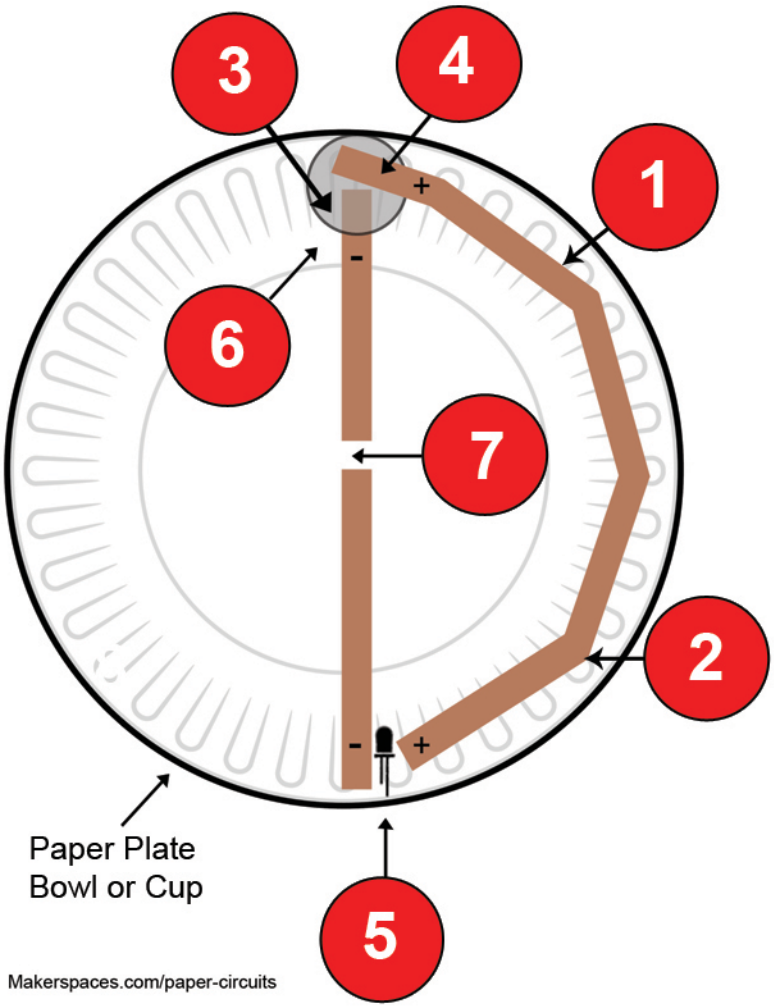
Water Switch



Materials:

Copper Tape - 1/4”
Battery - CR2032 - 3v
Transparent Tape
LED - 5mm or 10mm
Paper Plate or Bowl
Circuit Stickers (optional)
Buzzer (optional)

Tools:

Scissors
Scoring Tool
X-Acto Knife

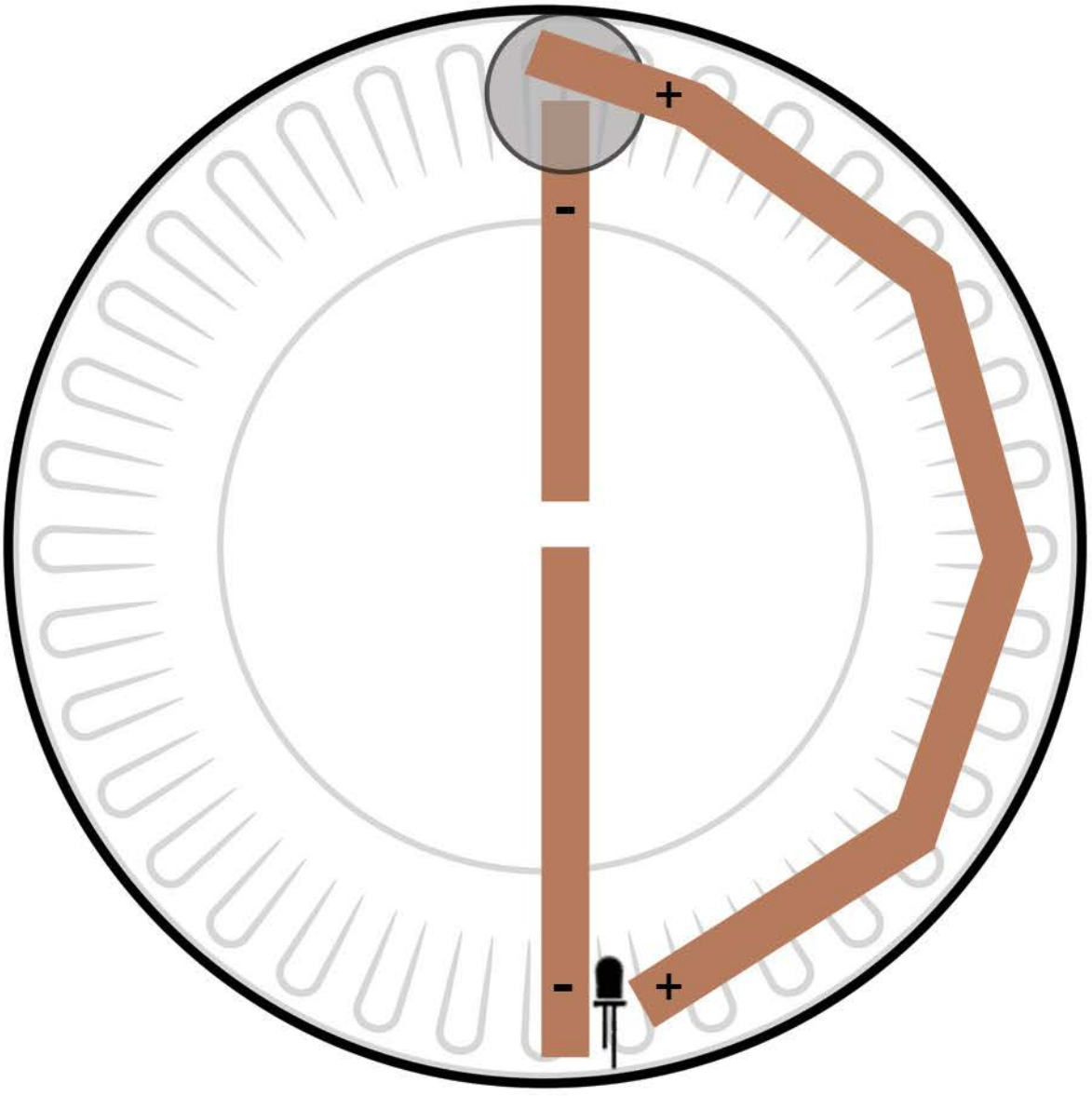
Time Required:

30 minutes

Steps:

1. Apply copper tape to trace line on paper plate / bowl Allow gap for LED.
2. Fold copper tape at all corners. Try to maintain a continuous strip with no cuts.
3. Place battery on top of copper tape with negative (-) facing down.
4. Stick the end of the copper tape to the top of the battery (+)
5. Bend legs of LED at a 90’ angle. Use clear tape to secure LED to copper tape. Long leg of LED goes on positive.
6. Apply clear tape over battery and copper to ensure good contact.
7. Pour water over gap in copper tape. Don’t let water reach battery or (+) trace. (short circuit)

Water Switch



ABC – Always Be Creative

This was only the beginning.

Now is the time for you to take this one step further and design your own paper circuit. Use your creativity to expand on the ideas that were presented in this book. You can make anything from light-up greeting cards to interactive posters and pictures. You are only limited by your own imagination.

We would love to see what you created. Please reach out to us any time on Twitter @Makerspaces_com and share your creation.

Never Stop Making -

Andrew Miller

Resources

Here are some great websites where you can find the items needed to complete the projects in this book.

Makerspaces.com	www.makerspaces.com
Adafruit	www.adafruit.com
Chibitronics	www.chibitronics.com
Maker Shed	www.makershed.com
Sparkfun	www.sparkfun.com
Electroninks	www.electroninks.com
Bare Conductive	www.bareconductive.com
Radio Shack	www.radioshack.com
Amazon	www.amazon.com
Harbor Freight	www.harborfreight.com
Michaels Crafts	www.michaels.com

Glossary

Circuit – is a closed loop or path in which electrons can travel

Conductive Ink - A type of ink that has conductive properties that allow the flow of electricity when connected to a power source

Copper Tape – adhesive backed tape that is made of thin pure copper. Usually sold on a roll in varying widths. Used for electronics or gardening projects

Coin Cell Battery – Also known as a button battery, this is a small 3v battery used to power everything from watches to electronics

LED – Short for light emitting diode, this device can emit visible or infrared light at low voltages

Paper Circuit – a functioning low voltage electronic circuit that is created on paper or cardboard using conductive copper tape, an LED and a coin cell battery

Squishy Circuit – a type of low voltage circuit that uses conductive and insulating dough to power an LED or motor

Switch – any device that is used to interrupt the flow of electrons in a circuit. It is used to start or stop the flow of electricity

Learn More

We are always sharing helpful info, projects, articles, ideas and more about makerspaces and maker education. Below are some of the places you can find us. We would love to hear from you.

Web - www.Makerspaces.com
Twitter - @Makerspaces_com
Facebook – www.FB.com/makerspaces
Instagram – www.Instagram.com/makerspaces
Pinterest – www.Pinterest.com/maker_spaces
Periscope - @Makerspaces
Snapchat – Makerspaces
Vine – Makerspaces_com

Workshop - If you are interested in having us run a paper circuit workshop please send a note to www.makerspaces.com/contact-us

Thank you
C.D