



Wire Up Your World!

5 Electronics Projects to Take Your Skills to the Next Level



About This Book

This all started because Sophia's 11-year-old son wanted to make a torch.

Straight away, he ran into trouble. The "click clack" junior electronics system he owned didn't was too bulky to fit into a cardboard tube for a torch. The pieces couldn't be attached easily.

He got some hobby electronics, including a plastic breadboard, but struggled to understand how to use them. It all felt way harder than it should.

We understand that you like to make things. You're at a stage where you're keen to get into the world of electronics and are ready for more - but need a helping hand to guide you.

In this eBook, we take you from Beginner to Intermediate level electronics. It includes:



5 original projects that increase in technical level



Clear circuit board drawings you can cut out and lay over your SharperThinker baseboard to show you exactly where to place your wires and tiles in a circuit



Challenge circuits to encourage thinking and experimenting

We have written this to accompany the <u>Tinker Tiles Base Set, now available in our online shop.</u>

However, you can adapt most of the circuit drawings with your own hobby electronics. Let's get started!

Ngā Mihi NUI, Sophia & Stefan Sharpe



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Use "eBookme" code for 10% Discount at checkout* *Only applies to full price Tinker Tiles Base Set Kit. **Only applies to full price Tinker Tiles Base Set Kit. **Only applies to full price Tinker Tiles Base Set Kit. **Only applies to full price Tinker Tiles Base Set Kit. **Only applies to full price Tinker Tiles Base Set Kit. **Only applies to full price Tinker Tiles Base Set Kit. **Only applies to full price Tinker Tiles Base Set Kit. **Only applies to full price Tinker Tiles Base Set Kit. **Only applies to full price Tinker Tiles Base Set Kit. **Only applies to full price Tinker Tiles Base Set Kit. **Only applies to full price Tinker Tiles Base Set Kit. **Only applies to full price Tinker Tiles Base Set Kit. **Only applies to full price Tinker Tiles Base Set Kit. **Only applies to full price Tinker Tiles Base Set Kit. **Only applies Tinker Tiles Base Set Kit. ***Only applies Tinker Tiles Base Set Kit. ***Only applies Tinker Tiles Base Set Kit. ****Only applies Tinker Tiles Base Set Kit. *****

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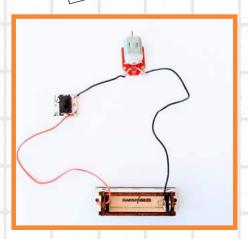
Enjoy making designs as the motor spins around.

This is a simple and fun way to wire up a motor in a first series circuit.

I had fun experimenting with colours and making different patterns - try squiggling or dabbing the pen.

you will need

You can see this project on the "How tos" page on our website: https://www.sharperthinker.co.nz/youtube-electronics-project/



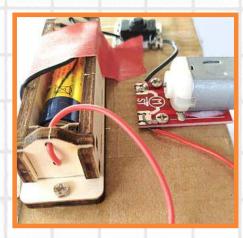
 Make this series circuit. Look at the back of this book for a printable circuit drawing.



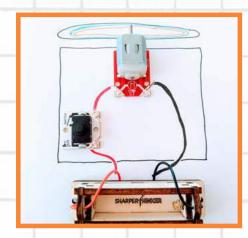
2. Firmly wrap 2cm wire around the corner of tiles. You can strip wires with a vege knife - see Technical Tips.



Cut a cardboard circle or square for spinner. This photo shows a screw on top, but you can just push the card onto the motor shaft.



4. Screw or tape the Motor and Switch tiles onto a cardboard box and use tape to attach the battery box.



5. Push your cardboard spinner onto the motor. Press the switch and the cardboard will spin!



6. Use feltpens or paint and see what you can make with your spinner. See a YouTube video of this project on the "how tos" page on our website.

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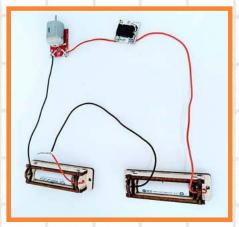


You can blu-tack your tiles anywhere and hide them with Lego bricks.
You could try wiring this car in parallel for more "push".
See the circuit drawings in Book 2
to understand about series and parallel. The Parallel Shooter project also
uses a parallel circuit.

#2 Make Your LEGO CAR GO!

You will need

2xAA Battery boxes * Switch Tile * Motor Tile * Blutack/Rubberband * Lego car. * Wires



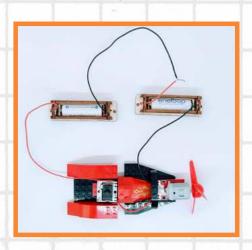
1 Make this series circuit. You will need 2xAA batteries to have enough "push" to make it go.



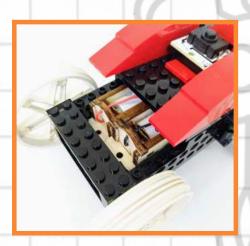
2. Firmly wrap 2cm wire around corner of tiles.



Blu-tack your switch somewhere that's easy to access.



4. Here's how we placed our tiles - your motor has to be free to move!



5. Once you've tested that the motor spins, hide your battery boxes.



6. Hints: The lighter the car, the faster it goes! Also, try for low friction wheels. This car was ALMOST too heavy to go - so start with a light car and build up!

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A single 1.5v AA battery doesn't have enough "push" to power an LED - which needs about 3v. However, once it gets 3v, the LED can "blow up" easily.

How to fix this? You need a booster and a resistor!

See more about LEDs in "A Sharper Thinker's Guide to Electronics"

Book 2 of this series.

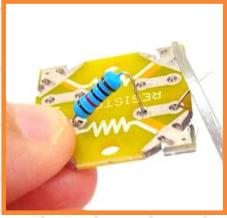


1xAA Battery Box & Battery * Switch Tile * Resistor Tile (10k) *

LED Tile * Boost Tile * Blutack * Wires *

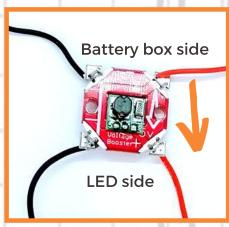
Cardboard tube or box and a piece of flat wood or

cardboard to screw wires onto.

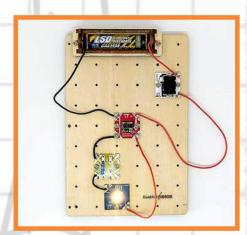


#3 Make a TORCH

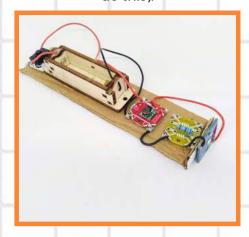
 Make up your resistor tile or attach a 6.80hm resistor onto the + side of your LED.
 (See Circuit Drawings for how to do this).



 A Booster Tile is needed for 1xAA battery (otherwise you need approx 3-4volts to power an LED).
 The arrow on the tile shows the direction of the power boost.



3. Look at the "Make a Torch" circuit drawing. Make it, check it - does the light go?



4. Here's how we placed our tiles.
The switch is at the back so you can reach in the tube and turn it on and off. What will your design be?



5. We used blutack to fix tiles to the cardboard but you could also screw or tape them. We bent up a flap so the LED could shine out.



6. Poke the cardboard insert down the tube and tape in place.

Time to decorate!

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Why would you wire a circuit in parallel? It's so both motors get the full power or "push" from the battery, In a series circuit, they have to share it.

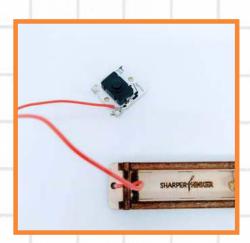
But this circuit is extra tricky because it also requires you to make the motors turn in opposite directions - that's what makes your marshmallow shoot out!



1xAA Battery Box & Battery * Switch Tile * 2xMotor Tiles * 2x15cm
Red Wire * 2x15cm Black Wire * 2x Cardboard Circles 5cm Diameter *
Board or Box to Attach * Screws or Blutack * Missiles (small marshmallows)



 Take your 2 motors and put 15cm red positive wire on opposite edges like this.



2. Connect one side of your switch to the positive side of the battery box.



Lay out your circuit like this.See the circuit drawing to help you make this circuit.



4. We've used the custom breadboard to screw the motors on for testing. You can use a cardboard box and screw or blutack the tiles on.



5. These cardboard circles are
5cm in diameter. This circuit will
make them go in opposite
directions. They need to be
placed so they grip the
marshmallow (enough to fire out!)



This is the circuit behind the Marshmallow Launcher 3000!

Can you make a structure that will hold your motors and feed the marshmallows through?

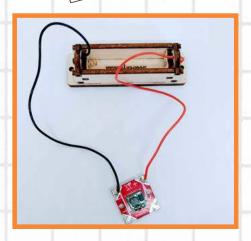
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RGB LED stands for Red, Green, Blue Light Emitting Diode. Using different combinations, we can make lots of colours. Let's work out how to wire one up by making a Glow Lamp for your room. Learn about LEDs in "A Sharper Thinker's Guide to Electronics" -Book Two of this series..



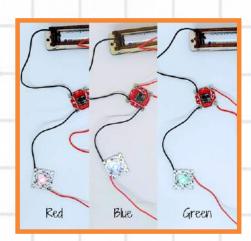
1xAA Battery Box & Battery * Switch Tile * RGB LED Tile * Boost Tile * 3x10cm Red Wire * 2x10cm Black Wire * Glass or Plastic Jar * A4 white paper * Tinker Tile Board * Screws or Blutack



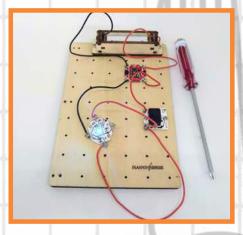
#5 Colour

GLOW LAMP

An LED needs more than 1.5volts so we need our Booster Tile. Make sure you wire both the "-" and "+" correctly..



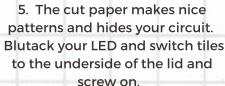
2. Use the circuit drawing to wire your switch and one of the "+" sides of the LED Tile with your red wire.



3. If you use 2 wires, you can mix colours on your LED Tile. I've mixed blue/green to make turquoise.



4. Cut your paper down to fit your jar. Then fold it in thirds and cut triangles and shapes half way into the fold. Open your paper up and it should have patterns like that above. Arrange it inside your jar.





6. Enjoy your lamp! You can also experiment with adding resistors to this circuit to make colours half strength. Book 2 covers this in more depth.

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Tinker Tiles: A New System of Electronics

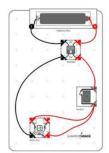
Tinker Tiles are PCBs (Printed Circuit Boards) with an electronic component such as an LED or switch, soldered onto them.

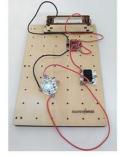
We designed the Tinker Tiles especially to help learners identify and use modern electronics easily. We have made them adaptable for use in "expert" projects as well so are future proof.

LEARN ELECTRONICS WITH OUR TINKER TILES BASE SET

It's as easy as 1, 2, 3

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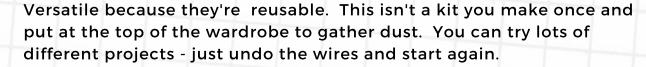


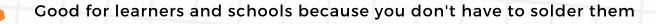
1 Print circuit

2 Make it on the board

3 Take it into real life

Tinker Tiles:





Easy to use because you tape, tack or screw them onto most surfaces (meaning they fit into cardboard tubes and enable you to make a torch)

The electronics are "exposed". We haven't hidden the resistors and LEDs under lots of plastic. This means learners can identify real world components which is important for their future engineering projects they will want to make!



Tinker Tiles: Technical Tips

STRIPPING WIRE:

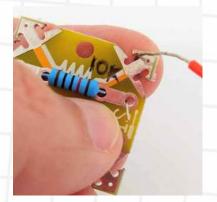
As soon as you graduate from systems that use magnetic or click together wires, you run into the issue of stripping wire. You can buy a wire stripper but good ones are expensive and somehow, they're never there when you want to lay your hands on one!

We use soft silicon wire in our kits and you can pinch hard and pull the insulation off the end to expose the wire ready to twist around your tile. However, some kids have said that's quite hard to do. Here's Stefan's quick tutorial about stripping wire using a plain vege knife from the kitchen. Visit the "How Tos" page on our website:

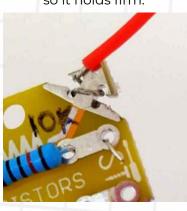
www.sharperthinker.co.nz/youtube-electronics-project/

WINDING WIRE AROUND TILES:

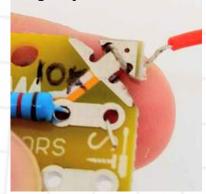
1 You need 2cm of bare wire. Hold it against the back corner.



3 There isn't a "right" way. Experiment with wrapping it so it holds firm.



2 Wrap all the way around and then pull up so the wire gets caught by the corner "anchors"



4 This is how you connect your tiles. Once you screw or tape them down, the wires make a strong connection.



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MAKING RESISTOR TILES:

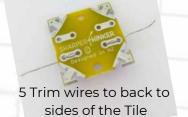
1 The Tile will take 2 resistors

2 Poke resistor ends through first hole

3 Bend up ends

4 Pull ends back through 2nd hole using pliers or scissors







6 Use a marker to write the resistor Ohm value on Tile

Tinker Tiles: Technical Tips SHARPER



Short circuits happen when we accidentally wire a battery to itself. This means that the current is flowing around our circuit with nothing to take the energy from the battery.

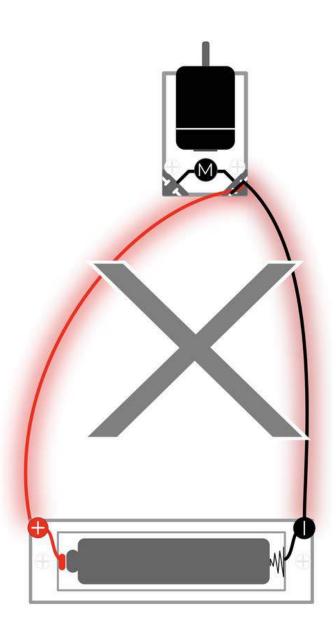
You can see in the drawing what's happened. The red wire is touching the black wire with nothing between them.

Usually the first sign of a short circuit is that your motor doesn't go.

Another sign will be that your wires and the springs in your battery box get so hot that they may even melt or scorch your wood. We've had this happen to us a few times!

If left for a long time in a short circuit, batteries can get very hot, leak or even burst.

SHORT CIRCUITS

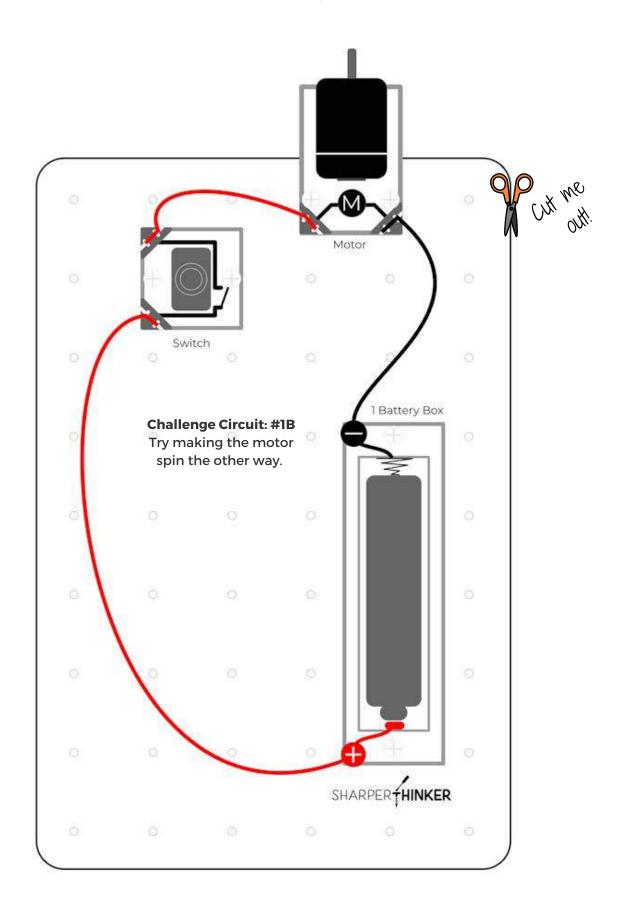


The good news is that because you made it, you know how to fix your battery box with a new spring and wires so don't need to buy a whole new thing - just the electronics.

Contact us to buy replacement electronics and you'll be good to go again!

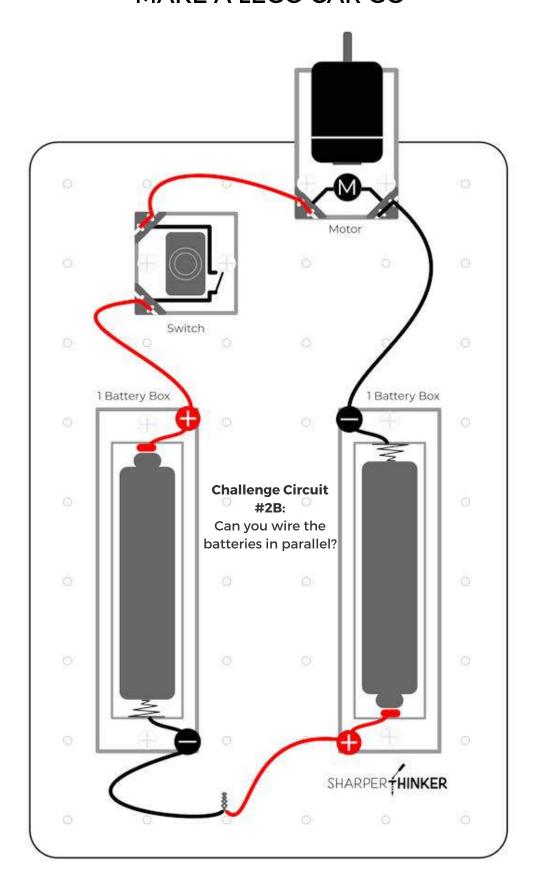
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CIRCUIT DRAWING #1 MAKE AN ART SPINNER



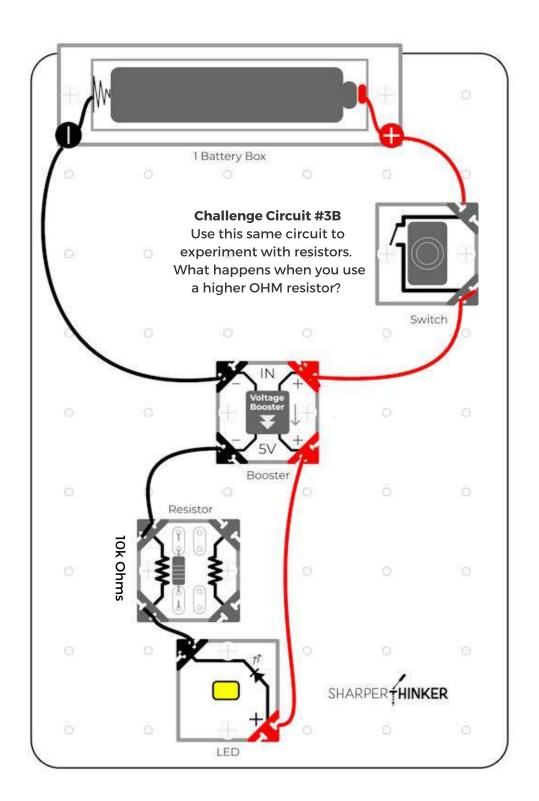
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CIRCUIT DRAWING #2 MAKE A LEGO CAR GO



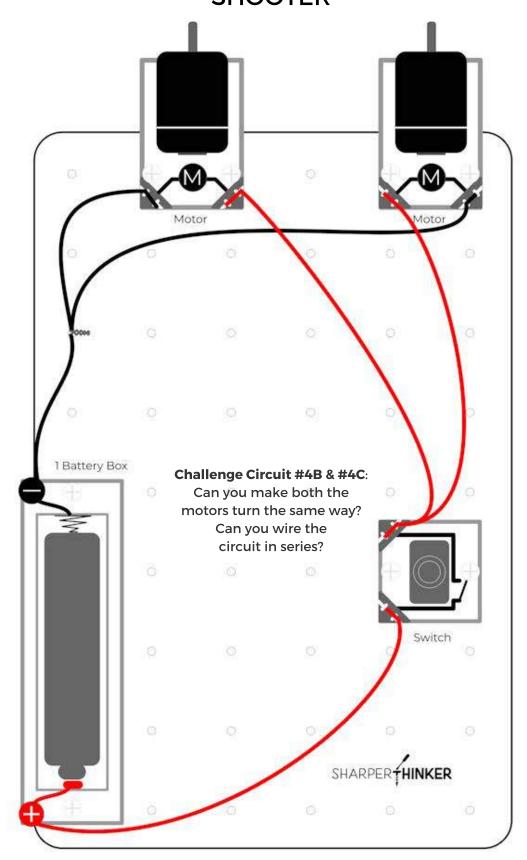
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CIRCUIT DRAWING #3 MAKE A TORCH



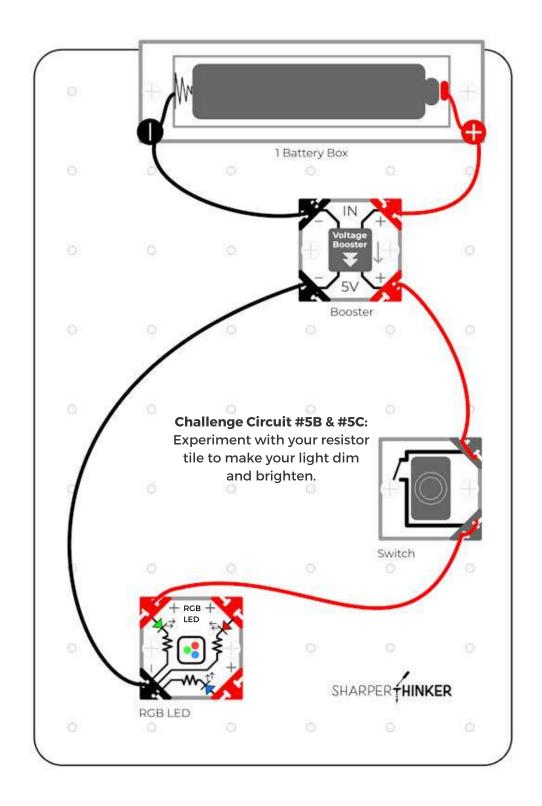
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CIRCUIT DRAWING #4 MAKE A PARALLEL SHOOTER



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CIRCUIT DRAWING #5 MAKE A COLOUR GLOW LAMP



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About Us



NZ MADE

We are in-laws Sophia and Stefan Sharpe running our family business in New Zealand. We make electronics kits for sciency kids age 9+. We're keen to be used in schools so get in touch if we can help you.

Our values are:



Promote hands-on "real" learning



High quality standards

Eco-friendly

You can see more about us on our website: www.sharperthinker.co.nz

Email is the best way to contact us: sharperthinker@gmail.com



10% Discount!

BOOK TWO: INTERMEDIATE TO ADVANCED

"A Sharper Thinker's Guide to Electronics: Book Two" has more circuit drawings including the "answers" to the Challenge Circuits in this book.

We've also taken time to give clear explanations of each electronic component and what it does in a circuit.

This is the book for older kids who have had a taste of electronics and want to go deeper. It will also help teachers and educators who are looking for good ways to explain more intermediate concepts. This eBook is coming soon on our website and will also be free.,

TINKER TILES BASE SET

The Tinker Tiles Base Set includes enough tiles to make approx 2 projects from this book at one time. You can view this set in our website shop.

Are you a teacher or educator looking for bulk sets? Please get in touch for this option. We do offer a bulk discount for 10 kits or more.

Use the code: "ebookme" to receive a 10% discount on the Tinker Tiles

Base Set at checkout.*

*Only applies to full price Tinker Tiles Base Set Kit. See full Ts&Cs on the website

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