

# BONUS PROJECTS

from  
**micro:bit in Wonderland**

**CODING & CRAFT**

with the BBC micro:bit

BUFSBFBEB  
BUUFShTBU

**THREE**  
Bonus Projects  
not in the book.  
Try Them!

**NEW**  
MakeCode  
editor ready

written by Dr Tracy Gardner & Elbrie de Kock  
Tech Age Kids

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Written by Dr Tracy Gardner & Elbrie de Kock.

Typeset and designed by Tech Age Kids.

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#### ACKNOWLEDGEMENTS

Screenshots made available by Microsoft MakeCode, [makecode.microbit.org](http://makecode.microbit.org). Microsoft MakeCode is based on the open source project Microsoft Programming Experience Toolkit (PXT).

Illustrations by Sir John Tenniel from 'Alice's Adventures in Wonderland' by Lewis Carroll.

Book inspired by 'Alice's Adventures in Wonderland' by Lewis Carroll.

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All the internet addresses (URLs) and information given in this book were valid at the date of print. Please contact Tech Age Kids if you find any missing or incorrect information.

# GUIDE TO THIS BOOKLET

This booklet contains three bonus projects that introduce you to the Tech Age Kids book *micro:bit in Wonderland*.

The projects are designed for beginners to coding and the BBC micro:bit. Each chapter recreates objects and scenes from Alice's adventures providing, an imaginative backdrop for developing modern skills.

Children, teens and adults will learn to code the micro:bit and make fun and useful things.

We've found that children are more engaged with coding and electronics when there's a purpose behind what they make.

The book, *micro:bit in Wonderland*, contains 12 further coding and craft projects inspired by the story of *Alice's Adventures in Wonderland* by Lewis Carroll.

## THE BBC MICRO:BIT

The BBC micro:bit is a small, programmable computer that has built-in inputs and outputs, with the capability to connect more. You can use it to make a wearable device, cool gadgets, useful science equipment and creative craft and coding projects.

The micro:bit can be powered from a battery pack with 2 AAA batteries. You also need a, preferably long, USB cable for programming.

## SAFETY

The projects in this booklet use electronics equipment and craft tools. The projects are intended to be completed with adult supervision or support. The projects are undertaken at your own risk.

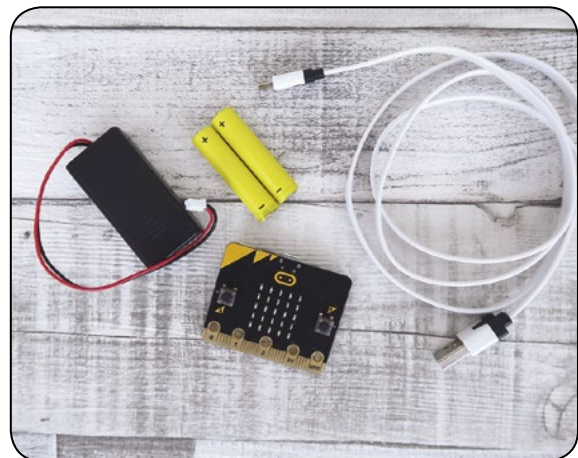
📖 **Read *Alice's Adventures in Wonderland*** by Lewis Carroll to complement the projects.

🌐 **Website** accompanying this booklet: [alice.techagekids.com](http://alice.techagekids.com)

## PROJECTS IN THIS BOOKLET

The projects in this booklet will introduce you to simple block-based coding, craft and electronics. They include:

- ♣ Chapter 1: **10/6 The Mad Hatter's Hat** (Learn how to download your program to the micro:bit.)
- ♣ Chapter 2: **Downside Up** (Discover code blocks and make things happen on the micro:bit.)
- ♣ Chapter 3: **Lock and Key** (Learn how to attach external inputs to the micro:bit.)



Please read the safety advice online at [microbit.org/guide/safety-advice](http://microbit.org/guide/safety-advice) before using the micro:bit.

## ADDITIONAL TIPS TO USE YOUR MICRO:BIT SAFELY

The tips below are not a substitute for reading the safety advice, however, we want to highlight some key points:

- ◆ Projects combine craft and tech activities. It's important that you have a tidy workspace. Make sure that materials don't unintentionally touch the micro:bit.
- ◆ Keep kitchen foil well away from the micro:bit unless you are using it as conductive material as instructed in a project. Don't use kitchen foil as decorative material.
- ◆ When you are not using the micro:bit, unplug the device and put it away.
- ◆ Try to only hold the micro:bit by its edges when it's in use.
- ◆ The micro:bit is designed to run cold. If yours is hot, stop using it and check the safety advice.
- ◆ None of the projects require you to connect crocodile clips to the micro:bit pin marked 3V (power supply pin).
- ◆ Do not attach the battery pack and the USB cable at the same time.

## CODING

You'll use the Microsoft MakeCode editor, with drag and drop code blocks, to programme the micro:bit.

The editor is free and runs in a web browser. It also runs on Chromebooks, Raspberry Pi computers and Android or iOS devices.

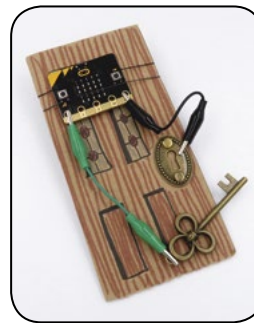
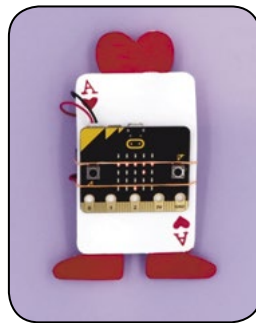
🌐 **Editor:** [makecode.microbit.org](https://makecode.microbit.org)

## CRAFT

We think it's important to continue to do craft activities to learn modern skills.

Each chapter includes some craft activity and tells you what materials you will need to complete the project.

🌐 **Find** additional templates and more information at [alice.techagekids.com](https://alice.techagekids.com).  
Templates are included in this booklet.



## MAKE IT YOURS

You will learn the skills needed to eventually imagine, design and make your own projects. Try the Challenges and Make It Yours sections in each chapter.

We'd love to see what you've created, so share images and videos of your projects with us on social media.

Remember when sharing to keep your personal information private. Take note of the age restrictions on social media platforms, children should ask a responsible adult to share their creations online.

🌐 **Find** us on [Facebook](#), [Twitter](#) and [Instagram](#) and share using the hashtag *#techalice*.



# 10/6 THE MAD HATTER'S HAT

## BONUS CHAPTER 1



### FOLLOW THE STORY

📖 **Read** Chapter 7 *A Mad Tea-Party* and meet the Mad Hatter with his top hat.

**A**t the Mad Tea Party the Hatter is wearing a top hat with a label on it. The label reads *In this style, 10/6*. It's a price tag.

The Hatter makes hats and this one is from his shop. Lewis Carroll wrote *Alice's Adventures in Wonderland* in 1865 when hats were handmade by Hatters.

### YOU WILL MAKE

In this project you'll use the micro:bit to make an electronic price tag for a papercraft top hat.

🖨️ **Print** a template from the website or find one with this booklet.

🌐 [alice.techagekids.com](https://alice.techagekids.com)

### YOU WILL NEED

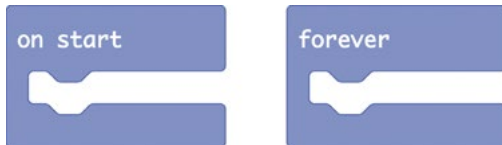
- ◆ micro:bit, USB cable and battery pack
- ◆ template or black/purple card
- ◆ loom bands
- ◆ scissors
- ◆ double-sided tape or sticky tape
- ◆ decorative material such as ribbon, washi tape, etc.



# CODING

## FIRST LINE OF CODE

In a browser go to the MakeCode editor ([makecode.microbit.org](https://makecode.microbit.org)). Start a new project. There will be two blocks on your screen **on start** and **forever**.



Let's find out what these blocks do.

Drag a **show string** block into the **on start**. You'll find it in the **Basic** section. Change the *Hello!* text so that it says *10/6*.

**Hint:** You should find the / (say **forward slash**) key to the right side of your keyboard.

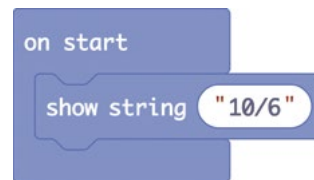
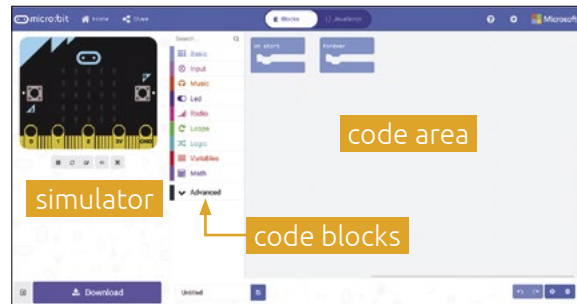
A **string** means a sequence of characters (like those you type on a keyboard).

Your code should automatically run in the simulator. Did you see it?

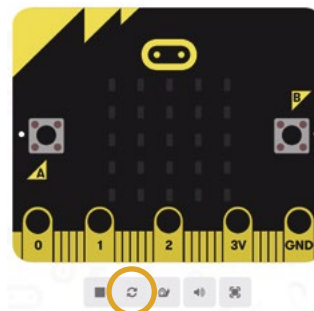
Don't worry, you can run your code again by pressing the **restart** button in the simulator.

Code that you put in the **start** block only runs once at the beginning of your program.

MakeCode editor



The character between the numbers in 10/6 is called a **slash** or **forward slash**.



## A BIT OF HISTORY: PRE-DECIMAL MONEY

Before we started using pounds and pence in 1971 there was an older system of money which used pounds, shillings and pence. 10/6 (say ten and six) means 10 shillings and 6 pence. A shilling was 12 pence so 10/6 is 10 lots of 12 pence plus 6 pence which is 120 pence + 6 pence or 126 pence. There were 240 pence in a pound so this was less than a pound.

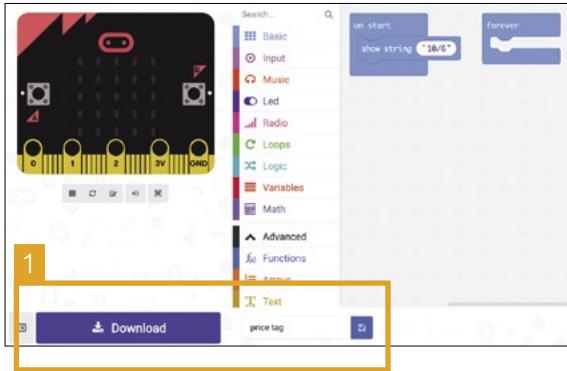
We changed to decimal money because most things are easier with 100 pence in a pound. 10/6 was quite a lot of money in Lewis Carroll's time. Hatters made hats by hand which took a lot of work.




## TRANSFER YOUR CODE TO THE MICRO:BIT

We'll show you a simple method to transfer your program from your computer to the micro:bit.

1. Name your project and click the big download button.



2. A pop-up screen will appear. Right-click the green download button and select **Save As**.

 **Tip:** Is the micro:bit connected to your computer with a USB cable?

3. Find the MICROBIT drive on your computer and click **Save**.

When the program is being transferred, a yellow LED will flash on the back of the micro:bit.


To restart the program, press the **reset** button on the back of the micro:bit.

## CHANGE YOUR CODE

It would be better if the price tag showed all the time.

Drag the **show string** block from the **on start** block and into the **forever** block.

What do you think will happen now?

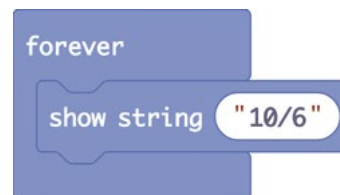
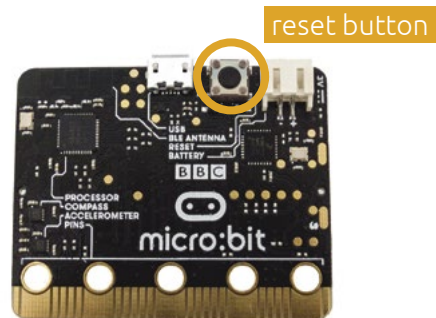
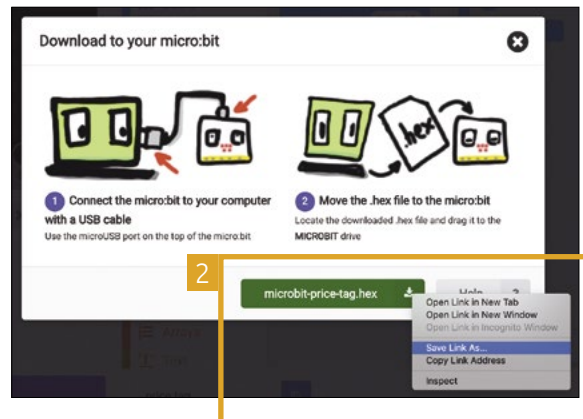
 **Test** your code in the simulator and see if you were correct.

When you are happy that your code is working, download it and transfer it to the micro:bit. You've made an electronic price tag.

### MICROBIT.ORG

You can program the micro:bit from a browser, Windows 10 app or mobile app. Learn more on [microbit.org](https://microbit.org).

Also find other projects, lessons and ideas to inspire you!




## CRAFT

Now become a Hatter and make a papercraft top hat for your price tag.

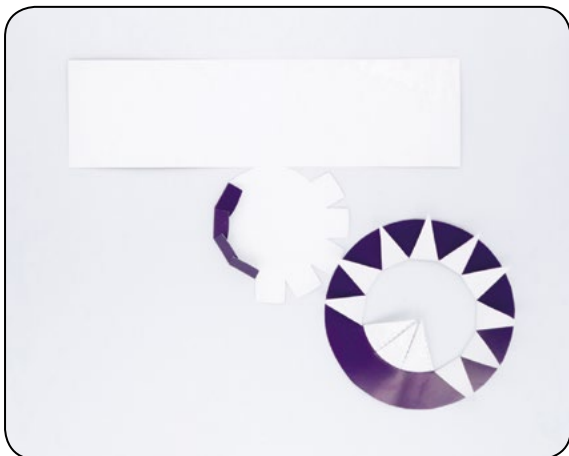
### HOW TO MAKE THE TOP HAT

1. Use scissors to cut out the two parts of the hat—the top and the brim. Cut along all the dashed lines. Be careful not to cut through the purple part on the brim.

 **Tip:** Fold the brim in half to cut all the dashed lines.

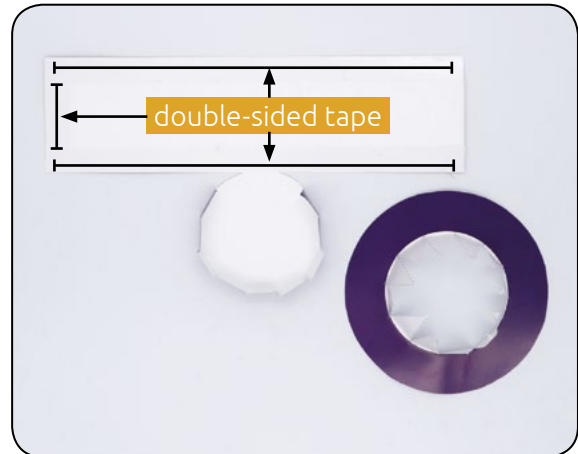


2. Fold the tabs of the top part inwards and fold the triangles of the brim outwards.

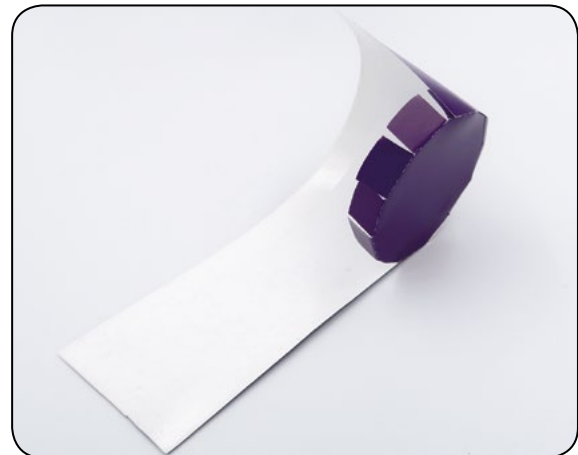


Print the template to make a mini top hat or use the template in this booklet.

3. Stick double-sided tape on the rectangle of the top part as shown below.



4. Roll the top part of the hat to create a tube. Stick the tabs to the double-sided tape as you go. You have two 3D pieces.





5. Attach the brim to the tube. The triangles will stick to the double-sided tape on the inside of the tube. Press down firmly with your fingers.



6. Decorate your top hat with ribbon, feathers, Washi tape, etc.


7. Attach your electronic price tag (micro:bit) to the top hat using a loom band.

Alternatively you can detach the micro:bit from the USB cable and power it from a battery pack.

## MAKE IT YOURS

Customise your project in your own style:

- ◆ Why not decorate the top hat with craft materials. You could add a coloured paper band around the top hat and a feather. Make sure you leave a clear space for the micro:bit price tag to go.
- ◆ How much would a handmade top hat cost today? Find out and change the price label to give a modern price.

**Tip:** To get a £ (pound) symbol on the keyboard you need to hold down the shift  key and tap the 3 key. Note: This may not be true for all keyboards.



## ATTACH THE BATTERY PACK

1. Secure the micro:bit battery pack inside the hat using sticky tape or double-sided tape.



2. Feed the wire through a gap in the top of the hat.



3. Attach the battery pack to the micro:bit and secure your electronic price tag to the top hat using a loom band.



## ABOUT

### MICRO:BIT IN WONDERLAND

*micro:bit in Wonderland* is a project book for the BBC micro:bit that guides beginners aged 9 and over through 12 projects inspired by *Alice's Adventures in Wonderland*. The projects develop modern skills in creative and computational thinking, computer programming, making and electronics.

The projects use simple, inexpensive electronics and everyday household and craft material and provide a playful introduction to coding, electronics and the BBC micro:bit.

Gradually build modern skills as you learn about wearables, electronic games, e-textiles, electronics circuits, digital music, animation and much more.

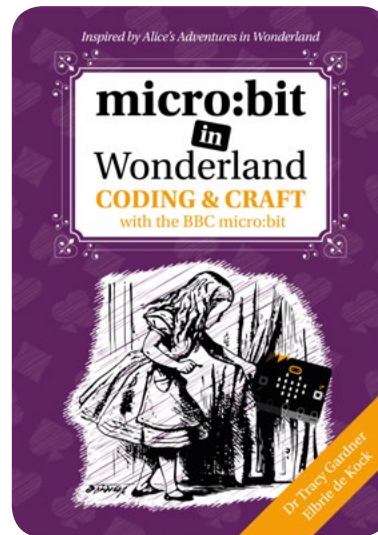
The book is published by Tech Age Kids and available in print or digital copy. It's updated to the latest MakeCode editor.

🌐 **Web:** [alice.techagekids.com](http://alice.techagekids.com) to purchase the book, micro:bit and accompanying electronics kit.

### THE AUTHORS

**Dr Tracy Gardner** has a **Computer Science** PhD. She worked as a software engineer and software architect, including 10 years at IBM. Tracy has two children and focuses on introducing technology to the next generation. She develops educational content for the Raspberry Pi Foundation. Between 2014 to 2017, Tracy taught Computing to Key Stage 2 children (aged 7-11). Tracy is a director of Tech Age Kids.

**Elbrie de Kock** has an Interior **Design** degree and worked in design, marketing and business development. Elbrie has three children. Her eldest son's passion for computer programming inspired her to find opportunities for kids to learn to code. She develops projects that combine craft, coding and electronics. Elbrie is a director of Tech Age Kids.



### TECH AGE KIDS

Tech Age Kids is an online company that helps parents and educators find **constructive** and **creative** uses of technology for children and teens.



The company creates educational material and online content for [techagekids.com](http://techagekids.com), including approachable project ideas, news and reviews of the latest educational and creative technology products, as well as advice on digital parenting issues.

Tech Age Kids believes that modern children should develop skills in **coding**, **electronics** and **design** so that they can understand the present and shape the future.

The company supports the **STEAM** (Science, Technology, Engineering, Art and Mathematics), **Maker** and Digital Making movements.

- ♣ Follow on social media at [Facebook](https://www.facebook.com/techagekids), [Twitter](https://twitter.com/techagekids), [Instagram](https://www.instagram.com/techagekids) and occasionally [Youtube](https://www.youtube.com/techagekids).
- ♣ Email at [hello@techagekids.com](mailto:hello@techagekids.com).

**PROJECT TEMPLATES**

**(BLACK & WHITE)**

Template for top hat and card character.

Print on card and cut along the **dashed** lines.

