

Create with **COZMO**[®]

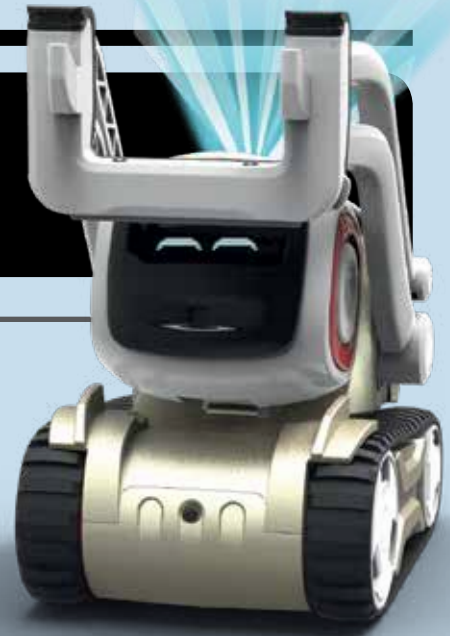
FUN WAYS TO
CODE YOUR
**ROBOT
SIDEKICK**



digitaldreamlabs

GETTING TO KNOW THE REAL COZMO

Cozmo is a gifted little robot with a mind of his own. To create him took a whole team of people, trained in robotics, computer science and movie sound design and animation.



IT TOOK **15** ENGINEERS,
2 ARTISTS, **3** DESIGNERS,
4 ANIMATORS AND
2 PRODUCERS OVER
3 YEARS TO CREATE COZMO.

COZMO USES **4** MOTORS AND
OVER **50** GEARS TO MOVE
AROUND THE WORLD!

Cozmo doesn't just get to see you —
he gets to know you! Cozmo uses a
high tech camera and facial recognition
software to see the world around him.



Cozmo engineers wrote millions of lines of code to help bring Cozmo to life.

In this book you'll be able to use code to create amazing projects with your own robot buddy!

Giving Cozmo the gift of sight was one of the first challenges the team had to overcome. Initially Cozmo had two big cameras that allowed him to see. It worked great, but he didn't look too friendly!

The team wanted to make Cozmo look more adorable. They tried out loads of different designs - including this one that looks a bit like a monkey cuddling his knees.

Cozmo ended up being exactly what the team wanted – fun, cute and mischievous. This was achieved by animating his eyes to communicate his different emotions. It also meant he didn't need his devilish horns any more!

When the real Cozmo emerged, all that was needed was to help him speak. Most of the time he talks to himself in his own language, but he can say a few different phrases that you'll understand and you can code him to say even more!



LET'S GET GOING!



LET'S GET STARTED WITH CODE LAB

You'll need to open up Code Lab in your Cozmo app to create all of the projects in this book.



HOW DOES IT WORK?

In Code Lab, you use **blocks** of code to create your projects. The blocks of code snap together to create stacks of code, which are also called scripts. In this book 'Block' refers to an individual block like this:

when face seen

'Stack' refers to multiple blocks of code that are snapped together like this:



You can run parts of your code by tapping the individual blocks and scripts. You can run your project by tapping the green flag button.



GREEN FLAG

when  clicked

Every time you create a new project you'll see a green flag block at the top of the screen. Once you snap this on to the top of your stack of code, you can run your project by clicking the green flag button.

USING THE BLOCKS



Drive



Actions



Animations



Events



Control



Sensors



Display



Operators

To use a block, go to the **Blocks Menu** on the left side of the screen and select a category. Hold your finger down on the block you want to use and drag it onto the blank space in the middle of the screen. You can see all the blocks in their categories in the Blocks Guide on pages 90–93.

To snap blocks together, drag another block (holding your finger down on the screen) and hover it over or close to the first block. Lift your finger up once you see the block's shadow and it will snap into place.

To take stacks of blocks apart, drag the bottom blocks down from the stack.

To remove blocks, drag them back to the Blocks Menu.

DIFFERENT LEVELS OF CODING



The first eight projects are **Coder Level I**. Each project is made with one stack of code. The stacks are broken down step by step to make them easy to understand. Once you get to grips with Level I, you're ready to move on to Level II.

Coder Level II. Projects have more than one stack of code. Each step breaks down different parts of each stack of code. When you move on to the next step, the stacks you've already made are faded out so that you can easily see what you've previously done. The instructions will tell you which part of the stack you're working on. At the end of each project, you can see all the stacks in one place.




Coder Level III is the most advanced. Each project consists of multiple stacks of code. You will use the coding concepts you learnt in Levels I and II. Complete this level and you're a coding expert!

BLOCK GUIDE

You can export using this button and submit it to be featured on the Cozmo website.

There is a guide at the back of this book that shows where you can find all the blocks.

There is also a glossary in the app that tells you what each block does. Use this button  to find it.

drive [X] mm at [Y] mm/s

drive 50 mm at 25 mm/s

Drive a distance of [X] millimetres at a speed of [Y] millimetres per second. Use a negative [X] distance to drive backwards.

Max [Y] speed: 220 mm/s.

turn [X] ° at [Y] °/s

turn 90 ° at 45 °/s

Turn [X] degrees at a speed of [Y] degrees per second.

A

Glossary

SOUND

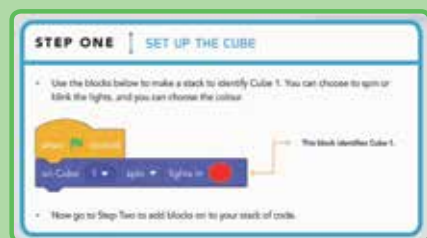
Don't forget before you start each project to turn your sound on.



STEPS

Each step in every project consists of three parts:

- **Title:** tells you which particular part of the project you're building.
- **Notes:** important information about how to build the stack.
- **Arrow to block text:** individual notes about the function of each block.



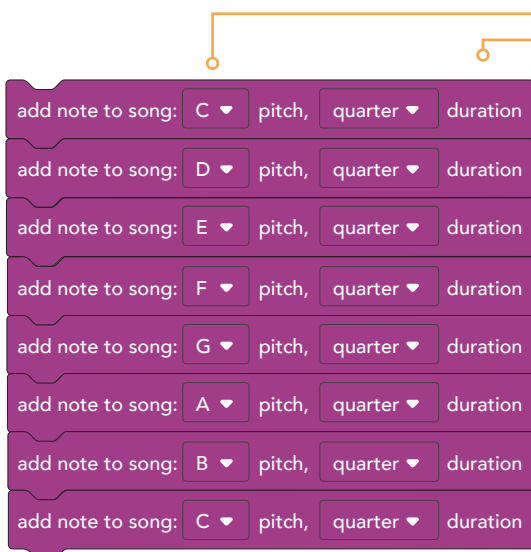
SINGIN' COZMO



Code Cozmo to sing a song.
In Step One, tell him which notes to sing.
In Step Two, learn to snap it all together to make him perform.

STEP ONE | ADD THE NOTES TO COZMO'S SONG

- Drag out eight of the blocks below and stack them together. Tap the drop-down menu in each block to change the notes. Change each duration to 'quarter'.
- Tap the stack to preview your song!



Play around with the notes to change the sounds.

The duration changes how long the note is played.

Each block adds a specific note with a specific length to the song.

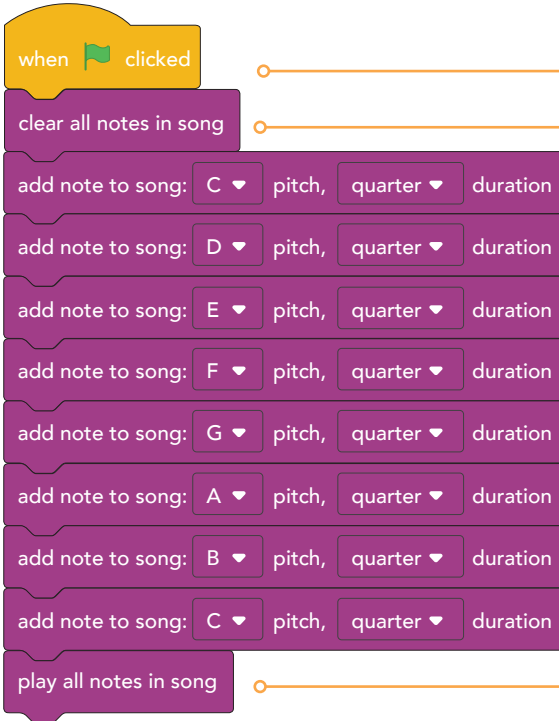
- Now go to Step Two to finish this stack of code and complete your project.

CODING CONCEPT: SEQUENCE

A sequence is a series of steps that make up a task. Snapping blocks together in a stack of code creates a sequence, like this song.

STEP TWO | MAKE THE SONG PLAY

- Complete your project by adding in the blocks below to the top and bottom of your stack.



Run the code when the green flag is tapped.

Add this block to 'refresh' Cozmo's song so that he doesn't save it.

This block tells Cozmo to sing the notes you've chosen.

CODING CONCEPT:

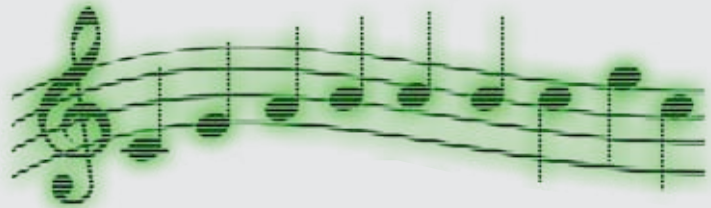
EVENTS

Events are things that cause another thing to happen. The **green flag** block is an example of an event that is included in each project of this book.

- Tap the green flag  to run your project.



YOU DID YOUR
FIRST PROJECT!
PAT YOURSELF
ON THE BACK!



THINGS TO TRY

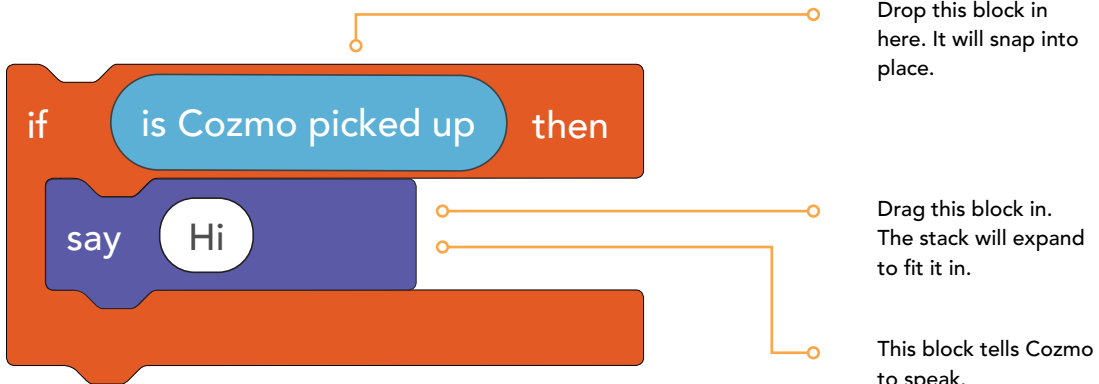
1. WHAT OTHER SONGS CAN COZMO SING?
2. WHAT OTHER SOUNDS CAN YOU TRY?
3. WHAT HAPPENS WHEN YOU CHANGE THE PITCH AND DURATION OF EACH NOTE?



Program Cozmo to talk to you.
In Step One, code him to talk when you pick him up.
In Step Two, learn to make it happen every time he's picked up.

STEP ONE | RESPOND TO BEING PICKED UP

- Start your project by dragging out the blocks below from the block categories. Place the **if then** block first and then drop the blue blocks into it.
- Tap the stack to preview your code. (Make sure you pick up Cozmo!)



- Now go to Step Two to add the final blocks to your stack of code.

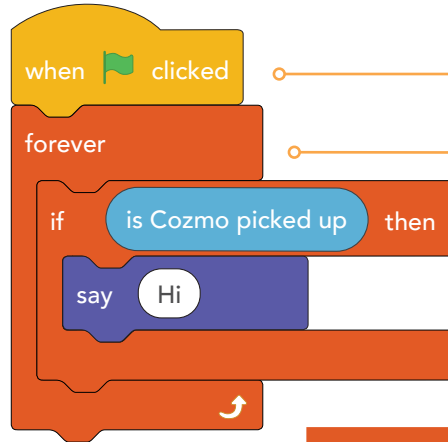
CODING CONCEPT:

CONDITIONALS

Conditionals make decisions based on things that can change. The **if then** block is an example of a conditional: **if** Cozmo is picked up, **then** he will say 'Hi'.

STEP TWO | MAKE YOUR CODE RUN FOREVER

- Drag out a **forever** block and hover it over the stack you've just created. When you take your finger off, it will snap around the entire stack.



Run the code when the green flag is tapped.

The **forever** block makes Cozmo say 'Hi' every time he is picked up.

These are the blocks you created in Step One.

CODING CONCEPT:

LOOPS

A loop makes your code repeat multiple times. This **forever** block is an example of a loop.

- Tap the green flag  to run your project.

STEP THREE | SAY SOMETHING ELSE

- Tap on the word 'Hi' in your stack and type in what you want Cozmo to say.



Cozmo can say more than 'Hi'!

OK

NO

GREAT

BONJOUR

YES



PROJECT NO.

3

CODER LEVEL I

LIGHTS. CAMERA COZMO!



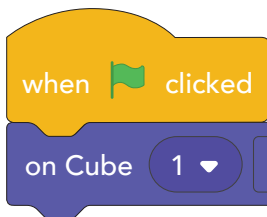
What will Cozmo do next?

In Step One, learn to communicate with Cozmo's Cube.

In Step Two, add in an animation to make Cozmo perform for you!

STEP ONE SET UP THE CUBE

- Use the blocks below to make a stack to identify Cube 1. You can choose to spin or blink the lights, and you can choose the colour.



This block identifies Cube 1.

- Now go to Step Two to add blocks to your stack of code.

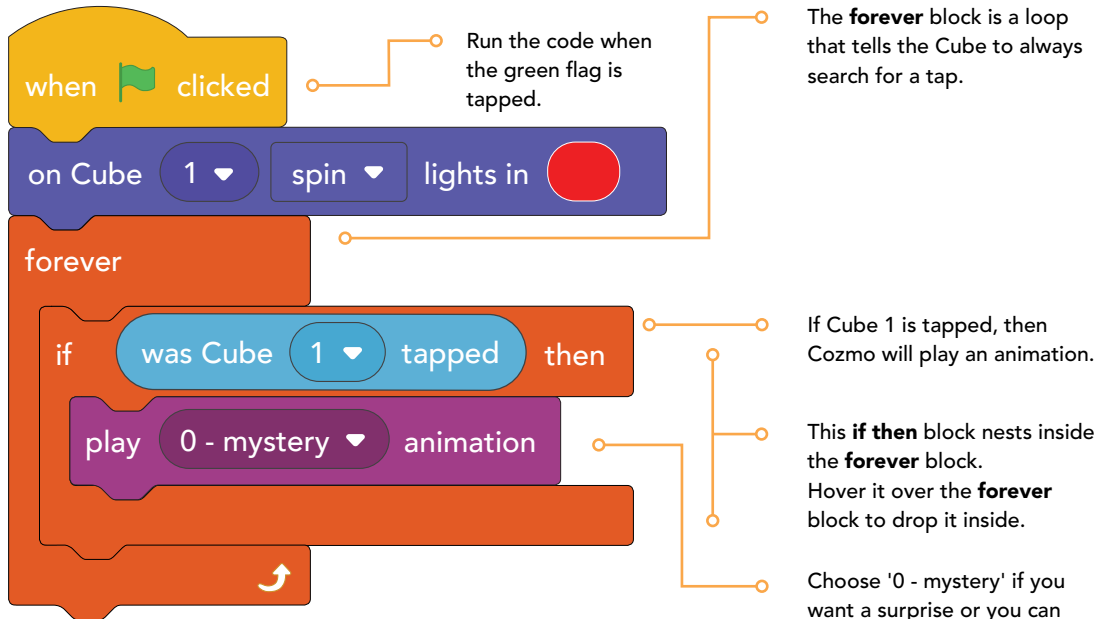
COZMO'S CUBES CAN FLASH,
SPIN THEIR LIGHTS AND
CHANGE COLOUR.



STEP TWO

CODE A MYSTERY ANIMATION

- Add the blocks below to the stack you've just created.
- Add the **forever** block first.



- Tap the green flag  to run your project.
- Then, tap Cube 1 to make Cozmo perform.



THINGS TO TRY

1. WHAT ELSE CAN YOU MAKE COZMO DO WHEN YOU TAP A CUBE?
2. WHAT OTHER ANIMATIONS DO YOU WANT TO TRY?
3. TRY ADDING MUSIC TO ACCOMPANY COZMO'S ANIMATION!



**DESIGN
TIME!**

DESIGN YOUR OWN PROJECT

CODER LEVEL 1

On this page you can design your own project, using the ideas you've learned as your inspiration. If your project doesn't work the way you expect it to, that's fine! Coders often discover new, surprising things when they experiment. Use the boxes to write down ideas and notes.



What are you going to try to do?

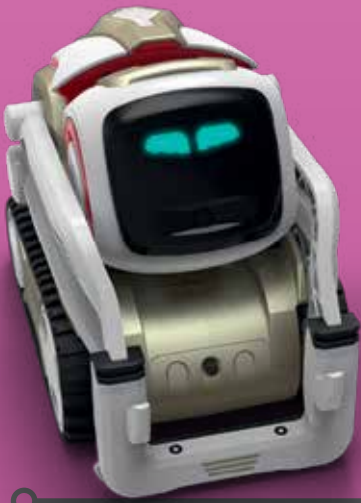
What blocks will you need to use?

How did you put it together?

Did your project work the way you expected it to? If not, what was surprising?

**YOU JUST INVENTED
AND CODED YOUR OWN
PROJECT! AWESOME!**





CREATIVE CODING

Express yourself with code!

These projects are designed to help you develop the mindsets and practices of a creative coder. As you create your projects, keep these ideas in mind!

CREATE AND EXPRESS:

Much like writing, coding is an act of expression where you can imagine, design, and make your ideas come to life. These projects are suggestions for the kinds of things you can create with Cozmo and Code Lab – use them as inspiration to design and create your own projects, too.

EXPERIMENT AND CHANGE:

The steps in this book are launching points – there's no one set way to make a project. As you code, your creation might surprise you! Try making a bit of your project, testing it out, then using what you discovered to make a little more.

TRY OUT AND DEBUG:

If something isn't working the way you want it to, that's okay! It's part of the coding process. Coders test out their projects as they go and figure out problems when they come up. If you're really stuck on something, try testing individual parts or working on another part of your project and returning to your debugging later.

SHARE AND REFLECT:

Sharing your work with others is an important part of the coding process! Try demo-ing your project to a friend or family member, and explaining how you created your work.



CODING CONCEPTS

All coders use these concepts!

As you move through the book, you'll encounter these computational concepts that are common across many programming languages. You've learnt about some of them already in the first eight projects.

SEQUENCES: Sequences are the steps that make up a task. Snapping blocks together in a stack of code creates a sequence.

LOOPS: Loops repeat a sequence multiple times.

CONDITIONALS: Conditionals make decisions based on things that can change, such as the value of a variable, or the environment.

VARIABLES: A variable is a value that you want your computer to remember.

EVENTS: One thing that causes another thing to happen.

OPERATORS: Operators support mathematical and logical expressions.

PHYSICAL SENSING: Code that allows interactions with cameras, gyroscopes, and other physical interfaces.

PARALLELISM: Parallelism is the idea of launching different sequences of instructions at the same time to make two or more things happen simultaneously.

COORDINATION AND SYNCHRONISATION: Code that coordinates and synchronises the actions of multiple stacks of code, such as the **broadcast** blocks.



GLOSSARY

Actions – Action blocks control Cozmo's lift movement, head movement, Cube lights and the lights found on his back

Adjective – a word that describes a noun or a pronoun

Advanced animation – the code used by the programmers for this is more advanced than the usual coding blocks

Alignment – position something in a straight line

Animation – in Cozmo's world an animation is when Cozmo does something to perform or comes to life for you

Backpack – part of Cozmo's physical makeup where he has his light on his back

Blocks – like building blocks, these snap together to make code

Broadcast – to send a message

Calibrated – to make or adjust settings or controls

Code – to write a computer program

Code Lab – the place where you can code with Cozmo on the app

Conditionals – things that can change, such as the value of a variable

Control – blocks that are used to control stacks


Coordination – makes things happen together

Cube – Cozmo's blocks that he can play with, work with and communicate with

Device – your phone, computer or tablet

Debug – to fix a piece of code that isn't working the way you want it to

Display – blocks that draw a temporary image that is only displayed on Cozmo's face



Drop-down menu – a block with an arrow, that when clicked reveals a menu

Emoji – an image used to express an idea or emotion digitally

Events – blocks that are used to start stacks and will always be at the top of a stack

Facial recognition software – computer software that identifies a person by comparing and analysing a person's facial contours

Gyroscope – spinning wheel or disc used to measure or maintain orientation

Inputs – used to describe when Cozmo's Cube is tapped

Laser – intense beam of light

Loops – repeat a sequence a number of times

Operators – blocks that let you code maths equations and use sequences of letters, numbers or other characters

Parallelism – to launch different sequences of instructions at the same time to make two or more things happen simultaneously

Physical sensing – code that allows interactions with cameras, gyroscopes and other physical interfaces

Program – either a computer program (a stack of code), or you can program code into stacks

Sensors – inputs that allow you to read current values

Script – another word for stack, when coding blocks are put together

Sequences – steps that make up a task

Stack – used in this book instead of script but has the same meaning

Synchronisation – coordination of events

Variables – a changeable value you want your computer to remember



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P33 Coding Concepts adopted from Brennan & Resnick, AERA

2012

and Computational Concepts Supported in Scratch

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