Edison the blueprint designer

Whether you are building a bridge, house, or a building it all starts with the ground plans, the blueprints. Can you program Edison to drive in different shapes so that the robot can draw different blueprints?

Jargon buster

What is a blueprint?

A blueprint is a design plan or technical drawing that details how to develop something. Blueprints are typically printed onto blue sheets with white lines and text that detail the dimensions and important structural components of designs. Blueprints are used in many different industries and are a fundamental part of engineering and architecture.

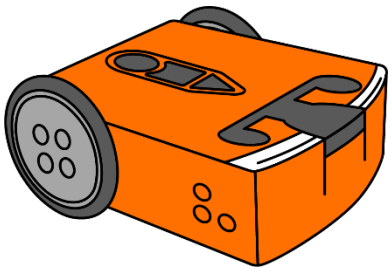
To program Edison to draw blueprints, there are a few things we need to learn:

- ☐ Part 1: What is an Edison robot?
- ☐ Part 2: How do you use EdScratch with Edison?
- ☐ Part 3: Let's try to make Edison draw a square!
- ☐ Part 4: What is a variable and iteration?
- ☐ Part 5: Your turn! Designing blueprints!

Have you used Edison robots and EdScratch before? Jump straight in at part 3!

Part 1: What is an Edison robot?

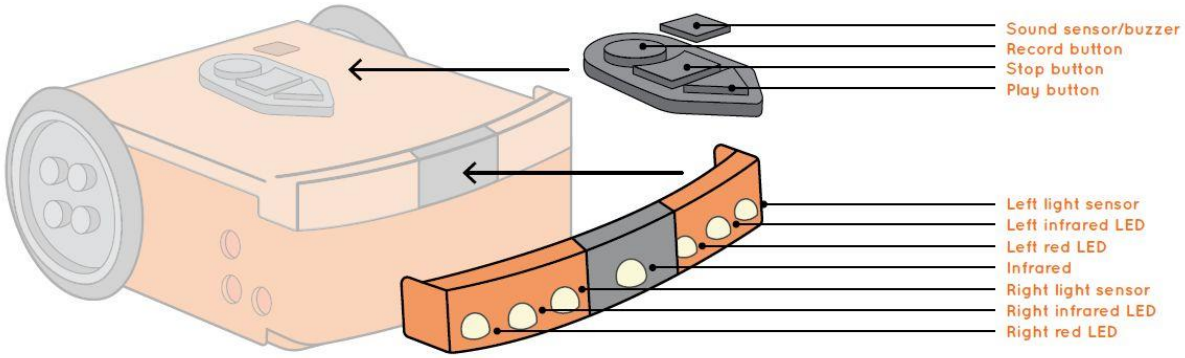
This is Edison, the programmable robot.



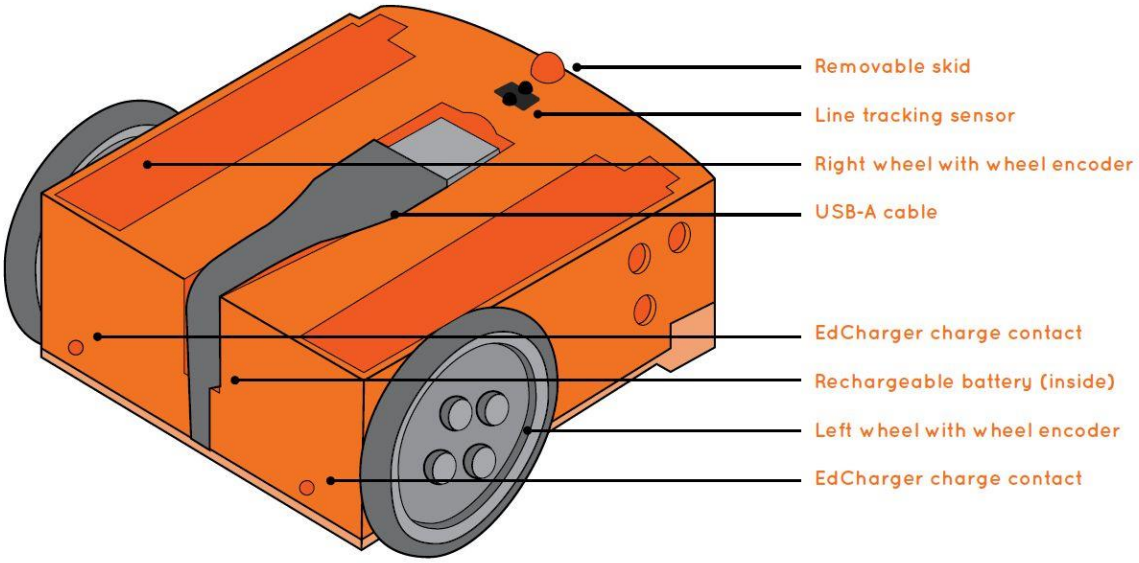
There's a lot we can do with our Edison robots. We can program the robot to do things like drive using its motors, flash its LED lights or make sounds. Edison also has different sensors which we can use to get the robot to behave in different ways.

Edison uses sensors and motors to interact with the world. The robot also has three buttons, a power switch and several removable parts. Knowing where Edison's parts are and what they do will help you use Edison.

Have a look at the top of your Edison robot. Try to find all of the parts labelled in the picture on your Edison robot.



Flip Edison over. Look at the picture and try to find all of the parts labelled in the picture on the bottom of your Edison robot.



Why is that?

The top of Edison is made of clear plastic. This way you can see the electronic components that make Edison work. One of the most important parts is the black-coloured square that sits just above the tip of the 'play' (triangle) button. Can you see it?

This is the robot's microchip. The microchip is basically a tiny computer, which is sometimes called a micro-computer. It contains the central processing unit (CPU). That's basically Edison's brain!

Part 2: How do you use EdScratch with Edison?

One of the best things about Edison is that you can make your own programs for your robot! To write a program for Edison, we need to use some special **software**.

Jargon buster

All computers have two main parts: hardware and software.

Hardware is the physical parts of a computer (or robot).

Software is the set of programs and applications that make hardware, like a computer or a robot, run.

The software we will use with Edison is a robot **programming language**.

Jargon buster

A **programming language** is a set of rules and instructions used to write computer programs. EdScratch is a programming language specially designed for programming Edison robots.

The programming language we will use is called EdScratch. Let's learn a bit about the EdScratch programming language.

Check out EdScratch

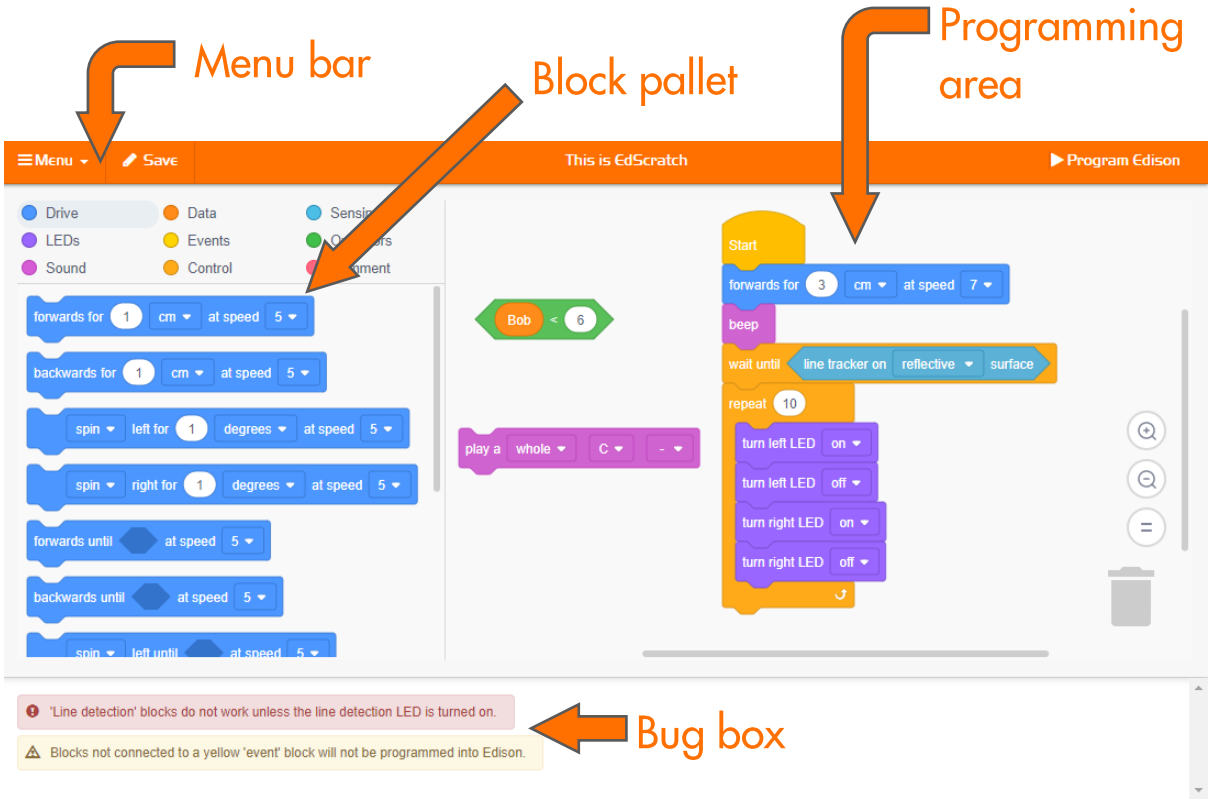
You can access EdScratch online.

Use this link

Go to www.edscratchapp.com

Whenever you want to program Edison using EdScratch, you will always need to go to the EdScratch app.

Here is what the EdScratch environment looks like:



The EdScratch programming environment has four main parts:

Block pallet

All of the blocks you can use are in the block pallet. To use a block, select it from the block pallet, and drag it into the programming area.

Programming area

The large area where you can connect blocks together into programs is called the programming area. Drag and drop blocks from the block pallet into this area to use them in your program.

Menu bar

Options such as 'Save' and 'Load' are accessed from the menu bar. The menu bar also has the 'Program Edison' button.

Bug box

Below the block pallet and programming area is the bug box. Warning messages will show up in the bug box.

Look at EdScratch on your computer. Find each of the four main parts of the EdScratch environment.

Part 3: Let's try to make Edison draw a square!

For this program, we are going to program Edison to draw a square, as squares are one of the fundamental shapes that are used in design blueprints.

When writing any program, it is a good idea to consider the steps a computer or robot would need to achieve the goal of the program and write *pseudocode*. When thinking of these steps, consider how Edison, or any computer would perform them, remember that computers need to be told exactly what to do!

Jargon buster

Pseudocode uses normal everyday writing to spell out exactly what you will be coding. It's a way to plan your code in English first and then you can translate it into computer language.

For pseudocode to be helpful you need to write out the steps you need to take to get from the beginning to the end of your program in detail, that way when it's time to code, you won't have to think what happens next.

For example, we know that a square has four sides and four corners. If we try to think like Edison, that means we need to drive straight four times (sides) and make four 90 degree turns (corners). Now we can write our pseudocode:

Repeat 4 times:

Drive forwards for (10) cm.
Turn left 90 degrees.

Then we turn our Pseudocode into code. Copy the program below into EdScratch:

The wait 0.3 second blocks are used to make sure Edison stops all momentum before attempting the next line of code, this ensures we have accurate turning.

Download your short program to Edison

Whenever you want to download a program from EdScratch to Edison, you need to follow these steps:

1. Connect Edison to your computer using the USB cable.
2. Go to the menu bar in EdScratch and click on the Program Edison button.
3. A pop-up window will appear asking to connect to Edison V3. Select 'Edison V3 – Paired' and click 'connect.'

Why is that?

Edison cannot understand the blocks in EdScratch the way they look on your computer screen. The blocks need to be changed into a format that Edison can understand before the program can be downloaded. This is known as compiling and can take a bit of time.

You will hear the program downloading to Edison. Once it is done downloading, Edison will make the 'success' beep. Don't unplug Edison until you hear the beep!

Why is that?

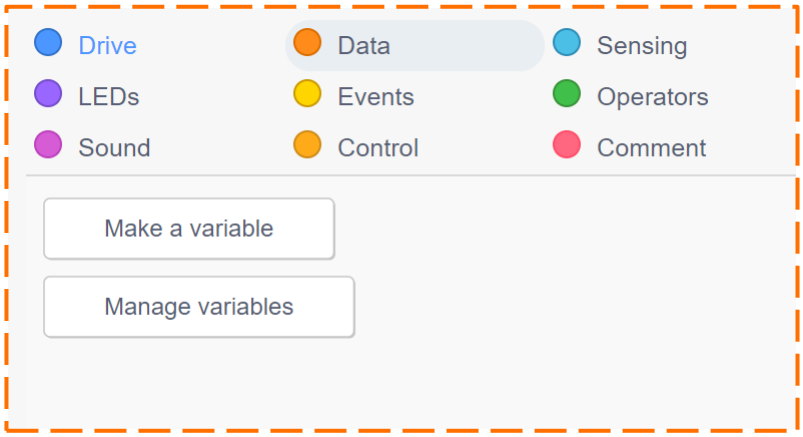
Edison will let you know if the program downloads correctly by making the 'success' beep. This is the same sound you hear when you first turn Edison on.

There's another sound Edison might make if a program does not download correctly. We call this the 'fail' sound. It means something went wrong when the program tried to download. If Edison makes this sound, try starting your download again.

After you hear Edison make the 'success' beep, unplug the robot from the USB cable. Press the play (triangle) button **one time** to run the program you should see Edison drive in a square!

Part 4: What are variables and iteration?

In EdScratch, there is one category of blocks that looks very different to the other categories when you first open it: the Data category.



When you first click on the Data category, there are no blocks available for you to use in an EdScratch program. Instead, there are two buttons: the Make a variable button and the Manage variables button. By using the Data category, we can create **variables** to use in our EdScratch programs.

Jargon buster

A **variable** is a bit of memory that is used to store a value in a program. You can think of a variable like a container that you can use to store some bit of information in a way that will make sense to a computer.

In computer programming, we often use the same bit of information multiple times in a single program. Variables make it a lot easier to do this. Using variables in programs lets us tell the computer to store a specific bit of information inside a variable. We can then use that variable in different places in the program. Any time the computer sees the variable, it will recall whatever information is stored inside the variable.

In EdScratch, when you click the Make a variable button, a pop-up window will open up asking you to give your variable a name. Giving variables good names is important: you want the name of your variable to make sense to you and tell you what bit of information is stored inside.

Your EdScratch variable names can only contain lowercase English letters, uppercase English letters, numbers, and underscores (_). Other symbols, like exclamation marks (!) or spaces, are not allowed.

Why is that?

Variable names need to make sense to you and to the computer. Computer languages often have rules about what characters can be used in variable names. The computer can only understand variables with names that follow these rules.

Give your variable a name that will help you identify what type of information is going to be stored inside the variable. If you want to change the name of a variable after you make it, you can do that using the Manage variables button.

Once you make and name a variable, it will appear in the Data category along with some other special blocks including the set block, the increment block and the decrement block. You can then use these blocks along with your variable in an EdScratch program.

Jargon buster

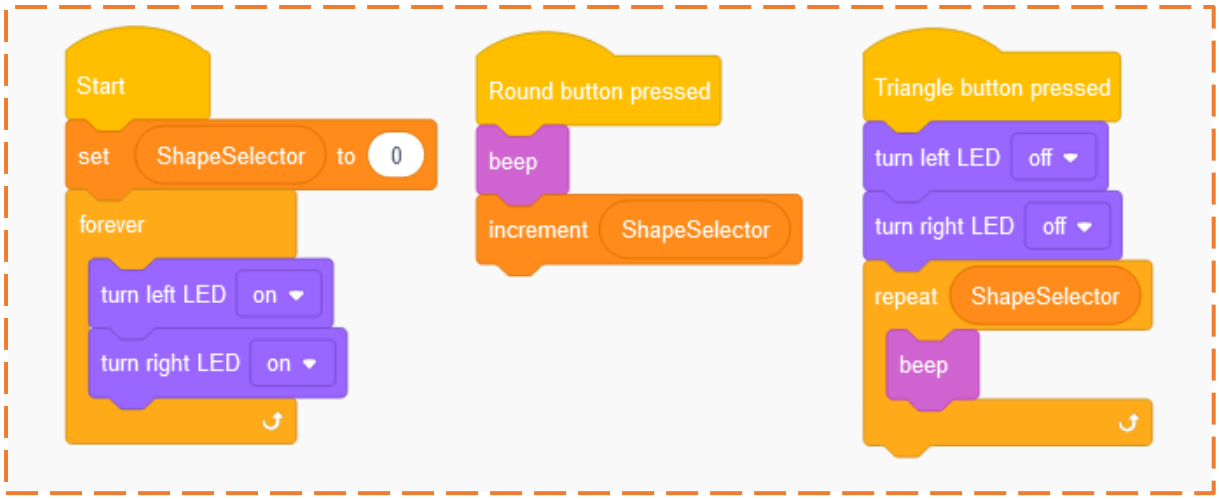
In computer programming, **increment** means to increase by 1 and **decrement** means to decrease by 1.

Creating the shape selector!

In EdScratch, we can use variables to store different values. One way that programmers use variables and values in various programs is comparing values. For example, if we have a variable that contains the value of 1 and another variable that contains the value of 1 a computer can tell us that these values are the same, which is very useful if we want the program output to change based on certain *conditions.*

To make Edison be able to draw various shapes that we program it with, we want to be able to select which shape Edison will draw, based on a condition. That condition is going to be the variable of ShapeSelector. Depending on what value ShapeSelector has at the time, Edison will be able to draw different shapes.

Try copying the code below into EdScratch:



This is going to be the main body of our blueprint drawing program, which contains an infinite loop to keep Edison on, an event that allows us to increment our ShapeSelector variable and another event that will tell Edison to 'go'.

It is important to note that a variable represents a value that is set somewhere in your program. That is why you always need to use code in your program to tell the computer what to set the variable to be.

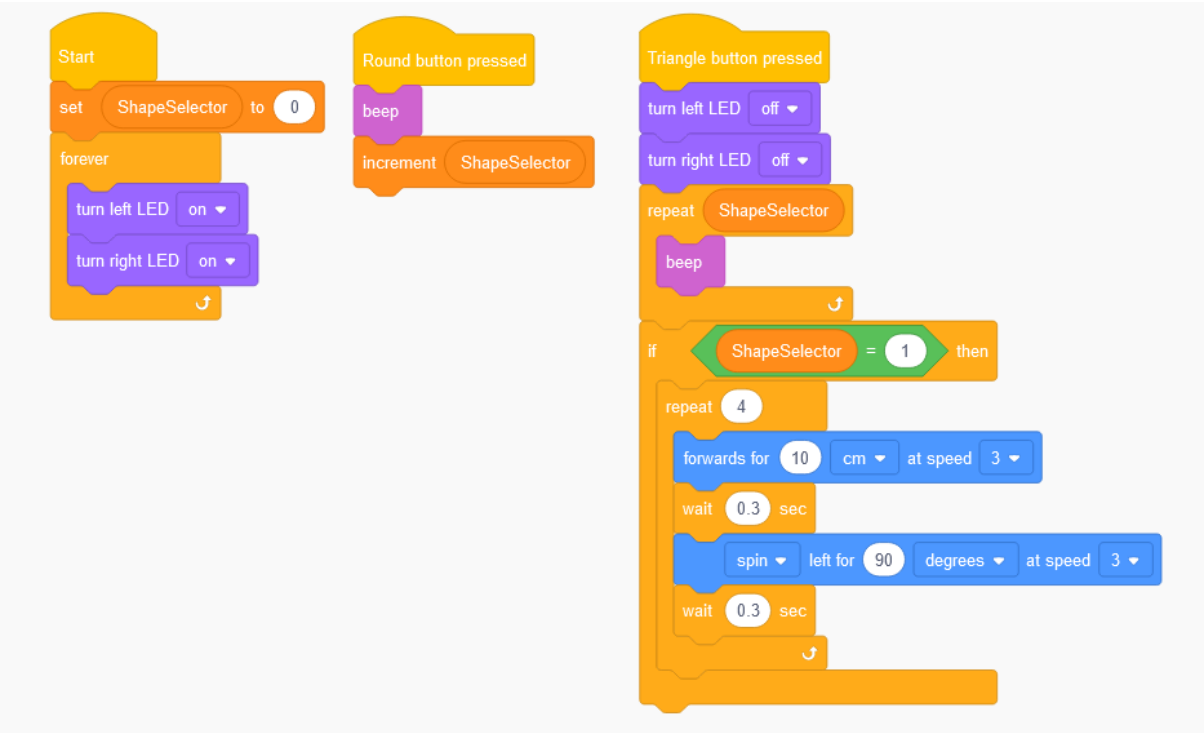
Using the set and increment blocks, we can maniupulate the ShapeSelector variable.

The increment block is under an event block and changes the variable ShapeSelector to a new value when the circle button is pressed.

In the future we will be using it to select which shape Edison is going to draw but for now it is only changing the amount of beeps Edison will do before returning to the infinite loop.

Part 5: Your turn! Time to design blueprints!

Using what you have learned about variables, and what you know about writing programs, program Edison so that you can increase the value of the ShapeSelector variable and change which shape Edison is drawing. A basic version of this program can be made by combining our short 'draw a square' program and our program that iterates the ShapeSelector variable, see below:



To add in new shape, you just need to add another if block that checks if the ShapeSelector variable is equal to another number, for example 2 or 3, and then add in your new shape.

The rest is up to you! You decide which shapes you will make Edison draw!

Please note: To get Edison to actually draw the shapes, you will need to design some sort of penholder that you can attach to Edison or have access to the EdSketch attachment!

Remember to plan out which shapes you think would be most useful for drawing blueprints and design the pseudocode to help you write the program! See what the strongest structure you can design is!

Bonus challenge!

Design a bridge blueprint with Edison, build the bridge out of your makers materials and see if you can get Edison to drive across it! If you don't have access to the EdSketch kit, you could also build your own penholder out of EdCreate or maker's materials!