

Gold Project

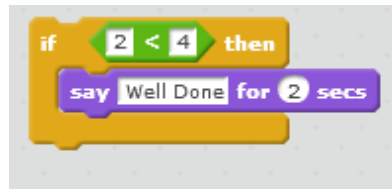
You can use scratch to draw pictures and make computer games. You can also use it to make your homework easier or to test your friends. In this project you are going to make a calculating machine that will test your friends and family on times tables. Let's see if you can beat your adult at home.

Here is a link to a completed calculating machine, have a play, but remember, the one you make can look and act however you want it to.

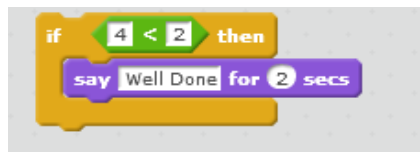
<https://scratch.mit.edu/projects/83554030/#editor>

I wanted scratch to check my sums. If I got them right Felix the scratch cat would say Well Done!

The first one said that 2 was smaller than 4. Try creating this code using the green OPERATOR block to see if I am right:



Is this one right? Does Felix say Well Done?

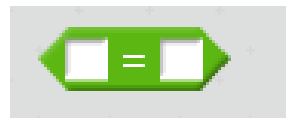


Let's try addition. I can put one operator block inside another to make an addition sum. Try this.

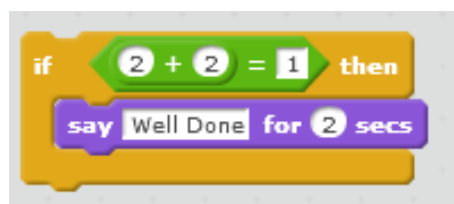
Put this block:



inside this block



To make this:



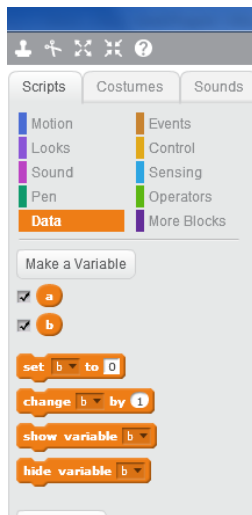
Is my sum correct? Can you fix it?

We can also work out multiplications using scratch, like this one:



Can you find the multiplication operator and make this code? What other multiplication calculations can you try out?

Each time we do a calculation we are telling scratch what numbers to use. Let's create a variable and get the player to give an answer and get Felix the cat to work out if the answer is correct. The first thing we need to do is make two variables:



If we have a variable **a** that can be any number and a variable **b** that can be any number we should be able to do any sum. So if **a** is 2 and **b** is 3 scratch could work out this sum with **c** being the answer:

$a + b = c$ so $2 + 3 = 5$ so for this sum **c** is 5.

If **a** was 6 and **b** was 9 then

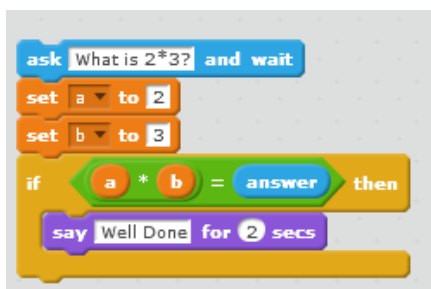
$a + b = c$ so $6 + 9 = 15$ so for this sum **c** is 15.

We could change the OPERATOR to Multiply (or Times) and do a different sum.



If **a** is 2 again and **b** is 3 again then, $a * b = c$ $2 * 3 = 6$ so the answer, **c**, is 6.

Try making this code:



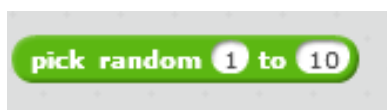
Can you change the code to ask the user these sums and get

Felix the cat to say if they are right:

$5 * 6$

$20 * 60$

We are still having to do work! Why can't Scratch decide what sum to ask? Well, it can if we give it the right code. We need to tell it to randomly pick its own number for variable **a** and **b** using this block:



We also need to join together words and variables into the sentence:

What is **a** multiplied by **b** using three of these blocks

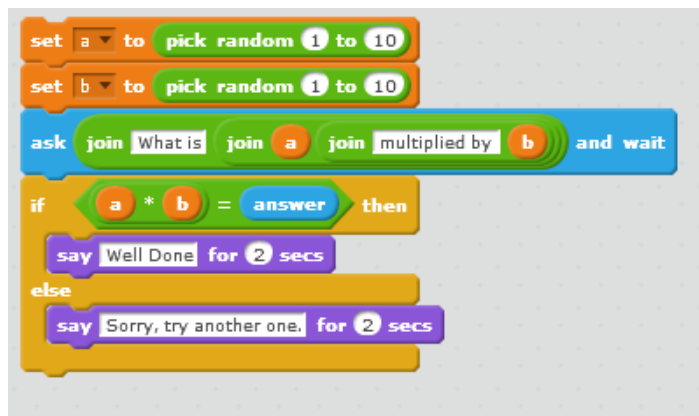


Try making this code, you will need three JOIN blocks:



Try changing the range of numbers in the random blocks to make the question easier and harder.

At the moment Felix the scratch cat only does something if the answer is correct. If the user gets it wrong they sit staring at an unchanging screen. Let's change our code to use an IF ELSE block, giving Scratch an instruction for what to do when $a*b$ does not equal the user's answer.



Try out your calculating machine on your friends and family. You may like to add a timer – how hard are you going to make it? You could add a score so you know how well each player did.

Have a look at the version we made:

<https://scratch.mit.edu/projects/83554030/#player>

Click on the SEE INSIDE button to look at the code. Does it make sense? What would you change? Taking someone else's project and altering it is called REMIXING.

Well Done!

You have taken one more step towards being a computer programmer. You looked for patterns and used them to solve a problem (this is Pattern Recognition and is very cool). You have solved a problem, making a calculating machine, by breaking it into smaller parts (this is called DECOMPOSITION and means you are totally boss). You have taken something complex, a multiplication sum and found a pattern to help you calculate *any* multiplication (this is called ABSTRACTION and means you beasted it).