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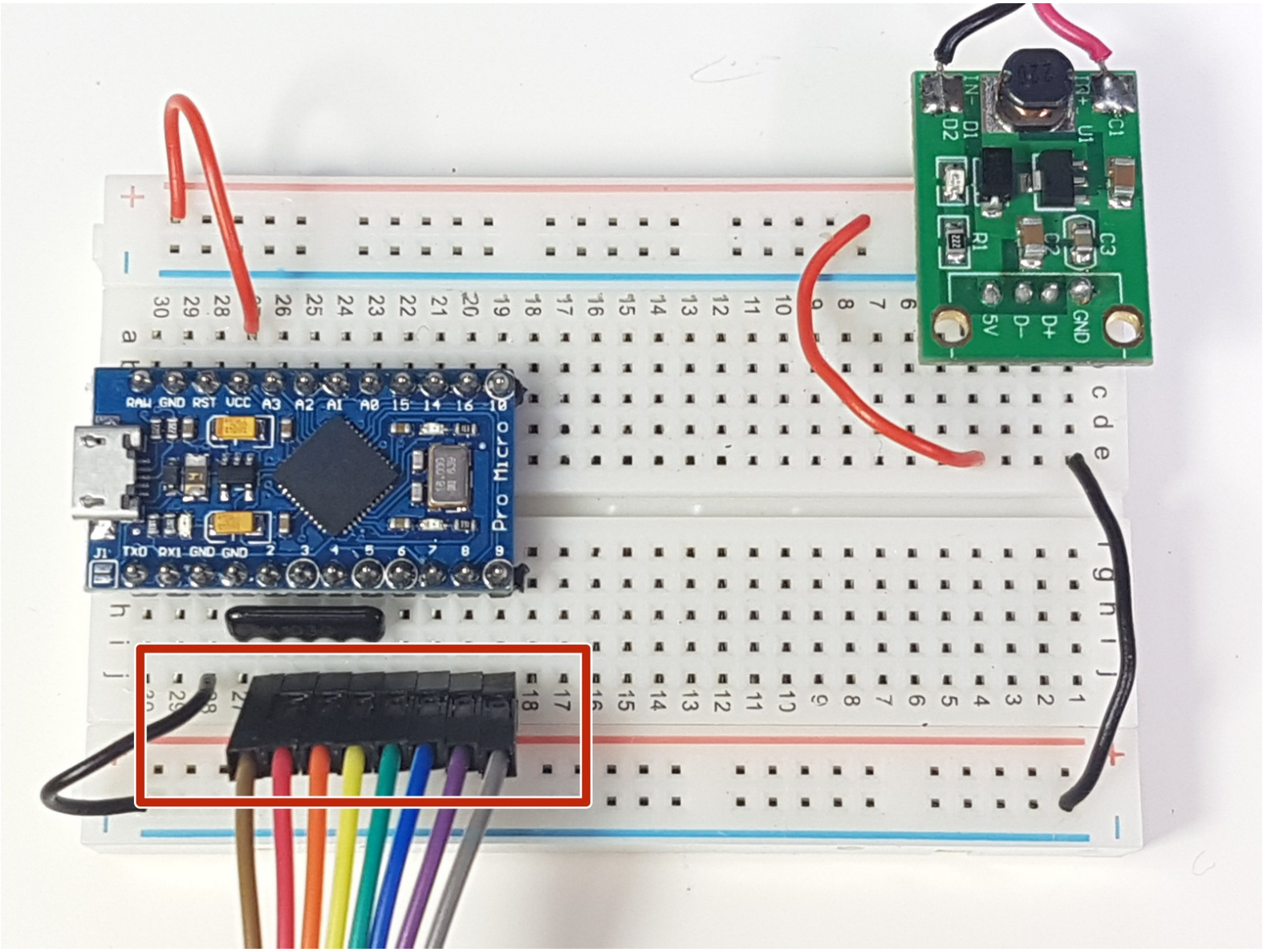
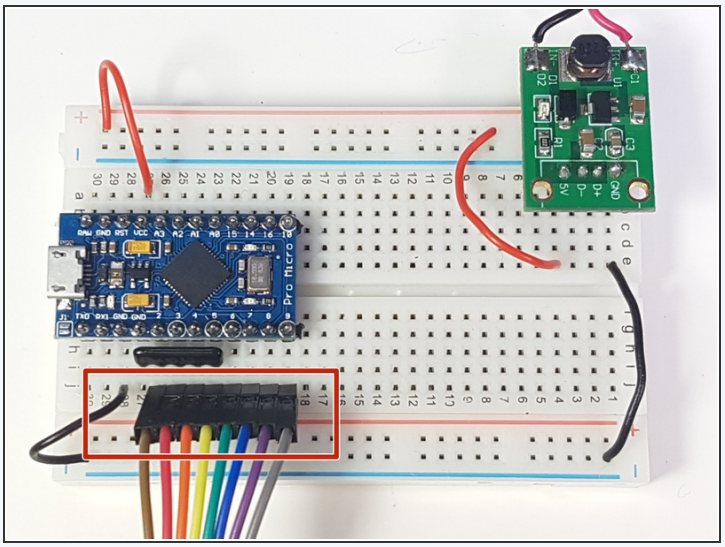
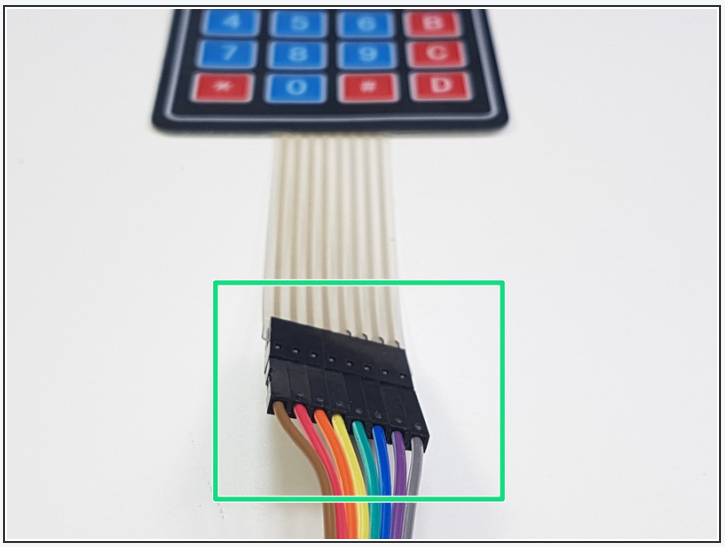
Inventor School Session 8 - Keypad

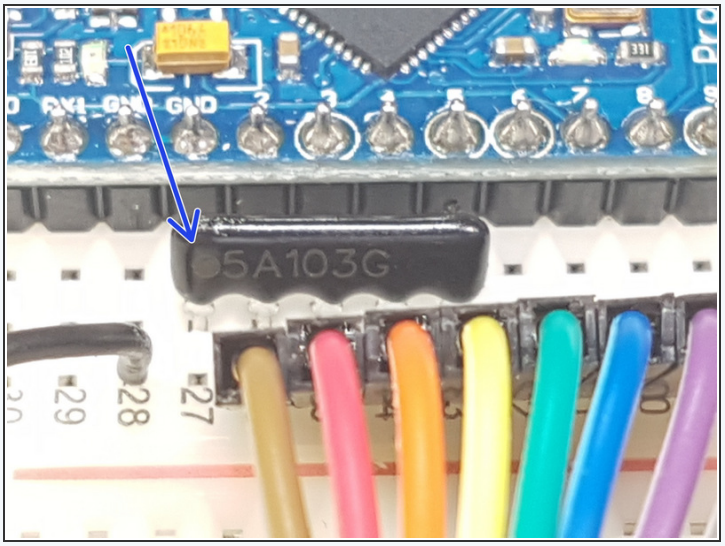


Step 1

Step 1 — Connecting the keypad







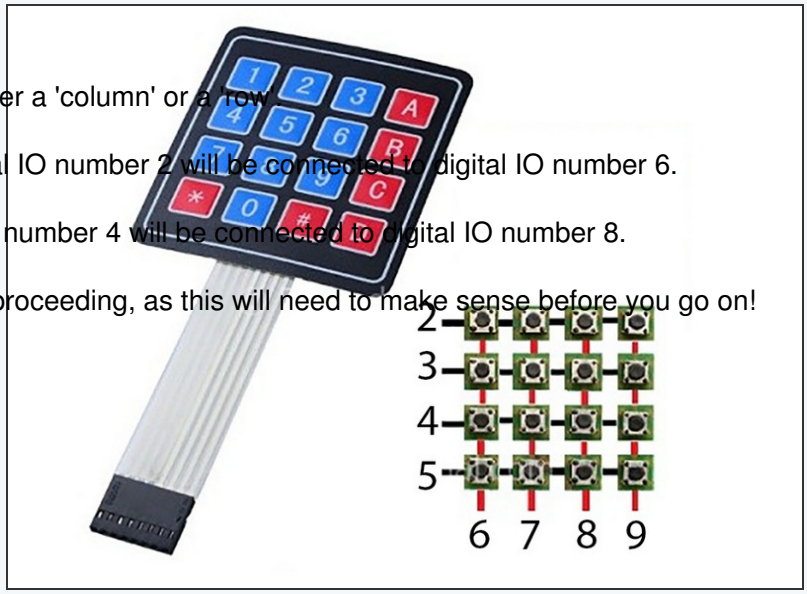
- Insert one end of the ribbon cable into pins 2-9 as shown. Make sure the colours look the same as the picture
- Connect the other end of the ribbon cable into the keypad as shown. Again, make sure the colours are the same as the picture.
- Insert the resistor network as shown. Note there is a dot printed on one end. This pin should be inserted into the column connected to the Arduino's 'GND' pin. The other pins should connect with the Arduino pins 2-5.

ⓘ This component is like 4 resistors in one - each connecting between one of the pins 2,3,4 and 5 and the GND pin. The purpose of this is to 'pull-down' the inputs so that they read a 'low' if none of the buttons is pressed.

Step 2

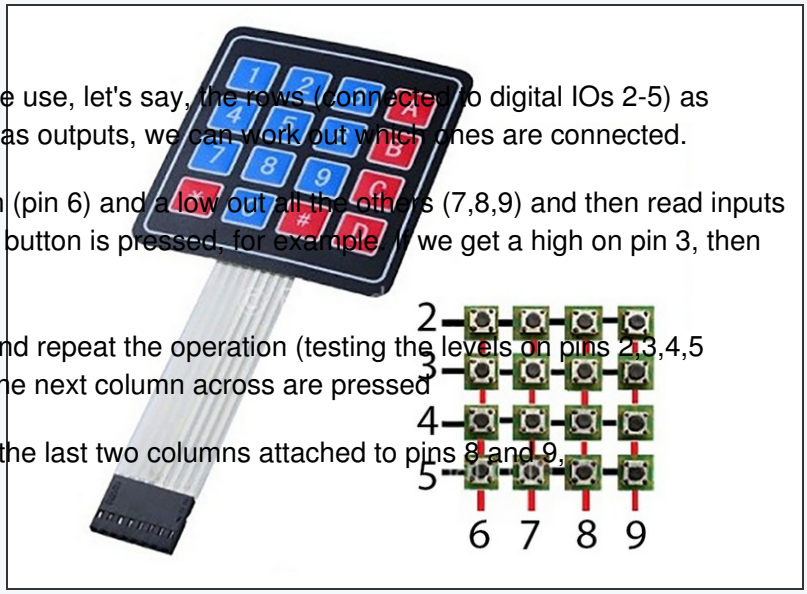
Step 2 — How the keypad works

- Each of the 8 pins of the keypad are connected to either a 'column' or a 'row'
- For example, if you press the top left button ('1'), digital IO number 2 will be connected to digital IO number 6.
- As another example, if you press the '9' key, digital IO number 4 will be connected to digital IO number 8.
- Clear as mud? If not, ask your tutor to explain before proceeding, as this will need to make sense before you go on!



Step 3 — Reading the keypad

- So how can we work out which button is pressed? If we use, let's say, the rows (connected to digital IOs 2-5) as inputs, and the columns (connected to digital IOs 6-9) as outputs, we can work out which ones are connected.
- The first step will be to send a high out the first column (pin 6) and a low out all the others (7,8,9) and then read inputs 2,3,4,5. If we get a high on pin 2, then we know the '1' button is pressed, for example. If we get a high on pin 3, then we know the '4' button is pressed.
- We'll then set pin 6 to a low, and just pin 7 to a high, and repeat the operation (testing the levels on pins 2,3,4,5 again) - this will allow us to work out if any buttons in the next column across are pressed
- We'll have to repeat this operation two more times for the last two columns attached to pins 8 and 9.

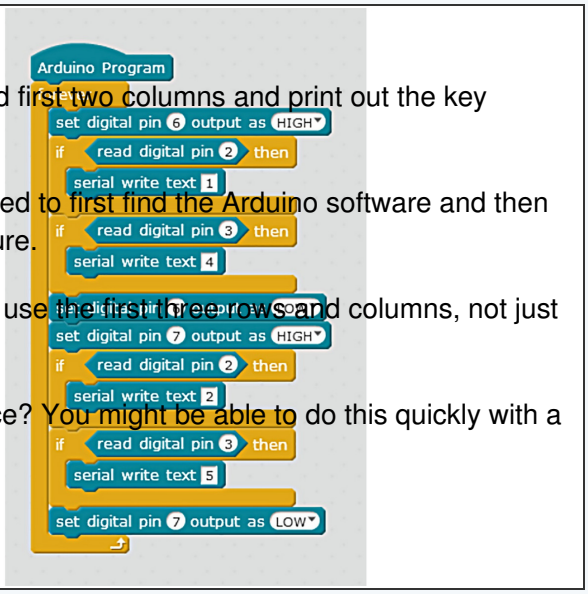


Step 4

Step 4 — Testing the Keypad

(M)

- Try the programme shown here. It should read just the first two rows and first two columns and print out the key pressed (key 1,2,4, or 5).
- To get this to work you'll need to use the Arduino serial monitor - you need to first find the Arduino software and then find it in the Tools menu. Your tutor can help you find this if you're not sure.
- Can you modify this programme to read all 9 digits? (Hint: you'll need to use the first three rows and columns, not just the first two!)
- Also can you get the programme to print out the digit you press only once? You might be able to do this quickly with a delay statment, but can you think of any other way of doing it?



Step 5 — Testing the keypad

(A)

- Try the programme shown here. It should read just the first two rows and first two columns and print out the key pressed (key 1,2,4, or 5).
- To get this to work you'll need to use the Arduino serial monitor - you can access this from the 'Tools' menu.
- Can you modify this programme to read all 9 digits? (Hint: you'll need to use the first three rows and columns, not just the first two!)
- Also can you get the programme to print out the digit you press only once? You might be able to do this quickly with a delay statment, but can you think of any other way of doing it?

```
void setup() {
  pinMode(6,OUTPUT);
  pinMode(7,OUTPUT);
  pinMode(9,OUTPUT);
  Serial.begin(9600);
}
void loop() {
  digitalWrite(6,HIGH);
  if(digitalRead(2))
    Serial.print('1');
  if(digitalRead(3))
    Serial.print('4');
  digitalWrite(6,LOW);
  digitalWrite(7,HIGH);
  if(digitalRead(2))
    Serial.print('2');
  if(digitalRead(3))
    Serial.print('5');
  digitalWrite(7,LOW);
}
```

Step 6

Step 6 — Reading the keypad and flashing lights

- Can you write a programme that reads the keypad and flashes a light the same number of times as the key you press? (Hint: you'll actually only need the first three rows and first three columns to do this)

Step 7 — Secret keypad deactivator

- Now create an alarm of whatever type you want (it could use the light or vibration sensor, or even the laser trip wire).
- Add to it a secret deactivator - when you type the correct 4 digit code, the alarm will deactivate

⚠ This is a tricky challenge! You'll probably want to ask your tutor for some help with this. They will be able to show you how to change your keypad reading code into a function to make it a little easier.