**Making Arduino on a Breadboard**

**Stuff should be used:**

* ATmega328P chip (already has Arduino bootloader)
* 16 MHz crystal
* Two tiny 22pF capacitors for the crystal
* 10k resistor for the reset pin
* Breadboard and some jumper wires
* FTDI USB-to-Serial adapter (5V one)
* Small 0.1µF capacitor (optional, but I put it in)
* 5V power from FTDI adapter

**How I connected things:**

**Power:**

* Connected pin 7 and pin 20 of the chip to +5V
* Connected pin 8 and pin 22 to ground

**Reset:**

* Put a 10k resistor from pin 1 (reset) to +5V
* Also connected pin 1 (reset) to FTDI DTR pin through a small 0.1µF capacitor — this makes auto-reset work

**Clock (Crystal):**

* Hooked one side of the 16 MHz crystal to pin 9 and the other side to pin 10
* From each side of the crystal, connected a 22pF capacitor going to ground

**FTDI connections:**

* FTDI VCC to +5V on the breadboard
* FTDI GND to ground
* FTDI TX to chip’s pin 2 (RX)
* FTDI RX to chip’s pin 3 (TX)
* FTDI DTR through 0.1µF capacitor to chip’s reset (pin 1)
* This is a way. Another way to upload code to the microcontroller is to sit it over Arduino uno ad reprogramme it.
* ANOTHER WAY :
* CONNECT tx of your Arduino board to pin 3.
* Rx to pin 2. And reset to pin 1 and upload code ..and make sure no microcontroller is plugged in Arduino .