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Arduino Help, Getting Started, & Links:

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(Source for the below info: http://electricrcaircraftguy.blogspot.com/2014/01/the-power-of-arduino.html)

For the Beginner:

- http://arduino.cc/en/Main/Products - it is very important that you thoroughly understand your Arduino --learn all about your particular Arduino board here!
- http://learn.adafruit.com/category/learn-arduino - absolute beginner tutorials--very fantastic website and information!
- http://arduino.cc/en/Tutorial/HomePage - hundreds of beginner tutorials and examples
- http://arduino.cc/en/Reference/HomePage - Arduino reference page -- you will come here often! If you aren't regularly referencing these pages, you should be! *You can also find the entire Arduino Reference right on your computer by going to Help --> Reference right inside the Arduino IDE (Integrated Development Environment). This is SUPER useful when working offline.*
- http://forum.arduino.cc/ - the Arduino forum - ask your questions and get help here
- Programming Arduino Getting Started with Sketches, By Simon Monk, $8.48 - GREAT BOOK.

For the Intermediate:

- Programming Arduino Next Steps: Going Further with Sketches, By Simon Monk, $12.89 - GREAT BOOK.
- http://playground.arduino.cc/Main/LibraryList - hundreds of user-contributed Arduino Libraries to expand what you can do with your Arduino!
    - Libraries I have contributed have names which begin with "eRCaGuy," so do a search for "eRCaGuy" on this page and you'll see my libraries.
- http://playground.arduino.cc//Main/InterfacingWithHardware - tons of user-contributed code and examples to interface with hardware
- http://playground.arduino.cc//Main/InterfacingWithSoftware - tons of user-contributed code and examples to interface with software (including data-logging and plotting, live data display, controlling your Arduino via a GUI on your computer, etc)
- http://www.cplusplus.com/ - Arduino is based on C/C++. As you become an intermediate user, you need to know that you are NOT limited just to the functions on the main Arduino Reference page. Rather, you have access to nearly *any* standard C/C++ function.
- http://www.nongnu.org/avr-libc/user-manual/modules.html - AVR Libc reference pages - This link contains a list of all of the C functions (organized by header files, .h files) that are available for use on ATmega microcontrollers/Arduino!
    - For a real description, & examples, of how to use one of these functions, however, I recommend simply Googling the function name you want, as follows: ex: I want to know how to use "scanf," so I Google "scanf c", and the first link that pops up is this: http://www.cplusplus.com/reference/cstdio/scanf/.
        - Or, let's say I don't know that "scanf" exists, but I want to know how to read parts of a string, out of a string. So, I Google "c read parts of a

string", and the first link I find is this: http://bytes.com/topic/c/answers/221802-how-read-part-string. Now, I read their code and see that "scanf" is used in their code, so I can either look for the reference page for this function on Cplusplus.com directly, *or* I can Google "scanf c", as described above, to find a good reference page describing it in detail.

- Alternatively, you can simply go directly to http://www.cplusplus.com/, or other similar C/C++ websites, and search for the function you want to use. Again, an Arduino can use virtually any C/C++ function, since that's what its language is based on!

For the Advanced:

- http://www.righto.com/2009/07/secrets-of-arduino-pwm.html - an absolutely FANTASTIC article on the intricacies of controlling the low-level PWM capabilities of an AVR microcontroller on an Arduino
- http://playground.arduino.cc/Main/TimerPWMCheatsheet - excellent info. to help you modify yourArduino PWM output frequencies quickly
- http://www.atmel.com/Images/Atmel-8271-8-bit-AVR-Microcontroller-ATmega48A-48PA-88A-88PA-168A-168PA-328-328P_datasheet.pdf - this is the 660 pg. datasheet of the Atmel ATmega 328 microcontroller, used by most Arduinos -- this is an absolutely ESSENTIAL document if you plan on doing low-level Arduino microcontroller programming, including direct manipulation of its timers, ports, registers and things
    - Find the main ATmega 328 webpage here: http://www.atmel.com/devices/atmega328p.aspx
- http://gammon.com.au/interrupts - an IMMENSELY USEFUL and well-written article, by Nick Gammon, on AVR microcontroller interrupts
- http://www.gammon.com.au/forum/?id=11504 - another EXTREMELY USEFUL article by Nick Gammon, on AVR microcontroller timers and counters
- http://yourduino.com/sunshop2/ and http://arduino-info.wikispaces.com/ - I have found a lot of good, useful info here.

Other Inspiring Links:

- TED Talk - Massimo Banzi (the primary founder of Arduino) - How Arduino is Open-Sourcing Imagination

More Links here:

Links in green are the ones I personally reference or recommend the most.

1. **Arduino Tutorials, Reference, & Help**
    a. Arduino.cc (http://arduino.cc/) – the main Arduino website
        i. → Learning → Getting Started - http://arduino.cc/en/Guide/HomePage - Arduino's "Getting Started with Arduino" page
        ii. → Download (http://arduino.cc/en/Main/Software) – download the software here
        iii. → Products (http://arduino.cc/en/Main/Products) – see the official line of Arduino products here; be sure to read the info for your specific product!
            1. → Compare Specs (http://arduino.cc/en/Products.Compare) – see how the various features of Arduino boards compare
            2. → Arduino Uno (http://arduino.cc/en/Main/ArduinoBoardUno) – the main documentation page all about the Uno!
            3. → Arduino Leonardo (http://arduino.cc/en/Main/ArduinoBoardLeonardo) – the main documentation page all about the Leonardo
                a. → "getting started page" – Guide to the Arduino Leonardo and Micro (http://arduino.cc/en/Guide/ArduinoLeonardoMicro)
        iv. → Learning → Getting Started
        v. → Learning → Examples – this page has TONS of code and examples to help you use a bunch of different hardware, sensors, libraries, code, functions, etc!
        vi. → Reference (http://arduino.cc/en/Reference/HomePage) – I use this page *nearly every single time I code*! It is absolutely essential to get familiar with these pages. An alternate way to get to the **Arduino Reference** pages is to go to "Help" → "Reference" within the Arduino IDE (Integrated Development Environment).
        vii. Forum – ask your questions and get help here! It can take as little as minutes or hours to get a response from a helpful, experienced user just trying to help others out.

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    b. The Power of Arduino (http://electricrcaircraftguy.blogspot.com/2014/01/the-power-of-arduino.html)
    c. https://learn.adafruit.com/category/learn-arduino - an EXCELLENT learning resource, containing lessons ranging from the "Adafruit Arduino Selection Guide: Which Arduino is right for me?," to Lesson 2 (LEDs), to Lessons 11 & 12 (LCD Displays), to motors, servos, sensing light, etc, all the way to Lesson 17 (email-sending movement detector…ie: an alarm-type system).

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    d. Books & FREE Code by Simon Monk
        i. http://arduinobook.com/ - see all of his books, and download his code, here.

ii. http://www.monkmakes.com/?page_id=408 – This is a nearly complete list of all of Simon Monk's books, many of which are for Arduino.
iii. Programming Arduino Getting Started with Sketches Paperback, $8.48 - http://www.amazon.com/Programming-Arduino-Getting-Started-Sketches/dp/0071784225
iv. Programming Arduino Next Steps: Going Further with Sketches, Paperback, $12.89 - http://www.amazon.com/Programming-Arduino-Next-Steps-Sketches/dp/0071830251

e. https://learn.sparkfun.com/
f. YouTube - https://www.youtube.com/
Ex: -Circuit Playground Episodes 1-3
1 - https://www.youtube.com/watch?v=exlRjDKHGRg
2 - https://www.youtube.com/watch?v=mzSnz6ZDkFE
3 - https://www.youtube.com/watch?v=sy_G1oYRQmM&hd=1
g. Lastly, Google it! Google "Arduino" and you will get thousands and thousands of hits. There are many hundreds of thousands, if not millions, of people using Arduino today!

2. Soldering Tutorials

a. https://learn.adafruit.com/adafruit-guide-excellent-soldering?view=all
b. https://learn.sparkfun.com/tutorials/how-to-solder---through-hole-soldering/all

3. Places to Purchase

a. Adafruit - https://www.adafruit.com/
b. Sparkfun - https://www.sparkfun.com/
c. Amazon - http://www.amazon.com/
i. Ex: http://www.amazon.com/Arduino-Ultimate-Starter-Includes-Instruction/dp/B00HI0RYJK (Arduino Arduino Uno Ultimate Starter Kit + LCD Module -- Includes 72 page Instruction Book, $65 –this is what we are using in our class!)
d. Ebay
i. Ex: ebay search for "arduino pro mini" - http://www.ebay.com/sch/i.html?_sacat=0&_from=R40&LH_BIN=1&_nkw=arduino+pro+mini&_sop=15 – cost as little as **~$2.50**, with shipping, for a board with full capability as the Uno, other than having a smaller voltage regulator (150mA max instead of 1000mA max).
1. Ex: http://www.ebay.com/itm/Arduino-PRO-MINI-ATMEGA328-5V-16M-MWC-avr328P-Development-Board-/271251071444 - **$2.59**, requires soldering headers
2. If you get the ~$2.50 Pro Mini board above, you'll also need a way to program it, so get one of these too:
a. Ebay search for "usb uart ttl 6pin" - http://www.ebay.com/sch/i.html?_sacat=0&_from=R40&LH_BIN=1&_nkw=usb+uart+ttl+6pin&_sop=15 **$2**
i. Ex: http://www.ebay.com/itm/USB-2-0-to-UART-TTL-6PIN-Connector-Module-Serial-Converter-

CP2012-TN2F-/291026499618 - **$2.05**; these work great!

e. YourDuino - http://yourduino.com/sunshop2/
f. Etc. etc. etc. Google it!

4. **Just a Few Neat Sensors to Try Out**
   a. http://www.adafruit.com/products/746 - Adafruit Ultimate GPS Breakout - 66 channel w/10 Hz updates - PRODUCT ID: 746 - $39.95
   b. http://www.adafruit.com/product/1603 - BMP180 Barometric Pressure/Temperature/Altitude Sensor - 5V ready - PRODUCT ID: 1603 - $9.95
   c. Ultrasonic Rangefinder (~$1.50 on ebay, or $5.38 here: http://www.amazon.com/SainSmart-HC-SR04-Ranging-Detector-Distance/dp/B004U8TOE6) – Tutorial here :http://arduino.cc/en/Tutorial/ping

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Ebay Shopping, Key Search Phrases, & Tips:

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Want ultra-economical prices? Need to use your *own* budget to fund your class projects or help students out? Ebay has super cheap prices to make this possible, without having to spend a ton of your own $$.

- Pros of Ebay shopping: dirt-cheap; high quality (usually)
- Cons of Ebay shopping: (usually) not helping the American producer/retailer; very slow shipping time (2~4 weeks)

Ebay Shopping Notes, Tips, & Keywords

-Don't buy from sellers with ratings below 97%. Seek for ratings 98% or higher.
-Use Paypal to complete your purchases.
-Use the "Contact the Seller" option, or open up a case if necessary, in the unlikely event that an item never arrives, or arrives broken. (Note: I have had a problem with < 3% of my orders, and all issues I've had have been resolved by refund or resending the product).
-Realize that most orders take 2~4 weeks to arrive, when coming from oversees.
-Seek out the items with FREE shipping where able.
-After typing in a search phrase, choose the "Buy it Now" filter option, and then sort it by price, lowest first, to make your life easier. Occasionally the "Best Match" sort is better than the "Sort by price" option.
-Here is an example search, to find dirt-cheap Arduinos to play around with:

1. Go to www.ebay.com
2. Type "arduino pro mini" into the search bar.
3. Click the "Buy it Now" option, and sort it by price, lowest to highest
4. Right click on the first item link and select "open in new tab"
5. Repeat for the next 5 or so that look good.

6. You now have 5 or 6 or so new tabs open. Quickly click through them to see the seller's rating. Find the right balance of seller rating and price that you like. (ex: I'd choose $3.30 and 98.2% rating over $2.68 and 97.1% rating).
7. Click the "Add to Cart" option.
8. Keep shopping.
9. When you have all the items in your cart that you want, click the "cart" button at the top-right corner of the screen, and check out. Be sure to pay with Paypal.

Key Ebay search strings for various Arduino parts (to help get you started):

-Don't forget to choose "Buy it Now" and to sort by price after typing in the search string

- "arduino pro mini" – get $3 Arduino boards, that have ALL of the same pins and features as an Uno. Note: they require soldering on headers, and they have 150mA 5V regulators instead of 1000mA 5V regulators, so beware that they can't provide much power to sensors and attached devices.
    - Ex: ebay search for "arduino pro mini" - http://www.ebay.com/sch/i.html?_sacat=0&_from=R40&LH_BIN=1&_nkw=arduino+pro+mini&_sop=15 – cost as little as **~$2.50**, with shipping, for a board with full capability as the Uno, other than having a smaller voltage regulator (150mA max instead of 1000mA max).
        - Ex: http://www.ebay.com/itm/Arduino-PRO-MINI-ATMEGA328-5V-16M-MWC-avr328P-Development-Board-/271251071444 - **$2.59**, requires soldering headers
        - If you get the ~$2.50 Pro Mini board above, you'll also need a way to program it, so get one of these too:
            - Ebay search for "usb uart ttl 6pin" - http://www.ebay.com/sch/i.html?_sacat=0&_from=R40&LH_BIN=1&_nkw=usb+uart+ttl+6pin&_sop=15 **$2**
                - Ex: http://www.ebay.com/itm/USB-2-0-to-UART-TTL-6PIN-Connector-Module-Serial-Converter-CP2012-TN2F-/291026499618 - **$2.05**; these work great!
- "arduino pro micro" – get $8 Arduino Leonardo-comparable boards, to be able to simulate a mouse or keyboard and manipulate a computer
- "arduino nano" – this time, click the "Buy it Now" option, but sort by "Best Match" instead of by price. For ~$8 you can get an Arduino Nano, which is basically identical to an Uno in capability, but is much smaller (requires being placed onto one of the 170-pin breadboards below). The nanos on Ebay usually have a 1000mA 5V regulator, similar to the Uno.
    - Ex: this one, sold by comelili: http://www.ebay.com/itm/Mini-USB-Nano-V3-0-ATmega328P-5V-16M-Micro-controller-Board-FT232RL-For-Arduino-/130977189883, $7.75 + $1 shipping; these work FANTASTIC! Never had a problem with one. They are very high quality, with excellent soldering and manufacturing.
- "10 170 breadboard" – get a pack of 10 pcs of 170-point mini breadboards for ~$10 with shipping
- "breadboard" – search around to your heart's content

- "tactile push button 6 6 4.3" – a very common, breadboardable pushbutton! – make sure its 6x6x4.3mm; you can get 100 of them for < ~$2.50
- "photoresistor" – get some light sensors! – get 20 or so for $0.99
- "22 Mohm resistor" – use to make your own Makey Makey! (http://makeymakey.com/)
- "5mm led" – buy leds to your heart's content!
    - Some come in really nice packs of 50 or so, of assorted colors, with included resistors!
- "arduino distance" – get the ultrasonic rangefinder ("ping") sensors for as little as $1~$2!
    - Ex: http://www.ebay.com/sch/i.html?_sacat=0&_from=R40&LH_BIN=1&_nkw=arduino+distance&_sop=15
- "bmp180" – pressure altimeters for ~$4.50~$5.00
    - However, these on Ebay usually require a level shifter (to change the Arduino pin voltage levels from 5V to 3.3V), so I recommend the one on Adafruit more instead, for $10 here: https://www.adafruit.com/products/1603
- "cd4050 buffer" – level shifters (convert your signal levels from 5V → 3.3V, for example, to communicate with devices that require 3.3V operation)
    - Note: Adafruit sells a nice, and very easy-to-use I^2C-compatible level shifter here, too, in case you want to use this instead: https://www.adafruit.com/products/757 (4-channel I2C-safe Bi-directional Logic Level Converter, $4)
- "3.3v regulator" – get 3.3V regulators for projects that require this voltage and would otherwise be damaged by 5V
- "2.54 pitch headers" – straight headers to solder onto the Pro Minis and things
- "2.54 right angle header" – angled headers to solder onto the Pro Minis and things – ex: these are great for the 6 programming pins on the Pro Mini, though straight headers can be used of course too
- "dupont jumper 40pcs" – very high quality jumper cables, for very low prices; they come with 40 strands all connected to a ribbon cable; to use them, simply peel off the individual cables from the ribbon.
    - You can get male to male, male to female, or female to female. I recommend getting some of each, since you never know what you might need on a project.
- "resistor kit" – assorted resistors; for this search, after clicking the "Buy it Now" filter, the "Best Match" sort option is probably better than sorting by price.
- "47uF capacitor 100" – get 100 pcs of this very common and useful electrolytic capacitor for only ~$3
- "1uF ceramic capacitor 100" – get 100 pcs of this very common and useful ceramic capacitor for only ~$2

When all is said and done, if you are not comfortable piecing and hacking things together, USE ADAFRUIT!!!! Her products come with very detailed instructions, are already put together in nice kits with all the parts you need, and THEY JUST WORK!!! Her tutorials are absolutely fantastic too, and she assembles all of her kits in the US!
-However, if you don't mind tinkering a little extra, and waiting a lot extra, and price is your dominating concern, then Ebay is the way to go.