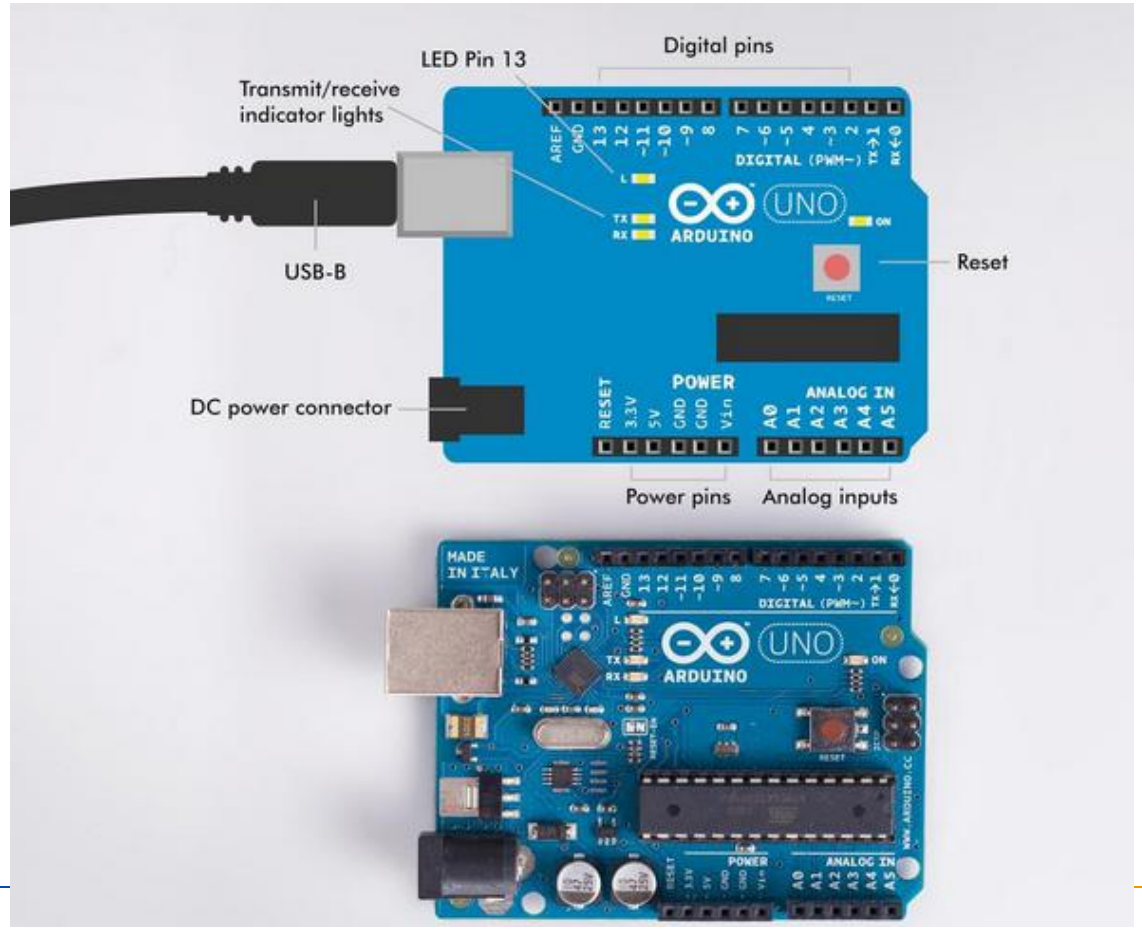
4. Development Tools-Arduino

Contents

Ready to work

- Arduino is a simple and robust development board (Figure 2-1). It's one of the simplest options available for making the electronics world programmable, and it's extremely reliable as well.
- It doesn't take much to get started with Arduino.
- To make something interesting happen, you just need an Arduino Uno and a USB cable;



Ready to work

- First, we'll show you how to install the Arduino development environment (often called IDE, or integrated development environment) on your computer.
- After that, you'll plug in a USB cable and upload your first program (called a *sketch* in Arduino parlance).
- There's only one program you install on the Arduino—the sketch that you're running.
- Aside from that, there's nothing else to maintain because, unlike with Raspberry Pi, Arduino has no operating system. It's just you, your program, and the bare metal.

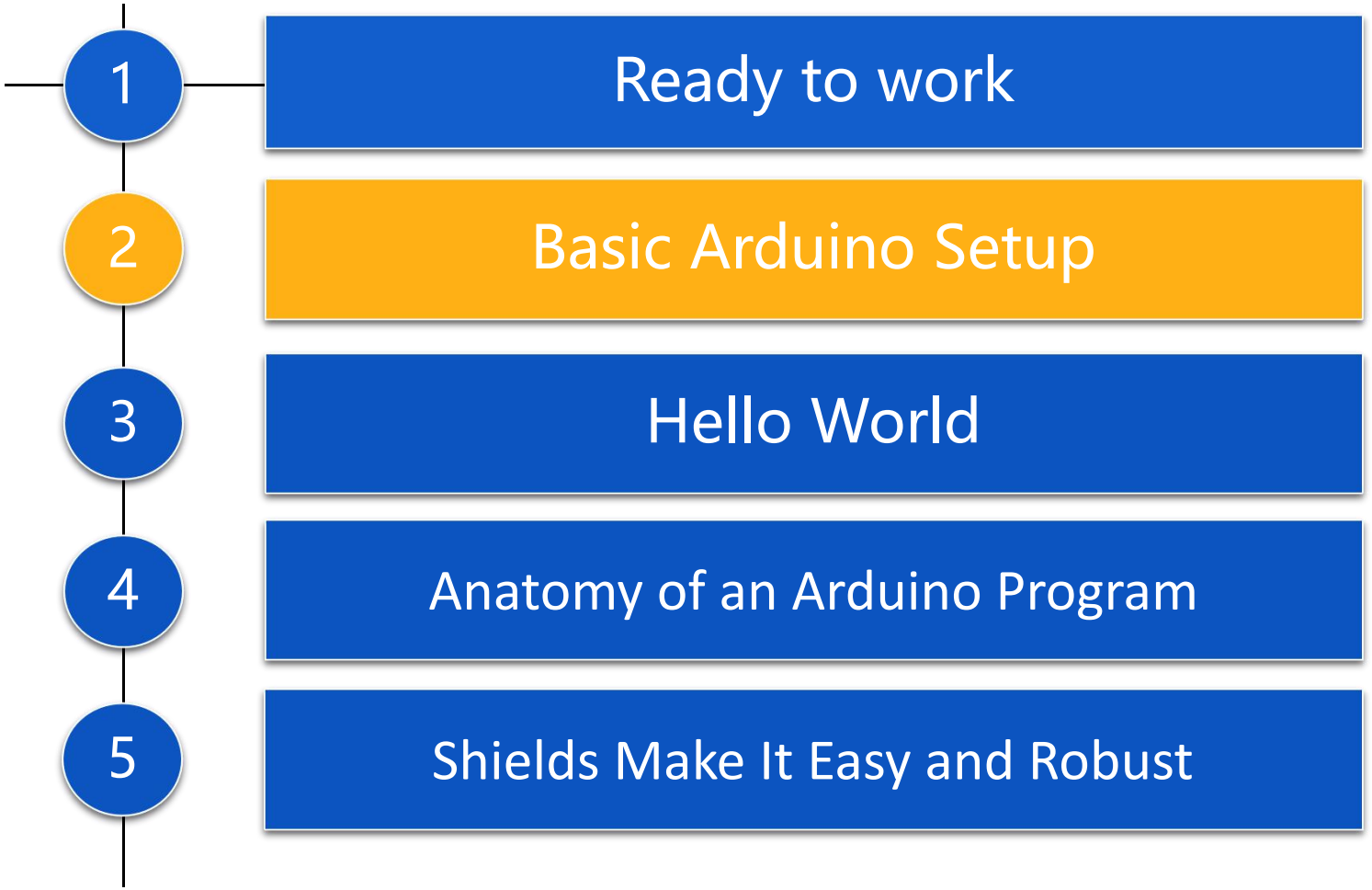
Ready to work

- There’s one more piece, actually. Arduino has a **bootloader** that occupies a small amount of the chip’s available storage.
- The bootloader is a small program that runs briefly when you power up or reset the board, and lets you load programs over USB without the need for a separate hardware programmer device.

Ready to work

- The Arduino Uno is robust. It's unlikely to suffer damage even if you were to connect a wire the wrong way (but don't get too careless because, with enough abuse, it is possible to fry a pin on the Arduino).
- It's very easy to learn Arduino. Beginners can accomplish a lot of things just by turning pins on and off.
- Unlike with Raspberry Pi, you can plug analog resistance sensors directly into the Arduino without needing external hardware, because Arduino has a built-in analog-to-digital converter.

Contents


1
Ready to work
2
Basic Arduino Setup
3
Hello World
4
Anatomy of an Arduino Program
5
Shields Make It Easy and Robust

Basic Arduino Setup

- Here's how to get set up with Arduino on Linux, Windows, and Mac.
- **UBUNTU LINUX**
  - Connect Arduino to your computer with a USB cable.
  - Arduino draws power directly from USB, so no external power supply is needed.
  - Start the terminal application.

Basic Arduino Setup

- Here's how to get set up with Arduino on Linux, Windows, and Mac.
- **UBUNTU LINUX**
  - To install the Arduino IDE, install the arduino package. Here's how you'd do it on Ubuntu Linux:

```
$ sudo apt-get update
$ sudo apt-get -y install arduino
```

Basic Arduino Setup

- UBUNTU LINUX
  - Give yourself the permission to access the serial over USB port
  - this is required by the Arduino development environment to function.
  - The first command adds you to the dialout group, and the second command switches you into that group without you needing to log out and back in again:

```
$ sudo adduser $(whoami) dialout
$ newgrp dialout
```

Basic Arduino Setup

- UBUNTU LINUX
  - Start Arduino:

    $ arduino

  - The Arduino IDE opens.
  - After you have logged out and back in, you can also start Arduino IDE from the menus.

Basic Arduino Setup

Windows 7 and Windows 8

- Download the latest version of the Arduino Software from http://arduino.cc/en/Main/Software. Unzip the file you downloaded to any location that you find suitable (your Desktop or Downloads directory for example).

Basic Arduino Setup

- **Windows 7 and Windows 8**
  - Connect Arduino to your computer with a USB cable.
  - Arduino draws power directly from USB, so no external power supply is needed.
  - Windows will automatically open the Arduino driver installer, which may fail to install and display an error dialog.

Basic Arduino Setup

- 如果驱动安装失败：

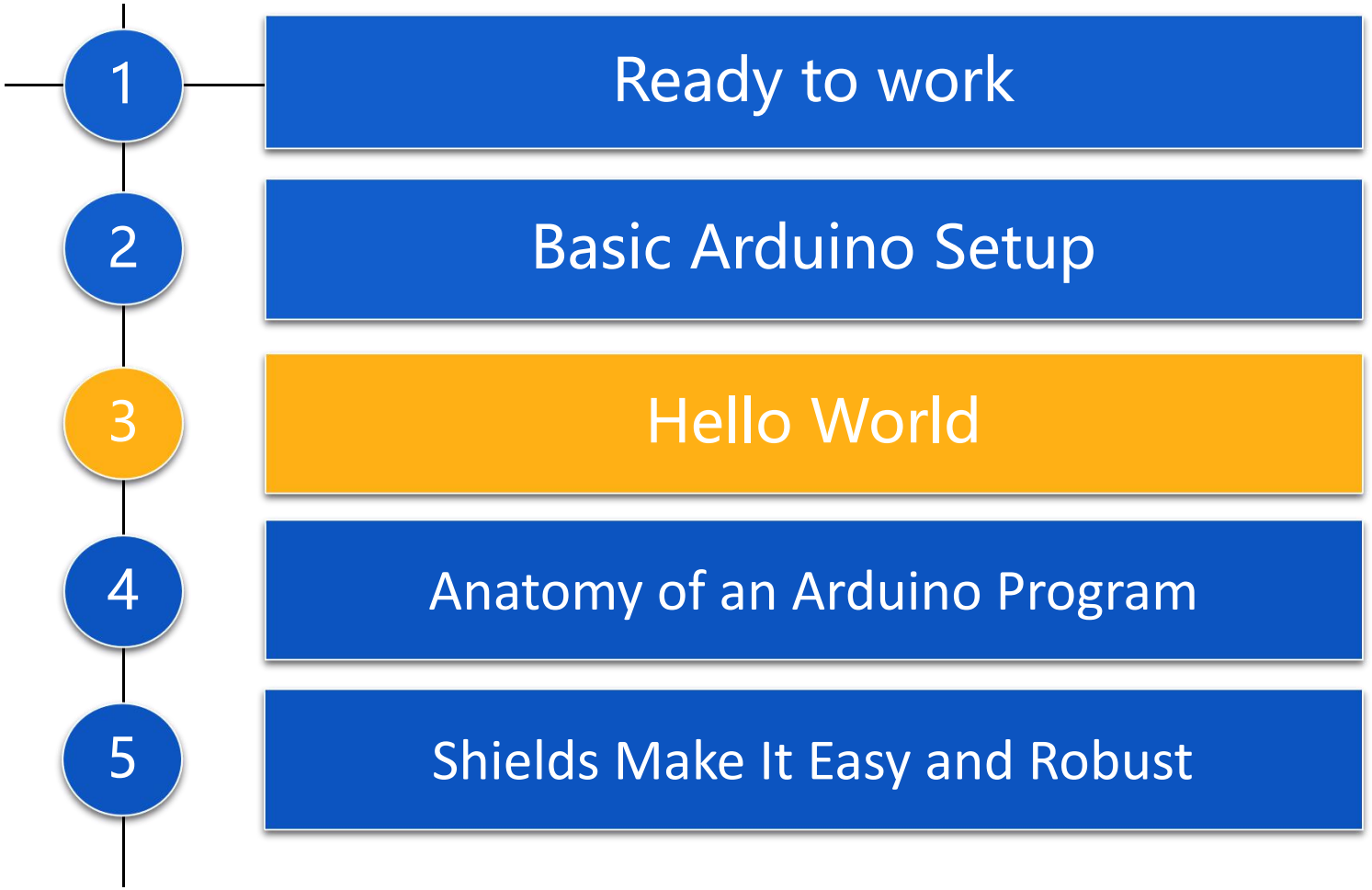
1. 打开文件资源管理器，右键点击【我的电脑】，选择【管理】
2. 在左侧的计算机管理中，选择设备管理器。在设备列表中找到Arduino Uno，右键选择更新程序软件。
3. 选择浏览计算机以查找驱动程序软件，点击浏览，找到Arduino的安装目录，打开drivers文件夹，选择arduino.inf，单击【下一步】
4. 现在Windows成功安装了驱动程序。

双击Arduino安装目录中的Arduino图标运行Arduino IDE.

Basic Arduino Setup

- OS X
  - Download the latest version of the Arduino Software
  - Unzip the file you downloaded to /Applications
  - Connect Arduino to your computer with a USB cable.
  - Arduino draws power directly from USB, so no external power supply is needed.
  - You don't need to install drivers on OS X
  - Run the Arduino IDE by double-clicking the Arduino icon in the application folder.

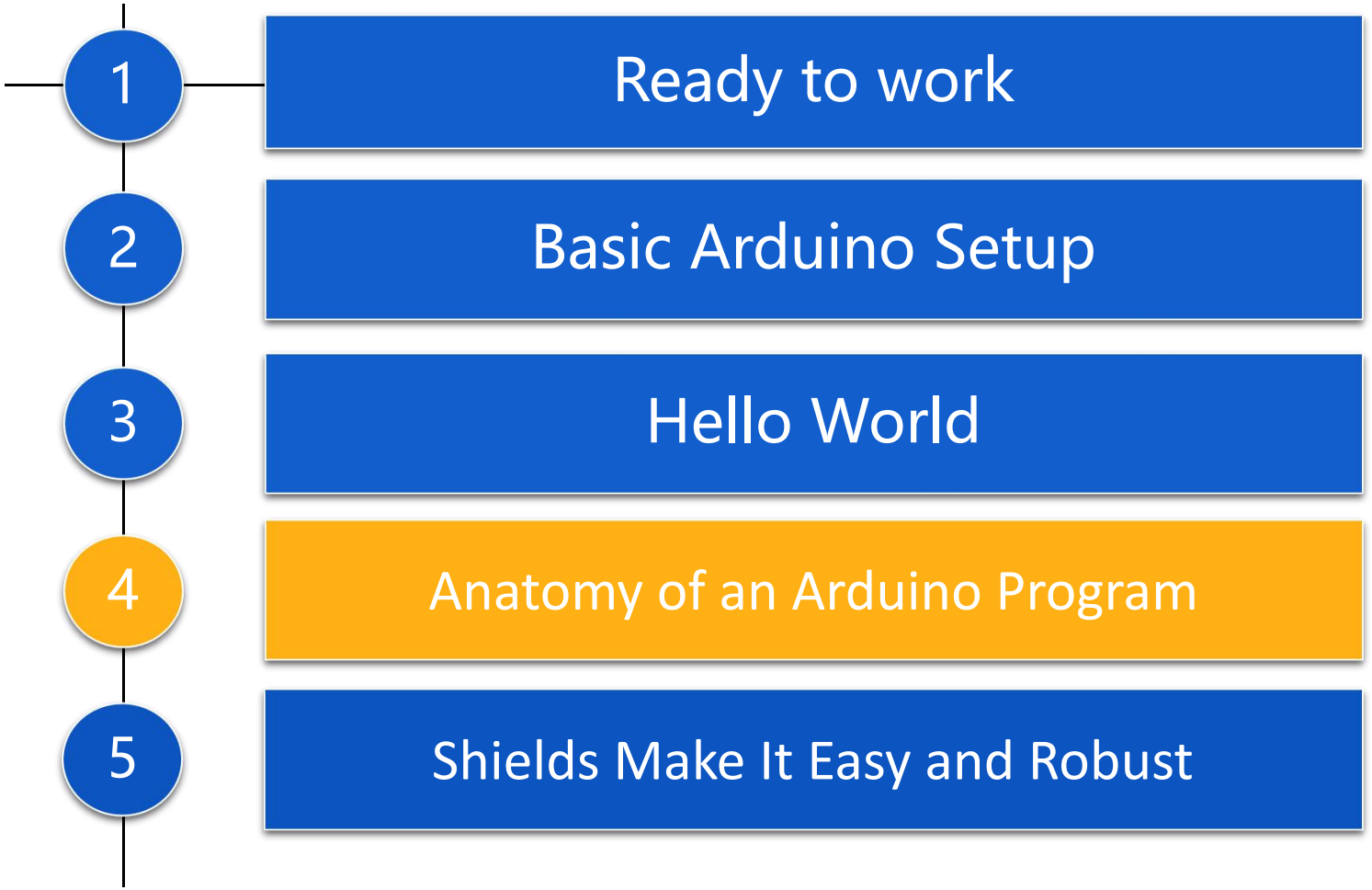
Contents


1
Ready to work
2
Basic Arduino Setup
3
Hello World
4
Anatomy of an Arduino Program
5
Shields Make It Easy and Robust

Hello World

- 既然Ardino IDE正常运行了，那就实现Arduino的“Hello World”
- 首先确认选择了正确的主板，因为IDE默认选择的是Arduino Uno主板，如果是其他主板，如Mega 或Leonardo，通过菜单中的【Tools】-->【Board】选择
- 然后上传Blink测试程序：
  - 【File】-->选择文件，单击【Upload】，编译代码，并上传至Arduino中。
  - 如果是第一次上传，可能会出错，如串口没找到等，这是因为串口选择不对。
  - 程序上传过程中，Arduino电路板的TX和RX指示灯会快速闪烁
- 运行程序，标有“L”的指示灯开始闪烁。

Contents

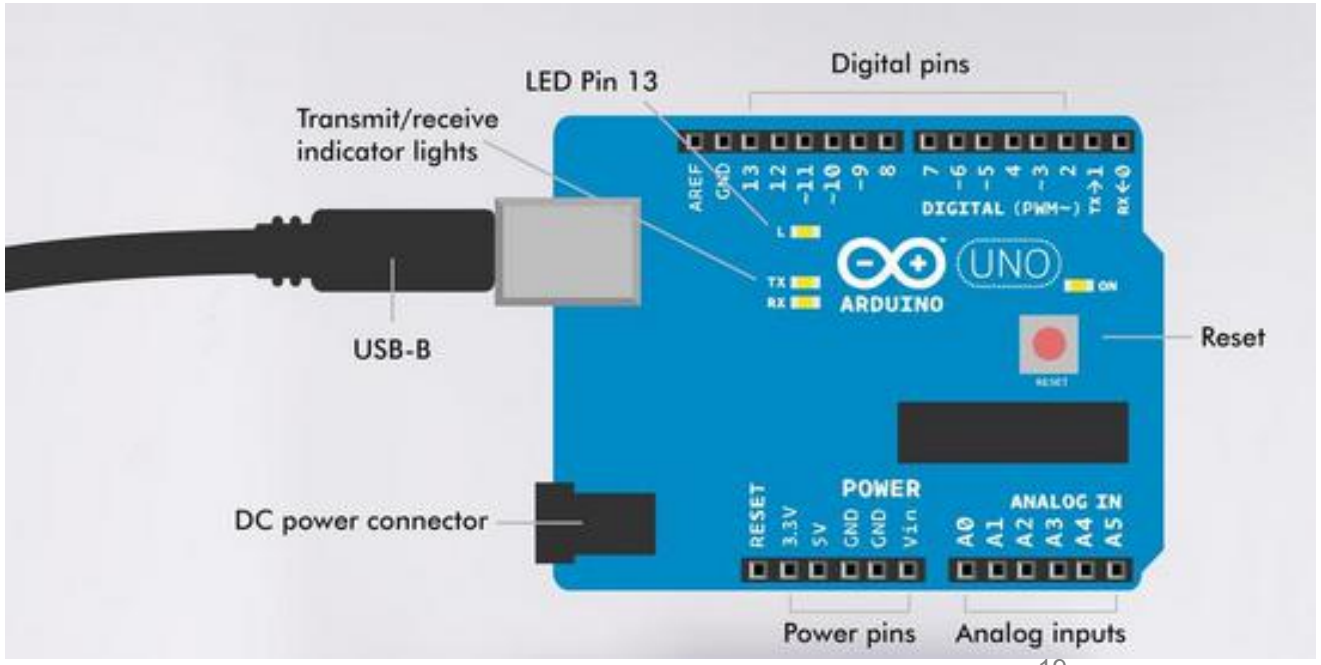

1
Ready to work
2
Basic Arduino Setup
3
Hello World
4
Anatomy of an Arduino Program
5
Shields Make It Easy and Robust

Anatomy of an Arduino Program

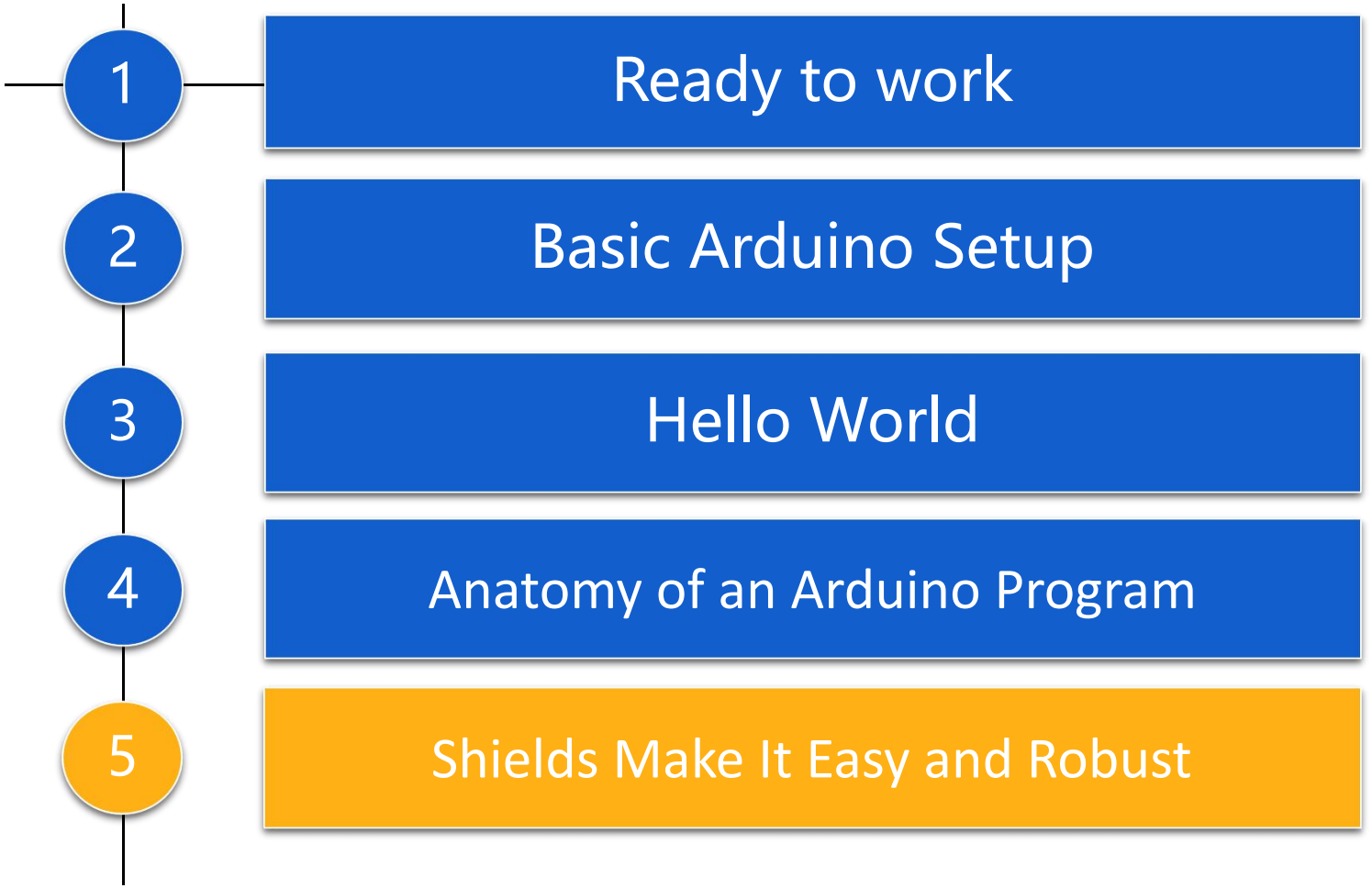
- An Arduino program starts by executing the code inside the setup() function once.
- After that, the code inside loop() is repeated forever (or until you disconnect the power). See Example 2-1.

- *Example 2-1. blink.ino*

```
// blink.ino - blink L LED to test development environment
// (c) BotBook.com - Karvinen, Karvinen, Valtokari
void setup() {
      pinMode(13, OUTPUT);
 }
void loop() {
      digitalWrite(13, HIGH);
      delay(1000);  // ms
      digitalWrite(13, LOW);
      delay(1000);
}
```

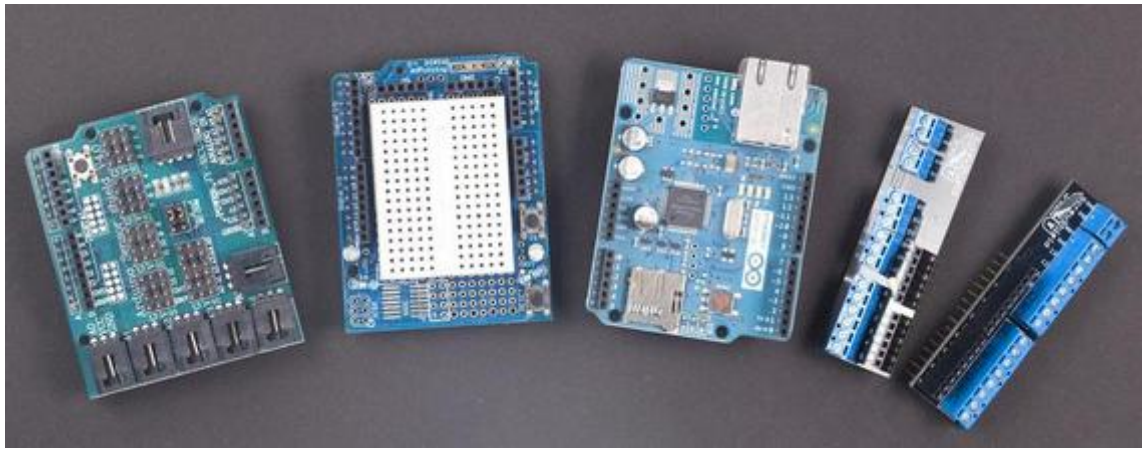


Contents


1
Ready to work
2
Basic Arduino Setup
3
Hello World
4
Anatomy of an Arduino Program
5
Shields Make It Easy and Robust

Shields Make It Easy and Robust

- hields are boards that attach on top of Arduino and extend its features or make it more usable (Figure 2-2).
  - There are many different shields available, from simple prototyping shields to more complex shields such as an Ethernet or WiFi shield.



- One of the best things about shields is how they reduce the need for extra wires; this is because they stack on top of the Arduino and use pin-to-pin connections instead of jumper wires.

Shields Make It Easy and Robust

- You can also consider building your own shields to make easy-to-use and robust Arduino add-ons Figure 2-3.
- Just solder pin headers to a circuit board so that they match the pin layout of Arduino.

Figure 2-3. Shields made by Andreas Zingerle