**Directions:** Backward design a project map that shows what you will need in order to complete your project, and explains why you need each step.

**Explain (1 box per step)**

**Project Mapping a Cockroach Robot**

Software & Hardware Setup

[download Boe-Bot pdf](https://www.parallax.com/sites/default/files/downloads/28125-Robotics-With-The-Boe-Bot-v3.0.pdf)

**Step 1**

I need to download the BASIC Stamp Editor software from www.parallax.com/basicstampsoftware. I also need follow the Boe-Bot chapter 1 tutorial for setting up my Boe-Bot hardware and making sure it’s communicating with the BASIC Stamp Editor software.

Assembling the Boe-Bot robot

[Boe-Bot Ch.3](https://www.parallax.com/sites/default/files/downloads/28125-Robotics-With-The-Boe-Bot-v3.0.pdf)

**Step 2**

I need build, program, and test the servo motors before I can mount them on the robot as wheels.

Building, testing, and programming Servo Motors

[Boe-Bot Ch.2](https://www.parallax.com/sites/default/files/downloads/28125-Robotics-With-The-Boe-Bot-v3.0.pdf), [WAM Ch.4](https://www.parallax.com/downloads/whats-microcontroller-text), and [Servo on Learn.Parallax.com](http://learn.parallax.com/search?search_api_views_fulltext=servo)

**Step 3**

I need to assemble the robot before I can program it to behave like a cockroach.

Maneuvers, Subroutines, and EEPROM

[Boe-Bot Ch.4](https://www.parallax.com/sites/default/files/downloads/28125-Robotics-With-The-Boe-Bot-v3.0.pdf), [WAM Ch.7](https://www.parallax.com/downloads/whats-microcontroller-text), [Maneuvers on Learn.Parallax.com](http://learn.parallax.com/search?search_api_views_fulltext=maneuvers), & [EEPROM on Learn.Parallax.com](http://learn.parallax.com/search?search_api_views_fulltext=eeprom)

**Step 4**

I need to program the Boe-Bot to move forward and backward and make turns.

Making decisions from tactile input

[Boe-Bot Ch.5](https://www.parallax.com/sites/default/files/downloads/28125-Robotics-With-The-Boe-Bot-v3.0.pdf) and [Whiskers on Learn.Parallax.com](http://learn.parallax.com/search?search_api_views_fulltext=whiskers)

**Step 5**

I need to program the Boe-Bot to know when it is bumping in to things so that it will change direction and continue moving

Measure light with phototransistor & making navigation decisions

[Boe-Bot Ch. 6](https://www.parallax.com/sites/default/files/downloads/28125-Robotics-With-The-Boe-Bot-v3.0.pdf), [WAM Ch.7](https://www.parallax.com/downloads/whats-microcontroller-text), & [Phototransistor on Learn.Parallax.com](http://learn.parallax.com/search?search_api_views_fulltext=phototransistor)

**Step 6**

Lastly, I need to program the Boe-Bot to behave like a cockroach by avoiding light and finding dark. If I’ve succeeded at each step to this point, my Boe-Bot cockroach should detect when the lights are on, begin roaming, changing direction if it bumps into things, and continue until it finds a dark place. Once it finds a dark place, it will stop and hide.

Assembling the Boe-Bot robot

[Boe-Bot Ch.3](https://www.parallax.com/sites/default/files/downloads/28125-Robotics-With-The-Boe-Bot-v3.0.pdf)

Software & Hardware Setup

[download Boe-Bot pdf](https://www.parallax.com/sites/default/files/downloads/28125-Robotics-With-The-Boe-Bot-v3.0.pdf)

Ohm’s Law

[Boe-Bot Ch.6](https://www.parallax.com/sites/default/files/downloads/28125-Robotics-With-The-Boe-Bot-v3.0.pdf), [WAM Ch.7](https://www.parallax.com/downloads/whats-microcontroller-text), and [Ohm’s Law on Learn.Parallax.com](http://learn.parallax.com/search?search_api_views_fulltext=ohms+law)

Making decisions from tactile input

[Boe-Bot Ch.5](https://www.parallax.com/sites/default/files/downloads/28125-Robotics-With-The-Boe-Bot-v3.0.pdf) and [Whiskers on Learn.Parallax.com](http://learn.parallax.com/search?search_api_views_fulltext=whiskers)

Digital input with pushbuttons

[WAM Ch.3](https://www.parallax.com/downloads/whats-microcontroller-text) and [Pushbutton on Learn.Parallax.com](http://learn.parallax.com/search?search_api_views_fulltext=pushbutton)

Using a dial (potentiometer) to vary input

[WAM Ch.5](https://www.parallax.com/downloads/whats-microcontroller-text) and [Potentiometer on Learn.Parallax.com](http://learn.parallax.com/search?search_api_views_fulltext=potentiometer)

Measure light with phototransistor & making navigation decisions

[Boe-Bot Ch. 6](https://www.parallax.com/sites/default/files/downloads/28125-Robotics-With-The-Boe-Bot-v3.0.pdf), [WAM Ch.7](https://www.parallax.com/downloads/whats-microcontroller-text), & [Phototransistor on Learn.Parallax.com](http://learn.parallax.com/search?search_api_views_fulltext=phototransistor)

Building, testing, and programming LED circuits

[download WAM pdf](https://www.parallax.com/downloads/whats-microcontroller-text)

Building, testing, and programming Servo Motors

[Boe-Bot Ch.2](https://www.parallax.com/sites/default/files/downloads/28125-Robotics-With-The-Boe-Bot-v3.0.pdf), [WAM Ch.4](https://www.parallax.com/downloads/whats-microcontroller-text), and [Servo on Learn.Parallax.com](http://learn.parallax.com/search?search_api_views_fulltext=servo)

Maneuvers, Subroutines, and EEPROM

[Boe-Bot Ch.4](https://www.parallax.com/sites/default/files/downloads/28125-Robotics-With-The-Boe-Bot-v3.0.pdf), [WAM Ch.7](https://www.parallax.com/downloads/whats-microcontroller-text), [Maneuvers on Learn.Parallax.com](http://learn.parallax.com/search?search_api_views_fulltext=maneuvers), & [EEPROM on Learn.Parallax.com](http://learn.parallax.com/search?search_api_views_fulltext=eeprom)

Navigating and measuring distance with IR

[Boe-Bot Ch. 7 & 8](https://www.parallax.com/sites/default/files/downloads/28125-Robotics-With-The-Boe-Bot-v3.0.pdf) and [IR on Learn.Parallax.com](http://learn.parallax.com/search?search_api_views_fulltext=ir)

Frequency and sound with the Piezospeaker

[Boe-Bot Ch.3](https://www.parallax.com/sites/default/files/downloads/28125-Robotics-With-The-Boe-Bot-v3.0.pdf), [WAM Ch.8](https://www.parallax.com/downloads/whats-microcontroller-text), and [Piezo on Learn.Parallax.com](http://learn.parallax.com/search?search_api_views_fulltext=piezo)

Navigating and measuring distance with IR

[Boe-Bot Ch. 7 & 8](https://www.parallax.com/sites/default/files/downloads/28125-Robotics-With-The-Boe-Bot-v3.0.pdf) and [IR on Learn.Parallax.com](http://learn.parallax.com/search?search_api_views_fulltext=ir)