SCORPION PROJECT WORKSHEET

Worksheet by Sebastian Yepez, June 2023

Hi, guys! I've loved working with all four of you for the past two weeks. But, now it's time to kick everything into final gear. Please answer all of the following questions thoughtfully and thoroughly.

Every team member must put their name on the document and also try to put as much input into this document as possible. Talk about the questions and answers and DON'T ask me for help unless something isn't clear! I really want you guys to get into the habit of working with your teammates, finding answers (even on the Internet), and thinking critically.

Names:

1.
2.
3.
4.

PART 1:

Project Knowledge:

1. Ultimately, what is the goal of the project? What are we trying to build?

2. Why are there 15 total "projects?"

3. When are we presenting the final project?

4. Where can you go to try finding more information on the subtask if you get stuck?

5. Why are we not using the included Arduino Plus board and shield that come with the kit?

6. What will be one of the most challenging parts of the project? Think about the original board of the kit compared to the one we're using.

7. What do S, V, and G stand for in the components of the Smart Home Kit? What do they correspond with on the Gravity IO Shield?

8. What are Port PINs and the Arduino IDE equivalents? What is the Port PIN equivalent of D11? What is the Arduino equivalent of Port PIN 26?

9. What will we be trying to accomplish today (Day 1)?

10. Give your individual responses below about what makes you most excited about this project:

1.
2.
3.
4.

Arduino Basic Knowledge:

1. What does the setup() function do?
2. How many times will loop() run?
3. How long will delay(5000) delay the program for?
4. What programming language is Arduino based on?
5. What is a library?
6. Why do you think we have to select a board and port before running the program?
7. What do you think the error: “Property 'upload.tool.' is undefined” would relate to? (Hint: relates to last question).

Subtask 1 - LED Blink:

1. What is the purpose of this subtask?
2. What number(s) did you have to replace in this program? Why?
3. Please give a brief explanation of how you think this program works. You may talk informally here if it helps. Pretend as if you were speaking to a friend.
4. Please copy and paste your code for Task 1 here:
5. Please copy and paste your code for Task 2 here:
6. Please copy and paste your code for Task 3 here:

Subtask 2 - Breathing Light:

1. What is the purpose of this subtask? What makes it different from LED Blink?

2. Why wouldn't the provided code work for this program? What code did you have to use?
3. Google "What is PWM lights" and explain, in your own words, what PWM is. How does the duty cycle of the LED relate to this?
4. Explain how the for loops inside the program relate to Pulse Width Modulation and duty cycle.
5. Please copy and paste your code for Task 1 here:

Subtask 3 - Passive Buzzer:

1. What is the purpose of this subtask?
2. Referring to the wiki, how can we use the buzzer to control different sounds? After skimming through this article, why is there a harsh, buzzy tone in the first program?
3. What does delay(num) and i<80 do in the program? Try different numbers before you answer this question.
4. After running the second program, try your best to give an explanation of what you think is going on.
5. Please copy and paste your code for Task 1 here:

Subtask 4 - Controlling LED by Button Module:

1. What is the purpose of this subtask? Why is it important to know how a physical input can give us a digital output?
2. Explain in your own words how val and the if-else statement are working hand in hand to give an output to the LED.
3. What was the most challenging part about Task 2?
4. Please copy and paste your code for Task 1 here:
5. Please copy and paste your code for Task 2 here:

Subtask 5 - 1-Channel Relay Module

1. What is the purpose of this subtask?
2. What is a relay module? What is the main message I wanted to get across?
3. Go to this website and research on Google about relay modules. Do your best to explain how they work. What does NO stand for? What about COM or NC? What is the purpose of the electromagnet?
4. Were you able to see your LED light up? Try your best to look from different angles. Mine was very dim sometimes to the point where I could only see it from a certain perspective, and sometimes it was bright depending on the angle of the pin in the NO contact terminal. Fidget with it and see if you get a response.

Subtask 6 - Photocell Sensor

1. What is the purpose of this subtask?
2. According to the wiki, what is a photocell sensor and how does it work? If you need to, use Google to find more information and do your best to describe the process.
3. What is the difference between an analog and digital signal? Why does this sensor need to be attached to an analog port on the microcontroller (ESP32)?
4. What real life implementations do you think this kind of sensor could be used for? List three examples and go into detail about each of them.
5. What is a photodiode? Give a very brief description and state how it is implemented into the code.
6. Please copy and paste your code for Task 1 here:

Subtask 7 - Adjusting Motor Servo Angle

1. What is the purpose of this subtask? Hint: read the wiki for this one.

2. What is the max rotation angle the servo motor can do? Try it out for yourself and then look on the wiki for confirmation.
3. Why can only digital pins 9 and 10 be used for this program? Hint: Look at the wiki.
4. What was the compilation error you ran into when trying the program for the first time? How did you fix it?
5. Please copy and paste your code for Task 1 here:

Subtask 8 - Fan Module

1. What is the purpose of this subtask?
2. Why can this fan control its direction and speed?
3. Looking and testing the code provided, why are there two signal wires connected to D6 and D7? What do they do?
4. After having done the task, please copy and paste your code here:

Subtask 9 - Steam Sensor

1. What is the purpose of this subtask?
2. What are some of the implications this component can have on your final project and the real world?
3. Do you think the steam sensor would be able to sense boiling water? Why or why not? Should we try it?

Subtask 10 - PIR Motion Detector

1. What is the purpose of this subtask?
2. What are some of the implications this component can have on your final project and the real world?
3. How does the PIR Motion Sensor detect if something is in front of it?

4. Please copy and paste your code for Task 1 here:

Subtask 11 - Gas Sensor

1. What is the purpose of this subtask?
2. What are some of the implications this component can have on your final project and the real world?
3. What does PPM mean in this context?
4. After completing Task 1, share your observations.

Subtask 12 - LCD Display

1. What is the purpose of this subtask?
2. What are some of the implications this component can have on your final project and the real world?
3. What does I2C mean? Use the Internet.
4. Please copy and paste your code from Task 1 here:

Subtask 13 - Soil Humidity Sensor

1. What is the purpose of this subtask?
2. What are some of the implications this component can have on your final project and the real world? Please answer thoroughly.
3. What happened when you put water into the soil?

Subtask 14 - Bluetooth Test

1. What is the purpose of this subtask?
2. What are some of the implications this component can have on your final project and the real world? Please answer thoroughly.