

Names: _____

1 servo

Using Tinkercad, open the “servo” circuit. You may choose to use text or blocks to program the Arduino.

1.1 10 points

Your Arduino has been pre-programmed to remind you how to use the Servo library. As written, the code will simply move the motor from 0 to 180 degrees and then start over. Roughly how long will the motor take to accomplish one rotation? Modify the code so that the pattern repeats at 0.5 Hz.

1.2 5 points

The middle pin of the potentiometer is wired to pin 8 of the Arduino. Is this appropriate? If not, choose an appropriate pin and explain your reasoning.

1.3 10 points

Modify your code such that the potentiometer can be used to control the position of the servo motor. Ensure that the dynamic range of the potentiometer (0 to 5 V) agrees with the dynamic range of the servo motor (0 to 180 degrees). Recall that the Arduino has a 10 bit analog-to-digital converter.

2 stopwatch

Your friend has designed a simple stopwatch using an Arduino, button, and LCD display. How clever of her! The circuit works perfectly, but the code is behaving strangely. She needs your help to debug the project. Open the stopwatch circuit in Tinkercad. You may choose to use text or blocks to program the Arduino.

2.1 10 points

The stopwatch starts correctly when the button is pressed the first time. Subsequent button presses reset the stopwatch. This is not intended behavior! Your friend wants her stopwatch to *pause* when the button is pressed a second time.

Briefly, explain to her *why* your friends' code doesn't work as intended. Be sure to describe the relationship between button presses and the "running" variable.

2.2 10 points

Fix your friends' code. Describe what you changed, and why that change fixes the problem.

2.3 5 points

Why did your friend add a while loop?

3 blink 2

Using Tinkercad, open the "blink2" circuit. You may choose to use text or blocks to program the Arduino.

3.1 5 points

Blink both LEDs, such that the green LED is on when the orange LED is off and vice versa.

3.2 20 points

Change the frequency of the green LED such that it is blinking three times slower than the orange LED. Keep the duty cycle of both LEDs at 50 %.

4 switch

Using Tinkercad, open the “switch” circuit. You may choose to use text or blocks to program the Arduino.

4.1 10 points

Consider the following definitions:

A *toggle switch* changes the state every time it is depressed. Once released, the new state (on or off) is maintained until the switch is pressed again. Example: common light-switch.

A *momentary switch* is on only while being pressed. Once released, the switch automatically turns off again. Example: computer keyboard key.

Is the button acting as a momentary switch or a toggle switch? Is this relationship defined by the circuit, or by the Arduino code? Explain how you know.

4.2 10 points

Without changing the circuit, modify your Arduino code so that the button acts like a toggle switch. Describe your approach.

4.3 5 points

How could you change the brightness of the LED?

Names: _____

5 Rubric

servo	/25
stopwatch	/25
blink 2	/25
switch	/25
Written	/100
traffic light	/10
rainbow	/10
dancing motor	/10
click counter	/20
binary counter	/20
7-segment	/30
Whatchamacallits	/100
Total	/200