

## QUIZ / Can I Make my own Sensor 2 / Programming

NAME

DATE

CLASS PERIOD

Put a check in the ☐ next to the correct answer, or write the answer below the question. Use another sheet of paper if you need more space.

**1. What is the function of the red wire that you have attached to the potentiometer?**

The live voltage will define the maximum voltage for the sensor, therefore the red wire will connect to the third terminal

**2. What is the function of the black wire that you have attached to the potentiometer?**

The ground voltage will define the minimum voltage for the sensor, therefore the black wire will connect to the first terminal (note that the picture here is shown from the back)

**3. What is the function of the white wire that you have attached to the potentiometer?**

The sensor's reading will be the inbetween voltage determined by the dial position, therefore the white wire will connect to the middle terminal

**4. How many volts does the potentiometer need to function?**

5 Volts

**5. What is the range of an analog sensor in ROBOTC?**

If they are simply wired to the microcontroller but not configured, they will read 1 or 0. If they are configured as the potentiometer lesson instructed, they will range between 0-1023.

**6. Does the range of the sensor match this range? Why do you think it may or may not?**

Not exactly, except by chance. But it should come close. The reason is that the function of a potentiometer is to be either a variable resistor or a voltage divider. The microcontroller senses the current sent by a 5 volt analog sensor, which in this case is a 5 volt potentiometer. Since the maximum current the microprocessor can receive will be assigned a value of 1023 and the minimum current will receive a value of 0, and current varies inversely with resistance, and the potentiometer is designed to be a variable resistor, the range of the potentiometer roughly matches the 0-1023 range of a configured analog sensor in ROBOTC.

**7. After you have plotted the angle, potentiometer and servo motor values, would you say that the graph shows a linear or nonlinear relationship?**

☒ linear

☐ nonlinear

**8. Are the angle values directly or inversely related to the potentiometer values?**

☐ directly

☒ inversely

**9. Are the angle values directly or inversely related to the servo values?**

☐ directly

☒ inversely

**10. Extrapolate from the graph values to predict what the potentiometer value should be when the angle is 105 degrees.**

(Will vary with every experiment, but it should be around 725)

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**11. Is there a constant you could multiply the servo motor value by to make it approximately equal to the potentiometer value?**

☐ yes

☐ no

**12. If so, what is it?**

Since the potentiometer value varies between approximately 0-1023, and the servo motor value varies between approximately 0-127, a constant of 4 would make them approximately equal. This is consistent with 128 being  $2^{6\text{th}}$  power and 1024 being  $2^{10\text{th}}$  power.

**13. Is there any difference between what the motor module does when you turn your sensor to its clockwise limit, and what it does when you turn your sensor to its counterclockwise limit? If so, what is it?**

At the clockwise limit, the motor provides no power. At the counterclockwise limit, the motor provides maximum power.

**14. Does your motor run faster when the sensor value is 5, or at 100?**

100.

**15. Does your motor run faster when the sensor value is 250, or at 200?**

250.

**16. Given the same inputs, how does the motor module act differently from the servo module?**

The motor module rotates continuously in proportion to its power. The servo motor turns a certain degree determined by its power and stops.

**17. If you have completed both Part 1 and Part 2 of "Can I Make my own Sensor", answer the following question: How do you think ROBOTC gets values from sensor inputs? Do you think it measures voltage, current, resistance, or something else? Explain.**

The microcontroller senses the current sent by a 5 volt analog sensor, which in this case is a 5 volt potentiometer. Since the maximum current the microprocessor can receive will be assigned a value of 1023 and the minimum current will receive a value of 0, and current varies inversely with resistance, and the potentiometer is designed to be a variable resistor, the range of the potentiometer roughly matches the 0-1023 range of a configured analog sensor in ROBOTC.