Name:

You may use your notes and a calculator for this homework and prelab.

1) The light sensor converts a measure of light intensity (where 0% means black and 100% means white) to a voltage varying from 0 to 4.7 volts. This 0-4.7 volt range is then converted by the analog-to-digital converter on the NXT brick to an integer represented by a 10-bit unsigned binary number.

a) What 10-bit unsigned binary number corresponds to a light intensity of 70%? Express your answer in binary and decimal.

b) A change in light intensity from 68% to 24% corresponds to a change of how many volts?

c) The output from the analog-to-digital converter connected to the light sensor is currently outputting the value 01 1010 1010 (represented as a 10-bit binary number). The sun comes out, increasing the light intensity reading by 12%. What is the new value (in binary) output from the analog-to-digital converter? Show your work for full credit.

d) What output voltage does the new reading in part (c) correspond to?

d) Represent the decimal number -42 as an 8-bit binary number in two's complement form.

2) In the next lab, you are going to explore several ways to use a light sensor to direct your tribot to follow a 2-inch-wide black line. Your tribot starts with the light sensor on the line, facing in the general direction of the line (i.e. assume the line runs approximately between the wheels and over the light sensor facing down onto the line).

Below, draw a flowchart that describes a simple algorithm for following the line. Assume that the sensor can only output two values: BLACK and WHITE, indicating the color that it sees. Your flow chart should consider what the robot should do when it sees black and white and how it should command the tribot to move. (Hint: It may help to take a look at Lab 2 first.)