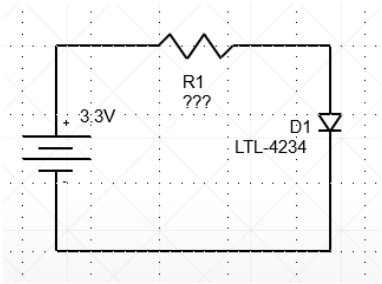
ENGI301: Assignment #1

Due: 09/05/2023 8pm

1) **Resistor color codes**: What are the 4-band resistor color codes for the following resistor values (all 5%):
   a. 22 Ohm
   b. 330 Ohm
   c. 1k Ohm
   d. 2.2k Ohm
   e. 4.7k Ohm
   f. 10k Ohm
   g. 100k Ohm
2) **Equivalent resistance**: Show circuit diagram with values for how to create the following resistors with the given approximate value (Use the resistor values from Question 1; There are multiple correct answers for b & c; Answers should have resistance within 1% of specified value):
   a. 250 Ohm resistor using 2 resistors (Hint: *(R1 || R2)*)
   b. 2500 Ohm resistor using 3 resistors (Hint: *(R1 + (R2 || R3))*)
   c. 1750 Ohm resistor using 4 resistors (Hint: *((R1 || R2) + (R3 || R4))*)
3) **Resistor Tolerance**: For the 250 Ohm resistor created in Question 2, given that each resistor has a tolerance of 5%, what is the minimum and maximum value of the resistor (rounded to the nearest ohm)?
4) **Circuit Analysis:** Using an LTL-4234 LED, what should the resistor value (standard 5%) be for the following circuit such that the LED has maximum brightness (highest forward current) over the entire temperature range.



5) **Circuit Analysis:** The circuit below is based around a TL5209. Given that V_{IN} is 5V and R1= 280K Ohms (1%) and R2 = 470K Ohms (1%). Answer the following questions:
   a. What is V_{OUT} (to the nearest tenth of a volt)?
   b. Based on resistor variation alone, what is the maximum and minimum V_{OUT}?
   c. What is the output voltage accuracy of the TL5209 over the entire temperature range?
   d. Given a stable output current of 500mA @ 25C, what is the typical power efficiency (P_{OUT} / P_{IN}) of this regulator? (Hint: Search "LDO power efficiency" on Google)