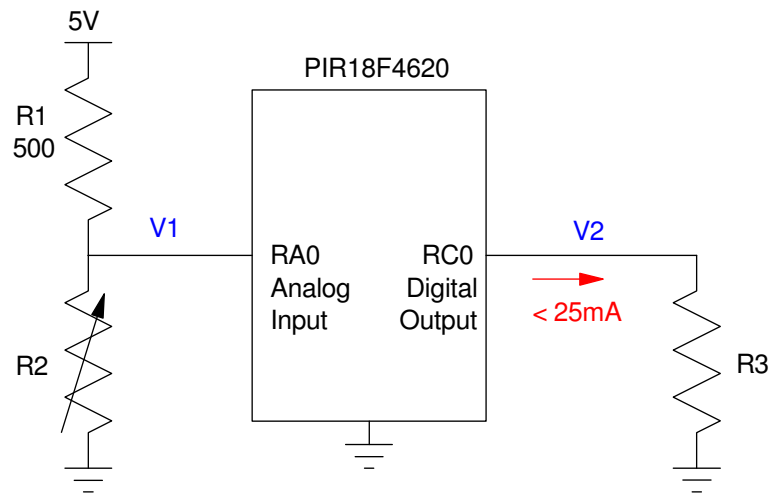


# ECE 376 - Homework #1

*PIC Background*

*Due Wednesday, September 4th*

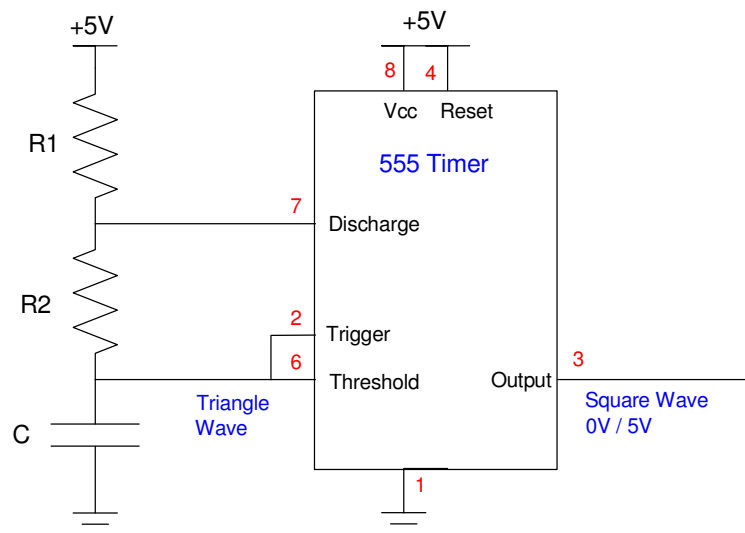
Problem	Answer
1) How many clocks does it take to do a floating point operation in C? • Check Homework #9 solutions for Spring 2024	3409 Clocks
2) A PIC's output is limited to 25mA. Assuming V2 is 5V, what is the smallest resistance you can connect to the output? (how small can R3 be?)	200 Ohms
<b>A PIC can measure voltage to 4.88mV. To give an idea of how small this is....</b>	
3) What is the smallest change in R2 a PIC can measure if R2 = 500 Ohms nominally? • How much does R2 have to change from 500 Ohms for V1 to change by 4.88mV?	2.1992 Ohms
4) Assume R2 is a thermistor. • What temperature is it if R2 = 500 Ohms? • How much does the temperature have to change for V1 to change by 4.88mV?	41.64 C 0.111 C
<b>A PIC can measure time to 100ns. To give an idea of how small this is....</b>	
5) The fastest animal is the Peregrine falcon - able to fly up to 389 km/h (242 mph). How far can a Peregrine falcon fly in 100ns?	10.8 um
6) Assume for the 555 timer • R1 = 500, R2 = 500, C = 0.22uF • What frequency does the 555 timer output on pin #3?	4.37 KHz
7) What is the smallest change in frequency a PIC can detect? • i.e. how much does the frequency have to change for the period to change by 100ns?	1.00 Hz
8) With this circuit, you can build an Ohm-meter (replace R2 with the resistance to be measured.) Assume R2 = 500 Ohms (nominally). How much does R2 have to change for the period to change by 100ns? • i.e. What is the resolution of this circuit when used as an Ohm-meter?	0.328 Ohms
9) Replace R2 with a thermistor which reads 500 Ohms nominally. How much does the temperature have to change for the period to increase by 100ns? • i.e. what is the resolution in degrees C?	0.0166 C



Problem #1 to #3

If R2 is a thermistor, assume

$$R_2 = 1000 \cdot \exp\left(\frac{3905}{T+273} - \frac{3905}{298}\right) \Omega$$



Astable 555 Timer: Problems 5-8

The square wave at the Output has a period of  $T = (R_1 + 2R_2) \cdot C \cdot \ln(2)$  seconds