2. You are designing a hard real-time autonomous driving system. It has following sensors in the inertial navigation subsystem for tracking and controlling vehicle attitude, velocity, and position:

Sensors	Sampling Frequency (Hz)	CPU time required (ms)
Accelerator	40	5
Gyroscope	25	4
Magnetometer	20	8
Wheel Speed	10	10

Suppose you also want to add wheel speed sensors to help the traffic collision analysis, each wheel speed sensor sampling frequency is **10** Hz, and the required CPU time for processing the wheel speed sensor data is **10**ms.

Determine how many wheel speed sensors you could add to system to still allow system to be schedulable. (Assume the overall overhead of the inertial navigation subsystem is .25) **Show** your work.

$$PTask = \frac{1}{Hz} \cdot 1000(ms)$$

	PTask (ms)	CTask (ms)	
Accelerator	25	5	$\frac{1}{40} \cdot 1000 = 25$
Gyroscope	40	4	$\frac{1}{25} \cdot 1000 = 40$
Magnetometer	50	8	$\frac{1}{20} \cdot 1000 = 50$
Wheel Speed	100	10	$\frac{1}{100} \cdot 1000 = 100$

$$\text{Schedulable Formula} = \sum_{i=1}^{N} \frac{c_i}{p_i} + Overhead \leq 1$$

$$\frac{5}{25} + \frac{4}{40} + \frac{8}{50} + .25 + \left(\frac{10}{100}\right)x \leq 1$$

$$.71 + \left(\frac{10}{100}\right)x \leq 1$$

$$\left(\frac{10}{100}\right)x \leq .29$$

$$\frac{.1x}{.1} \leq \frac{.29}{.1}$$

$$X = 2.9 \text{ but it asks for } \leq \text{ so}$$

$$\boxed{X = 2}$$

2 wheel Sensors