Sample Data Collection and Processing

Table 1: Time vs. Distance traveled by motorized car (Raw Data)

		Distance d/m Δd = ± .01 m				
		10	20	30	40	50
Time t/s Δt= ±0.1s	Trial 1	5.3	9.8	13.9	19.2	24.0
	Trial 2	5.8	9.1	14.4	19.0	23.9
	Trial 3	5.0	9.5	14.0	19.5	23.7

* Briefly explain why you chose your uncertainty values.

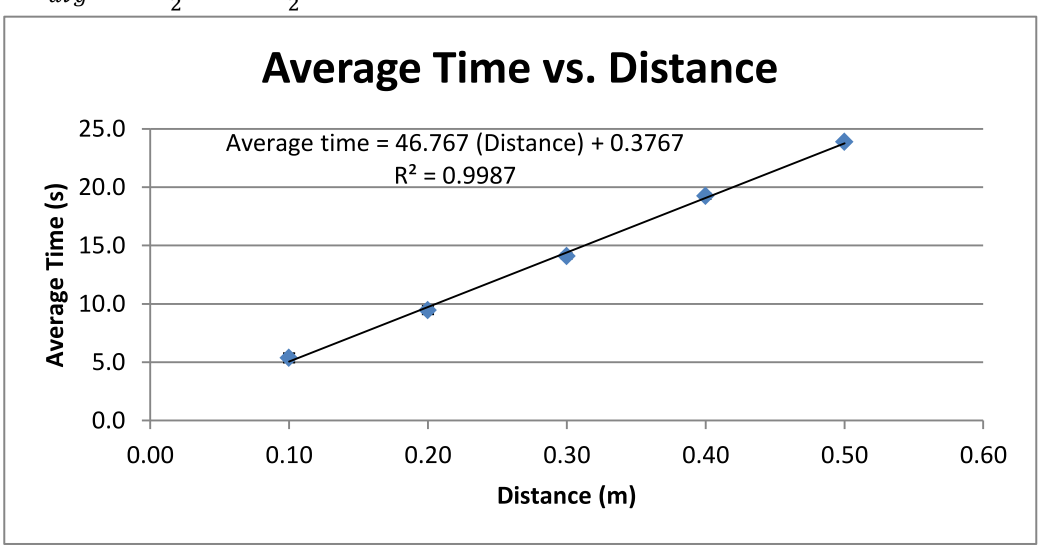
Table 2: Average Time vs. Distance traveled by motorized car (Processed Data)

	Distance d/m Δd = ± .01 m				
	0.10	0.20	0.30	0.40	0.50
Average Time t_{avg}/s	5.4	9.5	14.1	19.2	23.9
Average Time Error Δt_{avg}/s	0.4	0.4	0.3	0.3	0.2
Minimum value	5.0	9.1	13.9	19.0	23.7
Maximum value	5.8	9.8	14.4	19.5	24.0

* Briefly explain how you processed your data (averages, sums/differences, etc.)
* Include example calculations of each type of processed data
* Include uncertainty sample calculations and explanations

$$t_{avg} = \frac{t_1+t_2+t_3}{3} = \frac{(5.3+5.8+5.0)}{3} \approx 5.4 \text{ s}$$

$$\Delta t_{avg} = \frac{t_{max}-t_{min}}{2} = \frac{(5.8-5.0)}{2} \approx 0.4 \text{ s}$$



* Explanations/calculations of processed data, max/min gradients & uncertainty.

The computer generates the best-fit line with a gradient (slope) ***m*** = 46.767 s m^{-1}
The average speed is then calculated with thhis value:

$$v = \frac{d}{t} = \frac{1}{m} = \frac{1}{46.767\ sm^{-1}} = 0.02138 \approx 0.02\ ms^{-1}$$

The minimum and maximum experimental values of speed are calculated based on the uncertainty bars for average time using the first and last data points

$$v_{max} = \frac{1}{m_{max}} = \frac{1}{\frac{(23.7 - 5.8)}{(.50 - .10)}} = 0.0224\ ms^{-1}$$

$$v_{min} = \frac{1}{m_{min}} = \frac{1}{\frac{(24.0 - 5.0)}{(.50 - .10)}} = 0.0211\ ms^{-1}$$

$$\Delta v = \pm\frac{v_{max} - v_{min}}{2} = \pm\frac{(0.0224 - 0.211)ms^{-1}}{2} = \pm 0.00065\ \mathrm{ms}^{-1} \approx \pm 0.00ms^{-1}$$

The overall average speed and its uncertainty are thus:

$$v \pm \Delta v = (0.02 \pm 0.00)ms^{-1}$$