Uncertainties at Higher

Measured value X
2.36
2.65
2.45
2.78
2.11
2.87

Number of values, n
6

$$X(av.) = \frac{\text{Sum of X } (\Sigma)}{\text{Number of values (n)}} = \frac{15.22}{6} = 2.53667 = 2.54$$

$$U = \frac{X(max) - X(min)}{n} = \frac{2.87 - 2.11}{6} = 0.126666 = 0.13$$

Uncertainty quoted to one significant figure, **unless** first significant figure is 1: Then take two sig. figures.

X(av.) quoted to the same number of decimal places as value of uncertainty

Absolute Uncertainty: $\therefore X = 2.54 \pm 0.13$

Convert to %: $\frac{0.13}{2.54} \times 100 = 5.12$

Percentage Uncertainty: $\therefore X = 2.54 \pm 5\%$

Usually quoted to a full number of %

Experimental results and Uncertainties

Mass m (g)	Mass Uncertainties Absolute U_A (g)	Mass Uncertainties Percentage $U_{\%}$	Acceleration of trolley a_1 (ms^{-2})	a_2 (ms^{-2})	a_3 (ms^{-2})	$a_{(av)}$ (ms^{-2})	Accl^n Uncertainties Absolute U_A	Accl^n Uncertainties Percentage $U_{\%}$
169	±1	0.6	5.86	5.92	5.83	5.87	±0.03	0.5
377	±1	0.3	1.12	1.11	1.12	1.12	±0.01	0.9
546	±1	0.2	0.79	0.79	0.79	0.79	±0.01	1.3
763	±1	0.1	0.58	0.58	0.58	0.58	±0.01	1.7
932	±1	0.1	0.46	0.46	0.46	0.46	±0.01	2.2

Use the figures on the bottom row of the table to calculate the force on the trolley.
Determine % and absolute error in your value of force.

F = m x a
0.1% 2.2%

Take the largest % uncertainty from the separate values, as uncertainty of F

∴ F calculated to 2.2% uncertainty

F = m x a
= 0.932 x 0.46
= 0.42872 ± 2.2%

∴ F = 0.43 N ± 0.09 N

Quote final figure as an absolute uncertainty.