Sample Analysis O-6

The Excel worksheet on the opposite page is for Experiment O-6, but illustrates the pattern you should follow in all labs. Details are described in the list below. **The data in this sample is not real,** so don't worry if it differs from yours! The sample spreadsheet is based on the following data:

Distance mirror moved	$dL_1 = (.060 \pm .003)$ mm
Slide thickness	$T = (1.35 \pm .002)$ mm
Angle slide rotated	$A = (20.0 \pm .5)$ degrees
Number of fringe shifts:	$N = 154 \pm 1$, while mirror moved, trial 1

Note: The notation A4:C6 means all worksheet cells in columns A to C, rows 4 to 6.

Cell(s)	Description
Row 1	Type in descriptive headings where appropriate.
Row 2	Column headings: Keep them short, so you can make columns narrow and save paper.
Row 3	Uncertainty in values.
A4:C6	Enter your "best" values for lab measurements, each trial in a separate row.
D4:D6	Calculated wavelengths. After the data is entered, click on Cell D4 and enter the Excel formula, **= 2*1E6*B4/C4**. When the calculated result appears, use the "fill handle" to drag cell D4 down thru cell D6.
D7	Excel formula: **=AVERAGE(D4:D6)**.
D8	Excel formula: **=(D5 - D6)/2**. Since there are fewer than ten trials, the "worst case" method is used. Note: Always make uncertainties positive!
B7:B8	Type in descriptive labels where appropriate.
B9	Type in the final result, using the average in cell D7 and the uncertainty in D8, **retaining appropriate significant figures and including appropriate units**.
A10:D15	Partial uncertainty analysis for trial 1 (Row 4). First, [Copy] cells A4:D4 and [Paste] in cells A11:D11. Use the fill handle to drag row 11 down through row 15, giving you five identical rows. Then do the following:
B12	Replace contents with minimum $\mathbf{dL_1}$. Cell D12 will change automatically.
B13	Replace contents with maximum $\mathbf{dL_1}$. Cell D13 will change automatically.
C14	Replace contents with min **N**. Cell D14 will change automatically.
E16	Replace contents with max **N**. Cell D15 will change automatically.
E11:E15	Type brief descriptive comments, staying within page margins to save paper.
D16	Excel formula: **=(D13 - D12)/2**. Note: Uncertainties are always positive!
D17	Excel formula: **=(D14 - D15)/2**. Note: Always make uncertainties positive!
D18	Excel formula: **=D16 + D17**.
B16:B18	Type in descriptive labels where appropriate.
B19	Type in the final result, using the average in cell D7 and the uncertainty in D18, retaining only significant figures and including appropriate units.

	A	B	C	D	E	F
1	Wavelength (Lambda)					
2	Trial	dL1 (mm)	N	Lambda (nm)		
3		(± 0.003)	(± 1)			
4	1	0.060	154	779.2		
5	2	0.060	151	794.7		
6	3	0.060	156	769.2		
7		Average =		781.1		
8		Uncertainty =		12.7		
9		Final result: Lambda = (780 ± 10) nm				
10	Partial uncertainty analysis, trial 1					
11	1	0.060	154	779.2	best everything	
12	1	0.057	154	740.3	min dL1	
13	1	0.063	154	818.2	max dL1	
14	1	0.060	153	784.3	min N	
15	1	0.060	155	774.2	max N	
16		Partial unc wrt dL1 =		39.0		
17		Partial unc wrt N =		5.1		
18		Total uncertainty =		44.1		
19		Final result: Lambda = (780 ± 40) nm				