

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Your name		Date										
2	Partner's name												
3													
4	Phys 1101/1120 - Richmond campus				DISCLAIMER: These example data are purposefully inaccurate. You may test your spreadsheet equations for correctness using these values, but your real experimental values will be very different.								
5	Expt. 2: Friction												
6													
7	DATA												
8													
9	hanging mass				angle 1			accel. due to gravity					
10	mh (g)	d mh (g)	dmh/mh		θ (deg)	d θ (deg)	$\delta\theta/\theta$			g (m/s ²)	d g (m/s ²)	dg/g	
11	500	0.1	0.02%		5	0.3	6.00%			9.81	0.01	0.10%	
12													
13	mass of box				angle 2								
14	mb (g)	d mb (g)	dmb/mb		θ (deg)	d θ (deg)	$\delta\theta/\theta$						
15	1000	0.1	0.01%		10	0.3	3.00%						
16													
17	measured acceleration 1												
18	a (m/s ²)	da (m/s ²)	da1/a1										
19	0.71	0.0142	2.00%										
20													
21	measured acceleration 2												
22	a (m/s ²)	da (m/s ²)	da2/a2										
23	0.17	0.0034	2.00%										
24													
25													
26	CALCULATIONS												
27													
28	hanging mass				μ (angle 1)	d μ (angle 1)	$\delta\mu/\mu$			μ (angle 2)	d μ (angle 2)	$\delta\mu/\mu$	
29	mh (kg)	d mh (kg)	dmh/mh		0.30544387	0.00652826	2.14%			0.30499144	0.00377232	1.24%	
30	0.5	0.0001	0.02%										
31					Sub-calculations for:				Sub-calculations for:				
32	mass of box				μ_1					μ_2			
33	mb (kg)	d mb (kg)	dmb/mb		g-a	9.1	d(g-a)	0.0174		g-a	9.64	d(g-a)	0.0106
34	1	0.0001	0.01%		mh(g-a)	4.55	d[mh(g-a)]	0.0087		mh(g-a)	4.82	d[mh(g-a)]	0.0054
35					gsin θ	0.85499784	d(gsin θ)	0.0512		gsin θ	1.70348862	d(gsin θ)	0.0506
36					a+gsin θ	1.56499784	d(a+gsin θ)	0.0631		a+gsin θ	1.87348862	d(a+gsin θ)	0.0358
37					mb(a+gsin θ)	1.56499784	d[mb(a+gsin θ)]	0.0631		mb(a+gsin θ)	1.87348862	d[mb(a+gsin θ)]	0.0358
38					mbgcos θ	9.77266999	d[mbgcos θ]	0.011		mbgcos θ	9.66096406	d[mbgcos θ]	0.0133
39							dmh/mh	0.0002				dmh/mh	0.0002
40							dmb/mb	0.0001				dmb/mb	0.0001
41							da/a	0.02				da/a	0.02
42							dg/g	0.001				dg/g	0.001
43					sin θ	0.08715574	cos θ d θ /sin θ	0.0598		sin θ	0.17364818	cos θ d θ /sin θ	0.0297
44					cos θ	0.9961947	sin θ d θ /cos θ	0.0005		cos θ	0.98480775	sin θ d θ /cos θ	0.0009
45													
46	PRECISION ANALYSIS:												
47					There are 5 variables in μ , so to do our precision analysis correctly, we need to factor out the terms that accompany the 5 uncertainties								
48	Cofactors for:												
49		angle 1		angle 2									
50	dmh ²	9.2938035		10.7038									
51	dmb ²	1.2748769		1.404283									
52	da ²	0.1402881		0.143977									
53	dg ²	0.2615573		0.261588									
54	d θ ²	14.670124		3.735733									