STOPPING DISTANCE

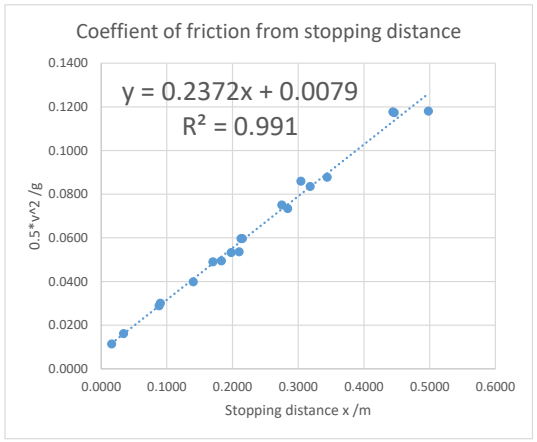
A. French 21/9/2021

x Displacement of rear flag position from light gate
t Time of 0.100m flag in light gate
v Average speed of block in light gate (m/s)

flag length /m **0.1**

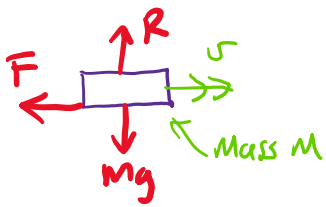
g Gravitational field strength (N/kg) **9.81**

x /cm	t /s	v / ms^-1	0.5*v^2/g	x /m
8.8	0.1329	0.7524	0.0289	0.0880
9.0	0.1301	0.7686	0.0301	0.0900
21.3	0.0924	1.0823	0.0597	0.2130
18.3	0.1015	0.9852	0.0495	0.1830
31.8	0.0781	1.2804	0.0836	0.3180
28.4	0.0833	1.2005	0.0735	0.2840
14.0	0.1130	0.8850	0.0399	0.1400
21.0	0.0975	1.0256	0.0536	0.2100
17.0	0.1019	0.9814	0.0491	0.1700
34.4	0.0762	1.3123	0.0878	0.3440
19.8	0.0978	1.0225	0.0533	0.1980
30.4	0.0770	1.2987	0.0860	0.3040
49.8	0.0657	1.5221	0.1181	0.4980
44.6	0.0659	1.5175	0.1174	0.4460
27.5	0.0824	1.2136	0.0751	0.2750
3.4	0.1774	0.5637	0.0162	0.0340
1.6	0.2108	0.4744	0.0115	0.0160
21.5	0.0924	1.0823	0.0597	0.2150
44.4	0.0658	1.5198	0.1177	0.4440



Coefficient of sliding friction is about 0.237

μ



Friction force $F = \mu R$

$R = Mg$

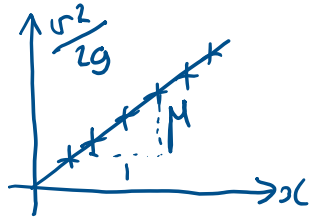
$\therefore F = \mu Mg$

If block leaves light gate at speed v and stops after x metres

$\frac{1}{2}Mv^2 = Fx$

$\therefore \frac{1}{2}Mv^2 = \mu Mgx$

$\frac{v^2}{2g} = \mu x$



μ is gradient of $\frac{v^2}{2g}$ vs x