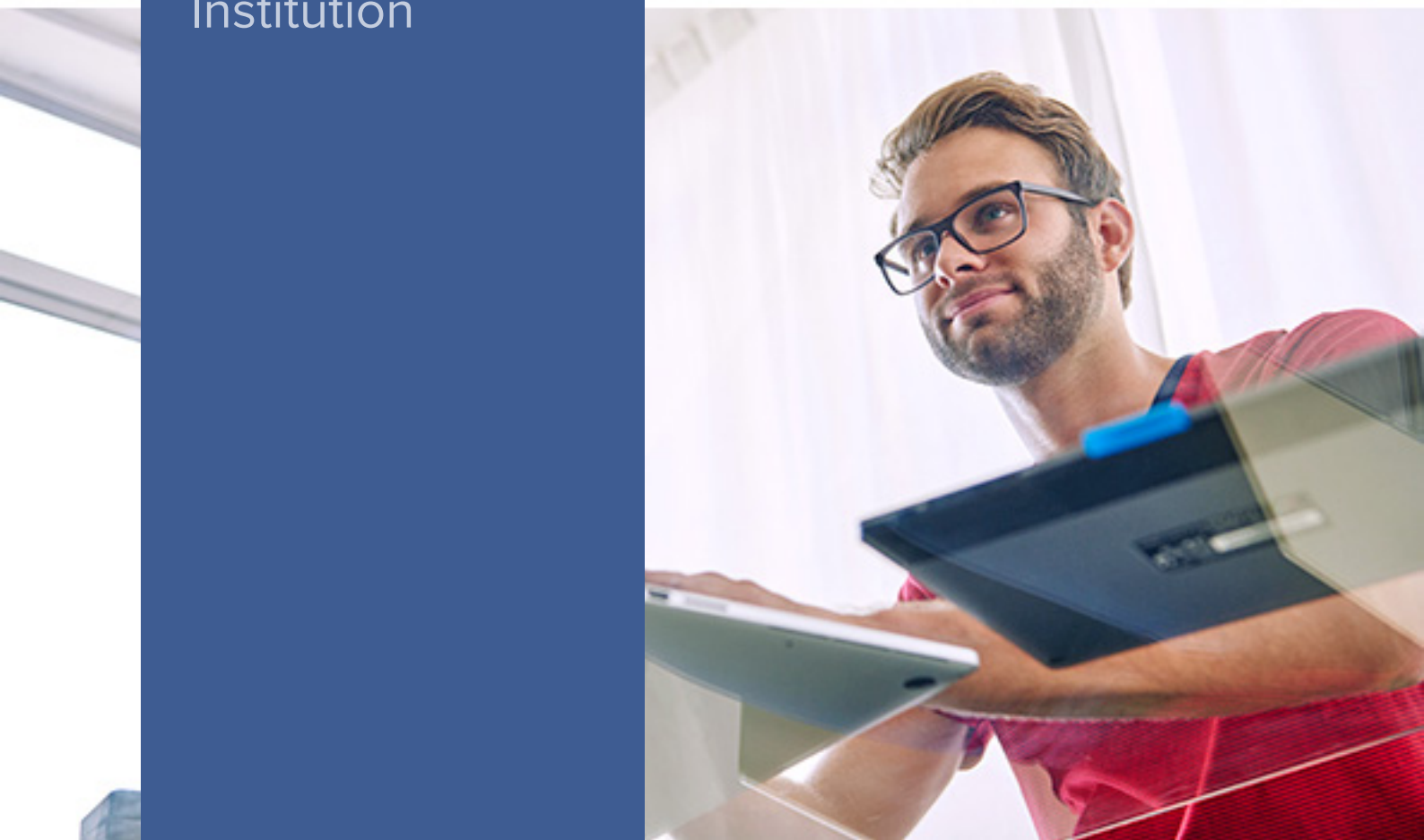
EXCEL AND UNCERTAINTY ASSIGNMENT

Name
Institution



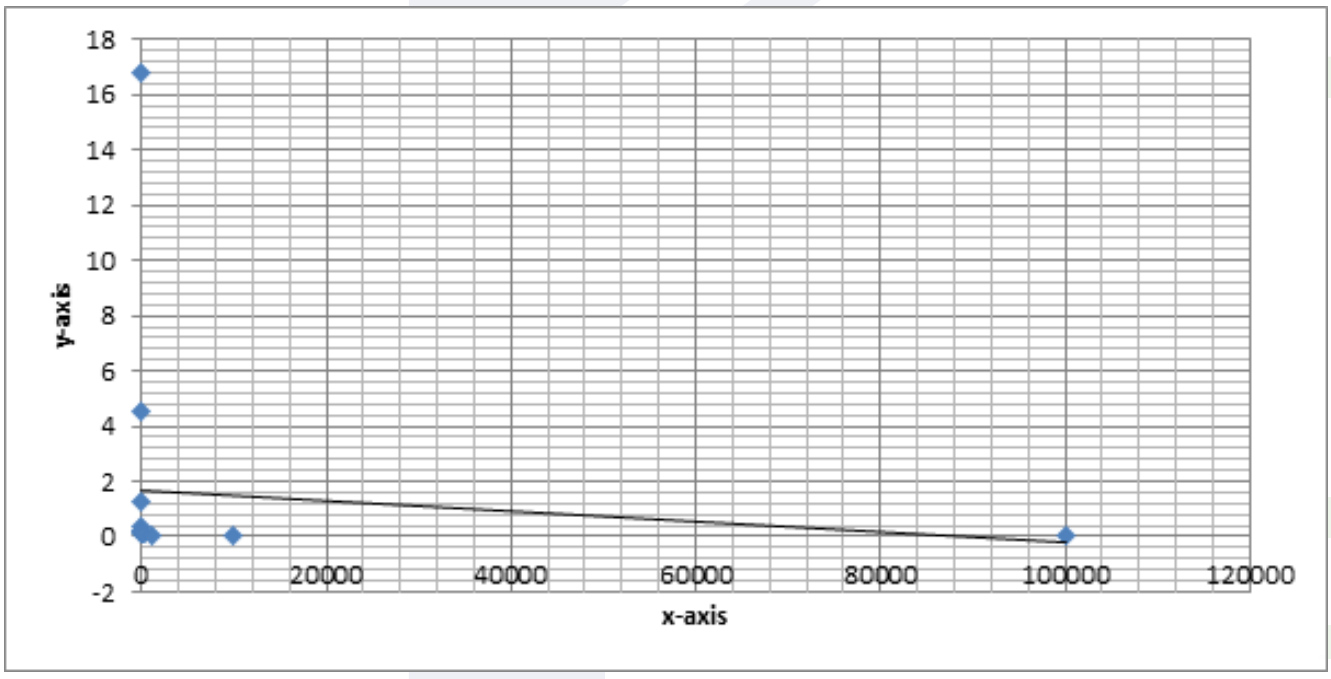
EXCEL AND UNCERTAINTY ASSIGNMENT

Part 1: EXCEL TEST

Quiz (1.1)

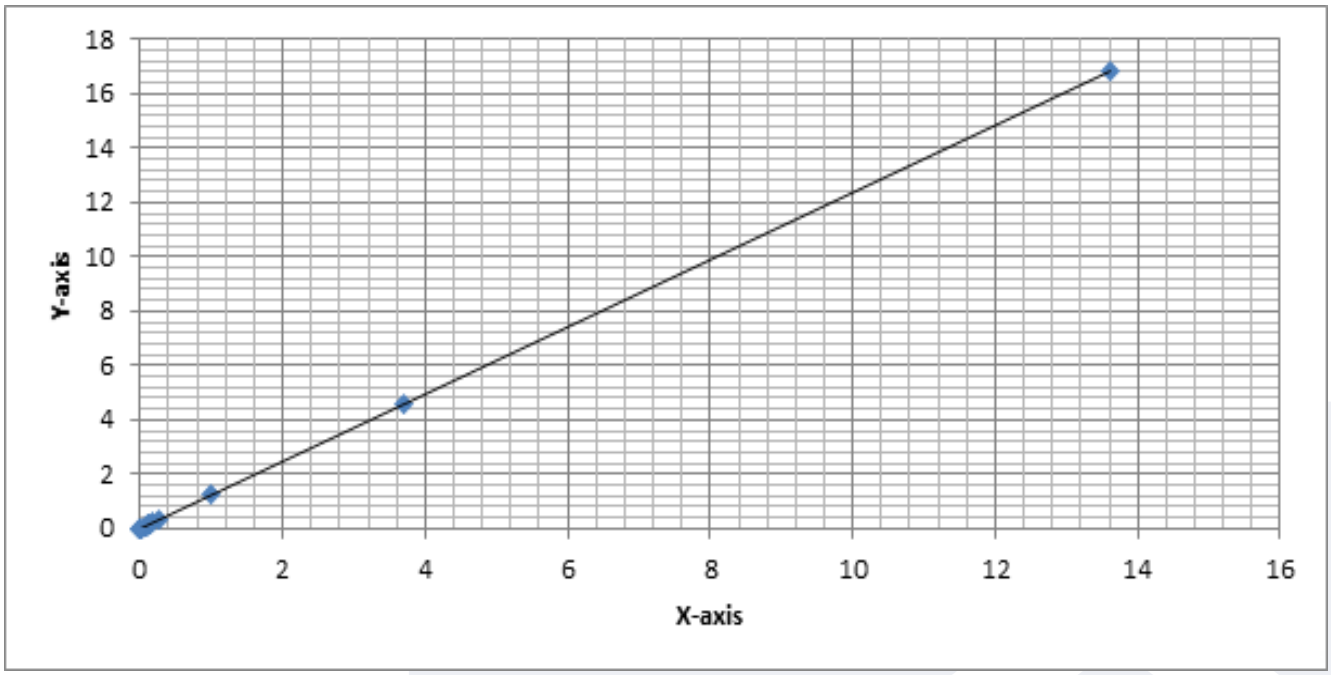
A	B	C	D	E	F
x	$Y = 1.234x^{-0.567}$	$X = x^{-0.567}$	$Y = y = 1.234x^{-0.567}$	X'ln(x)	Y'ln(y)
0.01	16.8	13.614	16.8	-4.605	2.821
0.1	4.553	13.69	4.553	-2.303	1.516
1	1.234	1	1.234	0	0.21
10	0.334	0.271	0.334	2.303	-1.097
20	0.226	0.183	0.226	2.996	-1.487
30	0.179	0.145	0.179	3.401	-1.72
40	0.152	0.123	0.152	3.689	-1.884
50	0.134	0.109	0.134	3.912	-2.01
60	0.121	0.098	0.121	4.094	-2.112
70	0.111	0.09	0.111	4.248	-2.198
80	0.103	0.083	0.103	4.382	-2.273
90	0.096	0.078	0.096	4.5	-2.343
100	0.091	0.073	0.091	4.605	-2.397
1000	0.025	0.02	0.025	6.908	-3.689
10000	0.007	0.005	0.007	9.21	-4.962
100000	0.002	0.001	0.002	11.513	-6.215

a. A graph of y against x



The graph takes a straight line of best fit

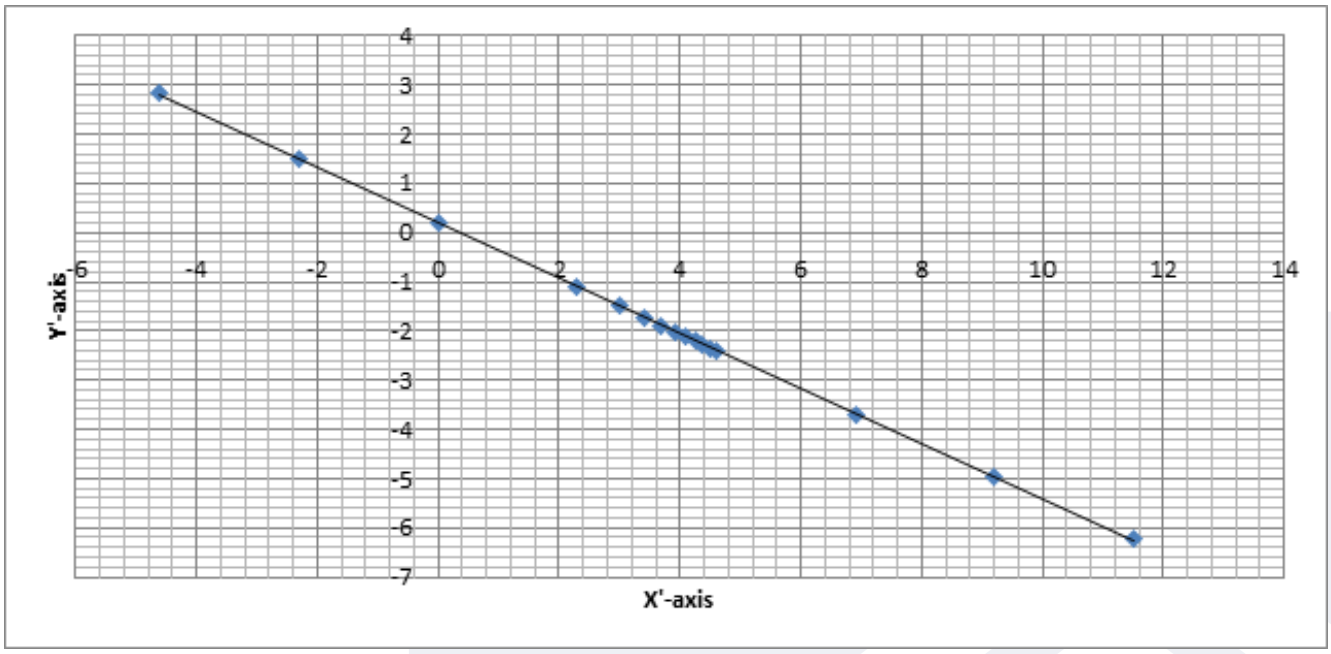
b. A graph of Y=y against $X=x^{-0.567}$



The line was expected to be a straight line since the values Y and X are the main factors of the graph in a) above.

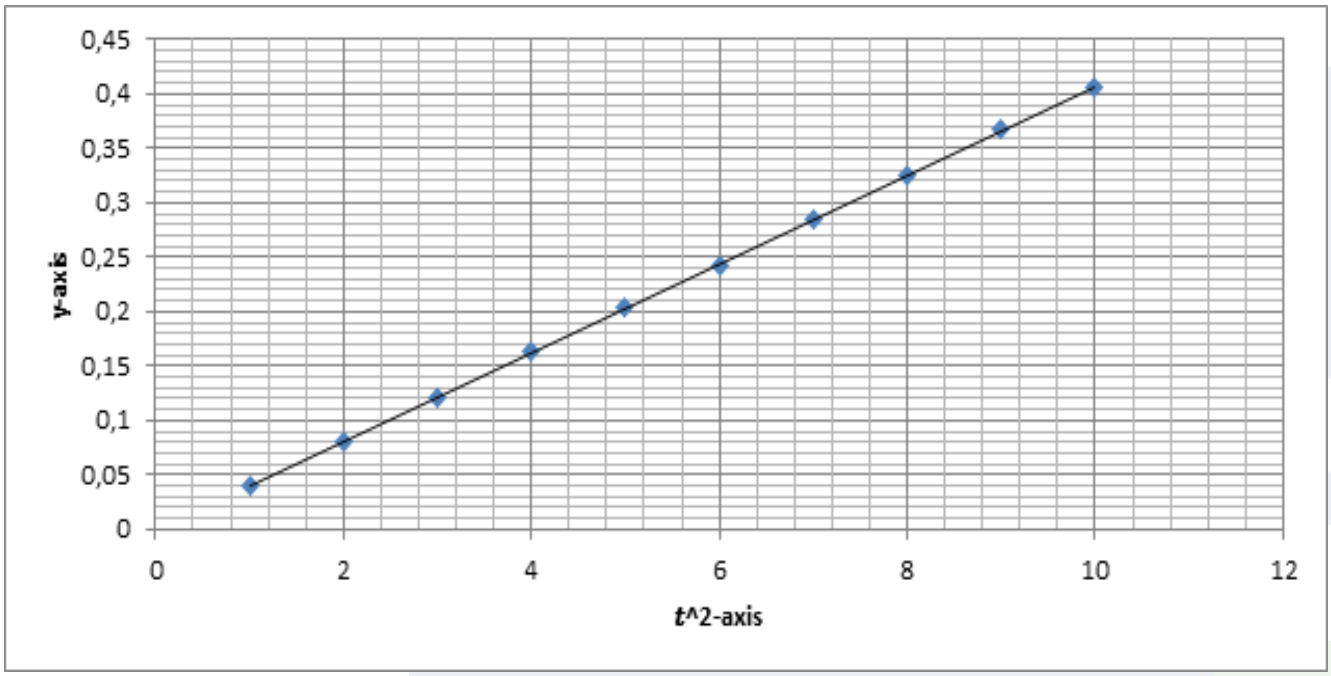
c. A graph of Y=ln(y) against X=ln(x)

The graph has to be a straight line since the natural logarithm has been take on both x and y components. The slope of the graph is -0.4 and the y intercept is (0,0.8)



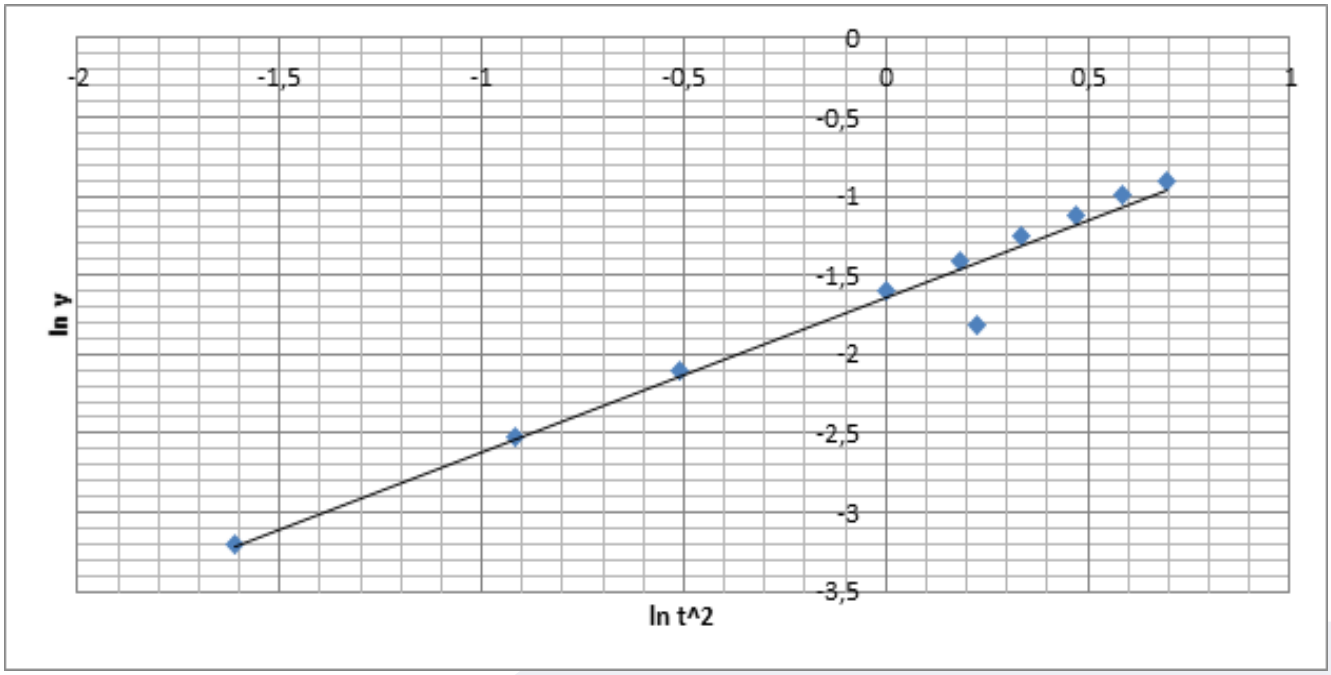
Quiz (1.2)

a. In the algebraic solution a graph of y against t^2 will be drawn as the gradient or the slope of the graph is thus determined which will represent the value of g. From the question y represents the vertical component, t^2 will represent the horizontal axis while the gradient will represent the unknown value of g. The sketch to represent this:



In this case, the value of g will be 4.969m/s^2

In the using of logarithmic solving, there will be the introduction of natural logs on all components of the above equation. Since the resulting equation still observes the equation of a straight line then the natural log of y will be plotted against the natural log of t^2. The result of this graph when its antilog is determined it represents the value of g which in this case is 5 m/s^2. The graph determined is;



b. The estimated value of g by excel program is 5 m/s^2.

Part 2: UNCERTAINTY TEST.

Quiz (2.1)

Recognize a phenomenon - Apparatus – Hypothesis - Experimental procedure – Observations – Conclusion.

Quiz (2.2)

The conversion is done by multiplying the required value by 1000 i.e.

1 g/cm3 = 1000 kg/m3

Quiz (2.3)

Accuracy can be defined as the level of closeness of estimations of an amount to that amount's actual quality while Precision is the extent to which a repeated estimations under unaltered conditions yields the

same results

Quiz (2.4)

Repeated, independent measurements of quantity will vary about the "accurate" value

Quiz (2.5)

Since we have been given the absolute uncertainty it then means that the minimum travelled distances and the maximum travelled distances can be determined by either adding the or subtracting the relative value from the reading that has been given.

x = 60.0+0.2 cm = 60.2 cm or 60.0-0.2 cm = 59.8 cm

t = 82.4 +0.3 s = 82.7 s 0r 82.4-0.3s = 82.1s

$$\text{The maximum velocity vm} = \frac{\text{(maximum distance travelled)}}{\text{(maximum time taken)}}$$

$$= \frac{60.2}{82.7x100} = 0.0073 \text{ m/s}$$

$$\text{The minimum velocity vs} = \frac{\text{(minimum distance travelled)}}{\text{(minimum time taken)}}$$

$$= \frac{59.8}{82.1x100} = 0.0073 \text{ m/s}$$

$$\text{Hence the average speed} = \frac{(vm+vs)}{2} = 0.0073 \text{m/s}$$

Quiz (2.6)

a. Since the value found in the measurement is less than 152.5 cm and not more than 152.8 cm. then the highest value and minimum measurement differ by 0.3cm hence the true value lies between the highest and lowest measurements i.e. 0.15cm from the highest and lowest measurements. Hence this can be represented as;

$$152.65 \pm 0.15 \text{ cm}$$

b. From the definition of the absolute uncertainty and the values that has been provided in the reading it then follows that the absolute uncertainty is 0.15 cm

c. The relative uncertainty in this case is (0.15)

Quiz (2.7)

Since the accuracy of the watch in question is a second and 60 seconds are equivalent to a minute it then follows that the represented time i.e. 08:36 the unseen seconds are between 0 and 59. In representing this, we consider a whole minute that has 60 seconds but from the known fact the 60^{th} second is equivalent to a minute hence a close number to represent this is the 59^{th} second. Hence the absolute uncertainty in this case is the lowest value possible that can be recorded by this clock is the one second. This concludes that the time will be represented as;

$$08:36:59 \pm 00:00:01$$

Quiz (2.8)

When taken into consideration, the exact value of $\sqrt{10}$ is much greater than the exact value of π. For this case, the difference between this will give an error which can be converted into percentage to represent the

exact amount the values differ from each other. The following procedure will help in determining this.

$\sqrt{10} = 3.16227766$

$\pi = 3.1421592654$

The error $\sqrt{10} - \pi$

$= 0.020685006$

$$\% \text{ error} = \frac{0.020685006}{3.16227766} \times 100\%$$

$= 0.6541\%$