DATA PROCESSING AND ERROR ANALYSIS

Name: _____ Date: _____ Section: _____
Show all your work for full credit.

1a) Write the following numbers in scientific notation:

1234	12.34	123.4	0.01234	0.00001234
_____	_____	_____	_____	_____

b) Give the number of significant digits in the following numbers.

123450	123.0	0.0123450	0.12345	12345
_____	_____	_____	_____	_____

2a) Add the following two numbers together. Keep the correct number of significant digits in the answer, round off properly if necessary, and then re-write the result in scientific notation.

1233.456 + 1.23467

Answer in decimal form _____

Answer in scientific notation _____

b) Subtract the following two numbers. Keep the correct number of significant digits in the answer, round off properly if necessary, and then re-write the result in scientific notation.

1233.456 - 1.23467

Answer in decimal form _____

Answer in scientific notation _____

3a). Multiply the following two numbers. Keep the correct number of significant digits in the answer, round off properly if necessary, and then re-write the result in scientific notation.

1233.456 x 5.23467

Answer in decimal form _____

Answer in scientific notation_____

b) Divide the following two numbers. Keep the correct number of significant digits in the answer, round off properly if necessary, and then re-write the result in scientific notation.

1233.456 / 5.23467

Answer in decimal form _____

Answer in scientific notation _____

4) The shape of the 3-D object on your lab bench is _____

1. Smallest division on the ruler or meter stick = _____ (***Don't forget the units***)
2. Length of side 1, L_1 = _____
3. Length of side 2, L_2 = _____
4. Uncertainty in length of side 1, ΔL_1 = _____
5. Uncertainty in length of side 2, ΔL_2 = _____
6. Sum of side 1 and 2 (including the propagation of uncertainty) = _____±_____
7. Difference of side 1 and 2 (including the propagation of uncertainty) = _____±_____

5) Calculate the area and uncertainty in the area of one side of your object. Hint: the area of a rectangle is given by the product of the two sides; the area of a triangle is given by half of the product of the two sides.

1. Area of one side, A = _____ (***Don't forget the units***)
2. Uncertainty in the area, ΔA = _____

6a) Count the number of times your heart beats in 1 minute: _____

b) Convert this into heartbeats per second_____ (Hb/s)

c) How many seconds are between each heartbeat? _____(s/Hb)

7a) Estimate the length of your hand span (with a meter stick): _____

b) Using your hand, count how many spans for the length of the long side of the lab table: _____

c) Estimated length of the long side of lab table: _____

d) Measure the actual length of the lab table: _____

e) Find the absolute deviation of your estimation from the measured value: _____

f) Find the relative percent deviation of your estimation from the measured value: _____

8. Find the average and standard deviation of the following six numbers (show your work). Keep the correct number of significant digits in the answer, and round off the result properly.

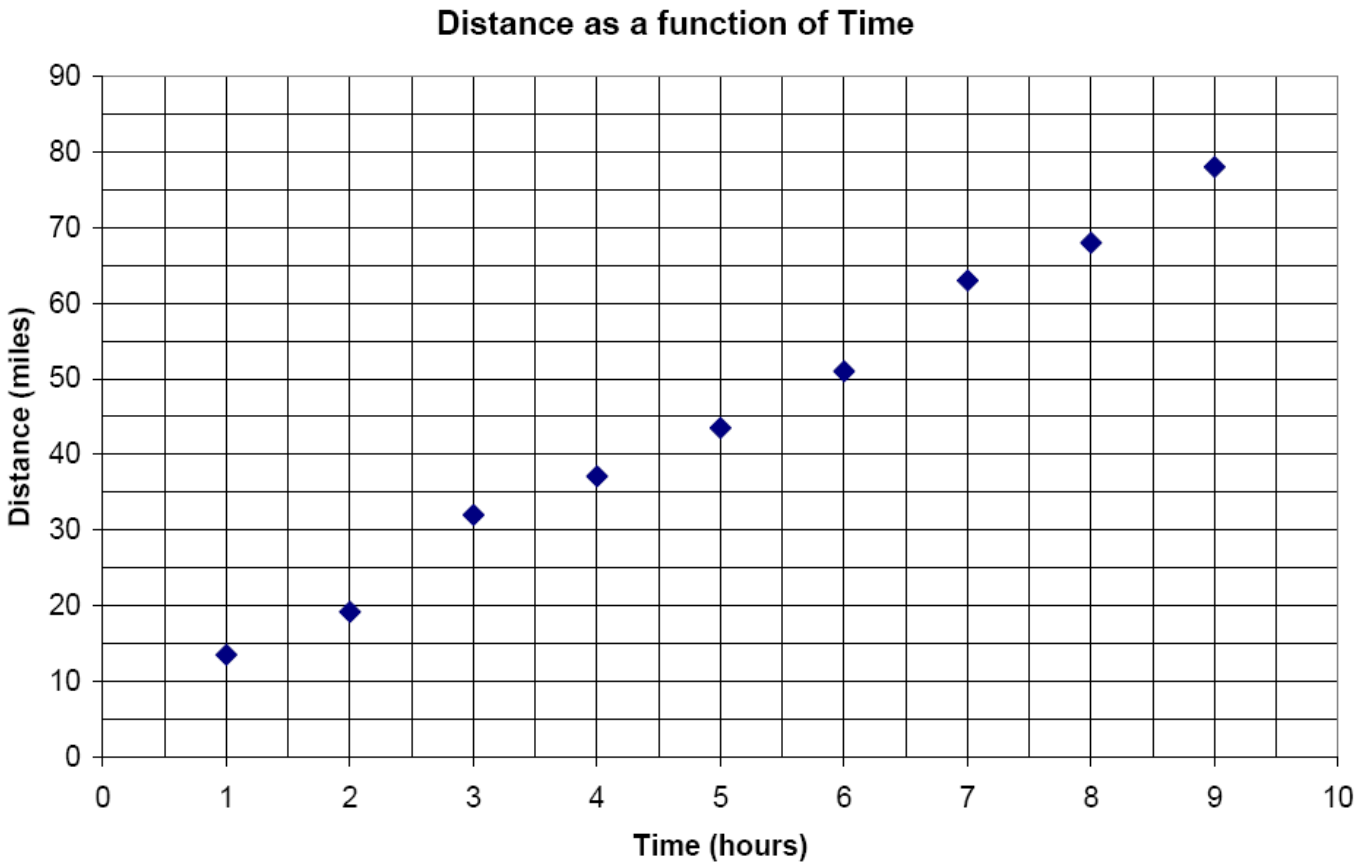
Values	**Residuals**	**Residuals^2**
48.564		
51.58		
53.2		
52.896		
52.35		
54.9		
Average =		Sum =

Average: _____

Standard Deviation: _____

Reported Result: _____ ± _____

9. Given the graph of the data from an experiment that measured the distance an object moved away from a starting point at a constant speed at different times:



a) Draw a best-fit line through the data points, assuming the relationship should be linear.

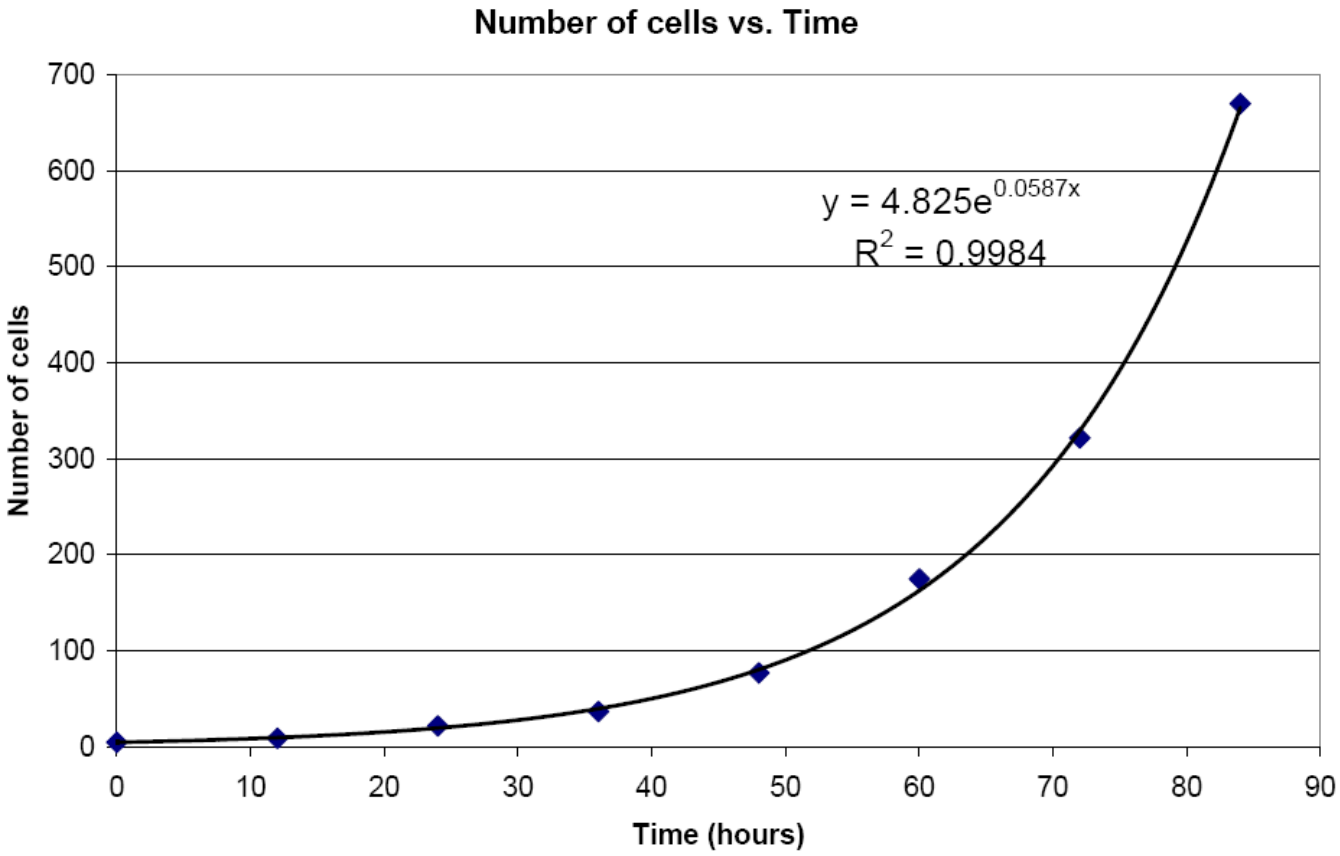
b) Find the slope of the straight line using the formula slope = rise/run = $(y_2-y_1)/(x_2-x_1)$. Note, the two points (x_2, y_2) and (x_1, y_1) are points on the best-fit line, not necessarily original data points. For the best determination, the two points should be at opposite ends of the line. ***Don't forget the units.***

c) Find the value of the y-intercept of the best-fit line. ***Don't forget the units.***

d) What does the y-intercept physically represent in this experiment?

e) Write the equation of the line in the form y = mx + b, where m is the slope and b is the intercept.

10. Given the graph of the data from an experiment that measured the growth rate of a sample of cancerous cells:



a) What is the independent variable in this experiment?

b) What is the dependent variable in this experiment?

c) Estimate at what time 400 cells were present.

d) Given the equation of the best fit line, calculate how many cells will be present after 10 days.

e) The quantity 0.0587x must be unit-less. What are the units of the number 0.0587?