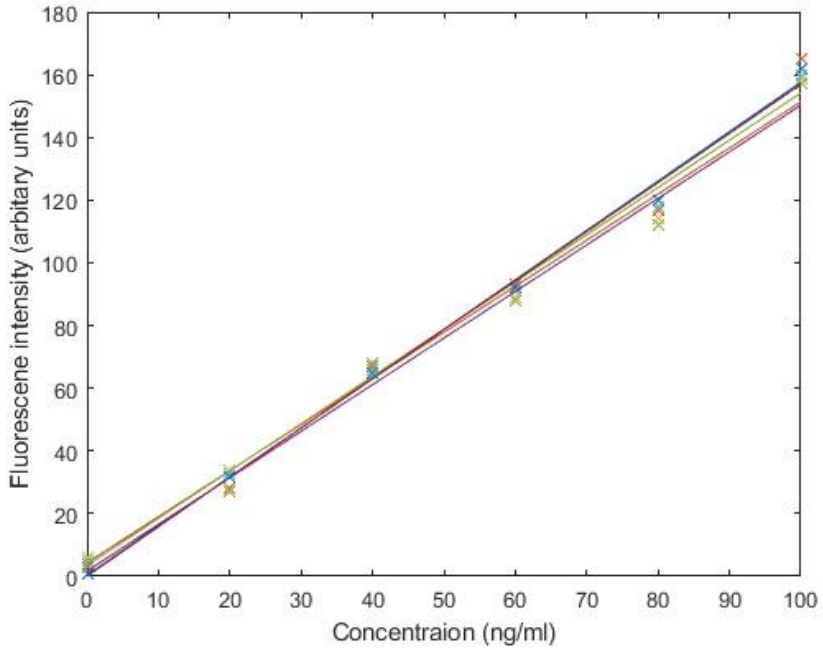
F028130 - 23CGC059, CW1

Question 1

With the given data, a bar graph seemed most suitable to present the different series at different concentrations. This is because they can be quickly interpreted and are easy to understand. Comparing multiple sets of data on one graph also becomes easier.

Scatter graphs were used to model regression; the data points are shown, with a regression line. Multiple figures were made to display these models. This is to show the figures clearly and to ensure interpretations can be done accurately as the data is easier to visualise.



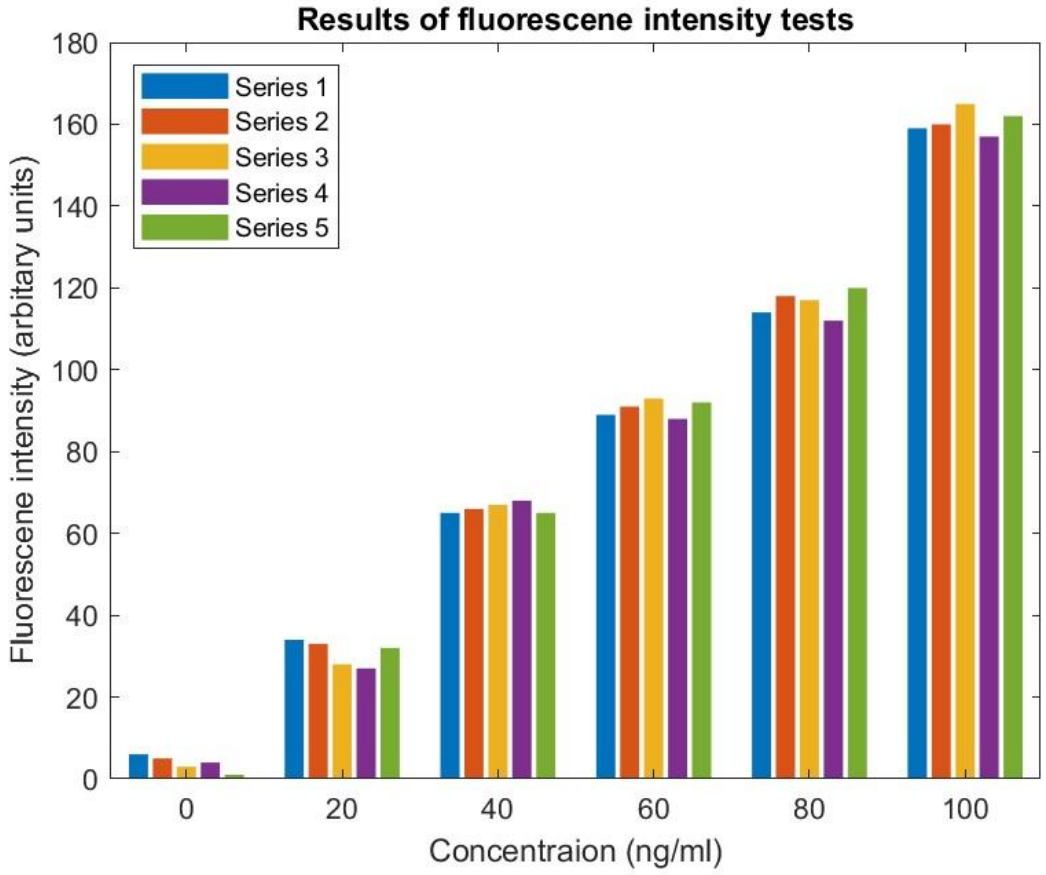
As can be seen by the figure above, the interpretations would be very difficult if I had put all the regression models on one graph. Hence, I decided to create multiple figures.

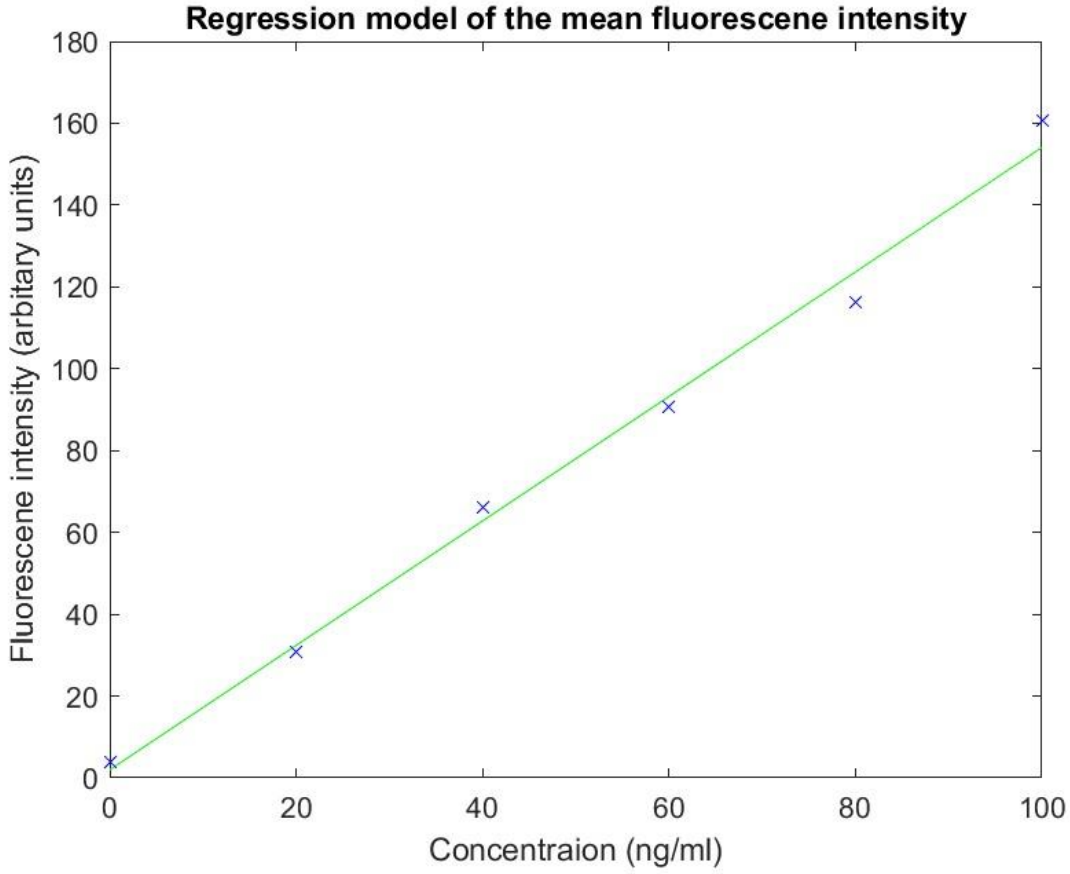
Series	Slope	Intercept	Regression
1	1.47	4.333333	1.4700*concentration + 4.3333
2	1.507143	3.47619	1.5071*concentration + 3.4762
3	1.575714	0.047619	1.5757*concentration + 0.0476
4	1.485714	1.714286	1.4857*concentration + 1.7143
5	1.565714	0.380952	1.5657*concentration + 0.3810

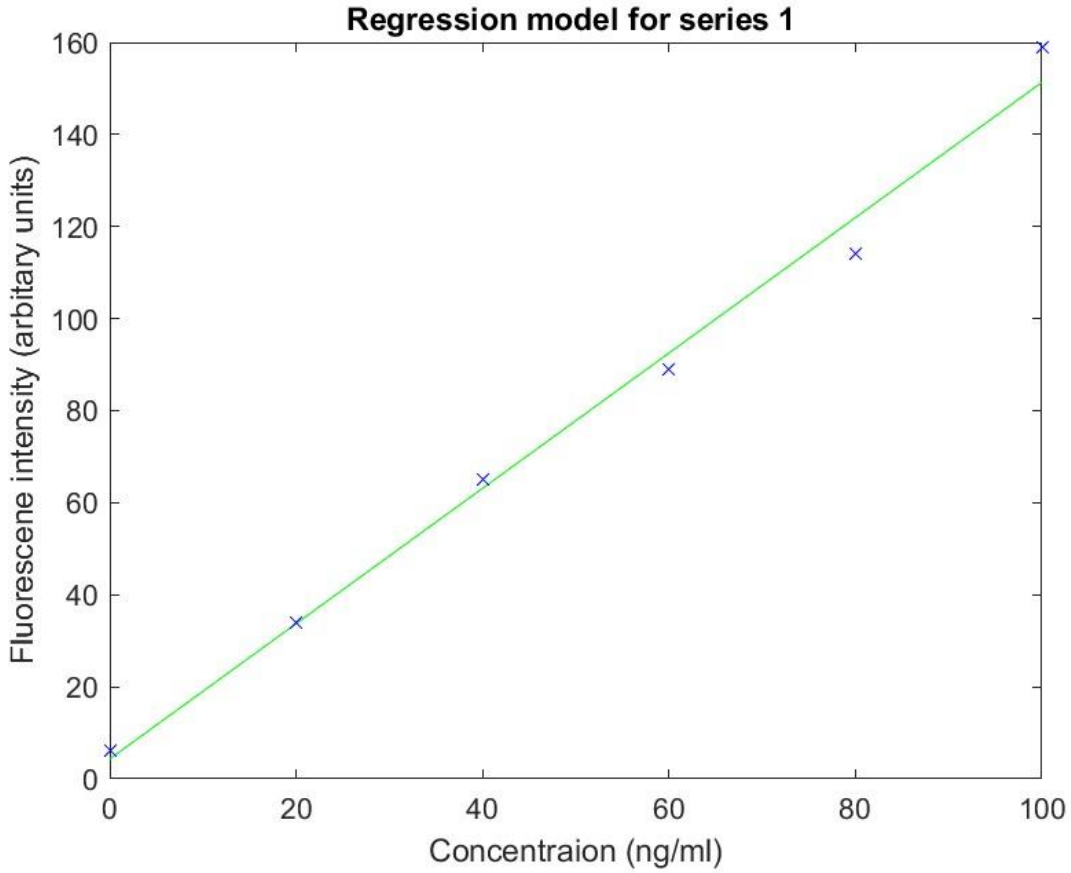
It can be observed that series 1 had the slowest rate of change in fluorescence intensity per unit change in concentration as series 1 has the smallest value for slope. However, series 1 also had the greatest intercept which represents the estimated fluorescence intensity when concentration is zero.

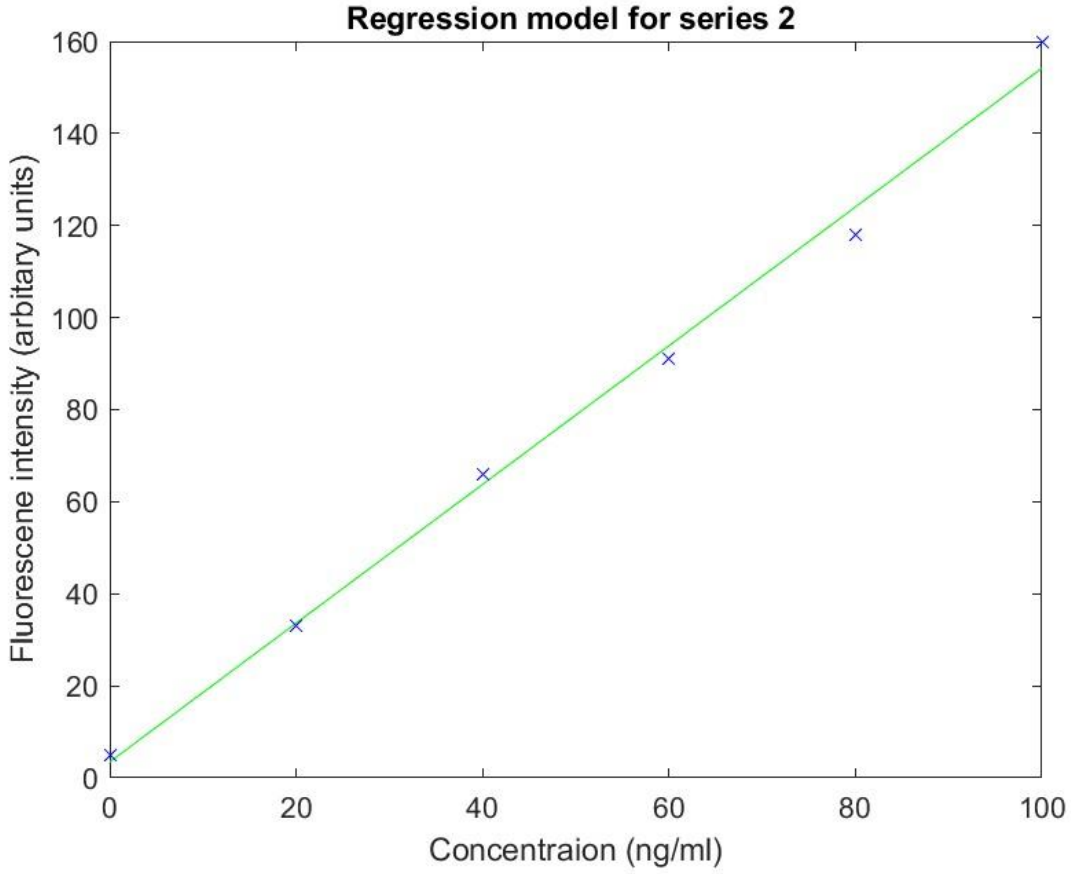
Additionally, series 3 showed the fastest rate of change in fluorescence intensity per unit change in concentration as series 3 has the greatest value for slope. Conversely, series 3 also had the smallest intercept.

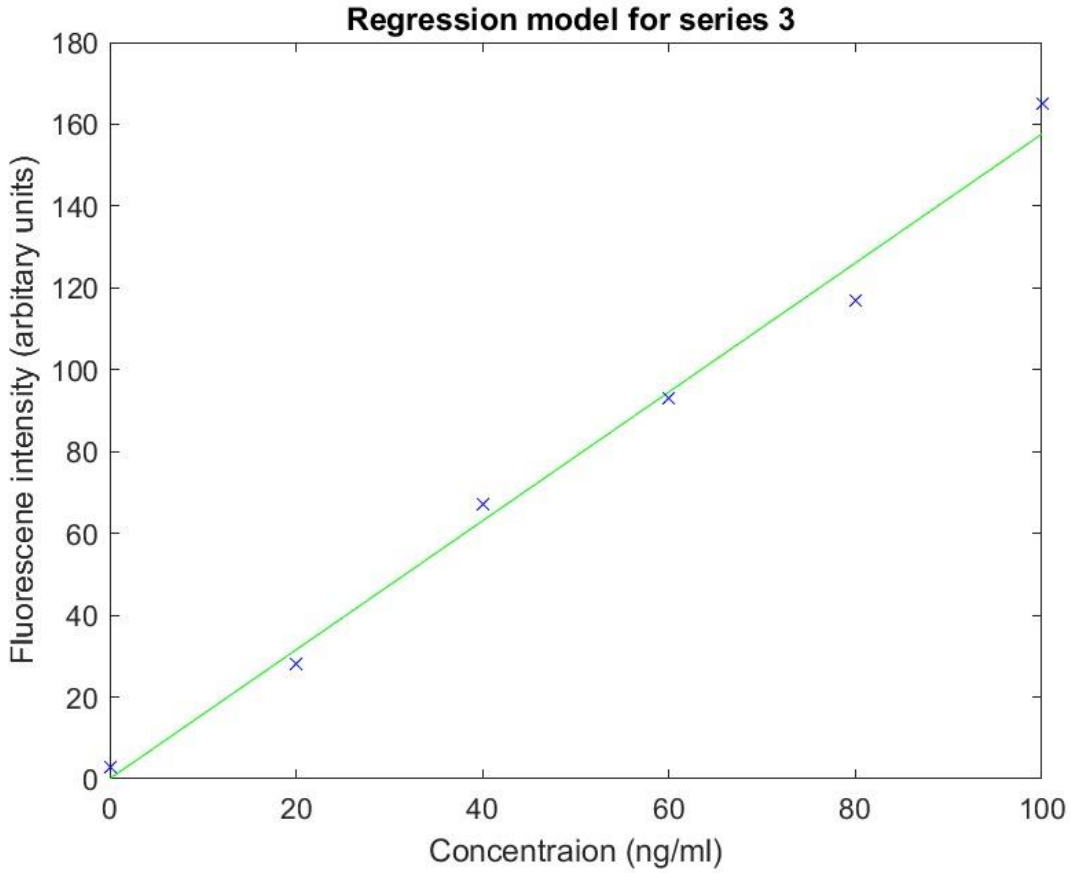
The data suggests that the regression models will clash and overlap.

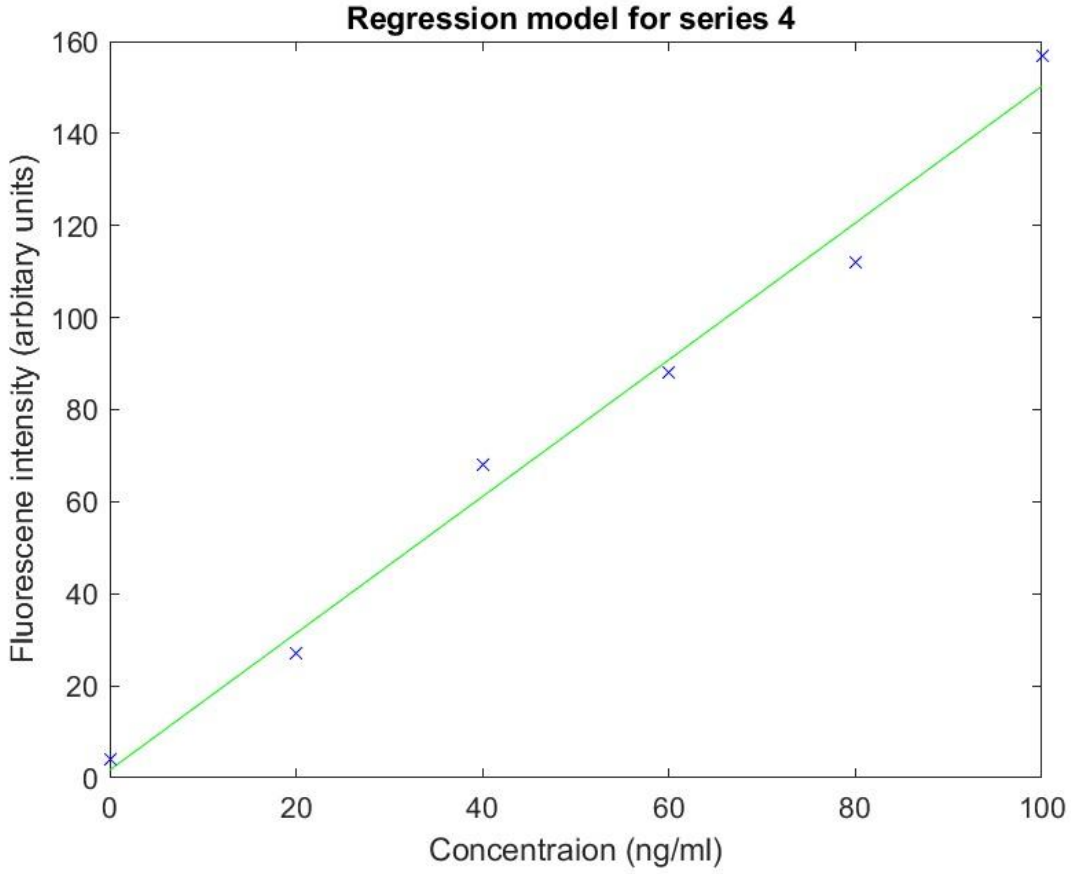

Results of fluorescene intensity tests
Series 1
Series 2
Series 3
Series 4
Series 5
Fluorescene intensity (arbitary units)
Concentraion (ng/ml)
0
20
40
60
80
100
120
140
160
180

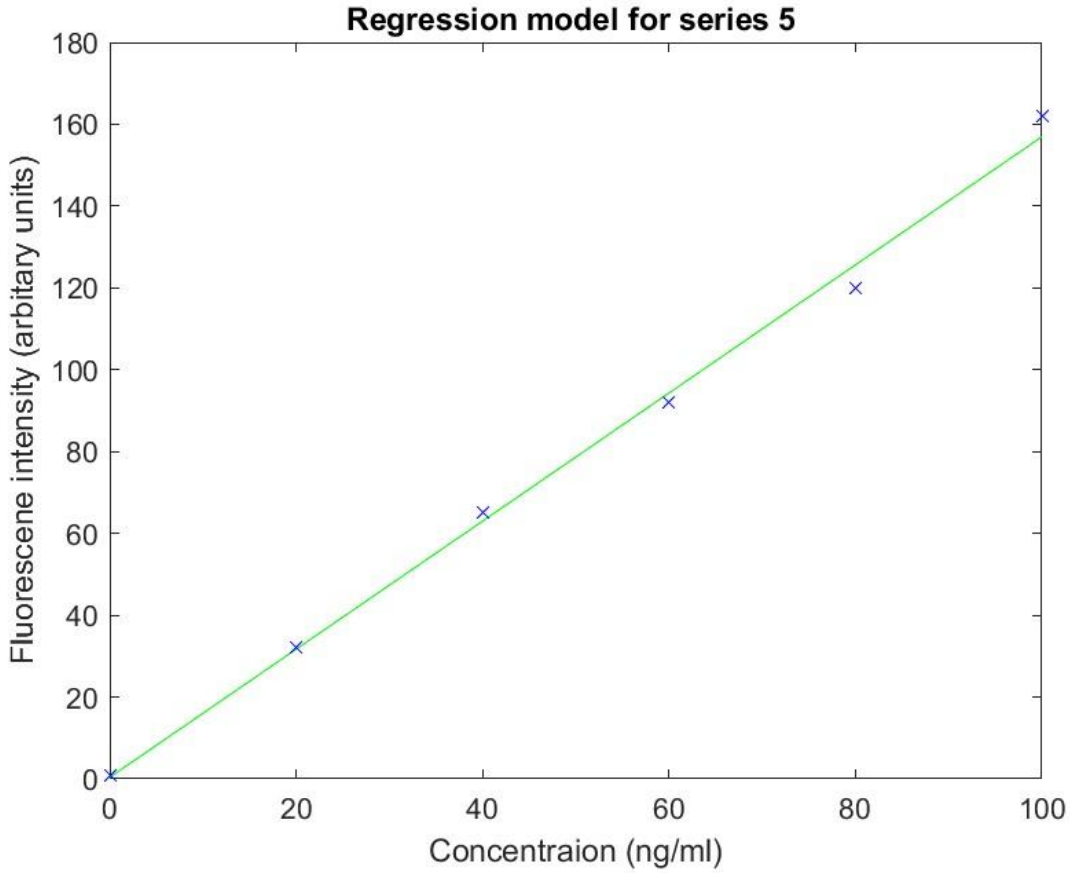

Regression model of the mean fluorescene intensity
Fluorescene intensity (arbitary units)
Concentraion (ng/ml)
0
20
40
60
80
100
120
140
160
180


Regression model for series 1
Fluorescene intensity (arbitary units)
Concentraion (ng/ml)
0
20
40
60
80
100
120
140
160


Regression model for series 2
Fluorescene intensity (arbitary units)
Concentraion (ng/ml)
0
20
40
60
80
100
120
140
160


Regression model for series 3
Fluorescene intensity (arbitary units)
Concentraion (ng/ml)
0
20
40
60
80
100
120
140
160
180


Regression model for series 4
Fluorescene intensity (arbitary units)
Concentraion (ng/ml)
0
20
40
60
80
100
120
140
160


Regression model for series 5
Fluorescene intensity (arbitary units)
Concentraion (ng/ml)
0
20
40
60
80
100
120
140
160
180

Question 2

With the given data, it seemed most suitable to produce the data in a bar chart. Once again it is easy to interpret.

sample number	certified value	mean	standard deviation	t statistic
1	0.705	0.714	0.026	0.9791
2	1.45	1.468	0.024	2.1213
3	2.268	2.276	0.028	0.8081
4	2.99	3.016	0.026	2.8284

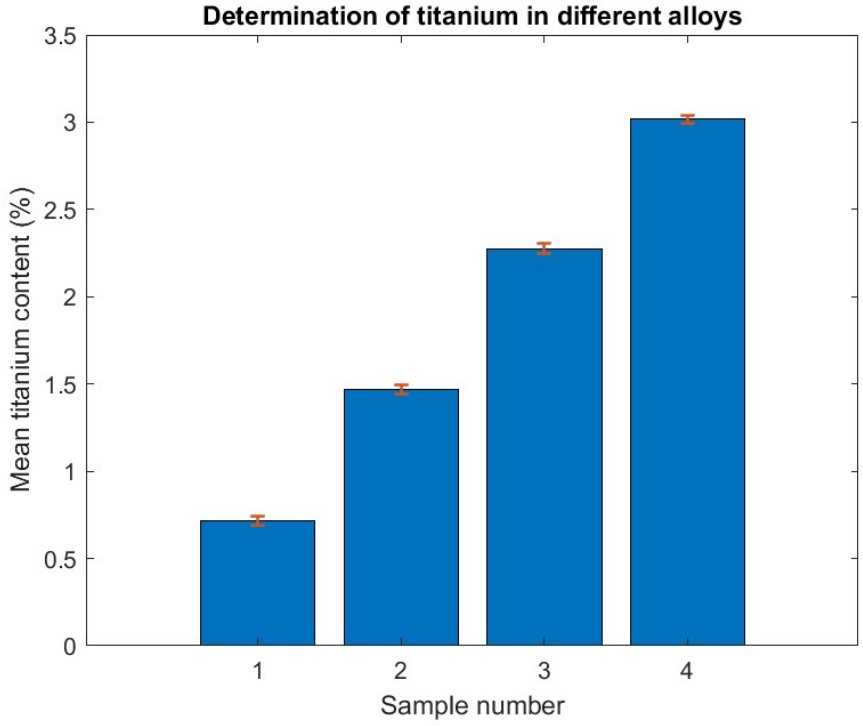
The critical t-value is 2.3646.

Sample 1: The t-statistic is less than the critical value at 95% confidence. This means that the mean value doesn't differ significantly from the certified value at 95% confidence.

Sample 2: The t-statistic is less than the critical value at 95% confidence. This means that the mean value doesn't differ significantly from the certified value at 95% confidence.

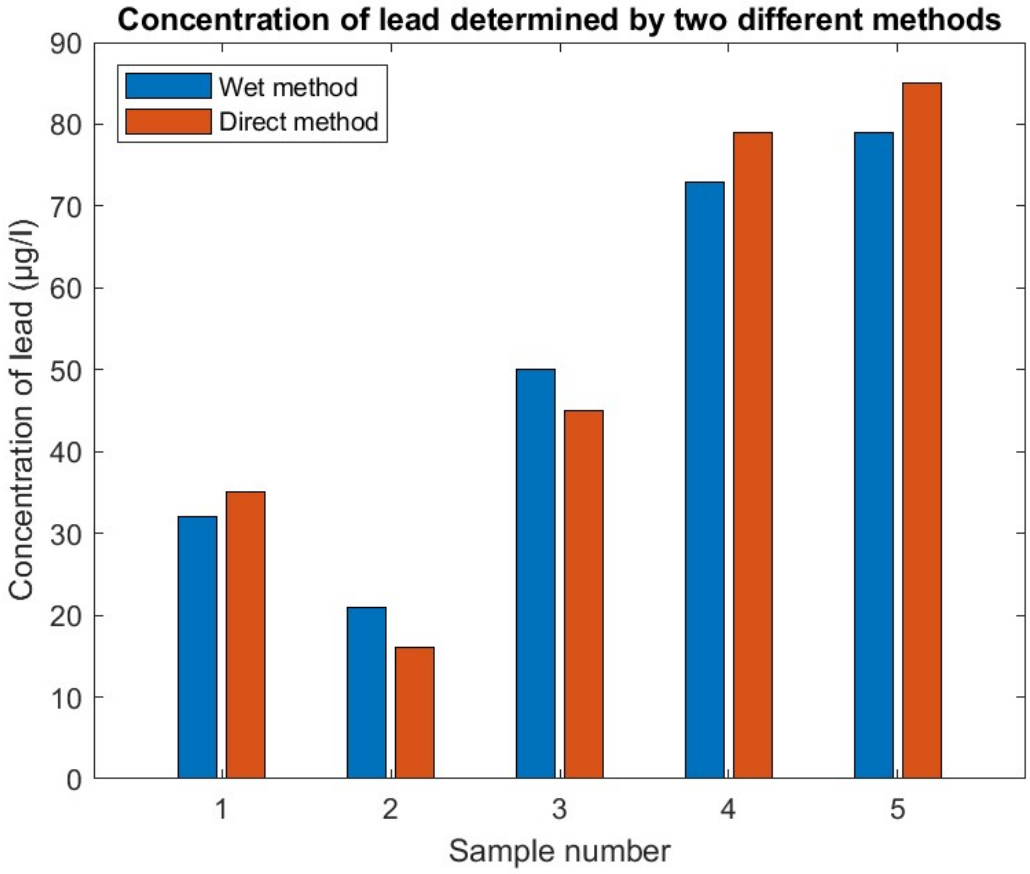
Sample 3: The t-statistic is less than the critical value at 95% confidence. This means that the mean value doesn't differ significantly from the certified value at 95% confidence.

Sample 4: The t-statistic is greater than the critical value at 95% confidence. This means that the mean value differs significantly from the certified value at 95% confidence.

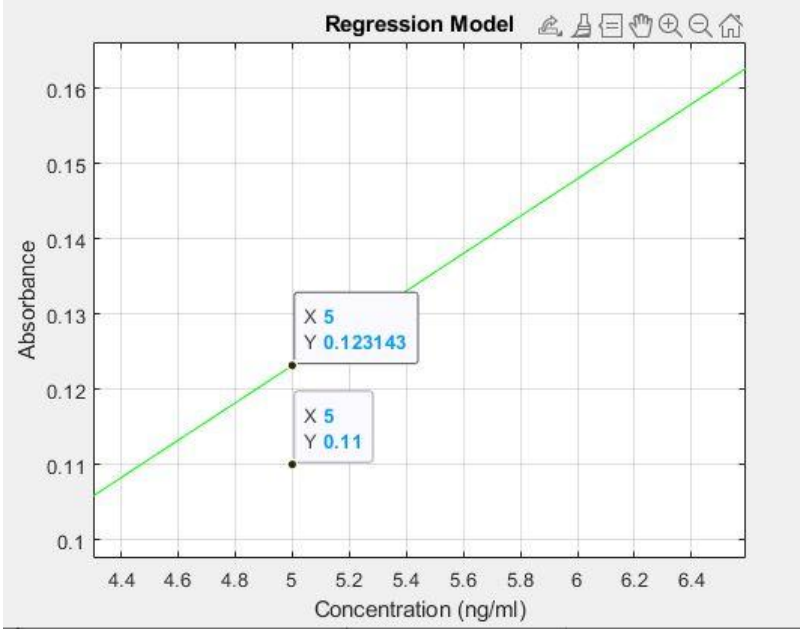


Question 3

At 95% confidence, t statistic is 0.3984, the critical t-value is 2.7764. The t statistic is less than the critical t value, suggesting that there is no significant difference between the mean values of the wet and direct methods. The null hypothesis is therefore accepted.



Question 4

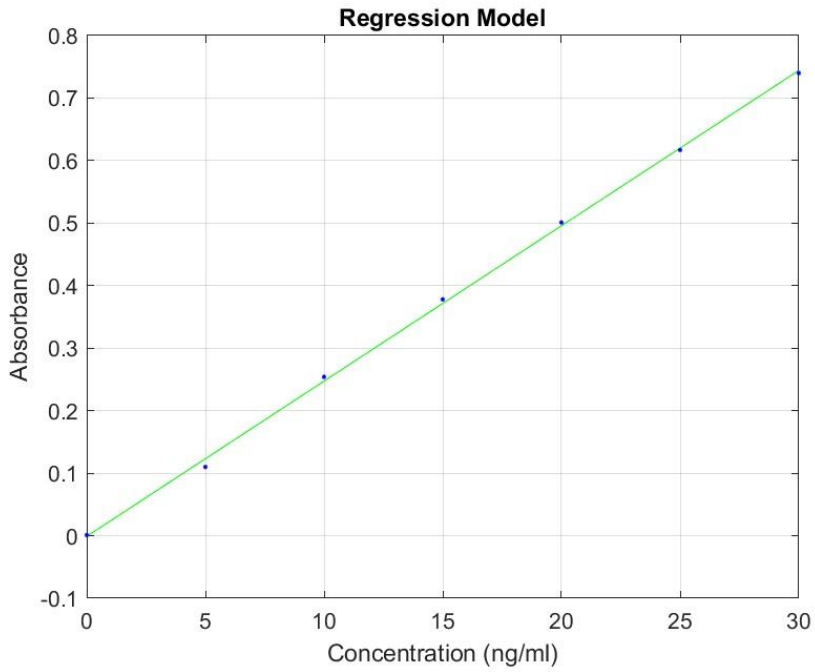


The furthest datapoint from the regression model can be observed at concentration of 5ng/ml. The difference in these points is 0.0131, suggesting that the model is relatively accurate.

Var1	Var2
Intercept	-0.00107
Slope	0.024843
std of intercept	0.326564
std of slope	0.000274
lower ci of intercept	-1.40616
upper ci of intercept	1.404019
lower ci of slope	0.023662
upper ci of slope	0.026024

For the slope, the lower confidence limit is 0.02366, the upper confidence limit is 0.02602; the slope is 0.02484, this lies within the limits. This means the true population slope is likely to fall within this interval.

For the intercept, the lower confidence limit is -1.40616, the upper confidence limit is 1.40402; the intercept is -0.00107, this lies within the limits. This means the true population intercept is likely to fall within this interval.


Regression Model
Absorbance
Concentration (ng/ml)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
0
5
10
15
20
25
30