

1. The grades obtained by a group of 20 IB students are listed below:

6 2 5 3 5 5 6 2 6 1
7 6 2 4 2 4 3 4 5 6

(a) Complete the following table for the grades obtained by the students.

Grade	Frequency
1	
2	
3	2
4	
5	4
6	
7	1

(2)

(b) Write down the modal grade obtained by the students.

(1)

(c) Calculate the median grade obtained by the students.

(2)

One student is chosen at random from the group.

(d) Find the probability that this student obtained either grade 4 or grade 5.

(1)

(Total 6 marks)

2. The diagram below shows the cumulative frequency distribution of the heights in metres of 600 trees in a wood.

(a) Write down the median height of the trees.

(1)

(b) Calculate the interquartile range of the heights of the trees.

(2)

(c) Given that the smallest tree in the wood is 3 m high and the tallest tree is 28 m high, draw the box and whisker plot on the grid below that shows the distribution of trees in the wood.

(3)

(Total 6 marks)

3. The distribution of the weights, correct to the nearest kilogram, of the members of a football club is shown in the following table.

Weight (kg)	40 – 49	50 – 59	60 – 69	70 – 79
Frequency	6	18	14	4

- (a) On the grid below draw a histogram to show the above weight distribution.

(2)

- (b) Write down the mid-interval value for the 40 – 49 interval.

(1)

- (c) Find an estimate of the mean weight of the members of the club.

(2)

- (d) Write down an estimate of the standard deviation of their weights.

(1)

(Total 6 marks)

4. The Venn diagram shows the numbers of pupils in a school according to whether they study the sciences Physics (P), Chemistry (C), Biology (B).

- (a) Write down the number of pupils that study Chemistry only.

(1)

- (b) Write down the number of pupils that study **exactly** two sciences.

(1)

- (c) Write down the number of pupils that do not study Physics.

(2)

- (d) Find $n[(P \cap B) \cap C]$.

(2)

(Total 6 marks)

5. The marks obtained by 8 candidates in Physics and Chemistry tests are given below.

Physics (x)	6	8	10	11	10	5	4	12
Chemistry (y)	8	11	14	13	11	7	5	15

(a) Write down the product moment correlation coefficient, r . (1)

(b) Write down, in the form $y = mx + c$, the equation of the regression line y on x for the 8 candidates. (2)

A ninth candidate obtained a score of 7 in the Physics test but was absent for the Chemistry test.

(c) Use your answer to (b) to estimate the score he would have obtained on the Chemistry test. (2)

(d) Give a reason why it is valid to use this regression line to estimate the score on the Chemistry test. (1)

(Total 6 marks)

6. Jorge conducted a survey of 200 drivers. He asked two questions:

How long have you had your driving licence?
Do you wear a seat belt when driving?

The replies are summarized in the table below.

	Wear a seat belt	Do not wear a seat belt
Licence less than 2 years	38	42
Licence between 2 and 15 years	30	45
Licence more than 15 years	30	15

(a) Jorge applies a χ^2 test at the 5 % level to investigate whether wearing a seat belt is associated with the time a driver has had their licence.

(i) Write down the null hypothesis, H_0 .

(ii) Write down the number of degrees of freedom.

(iii) Show that the expected number of drivers that wear a seat belt and have had their driving licence for more than 15 years is 22, correct to the nearest whole number.

(iv) Write down the χ^2 test statistic for this data.

(v) Does Jorge accept H_0 ? Give a reason for your answer.

(8)

(b) Consider the 200 drivers surveyed. One driver is chosen at random. Calculate the probability that

(i) this driver wears a seat belt;

(ii) the driver does not wear a seat belt, **given that** the driver has held a licence for more than 15 years.

(4)

(c) Two drivers are chosen at random. Calculate the probability that

(i) both wear a seat belt.

(ii) at least one wears a seat belt.

(6)

(Total 18 marks)