1. From January to September, the mean number of car accidents per month was 630. From October to December, the mean was 810 accidents per month.

   What was the mean number of car accidents per month for the whole year?

   (Total 6 marks)

2. Three positive integers a, b, and c, where $a < b < c$, are such that their median is 11, their mean is 9 and their range is 10. Find the value of a.

   (Total 6 marks)

3. The table below shows the marks gained in a test by a group of students.

Mark	1	2	3	4	5
Number of students	5	10	p	6	2

   The median is 3 and the mode is 2. Find the **two** possible values of p.

   (Total 6 marks)

4. The mean of the population x_1, x_2, ... , x_{25} is m. Given that $\sum_{i=1}^{25} x_i = 300$ and

   $$\sum_{i=1}^{25} (x_i - m)^2 = 625, \text{ find}$$

   (a) the value of m;

   (b) the standard deviation of the population.

   (Total 4 marks)

5. Consider the four numbers a, b, c, d with $a \le b \le c \le d$, where $a, b, c, d \in \mathbb{Z}$.
   The mean of the four numbers is 4.
   The mode is 3.
   The median is 3.
   The range is 6.

   Find the value of a, of b, of c and of d.

   (Total 6 marks)

6. The population below is listed in ascending order.

$$5, 6, 7, 7, 9, 9, r, 10, s, 13, 13, t$$

The median of the population is 9.5. The upper quartile Q_3 is 13.

(a) Write down the value of

(i) r;

(ii) s.

(b) The mean of the population is 10. Find the value of t.

(Total 6 marks)

7. A set of data is

$$18, 18, 19, 19, 20, 22, 22, 23, 27, 28, 28, 31, 34, 34, 36.$$

The box and whisker plot for this data is shown below.

(a) Write down the values of A, B, C, D and E.

A = ...   B = ...   C= ......   D = ...   E = ...

(b) Find the interquartile range.

(Total 6 marks)

8. A standard die is rolled 36 times. The results are shown in the following table.

| Score	1	2	3	4	5	6
Frequency	3	5	4	6	10	8

(a) Write down the standard deviation.

(2)

(b) Write down the median score.

(1)

(c) Find the interquartile range.

(3)
(Total 6 marks)

9. A scientist has 100 female fish and 100 male fish. She measures their lengths to the nearest cm. These are shown in the following box and whisker diagrams.

Female fish
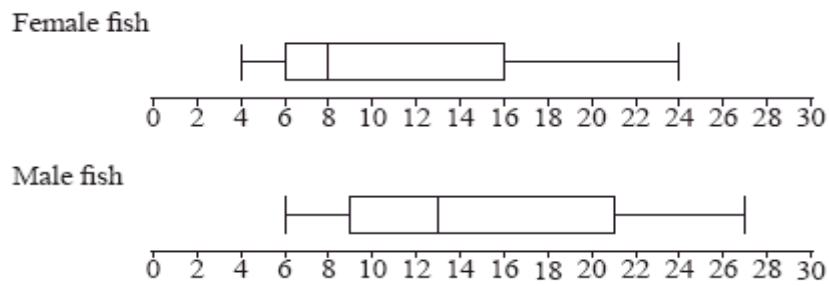
Male fish

(a) Find the range of the lengths of **all** 200 fish.

(3)

(b) Four cumulative frequency graphs are shown below.
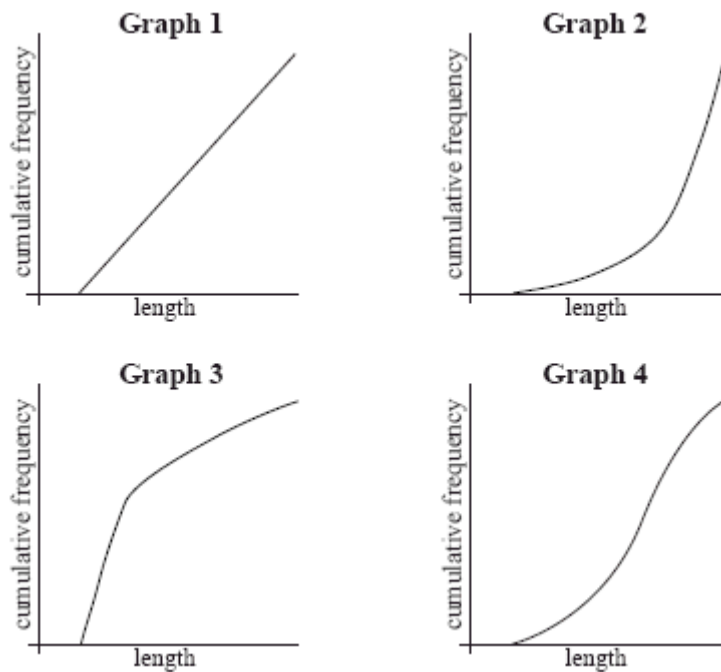
Which graph is the best representation of the lengths of the **female** fish?

(2)
(Total 5 marks)

10. The following frequency distribution of marks has mean 4.5.

Mark	1	2	3	4	5	6	7
Frequency	2	4	6	9	x	9	4

(a) Find the value of x.

(4)

(b) Write down the standard deviation.

(2)
(Total 6 marks)

11. The following table gives the examination grades for 120 students.

Grade	Number of students	Cumulative frequency
1	9	9
2	25	34
3	35	p
4	q	109
5	11	120

(a) Find the value of

(i) p;

(ii) q.

(4)

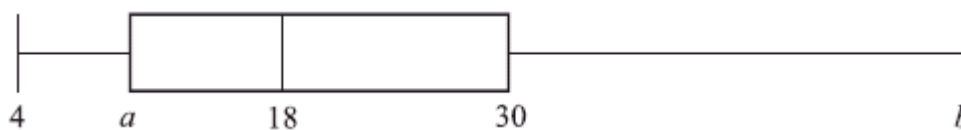(b) Find the mean grade.

(2)

(c) Write down the standard deviation.

(1)
(Total 7 marks)

12. The following diagram is a box and whisker plot for a set of data.

The interquartile range is 20 and the range is 40.

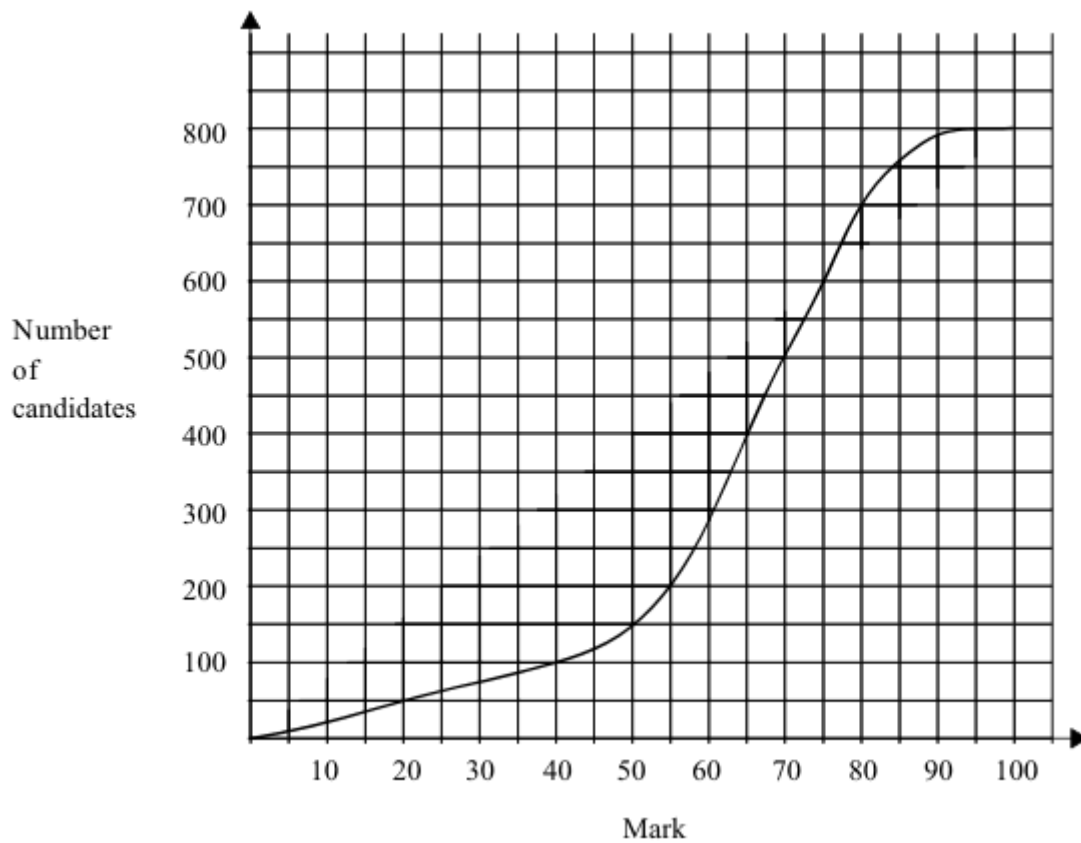(a) Write down the median value.

(1)

(b) Find the value of

(i) a;

(ii) b.

(4)
(Total 5 marks)

13. A test marked out of 100 is written by 800 students. The cumulative frequency graph for the marks is given below.

(a) Write down the number of students who scored 40 marks or less on the test.
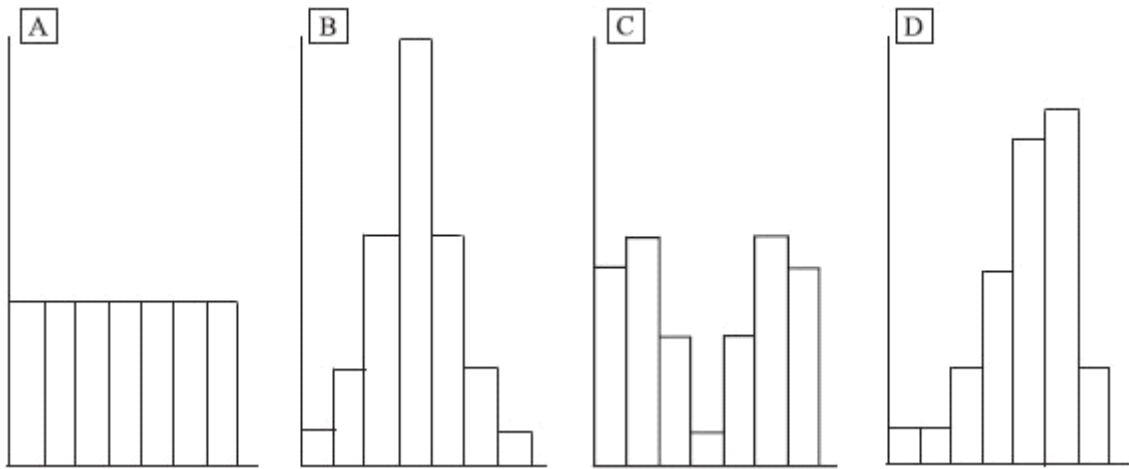
(2)

(b) The middle 50 % of test results lie between marks a and b, where $a < b$.
Find a and b.

(4)
(Total 6 marks)

14. The four populations A, B, C and D are the same size and have the same range. Frequency histograms for the four populations are given below.

(a) Each of the three box and whisker plots below corresponds to one of the four populations. Write the letter of the correct population under each plot.

....
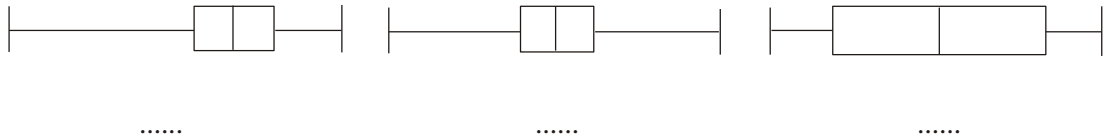
(b) Each of the three cumulative frequency diagrams below corresponds to one of the four populations. Write the letter of the correct population under each diagram.

....
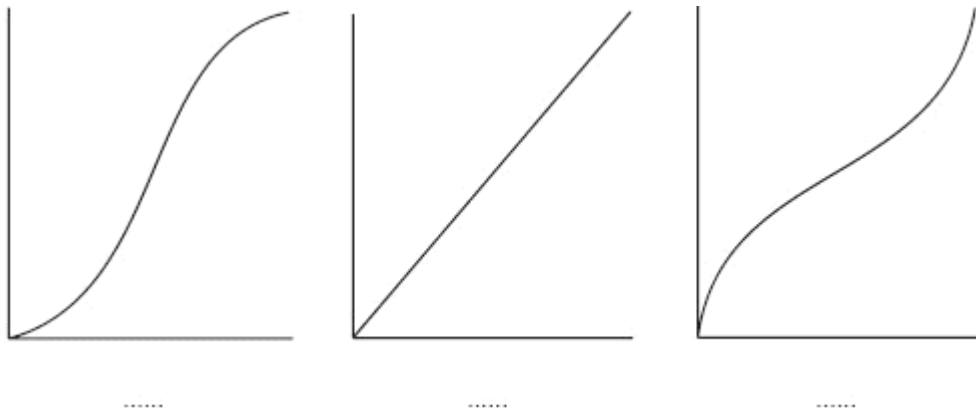
(Total 6 marks)

15. Consider the data set $\{k - 2, k, k +1, k + 4\}$, where $k \in \mathbb{R}$.

    (a)   Find the mean of this data set in terms of k.

                                (3)

    Each number in the above data set is now **decreased** by 3.

    (b)   Find the mean of this **new** data set in terms of k.

                                (2)
                        (Total 5 marks)

16.   (a)   Consider the set of numbers a, $2a$, $3a$, ..., na where a and n are positive integers.

            (i)   Show that the expression for the mean of this set is $\dfrac{a(n+1)}{2}$.

            (ii)   Let $a = 4$. Find the minimum value of n for which the sum of these numbers exceeds its mean by more than 100.

                                (6)

    (b)   Consider now the set of numbers x_1, ... , x_m, y_1, ... , y_1, ... , y_n where $x_i = 0$ for $i = 1$, ... , m and $y_i = 1$ for $i = 1$, ... , n.

            (i)   Show that the mean M of this set is given by $\dfrac{n}{m+n}$ and the standard deviation S by $\dfrac{\sqrt{mn}}{m+n}$.
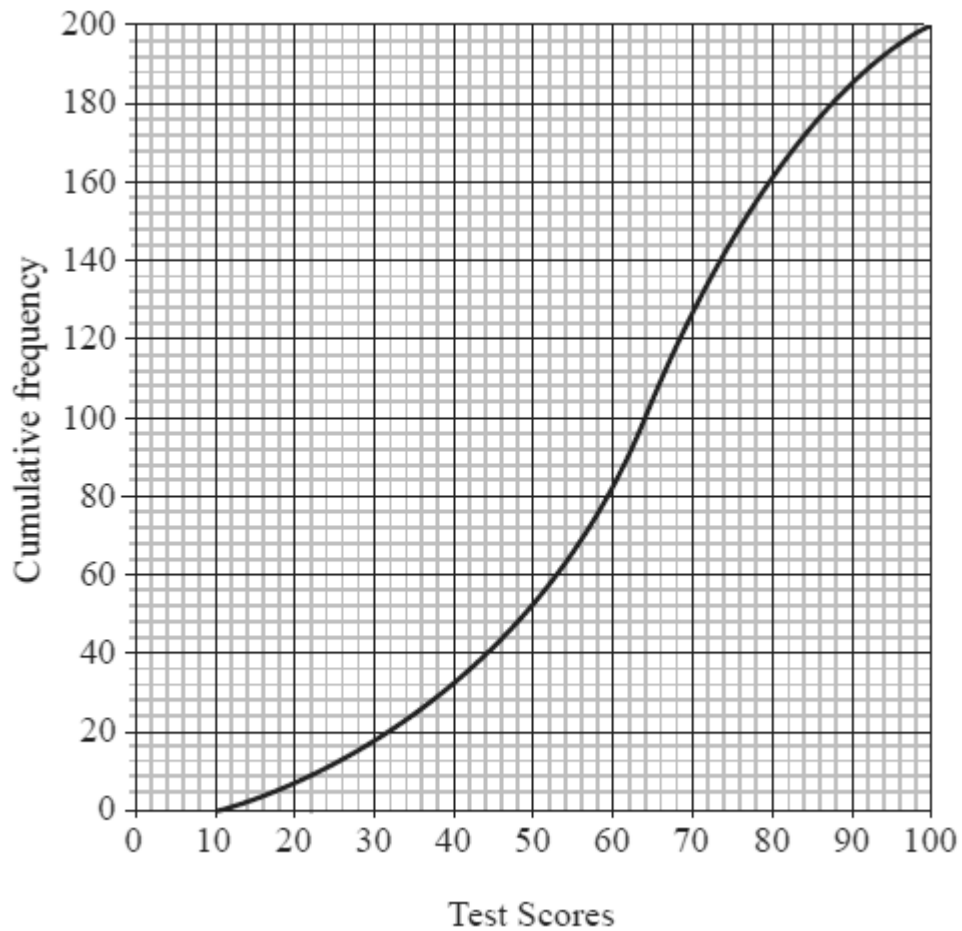
            (ii)   Given that $M = S$, find the value of the median.

                              (11)
                      (Total 17 marks)

17. The test scores of a group of students are shown on the cumulative frequency graph below.

(a) Estimate the median test score.

(1)

(b) The top 10 % of students receive a grade A and the next best 20 % of students receive a grade B. Estimate

(i) the minimum score required to obtain a grade A;

(ii) the minimum score required to obtain a grade B.

(4)
(Total 5 marks)