Representation of Data
(Past Year Topical Questions 2010-2015)

May/June 2010 (61)

2 The numbers of people travelling on a certain bus at different times of the day are as follows.

17	5	2	23	16	31	8
22	14	25	35	17	27	12
6	23	19	21	23	8	26

    (i) Draw a stem-and-leaf diagram to illustrate the information given above.   [3]

    (ii) Find the median, the lower quartile, the upper quartile and the interquartile range.   [3]

    (iii) State, in this case, which of the median and mode is preferable as a measure of central tendency, and why.   [1]

May/June 2010 (62)

1 The times in minutes for seven students to become proficient at a new computer game were measured. The results are shown below.

15	10	48	10	19	14	16

    (i) Find the mean and standard deviation of these times.   [2]

    (ii) State which of the mean, median or mode you consider would be most appropriate to use as a measure of central tendency to represent the data in this case.   [1]

    (iii) For each of the two measures of average you did not choose in part **(ii)**, give a reason why you consider it inappropriate.   [2]

3
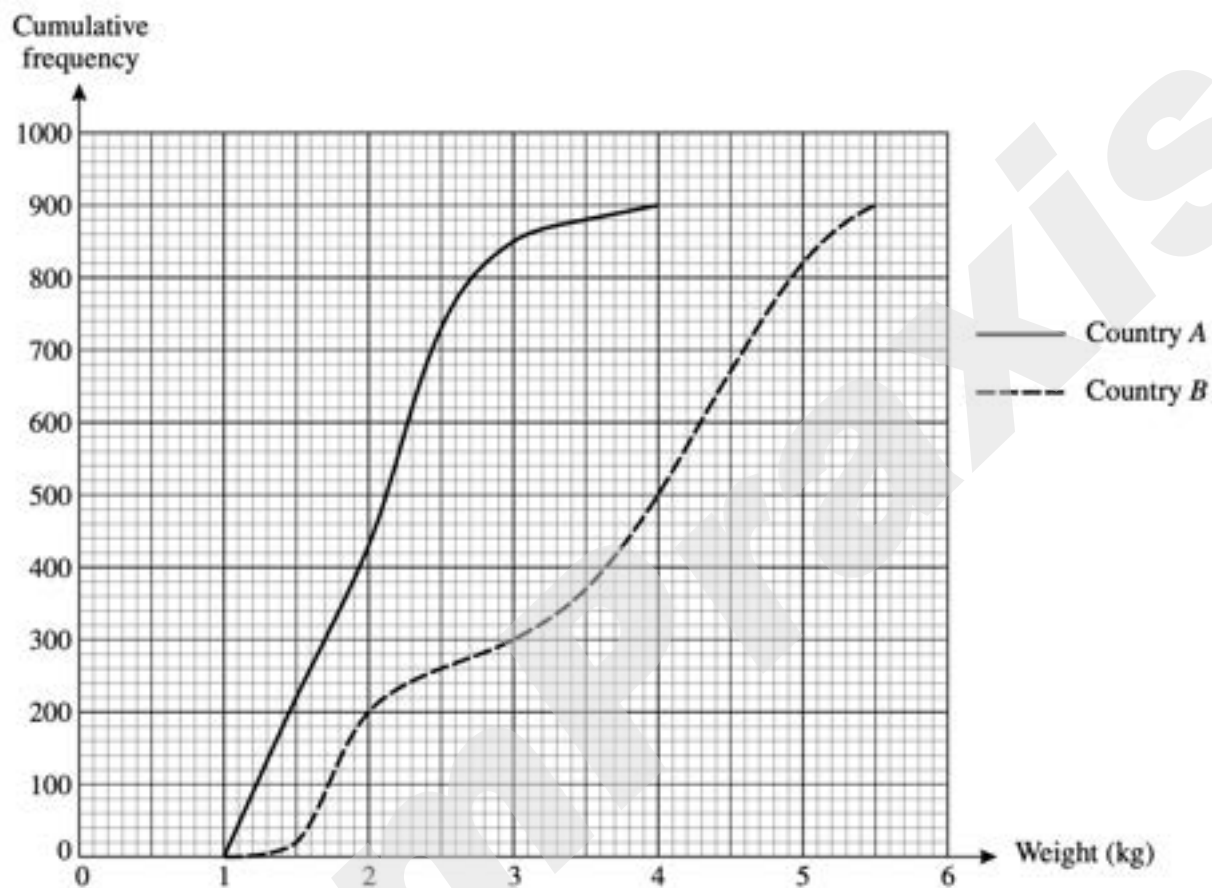
The birth weights of random samples of 900 babies born in country A and 900 babies born in country B are illustrated in the cumulative frequency graphs. Use suitable data from these graphs to compare the central tendency and spread of the birth weights of the two sets of babies. [6]

May/June 2010 (63)

2 The heights, x cm, of a group of 82 children are summarised as follows.

$$\Sigma(x - 130) = -287, \qquad \text{standard deviation of } x = 6.9.$$

(i) Find the mean height. [2]

(ii) Find $\Sigma(x - 130)^2$. [2]

6 The lengths of some insects of the same type from two countries, X and Y, were measured. The stem-and-leaf diagram shows the results.

	Country X			Country Y	
(10)	9 7 6 6 6 4 4 4 3 2	80			
(18)	8 8 8 7 7 6 6 5 5 5 4 4 3 3 3 2 2 0	81	1 1 2 2 3 3 3 5 5 6 7 8 9	(13)
(16)	9 9 9 8 8 7 7 6 5 5 3 2 2 1 0 0	82	0 0 1 2 3 3 3 q 4 5 6 6 7 8 8	(15)
(16)	8 7 6 5 5 5 3 3 2 2 2 1 1 1 0 0	83	0 1 2 2 4 4 4 5 5 6 6 7 7 7 8 9	(17)
(11)	8 7 6 5 5 4 4 3 3 1 1	84	0 0 1 2 4 4 5 5 6 6 7 7 7 8 9	(15)
		85	1 2 r 3 3 5 5 6 6 7 8 8	(12)
		86	0 1 2 2 3 5 5 5 8 9 9	(11)

Key: 5 | 81 | 3 means an insect from country X has length 0.815 cm
and an insect from country Y has length 0.813 cm.

(i) Find the median and interquartile range of the lengths of the insects from country X. [2]

(ii) The interquartile range of the lengths of the insects from country Y is 0.028 cm. Find the values of q and r. [2]

(iii) Represent the data by means of a pair of box-and-whisker plots in a single diagram on graph paper. [4]

(iv) Compare the lengths of the insects from the two countries. [2]

October/November 2010 (61)

1 Anita made observations of the maximum temperature, $t\,°C$, on 50 days. Her results are summarised by $\Sigma t = 910$ and $\Sigma(t - \bar{t})^2 = 876$, where $\bar{t}$ denotes the mean of the 50 observations. Calculate $\bar{t}$ and the standard deviation of the observations. [3]

4   The weights in grams of a number of stones, measured correct to the nearest gram, are represented in the following table.

Weight (grams)	1 – 10	11 – 20	21 – 25	26 – 30	31 – 50	51 – 70
Frequency	$2x$	$4x$	$3x$	$5x$	$4x$	x

A histogram is drawn with a scale of 1 cm to 1 unit on the vertical axis, which represents frequency density. The 1 – 10 rectangle has height 3 cm.

(i) Calculate the value of x and the height of the 51 – 70 rectangle.   [4]

(ii) Calculate an estimate of the mean weight of the stones.   [3]

October/November 2010 (62)

2   Esme noted the test marks, x, of 16 people in a class. She found that $\Sigma x = 824$ and that the standard deviation of x was 6.5.

(i) Calculate $\Sigma(x - 50)$ and $\Sigma(x - 50)^2$.   [3]

(ii) One person did the test later and her mark was 72. Calculate the new mean and standard deviation of the marks of all 17 people.   [3]

4   The weights in kilograms of 11 bags of sugar and 7 bags of flour are as follows.

Sugar: 1.961   1.983   2.008   2.014   1.968   1.994   2.011   2.017   1.977   1.984   1.989

Flour: 1.945   1.962   1.949   1.977   1.964   1.941   1.953

(i) Represent this information on a back-to-back stem-and-leaf diagram with sugar on the left-hand side.   [4]

(ii) Find the median and interquartile range of the weights of the bags of sugar.   [3]

October/November 2010 (63)

4 Delip measured the speeds, x km per hour, of 70 cars on a road where the speed limit is 60 km per hour. His results are summarised by $\Sigma(x - 60) = 245$.
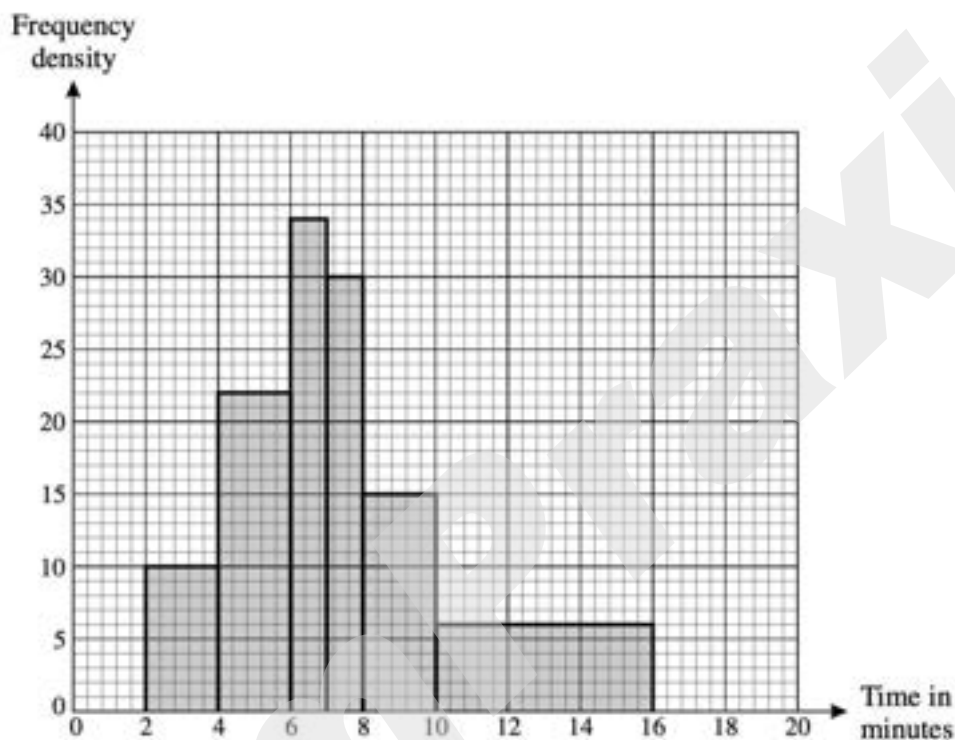
   (i) Calculate the mean speed of these 70 cars.   [2]

His friend Sachim used values of $(x - 50)$ to calculate the mean.

   (ii) Find $\Sigma(x - 50)$.   [2]

   (iii) The standard deviation of the speeds is 10.6 km per hour. Calculate $\Sigma(x - 50)^2$.   [2]

5 The following histogram illustrates the distribution of times, in minutes, that some students spent taking a shower.

(i) Copy and complete the following frequency table for the data. [3]

Time (t minutes)	$2 < t \leqslant 4$	$4 < t \leqslant 6$	$6 < t \leqslant 7$	$7 < t \leqslant 8$	$8 < t \leqslant 10$	$10 < t \leqslant 16$
Frequency						

(ii) Calculate an estimate of the mean time to take a shower. [2]

(iii) Two of these students are chosen at random. Find the probability that exactly one takes between 7 and 10 minutes to take a shower. [3]

May/June 2011 (61)

6 There are 5000 schools in a certain country. The cumulative frequency table shows the number of pupils in a school and the corresponding number of schools.

Number of pupils in a school	⩽100	⩽150	⩽200	⩽250	⩽350	⩽450	⩽600
Cumulative frequency	200	800	1600	2100	4100	4700	5000

(i) Draw a cumulative frequency graph with a scale of 2 cm to 100 pupils on the horizontal axis and a scale of 2 cm to 1000 schools on the vertical axis. Use your graph to estimate the median number of pupils in a school. [3]

(ii) 80% of the schools have more than n pupils. Estimate the value of n correct to the nearest ten. [2]

(iii) Find how many schools have between 201 and 250 (inclusive) pupils. [1]

(iv) Calculate an estimate of the mean number of pupils per school. [4]

May/June 2011 (62)

3 A sample of 36 data values, x, gave $\Sigma(x - 45) = -148$ and $\Sigma(x - 45)^2 = 3089$.

(i) Find the mean and standard deviation of the 36 values. [3]

(ii) One extra data value of 29 was added to the sample. Find the standard deviation of all 37 values. [4]

5 A hotel has 90 rooms. The table summarises information about the number of rooms occupied each day for a period of 200 days.

Number of rooms occupied	1 – 20	21 – 40	41 – 50	51 – 60	61 – 70	71 – 90
Frequency	10	32	62	50	28	18

(i) Draw a cumulative frequency graph on graph paper to illustrate this information. [4]

(ii) Estimate the number of days when over 30 rooms were occupied. [2]

(iii) On 75% of the days at most n rooms were occupied. Estimate the value of n. [2]

<u>May/June 2011 (63)</u>

1   Red Street Garage has 9 used cars for sale. Fairwheel Garage has 15 used cars for sale. The mean age of the cars in Red Street Garage is 3.6 years and the standard deviation is 1.925 years. In Fairwheel Garage, $\Sigma x = 64$ and $\Sigma x^2 = 352$, where x is the age of a car in years.

  (i) Find the mean age of all 24 cars. [2]

  (ii) Find the standard deviation of the ages of all 24 cars. [4]

3   The following cumulative frequency table shows the examination marks for 300 candidates in country A and 300 candidates in country B.

Mark	<10	<20	<35	<50	<70	<100
Cumulative frequency, A	25	68	159	234	260	300
Cumulative frequency, B	10	46	72	144	198	300

  (i) Without drawing a graph, show that the median for country B is higher than the median for country A. [2]

  (ii) Find the number of candidates in country A who scored between 20 and 34 marks inclusive. [1]

  (iii) Calculate an estimate of the mean mark for candidates in country A. [4]

<u>October/November 2011 (61)</u>

2   The values, x, in a particular set of data are summarised by

$$\Sigma(x-25) = 133, \qquad \Sigma(x-25)^2 = 3762.$$

The mean, $\bar{x}$, is 28.325.

  (i) Find the standard deviation of x. [4]

  (ii) Find Σx^2. [2]

4 The marks of the pupils in a certain class in a History examination are as follows.

28   33   55   38   42   39   27   48   51   37   57   49   33

The marks of the pupils in a Physics examination are summarised as follows.

Lower quartile: 28,   Median: 39,   Upper quartile: 67.
The lowest mark was 17 and the highest mark was 74.

(i) Draw box-and-whisker plots in a single diagram on graph paper to illustrate the marks for History and Physics. [5]

(ii) State one difference, which can be seen from the diagram, between the marks for History and Physics. [1]

October/November 2011 (62)

1 The following are the times, in minutes, taken by 11 runners to complete a 10 km run.

48.3   55.2   59.9   67.7   60.5   75.6   62.5   57.4   53.4   49.2   64.1

Find the mean and standard deviation of these times. [3]

4 The weights of 220 sausages are summarised in the following table.

Weight (grams)	<20	<30	<40	<45	<50	<60	<70
Cumulative frequency	0	20	50	100	160	210	220

(i) State which interval the median weight lies in. [1]

(ii) Find the smallest possible value and the largest possible value for the interquartile range. [2]

(iii) State how many sausages weighed between 50 g and 60 g. [1]

(iv) On graph paper, draw a histogram to represent the weights of the sausages. [4]

5

Salary (thousands of euros)
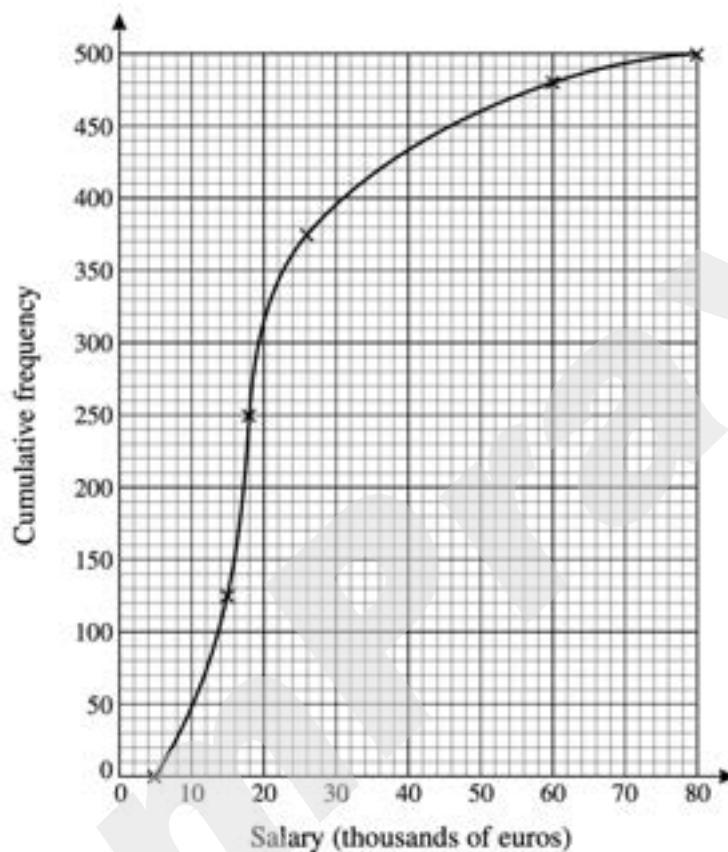
The cumulative frequency graph shows the annual salaries, in thousands of euros, of a random sample of 500 adults with jobs, in France. It has been plotted using grouped data. You may assume that the lowest salary is 5000 euros and the highest salary is 80000 euros.

(i) On graph paper, draw a box-and-whisker plot to illustrate these salaries.   [4]

(ii) Comment on the salaries of the people in this sample.   [1]

(iii) An 'outlier' is defined as any data value which is more than 1.5 times the interquartile range above the upper quartile, or more than 1.5 times the interquartile range below the lower quartile.

(a) How high must a salary be in order to be classified as an outlier?   [3]

(b) Show that none of the salaries is low enough to be classified as an outlier.   [1]

May/June 2012 (61)

5   The lengths of the diagonals in metres of the 9 most popular flat screen TVs and the 9 most popular conventional TVs are shown below.

Flat screen :   0.85   0.94   0.91   0.96   1.04   0.89   1.07   0.92   0.76

Conventional :   0.69   0.65   0.85   0.77   0.74   0.67   0.71   0.86   0.75

(i) Represent this information on a back-to-back stem-and-leaf diagram.   [4]

(ii) Find the median and the interquartile range of the lengths of the diagonals of the 9 conventional TVs.   [3]

(iii) Find the mean and standard deviation of the lengths of the diagonals of the 9 flat screen TVs.   [2]

May/June 2012 (62)

1   The ages, x years, of 150 cars are summarised by $\Sigma x = 645$ and $\Sigma x^2 = 8287.5$. Find $\Sigma(x - \bar{x})^2$, where $\bar{x}$ denotes the mean of x.   [4]

4   The back-to-back stem-and-leaf diagram shows the values taken by two variables A and B.

	A			B	
(3)	3 1 0	15	1 3 3 5		(4)
(2)	4 1	16	2 2 3 4 4 5 7 7 7 8		(10)
(3)	8 3 3	17	0 1 3 3 3 4 6 6 7 9 9		(11)
(12)	9 8 8 6 5 5 4 3 2 1 1 0	18	2 4 7		(3)
(8)	9 9 8 8 6 5 4 2	19	1 5		(2)
(5)	9 8 7 1 0	20	4		(1)

Key: 4 | 16 | 7   means $A = 0.164$ and $B = 0.167$.

(i) Find the median and the interquartile range for variable A.   [3]

(ii) You are given that, for variable B, the median is 0.171, the upper quartile is 0.179 and the lower quartile is 0.164. Draw box-and-whisker plots for A and B in a single diagram on graph paper.   [3]

1 Ashfaq and Kuljit have done a school statistics project on the prices of a particular model of headphones for MP3 players. Ashfaq collected prices from 21 shops. Kuljit used the internet to collect prices from 163 websites.

   (i) Name a suitable statistical diagram for Ashfaq to represent his data, together with a reason for choosing this particular diagram. [2]

   (ii) Name a suitable statistical diagram for Kuljit to represent her data, together with a reason for choosing this particular diagram. [2]

2 The heights, x cm, of a group of young children are summarised by

$$\Sigma(x - 100) = 72, \qquad \Sigma(x - 100)^2 = 499.2.$$

The mean height is 104.8 cm.

   (i) Find the number of children in the group. [2]

   (ii) Find $\Sigma(x - 104.8)^2$. [3]

4 The six faces of a fair die are numbered 1, 1, 1, 2, 3, 3. The score for a throw of the die, denoted by the random variable W, is the number on the top face after the die has landed.

   (i) Find the mean and standard deviation of W. [3]

2 The amounts of money, x dollars, that 24 people had in their pockets are summarised by $\Sigma(x - 36) = -60$ and $\Sigma(x - 36)^2 = 227.76$. Find Σx and Σx^2. [5]

4 Prices in dollars of 11 caravans in a showroom are as follows.

16 800   18 500   17 700   14 300   15 500   15 300   16 100   16 800   17 300   15 400   16 400

   (i) Represent these prices by a stem-and-leaf diagram. [3]

   (ii) Write down the lower quartile of the prices of the caravans in the showroom. [1]

October/November 2012 (62)

3 The table summarises the times that 112 people took to travel to work on a particular day.

Time to travel to work (t minutes)	$0 < t \leqslant 10$	$10 < t \leqslant 15$	$15 < t \leqslant 20$	$20 < t \leqslant 25$	$25 < t \leqslant 40$	$40 < t \leqslant 60$
Frequency	19	12	28	22	18	13

    (i) State which time interval in the table contains the median and which time interval contains the upper quartile. [2]

    (ii) On graph paper, draw a histogram to represent the data. [4]

    (iii) Calculate an estimate of the mean time to travel to work. [2]

October/November 2012 (63)

4 In a survey, the percentage of meat in a certain type of take-away meal was found. The results, to the nearest integer, for 193 take-away meals are summarised in the table.

Percentage of meat	$1-5$	$6-10$	$11-20$	$21-30$	$31-50$
Frequency	59	67	38	18	11

    (i) Calculate estimates of the mean and standard deviation of the percentage of meat in these take-away meals. [4]

    (ii) Draw, on graph paper, a histogram to illustrate the information in the table. [5]

May/June 2013 (61)

1 A summary of 30 values of x gave the following information:

$$\Sigma(x - c) = 234, \qquad \Sigma(x - c)^2 = 1957.5,$$

where c is a constant.

    (i) Find the standard deviation of these values of x. [2]

    (ii) Given that the mean of these values is 86, find the value of c. [2]

3 The following back-to-back stem-and-leaf diagram shows the annual salaries of a group of 39 females and 39 males.

Females										Stem	Males									
(4)					5	2	0	0		20	3									(1)
(9)	9	8	8	7	6	4	0	0	0	21	0	0	7							(3)
(8)		8	7	5	3	3	1	0	0	22	0	0	4	5	6	6				(6)
(6)			6	4	2	1	0	0		23	0	0	2	3	3	5	6	7	7	(9)
(6)			7	5	4	0	0	0		24	0	1	1	2	5	5	6	8	8 9	(10)
(4)					9	5	0	0		25	3	4	5	7	7	8	9			(7)
(2)							5	0		26	0	4	6							(3)

Key: 2 | 20 | 3 means $20 200 for females and $20 300 for males.

(i) Find the median and the quartiles of the females' salaries. [2]

You are given that the median salary of the males is $24 000, the lower quartile is $22 600 and the upper quartile is $25 300.

(ii) Represent the data by means of a pair of box-and-whisker plots in a single diagram on graph paper. [3]

May/June 2013 (62)

2 A summary of the speeds, x kilometres per hour, of 22 cars passing a certain point gave the following information:

$$\Sigma(x - 50) = 81.4 \quad \text{and} \quad \Sigma(x - 50)^2 = 671.0.$$

Find the variance of the speeds and hence find the value of Σx^2. [4]

5   The following are the annual amounts of money spent on clothes, to the nearest $10, by 27 people.

$$
\begin{array}{ccccccccc}
10 & 40 & 60 & 80 & 100 & 130 & 140 & 140 & 140 \\
150 & 150 & 150 & 160 & 160 & 160 & 160 & 170 & 180 \\
180 & 200 & 210 & 250 & 270 & 280 & 310 & 450 & 570
\end{array}
$$

  (i) Construct a stem-and-leaf diagram for the data.   [3]

  (ii) Find the median and the interquartile range of the data.   [3]

An 'outlier' is defined as any data value which is more than 1.5 times the interquartile range above the upper quartile, or more than 1.5 times the interquartile range below the lower quartile.

  (iii) List the outliers.   [3]

May/June 2013 (63)

6   The weights, x kilograms, of 144 people were recorded. The results are summarised in the cumulative frequency table below.

Weight (x kilograms)	$x < 40$	$x < 50$	$x < 60$	$x < 65$	$x < 70$	$x < 90$
Cumulative frequency	0	12	34	64	92	144

  (i) On graph paper, draw a cumulative frequency graph to represent these results.   [2]

  (ii) 64 people weigh more than c kg. Use your graph to find the value of c.   [2]

  (iii) Calculate estimates of the mean and standard deviation of the weights.   [6]

October/November 2013 (61)

3   Swati measured the lengths, x cm, of 18 stick insects and found that $\Sigma x^2 = 967$. Given that the mean length is $\frac{58}{9}$ cm, find the values of $\Sigma(x - 5)$ and $\Sigma(x - 5)^2$.   [5]

4   The following are the house prices in thousands of dollars, arranged in ascending order, for 51 houses from a certain area.

| 253 | 270 | 310 | 354 | 386 | 428 | 433 | 468 | 472 | 477 | 485 | 520 | 520 | 524 | 526 | 531 | 535 |
| 536 | 538 | 541 | 543 | 546 | 548 | 549 | 551 | 554 | 572 | 583 | 590 | 605 | 614 | 638 | 649 | 652 |
| 666 | 670 | 682 | 684 | 690 | 710 | 725 | 726 | 731 | 734 | 745 | 760 | 800 | 854 | 863 | 957 | 986 |

   (i) Draw a box-and-whisker plot to represent the data.   [4]

An expensive house is defined as a house which has a price that is more than 1.5 times the interquartile range above the upper quartile.

   (ii) For the above data, give the prices of the expensive houses.   [2]

   (iii) Give one disadvantage of using a box-and-whisker plot rather than a stem-and-leaf diagram to represent this set of data.   [1]

**4** The following histogram summarises the times, in minutes, taken by 190 people to complete a race.
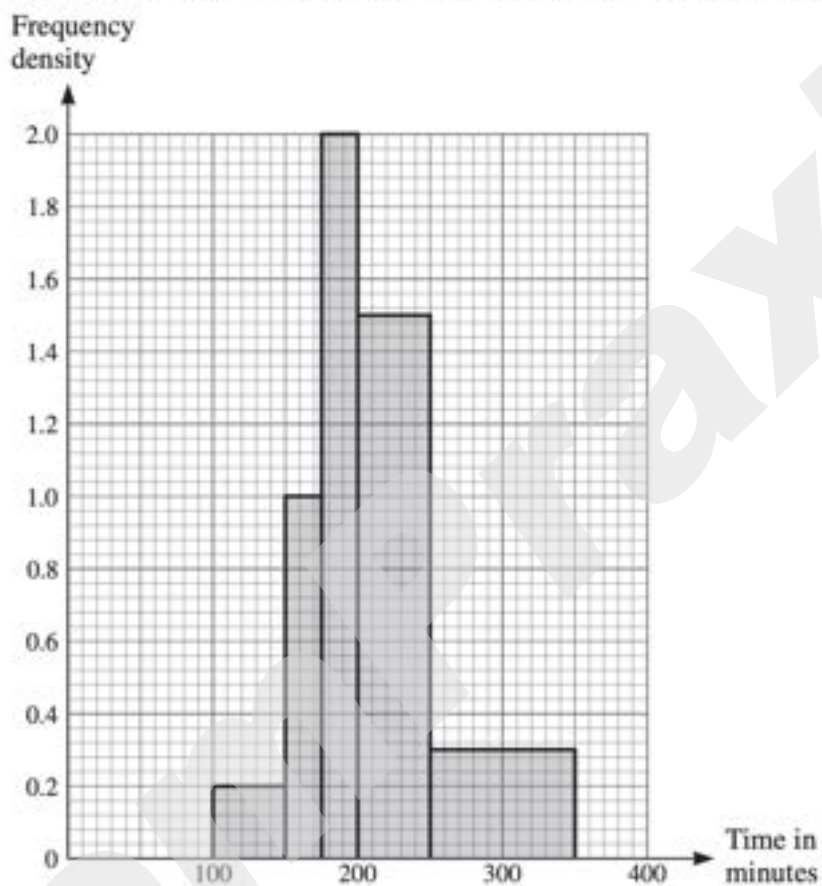
(i) Show that 75 people took between 200 and 250 minutes to complete the race. [1]

(ii) Calculate estimates of the mean and standard deviation of the times of the 190 people. [6]

(iii) Explain why your answers to part **(ii)** are estimates. [1]

October/November 2013 (63)

1 The distance of a student's home from college, correct to the nearest kilometre, was recorded for each of 55 students. The distances are summarised in the following table.

Distance from college (km)	1 – 3	4 – 5	6 – 8	9 – 11	12 – 16
Number of students	18	13	8	12	4

Dominic is asked to draw a histogram to illustrate the data. Dominic's diagram is shown below.
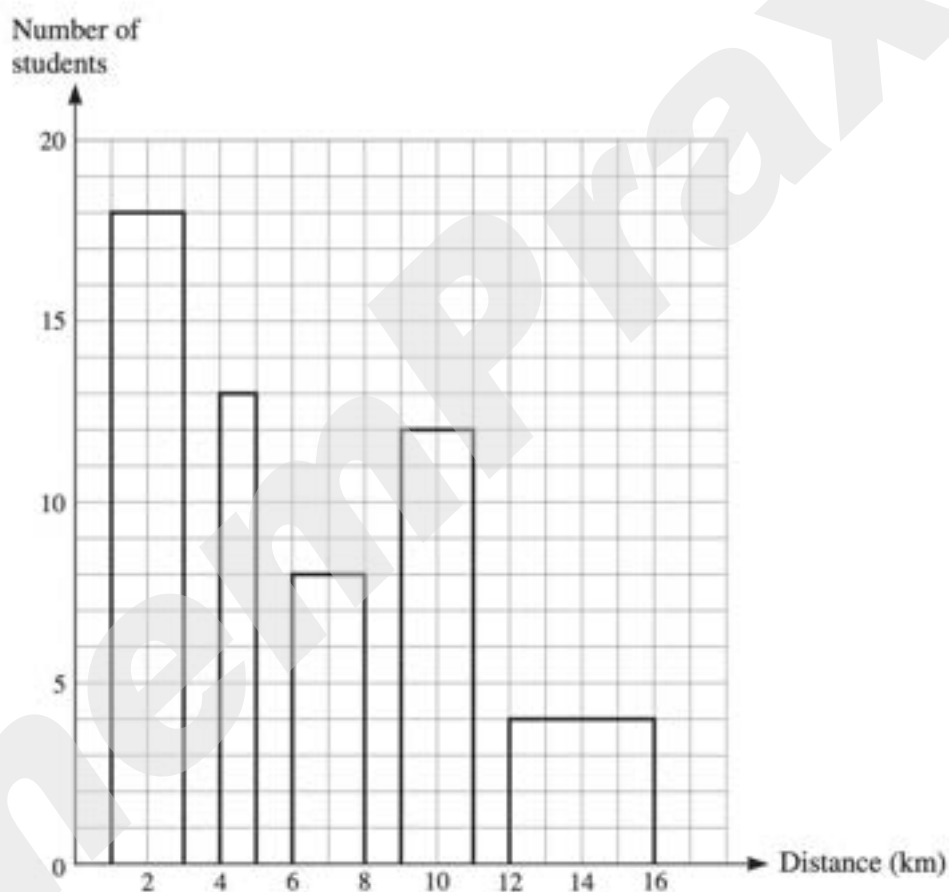
Give two reasons why this is not a correct histogram. [2]

4   Barry weighs 20 oranges and 25 lemons. For the oranges, the mean weight is 220 g and the standard deviation is 32 g. For the lemons, the mean weight is 118 g and the standard deviation is 12 g.

(i) Find the mean weight of the 45 fruits.   [2]

(ii) The individual weights of the oranges in grams are denoted by x_o, and the individual weights of the lemons in grams are denoted by x_l. By first finding Σx_o^2 and Σx_l^2, find the variance of the weights of the 45 fruits.   [5]

May/June 2014 (61)

7   A typing test is taken by 111 people. The numbers of typing errors they make in the test are summarised in the table below.

Number of typing errors	$1-5$	$6-20$	$21-35$	$36-60$	$61-80$
Frequency	24	9	21	15	42

(i) Draw a histogram on graph paper to represent this information.   [5]

(ii) Calculate an estimate of the mean number of typing errors for these 111 people.   [3]

(iii) State which class contains the lower quartile and which class contains the upper quartile. Hence find the least possible value of the interquartile range.   [3]

May/June 2014 (62)

6   The times taken by 57 athletes to run 100 metres are summarised in the following cumulative frequency table.

Time (seconds)	<10.0	<10.5	<11.0	<12.0	<12.5	<13.5
Cumulative frequency	0	4	10	40	49	57

(i) State how many athletes ran 100 metres in a time between 10.5 and 11.0 seconds.   [1]

(ii) Draw a histogram on graph paper to represent the times taken by these athletes to run 100 metres.   [4]

(iii) Calculate estimates of the mean and variance of the times taken by these athletes.   [4]

<u>May/June 2014 (63)</u>

1   Some adults and some children each tried to estimate, without using a watch, the number of seconds that had elapsed in a fixed time-interval. Their estimates are shown below.

Adults: 55 58 67 74 63 61 63 71 56 53 54 78 73 64 62
Children: 86 95 89 72 61 84 77 92 81 54 43 68 62 67 83

(i) Draw a back-to-back stem-and-leaf diagram to represent the data.   [3]

(ii) Make two comparisons between the estimates of the adults and the children.   [2]

4   The heights, x cm, of a group of 28 people were measured. The mean height was found to be 172.6 cm and the standard deviation was found to be 4.58 cm. A person whose height was 161.8 cm left the group.

(i) Find the mean height of the remaining group of 27 people.   [2]

(ii) Find Σx^2 for the original group of 28 people. Hence find the standard deviation of the heights of the remaining group of 27 people.   [4]

<u>October/November 2014 (61)</u>

1   Find the mean and variance of the following data.   [3]

5   −2   12   7   −3   2   −6   4   0   8

4   The following back-to-back stem-and-leaf diagram shows the times to load an application on 61 smartphones of type A and 43 smartphones of type B.

	Type A		Type B	
(7)	9 7 6 6 4 3 3	2	1 3 5 8	(4)
(7)	5 5 4 4 2 2 2	3	0 4 4 5 6 6 6 6 7 8 8 9	(12)
(13)	9 9 8 8 8 7 6 6 4 3 2 2 0	4	0 1 1 2 3 6 8 8 9 9	(10)
(9)	6 5 5 4 3 2 1 1 0	5	2 5 6 6 9	(5)
(4)	9 7 3 0	6	1 3 8 9	(4)
(6)	8 7 4 4 1 0	7	5 7	(2)
(10)	7 6 6 6 5 3 3 2 1 0	8	1 2 4 4	(4)
(5)	8 6 5 5 5	9	0 6	(2)

Key: 3 | 2 | 1   means 0.23 seconds for type A and 0.21 seconds for type B.

(i) Find the median and quartiles for smartphones of type A.   [3]

You are given that the median, lower quartile and upper quartile for smartphones of type B are 0.46 seconds, 0.36 seconds and 0.63 seconds respectively.

(ii) Represent the data by drawing a pair of box-and-whisker plots in a single diagram on graph paper.   [3]

(iii) Compare the loading times for these two types of smartphone.   [1]

October/November 2014 (62)

6   On a certain day in spring, the heights of 200 daffodils are measured, correct to the nearest centimetre. The frequency distribution is given below.

Height (cm)	4 – 10	11 – 15	16 – 20	21 – 25	26 – 30
Frequency	22	32	78	40	28

(i) Draw a cumulative frequency graph to illustrate the data.   [4]

(ii) 28% of these daffodils are of height h cm or more. Estimate h.   [2]

(iii) You are given that the estimate of the mean height of these daffodils, calculated from the table, is 18.39 cm. Calculate an estimate of the standard deviation of the heights of these daffodils.   [3]

<u>October/November 2014 (63)</u>

2 A traffic camera measured the speeds, x kilometres per hour, of 8 cars travelling along a certain street, with the following results.

$$62.7 \quad 59.6 \quad 64.2 \quad 61.5 \quad 68.3 \quad 66.9 \quad 62.0 \quad 62.3$$

    (i) Find $\Sigma(x - 62)$.   [1]

    (ii) Find $\Sigma(x - 62)^2$.   [1]

    (iii) Find the mean and variance of the speeds of the 8 cars.   [3]

4 A random sample of 25 people recorded the number of glasses of water they drank in a particular week. The results are shown below.

$$
\begin{array}{ccccc}
23 & 19 & 32 & 14 & 25 \\
22 & 26 & 36 & 45 & 42 \\
47 & 28 & 17 & 38 & 15 \\
46 & 18 & 26 & 22 & 41 \\
19 & 21 & 28 & 24 & 30 \\
\end{array}
$$

    (i) Draw a stem-and-leaf diagram to represent the data.   [3]

    (ii) On graph paper draw a box-and-whisker plot to represent the data.   [5]

<u>May/June 2015 (61)</u>

2 The table summarises the lengths in centimetres of 104 dragonflies.

Length (cm)	2.0 – 3.5	3.5 – 4.5	4.5 – 5.5	5.5 – 7.0	7.0 – 9.0
Frequency	8	25	28	31	12

    (i) State which class contains the upper quartile.   [1]

    (ii) Draw a histogram, on graph paper, to represent the data.   [4]

5 The table shows the mean and standard deviation of the weights of some turkeys and geese.

	Number of birds	Mean (kg)	Standard deviation (kg)
Turkeys	9	7.1	1.45
Geese	18	5.2	0.96

(i) Find the mean weight of the 27 birds. [2]

(ii) The weights of individual turkeys are denoted by x_t kg and the weights of individual geese by x_g kg. By first finding Σx_t^2 and Σx_g^2, find the standard deviation of the weights of all 27 birds. [5]
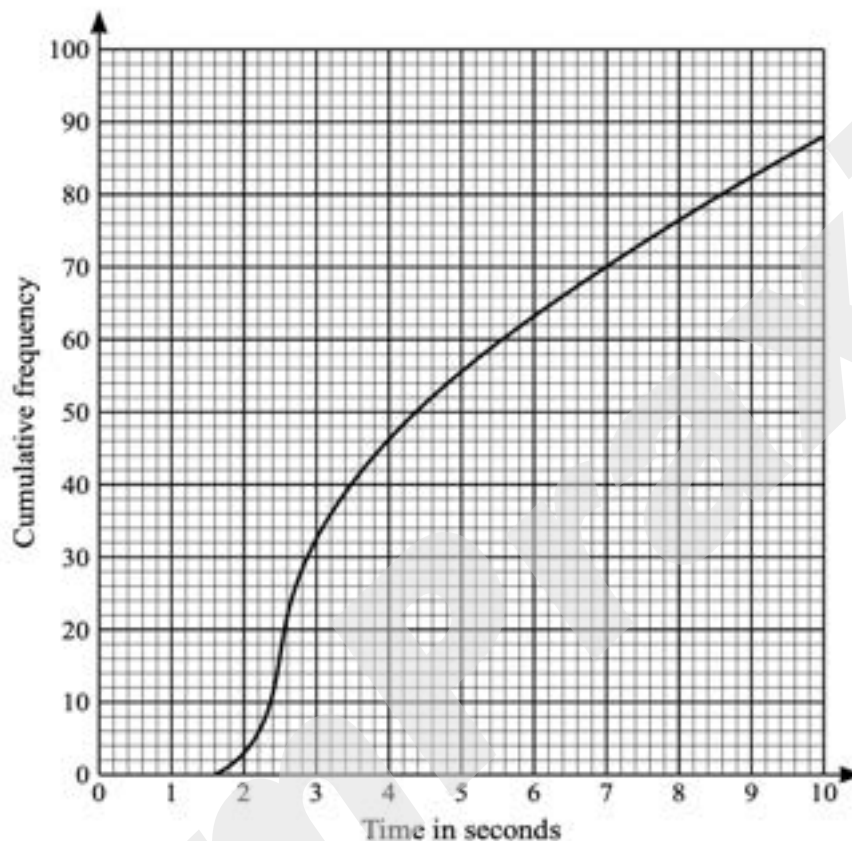
May/June 2015 (62)

2 120 people were asked to read an article in a newspaper. The times taken, to the nearest second, by the people to read the article are summarised in the following table.

Time (seconds)	1 – 25	26 – 35	36 – 45	46 – 55	56 – 90
Number of people	4	24	38	34	20

Calculate estimates of the mean and standard deviation of the reading times. [5]

3

In an open-plan office there are 88 computers. The times taken by these 88 computers to access a particular web page are represented in the cumulative frequency diagram.

(i) On graph paper draw a box-and-whisker plot to summarise this information. [4]

An 'outlier' is defined as any data value which is more than 1.5 times the interquartile range above the upper quartile, or more than 1.5 times the interquartile range below the lower quartile.

(ii) Show that there are no outliers. [2]

May/June 2015 (63)

6 Seventy samples of fertiliser were collected and the nitrogen content was measured for each sample. The cumulative frequency distribution is shown in the table below.

Nitrogen content	⩽ 3.5	⩽ 3.8	⩽ 4.0	⩽ 4.2	⩽ 4.5	⩽ 4.8
Cumulative frequency	0	6	18	41	62	70

   (i) On graph paper draw a cumulative frequency graph to represent the data.   [3]

   (ii) Estimate the percentage of samples with a nitrogen content greater than 4.4.   [2]

   (iii) Estimate the median.   [1]

   (iv) Construct the frequency table for these results and draw a histogram on graph paper.   [5]

October/November 2015 (61)

3 Robert has a part-time job delivering newspapers. On a number of days he noted the time, correct to the nearest minute, that it took him to do his job. Robert used his results to draw up the following table; two of the values in the table are denoted by a and b.

Time (t minutes)	60 – 62	63 – 64	65 – 67	68 – 71
Frequency (number of days)	3	9	6	b
Frequency density	1	a	2	1.5

   (i) Find the values of a and b.   [3]

   (ii) On graph paper, draw a histogram to represent Robert's times.   [3]

4   **(a)** Amy measured her pulse rate while resting, x beats per minute, at the same time each day on 30 days. The results are summarised below.

$$\Sigma(x - 80) = -147 \qquad \Sigma(x - 80)^2 = 952$$

Find the mean and standard deviation of Amy's pulse rate.   [4]

October/November 2015 (62)

1 For n values of the variable x, it is given that $\Sigma(x - 100) = 216$ and $\Sigma x = 2416$. Find the value of n.

[3]

5 The weights, in kilograms, of the 15 rugby players in each of two teams, A and B, are shown below.

Team A	97	98	104	84	100	109	115	99	122	82	116	96	84	107	91
Team B	75	79	94	101	96	77	111	108	83	84	86	115	82	113	95

(i) Represent the data by drawing a back-to-back stem-and-leaf diagram with team A on the left-hand side of the diagram and team B on the right-hand side. [4]

(ii) Find the interquartile range of the weights of the players in team A. [2]

(iii) A new player joins team B as a substitute. The mean weight of the 16 players in team B is now 93.9 kg. Find the weight of the new player. [3]

October/November 2015 (63)

1 The time taken, t hours, to deliver letters on a particular route each day is measured on 250 working days. The mean time taken is 2.8 hours. Given that $\Sigma(t - 2.5)^2 = 96.1$, find the standard deviation of the times taken. [3]

6 The heights to the nearest metre of 134 office buildings in a certain city are summarised in the table below.

Height (m)	21 – 40	41 – 45	46 – 50	51 – 60	61 – 80
Frequency	18	15	21	52	28

(i) Draw a histogram on graph paper to illustrate the data. [4]

(ii) Calculate estimates of the mean and standard deviation of these heights. [5]