Cumulative Frequency

6 The table below refers to the salaries, £x thousand, of each of a sample of 60 company Chief Executive Officers.

x	Frequency
$0 < x \leqslant 100$	2
$100 < x \leqslant 200$	5
$200 < x \leqslant 300$	18
$300 < x \leqslant 400$	13
$400 < x \leqslant 500$	4
$500 < x \leqslant 600$	5
$600 < x \leqslant 700$	5
$700 < x \leqslant 900$	7
$900 < x \leqslant 1100$	0
$1100 < x \leqslant 1300$	1

Jun 04

(i) On graph paper draw a cumulative frequency graph to represent the data in the table. [4]

(ii) Use your cumulative frequency graph to estimate

(a) the median, q_2, [1]

(b) the lower quartile, q_1, [1]

(c) the upper quartile, q_3. [1]

For a given set of data any value which is unusually high or unusually low is called an **outlier**. One way of identifying an outlier is to find two boundary values, $A = q_1 - \frac{3}{2}(q_3 - q_1)$, the lower boundary, and $B = q_3 + \frac{3}{2}(q_3 - q_1)$, the upper boundary. Any values in the data which fall above the upper boundary or below the lower boundary are then defined to be outliers.

(iii) Calculate A and B for the data in the table, and hence state whether there are any outliers. [3]

1 A senior officer at a fire station carried out an investigation into the time taken for a fire engine to reach the scene of an emergency. He recorded the time, t minutes, between receiving a call for assistance and the arrival of the fire engine at the scene of the emergency. The results are given in the table below.

Nov 02

t	Frequency
$0 < t \leqslant 2$	6
$2 < t \leqslant 4$	8
$4 < t \leqslant 6$	7
$6 < t \leqslant 10$	9
$10 < t \leqslant 20$	20

(i) On graph paper draw a cumulative frequency graph to represent the data. [4]

(ii) From your graph estimate

(a) the median time, [1]

(b) the upper quartile of the times. [1]

Cumulative freq. (cont 1)

6 The table below refers to the mass, m kg, of each of a sample of 60 dogs examined in a vet's surgery.

Mass, m kg	$0 \leqslant m < 5$	$5 \leqslant m < 10$	$10 \leqslant m < 15$	$15 \leqslant m < 20$	$20 \leqslant m < 30$	$30 \leqslant m < 50$
Frequency	2	7	17	19	8	7

Jun 04

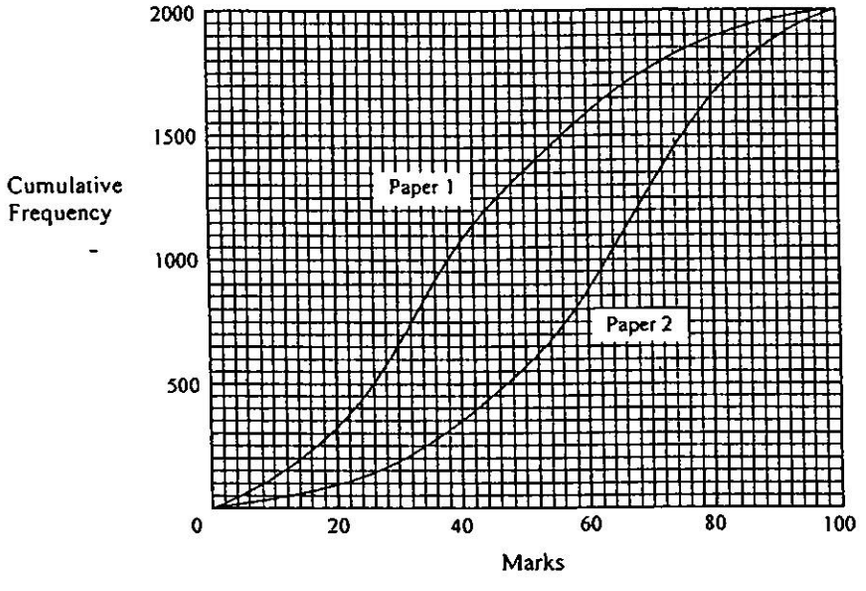
(i) Draw a cumulative frequency graph for the data in the table. [3]

(ii) Use your cumulative frequency graph to estimate the median and the interquartile range for the data. [3]

(iii) You are now given that the minimum mass in the sample of 60 dogs was 4 kg and the maximum was 47 kg. Use your estimates from part (ii) to draw a box-and-whisker plot of the data. [3]

(iv) Give one feature of the data which you can deduce from a box-and-whisker plot more easily than from a cumulative frequency graph. [1]

Spec 6



The diagram shows the cumulative frequency graphs for the marks scored by the candidates in an examination. The 2000 candidates each took two papers; the upper curve shows the distribution of marks on paper 1 and the lower curve shows the distribution on paper 2. The maximum mark on each paper was 100.

(i) Use the diagram to estimate the median mark for each of paper 1 and paper 2. [3]

(ii) State with a reason which of the two papers you think was the easier one. [2]

(iii) To achieve grade A on paper 1 candidates had to score 66 marks out of 100. What mark on paper 2 gives equal proportions of candidates achieving grade A on the two papers? What is this proportion? [4]

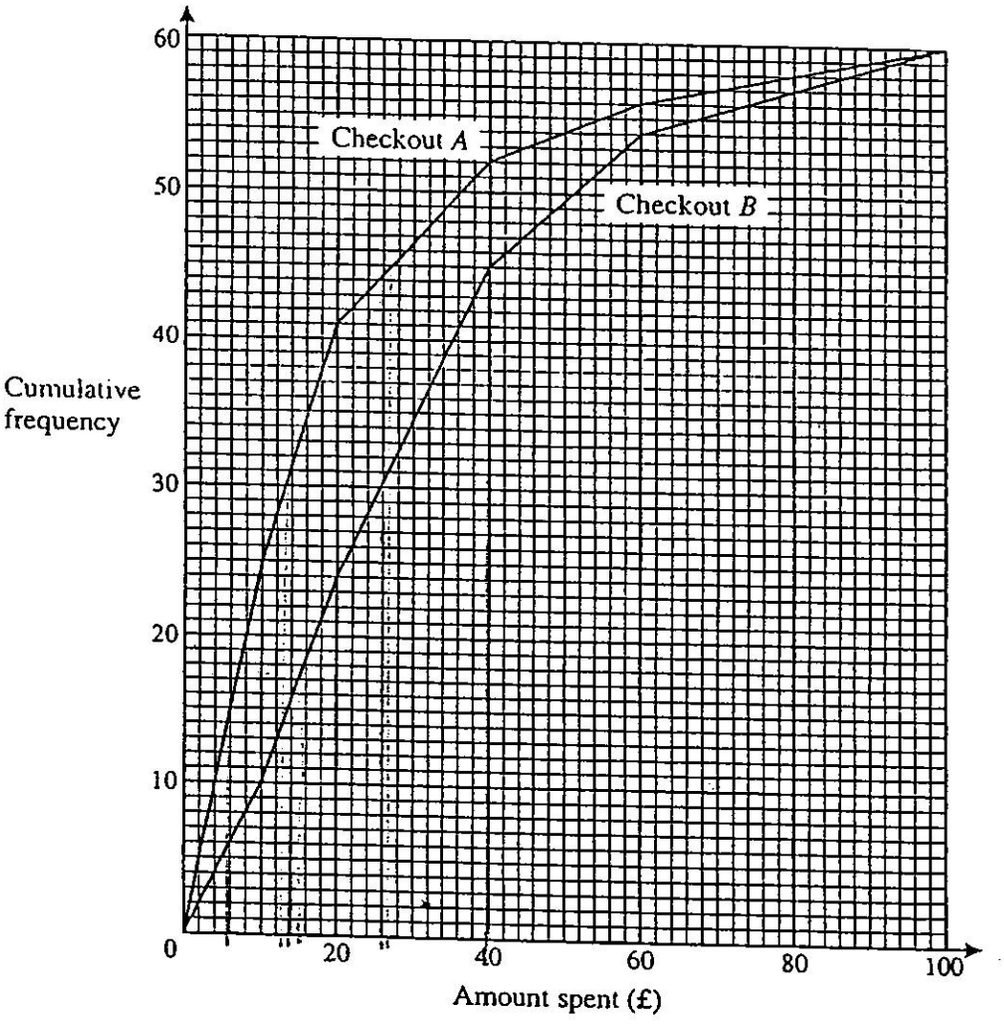
(iv) The candidates' marks for the two papers could also be illustrated by means of a pair of box-and whisker plots. Give two brief comments comparing the usefulness of cumulative frequency graphs and box-and-whisker plots for representing the data. [2]

Cumulative Freq (cont 2)

7 As part of a statistics project a student recorded the amount of money spent, in £, by each of a random sample of 60 customers at checkout A in a supermarket. She also recorded the amount spent by each of a random sample of 60 customers who used another checkout at checkout B in the same supermarket. The results are given in the table below.

Amount spent	⩽ £10	⩽ £20	⩽ £40	⩽ £60	⩽ £100
Cumulative frequency for Checkout A	25	41	52	56	60
Cumulative frequency for Checkout B	10	24	45	54	60

The diagram shows the cumulative frequency graphs for the data.



Jun 01

(i) Use the diagram to estimate the median amount spent at

(a) checkout A,

(b) checkout B.

[3]

(ii) Use the diagram to estimate the interquartile range of the amount spent at

(a) checkout A,

(b) checkout B.

[4]

(iii) One of the two checkouts was an 'express' checkout. Customers are allowed a maximum of nine items when they pass through an express checkout. State, with a reason, which of the two checkouts, A or B, was more likely to have been the express checkout. [2]

(iv) Calculate an estimate of the mean amount spent at checkout B. [4]