

Business Statistics



Level 2

Series 2 2004

(Code 2009)

Model Answers

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How to use this booklet

Model Answers have been developed by LCCIEB to offer additional information and guidance to Centres, teachers and candidates as they prepare for LCCIEB examinations. The contents of this booklet are divided into 3 elements:

- (1) Questions – reproduced from the printed examination paper
- (2) Model Answers – summary of the main points that the Chief Examiner expected to see in the answers to each question in the examination paper, plus a fully worked example or sample answer (where applicable)
- (3) Helpful Hints – where appropriate, additional guidance relating to individual questions or to examination technique

Teachers and candidates should find this booklet an invaluable teaching tool and an aid to success.

The London Chamber of Commerce and Industry Examinations Board provides Model Answers to help candidates gain a general understanding of the standard required. The Board accepts that candidates may offer other answers that could be equally valid.

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QUESTION 1

(a) Explain the difference between discrete and continuous data, giving an example of **each** type. (4 marks)

(b) The number of defective items produced each day by a manufacturing company over a 15-day period were recorded as follows:

12	12	16	12	8	4	13	15
18	20	18	14	23	19	6	

Find the value of the following measures for the data given above:

(i) Quartile deviation

(ii) Mean deviation. (9 marks)

(c) For **each** of the measures listed in (b) above, state what is being measured and give **one advantage** and **one disadvantage** for **each** measure. (6 marks)

(d) Give **two** detailed business examples of the use of computers in data handling and analysis. (6 marks)

(Total 25 marks)

Model Answer to Question 1

- (a) Discrete : integer values eg items made
Continuous : values within a given range eg heights

- (b) (i) Order

4, 6 8 23

$$Q_1 = \frac{n+1}{4} = 4\text{th item}$$

read off list giving 12

$$Q_3 = \frac{3(n+1)}{4} = 12\text{th item}$$

read off list giving 18

$$Q.D = \frac{Q_3 - Q_1}{2} = \frac{18 - 12}{2} = 3$$

- (ii) Mean = $\frac{\sum x}{n} = \frac{210}{15} = 14$

$$\sum |x - \bar{x}| = 62$$

$$m.d = \frac{\sum |x - \bar{x}|}{n} = \frac{62}{15}$$

$$= 4.1\dot{3}$$

- (c) Quartile deviation : average of the differences of the quartiles from the median
– easy to determine :
– ignores values outside middle 50% of data

Mean deviation : average difference from mean ignoring sign

- easy to understand :
– affected by extreme items

- (d) Examples:

Data logging eg EPOS systems for recording sales value, reorder levels etc

Statistical packages for graphics and analysis eg sales forecasting

Databases : records on purchases, debt levels etc

QUESTION 2

A company uses three different energy sources: coal, gas and electricity.

The table below shows the unit price and quantity consumed for each of these energy sources for the years 2001 and 2003:

	Coal		Gas		Electricity	
	Price (£)	Quantity	Price (£)	Quantity	Price (£)	Quantity
2001	8.30	800	0.75	1,400	0.25	840
2003	9.15	740	1.35	1,800	0.30	700

- (a) Calculate the Laspeyres price index number for 2003 with 2001 as base. (7 marks)
- (b) Calculate the Paasche price index number for 2003 with 2001 as base. (7 marks)
- (c) Explain why the two have different values. (2 marks)

The Index of Retail Prices with January 2000 equal to 100 is given as:

Year	Index of Retail Prices (Jan 2000 = 100)
2001	104.5
2002	112.8
2003	120.4

- (d) (i) Convert the Index of Retail Prices to a series with 2001 as the base year. (3 marks)
- (ii) Comment on the difference between the Index of Retail Prices above and the Laspeyres index calculated in part (a). (2 marks)
- (e) State the main steps involved in the construction of a retail price index. (4 marks)

(Total 25 marks)

Model Answer to Question 2

(a) $\Sigma P_o Q_o = 7,900$
 $\Sigma P_n Q_o = 9,462$

$$\begin{aligned} \text{LPI} &= \frac{\Sigma (P_n Q_o)}{\Sigma (P_o Q_o)} \times 100 \\ &= \frac{9,462}{7,900} \times 100 \\ &= 119.8 \end{aligned}$$

(b) $\Sigma (P_n Q_n) = 9,411$
 $\Sigma (P_o Q_n) = 7,667$

$$\begin{aligned} \text{P.P.I} &= \frac{\Sigma (P_n Q_n)}{\Sigma (P_o Q_n)} \times 100 \\ &= \frac{9,411}{7,667} \times 100 \\ &= 122.7 \end{aligned}$$

(c) Different weights

(d) (i)	Year	Index
	2001	100
	2002	107.9
	2003	115.2

(ii) Energy prices increasing faster than R.P.I.

- (e) Decide goods and services to include
- select weights
 - choose base year
 - decide on formula

QUESTION 3

(a) Using suitable business examples, sketch scatter diagrams to show:

- (i) a high negative correlation
- (ii) a weak positive correlation.

(4 marks)

The following table shows the number of staff employed and the value of the sales in a particular week for each of eight retail stores:

Store	A	B	C	D	E	F	G	H
Number of staff employed	10	6	15	9	21	14	8	17
Value of sales (£000)	62	70	78	54	114	72	60	90

(b) Plot the data on a scatter diagram.

(3 marks)

(c) Calculate the product moment correlation coefficient for the data and comment on your result.

(10 marks)

(d) Use the value obtained in (c) above to calculate the coefficient of determination and explain what this measures.

(4 marks)

(e) Given the appropriate regression line, could the sales value for a store employing 35 staff be estimated accurately?

Give reasons for your answer.

(4 marks)

(Total 25 marks)

Model Answer to Question 3



- (b) Plot:
 labels, axes, title
 Points accurate

$$\begin{aligned} \Sigma x &= 100 & \Sigma y &= 600 \\ \Sigma x^2 &= 1,432 & \Sigma y^2 &= 47,624 \\ \Sigma x y &= 8,108 \end{aligned}$$

$$r = \frac{n \Sigma x y - (\Sigma x) (\Sigma y)}{\sqrt{[n \Sigma x^2 - (\Sigma x)^2] [n \Sigma y^2 - (\Sigma y)^2]}}$$

$$r = \frac{4,864}{\sqrt{[1,456 \times 20,992]}}$$

$$r = \frac{4,864}{5,528.5} = .88$$

- (c) Comment : moderate positive

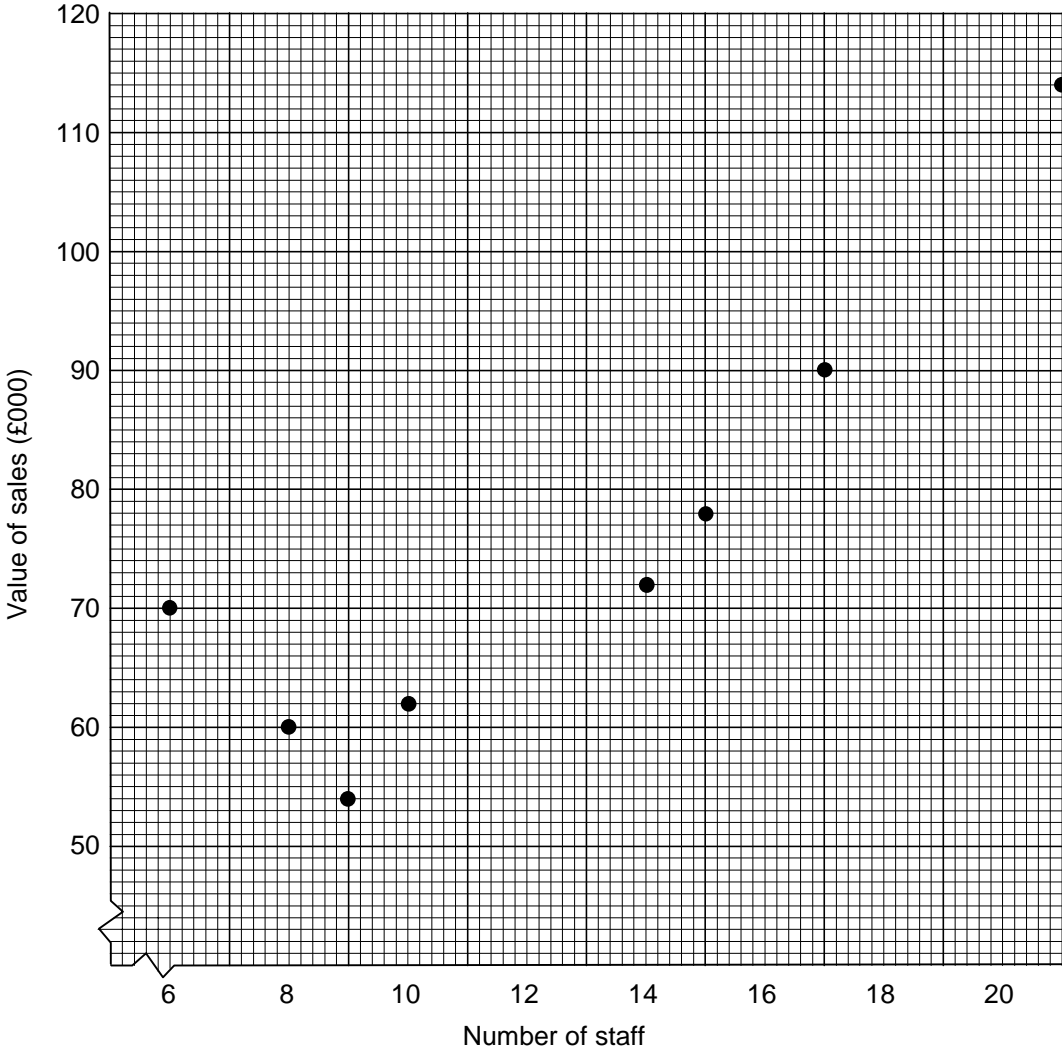
- (d) C of D = $r^2 = (.88)^2 = .774$

Shows amount of variation in the dependent variable explained by the explanatory variable
 77% of sales variation is explained by changes in staffing levels

- (e) Inaccurate: extrapolation :
 correlation not perfect
 'r' based on small sample

Model Answer to Question 3 continued

(b)



QUESTION 4

A furnishing company employs 100 staff of whom 80 work in production, 15 in administration and the remainder in sales.

Females account for 25% of the production staff, 60% of the administration staff and 40% of sales staff.

(a) If an employee is selected at random from the company, find the probability that the person chosen is:

(i) a male administration worker

(ii) a female employee. (8 marks)

(b) If three members of staff are selected at random with replacement, what is the probability that one only of the three is a male production employee?

(5 marks)

The company is planning to survey the workforce in order to gather their views on proposed changes to the shift pattern of work.

(c) Briefly describe how the following sampling methods could be used for such a survey, listing **one advantage** and **one disadvantage** in **each** case:

(i) systematic sampling

(ii) quota sampling. (8 marks)

The survey will be conducted using postal questionnaires.

(d) Give **2** ways in which it might be possible to improve the response rate to this survey.

(4 marks)

(Total 25 marks)

Model Answer to Question 4

(a) (i) $.15 \times .4 = .06$

(ii) $.8 \times .25 = .2$
 $.15 \times .6 = .09$
 $.05 \times .4 = .02$

$$.2 + .09 + .02 = .31$$

(b) $.8 \times .75 = .6$

$$1 - .6 = .4$$
$$3 (.4)^2 (.6)$$
$$= .288$$

(c) (i) Systematic
List, random start, every nth

- easy to apply
- not fully random
- avoid periodic data

(ii) Quota
Take sample containing fixed number, use of quota controls to ensure representativeness

- does not require a sample frame, inexpensive
- sample bias, not possible to estimate sampling error

(d) – call backs
– use variety of collection methods
– provide incentive eg payment for return of questionnaire

QUESTION 5

The following data shows the length of time 200 employees in a particular company have spent in their present job:

Length of time (years)	Number of employees
Less than 1	14
1 and less than 5	60
5 and less than 10	65
10 and less than 15	30
15 and less than 25	22
25 and less than 40	9

- (a) Draw a histogram to represent these data. (8 marks)
- (b) State the modal class. (2 marks)
- (c) Calculate estimates of the mean and standard deviation of the time spent in a job. (11 marks)
- (d) (i) Use your results from (c) above to calculate the coefficient of variation for the data. (2 marks)

Data from a similar study of a competitor company gave a coefficient of variation equal to 34%.

- (ii) Explain what the coefficients show about the lengths of time employees spend in jobs for the two companies. (2 marks)

(Total 25 marks)

Model Answer to Question 5

(a) Frequency density

14 15 13 6 2.2 .6

Histogram: title, axes, labels

Horizontal position

Vertical

(b) 1 and less than 5

(c) Mid points .5 3 7.5 12.5 20 32.5

$$\Sigma fx = 1,782$$

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f} = \frac{1,782}{200} = 8.91 \text{ years}$$

$$\Sigma fx^2 = 27,193.5$$

$$\text{St devn} = \sqrt{\frac{\Sigma fx^2}{\Sigma f} - (\bar{x})^2}$$

$$\sqrt{\frac{27,193.5}{200} - (8.91)^2}$$

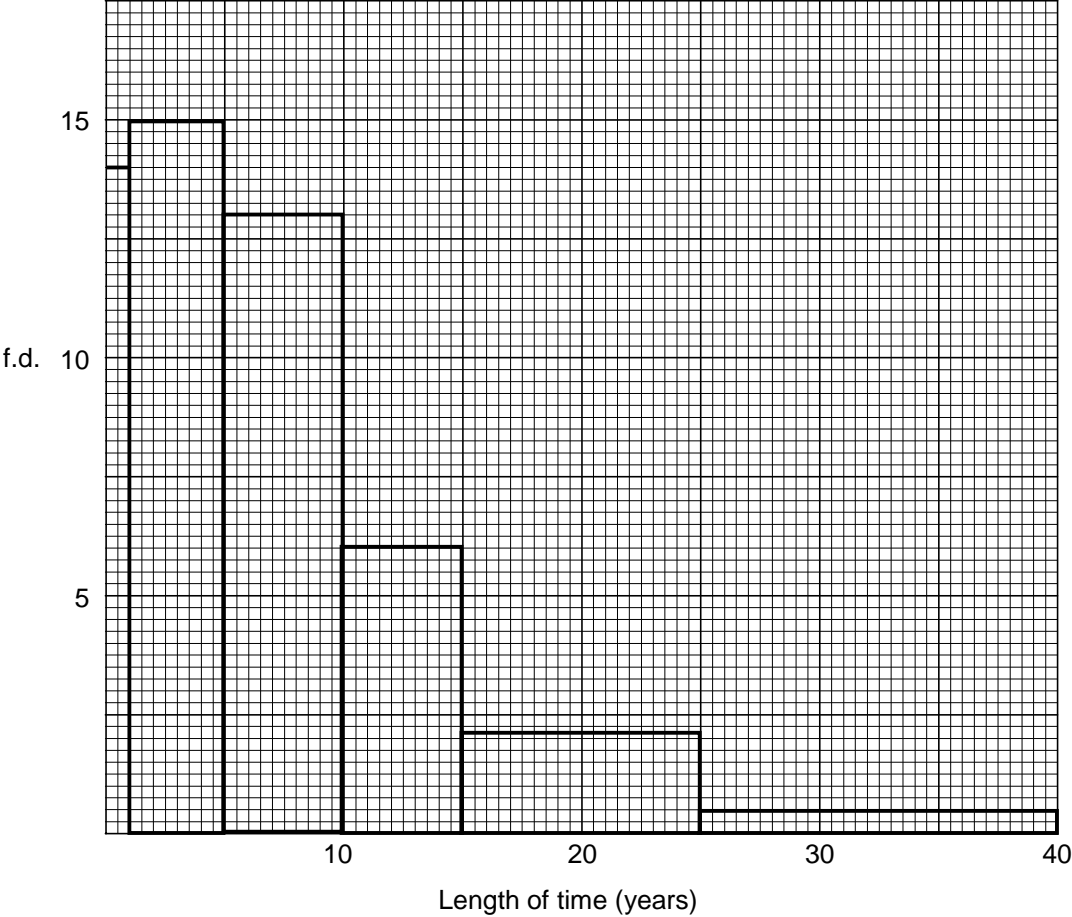
$$= 7.522 \text{ years}$$

(d) (i) C of V = $\frac{7.522}{8.91} \times 100 = 84.4\%$

(ii) Competitor higher level of consistency – lower relative variation.

Model Answer to Question 5 continued

(a)



QUESTION 6

The table below shows the value of monthly sales for a company during the years 2002 and 2003.

Sales (£000)		
Month	2002	2003
January	91	115
February	81	102
March	100	120
April	124	136
May	140	152
June	145	166
July	158	184
August	152	173
September	114	131
October	92	118
November	70	89
December	161	194

(a) Draw a Z chart to represent the above data.

(11 marks)

(b) Give **three** detailed comments on your results.

(6 marks)

The totals for May 2002 and 2003 are based on sales achieved by the company in four European countries.

The value of the sales were as follows:

May Sales (£000)		
Country	2002	2003
France	35	35
Spain	60	85
Germany	15	22
Italy	30	10

(c) Represent these data in the form of a component bar chart showing two bars, one for each of the two years listed.

(4 marks)

(d) Comment on two differences shown by the component bar chart.

(4 marks)

(Total 25 marks)

Model Answer to Question 6

- (a) Cumulative data 2003
115, 217, 337 1680

Moving annual total

1452, 1473, 1493, 1505, 1517
1538, 1564, 1585, 1602, 1628, 1647, 1680

Axes, title, labels
Clear 'joined' Z shape

3 separate plots
labelling

- (b) Marked seasonal effect, high summer sales

M.A.T shows rising sales

Cumulative total shows sales rising steadily up to particular points

- (c) Axes, title, labels

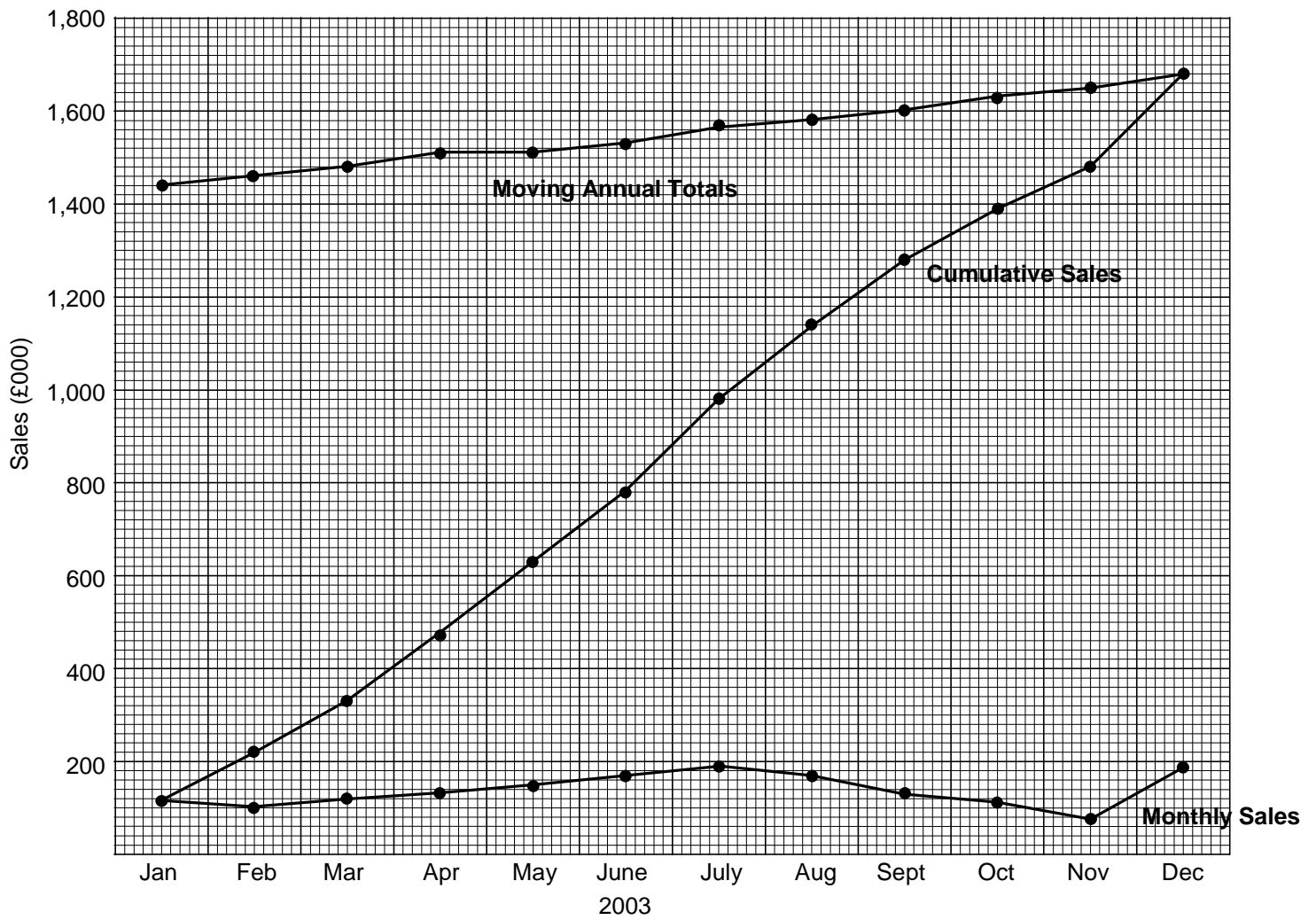
2 accurate component bars
labels/key

- (d) Examples : increasing sales overall
: Spain higher level
: Italy decrease

Model Answer to Question 6 continued

(a)

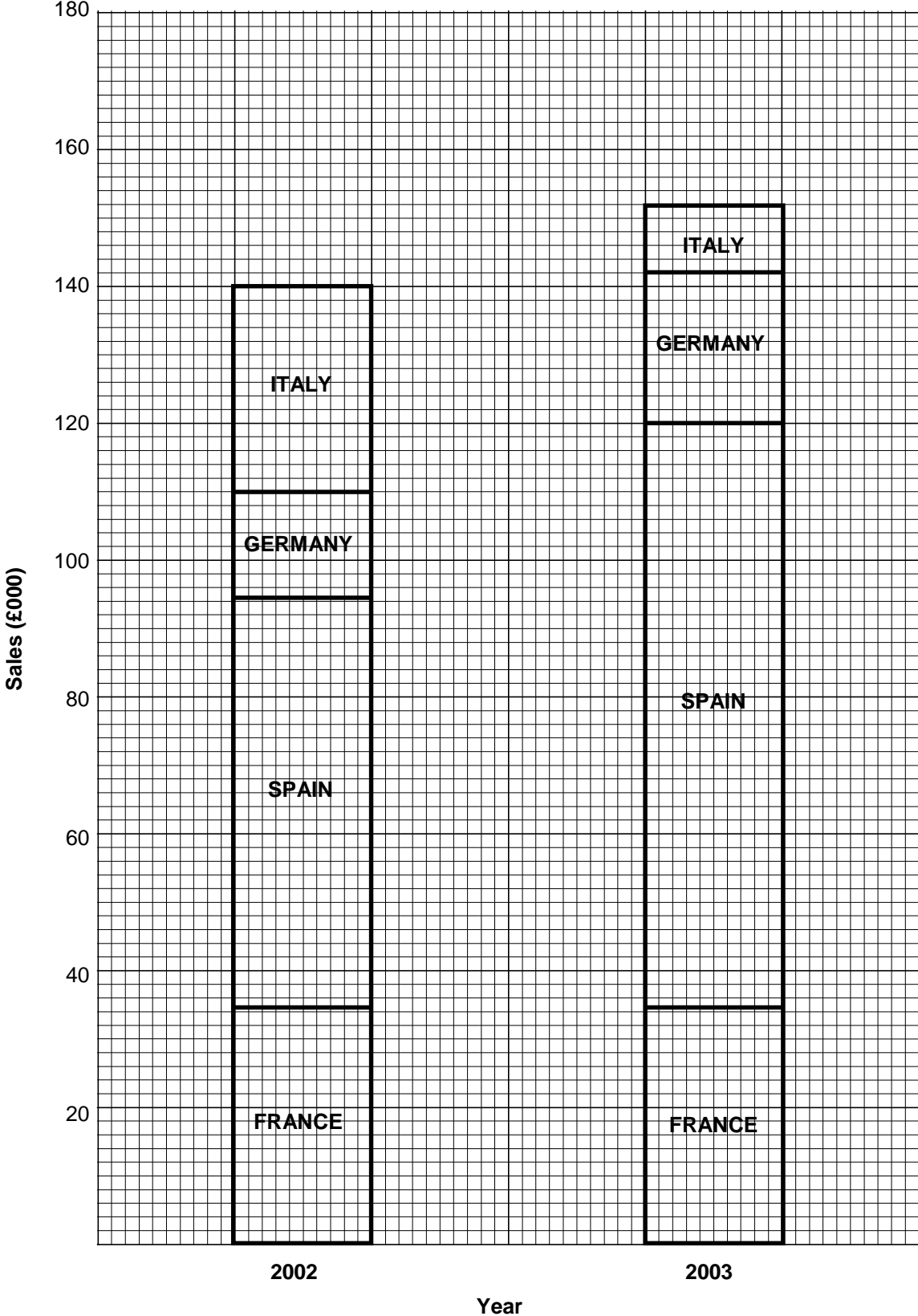
'Z' Chart



Model Answer to Question 6 continued

(c)

Component bar chart: European Sales





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