



Rewarding Learning

General Certificate of Secondary Education
2018

Centre Number

--	--	--	--	--

Candidate Number

--	--	--	--

Statistics

Unit 1
Higher Tier



GST12

[GST12]

THURSDAY 21 JUNE, MORNING

TIME

2 hours.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Write your answers in the spaces provided in this question paper.

Answer **all thirteen** questions.

Any working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.

You **may** use a calculator for this paper.

INFORMATION FOR CANDIDATES

The total mark for this paper is 100.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

You should have a calculator, ruler, compasses and protractor.

The formula sheet is on page 2.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
Total Marks	

HIGHER TIER FORMULAE SHEET

$$\text{Standard deviation} = \sqrt{\frac{\sum fx^2}{n} - \left(\frac{\sum fx}{n}\right)^2}$$

Spearman's Rank Correlation Coefficient

$$r_s = 1 - \left(\frac{6 \sum d^2}{n(n^2 - 1)}\right)$$

BLANK PAGE
(Questions start overleaf)

Answer **all** questions

- 1 The table below shows the number of each type of traffic offence recorded by the police in Northern Ireland each month in 2016

Offence	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Breach of signs and signals	46	37	30	30	39	14	13	29	26	43	41	39	387
Careless driving	486	551	527	405	386	250	94	79	95	129	140	103	3245
Construction and use	411	357	315	206	165	174	98	78	70	106	99	66	2145
Dangerous driving	7	25	30	16	6	7	7	2	0	4	1	4	109
Lighting	58	56	60	29	19	20	47	26	26	52	40	49	482
Miscellaneous	68	78	105	82	51	23	13	14	10	12	14	14	484
Parking	145	87	122	57	57	45	35	45	62	152	181	70	1058
Pedal cyclists	2	0	1	2	4	3	1	0	1	2	1	1	18
Pedestrian	12	8	9	3	5	7	2	1	3	5	3	4	62
Seatbelt	54	121	111	68	88	98	84	50	75	83	67	67	966
Speeding	505	680	569	498	472	492	524	411	386	513	462	326	5838
Tachograph	0	1	0	0	0	0	1	0	0	2	1	1	6
Using a mobile phone	423	467	537	468	403	428	396	352	413	379	465	275	5006
No insurance	76	81	98	60	58	69	84	72	56	74	76	67	871
No vehicle test certificate	50	64	68	54	22	36	71	38	41	44	56	67	611
No driving licence	6	9	5	4	1	2	0	0	0	0	0	0	27
TOTAL	2349	2622	2587	1982	1776	1668	1470	1197	1264	1600	1647	1153	21 315

© PSNI motoring-offences-statistics 2016 report <http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

2 Sophie is designing a questionnaire to survey her class about how they travel to school.

(a) Write down an example of a closed question Sophie could use.

_____ [2]

(b) Give one advantage and one disadvantage of using closed questions.

Advantage _____

_____ [1]

Disadvantage _____

_____ [1]

While carrying out her survey, Sophie discovers that she keeps having to explain what one of the questions on the questionnaire means.

(c) What should Sophie have done with her questionnaire before using it for her survey? Explain why she should have done this.

_____ [2]

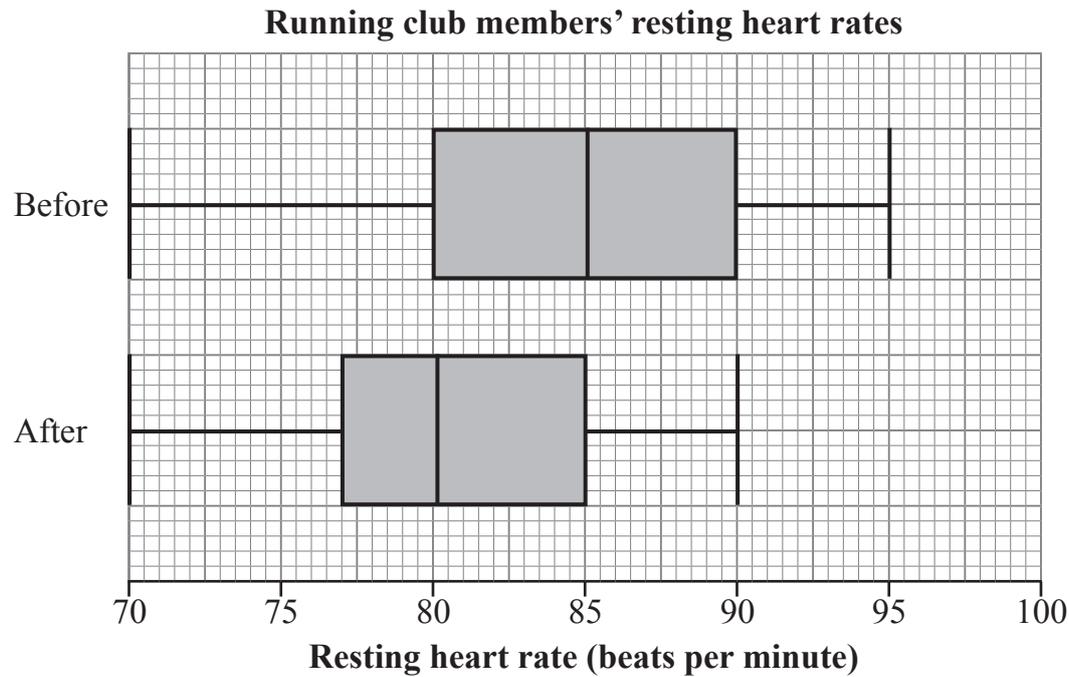
Examiner Only	
Marks	Remark

- 3 During the summer, a running club organises a boot camp where members can try to improve their general fitness.

A group of 60 members took part in the boot camp. The instructor measured their resting heart rates, in beats per minute, before the boot camp and found that they were, in general, too high.

He then measured their resting heart rates again after the boot camp.

The results for both measurements are shown in the following box plots.



Using the information in the box plots, describe the effect of the boot camp on the resting heart rates of the group.

[3]

Examiner Only	
Marks	Remark

- 4 A mail order company operates a customer service helpline.

On its website the company claims that calls are answered, on average, within 20 seconds.

One day, the manager records the length of time taken to answer all calls to the helpline.

The results are given in the table below.

Time, t (seconds)	Frequency, f		
$0 < t \leq 10$	343		
$10 < t \leq 20$	214		
$20 < t \leq 30$	197		
$30 < t \leq 40$	145		
$40 < t \leq 50$	72		
$50 < t \leq 60$	29		
TOTAL	1000		

- (a) Give one advantage and one disadvantage of using a grouped frequency table for this data.

Advantage _____

_____ [1]

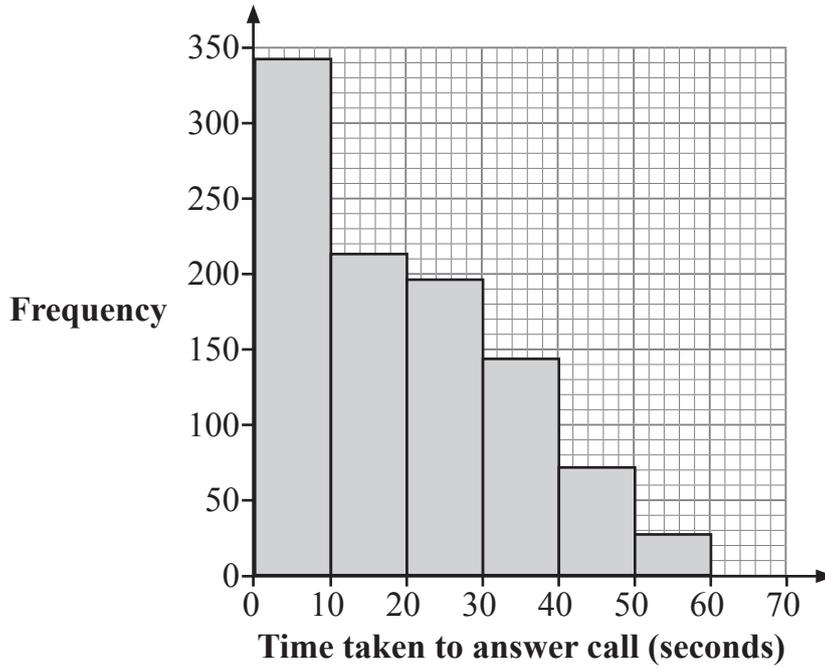
Disadvantage _____

_____ [1]

Examiner Only

Marks Remark

A histogram showing the distribution of the times taken to answer the calls is shown below.



- (d) (i) Do you think that this data could be modelled by a normal distribution?

Tick the correct box.

Yes No [1]

- (ii) Explain your answer.

[1]

Examiner Only	
Marks	Remark

5 A local council is planning to close the library in a small town.

The council decides to investigate the opinions of the people who live in the town about their plan to close the library.

(a) What is the population for this investigation?

_____ [1]

One of the questions on the questionnaire is:

How many times have you used the local library recently?

1–5 6–10 More than 10

(b) Give **two** reasons why this is not a suitable question.

Reason 1 _____

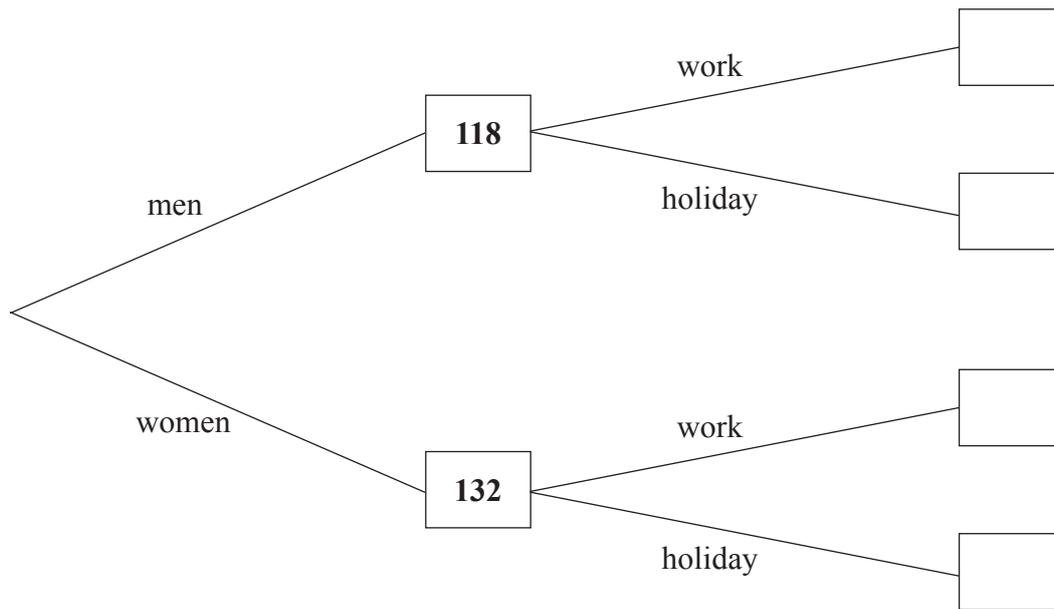
_____ [1]

Reason 2 _____

_____ [1]

Examiner Only	
Marks	Remark

- 6 In a survey, all passengers in an airport lounge said they were either travelling for work or on holiday. The partially completed frequency tree shows some of the information collected.



- (a) 71 men and 64 women were travelling for work.

Complete the frequency tree.

[2]

- (b) A female passenger is chosen at random.

What is the probability that she is travelling on holiday?

Answer _____ [2]

Examiner Only	
Marks	Remark

(c) One of the passengers travelling on holiday is chosen at random.

What is the probability that the passenger is male?

Answer _____ [2]

Examiner Only	
Marks	Remark

- 7 Eight friends are talking about the number of times they had been to the cinema in the past year.

Their results are as follows.

3 8 9 5 12 4 2 1

- (a) Calculate the mean of these numbers.

Answer _____ [2]

- (b) Lisa says that the mode of these numbers is 12

Explain why Lisa is **not** correct.

[1]

- (c) One of the group remembered that she had been to the cinema 7 times and not 9 times.

What effect will this have on the value of the mean?

Tick the correct box.

Increase Decrease No change [1]

Examiner Only	
Marks	Remark

- (d) Jenny thinks that the number of times a person goes to the cinema might be related to how far they live from it.

Write down a hypothesis Jenny could use.

Hypothesis

[1]

Jenny plans to ask some people about:

- the distance they live from the nearest cinema; and
- the number of times they have been to the cinema in the past year.

- (e) What kind of data is the number of visits to the cinema?

Circle **two** words from the list below that describe the data.

Qualitative

Discrete

Continuous

Bivariate

Quantitative

Categorical

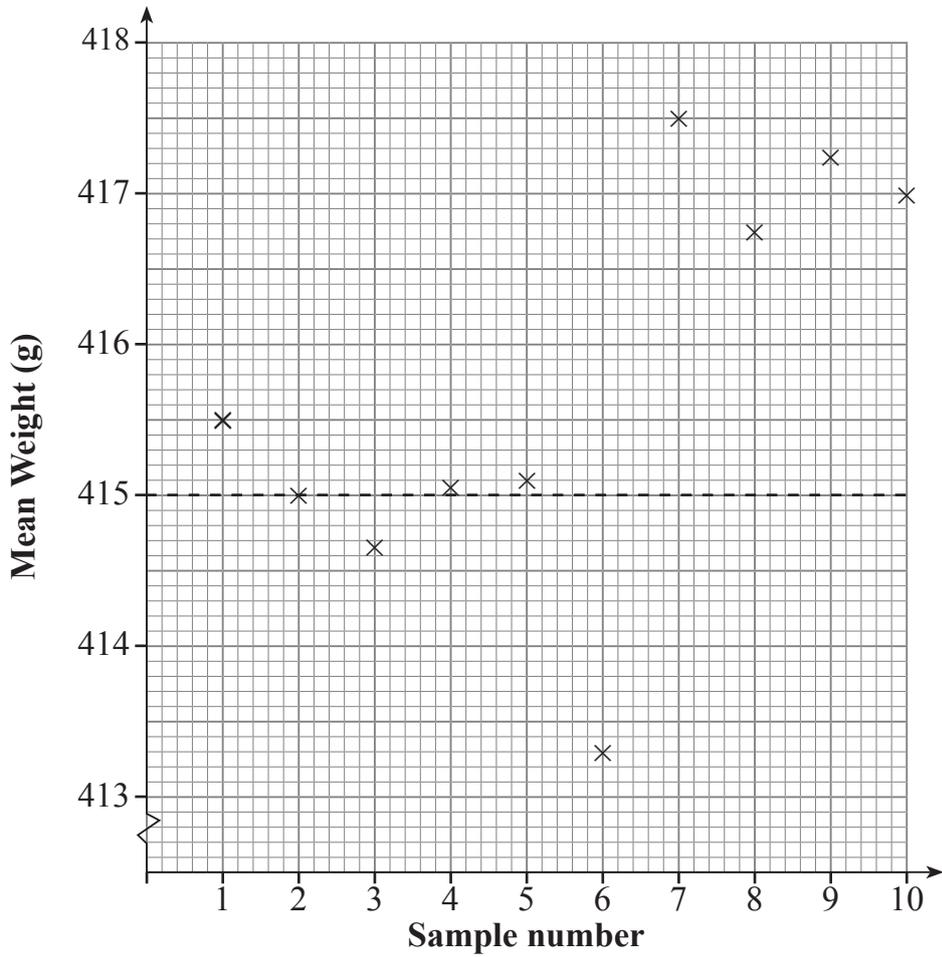
[2]

After collecting her data, Jenny calculated the product moment correlation coefficient to be -0.769

- (f) What conclusion could Jenny draw from this value?

[2]

Examiner Only	
Marks	Remark



Examiner Only	
Marks	Remark

(d) During the shift, the production manager went home sick so the control chart went unchecked.

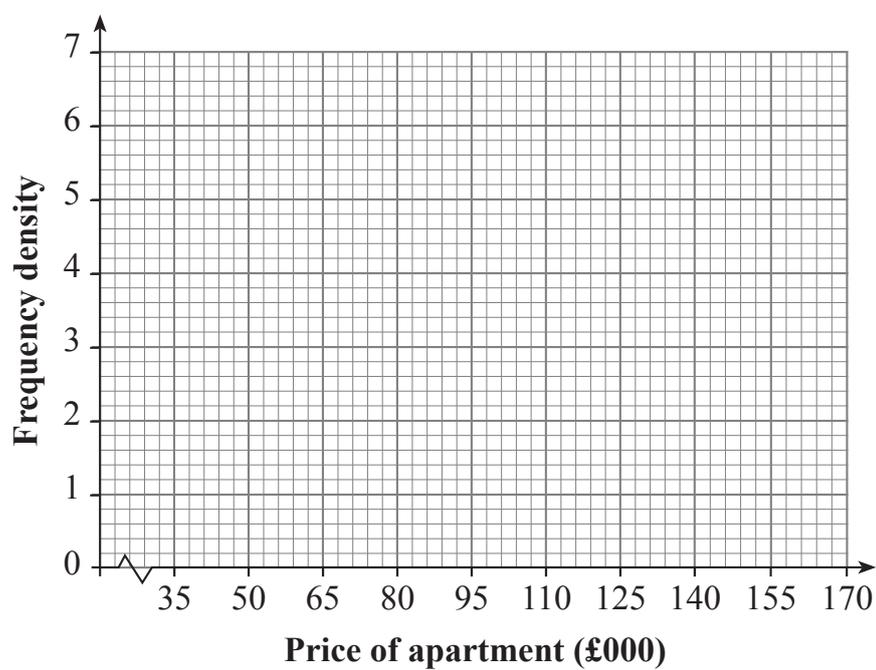
Explain, with reasons, how the production manager would have responded to the chart if he had been at work.

[4]

- 9 An estate agent is doing some research on property values in a city. The prices in thousands of pounds (£000) of a sample of apartments which were sold during one year are given in the grouped frequency table below.

Price (£000)	No. of Apartments
$35 \leq p < 65$	42
$65 \leq p < 95$	114
$95 \leq p < 110$	96
$110 \leq p < 125$	81
$125 \leq p \leq 155$	18

- (a) Use the information in the table to draw a histogram for the prices of the apartments.



[4]

Examiner Only

Marks Remark

(b) Victor says that the table indicates that the most expensive apartment in the city cost £155 000

Give two reasons why Victor may not be correct.

Reason 1

[1]

Reason 2

[1]

Examiner Only	
Marks	Remark

- 10 The table below shows the number of complaints received by a company each quarter over a three-year period.

Year	Quarter	No. of complaints	4-point moving averages
2012	Q1	79	
	Q2	102	
	Q3	120	103
	Q4	111	105
2013	Q1	87	106
	Q2	106	108.5
	Q3	130	109.5
	Q4	115	112
2014	Q1	97	
	Q2	120	
	Q3	134	
	Q4	125	

- (a) Explain briefly why **4-point** moving averages are used for this data.

[1]

- (b) Complete the table above.

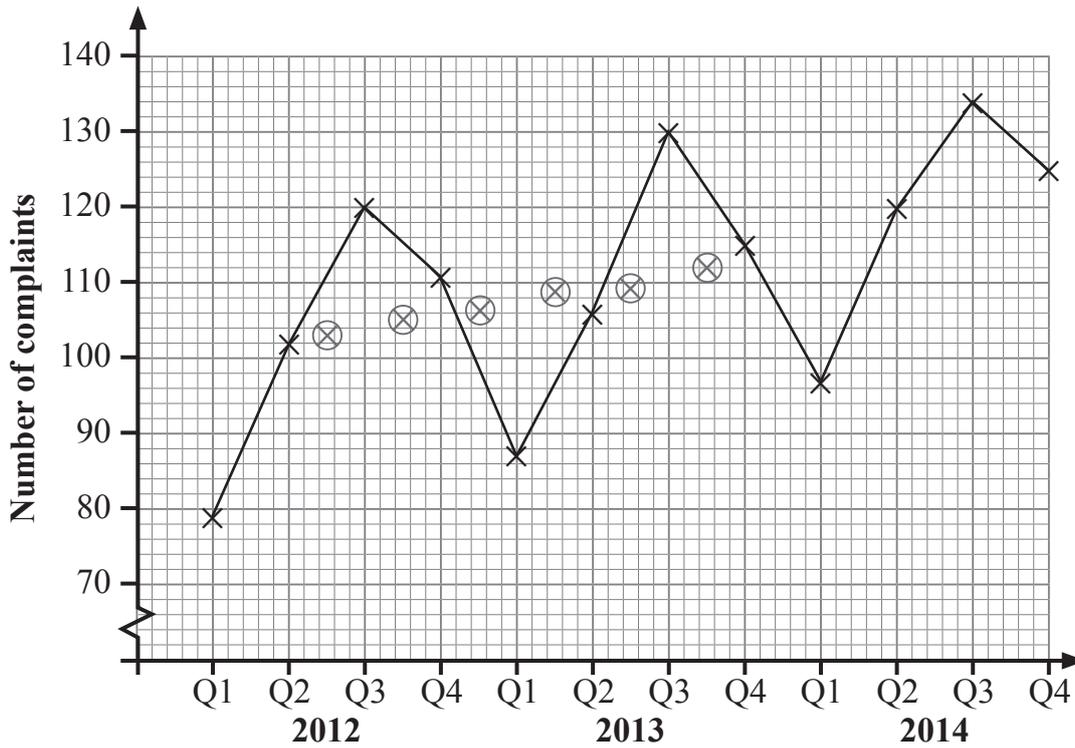
[3]

Examiner Only

Marks Remark

The data from the table is plotted as a time series graph below.

Examiner Only	
Marks	Remark



(c) Plot the remaining 4-point moving averages and draw a trend line. [2]

(d) Describe the trend in the number of complaints received by the company over the three-year period.

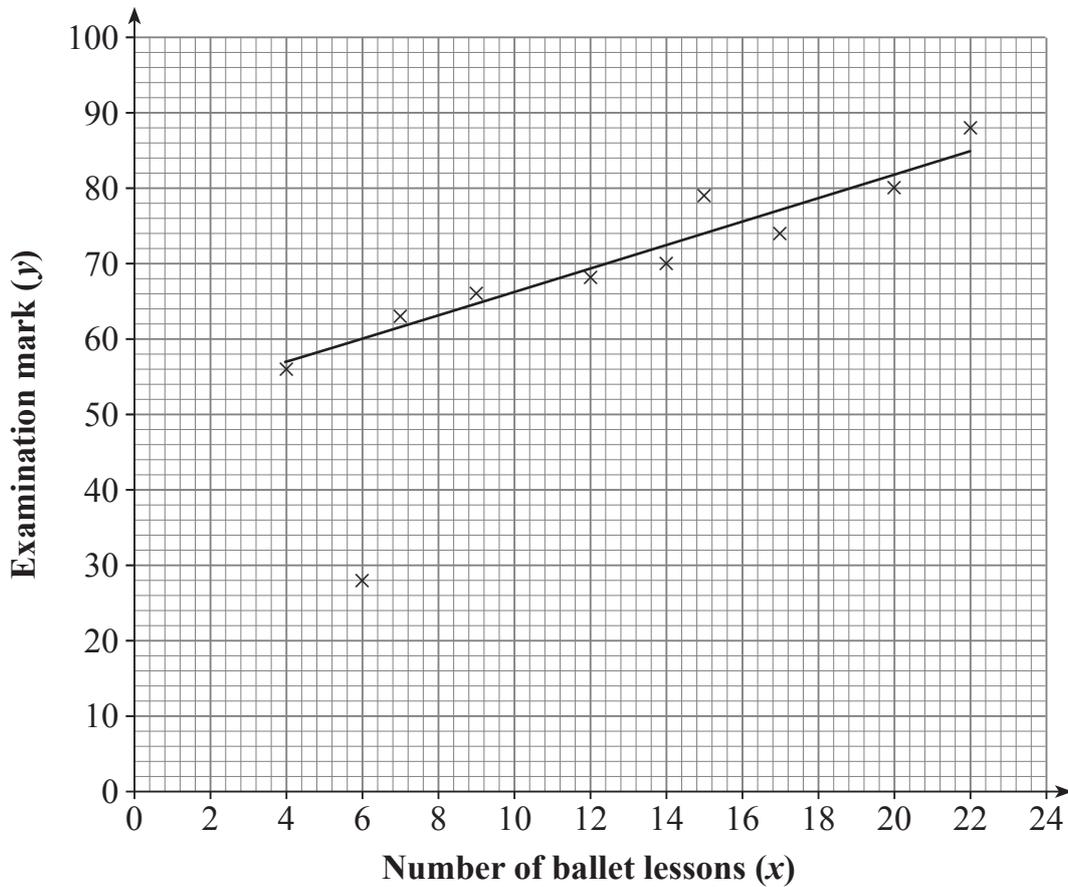
[1]

(e) Using your trend line, estimate the number of complaints the company could expect to receive during the first quarter of 2015

Answer _____ [3]

- 11 Grace carries out a survey among ten of her friends about the number of ballet lessons they took and the mark they got in their recent ballet examination.

Her results are given in the scatter diagram below.



- (a) One of the results is an outlier.

Put a circle around the point on the graph representing this result. [1]

Examiner Only	
Marks	Remark

During the summer holidays, Anna took part in a ballet competition.

The eight dancers were ranked by two judges. The ranks are as follows:

Dancer	Judge 1	Judge 2		
A	1	2		
B	2	1		
C	3	3		
D	4	4		
E	5	6		
F	6	5		
G	7	7		
H	8	8		

- (d) Calculate Spearman's rank correlation coefficient for this data, giving your answer correct to three decimal places.

Answer _____ [3]

- (e) Anna thinks one of the judges is not judging consistently.

Using your result from (d), comment on Anna's claim.

[2]

Examiner Only	
Marks	Remark

BLANK PAGE
(Questions continue overleaf)

- 12 The table below shows the price of a jar of coffee on 1st January over four years.

Year	2014	2015	2016	2017
Price	£3.09		£3.22	£3.17
Chain base index number	100	101.0	103.2	

- (a) Calculate the price of a jar of coffee on 1st January 2015

Answer £ _____ [2]

- (b) Calculate the chain base index number for 2017

Answer _____ [3]

Examiner Only	
Marks	Remark

(c) Explain the meaning of the value of the chain base index number for 2017 which you calculated in part (b).

[2]

Examiner Only	
Marks	Remark

The company which produces the coffee has three departments: production, administration and management.

The percentage of the total wages bill for each of the departments is as follows:

60% production

25% administration

15% management

Taking 2015 as the base year, the index numbers for the company's total wages bill for each department in 2016 are as follows:

Production	Administration	Management
106	103	107

(d) In 2015, the total wages bill for the company was £340 540

Calculate the wages bill for the **production** department in 2016

Answer _____ [4]

Examiner Only

Marks Remark

(e) Calculate the weighted index number for the company's total wages bill for 2016

Examiner Only	
Marks	Remark

Answer _____ [4]

Upon returning to school, Simon accidentally mixed up some of the stones.

He selected one at random and measured its length to be 32 mm.

- (c) Using standardised scores, work out which location the stone is more likely to have come from.

_____ [4]

- (d) What assumption must be made about the distributions of the lengths of the stones at each location in order to use standardised scores?

 _____ [1]

THIS IS THE END OF THE QUESTION PAPER

Examiner Only	
Marks	Remark

Permission to reproduce all copyright material has been applied for.
In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA
will be happy to rectify any omissions of acknowledgement in future if notified.