Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
Level 1/Level 2 GCSE (9–1)

Centre Number | | | | | |

Candidate Number | | | | |

Thursday 12 November 2020

Afternoon (Time: 1 hour 30 minutes) | Paper Reference **1ST0/1H**

Statistics

Paper 1
Higher Tier

You must have:
Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, scientific calculator.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- Scientific calculators may be used.
- You must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

Information

- The total mark for this paper is 80
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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P 6 2 7 1 1 A 0 1 2 4

Pearson

Higher Tier Formulae

You must not write on this page.

Anything you write on this page will gain NO credit.

$$\text{Skew} = \frac{3(\text{mean} - \text{median})}{\text{standard deviation}}$$

$$\text{Standard deviation} = \sqrt{\frac{1}{n}\sum(x - \bar{x})^2}$$

An alternative formula for standard deviation is

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

Spearman's rank correlation coefficient

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

Rates of change (e.g. Crude birth rate = $\frac{\text{number of births} \times 1000}{\text{total population}}$)

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Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 A presenter wants to get feedback on a lecture that she gave.

There were 467 students at the lecture.

The presenter plans to give a questionnaire to a sample of 50 of these students.

One of the questions on the questionnaire is

> To what extent do you agree with the statement, the presenter was knowledgeable?
>
> Use a scale from 0 to 5, where 0 means **I strongly disagree** and 5 means **I strongly agree**

(a) Circle the word from the list that best describes the type of data that this question collects.

ordinal **bivariate** **continuous** **grouped**

(1)

(b) Describe how the presenter can use a list of random numbers to select a simple random sample of 50 students.

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(3)

(Total for Question 1 is 4 marks)

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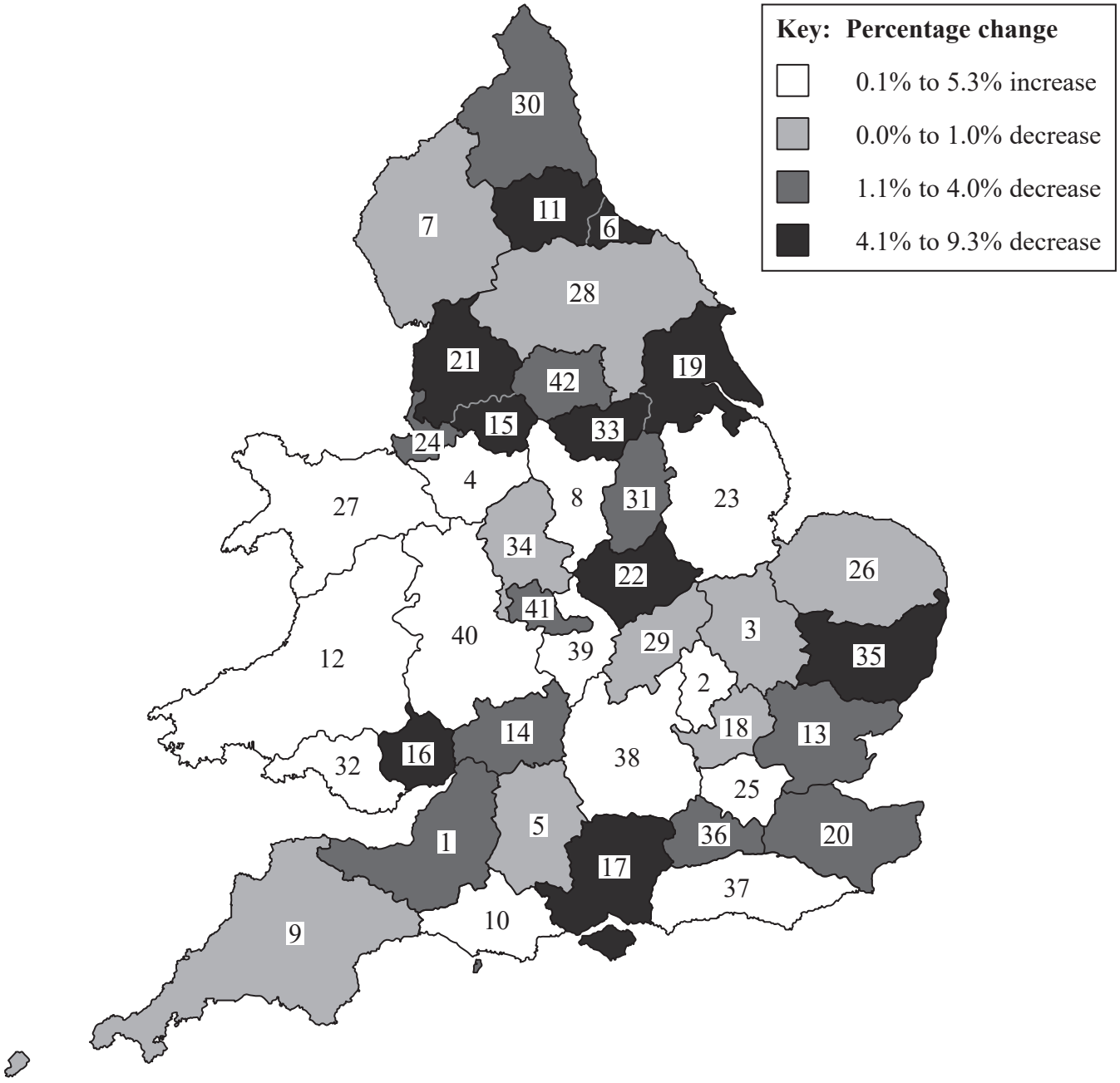
2 The map below gives information about the percentage change in the number of police officers in each of the 42 different police force regions of England and Wales between 2014 and 2015



(Source: *ONS*)

(a) Write down the percentage change in the number of police officers in region 17

.....

(1)

(b) In how many of the 42 regions did the number of police officers increase?

.....

(1)

Sadiq thinks that the map shows that there was a decrease in the overall number of police officers in England and Wales between 2014 and 2015

(c) Explain why Sadiq may **not** be correct.

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(1)

(d) Write down the statistical name for the type of map used in this question.

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(1)

(Total for Question 2 is 4 marks)

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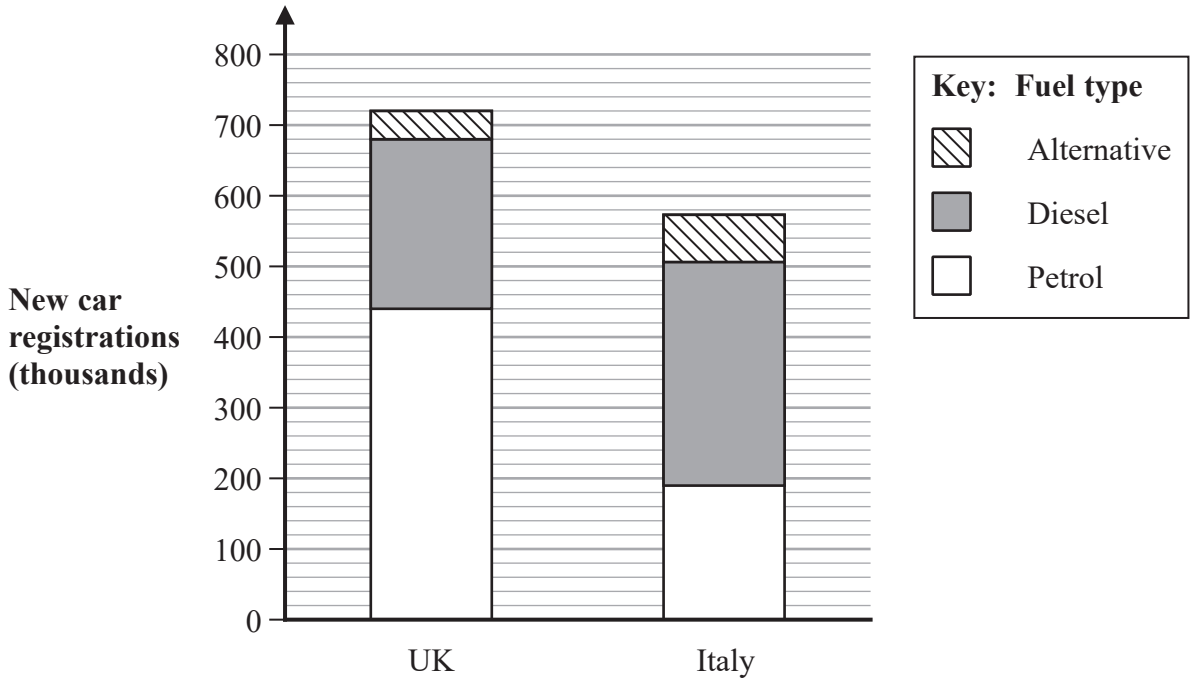
3 The composite bar chart shows information about the number of new car registrations for the first quarter of 2018 in the UK and in Italy for each fuel type.



(Source: *European Automobile Manufacturers Association*)

In total, there were more new car registrations in the UK than in Italy.

(a) Work out an estimate for how many more.

..... thousand

(2)

(b) Explain why the answer to part (a) is an estimate.

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(1)

(c) For each fuel type, compare the number of new car registrations in the UK with the number of new car registrations in Italy.

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(2)

The table below shows the number of alternative fuel new car registrations in the UK for the first quarter of each year from 2015 to 2017

	Q1 2015	Q1 2016	Q1 2017
Alternative fuel new car registrations	20 785	25 707	33 405

Michael says that the information in the table shows that the total number of alternative fuel new car registrations in the UK for 2015 to 2017 increased each year.

(d) Explain why Michael's conclusion may **not** be valid.

.....

.....

(1)

(Total for Question 3 is 6 marks)

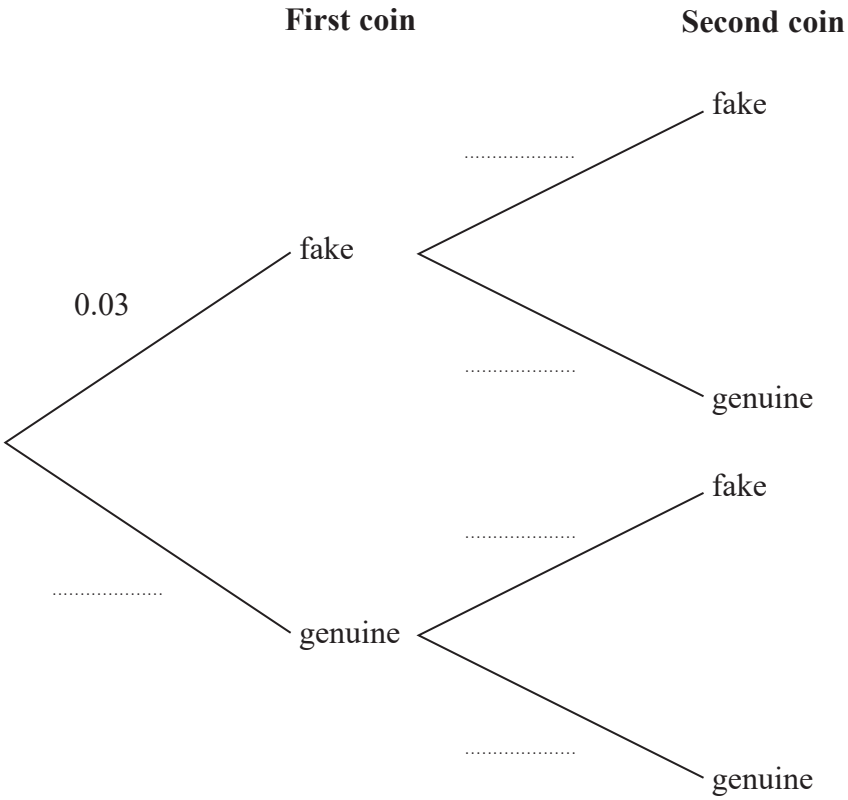
4 It was reported that 3% of the old style £1 coins are fake.

All the other old style £1 coins are genuine.

Shreya has two old style £1 coins.

She does not know if each coin is genuine or fake.

(a) Complete the probability tree diagram.



(2)

(b) Show that the probability that both of Shreya's coins are genuine is 0.9409

(1)

Shreya claims that the probability that exactly one of her two coins is fake is less than 6%

(c) Determine whether or not Shreya is correct.

(3)

(Total for Question 4 is 6 marks)

5 The table shows information from a survey about train passengers' satisfaction with 10 categories of train facilities in spring 2018

Train facilities	sample size	% satisfied or good	% neither /nor	% dissatisfied or poor
Frequency of the trains on that route	24 739	74	10	16
Punctuality (arriving/departing on time)	24 868	72	9	19
Value for money of the price of your ticket	23 701	45	21	35
Provision of information during the journey	23 353	73	18	9
Helpfulness and attitude of staff on train	13 961	65	24	10
Toilet facilities	11 381	41	19	40
Your personal security on board	23 239	74	22	4
Cleanliness of the inside	25 219	75	14	11
How well train company deals with delays	6581	37	34	29
Level of crowding	24 728	70	13	17

(Source: *National Rail Passenger Survey*)

(a) In which of the 10 categories was

(i) the '% satisfied or good' the least?

.....

(1)

(ii) the '% dissatisfied or poor' the greatest?

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(1)

(b) How many people said 'satisfied or good' for punctuality?

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(2)

Michelle claims that the percentages for 'Cleanliness of the inside' are the most reliable for these 10 categories.

(c) Using the information in the table, suggest why she might think this.

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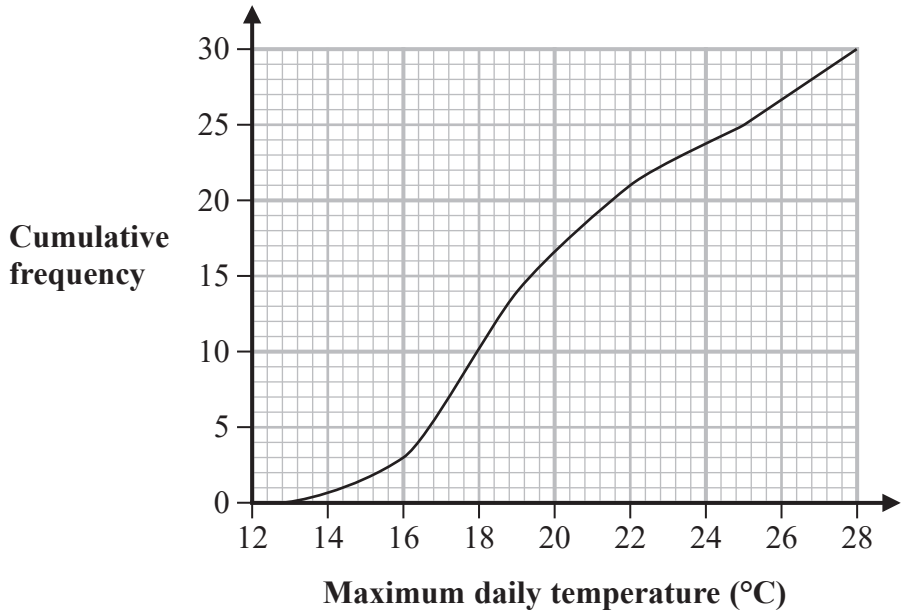
(1)

(Total for Question 5 is 5 marks)

6 The cumulative frequency graph shows information about the maximum daily temperature, in °C, in Bingley for the 30 days of June 2018



(Source: *WeatherOnline*)

(a) (i) Find the 90th percentile.

..... °C

(1)

(ii) Interpret your 90th percentile in context.

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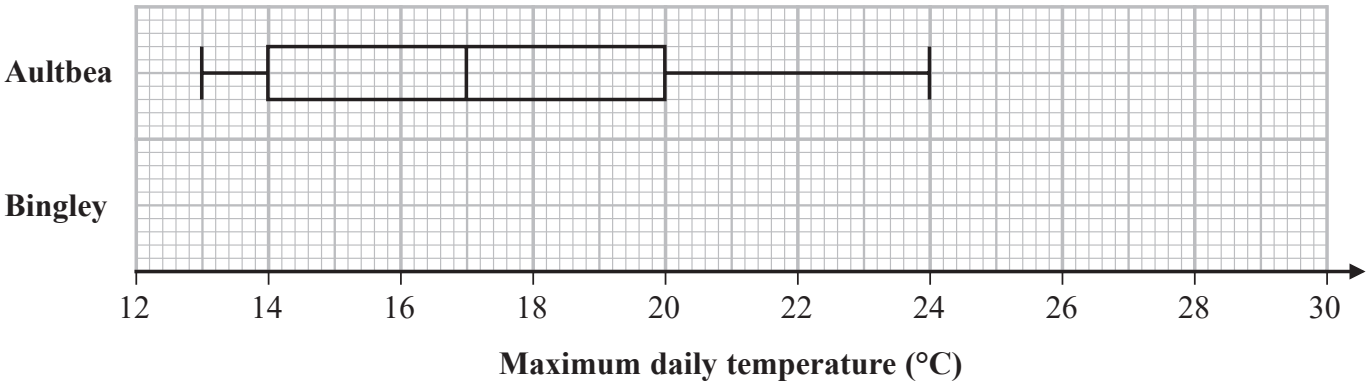
(1)

For Bingley in June 2018, the lowest maximum daily temperature was 13 °C and the greatest maximum daily temperature was 28 °C.

(b) Show that the greatest maximum daily temperature in June is not an outlier.

(4)

The box plot below shows information about the maximum daily temperature, in °C, in Aultbea for each day of June 2018



(Source: *WeatherOnline*)

(c) On the grid above, draw a box plot for the maximum daily temperatures in June 2018 for Bingley.

(2)

(d) Compare the distributions of maximum daily temperatures in June 2018 for Aultbea and for Bingley.

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(3)

(Total for Question 6 is 11 marks)

7 Reeta read a report that said that these days more 18 to 24 year olds find out what is happening in the news from social media than find out by watching TV.

She decided to investigate how the 12 000 students at her university find out what is happening in the news.

Reeta wrote the following as a hypothesis:

Do more students get their news from social media than from other sources?

(a) Comment on whether it is appropriate to use this as a hypothesis.

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(1)

Reeta planned to use a sample of the students at her university stratified by gender and by age.

(b) Explain why this method of sampling would be appropriate.

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(1)

Reeta found that she could not get a list of all the students at her university to use for her stratified sample.

Instead she decided she would question students in the university cafeteria.

Here is the data collection sheet Reeta plans to use.

Access to news	Male	Female
Newspapers		
Online subscription news service		
Television news		
Social media		

(c) Discuss whether Reeta's data collection sheet is appropriate for her to use.

You should consider how Reeta might use the responses and describe any problems she may have when she uses the data collection sheet.

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(3)

Reeta's friend George is at a different university with 18 000 students.

George carried out a similar investigation at his university so that he and Reeta could compare their results.

They each questioned the same percentage of students at the university they each attend.

They decided to compare their results by using comparative pie charts.

(d) Explain why comparative pie charts would be appropriate.

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(1)

Reeta used a circle with diameter 10 cm for her pie chart.

(e) Calculate the diameter of the circle that George used for his pie chart.

..... cm

(2)

(f) Discuss **two** things that Reeta and George should have considered in planning their investigations to help improve the reliability and validity of their comparisons.

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(2)

(Total for Question 7 is 10 marks)

8 The table shows information about the performance of students in a Maths examination and in a Statistics examination.

Examination	Mean mark	Standard deviation
Maths	52	10
Statistics	59	6

Freya scored 62 marks in her Statistics examination.

(a) Show that Freya's standardised score for Statistics is 0.5

(1)

Freya's Maths examination mark was 59 giving her a standardised score for Maths of 0.7

She thinks she did better in the Statistics examination than in the Maths examination.

(b) Explain whether or not Freya is correct.

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(2)

Freya also took a French examination.
She says that her mark in this examination is below average.

(c) Explain how Freya's standardised score for French can be used to confirm this.

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(1)

(Total for Question 8 is 4 marks)

9 Tamiki wants to estimate the number of pigeons in a park.

He catches a sample of 48 pigeons in the park, tags each pigeon and then releases it.

A week later, Tamiki catches a sample of 20 pigeons in the park.

He uses the Petersen capture recapture formula to estimate that there are 240 pigeons in the park.

(a) Work out how many of the 20 pigeons in Tamiki's sample had tags.

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(2)

(b) Comment on the reliability of Tamiki's estimate by considering the assumptions that he needed to make in order to use the Petersen capture recapture formula.

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(3)

(Total for Question 9 is 5 marks)

10 The table gives the price index number for the average rail fare in Great Britain for each of six years, with 2012 as base year.

The table also gives some of the chain base index numbers for the same information.

Year	Price index number	Chain base index number
2012	100	
2013	104.3	104.30
2014	107.0	102.59
2015	109.4	102.24
2016	110.1	100.64
2017	111.4	

(Source: *Office of Rail and Road*)

(a) Find, correct to 2 decimal places, the chain base index number for 2017

.....

(2)

Chris wanted to know the percentage increase in the cost of the average rail fare in Great Britain between 2016 and 2017

Here is his working.

> 111.4 – 110.1 = 1.3
>
> Hence, the cost of the average rail fare in Great Britain has risen by 1.3% between 2016 and 2017

(b) Explain whether or not Chris is correct.

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(2)

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The geometric mean of the chain base index numbers for 2013 to 2017 is 102.18

(c) Interpret this geometric mean in the context of the average rail fare in Great Britain.

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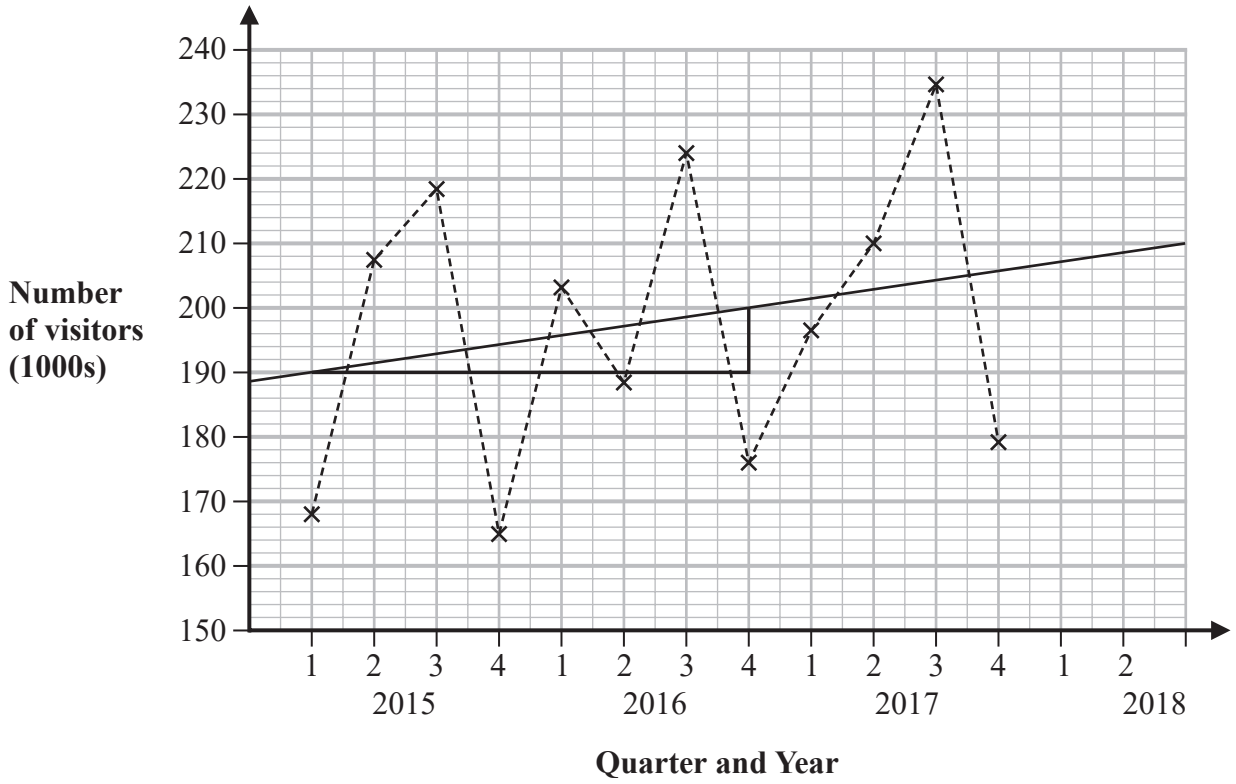
(2)

(Total for Question 10 is 6 marks)

11 The time series graph and the trend line show information about the number, in thousands, of visitors per quarter to a museum for the years 2015, 2016 and 2017



(Source: *gov.uk/DCMS*)

(a) Describe the trend in visitor numbers to the museum over these three years.

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(1)

(b) For which quarter each year does the museum have the fewest visitors?

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(1)

David has drawn a right-angled triangle on the graph from 2015 Quarter 1 to 2016 Quarter 4 so that he can calculate the gradient of the trend line, correct to one decimal place.

Here is his calculation.

$$\frac{200 - 190}{7 \text{ quarters}} = \frac{10}{7} = 1.4$$

(c) Interpret, in context, the gradient of 1.4

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(1)

David used the trend line and mean seasonal variation (or average seasonal effect) to predict the number of visitors to the museum for Quarter 2 of 2018

(d) Comment on the validity of a prediction found in this way.

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(1)

The actual number of visitors to the museum in Quarter 2 of 2018 was 203100

(e) Determine how close David's prediction was to 203100

(5)

(Total for Question 11 is 9 marks)

12 In a town music competition, 6 groups competed against each other.

The table shows the marks awarded to each group by the invited independent judge.

The table also shows what the Mayor thought the rank order of the groups should be.
(Best group is given rank 1)

Group	Marks from judge	Mayor's rank			
Artex Monkeys	37	2			
Brevity	39	1			
Carfax	36	5			
Deft Ducks	29	4			
Extinct	27	6			
Flaming Friars	34	3			

Using suitable calculations, investigate how much agreement there is between the judge and the Mayor.

You may use the blank columns in the table for your working.

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(Total for Question 12 is 5 marks)

13 Fruitees sweets come in different flavours.

There are 8 sweets in a pack of mixed flavours and the flavours for each pack are chosen at random.

The mean number of strawberry flavour Fruitees in a pack of 8 sweets is 2

Ed suggests that the number of strawberry flavour Fruitees in a pack of 8 sweets can be modelled by a binomial distribution.

(a) By considering the conditions that make a binomial distribution a suitable model, explain why Ed's suggestion is appropriate.

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(2)

One sweet is selected at random from a pack of Fruitees.

(b) Find the probability that the flavour of this sweet is strawberry.

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(1)

Ed buys a pack of Fruitees.

(c) Find the probability that there will be exactly 3 strawberry flavour Fruitees in the pack.

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(2)

(Total for Question 13 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS

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