



Rewarding Learning

General Certificate of Secondary Education  
2019

Centre Number

--	--	--	--	--

Candidate Number

--	--	--	--

# Statistics

Unit 1  
Higher Tier



\*GST12\*

[GST12]

THURSDAY 13 JUNE, AFTERNOON

### 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 ten** 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	
<b>Total Marks</b>	

## HIGHER TIER FORMULA SHEET

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

Spearman's Rank Correlation Coefficient

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

**BLANK PAGE**  
**(Questions start overleaf)**





- 2 The table below gives information about the employment rate and median starting salary for students graduating from university in 2017

Examiner Only

Marks Remark

Graduates 21–30	Employment rate	Unemployment rate	Continuing education	Median salary (nearest £500)
<b>Gender</b>				
Male	78.6%	4.7%	17.0%	£26,500
Female	78.8%	3.5%	18.0%	£23,000
<b>Area of England</b>				
East Midlands	79.0%	3.8%	17.3%	£22,000
East of England	77.9%	5.2%	17.2%	£26,000
London	78.8%	5.4%	16.0%	£29,500
North East	74.9%	12.1%	12.9%	£22,000
North West	79.1%	2.4%	18.5%	£23,500
South East	80.3%	2.9%	16.8%	£26,500
South West	77.7%	2.0%	20.3%	£24,000
West Midlands	77.7%	3.5%	18.8%	£22,000
Yorkshire and the Humber	79.8%	2.7%	17.5%	£23,000

© Crown copyright - www.gov.uk

For one area of England, the unemployment rate is twice that of another.

- (a) Name these two areas.

\_\_\_\_\_ [1]

- (b) Does the area of England with the highest employment rate have the lowest unemployment rate?

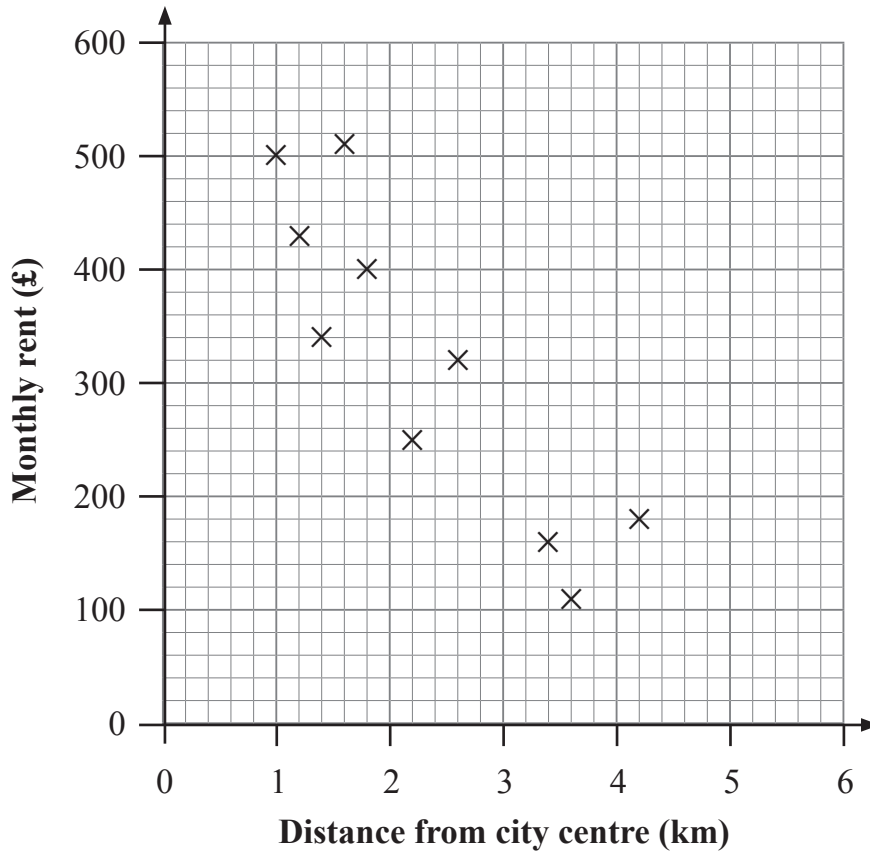
Yes

No

[1]



- 3 The scatter diagram below shows some information about the monthly rent and distance from the city centre for 10 apartments in a city.



- (a) Show that the mean distance from the city centre is 2.3 km.

[2]

The mean monthly rent for the 10 apartments is £320

- (b) Plot the double mean point on the scatter diagram and draw a line of best fit.

[2]

Examiner Only	
Marks	Remark



4 Peter and Helen want to collect information about how much time pupils at their school spend on homework every week. They attend a large post-primary school with 1400 pupils.

Peter is planning to use systematic sampling to select 50 pupils.

(a) Describe how Peter could select his sample.

---



---



---



---

[3]

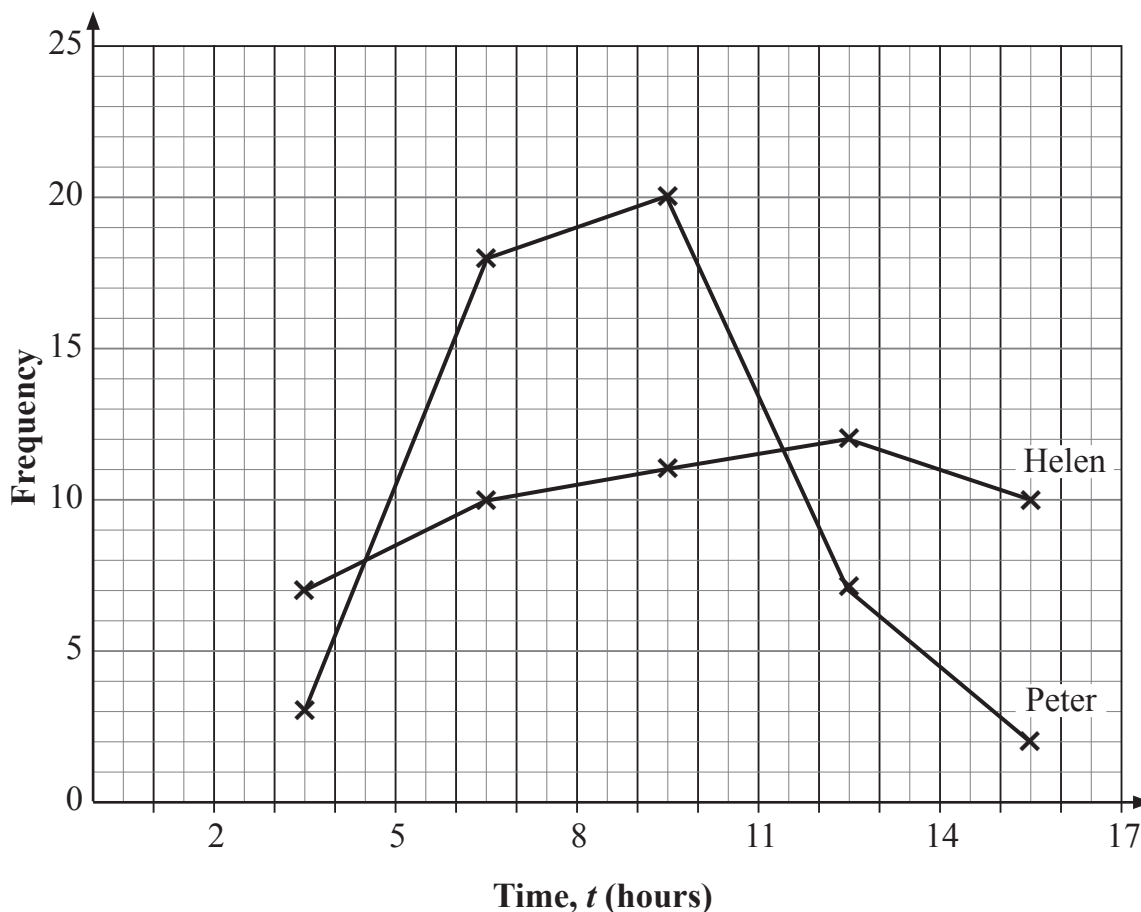
Helen is planning to select 50 pupils from outside the canteen.

(b) Name the method of sampling which Helen is planning to use.

---

[1]

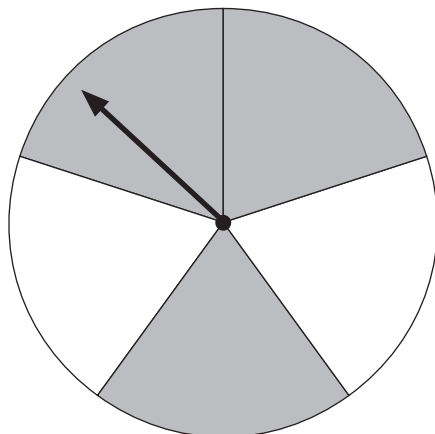
Peter and Helen summarise their results in a frequency polygon.





5 Cathy and John are doing an investigation with a spinner.

The spinner has equally-sized sectors which are either shaded (S) or not shaded (N), as shown in the diagram below.

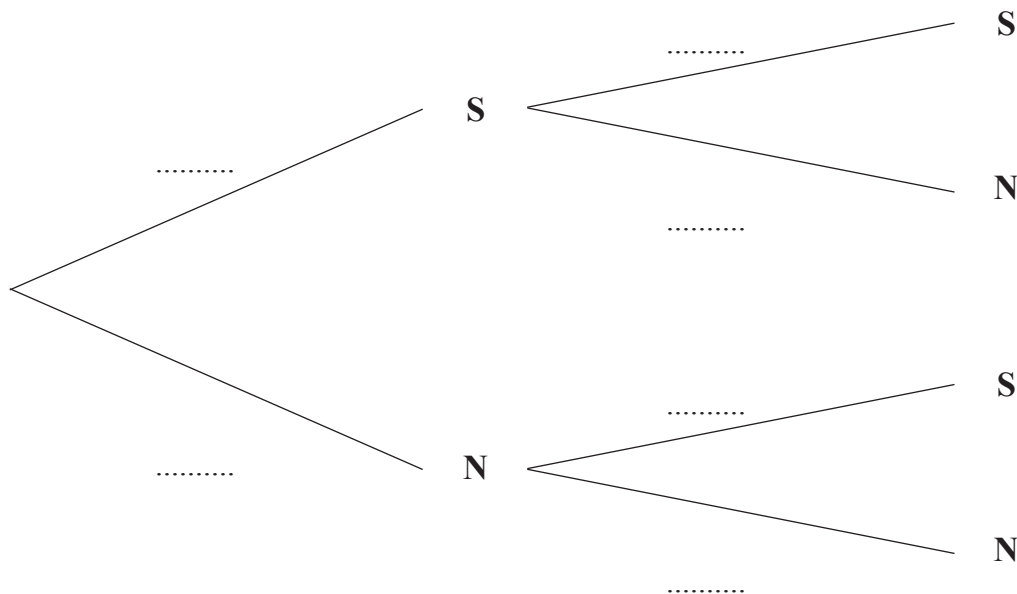


John spins the spinner twice.

(a) Write down the probability that the arrow lands on a shaded sector on John's first spin.

Answer \_\_\_\_\_ [1]

(b) Complete the probability tree diagram for John's two spins.

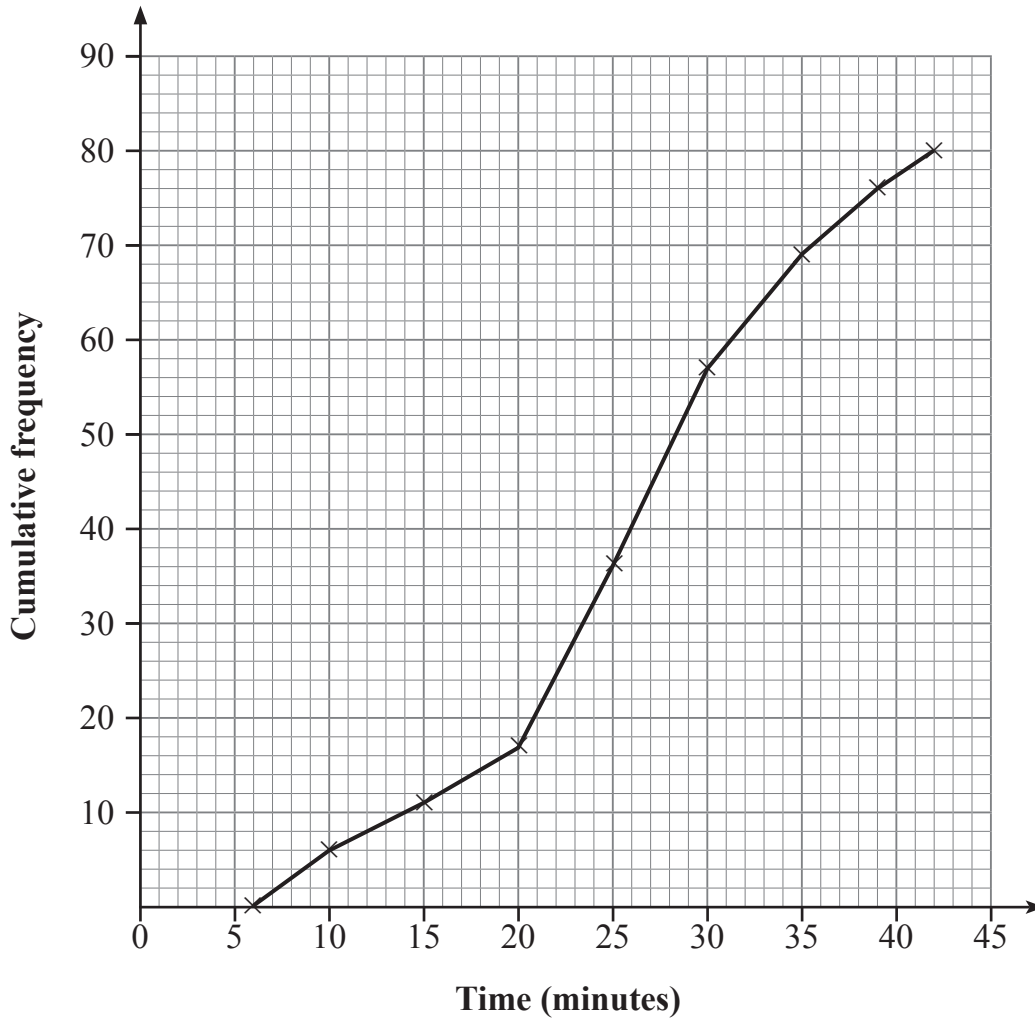


[3]

Examiner Only	
Marks	Remark



- 6 Mark surveyed the teachers in his school to find out how long it took them to travel to work. He plotted his results in the cumulative frequency diagram below.



- (a) What was the median time taken by the teachers to travel to school?

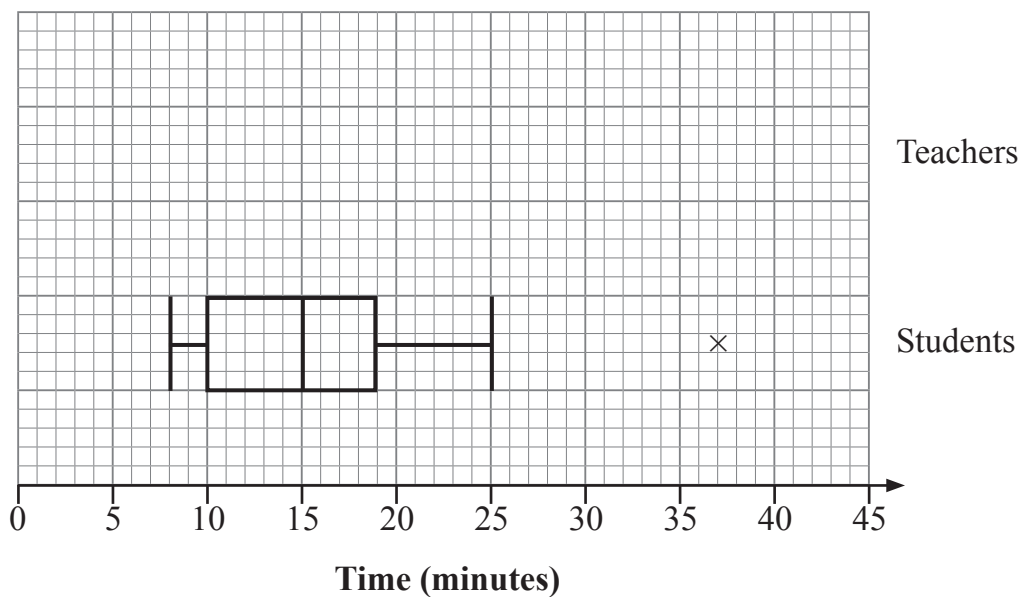
Answer \_\_\_\_\_ minutes [1]

- (b) Find the interquartile range of the times taken by the teachers to travel to school.

Answer \_\_\_\_\_ minutes [2]

Examiner Only	
Marks	Remark

On the same day, Mark surveyed the students in the school about how long it took them to travel to school. His results are summarised in the box plot below.



The point marked  $\times$  on the diagram represents an outlier.

- (c) Use a suitable calculation to verify that the value represented by  $\times$  is an outlier.

[3]

- (d) In the space indicated on the diagram, draw a box plot for the teachers.

[3]

- (e) Compare the travel times for teachers with the travel times for students.

---



---



---



---



---



---



---

[4]

Examiner Only	
Marks	Remark

Due to roadworks, the travel time for every student in the school will increase by exactly 5 minutes.

**(f)** Comment on the effect this will have on

**(i)** the median of the journey times for students;

\_\_\_\_\_ [1]

**(ii)** the range of the journey times for students.

\_\_\_\_\_ [1]

Examiner Only	
Marks	Remark

**BLANK PAGE**

**(Questions continue overleaf)**

7 **Table 1** below shows the estimated quarterly expenditure on cycling equipment in Northern Ireland between 2014 and 2016

Examiner Only	
Marks	Remark

**Table 1**

		Expenditure (nearest £ thousand)			
		Q1	Q2	Q3	Q4
Year	2014	127	188	240	160
	2015	145	199	254	147
	2016	145	202	254	163

The estimated expenditure on cycling equipment was highest in Quarter 3 each year.

(a) Suggest a reason for this.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [1]

(b) The first seven 4-point moving averages have been calculated, to the nearest thousand, as follows:

**179    183    186    190    186    186    187**

(i) Explain briefly why a 4-point moving average has been used.

\_\_\_\_\_

\_\_\_\_\_

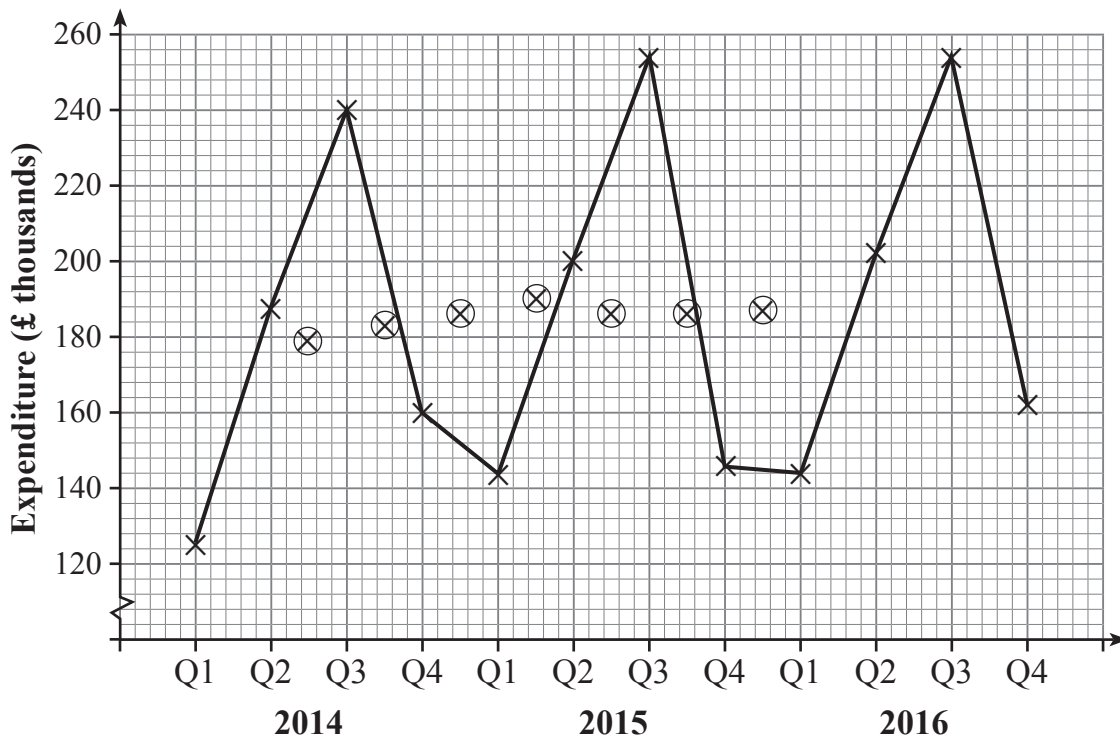
\_\_\_\_\_ [1]

(ii) Calculate the last two 4-point moving averages.

Answer \_\_\_\_\_ and \_\_\_\_\_ [2]

The time series graph below shows the data in **Table 1**.  
 In addition, the first seven moving averages have been plotted.

Examiner Only	
Marks	Remark



(c) Plot the remaining two moving averages, calculated in part (b)(ii), on the graph and draw a trend line. [2]

(d) Use your trend line to estimate the expenditure, to the nearest £ thousand, for Quarter 1 of 2017

Answer £ \_\_\_\_\_ thousand [3]





9 On a given day, the probability that Michael is on time for work is 0.6

- (a) Calculate the probability that Michael is not on time for work on two days in a row.

Answer \_\_\_\_\_ [2]

- (b) (i) Write down the name of the most appropriate distribution to model the number of times Michael will be on time for work in a five-day period.

Answer \_\_\_\_\_ [1]

- (ii) For this model, write down the number of trials,  $n$ , and the probability of a success,  $p$ .

$n =$  \_\_\_\_\_ [1]

$p =$  \_\_\_\_\_ [1]

- (c) Calculate the probability that Michael will be on time for work twice in a five-day period.

You may use  $(p + q)^5 = p^5 + 5p^4q + 10p^3q^2 + 10p^2q^3 + 5pq^4 + q^5$

Answer \_\_\_\_\_ [3]

Examiner Only

Marks Remark

- (d) Calculate the probability that Michael will be on time for work at least four times in a five-day period.

You may use  $(p + q)^5 = p^5 + 5p^4q + 10p^3q^2 + 10p^2q^3 + 5pq^4 + q^5$

Answer \_\_\_\_\_ [3]

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.