Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel Award

Centre Number | | | | | |

Candidate Number | | | | |

Wednesday January 13 2021

Morning (Time: 1 hour 30 minutes) | Paper Reference **AST20/01**

Statistical Methods

Level 2
Calculator allowed

You must have:
Pen, HB pencil, eraser, calculator, ruler.

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.*
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.

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.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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Pearson

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 David is collecting information about the trees in a park.

Here are some words that can be used to describe types of data.

discrete **continuous** **categorical**

(a) Use a word from the list to complete correctly the following sentences.

The height of a tree is an example of ..... data.

The type of tree is an example of ..... data.

The number of trees in the park is an example of ..... data.

(2)

David recorded the heights, in metres, of 40 trees in the park.

Here are his results.

14	25	19	11	4	14	17	28	24	21
6	18	8	22	26	19	9	13	16	22
4	16	8	18	14	18	6	7	2	11
27	12	7	14	23	17	13	24	18	6

(b) Complete the grouped frequency table for David's results.

Height (h metres)	Tally	Frequency
$0 < h \leqslant 5$		
$5 < h \leqslant 10$		
$10 < h \leqslant 15$		
$15 < h \leqslant 20$		
$20 < h \leqslant 25$		
$25 < h \leqslant 30$		

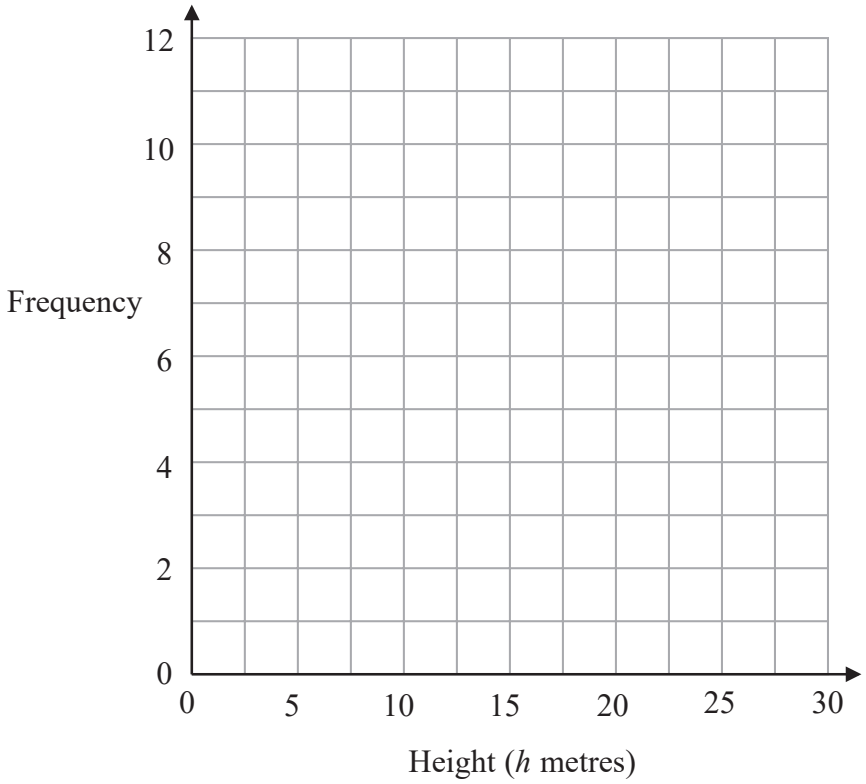
(2)

(c) Write down the modal class interval.

.....

(1)

(d) On the grid, draw a frequency polygon for the information in your grouped frequency table.



(2)

(Total for Question 1 is 7 marks)

2 The directors of a company are researching the health and well-being of their employees.

As part of this research, 80 employees were asked whether or not they use the staff canteen.

Of these 80 employees,

36 are office workers

28 of the warehouse workers use the staff canteen

15 of the office workers do not use the staff canteen

(a) Complete this two-way table.

	Use the staff canteen	**Do not use the staff canteen**	**Total**
Office workers			
Warehouse workers			
Total			

(3)

The directors are considering a company gym membership scheme.

They want to find out how much time their employees spend exercising.

They will use a questionnaire.

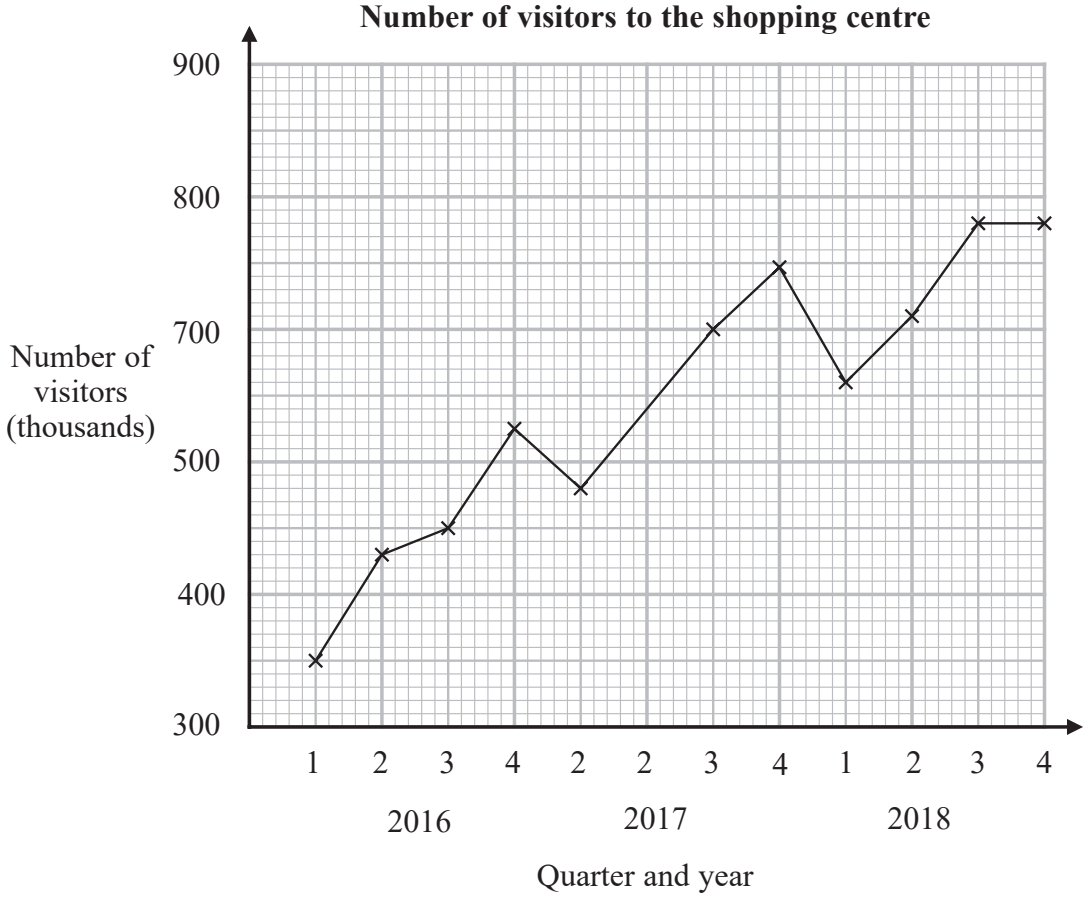
(b) Design a suitable question that the directors could use in their questionnaire.

You must include some response boxes.

(2)

(Total for Question 2 is 5 marks)

3 The time-series graph gives information about the number of people who visited a shopping centre each quarter in 2016, 2017 and 2018.



Write down three things that are misleading or are wrong with this time-series graph.

1 .....

.....

.....

2 .....

.....

.....

3 .....

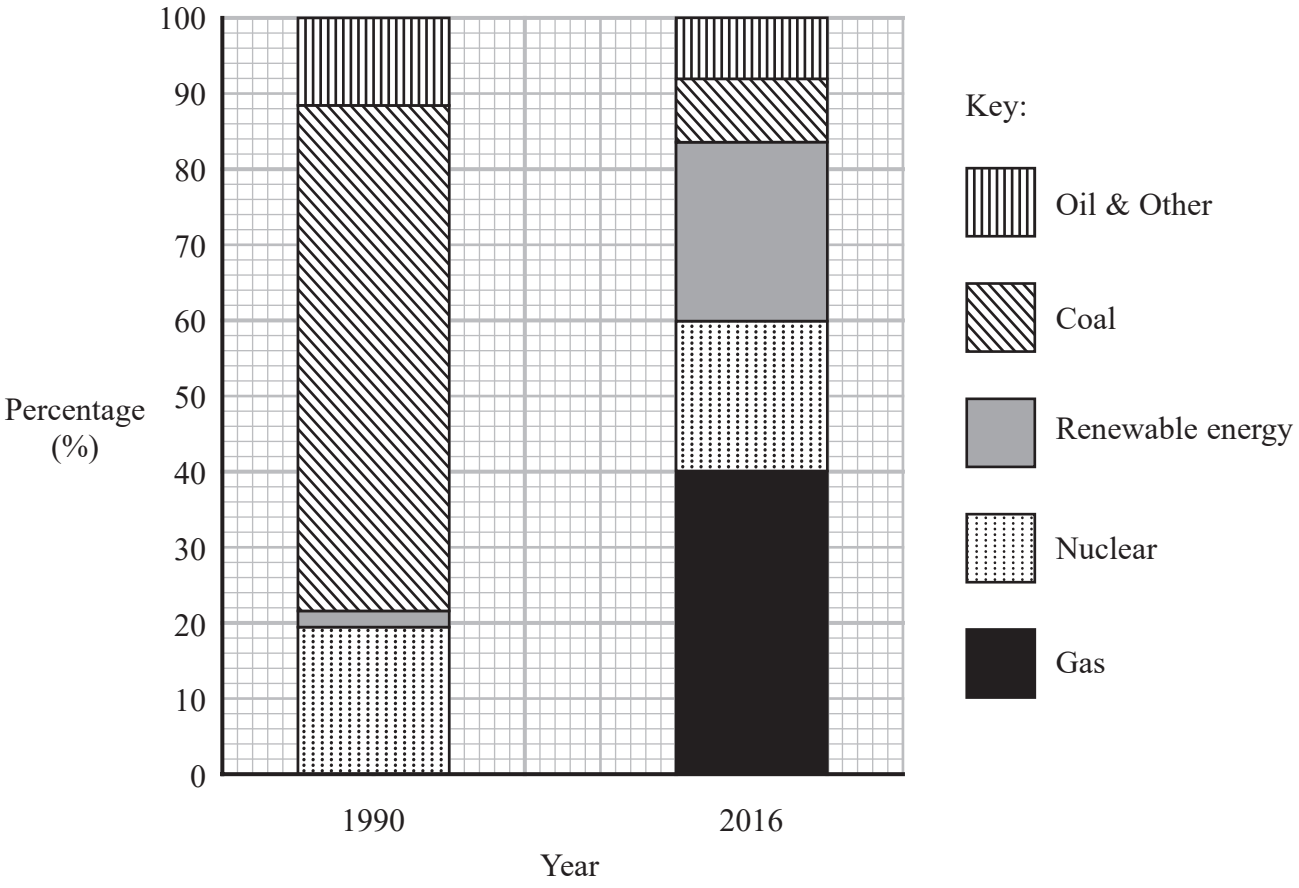
.....

.....

(Total for Question 3 is 3 marks)

4 The composite bar charts give information about the power used in a country in 1990 and in 2016.

They show the percentage of the total power used that was produced by each of five different methods.



(a) Write down the percentage of the total power that was produced from Gas in 2016.

.....%

(1)

In 2016, two of the five methods produced the same percentage of the total power.

(b) Which two methods?

..... and .....

(1)

(c) Work out the percentage of the total power that was produced from Coal in 1990.

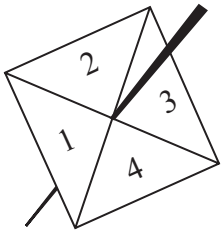
.....%

(2)

(Total for Question 4 is 4 marks)

5 Matthew has a fair 4-sided spinner.

The spinner can land on 1 or on 2 or on 3 or on 4



Matthew is going to spin the spinner twice and record the number that he gets on each spin.

The incomplete sample space diagram shows some of the possible outcomes.

		Second spin			
		1	**2**	**3**	**4**
First spin	**1**	(1, 1)	(1, 2)	(1, 3)	(1, 4)
	2	(2, 1)	(2, 2)		
	3				
	4				

(a) Complete the sample space diagram to show all of the possible outcomes.

(2)

(b) Find the probability that

(i) the two numbers that Matthew records are both even numbers,

.....

(1)

(ii) the two numbers that Matthew records are **not** equal.

.....

(2)

(Total for Question 5 is 5 marks)

6 Irina has a biased dice.

The 6 faces of the dice each have a different colour.

The table gives information about the probabilities that, when the dice is rolled, it will land on the red face or on the blue face or on the green face or on the yellow face or on the orange face.

Colour of face	Red	Blue	Green	Yellow	Orange	Purple
Probability	0.1	0.15	0.25	0.15	0.2	

Irina rolls the dice once.

(a) Work out the probability that the dice lands on the red face or on the yellow face.

.....

(2)

(b) Work out the probability that the dice lands on the purple face.

.....

(2)

Irina is going to roll the dice 300 times.

(c) (i) Work out an estimate for the number of times the dice will land on the green face.

.....

(2)

(ii) Explain why the dice might not land on the green face **exactly** as many times as your answer to part (i).

.....

.....

(1)

(Total for Question 6 is 7 marks)

7 The headteacher of a sixth form college is planning to improve the facilities at the college.

She wants to survey the students at the sixth form college about the proposed improvements.

(a) What is the population for her survey?

.....

(1)

The headteacher decides to survey a sample of the students rather than the population.

(b) Suggest one reason why she would do this.

.....

(1)

Each student at the college studies at one of three locations – Attwood Road, Bailey Street or Cross Hill.

The table gives information about the number of students who study at each of these locations.

Location	Attwood Road	Bailey Street	Cross Hill
Number of Students	540	383	427

The headteacher is going to take a sample of 60 students stratified by the location where they study.

(c) Work out the number of students from each location in the headteacher's sample.

Attwood Road .....

Bailey Street .....

Cross Hill .....

(3)

(Total for Question 7 is 5 marks)

8 Amy is the manager of a charity shop.

She recorded the number of hours that each of 19 volunteers worked in the shop over a six month period.

Here are her results.

45	20	18	58	53	24	18	27	32	38
48	17	33	57	43	9	24	45	16	

(a) Draw an ordered stem and leaf diagram for this information.

(3)

(b) Find the median.

..... hours

(1)

(c) Find the interquartile range.

..... hours

(2)

Baljit is the manager of a different charity shop.

He also recorded the number of hours worked in his shop by each volunteer over the same six month period.

For Baljit's results,

the median is 37 hours

the interquartile range is 25 hours

(d) For the volunteers at Amy's charity shop and the volunteers at Baljit's charity shop,

(i) compare the median time spent working,

.....

.....

(1)

(ii) compare **in context** the interquartile range of time spent working.

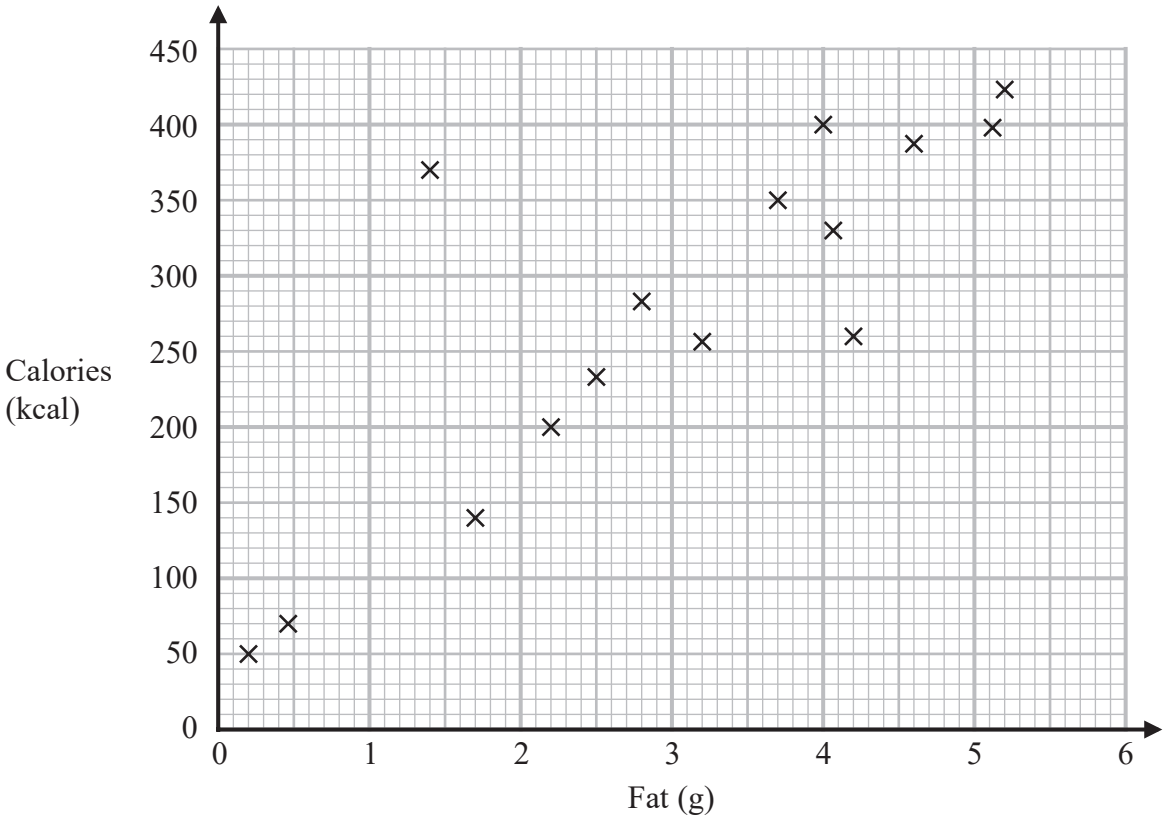
.....

.....

(1)

(Total for Question 8 is 8 marks)

9 The scatter graph shows the amount of fat and the number of calories in each of 15 breakfast cereals.



(a) What statistical name would you give to the point (1.4, 370) which does not fit the pattern of the other points?

.....

(1)

(b) Ignoring the point (1.4, 370), describe the relationship between the amount of fat and the number of calories for these breakfast cereals.

.....

.....

(1)

(c) Ignoring the point (1.4, 370), draw a line of best fit on the scatter graph.

(1)

Another breakfast cereal has 1.2 g of fat.

(d) Using your line of best fit, find an estimate for the number of calories in this breakfast cereal.

..... kcal

(1)

(Total for Question 9 is 4 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

10 A local councillor for a town wants to find out which facilities local residents want in a new community centre.

He plans to obtain a sample of opinions by interviewing the residents of Church Street on Monday morning.

(a) Explain why this might give a biased sample.

.....

(1)

A second councillor suggests that they should telephone every 5th person in the telephone directory for the town.

(b) Explain why this might give a biased sample.

.....

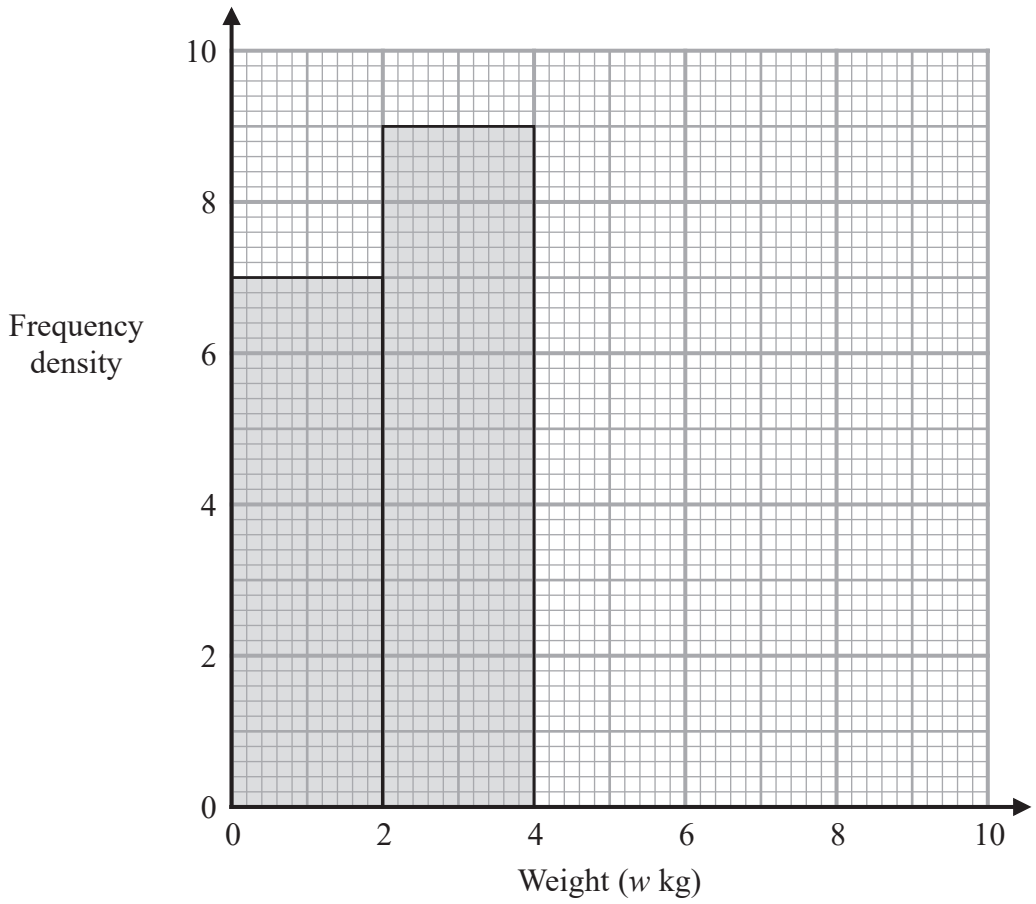
(1)

(Total for Question 10 is 2 marks)

11 Paul recorded the weights, in kilograms, of the fish that he caught one month.

The incomplete table and histogram give some information about the weights of these fish.

Weight (w kg)	Frequency
$0 < w \leqslant 2$	14
$2 < w \leqslant 4$	
$4 < w \leqslant 6$	12
$6 < w \leqslant 8$	5



(a) Use the information in the histogram to complete the table.

(1)

(b) Use the information in the table to complete the histogram.

(2)

(c) Describe the skew of the distribution of the weights of these fish.

.....

(1)

Jasper recorded the weights, in kilograms, of the fish that he caught in the same month.

He used this information to complete the following table.

Weight (w kg)	Frequency
$0 < w \leqslant 2$	15
$2 < w \leqslant 4$	13
$4 < w \leqslant 6$	9
$6 < w \leqslant 8$	7
$8 < w \leqslant 10$	6

(d) Find the class interval that contains the median weight.

.....

(1)

(e) Calculate an estimate for the mean weight of the fish that Jasper caught.

..... kilograms

(4)

(Total for Question 11 is 9 marks)

12 Louise is at her village fete.

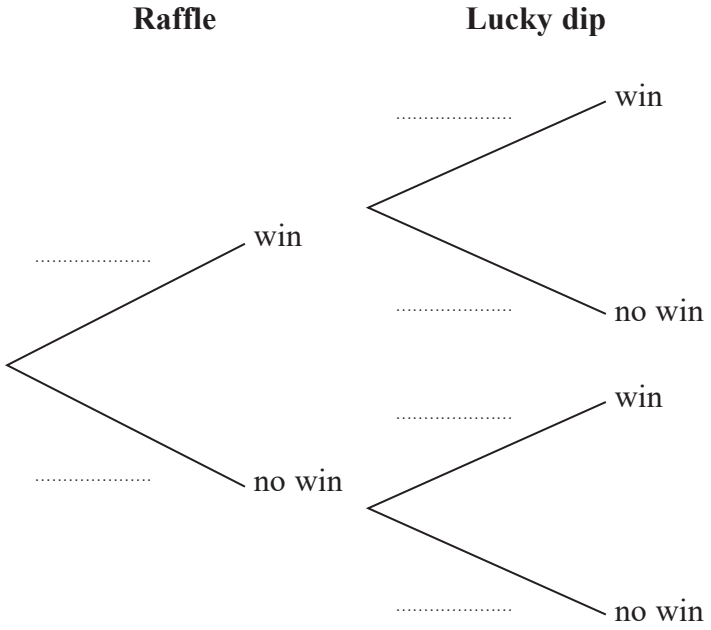
At the fete, one of the stalls has a raffle and a lucky dip.

Louise is going to buy a single ticket at random in the raffle and have a single pick at random from the lucky dip.

The probability of winning a prize with a single ticket in the raffle is 0.15

The probability of winning a prize with a single pick from the lucky dip is 0.25

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that Louise will **not** win a prize in the raffle and will win a prize from the lucky dip.

.....

(2)

(c) Work out the probability that Louise will win at least one prize.

.....

(3)

(Total for Question 12 is 7 marks)

13 The following table shows the price of a house in 1998 and in 2018.

Year	Price
1998	£500 000
2018	£775 000

(a) Using 1998 as the base year, work out the index number for the price of the house in 2018.

.....

(2)

(b) Interpret the index number worked out in part (a).

.....

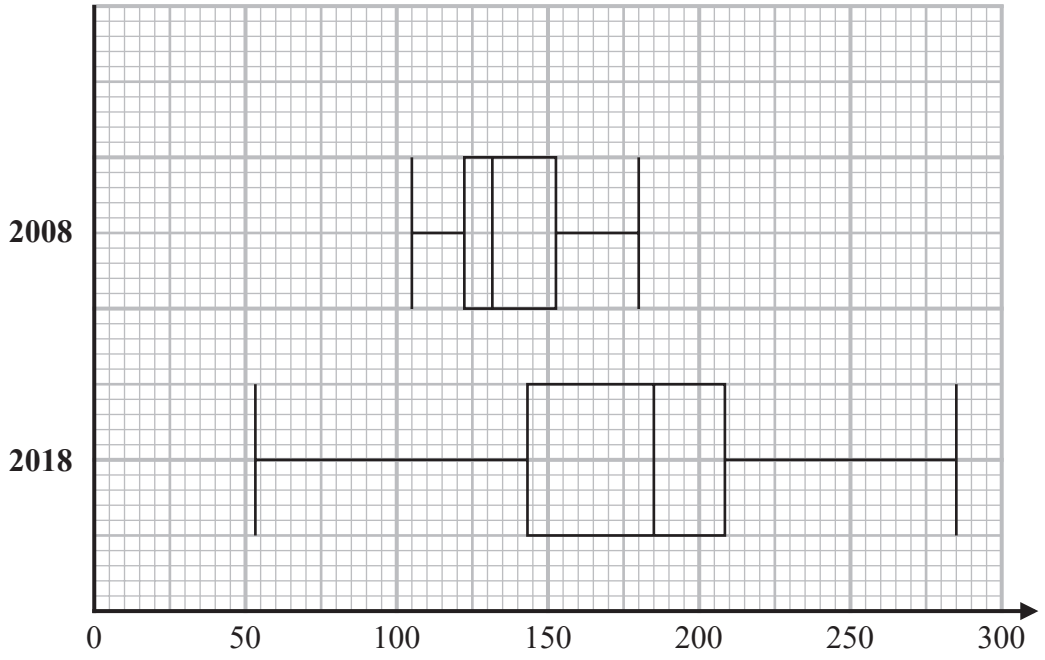
.....

(1)

(Total for Question 13 is 3 marks)

14 Leika collects information about the lengths of songs, in seconds, released by a band in 2008 and in 2018.

The box plots summarise her results.



Compare the distribution of the lengths of songs released by the band in 2008 with the distribution of the lengths of songs released by the band in 2018.

Write down three comparisons.

1 .....

.....

.....

2 .....

.....

.....

3 .....

.....

.....

(Total for Question 14 is 3 marks)

15 A competition takes place over two days.

Some competitors took part in the competition on Saturday and different competitors took part in the competition on Sunday.

The table gives the number of competitors who took part for each of the two days and the mean score of the competitors for each day.

Day	Number of competitors	Mean score
Saturday	12	14.6
Sunday	18	11.4

Calculate the mean score of all the competitors who took part on Saturday and Sunday.

.....

(Total for Question 15 is 3 marks)

16 The length, x cm, of each carrot in a box was measured.

The mean length of the carrots in the box was 19 cm.

Given that $\sum x = 418$

(a) work out the number of carrots in the box.

.....

(2)

Given also that $\sum x^2 = 8114$

(b) work out the standard deviation of the lengths of the carrots in the box.

Give your answer correct to one decimal place.

.....

(3)

(Total for Question 16 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS