Edexcel Awards
Mathematics

Sample Assessment Materials

Edexcel Level 1 Award in Statistical Methods (AST10)
Edexcel Level 2 Award in Statistical Methods (AST20)
Edexcel Level 3 Award in Statistical Methods (AST30)

For first teaching from January 2013

Pearson Education Limited is a registered company number 872828 with its registered office at Edinburgh Gate, Harlow, Essex CM20 2JE

Contents

NOTES ON MARKING PRINCIPLES

1 Types of mark

M marks: method marks
A marks: accuracy marks
B marks: unconditional accuracy marks (independent of M marks)

2 Abbreviations

cao – correct answer only
isw – ignore subsequent working
oe – or equivalent (and appropriate)
indep - independent
ft – follow through
SC: special case
dep – dependent

3 No working

If no working is shown then correct answers normally score full marks, unless indicated in the mark scheme.
If no working is shown then incorrect (even though nearly correct) answers score no marks.

4 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks.
If there is no answer on the answer line then check the working for an obvious answer.
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

5 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

6 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect cancelling of a fraction that would otherwise be correct

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

7 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

8 Use of ranges for answers

If an answer is within a range this is inclusive, unless otherwise stated.

Write your name here

Surname	Other names

Edexcel Award

Centre Number | Candidate Number

Statistical Methods

Level 1
Calculator allowed

Sample Assessment Material
Time: 1 hour 30 minutes

Paper Reference
AST10/01

You must have:
Pen, calculator, ruler, protractor.

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 ▶

S42821A

S 4 2 8 2 1 A 0 1 2 1

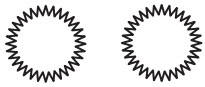
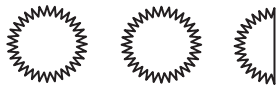
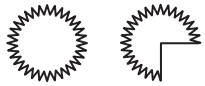
PEARSON

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1 The pictogram below gives information about the number of hours of sunshine in Hastings on Monday, on Tuesday and on Wednesday last week.

	Hours of sunshine
Monday	
Tuesday	
Wednesday	
Thursday	

Key:

 represents 4 hours

(a) Write down the number of hours of sunshine on:

(i) Monday

..... hours

(ii) Wednesday.

..... hours

(2)

On Thursday there were 5 hours of sunshine.

(b) Represent this information on the pictogram.

(1)

(Total for Question 1 is 3 marks)

2 The table below gives information about the number of medals won by each of 6 countries in the 2000 Olympic Games.

Country	Gold	Silver	Bronze	Total
United States	40	24	33	97
Russia	32	28	29	89
China	28	16	14	58
Australia	16	25	17	58
Italy	13	8	13	34
Cuba	11	11	7	29
Great Britain				

Great Britain won 11 Gold medals, 10 Silver medals and 7 Bronze medals.

(a) Use this information to complete the table.

(2)

(b) Which country won the most Gold medals?

.....

(1)

The total number of medals won by the United States is more than the total number of medals won by China.

(c) How much more?

.....

(2)

One of these countries won more Bronze medals than Gold medals.

(d) (i) Which country?

.....

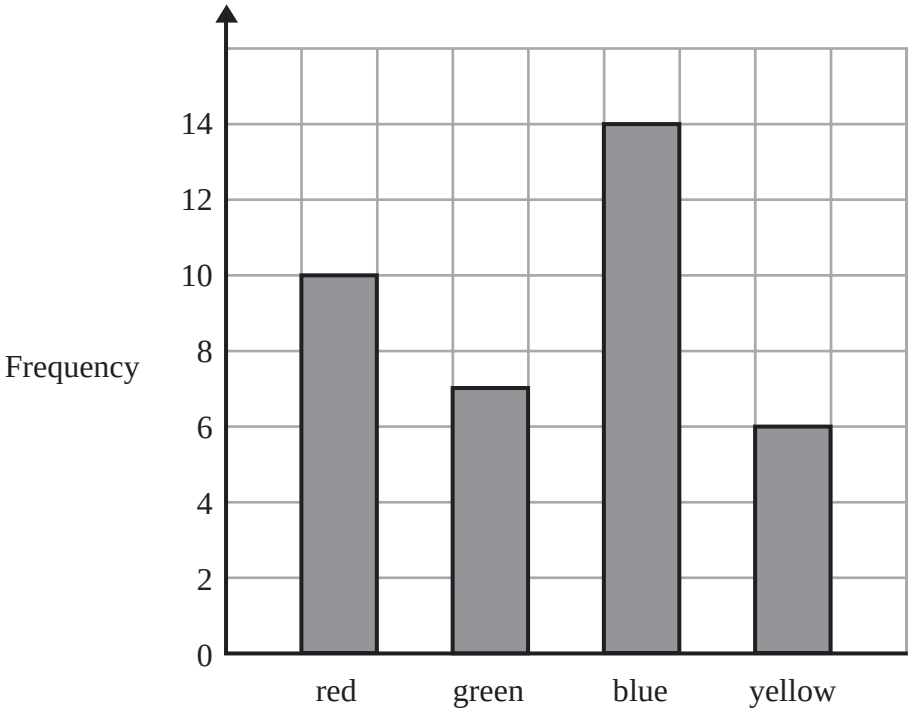
(ii) Write down the number of Silver medals won by this country.

.....

(2)

(Total for Question 2 is 7 marks)

3 The bar chart gives information about the pencils in a pencil case.



(a) Tamsin says

‘red is the most common colour in the pencil case’.

Is she right?
Give a reason for your answer.

.....

(2)

There are more blue pencils then yellow pencils.

(b) How many more?

..... pencils

(1)

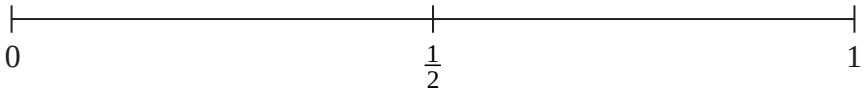
(c) Work out the total number of pencils in the pencil case.

..... pencils

(2)

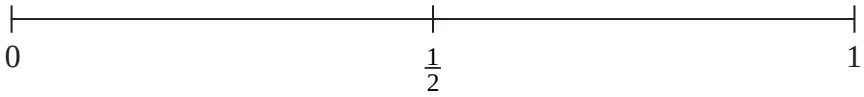
(Total for Question 3 is 5 marks)

4 (a) On the probability scale, mark with a cross (×) the probability that something is certain to occur.



(1)

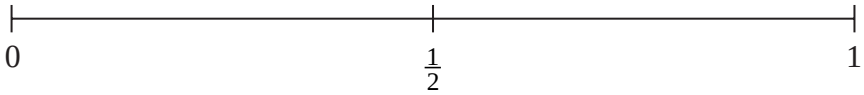
(b) On the probability scale, mark with a cross (×) the probability that something is unlikely to occur.



(1)

Fiona spins an ordinary coin once.

(c) On the probability scale, mark with a cross (×) the probability that the coin will show heads.



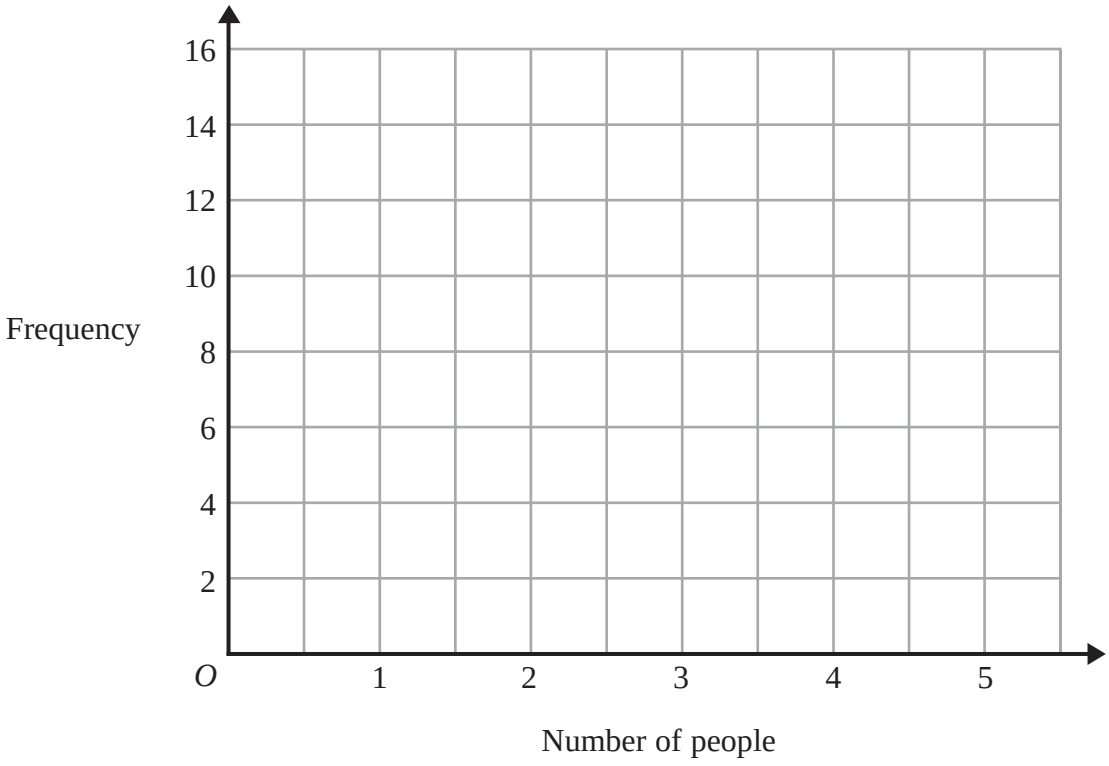
(1)

(Total for Question 4 is 3 marks)

5 Mary recorded the number of people in each of 40 cars.
The table below gives information about her results.

Number of people	Frequency
1	14
2	10
3	7
4	6
5	3

Draw a line graph to show the information in the table.



(Total for Question 5 is 3 marks)

6 Here are the number of eggs in each of 10 sparrow's nests.

2 3 3 2 3 2 3 3 1 1

(a) Find the mode.

.....

(1)

(b) Find the median.

.....

(2)

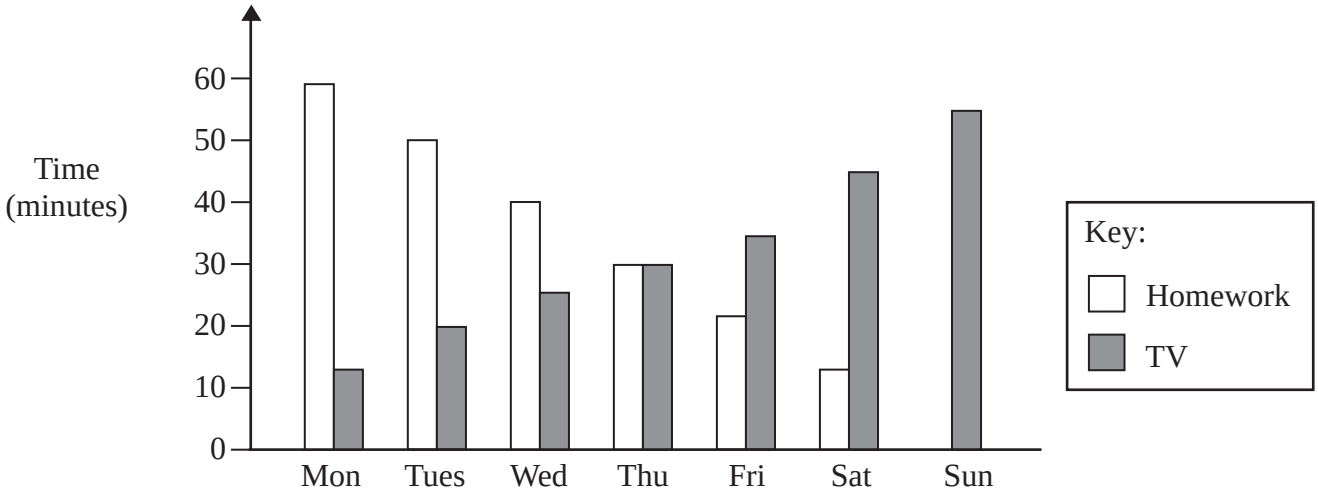
(c) Work out the mean.

.....

(2)

(Total for Question 6 is 5 marks)

7 Felix recorded the amount of time he spent watching TV and the amount of time he spent doing his homework for each day last week.
His results are represented in the dual bar chart.



(a) Write down the amount of time Felix spent doing his homework on Monday.

..... minutes
(1)

(b) Write down the amount of time Felix spent watching TV on Tuesday.

..... minutes
(1)

On one of these days Felix spent the same amount of time watching TV as doing his homework.

(c) Which day?

.....
(1)

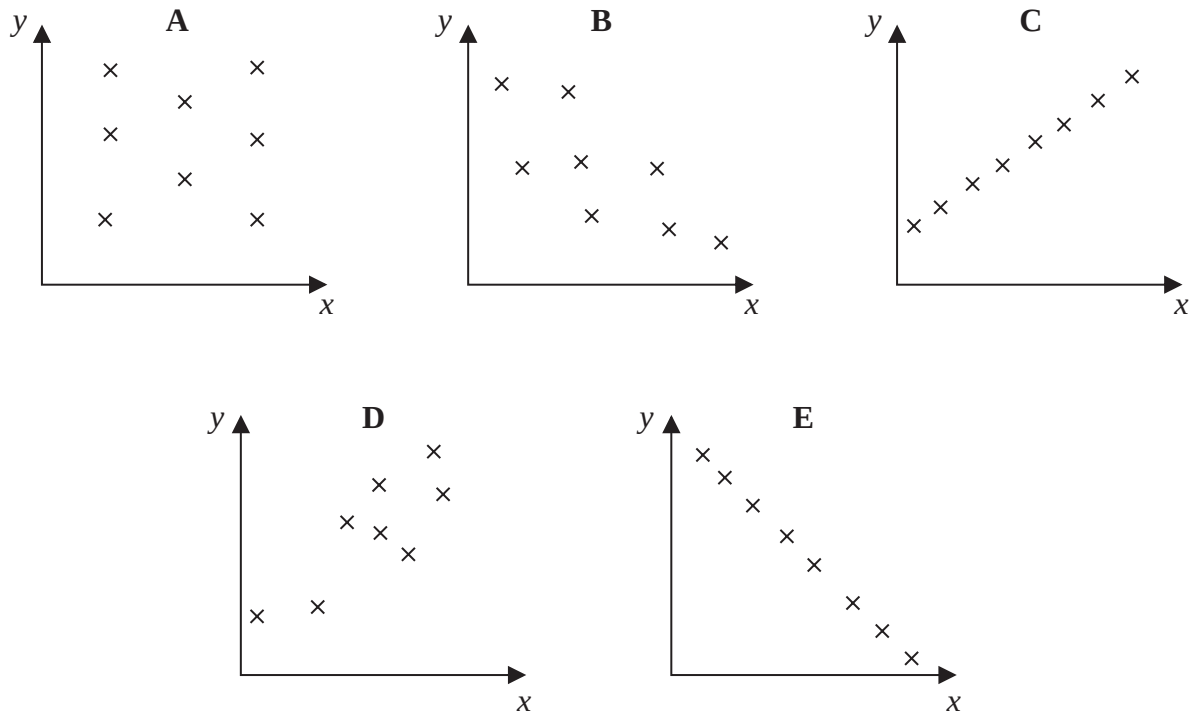
(d) Write down **two** comparisons between the amount of time Felix spent watching TV and the amount of time he spent doing his homework.

1. .....

2. .....
(2)

(Total for Question 7 is 5 marks)

8 Here are some scatter graphs.



(a) Write down the letter of a scatter graph which shows perfect correlation.

.....

(1)

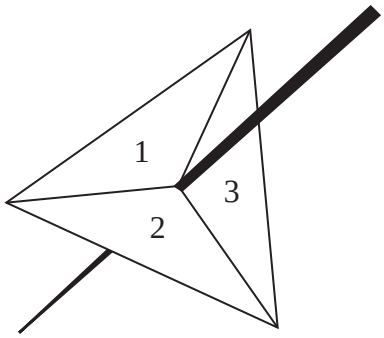
(b) Write down the letter of the scatter graph which shows no correlation.

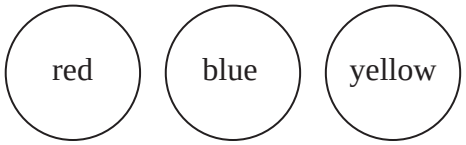
.....

(1)

(Total for Question 8 is 2 marks)

9 Here is a 3-sided spinner and three counters.





Jasmine is going to spin the spinner once and pick one of the counters at random.

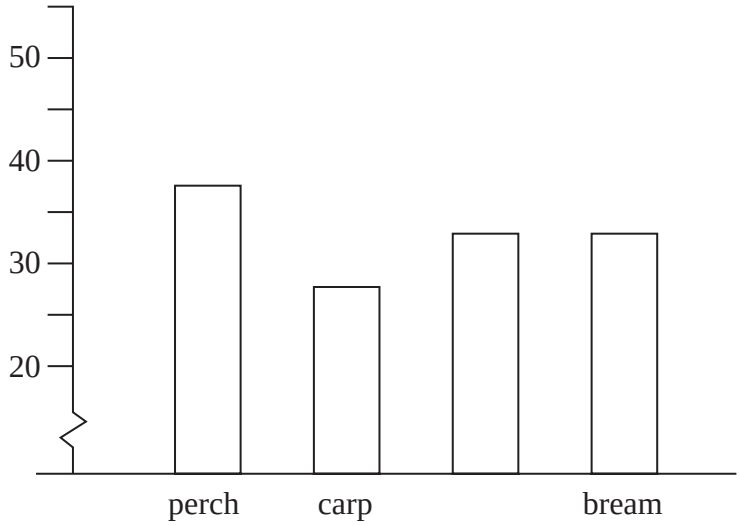
Write down all the possible combinations she can get.
One has been done for you.

(1, *r*).....

.....

(Total for Question 9 is 3 marks)

10



The bar chart shows information about the fish in a lake.

Write down **two** things that could be misleading or wrong with the bar chart.

1. .....

2. .....

(Total for Question 10 is 2 marks)

11 Peter wants to find out about the colour of people's eyes.
He is going to use a data collection sheet.

Design a data collection sheet for Peter to use.

(Total for Question 11 is 2 marks)

12 Peter rolls an ordinary dice.

Write down the probability that the dice will land on 4

.....

(Total for Question 12 is 1 mark)

13 Kerry recorded the total number of goals scored in each of 30 games of football.
Here are her results.

0	2	1	2	4	1
2	4	4	6	0	7
3	3	1	5	6	2
5	0	8	6	2	5
3	8	9	2	4	3

Total number of goals	Tally	Frequency
0 – 1		
2 – 3		
4 – 5		
6 – 7		
8 – 9		

Complete the grouped frequency table for the data.

(Total for Question 13 is 3 marks)

14 50 people went to a cafe.
They each had a cake and a drink.
The two-way table below gives information about the cake and drink they each had.

		Drink			
		Orange	**Tea**	**Coffee**	**Total**
Cake	**Walnut**		3	6	
	Chocolate			7	26
	Total	27			50

(a) Complete the two-way table.

(3)

One of these people is picked at random.

(b) Write down the probability that this person had a chocolate cake and a coffee.

.....

(2)

(Total for Question 14 is 5 marks)

15 The stem and leaf diagram gives information about the height, in metres, of some trees.

1	2 2 5 6 7 8 8
2	0 0 1 4 5 5 5 5 5 5 8 9
3	1 1 1 1 3 5 6 6 7 7 8 9 9 9
4	0 0 0 2 4 7 8 8
5	1 4 6 9
6	3 5

Key:
1 | 2 represents 12 metres

(a) Write down the modal height.

..... m
(1)

(b) Work out the range.

..... m
(2)

(Total for Question 15 is 3 marks)

16 In a pencil case there are 8 coloured pencils.

There are:
3 red pencils
4 blue pencils
1 green pencil.

Sonya takes a pencil at random from the pencil case.

(a) Write down the probability that the pencil will be a red pencil.

.....

(2)

(b) Write down the probability that the pencil will **not** be a green pencil.

.....

(2)

(c) Write down the probability that the pencil will be a yellow pencil.

.....

(1)

(Total for Question 16 is 5 marks)

17 Deeval wants to find out about the amount of time people spend on the internet.
He uses this question in a questionnaire.

> How much time do you spend on the internet?
>
> ☐ 1 – 2 hours ☐ 2 – 3 hours ☐ 3 – 5 hours ☐ 5 – 10 hours

Write down **three** things that are wrong with this question.

1. .....

2. .....

3. .....

(Total for Question 17 is 3 marks)

18 Hillary is going to have a game of chess with Donald.
She will win, or draw, or lose the game.

The probability that she will win the game is 0.65
The probability that she will draw the game is 0.15

(a) Work out the probability that she will **not** win the game.

.....

(2)

(b) Work out the probability that she will lose the game.

.....

(2)

(Total for Question 18 is 4 marks)

19 Raki bought 10 bags of plums to make jam.

The frequency table below gives information about the number of plums in each bag.

Number of plums	Frequency
10	2
11	3
12	5

(a) Write down the mode number of plums in a bag.

.....

(1)

(b) Work out the total number of plums Raki bought.

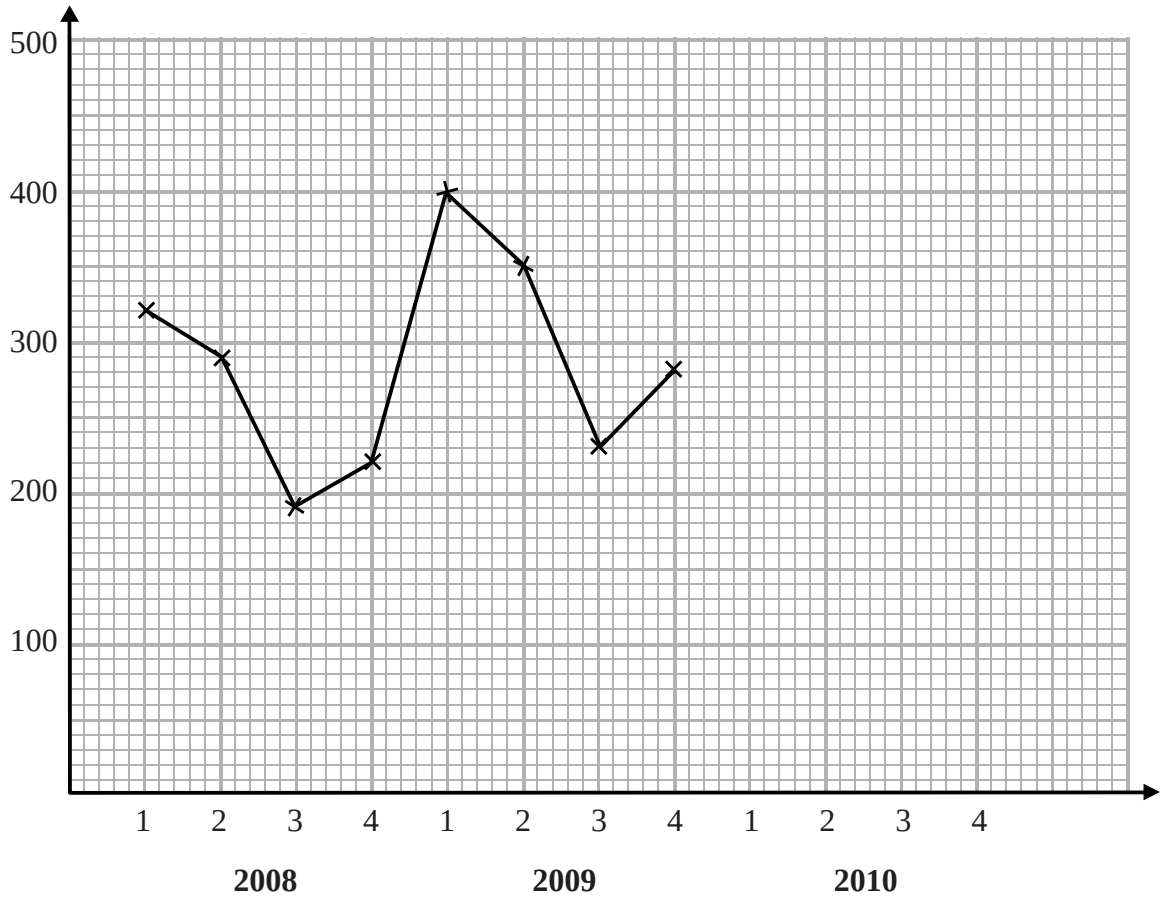
.....

(2)

(Total for Question 19 is 3 marks)

20 The incomplete table and time-series graph give some information about the number of units of electricity used by a shop in each quarter from 2008 to 2010.

Year	**2008**				**2009**				**2010**			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4
Units	320	290	190	220					430	380	270	320



(a) Use the time-series graph to complete the table.

(2)

(b) Use the table to complete the time-series graph.

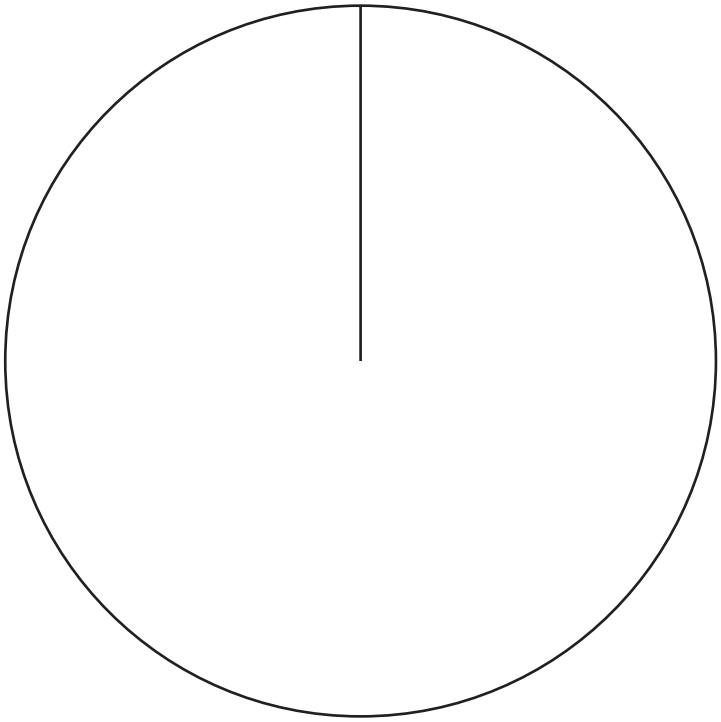
(2)

(Total for Question 20 is 4 marks)

21 60 children each chose a language to study in the summer break.
The table below gives information about their choices.

Language	French	German	Spanish	Italian
Total	20	18	12	10

In the circle, draw a pie chart to represent this information.



(Total for Question 21 is 4 marks)

22 Shamina has a spinner.
The spinner is biased.

One side of the spinner is green.

Shamina spins the spinner 10 times.
The spinner lands on green 3 times.

(a) Write down an estimate for the probability that next time she spins the spinner it will land on green.

.....

(1)

(b) Is this a good estimate?
Explain your answer.

.....

.....

(1)

(Total for Question 22 is 2 marks)

Level 1 Award in Statistical Methods AST10					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	a(i)		8	2	B1 for 8 B1 for 7 B1 for one and a quarter suns drawn
	a(ii)		7		
	b		one and a quarter suns drawn	1	
2	a		11, 10, 7, 28	2	B1 for 11, 10 and 7 in table B1 for 28
	b		United States	1	B1 for United States or US
	c	97 – 58	39	2	M1 for 97 – 58 or 58 + 39 (= 97) A1 cao
	d (i)		Australia	2	B1 for Australia
	d (ii)		25		B1 for 25
3	a		No + reason	2	B1 for no B1 for blue or 14 (most common) identified
	b	4 × 2 or 14 – 6	8	1	B1 cao
	c	10 + 7 + 14 + 6	37	2	M1 for 10 + 7 + 14 + 6 A1 cao

Level 1 Award in Statistical Methods AST10					
Question		**Working**	**Answer**	**Mark**	**Notes**
4	a		Cross marked at 1	1	B1 for cross at 1
	b		Cross marked in region	1	B1 for cross in region (overlay)
	c		Cross marked at 0.5	1	B1 for cross marked at 0.5
5			Line graph with points (1,14), (2,10), (3,7), (4,6), (5, 3) joined by line segments	3	M1 for an attempt to draw a line graph with at least one point plotted correctly, ignore extra line segments A1 for 2, 3 or 4 points plotted correctly or for 5 points plotted correctly with extra line segments A1 cao
6	a		3	1	B1 cao
	b	1, 1, 2, 2, 2, 3, 3, 3, 3, 3	2.5	2	M1 for 1, 1, 2, 2, 2, 3, 3, 3, 3, 3 condone one error or omission A1 cao
	c	(1+1+2+2+2+3+3+3+3+3)÷10	2.3	2	M1 for (1+1+2+2+2+3+3+3+3+3)÷10 A1 cao

Level 1 Award in Statistical Methods AST10					
Question		**Working**	**Answer**	**Mark**	**Notes**
7	a		60	1	B1 cao
	b		20	1	B1 cao
	c		Thu(rsday)	1	B1 cao
	d		Comparisons	2	B2 for two correct comparisons, e.g. homework decreasing, TV increasing, no homework on Sunday (B1 for one correct comparison)
8	a		C or E	1	B1 for C or E (or both)
	b		A	1	B1 cao

Level 1 Award in Statistical Methods AST10					
Question		**Working**	**Answer**	**Mark**	**Notes**
9		(1, r), (r, 2), (3, r) (1, b), (2, b), (3, b) (1, y), (2, y), (3, y)	Correct combinations	3	B3 for exactly 9 correct combinations (B2 for 6, 7 or 8 correct combinations) (B1 for 3, 4 or 5 correct combinations)
10			Correct reasons	2	B2 for any two correct reasons from no (*y*-) axis label, missing (data/fish) label, broken (vertical) axis (B1 for one correct reason)
11			Data collection sheet	2	B1 for two or more colours B1 for space for tallies or a frequency column
12			$\frac{1}{6}$	1	B1 for $\frac{1}{6}$ oe
13			6, 10, 7, 4, 3	3	M1 for an attempt to use tallies A1 for 2, 3 or 4 correct tallies or frequencies A1 for 5 correct tallies and frequencies
14	a		15, 24 12, 7, (26) 10, 13	3	B3 cao (B2 for 5 or 6 correct entries ft '24' and '13') (B1 ft for 2, 3 or 4 correct entries ft '24' and '13')
	b		$\frac{7}{50}$	2	B2 cao (B1 for $\frac{a}{50}$ or $\frac{7}{b}$

Level 1 Award in Statistical Methods AST10					
Question		**Working**	**Answer**	**Mark**	**Notes**
15	a		25	1	B1 cao
	b	65 – 12	53	2	M1 for 65 – 12 or 65 and 12 seen A1 cao
16	a		$\frac{3}{8}$	2	B2 for $\frac{3}{8}$ oe (B1 for $\frac{a}{8}$ or $\frac{3}{b}$)
	b		$\frac{7}{8}$	2	M1 for $1 - \frac{1}{8}$ or $\frac{3+4}{8}$ A1 for $\frac{7}{8}$ oe
	c		0	1	B1 cao
17			3 reasons	3	B1 for overlapping intervals oe B1 0 (hours) missing or no more than 10 (hours) missing oe B1 for no time period, e.g. per day, oe
18	a	1 – 0.65	0.35	2	M1 for 1 – 0.65 A1 cao
	b	1 – (0.65 + 0.15)	0.2	2	M1 for 1 – (0.65 + 0.15) or '0.35' – 0.15 A1 for 0.2 or ft '0.35' – 0.15

Level 1 Award in Statistical Methods AST10					
Question		**Working**	**Answer**		**Notes**
19	a		12	1	B1 cao
	b	10 × 2 + 11 × 3 + 12 × 5 = 20 + 33 + 60	113	2	M1 for 10 × 2 + 11 × 3 + 12 × 5 A1 cao
20	a		400, 350, 230, 280	2	B2 for 400, 350, 230, 280 (±10 each value) (B1 for any two correct (±10 each value))
	b		(1, 430), (2, 380), (3, 270), (4, 320)	2	M1 for 2 or more correct points plotted (±2 mm square each value) A1 for 4 correct points plotted and joined with line segments
21		$\frac{20}{60} \times 360 = 120$ $\frac{18}{60} \times 360 = 108$ $\frac{12}{60} \times 360 = 72$ $\frac{10}{60} \times 360 = 60$	Pie chart	4	M1 for 120 or 108 or 72 or 60 may be implied by sector in pie chart M1 for any two of 120, 108, 72, 60 correctly drawn (±2 each angle) A1 for fully correct pie chart (overlay) B1 for correct sector labels

Level 1 Award in Statistical Methods AST10					
Question		**Working**	**Answer**		**Notes**
22	a		0.3	1	B1 for 0.3 oe
	b		No with reason	1	B1 for no, need more spins oe
23	a		Pine	1	B1 cao
	b		300	2	M1 for 2 × 150 or 150 ÷ 50 × 100 A1 cao

Write your name here

Surname	Other names

Edexcel Award

Centre Number | Candidate Number

Statistical Methods

Level 2
Calculator allowed

Sample Assessment Material
Time: 1 hour 30 minutes

Paper Reference
AST20/01

You must have:
Pen, calculator, ruler.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
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- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

S42820A

S 4 2 8 2 0 A 0 1 2 0

PEARSON

Answer ALL questions.

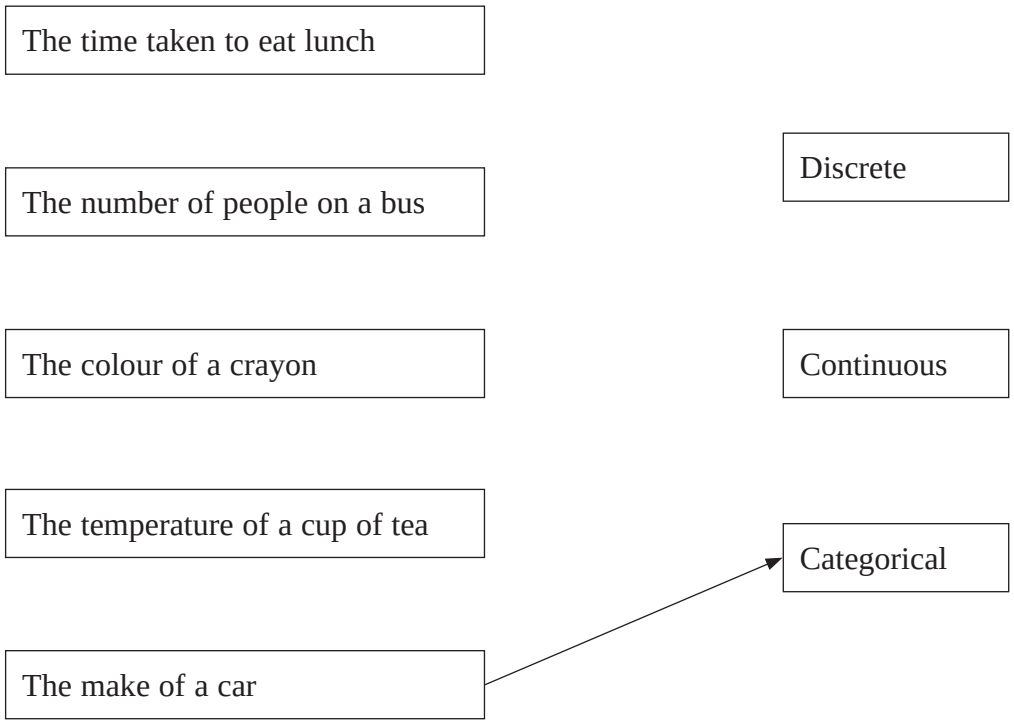
Write your answers in the spaces provided.

You must write down all stages in your working.

1. Here are sentences about some data.

Draw a line from each sentence to the word that best describes the type of data.

One has been done for you.

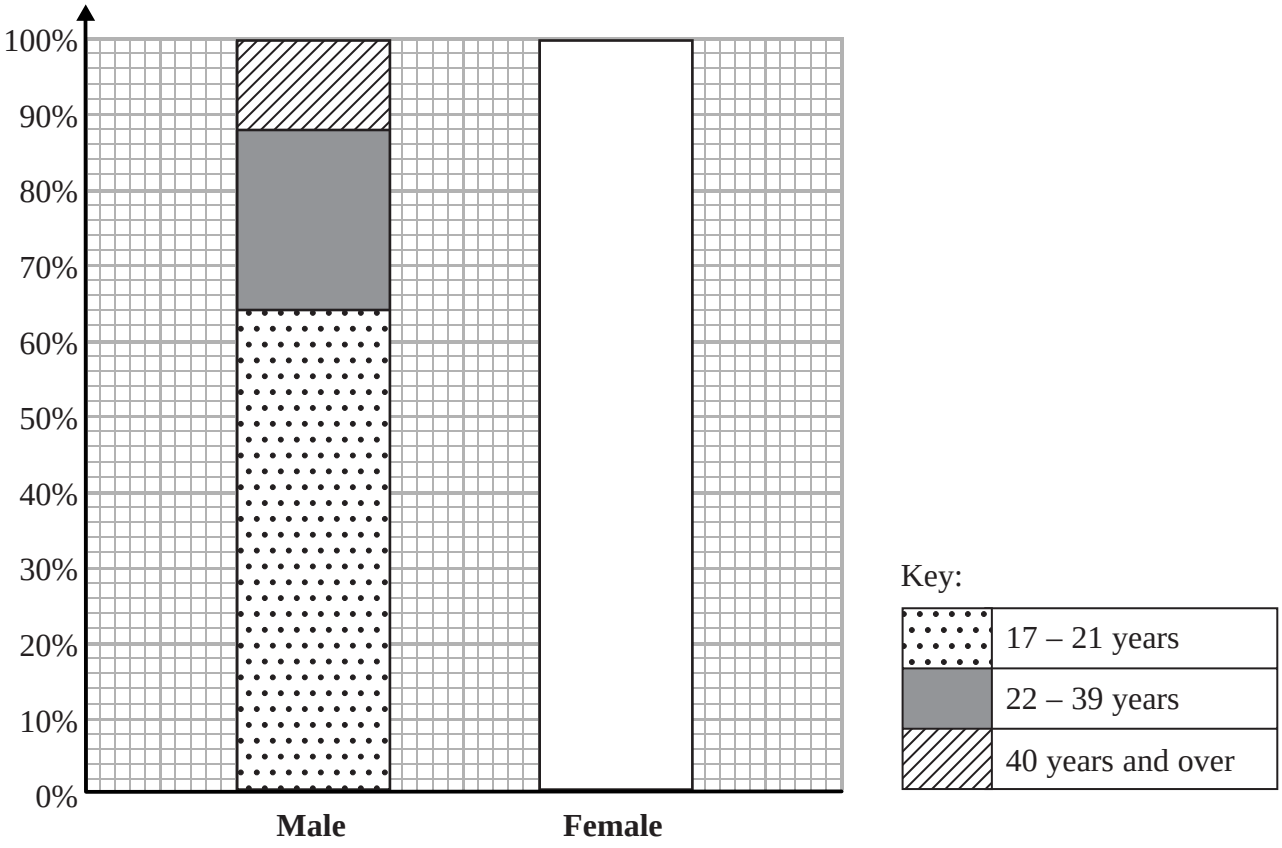


(Total for Question 1 is 3 marks)

2. Some drivers were caught speeding in Hampshire last weekend.

The incomplete table and composite bar chart below give some information about these drivers.

	Age of driver (in years)		
	17 – 21	**22 – 39**	**40 and over**
Male			
Female	38%	28%	34%



(a) Use the information from the composite bar chart to complete the table for males.

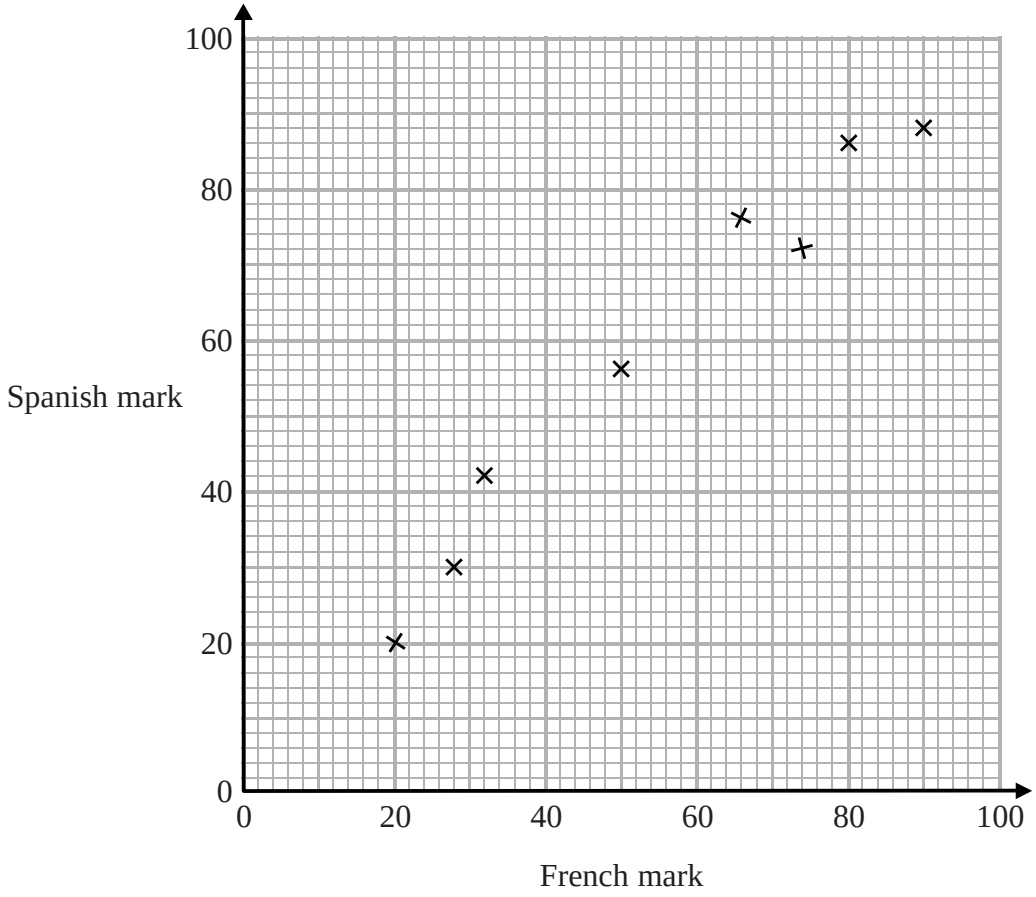
(3)

(b) Use the information from the table to complete the composite bar chart for females.

(3)

(Total for Question 2 is 6 marks)

3. Some students each did a French test and a Spanish test.
The scatter graph gives information about the marks for 8 of these students.



(a) (i) What type of correlation does the scatter graph show?

.....

(ii) Describe the relationship between the French marks and the Spanish marks.

.....

.....

(2)

Safta's French mark is 58

(b) Find an estimate for Safta's Spanish mark.

.....

(2)

(Total for Question 3 is 4 marks)

4. Josh has a 4-sided dice.
The dice is biased.

The table below shows the probability that the dice will land on 1 or 2 or 3

Number	1	2	3	4
Probability	0.16	0.25	0.18	

(a) Work out the probability that the dice will land on 4

.....

(2)

Josh is going to roll the dice 250 times.

(b) Work out an estimate for the number of times the dice will land on 3

.....

(2)

(Total for Question 4 is 4 marks)

5. Here are the weights, in kg, of 30 parcels.

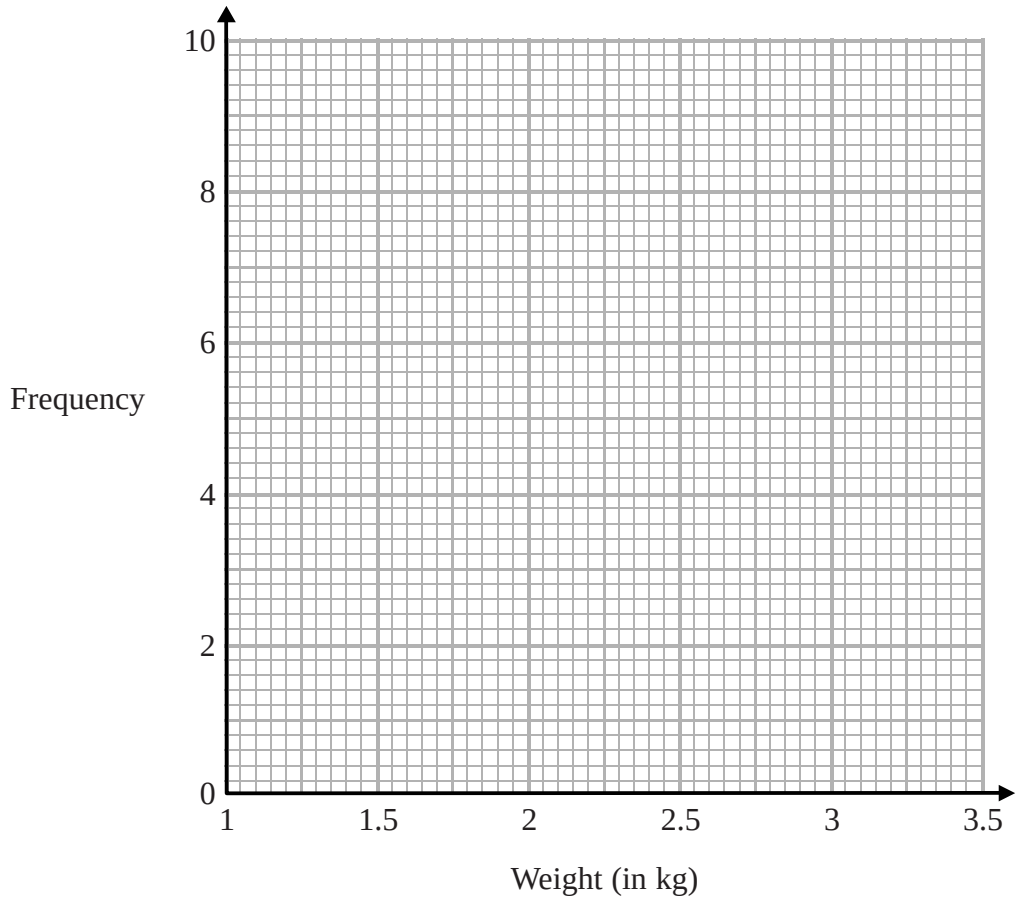
1.2	1.6	2.1	2.1	1.2	1.6
2.0	1.7	1.9	1.2	2.7	1.9
1.6	2.6	1.1	1.8	3.4	1.4
2.6	1.9	1.7	1.3	2.8	2.4
2.4	2.9	2.3	3.1	3.4	1.1

(a) Summarise this data in the grouped frequency table below.

Weight (w kg)	**Tally**	**Frequency**
$1.0 < w \leqslant 1.5$		
$1.5 < w \leqslant 2.0$		
$2.0 < w \leqslant 2.5$		
$2.5 < w \leqslant 3.0$		
$3.0 < w \leqslant 3.5$		

(3)

(b) On the grid, draw a frequency polygon to represent the information in your grouped frequency table.



(2)

(Total for Question 5 is 5 marks)

6. Here are the weights, in grams, of 19 eggs.

58	65	81	80	71	62	78	67	76	68
79	81	71	82	65	75	77	77	72	

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

(4)

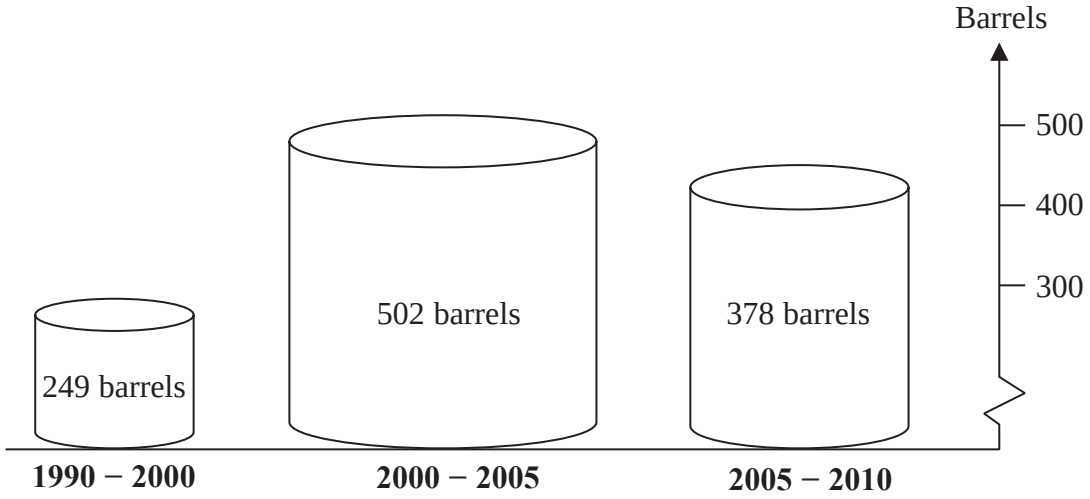
(b) Find the interquartile range.

..... grams

(2)

(Total for Question 6 is 6 marks)

7. The diagram below shows information about the amount of oil used by a factory.



Write down **three** things that could be misleading in the diagram.

1. .....

2. .....

3. .....

(Total for Question 7 is 3 marks)

8. The weight of luggage, in kg, for each of 40 people on a plane was recorded.
The table below gives information about these weights.

Weight (w kg)	Frequency
$0 < w \leqslant 4$	15
$4 < w \leqslant 6$	12
$6 < w \leqslant 8$	8
$8 < w \leqslant 10$	5

(a) Write down the modal class interval.

.....

(1)

(b) Find the class interval which contains the median.

.....

(1)

(c) Work out an estimate of the mean.

..... kg

(4)

One of these people is picked at random.

(d) Find the probability that the weight of their luggage is less than or equal to 8 kg.

.....

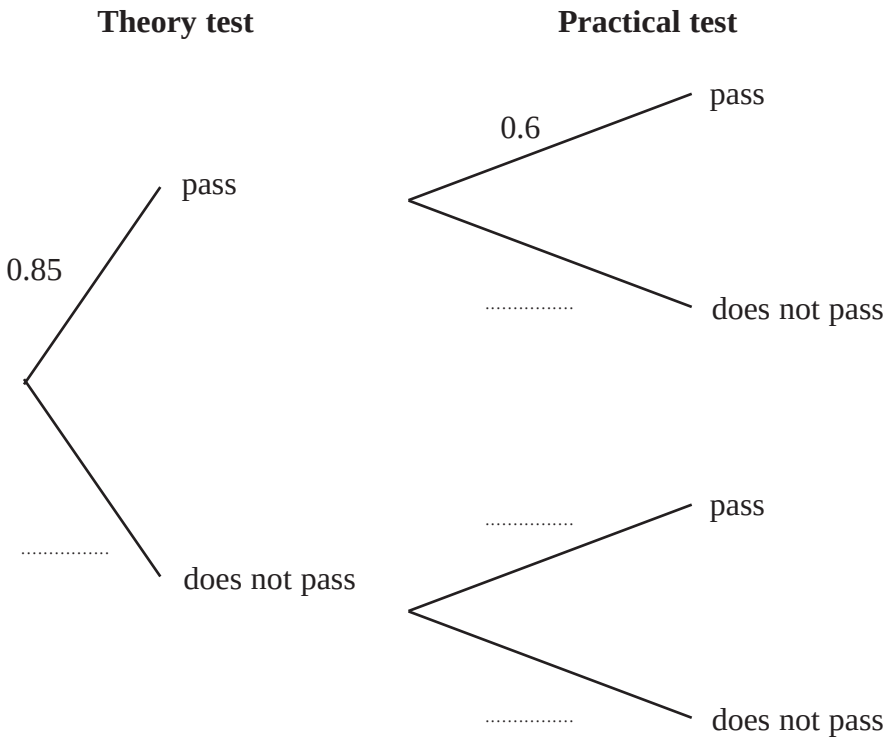
(2)

(Total for Question 8 is 8 marks)

9. Ruth is going to take her driving test.

The probability that she will pass the theory test is 0.85
The probability that she will pass the practical test is 0.6

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that Ruth will pass both the theory test and the practical test.

.....

(2)

(Total for Question 9 is 4 marks)

10. In January 2010 the cost of some groceries was £32.68
In January 2011 the cost of the same groceries was £34.24

Using January 2010 as the base year, work out the index number for the cost of the groceries in January 2011.
Give your answer correct to one decimal place.

.....

(Total for Question 10 is 2 marks)

11. Mr. Bryan measured the height of each student in his class.
The table below gives some information about these heights.

	Number of students	**Mean height (in cm)**
Boys	13	167.5
Girls	17	158.1

Work out the mean height of the 30 students.

..... cm

(Total for Question 11 is 3 marks)

12. Fiona spins a coin 20 times.
She gets 6 heads.

Fiona says

'this coin is biased'.

(a) Fiona may be **right**.
Explain why.

.....

.....

(1)

(b) Fiona may be **wrong**.
Explain why.

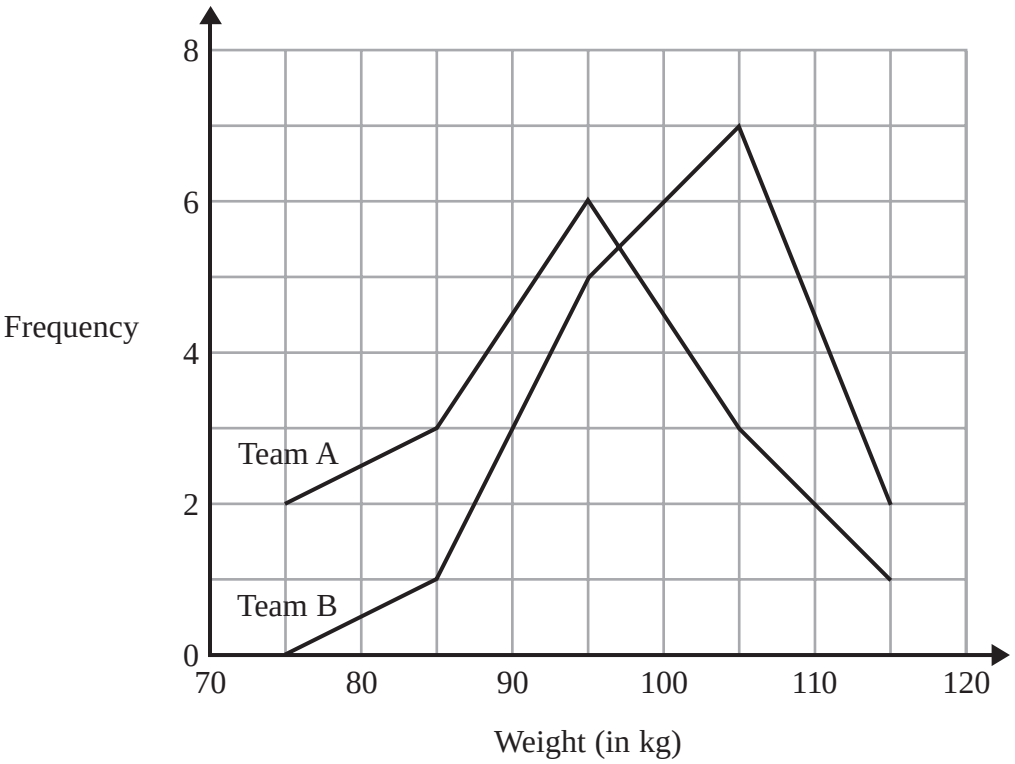
.....

.....

(1)

(Total for Question 12 is 2 marks)

13. The frequency polygons give information about the weights, in kg, of the players in two rugby teams, team A and team B.



Make two comparisons between team A and team B from the information given by the frequency polygons.

1. .....

.....

2. .....

.....

(Total for Question 13 is 2 marks)

14. The table below gives information about the number of DVDs sold by a shop in each quarter from 2010 to 2011.

Year	**2010**				**2011**			
Quarter	1	2	3	4	1	2	3	4
Number of DVDs	350	400	380	338	398	424	396	378

(a) Calculate the 4-point moving averages for this information.
The first three have been done for you.

367, 379, 385, ..., ...

(2)

(b) Describe what the moving averages show about the trend in the number of DVDs sold in the shop over this period.

.....

(1)

(Total for Question 14 is 3 marks)

15. A blue dice and a red dice are rolled.
The sample space diagram shows some of the possible outcomes.

Red dice							
	6	(1, 6)	(2, 6)	(3, 6)	.....	.....	.....
	5	(1, 5)	(2, 5)	(3, 5)	.....	.....	.....
	4	(1, 4)	(2, 4)	(3, 4)	.....	.....	.....
	3	(1, 3)	(2, 3)	(3, 3)	.....	.....	.....
	2	(1, 2)	(2, 2)	(3, 2)	(4, 2)	(5, 2)	(6, 2)
	1	(1, 1)	(2, 1)	(3, 1)	(4, 1)	(5, 1)	(6, 1)
		1	**2**	**3**	**4**	**5**	**6**
		Blue dice					

(a) Complete the sample space diagram.

(2)

Timothy is going to roll each dice once.

(b) (i) Find the probability that the number he gets on each dice will add up to 6

.....

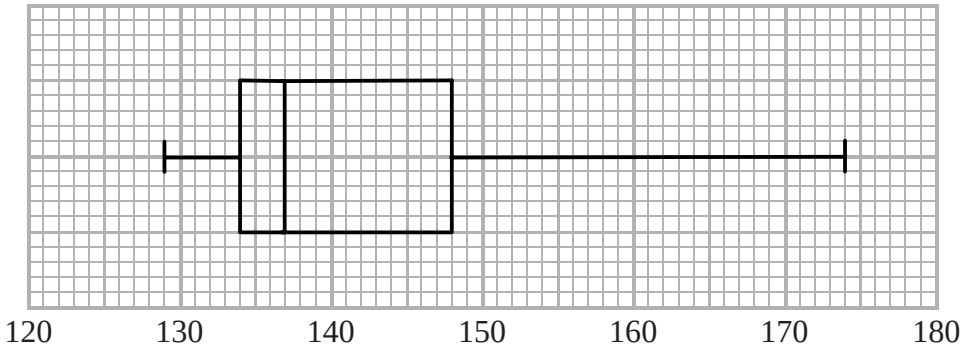
(ii) Find the probability that the number he gets on the red dice will be greater than the number he gets on the blue dice.

.....

(3)

(Total for Question 15 is 5 marks)

16. The box plot gives information about the times taken by some athletes to run a marathon.



(a) Write down the median.

..... minutes

(1)

(b) Work out the interquartile range.

..... minutes

(2)

(c) Describe the skew of the distribution.

.....

(1)

(Total for Question 16 is 4 marks)

17. Peter wants to find out about who people are going to vote for in an election.
He is going to take a sample.

Write down **one** advantage of taking a sample.

.....

.....

(Total for Question 17 is 1 mark)

18. Harry wants to find out the amount of time people spend watching TV.
He will use a questionnaire.

(a) Design a suitable question for Harry to use in his questionnaire.
You must include some response boxes.

(2)

Harry is going to give the questionnaire to a sample of 10 students in his year.

(b) Write down two reasons why this may **not** be a good sample.

1. .....

2. .....

(2)

(Total for Question 18 is 4 marks)

19. 190 students each study one of three languages.
The table below shows information about these languages.

	French	**German**	**Spanish**
Number of students	85	37	68

A sample of 35 students is taken.
The sample is stratified by language.

Work out the number of students studying French in the sample.

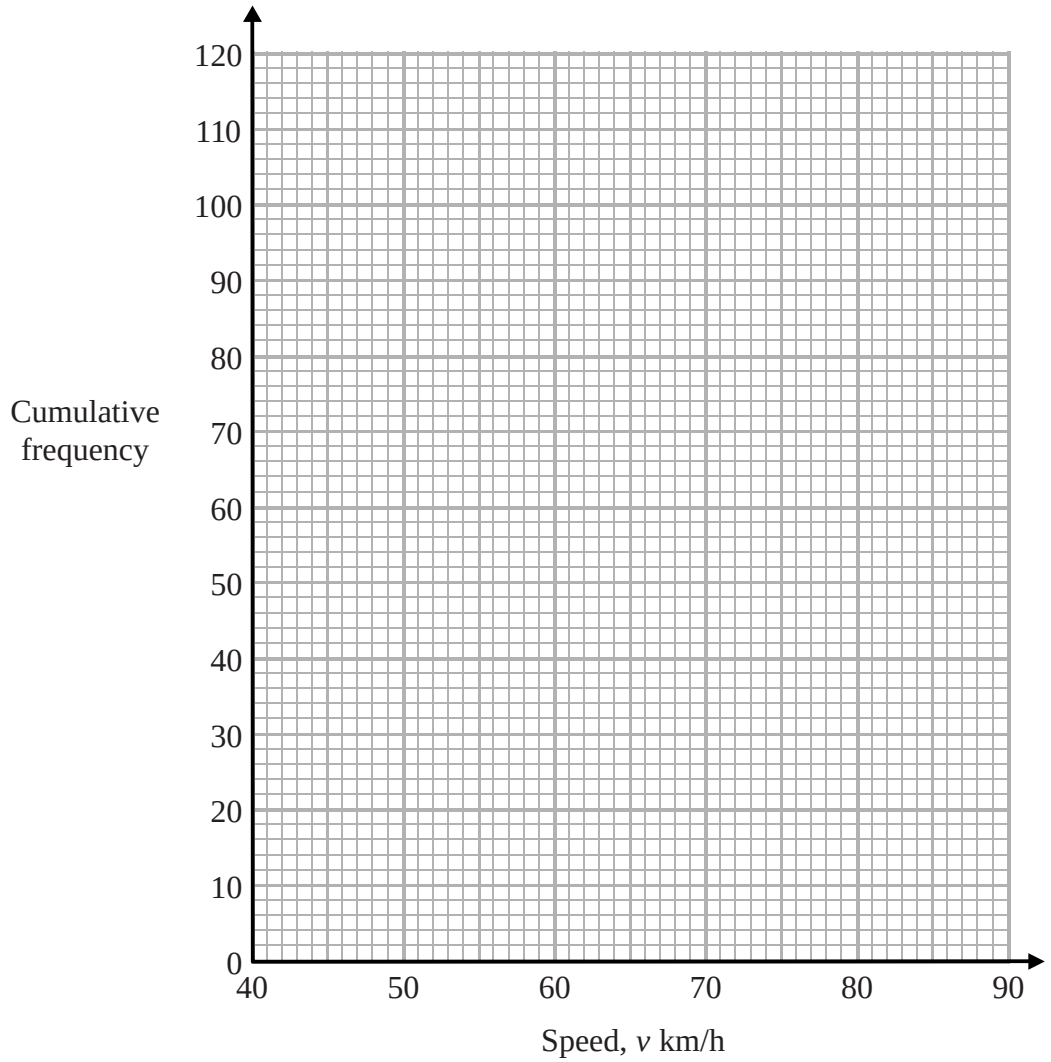
.....

(Total for Question 19 is 2 marks)

20. The table below gives information about the speeds of 120 cars on a road.

Speed (v km/h)	Frequency
$40 < v \leqslant 50$	12
$50 < v \leqslant 60$	28
$60 < v \leqslant 70$	42
$70 < v \leqslant 80$	30
$80 < v \leqslant 90$	8

(a) On the grid, draw a cumulative frequency graph for this information.



(3)

(b) Use your cumulative frequency graph to find an estimate for the number of cars with a speed greater than 75 km/h.

.....

(2)

(Total for Question 20 is 5 marks)

21. $n = 20$
$\sum x = 42$
$\sum x^2 = 108$

(a) Calculate the mean.

.....

(2)

(b) Calculate the standard deviation.
Give your answer correct to three decimal places.

.....

(2)

(Total for Question 21 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS

Level 2 Award in Statistical Methods AST20					
Question		**Working**	**Answer**	**Mark**	**Notes**
1		time taken to eat lunch → continuous number of people on bus → discrete colour of crayon → categorical temperature of tea → continuous	Types identified	3	B3 cao (B2 for 3 correctly identified) (B1 for 2 correctly identified)
2	a		64, 24, 12	3	B3 for 64, 24, 12 condone any missing % signs (B2 for any 2 correct, totals need not equal 100%) (B1 for any one correct)
	b		Complete bar chart	3	M1 for one correct partition A1 for all partitions correct B1 for correct shading for partitions
3	a(i)		Positive	2	B1 for positive (correlation)
	a(ii)		The higher the French mark the higher the Spanish mark		B1 for the higher the French mark the higher the Spanish mark oe
	b		62	2	M1 for line of best fit drawn between (30, 30) and (30, 50) and (80, 70) and (80, 90) may be implied by answer in range A1 for 60 – 64

Level 2 Award in Statistical Methods AST20					
Question		**Working**	**Answer**	**Mark**	**Notes**
4	a	1 – (0.16 + 0.25 + 0.18)	0.41	2	M1 for 0.16 + 0.25 + 0.18 or 0.59 seen A1 cao
	b	0.18 × 250	45	2	M1 for 0.18 × 250 seen or implied A1 cao
5	a		7, 9, 6, 5, 3	3	M1 for an attempt to use tallies A1 for 2, 3 or 4 correct tallies or frequencies A1 for 5 correct tallies and frequencies
	b	(1.25, 7), (1.75, 9), (2.25, 6), (2.75, 5), (3.25, 3)	Frequency polygon	2	M1 for 'frequencies' plotted consistently within intervals A1 for 'frequencies' plotted at mid intervals and joined with line segments, ignore line segments drawn outside range of points
6	a	5 | 8 6 | 2 5 5 7 8 7 | 1 1 2 5 6 7 7 8 9 8 | 0 1 1 2	Stem and leaf diagram	4	M1 for stem and leaf diagram with stems 5, 6, 7 and 8 (condone extra or stems 50, 60, 70 and 80) A2 for correct ordered diagram (A1 for unordered diagram or ordered diagram with no more than one error or omission) B1 for key, e.g. 5 | 8 represents 58 grams
	b	79 – 67	12	2	M1 for '79 – 67' A1 for 12, ft from 'their diagram'
7			Correct reasons	3	B1 for broken axis oe B1 for 3-D diagram oe B1 for overlapping intervals oe

Level 2 Award in Statistical Methods AST20					
Question		**Working**	**Answer**	**Mark**	**Notes**
8	a		$0 < w \leq 4$	1	B1 cao
	b		$4 < w \leq 6$	1	B1 cao
	c	$(2 \times 15 + 5 \times 12 + 7 \times 8 + 9 \times 5) \div 40$	4.775	4	M1 for using a value for x consistently in each interval M1 for $2 \times 15 + 5 \times 12 + 7 \times 8 + 9 \times 5$ M1 for $(2 \times 15 + 5 \times 12 + 7 \times 8 + 9 \times 5) \div 40$ A1 for 4.7 – 4.8
	d	$\frac{15+12+8}{40}$	$\frac{35}{40}$	2	M1 for $\frac{15+12+8}{40}$ or $\frac{40-5}{40}$ or $\frac{a}{40}$ or $\frac{35}{b}$ A1 for $\frac{35}{40}$ oe
9	a		0.15 0.4, 0.6, 0.4	2	B1 for 0.15 B1 for 0.4, 0.6, 0.4
	b	0.85×0.6	0.51	2	M1 for 0.85×0.6 oe A1 cao

Level 2 Award in Statistical Methods AST20					
Question		**Working**	**Answer**		**Notes**
10		$\frac{34.24}{32.68} \times 100$	104.8	2	M1 for $\frac{34.24}{32.68} \times 100$ or $\frac{34.24}{32.68}$ A1 for 104.7 – 104.8
11		(13 × 167.15 + 17 × 158.1) ÷ 30	162.2	3	M1 for 13 × 167.15 or 17 × 158.1 M1 for (13 × 167.15 + 17 × 158.1) ÷ 30 A1 for 162.1 – 162.2
12	(a) (b)		Expects more heads Not enough spins to be reliable	1 1	B1 for a reason, e.g. expects to get 10 (heads) oe B1 for a reason, e.g. not enough spins (to be reliable)
13			Comparisons	2	B2 for 2 correct conclusions, e.g. team B greater modal class, team B (generally) heavier, team A greater range, same total frequency (=15) oe (B1 for 1 correct conclusion)

Level 2 Award in Statistical Methods AST20					
Question		**Working**	**Answer**	**Mark**	**Notes**
14	a	(338 + 398 + 424 + 396) ÷ 4 (398 + 424 + 396 + 378) ÷ 4	389, 399	2	M1 for (338 + 398 + 424 + 396) ÷ 4 or (398 + 424 + 396 + 378) ÷ 4 A1 for 389 and 399
	b		Increasing	1	B1 for increasing oe
15	a	(4, 6), (5, 6), (6, 6) (4, 5), (5, 5), (6, 5) (4, 4), (5, 4), (6, 4) (4,3), (5, 3), (6, 3)	Complete diagram	2	B2 for fully correct entries condone missing brackets (B1 for 6, 7 or 8 correct entries)
	b(i)		$\frac{5}{36}$	3	M1 for $\frac{a}{36}$, where $a < 36$ A1 for $\frac{5}{36}$ or ft table A1 for $\frac{15}{36}$ oe or ft table
	b(ii)		$\frac{15}{36}$		

Level 2 Award in Statistical Methods AST20					
Question		**Working**	**Answer**	**Mark**	**Notes**
16	a		137	1	B1 cao
	b	148 – 134	14	2	M1 for 148 – 134 or 148 and 134 seen A1 cao
	c		Positive skew	1	B1 for positive (skew)
17			Response	1	B1 for asking everyone would be impossible oe sample can represent population
18	a		Question	2	B2 for all of 3 or more non-overlapping response boxes Choices for all possible responses Time period in question or with response boxes (B1 for any two)
	b		Sample size too small Biased sample	2	B1 for sample size too small oe B1 for biased (sample) oe
19		$\frac{85}{190} \times 35$	16	2	M1 for $\frac{85}{190} \times 35$ A1 for 15 or 16

Level 2 Award in Statistical Methods AST20					
Question		**Working**	**Answer**	**Mark**	**Notes**
20	a	(50, 12), (60, 40), (70, 82), (80, 112), (90, ,20)	Cumulative frequency graph	3	B3 for correct cf graph ±1 sq (B2 for cf graph with 3 or more correct points plotted ±1 sq or for 5 correct points plotted ±1s q at ends of intervals) (B1 for 3 or more correct points plotted at ends of intervals)
	b	120 – 98	20 − 22	2	M1 for 120 – '98' A1 ft for 20 − 22
21	(a)	42 ÷ 20	2.1	2	M1 42 ÷ 20 A1 cao
	(b)	$\sqrt{\frac{108}{20} - 2.1^2}$	0.995	2	M1 for $\frac{108}{20} - 2.1^2$ or 5.4 seen M1 for $\sqrt{(\frac{108}{20} - 2.1^2)}$ A1 for 0.994 – 0.995

Write your name here

Surname	Other names

Edexcel Award

Centre Number | Candidate Number

Statistical Methods

Level 3
Calculator allowed

Sample Assessment Material
Time: 2 hours

Paper Reference
AST30/01

You must have:
Pen, 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 90
- The marks for **each** question are shown in brackets
  – use this as a guide as to how much time to spend on each question.
- Normal distribution tables can be found on the inside of the front cover of this paper.

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 ▶

S42822A

S 4 2 8 2 2 A 0 1 2 4

PEARSON

THE NORMAL DISTRIBUTION FUNCTION

Th efunction tabulated below is $\Phi(z)$, defined as $\Phi(z) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{z} e^{-\frac{1}{2}t^2} \, dt$.

z	$\Phi(z)$	z	$\Phi(z)$	z	$\Phi(z)$	z	$\Phi(z)$	z	$\Phi(z)$
0.00	0.5000	0.50	0.6915	1.00	0.8413	1.50	0.9332	2.00	0.9772
0.01	0.5040	0.51	0.6950	1.01	0.8438	1.51	0.9345	2.02	0.9783
0.02	0.5080	0.52	0.6985	1.02	0.8461	1.52	0.9357	2.04	0.9793
0.03	0.5120	0.53	0.7019	1.03	0.8485	1.53	0.9370	2.06	0.9803
0.04	0.5160	0.54	0.7054	1.04	0.8508	1.54	0.9382	2.08	0.9812
0.05	0.5199	0.55	0.7088	1.05	0.8531	1.55	0.9394	2.10	0.9821
0.06	0.5239	0.56	0.7123	1.06	0.8554	1.56	0.9406	2.12	0.9830
0.07	0.5279	0.57	0.7157	1.07	0.8577	1.57	0.9418	2.14	0.9838
0.08	0.5319	0.58	0.7190	1.08	0.8599	1.58	0.9429	2.16	0.9846
0.09	0.5359	0.59	0.7224	1.09	0.8621	1.59	0.9441	2.18	0.9854
0.10	0.5398	0.60	0.7257	1.10	0.8643	1.60	0.9452	2.20	0.9861
0.11	0.5438	0.61	0.7291	1.11	0.8665	1.61	0.9463	2.22	0.9868
0.12	0.5478	0.62	0.7324	1.12	0.8686	1.62	0.9474	2.24	0.9875
0.13	0.5517	0.63	0.7357	1.13	0.8708	1.63	0.9484	2.26	0.9881
0.14	0.5557	0.64	0.7389	1.14	0.8729	1.64	0.9495	2.28	0.9887
0.15	0.5596	0.65	0.7422	1.15	0.8749	1.65	0.9505	2.30	0.9893
0.16	0.5636	0.66	0.7454	1.16	0.8770	1.66	0.9515	2.32	0.9898
0.17	0.5675	0.67	0.7486	1.17	0.8790	1.67	0.9525	2.34	0.9904
0.18	0.5714	0.68	0.7517	1.18	0.8810	1.68	0.9535	2.36	0.9909
0.19	0.5753	0.69	0.7549	1.19	0.8830	1.69	0.9545	2.38	0.9913
0.20	0.5793	0.70	0.7580	1.20	0.8849	1.70	0.9554	2.40	0.9918
0.21	0.5832	0.71	0.7611	1.21	0.8869	1.71	0.9564	2.42	0.9922
0.22	0.5871	0.72	0.7642	1.22	0.8888	1.72	0.9573	2.44	0.9927
0.23	0.5910	0.73	0.7673	1.23	0.8907	1.73	0.9582	2.46	0.9931
0.24	0.5948	0.74	0.7704	1.24	0.8925	1.74	0.9591	2.48	0.9934
0.25	0.5987	0.75	0.7734	1.25	0.8944	1.75	0.9599	2.50	0.9938
0.26	0.6026	0.76	0.7764	1.26	0.8962	1.76	0.9608	2.55	0.9946
0.27	0.6064	0.77	0.7794	1.27	0.8980	1.77	0.9616	2.60	0.9953
0.28	0.6103	0.78	0.7823	1.28	0.8997	1.78	0.9625	2.65	0.9960
0.29	0.6141	0.79	0.7852	1.29	0.9015	1.79	0.9633	2.70	0.9965
0.30	0.6179	0.80	0.7881	1.30	0.9032	1.80	0.9641	2.75	0.9970
0.31	0.6217	0.81	0.7910	1.31	0.9049	1.81	0.9649	2.80	0.9974
0.32	0.6255	0.82	0.7939	1.32	0.9066	1.82	0.9656	2.85	0.9978
0.33	0.6293	0.83	0.7967	1.33	0.9082	1.83	0.9664	2.90	0.9981
0.34	0.6331	0.84	0.7995	1.34	0.9099	1.84	0.9671	2.95	0.9984
0.35	0.6368	0.85	0.8023	1.35	0.9115	1.85	0.9678	3.00	0.9987
0.36	0.6406	0.86	0.8051	1.36	0.9131	1.86	0.9686	3.05	0.9989
0.37	0.6443	0.87	0.8078	1.37	0.9147	1.87	0.9693	3.10	0.9990
0.38	0.6480	0.88	0.8106	1.38	0.9162	1.88	0.9699	3.15	0.9992
0.39	0.6517	0.89	0.8133	1.39	0.9177	1.89	0.9706	3.20	0.9993
0.40	0.6554	0.90	0.8159	1.40	0.9192	1.90	0.9713	3.25	0.9994
0.41	0.6591	0.91	0.8186	1.41	0.9207	1.91	0.9719	3.30	0.9995
0.42	0.6628	0.92	0.8212	1.42	0.9222	1.92	0.9726	3.35	0.9996
0.43	0.6664	0.93	0.8238	1.43	0.9236	1.93	0.9732	3.40	0.9997
0.44	0.6700	0.94	0.8264	1.44	0.9251	1.94	0.9738	3.50	0.9998
0.45	0.6736	0.95	0.8289	1.45	0.9265	1.95	0.9744	3.60	0.9998
0.46	0.6772	0.96	0.8315	1.46	0.9279	1.96	0.9750	3.70	0.9999
0.47	0.6808	0.97	0.8340	1.47	0.9292	1.97	0.9756	3.80	0.9999
0.48	0.6844	0.98	0.8365	1.48	0.9306	1.98	0.9761	3.90	1.0000
0.49	0.6879	0.99	0.8389	1.49	0.9319	1.99	0.9767	4.00	1.0000
0.50	0.6915	1.00	0.8413	1.50	0.9332	2.00	0.9772		

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1 Jasmine is a director of a company.
There are 2500 employees in the company.

Jasmine wants to find out what the employees think about a new pension scheme for the company.
She is going to take a sample rather than a census.

(a) Write down one advantage of taking a sample.

.....

(1)

(b) Describe a sampling frame that Jasmine could use.

.....

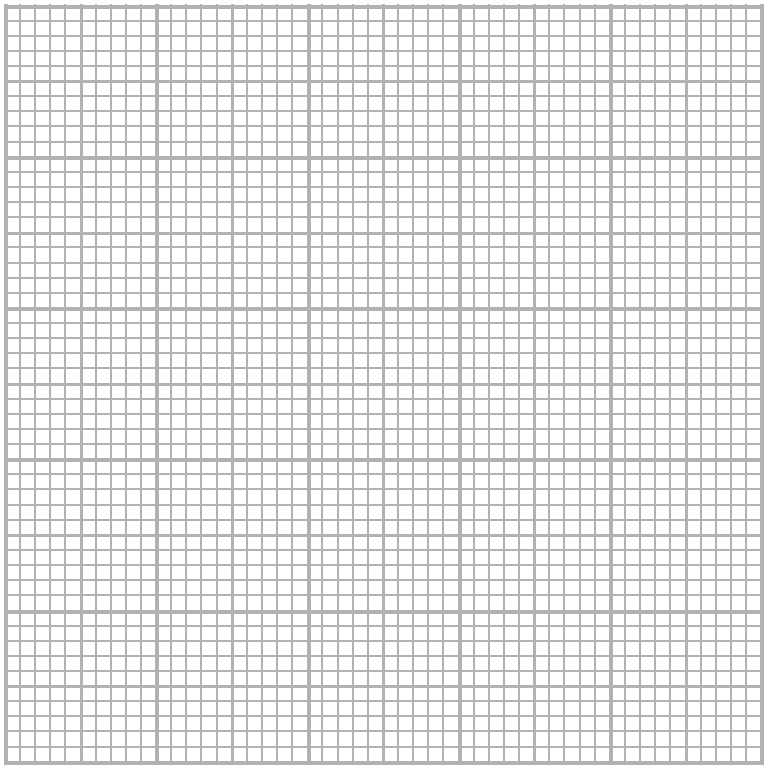
(1)

(Total for Question 1 is 2 marks)

2 The weights of 100 letters were recorded.
The frequency table gives information about these letters.

Weight (x grams)	$40 < x \leqslant 50$	$50 < x \leqslant 60$	$60 < x \leqslant 70$	$70 < x \leqslant 80$	$80 < x \leqslant 90$
Frequency	16	30	34	14	6

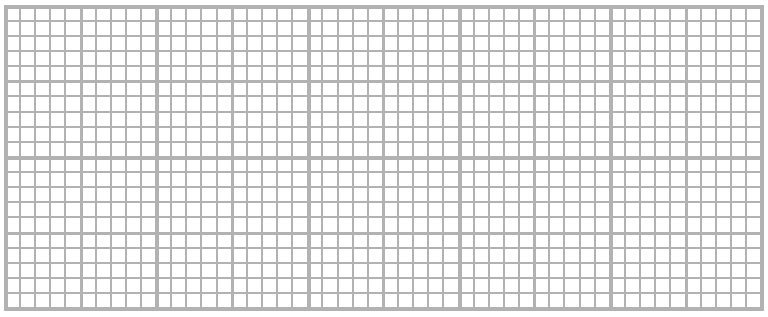
(a) On the grid, draw a cumulative frequency graph for this information.



(3)

The weight of the lightest letter was 45 g.
The weight of the heaviest letter was 86 g.

(b) On the grid, draw a box plot for this information.



(3)

(Total for Question 2 is 6 marks)

3 Enoch plays a game of badminton and a game of snooker.

The probability he will win at badminton is 0.65
The probability he will win at snooker is 0.8

(a) Draw a probability tree diagram for this information.

(3)

(b) Work out the probability that Enoch will win either the game of badminton or the game of snooker, but not both games.

.....

(3)

(Total for Question 3 is 6 marks)

4 30 students did a test.
Here is the gender and mark of each student.

(male, 67)	(female, 59)	(female, 51)	(male, 62)	(female, 85)	(male, 72)
(male, 89)	(female, 69)	(male, 73)	(male, 55)	(female, 73)	(female, 84)
(female, 60)	(male, 69)	(female, 91)	(female, 77)	(male, 89)	(female, 78)
(female, 71)	(female, 53)	(male, 76)	(female, 68)	(male, 68)	(male, 51)
(male, 78)	(female, 65)	(male, 64)	(female, 84)	(male, 83)	(female, 62)

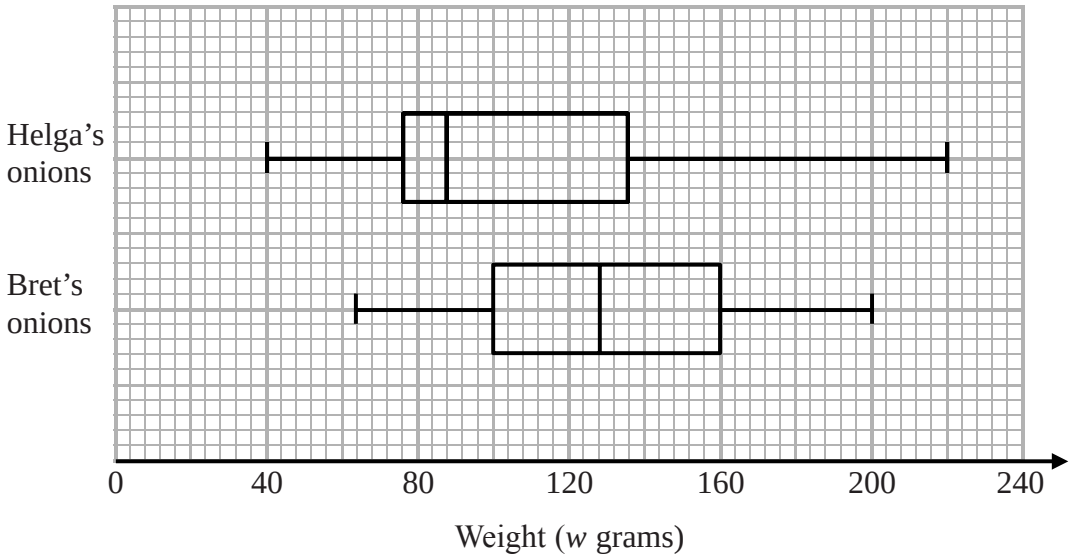
Draw an ordered back-to-back stem and leaf diagram to represent this information.

Male mark		**Female mark**
	5	
	6	
	7	
	8	
	9	

(Total for Question 4 is 4 marks)

5 Helga and Bret each have an allotment.
They both grow onions.

The box plots below show information about the weights of the onions on each allotment.



Compare the distribution of the weights of the onions on these allotments.
Write down **three** comparisons.

1. .....

.....

2. .....

.....

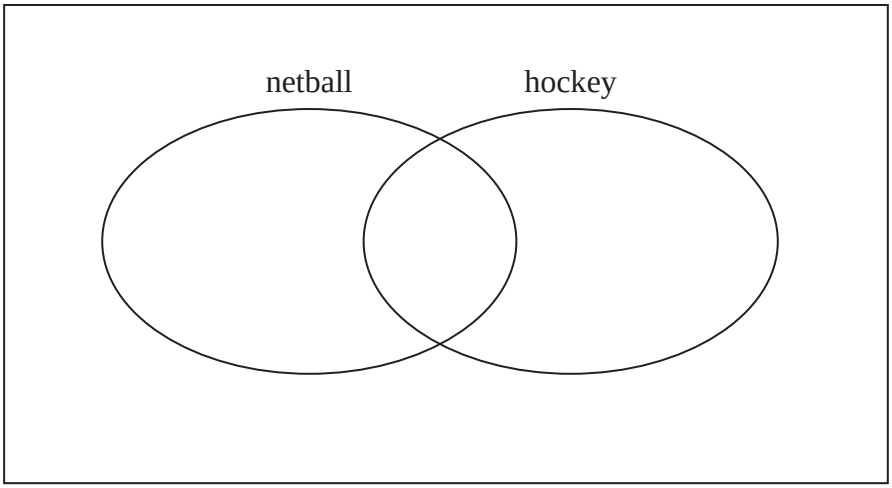
3. .....

.....

(Total for Question 5 is 3 marks)

6 In a class of 29 girls:
18 girls play netball
13 girls play hockey
5 girls do **not** play either netball or hockey.

(a) Complete the Venn diagram below for this information.



(3)

One of these girls is picked at random.

(b) Given that this girl plays netball, write down the probability that she also plays hockey.

.....

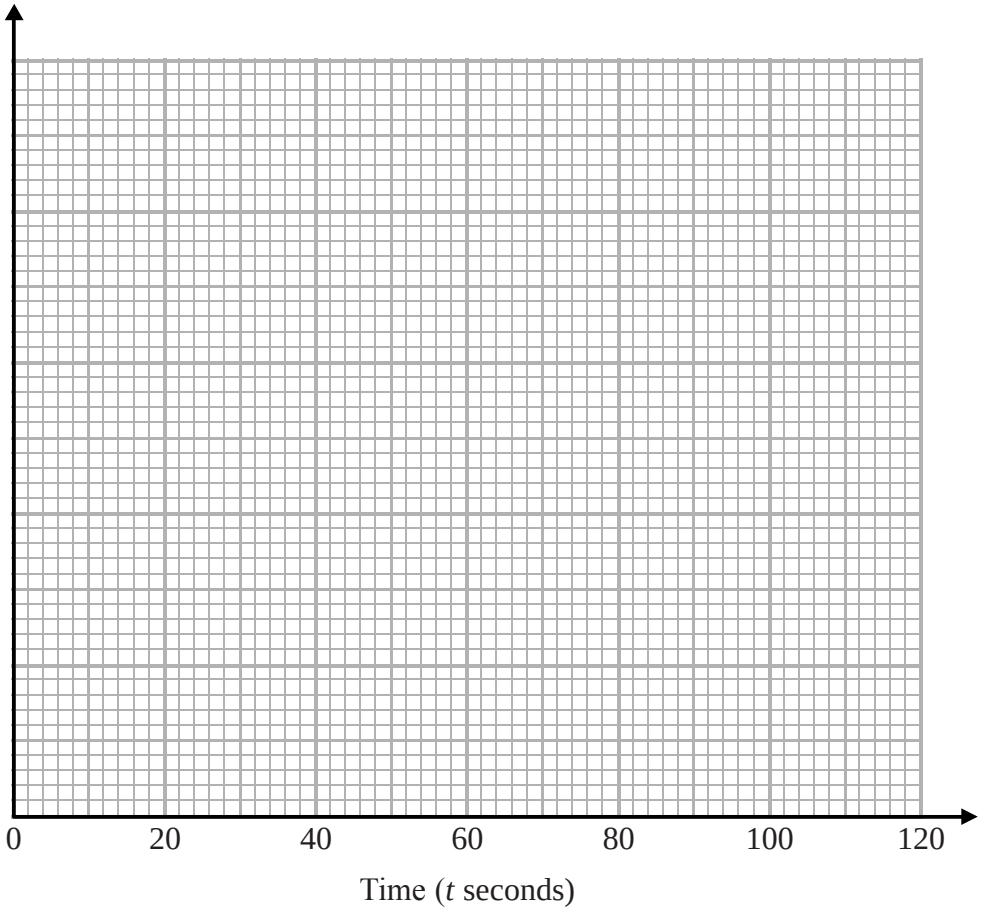
(2)

(Total for Question 6 is 5 marks)

7 The table below gives information about the time taken, in seconds, for each of 259 telephone calls to a call centre.

Time (t seconds)	Frequency
$0 < t \leqslant 20$	40
$20 < t \leqslant 30$	48
$30 < t \leqslant 60$	96
$60 < t \leqslant 110$	75

(a) Draw a histogram for this information.



(3)

(b) Work out an estimate for the number of telephone calls that took less than 50 seconds.

.....

(3)

(Total for Question 7 is 6 marks)

8 The table below gives information about the number of students in Year 10.

	Form				Total
	A	**B**	**C**	**D**	
Boys	15	15	10	19	59
Girls	17	15	22	12	66
Total	32	30	32	31	125

Simone wants to take a sample of 30 students stratified by gender and by form.

Work out the number of girls from form C in her sample.

.....

(Total for Question 8 is 2 marks)

9 *A* and *B* are independent events.

P(*A*) = 0.4

P(*B*) = 0.7

Work out P(*A* or *B*)

.....

(Total for Question 9 is 3 marks)

10 Talil and Guy were each asked to rank 10 paintings in a competition.

The table below gives information about their rankings.

Painting	Talil's rankings	Guy's rankings
A	1	5
B	2	4
C	3	1
D	4	7
E	5	3
F	6	2
G	7	9
H	8	6
I	9	10
J	10	8

(a) Calculate Spearman's coefficient of rank correlation for this data.

.....

(3)

(b) Interpret your answer.

.....

(1)

(Total for Question 10 is 4 marks)

11 Ben wants to find an estimate for the number of fish in a lake.
He catches 50 fish from the lake and marks each one with a dye.
He then returns the fish to the lake.

The next day Ben catches another 50 fish.
12 of these fish are marked with the dye.

Estimate the number of fish in the lake.
Write down any assumptions you have made.

.....

.....

(Total for Question 11 is 3 marks)

12 Here are the ages, in years, of 11 people.

12 15 18 18 23 22 25 27 28 41 45

The oldest person is 45 years old.

Is 45 an outlier for this data?
Give a reason for your answer.

(Total for Question 12 is 3 marks)

13 The table below gives information about the cost of running a car in 1995, 2000, 2005 and 2010.

Year	**1995**	**2000**	**2005**	**2010**
Cost	£1235	£1105	£980	£1560

(a) Using 1995 as the base year, calculate index numbers for 2005 and 2010 and complete the table.
Give your answers correct to one decimal place.

Year	**2000**	**2005**	**2010**
Index number	89.5	.....	.....

(2)

(b) Calculate the geometric mean of the index numbers for 2000, 2005 and 2010.
Give your answer correct to one decimal place.

.....

(2)

(c) Describe what the geometric mean shows about the cost of running the car over this period.

.....

.....

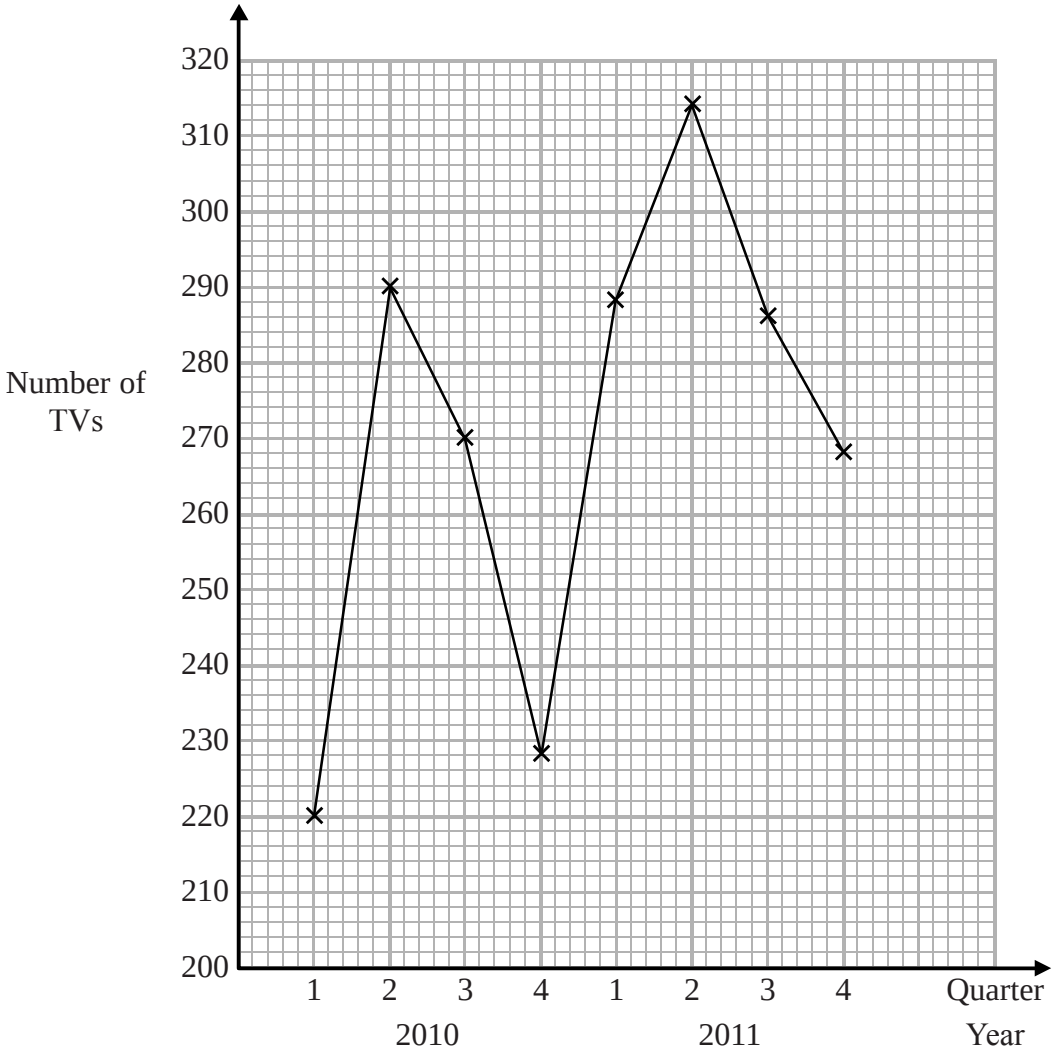
(2)

(Total for Question 13 is 6 marks)

14 The table below gives information about the number of TVs sold by a shop in each quarter from 2010 to 2011.

Year	**2010**				**2011**			
Quarter	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Number of TVs	220	290	270	228	288	314	286	268

(a) Plot the 4-point moving averages for this information on the time-series graph.



(4)

(b) (i) Find an estimate for the mean seasonal variation for quarter 2.

.....

(ii) Predict the number of TVs that will be sold in quarter 2 of 2012.

.....

(5)

(Total for Question 14 is 9 marks)

15 Some students did a psychometric test.
The table below gives some information about these students.

	Mean	**Standard deviation**
Female score	30	10
Male score	36	12

Mary's score was 38
Peter's score was 45

(a) Calculate the standardised scores for Mary and Peter.

Mary's standardised score .....

Peter's standardised score .....

(2)

(b) Interpret the standardised scores.

.....

(1)

(Total for Question 15 is 3 marks)

16 There are 8 counters in a box.
5 of the counters are black.
3 of the counters are white.

Greta takes two counters from the box at random, without replacement.

Work out the probability that both counters are the same colour.

.....

(Total for Question 16 is 3 marks)

17 The table below gives information about the speeds of 120 lorries on a road.

Speed (s km/h)	Frequency
$40 < s \leqslant 50$	12
$50 < s \leqslant 60$	28
$60 < s \leqslant 70$	42
$70 < s \leqslant 80$	30
$80 < s \leqslant 90$	8

(a) Calculate an estimate of the mean.

..... km/h

(3)

(b) Calculate an estimate of the standard deviation.
Give your answer correct to one decimal place.

..... km/h

(3)

(Total for Question 17 is 6 marks)

18 Astan has a coin.
The coin is biased.

The probability the coin will land on heads is 0.6

Astan spins the coin 5 times.

Work out the probability that the coin will land on heads:

(a) exactly 3 times

.....

(3)

(b) at least once.

.....

(2)

(Total for Question 18 is 5 marks)

19 A particular type of egg has a weight which is normally distributed with mean 70 g and standard deviation 8 g.

One of these eggs is picked at random.

(a) (i) Find the probability that this egg has a weight less than 76 g.

.....

(ii) Find the probability that this egg has a weight greater than 80 g.

.....

(5)

A scientist weighs 300 of these eggs.

(b) Work out an estimate for the number of eggs with a weight greater than 80 g.

.....

(2)

(Total for Question 19 is 7 marks)

20 The table below shows the yield, y tonnes per acre, of a crop and the rainfall, x cm, for each of 8 years.

Year	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
y	12.5	13.7	14.5	11.2	13.2	14.1	12.0	11.8
x	6.17	8.12	8.42	5.33	7.21	8.71	5.68	6.86

Given $\sum xy = 737.246$ $S_{xx} = 11.44755$ $S_{yy} = 9.795$

Calculate the product-moment correlation coefficient for this data.
Give your answer correct to two decimal places.

You may use $S_{xy} = \sum xy - \frac{\sum x \sum y}{n}$ and $\frac{S_{xy}}{\sqrt{S_{yy}S_{xx}}}$.

.....

(Total for Question 20 is 4 marks)

TOTAL FOR PAPER: 90 MARKS

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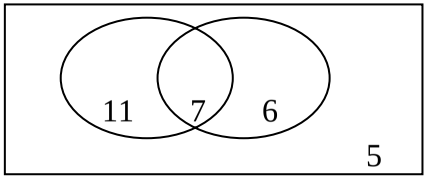
Level 3 Award in Statistical Methods AST30						
Question		**Working**	**Answer**	**Mark**	**Notes**	
1	a		Advantage	1	B1 for a reason, e.g. quicker, cheaper, easier	
	b		Sampling frame	1	B1 for sampling frame, e.g. list, register	
2	a	(50, 16), (60, 46), (70, 80), (80, 94), (90, 100)	Cumulative frequency graph	3	B3 for correct cf graph ± 1 sq (B2 for cf graph with 3 or more correct points plotted ± 1 sq or for 5 correct points plotted ± 1 sq at ends of intervals) (B1 for 3 or more correct points plotted at ends of intervals)	
	b		Box plot	3	M1 for box plot with any one correct from: • median • upper and lower quartiles • largest and smallest values. A1 for any two correct A1 for all three correct	

Level 3 Award in Statistical Methods AST30						
Question		**Working**	**Answer**	**Mark**	**Notes**	
3	a		0.65, 0.35 0.8, 0.2, 0.8, 0.2	3	M1 for an attempt to draw a tree diagram with two then 4 branches A1 for 2 or correct probabilities marked A1 cao	
	b	0.65 × 0.2 + 0.35 × 0.8	0.41	3	M1 for 0.65 × 0.2 or 0.35 × 0.8 oe or ft tree diagram' M1 for 0.65 × 0.2 + 0.35 × 0.8 or ft 'tree diagram' A1 cao	
4		5, 1 (5) 1, 3, 9 9, 8, 7, 4, 2 (6) 0, 2, 5, 8, 9 8, 6, 3, 2 (7) 1, 3, 7, 8 9, 9, 3 (8) 4, 4, 5 (9) 1 Key: Male 5 ı 1 means 51 marks Female 1 ı 5 means 51 marks	Stem and leaf diagram + key	4	M1 for correct ordered stem and leaf diagram for males or females A1 for both correct B2 for correct key for males and females (B1 for correct key for males or females)	

Level 3 Award in Statistical Methods AST30						
Question		**Working**	**Answer**	**Mark**	**Notes**	
5			Comparisons	3	B1 for comparing medians or corresponding values, e.g. Bret's median higher or Helga has the heaviest onion B1 for comparing spreads, e.g. Helga has biggest range or interquartile ranges are equal B1 for comparing skew, e.g. Helga's are positively skewed and Bret's are symmetrical Accept appropriate responses in words or inclusion of numerical values.	
6	a	$(18 - x) + x + (13 - x) + 5 = 29$ $x = 7$  	11, 7, 6, 5	3	B1 for 7 B1 for 11 and 6 B1 for 5	
	b		$\frac{7}{18}$	2	M1 for $\frac{a}{18}$ or $\frac{7}{b}$ A1 cao	

Level 3 Award in Statistical Methods AST30						
Question		**Working**	**Answer**	**Mark**	**Notes**	
7	a	Bar 1: height 2, width 20 Bar 2: height 4.8, width 10 Bar 3: height 3.2, width 30 Bar 4: height 1.5, width 50	Histogram	3	B3 for fully correct histogram (B2 for 3 correct bars) (B1 for 2 correct bars) SC B1 for correct key, e.g. 1 cm^2 = 5 (telephone calls) or correct freq ÷ class interval for at least two frequencies	
	b	40 + 48 + 3.2 × (30 – 10)	152	3	M1 for 40 + 48 + *k* M1 for '3.2'× (30 – 10) A1 cao	
8		$\frac{22}{125} \times 30$	5	2	M1 for $\frac{22}{125} \times 30$ A1 for 5 or 6	
9		P(*A* or *B*) = P(*A*) + P(*B*) – P(*A* and *B*) P(*A* and *B*) = P(*A*) × P(*B*) = 0.4 + 0.7 – 0.4 × 0.7	0.82	3	M1 for an attempt to use P(*A* or *B*) = P(*A*) + P(*B*) – P(*A* and *B*) M1 for an attempt to use P(*A* and *B*) = P(*A*) × P(*B*) A1 cao	

Level 3 Award in Statistical Methods AST30						
Question		**Working**	**Answer**	**Marks**	**Notes**	
10	a	$\sum d^2 = 16 + 4 + 4 + \ldots = 66$	0.6	3	M1 for $(\sum d^2 =)$ 16 + 4 + 4 + ... (= 66) M1 for $1 - \frac{6\times'66'}{10(99)}$ A1 cao (SC: award full marks for correct answer seen without working)	
	b	$1 - \frac{6\times'66'}{10(99)}$	Positive correlation	1	B1 for positive correlation oe	
11		$\frac{50}{n} = \frac{12}{50}$	208 + assumption	3	M1 for $\frac{50}{n} = \frac{12}{50}$ oe A1 for 200 – 210 B1 for correct assumption, e.g. *n* constant or random selection (of fish) or dye not washed off	

Level 3 Award in Statistical Methods AST30						
Question		**Working**	**Answer**	**Mark**	**Notes**	
12		(UQ – LQ =) 28 – 18 = 10 (UB =) 28 + 1.5×10 = 43 45 > 43 so outlier	Yes + reason	3	M1 for (IQR =) 28 – 18 or 10 seen M1 for an attempt to use UQ + 1.5 × IQR A1 for yes and 43 seen	
13	a	$\frac{980}{1235} \times 100$	79.4, 126.3	2	M1 for $\frac{980}{1235} \times 100$ or $\frac{1560}{1235} \times 100$ A1 for 79.3(5) and 126.3(1)	
	b	$\frac{1560}{1235} \times 100$	96.5	2	M1 for $\sqrt[3]{'89.5' \times '79.4' \times '126.3'}$ A1 for 96.4 − 96.5	
	c	$\sqrt[3]{89.5 \times 79.4 \times 126.3}$	Cost decreased by 3.5%	2	B1 for (cost) decreased oe B1 for 3.5(%) or ft 100 – '96.5'	

Level 3 Award in Statistical Methods AST30						
Question		**Working**	**Answer**	**Mark**	**Notes**	
14	a	$\frac{220+290+270+228}{4}$ $\frac{290+270+228+288}{4}$ $\frac{270+228+288+314}{4}$ $\frac{288+314+286+268}{4}$	(2.5, 252), (3.5, 269), (4.5, 275), (1.5, 279), (2.5, 289) plotted	4	M1 for a correct attempt to calculate at least one 4-point moving average, e.g. $\frac{288+314+286+268}{4}$ M2 for plotting (2.5, '252'), (3.5, '269'), (4.5, '275'), (1.5, '279'), (2.5, '289') (M1 for plotting their 4-point moving averages consistently) A1 cao	
	b(i)	(2.5, 252), (3.5, 269), (4.5, 275), (1.5, 279), (2.5, 289) $\frac{(290-'254')+(314-'286')}{2}$	32	5	B1 for line of best fit ft 'moving averages' M1 for $\frac{(290-'254')+(314-'286')}{2}$ where 254 and 286 are interpreted from line of best fit oe A1 ft for 32	
	b(ii)	'318' + '32'	350		M1 for '318' + '32', where 318 is interpreted from line of best fit oe A1 ft for 350	