Centre Number						Paper Reference	Surname	Other Names
Candidate Number							Candidate Signature	

For Examiner's use

For Team Leader's use

1389

Edexcel GCSE

Statistics

Paper 1H

HIGHER TIER

Specimen Paper

Time: 2 hours 30 minutes

Materials required for the examination

Ruler graduated in centimetres and millimetres, protractor, compass, pen, HB pencil, eraser, electronic calculator.

Items included with these question papers

Formulae sheet.

Instructions to Candidates

In the boxes above, write your centre number, candidate number, the paper reference, your surname and other names and your signature. The paper reference is shown above.

Answer **all** questions in the spaces provided in this book.

Supplementary answer sheets may be used.

Information for Candidates

The total mark for this paper is 100.

The marks for the various parts of questions are shown in round brackets: e.g. **(2)**.

This question paper has 9 questions in Section A and 8 questions in Section B.

Advice to Candidates

Work steadily through the paper.

Do not spend too long on one question.

Show all stages in any calculations.

If you cannot answer a question, leave it and attempt the next one.

Return at the end to those you have left out.

N0000

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Edexcel Foundation

GCSE Statistics

Formulae Sheet

Higher Tier

Mean of a frequency distribution $= \dfrac{\sum fx}{\sum f}$.

Mean of a grouped frequency distribution $= \dfrac{\sum fx}{\sum f}$, where x is the mid-interval value.

Variance $= \dfrac{\sum (x - \bar{x})^2}{n}$

Standard deviation (set of numbers) $\sqrt{\left[\dfrac{\sum x^2}{n} - \left(\dfrac{\sum x}{n}\right)^2\right]}$

or $\sqrt{\left[\dfrac{\sum (x - \bar{x})^2}{n}\right]}$

where $\bar{x}$ is the mean of the set of values.

Standard deviation (discrete frequency distribution) $\sqrt{\left[\dfrac{\sum fx^2}{\sum f} - \left(\dfrac{\sum fx}{\sum f}\right)^2\right]}$

or $\sqrt{\left[\dfrac{\sum f(x - \bar{x})^2}{\sum f}\right]}$

Spearman's Rank Correlation coefficient $1 - \dfrac{6\sum d^2}{n(n^2 - 1)}$

Leave blank

Write down your answers in the spaces provided.

You must write down all stages in your working.

Section A

Answer ALL NINE questions.

1. The sequences of numbers given below are taken from a random number table. It is to be used to simulate ten throws of an unbiased six-sided die.

11 74 26 93 81 44 33 93 08 72 30 79 76 39

Describe the rule you would use for selecting the numbers showing on the die.

……

(1)

Use the above rule to fill in the table below.

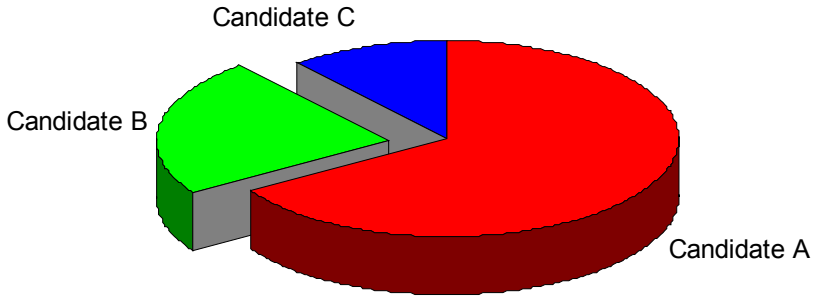
Throw	1	2	3	4	5	6	7	8	9	10
Number showing on die										

(1)

---

2. This pie chart shows the number of people who voted for one of three candidates in a recent election.

Votes cast in election



Give one way in which this method of data representation is misleading.

……

……

(1)

Leave blank

3. In a study into smoking a doctor selected a sample of adult patients from those registered with him and looked at their records to see to what degree they claimed to smoke.

(a) What is the population being studied?

……

(1)

(b) If the doctor wished to get the number of males and the number of females in proportion to the numbers on his register, what sampling method should he use?

……

(1)

(c) The doctor's information on smoking was obtained by asking the patients, at the time of setting up a database. Give two reasons why the figures obtained may be unreliable.

……

……

(2)

---

4. The nutritional information for two breakfast cereals is shown below.

	Weetabix per serving	Shredded Wheat per serving
Protein	4.2g	5.2g
Carbohydrate	25.4g	30.4g
Fat	1.0g	1.0g
Fibre	3.9g	5.2g

Marathon runners need a diet high in carbohydrate and protein, but low in fat.

(a) Draw composite bar charts to display these data on the grid opposite.

(2)

(b) Which of the two breakfast cereals would you recommend a marathon runner to eat? Explain your answer.

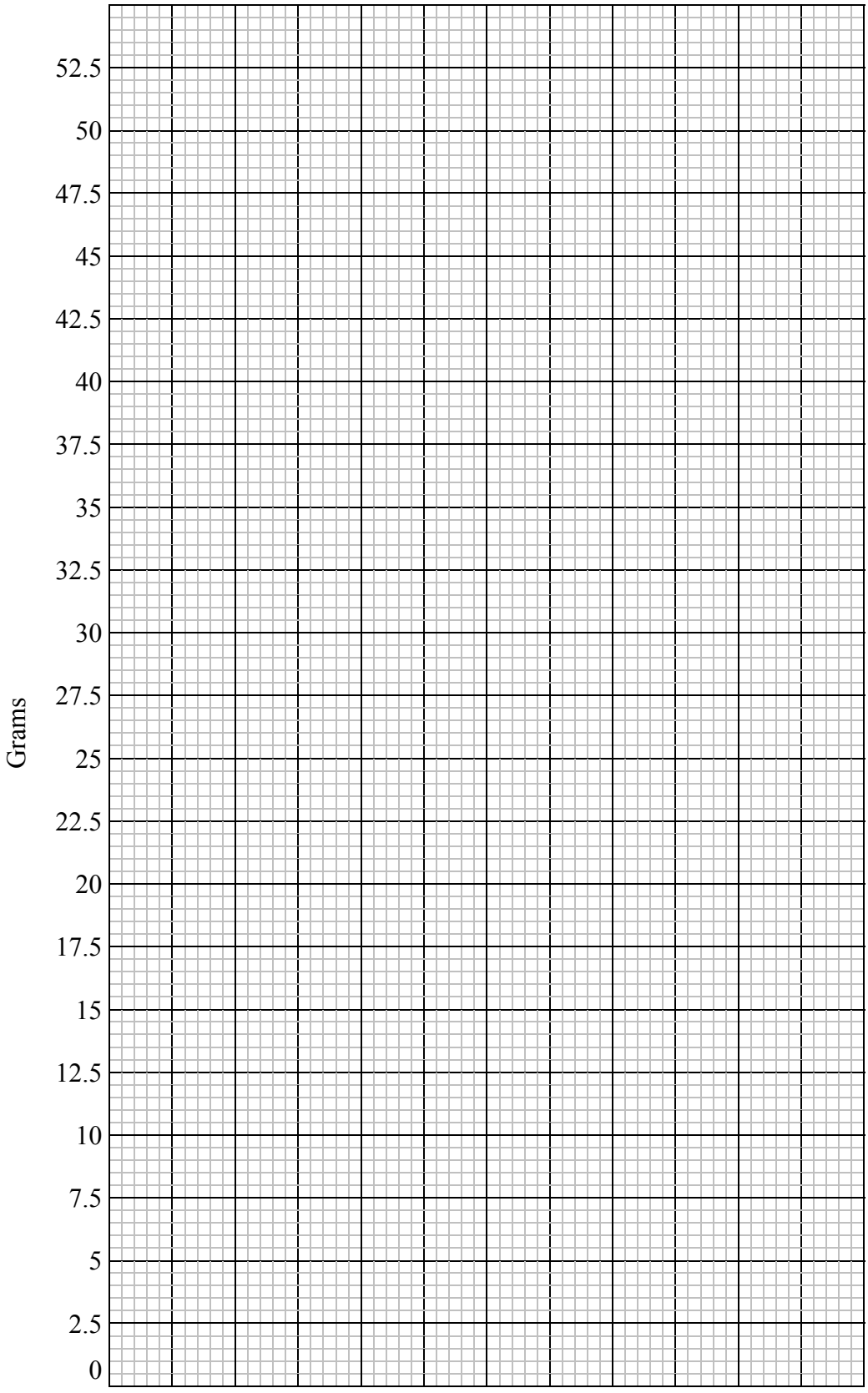
……

……

……

(2)

Leave blank


Grams
52.5
50
47.5
45
42.5
40
37.5
35
32.5
30
27.5
25
22.5
20
17.5
15
12.5
10
7.5
5
2.5
0

5. The table shows the attitudes to the teaching of basic skills in State secondary schools in 1987. This was just before the national curriculum was introduced.

3.13 Attitudes to the teaching of basic skills in State secondary schools: by age, 1987

Great Britain — Percentages and numbers

	How well do you think state secondary schools nowadays teach young people basic skills, such as reading, writing and maths?					
	Very well	Quite well	Not very well	Not at all well	Don't know/ not answered	Weighted base (=100%) (Numbers)
Age groups (years)						
18 – 24	19	59	14	8	0	174
25 – 34	11	58	24	7	–	238
35 – 44	12	47	31	9	1	252
45 – 54	7	45	36	12	–	202
55 – 64	7	37	41	15	1	181
65 and over	7	30	42	17	3	195
All	10	46	31	11	1	1243

Source: British Social Attitudes Survey, 1987. Social Community Planning and Research.

Social Trends 20, 1990. Table 3.13

(a) Write down the type of scale used for the horizontal measurements (*Very well, quite well, etc ...*)

……

(1)

(b) Write down the number of people surveyed.

……

(1)

The following statement is wrong:

"*19% of those who said 'very well' were 18 – 24 years old*"

(c) Write down a correct version of this statement.

.....

.....

(1)

(d) Describe briefly what the table shows about how attitudes to the teaching of basic skills in state secondary schools changes with age.

.....

.....

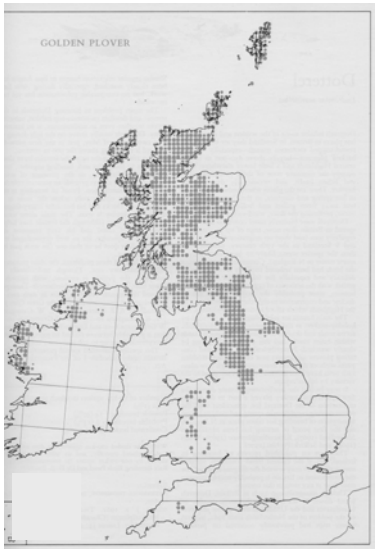
.....

(1)

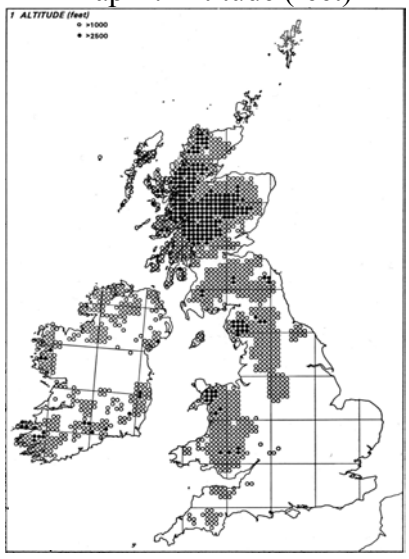
Leave blank

6. The diagrams below show the distribution of the Golden Plover birds in the UK (Map A) together with the maps B, C and D which show three possible factors that may influence positively the distribution of Golden Plovers. Heavier shading implies greater density in maps A and C, higher altitudes in map B and higher rainfall in map C.

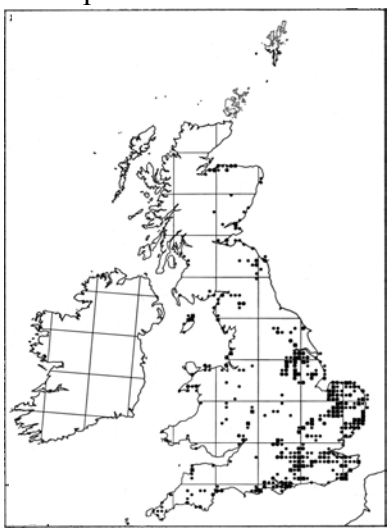
Map A: Distribution of Golden Plover



Map B: Altitude (feet)



Map C: Lowland Heath



Map D: Annual Rainfall (mm)

By looking at the maps B, C and D, and comparing them to map A above, decide which of the three factors are most likely to influence the distribution of Golden Plovers. Give a reason for your answer.

……

……

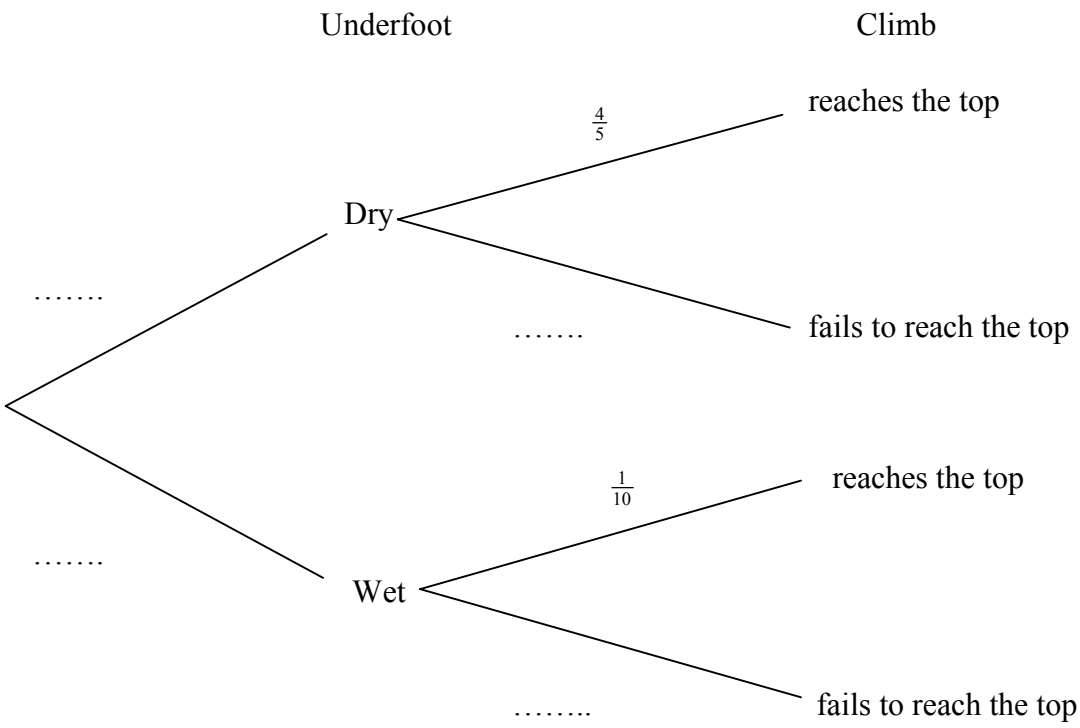
(2)

Source: *The Atlas of Breeding Birds of Britain and Ireland* (BTO/IWC 1976), ISBN 0903793 01 6.

Leave blank

7. The probability that a climber reaches the top of a particular crag when the ground is dry underfoot is $\frac{4}{5}$. When the ground is wet underfoot, the probability that he reaches the top of the crag is $\frac{1}{10}$. Past weather statistics from the crag show that the probability that it will be wet underfoot on any particular day is $\frac{1}{4}$.

(a) Complete the tree diagram below.



(2)

(b) Find the probability that, on a day chosen at random, a climber makes it to the top of the crag.

.....

(2)

(c) Given the climber makes it to the top of the crag, find the probability that the ground is wet underfoot.

.....

(2)

Leave blank

8. Mary is carrying out an investigation into the cost of food at her college canteen.

She asks people in the queue for canteen food

"Do you agree that canteen food is value for money?"

(a) Why is her sample of people likely to be biased?

.....

.....

(1)

(b) Why is her question biased?

….....

(1)

(c) Suggest two reasons for her to carry out a pilot survey.

(i).....……

(ii).....……

(2)

For another investigation Mary selects a sample of 30 students from the 720 students at her college.

(d) Describe how she would select a simple random sample.

.....

.....…….....

…….....

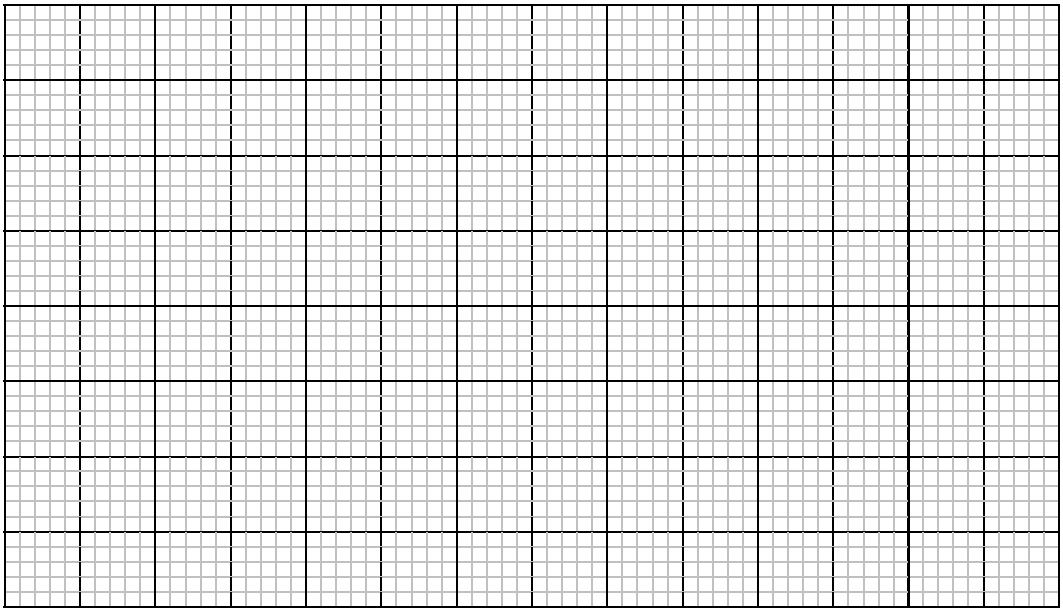
(2)

Leave blank

9. 178 female and 220 male adult tortoises are weighed. The summary statistics of these data are shown in the table below.

Tortoise weight (grams)	Minimum	Lower Quartile	Median	Upper Quartile	Maximum
Female	155	520	615	718	964
Male	633	996	1121	1220	1390

(a) Draw two box plots to represent these data on the grid.



(4)

(b) Discuss how you might use the weight of an adult tortoise to infer whether it is male or female.

……

……

……

……

……

(2)

TOTAL FOR SECTION A: 35 MARKS

Leave blank

Section B

Answer ALL EIGHT questions.

1. A teacher asks his class of 15 students to measure, to the nearest degree, an angle using a protractor.

The values of the angles as measured by the students are shown below.

72°, 73°, 75°, 102°, 105°, 107°, 107°, 107°, 108°, 108°, 108°, 108°, 108°, 108°, 110°.

(a) Complete the stem and leaf diagram below.

Angles 10|8 means 108

7	2 3
8	
9	
10	
11	

(1)

(b) Write down the mode of these data.

……..

(1)

(c) Find the median of these data.

……..

(1)

(d) Find the interquartile range of these data.

……..

(2)

The teacher suspects that three of the students have read the wrong scale on their protractors. The suspected wrong measurements are 72°, 75° and 73°.

(e) Are these measurements outliers? Justify your answer.

……

……

……

……

(2)

The teacher corrects these three measurements by subtracting them from 180°.

(f) Find the median of the new data set.

……

(2)

(g) The mean of the old data set was 86.7°. Without doing any further calculations, say whether the new mean changed by more or less than the new median? Explain your answer.

……

……

……

……

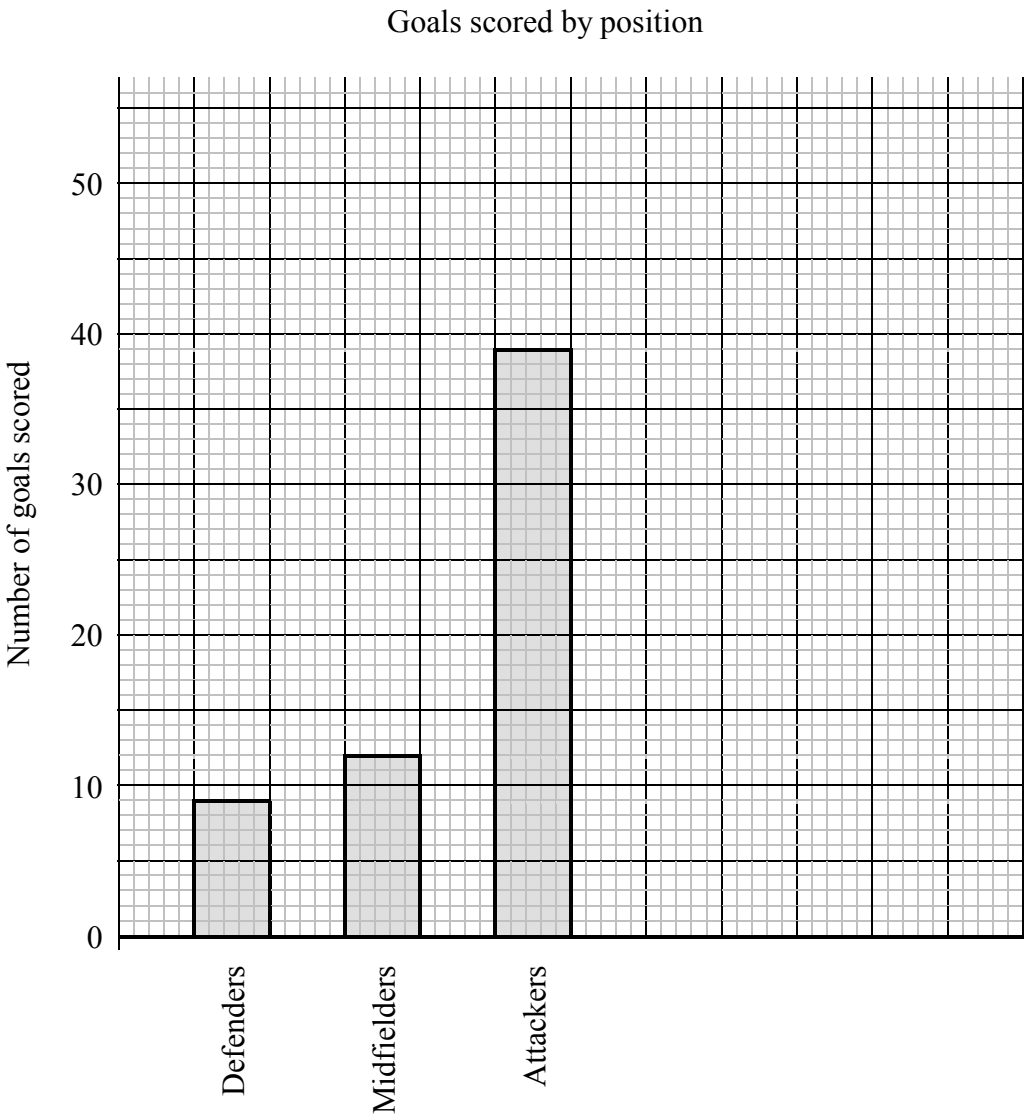
……

……

(2)

Leave blank

2. The bar chart below shows the goals scored by players playing in different positions for Bude Hockey Club during the season 2002/03.



The breakdown of goals scored by Bude Hockey Club by position in 2001/02 is shown below.

Defenders	Midfielders	Attackers
6	21	21

Leave blank

(a) Draw two comparative pie charts to show the breakdown of goals scored by position in 2001/02 and 2002/03. Make the diameter of the 2001/2002 pie chart 6 cm. The size of the 2002/2003 pie chart should reflect accurately the different number of goals scored in 2002/2003.

(4)

(b) Comment on two differences or similarities between the numbers of goals scored by players playing in different positions for Bude Hockey Club in 2001/2002 and 2002/2003.

……..……...

……

(2)

Leave blank

3. The table shows the quarterly profits in £(millions) recorded at the end of each quarter in the years 2001, 2002 and 2003 by a manufacturing company.

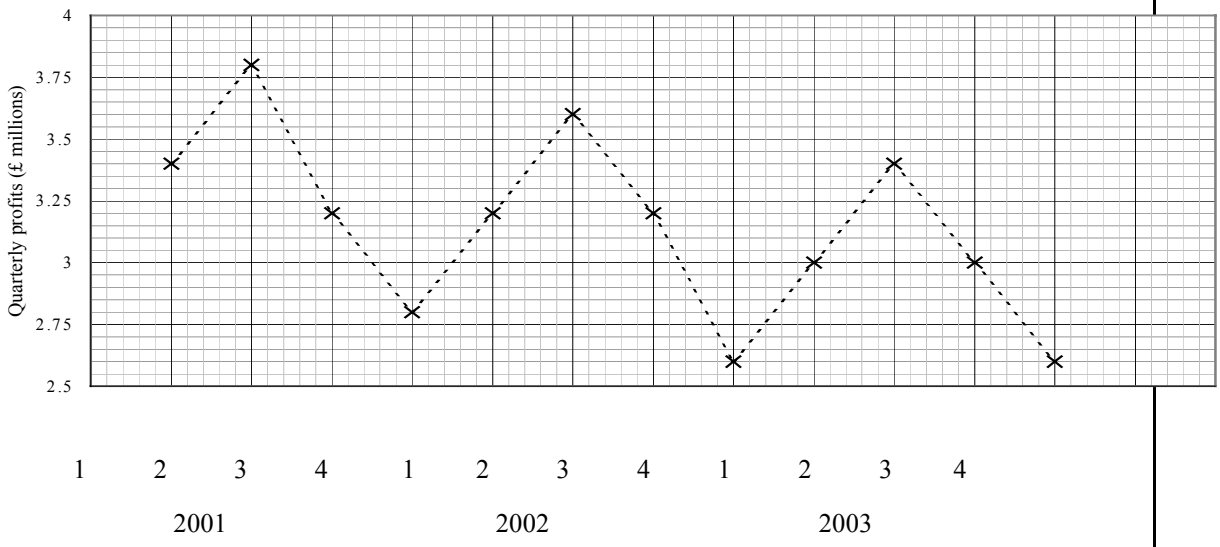
		Quarter			
		1	2	3	4
Year	2001	3.4	3.8	3.2	2.8
	2002	3.2	3.6	3.2	2.6
	2003	3.0	3.4	3.0	2.6

(a) Use the table given below to work out the four-point moving averages. The first one has been worked out for you.

Year and Quarter	**Quarterly profits (£ millions)**	**4-point moving averages**
2001 1	3.4	
2001 2	3.8	
		(3.4 + 3.8 + 3.2 + 2.8) ÷ 4 = 3.3
2001 3	3.2	
2001 4	2.8	
2002 1	3.2	
2002 2	3.6	
2002 3	3.2	
2002 4	2.6	
2003 1	3.0	
2003 2	3.4	
2003 3	3.0	
2003 4	2.6	

(3)

(b) Complete the time-series graph below by plotting the moving averages and drawing in a trend line.



(3)

(c) Are profits going up or going down from January 2001 to December 2003? Explain your answer.

……

……

(1)

(d) Find the equation of the trend line.

……

(3)

Leave blank

(e) Given that the mean seasonal effect for the first quarter is +0.05 millions, estimate the profits at the end of the first quarter of 2004.

…..…….……..

(2)

Leave blank

4. The times taken by an operator at a call centre to answer each of 150 calls made during one shift are shown in the table below.

Times (mins)	Number of calls(f)	Frequency density	Mid-point x	$f \times x$
$0 < x \leq 10$	10	1	5	50
$10 < x \leq 25$	20			
$25 < x \leq 30$	35			
$30 < x \leq 40$	45			
$40 < x \leq 50$	40			
$50 < x$	0			
Totals				

(a) Complete the table above.

(3)

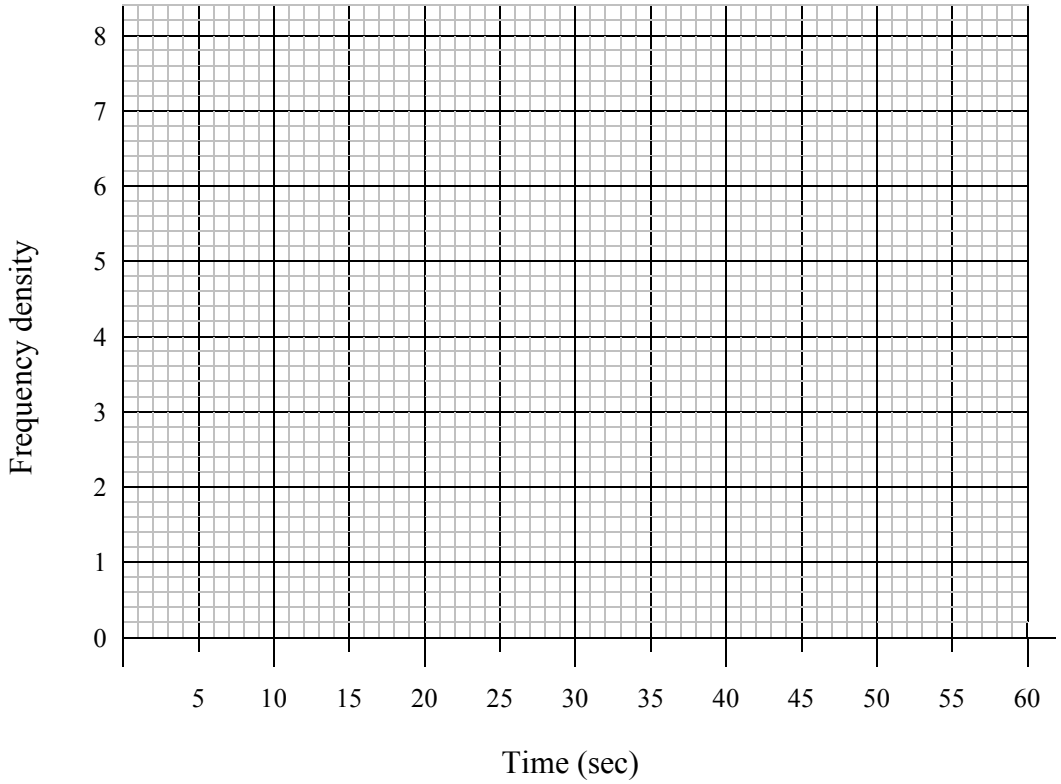
(b) Calculate an estimate of the mean time taken to answer a call.

.....

(2)

Leave blank

(c) Draw a frequency density histogram to represent these data.



(2)

(d) Describe the skewness of the time taken to answer a call.

……

(1)

Leave blank

5. Two students Paul and Jane did examinations in Mathematics and in English. Both examinations were marked out of 100. The table below shows the marks they attained together with mean and standard deviations of the overall marks in each subject. They wish to see who did best in the examinations.

	Mark	Jane	Mean	Standard deviation
Mathematics	55	65	60	15
English	47	45	45	8

(a) Explain why the students standardised scores should be used.

……

……

……

(1)

(b) Work out Paul and Jane's standard scores in Mathematics and English.

Paul: Maths……English…….

Jane: Maths……English…….

(3)

(c) Comment on the examination performance of the two students. Who did best overall?

……

……

……

……

……

(2)

Leave blank

6. Eleven dragonflies are observed. Their wing lengths are measured and the territories they occupy are ranked in descending order of size (i.e. largest to smallest). The data are summarized in the table below.

Territory Rank	Wing length (mm)	Wing length Rank		
1	15.1			
2	14.9			
3	14.7			
4	15.3			
5	14.1			
6	14.5			
7	14.3			
8	15.0			
9	13.8			
10	14.0			
11	13.6			

(a) Using the table above, rank the wing lengths in descending order.

(1)

(b) Calculate Spearman's Rank Correlation coefficient for Territory against Wing length. You may use the blank columns to help you.

……

(4)

(c) Comment on your answer to part (b).

……

……

(2)

Leave blank

7. A council estate has 120 houses. Of these houses, 36 have a video player and 50 have a DVD player. 16 houses have both a video player and a DVD player.

(a) Draw a Venn diagram to show this information.

(2)

(b) Find the probability that a house chosen at random has a video player, a DVD player or both.

……

(3)

(c) Two houses are chosen at random. Find the probability that neither house has both a video player and a DVD player.

……

(3)

Leave blank

8. A manufacturer of electrical motors is making the central motor shafts. The target diameter of the shafts is 38 mm. Samples of the shafts are taken at half-hourly intervals. The machine on which the shafts are produced is such that the mean size of the samples is normally distributed with a mean value of 38 mm and a standard deviation of 0.26 mm.

(a) Calculate the warning and action limits if these are set so that 95% of the samples means are to fall within the warning limits and 99.8% within the action limits.

Warning limits:……..

Action limits:...……..

(3)

(b) Explain why a control chart for range or variance would also be used by the manufacturer.

……....

……

(2)

(c) What action would be taken if a sample mean fell between the warning and action limits?

……....

……

(1)

(d) What action would be taken if a sample mean fell outside the action limits?

……

……

(1)

TOTAL FOR SECTION B: 65 MARKS

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GCSE STATISTICS DRAFT SPECIMEN MARK SCHEME – PAPER 1H

No	Working	Answer	Mark	Notes
Section A				
1.		Take each number 1-6 inclusive 1 1 4 2 6 3 1 4 4 3 or take second number of each pair 1 4 6 3 1 4 3 3 2 6 or number as mod 6 5, 2, 2, 3, 3, 2, 3, 3, 2, 0 or any other method	1 1	B1 B1
2.		The 3D effect alters angles of sectors *or* The exploded sector makes comparison difficult	1	B1
3 (a)		The population is all adult patients registered with the doctor	1	B1
(b)		Stratified sampling	1	B1
(c)		Data may be out of date. Patients may not like to own up to smoking	2	B2
4. (a)		Correct bars, labels and key	2	B2
(b)		Shredded Wheat	1	B1
		The fat contents are the same but Shredded wheat has higher protein and carbohydrates	1	B1
5. (a)		Rank	1	B1
(b)		1243 (inetrsection of 'All' row and 'Number' column	1	B1
(c)		19% of all people between 18 and 24 years old said 'very well'	1	B1
(d)		Dissatisfaction with the teaching of basic skills increase with age (shown by 'Not very' and 'not at all well' columns)	1	B1
6.		Altitude – the map matches most closely to the distribution map	2	B1 B1

GCSE STATISTICS SPECIMEN MARK SCHEME – PAPER 1H

No		Working	Answer	Mark	Notes
7.	(a)	$P(\text{dry}) = 1 - \frac{3}{4} = \frac{1}{4}$ $P(\text{dry}) = 1 - \frac{1}{4} = \frac{3}{4}$	$\frac{3}{4}$ and $\frac{1}{4}$	2	B1
		$P(\text{fails} \mid \text{dry}) = 1 - \frac{4}{5}$ $P(\text{fails} \mid \text{dry}) = 1 - \frac{1}{10}$	$\frac{1}{5}$ and $\frac{9}{10}$		B1
	(b)	$\left(\frac{3}{4} \times \frac{4}{5}\right) + \left(\frac{1}{4} \times \frac{1}{10}\right)$	$\frac{5}{8}$ or $\frac{10}{16}$ or 0.625	2	M1 A1
	(c)	$\frac{1}{40} \div \left(\frac{1}{40} + \frac{3}{5}\right)$	$\frac{1}{25}$ or 0.04	2	M1 A1
8.	(a)		Likely to be not representative, students who dislike the canteen will eat elsewhere	1	B1
	(b)		This is a leading question – the respondent is invited to agree with interviewer	1	B1
	(c)		To test if the questions are clear. To see if the information collected is what is required	2	B1 B1
	(d)		Allocate a unique number to each member of population. Use random numbers to select sample	2	B1 B1
9.	(a)		Labels, boxplots. Correct points for each	4	B1 B1 B1 B1
	(b)		Male generally heavier than females Below 633 g fairly sure female (could accept up tp 750 g) Above 964 g fairly sure male (could accept down to 850 g)	2	 B1 B1

GCSE STATISTICS DRAFT SPECIMEN MARK SCHEME – PAPER 1H

No		Working	Answer	Mark	Notes
Section B					
1.	(a)		7 | 5, 10 | 2 5 7 7 7 8 8 8 8 8 8 and 11 | 0	1	B1
	(b)		108 (greatest frequency)	1	B1
	(c)		107 (middle value)	1	B1
	(d)	108 – 102	6	2	M1 A1
	(e)	102 – 9 = 93	Outliers are less than LQ – $1\frac{1}{2}$ IQR, 72, 75 and 73 are outliers	2	M1 A1
	(f)	New data 102, <u>105</u>, 105, <u>107</u>, 107, 107, 107, <u>108</u>, 108, 108, 108, 108, 108, 108, 110	108 (middle value of new data)	2	B1 B1
	(g)		More; mean is more affected by extreme values than median	2	B2
2.	(a)	<u>2002/2003:</u> (Defenders) $\frac{6}{48} \times 360 = 45°$,			
		(Midfield or Attackers) $\frac{21}{48} \times 360 = 157.5°$,	45°, 157.5° on pie chart	2	M1 A1
		<u>2001/2002:</u>			
		Defenders $\frac{9}{60} \times 360 = 54°$,			
		(Midfield) $\frac{12}{60} \times 360 = 72°$			
		(Attackers) $\frac{39}{60} \times 360 = 234°$,			
		Diameter = $\sqrt{\left(\frac{60}{43} \times 6^2\right)} = 6.7$ cm	6.7 cm, 54°, 720°, 234° on pie chart	2	M1 A1
	(b)		Fewer goals were scored in 2001/2002. The proportion scored by attackers was much smaller	2	B1 B1

GCSE STATISTICS SPECIMEN MARK SCHEME – PAPER 1H

No		Working	Answer	Mark	Notes
3.	(a)	Next moving average = $(3.8 + 3.2 + 2.8 + 3.2)/4$	3.25	3	M1
			other moving averages = 3.2, 3.2, 3.15, 3.1, 3.05, 3.0, 3.0.		A1 (3 corr.) A1 (All)
	(b)		Plot points correctly	3	B2
			Trend line		B1
	(c)	$y = ax + b$, $b = 3.4$ from graph	Profits are decreasing since moving averages decrease	1	B1
	(d)	$A = \frac{y_1 - 3.4}{x_1}$ (for some (x_1, y_1)) $= -0.04$	$y = -0.04x + 3.4$ (Tolerance for a: 0.005: tolerance for b: 0.05)	3	M1 M1 A1
	(e)	$2.9 + 0.05$	£2.95 million	2	M1 A1
4.	(a)		FD: 1, 1.3, 7, 4.5, 4, 0.	3	
			Mid-point 5, 17.5, 27.5, 35, 45, 0		B1
			$f \times x$: 50, 350, 962.5 1575, 1800, 0.		B1
			Tots: 150, 17.8, 4737.5		B1
	(b)	$\frac{4737.5}{50}$	31.6	2	M1 A1
	(c)		Bars plotted correctly	2	B1 (4 corr) B1 (all corr)
	(d)		Negative Skew	1	B1

GCSE STATISTICS DRAFT SPECIMEN MARK SCHEME – PAPER 1H

No		Working	Answer	Mark	Notes
5.	(a)		Standardised scores let you compare data from different distributions	1	B1
	(b)	St. Score = $\frac{\text{Score} - \text{Mean}}{\text{Stand. dev.}}$ Paul: Maths = $\frac{55-60}{15} = -0.3$ English = $\frac{47-45}{15} = 0.25$ Jane: Maths = $\frac{65-60}{15} = 0.3$ English = $\frac{45-45}{8} = 0$	Paul: Maths – 0.3, Eng 0.625 Jane: Maths 0.3, Eng – 0.625	3	M1 A1 A1
	(c)		Paul better than average at English, Jane at Maths, but Jane has no negative values so has done better	2	B1 B1
6.	(a)		Rank: 2, 4, 5, 1, 8, 6, 7, 3, 10, 9, 11	1	B1
	(b)	$1-\frac{6\times 54}{1320}$	Diff: 1, 2, 2, 3, 3, 0, 0, 5, 1, 1, 0. d^2 : 1, 4, 4, 9, 9, 0, 0, 25, 1, 1, 0 0.754	4	B1 B1 M1 A1
	(c)		+ve correlation. The larger the wing span the larger the territory	2	B1 B1

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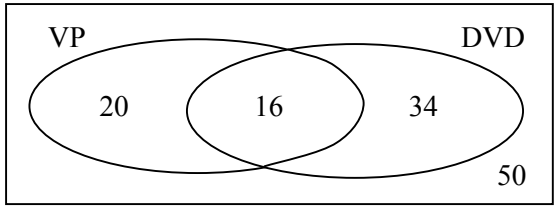
No		Working	Answer	Mark	Notes
7.	(a)		Venn Diagram. Correct numbers	2	B1, B1
	(b)	$20 + 16 + 34 = 70$. Prob. $= \frac{70}{120} = \frac{7}{12}$	$\frac{7}{12}$	3	M1 M1 A1
	(c)	P(neither Video or DVD) $= \frac{120 - 16}{120}$	$\frac{104}{120}$	3	M1
		P(two houses) $= \frac{104}{120} \times \frac{103}{119}$	0.75 or equivalent		M1 A1
8.	(a)	W.L: $38 \pm 2 \times 0.26$. AL: $38 \pm 3 \times 0.26$	Warning limits 38.52 and 37.48. Action limits 38.78 and 37.22	3	M1 A1 A1
	(b)		Limits on mean depend upon standard deviation if it changes limits are no longer valid.	2	B1 B1
	(c)		A new sample would be taken immediately	1	B1
	(d)		The process would be stopped and machinery reset	1	B1

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Question	Subject area	Spec ref	Mark		AO1	AO2	AO3	AO4
Section A								
1. Die simulation	simulation	1(d)	2		2			
2. 3D Pie	misrepresenting data	2(b)	1					1
3. Doctors surgery	sampling methods	1(c)	4		4			
4. Breakfast cereals	composite bar charts	2(b)	4			2		2
5. Teaching skills	data analysis	2(a)	4			1		3
6. Golden Plover	choropleth	2(b)	2			1		1
7. Climbing crags	conditional probability	4	6			2	4	
8. College canteen	survey design, sampling strategy	1(d)	6		6			
8. Tortoises	boxplots	2(d), 3	6			3		3
Section A total			**35**					
Section B								
1. Protractor angles	stem & leaf, mode, median and range; outliers	2(d)	11			2	6	3
2. Hockey	comparative pie charts	2(b)	6		2	2		2
3. Prices in Guernsey	moving averages	2(g)	12			3	7	2
4. Call centre	mean, histogram, skewness	2(d), 2(c)	8			5	2	1
5. Exam marks	Standard scores	2(d)	6				3	3
6. Dragonflies	Spearman's	2(f), 3	7				5	2
7. Video/DVD player	Venn diagrams	4	8			2	6	
8. Elect. motor shafts	Control charts	2(h)	7				3	4
Section B total			**65**					
Totals			**100**		**14**	**23**	**36**	**27**
			Max		16	30	43	30
			Min		13	20	26	20