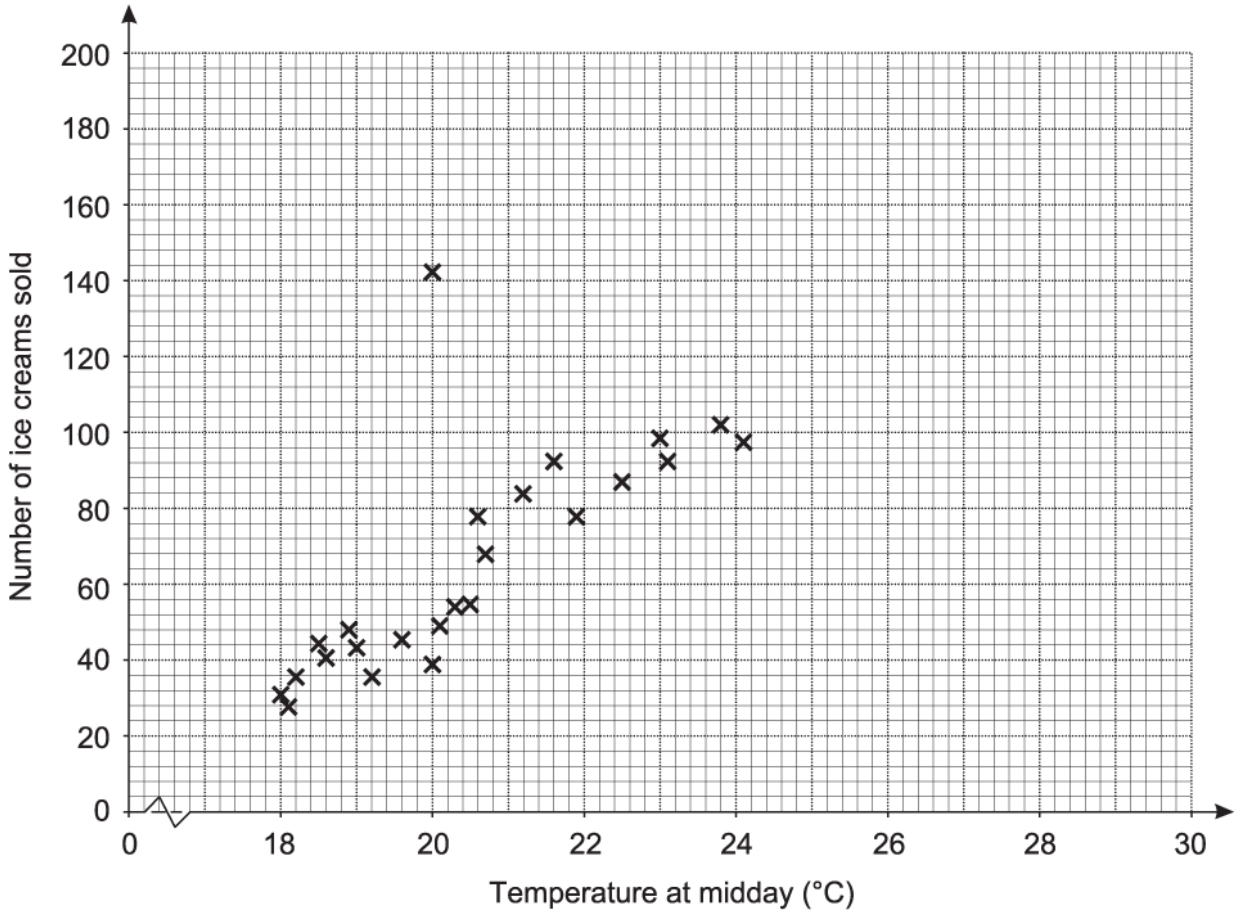
1. This table summarises the times taken by the 30 members of group 7P.

Time (t seconds)	Frequency
$20 \leq t < 30$	3
$30 \leq t < 40$	7
$40 \leq t < 50$	13
$50 \leq t < 60$	6
$60 \leq t < 70$	1

Calculate an estimate of the mean time taken by group 7P.

_____ seconds **[4]**

2(a). The graph shows the number of ice creams sold in a shop each day against the temperature at midday that day.



Use the scatter graph to predict the number of ice creams sold on a day when the temperature at midday was

(i) 22°C

(i) _____ [1]

(ii) 28°C.

(ii) _____ [1]

(iii) Explain which of these two predictions is more reliable.

_____

_____

[2]

(b). A newspaper headline reads

High temperatures make more people buy ice cream!

Does the graph above prove this claim?
Give a reason for your decision.

---

[2]

3. The wages of eleven people, in thousands of pounds, are:

16 34 23 22 15 25 16 27 61 23 16

(i) Work out their median wage.

£_____thousand

[2]

(ii) Work out the range of their wages.

£_____thousand

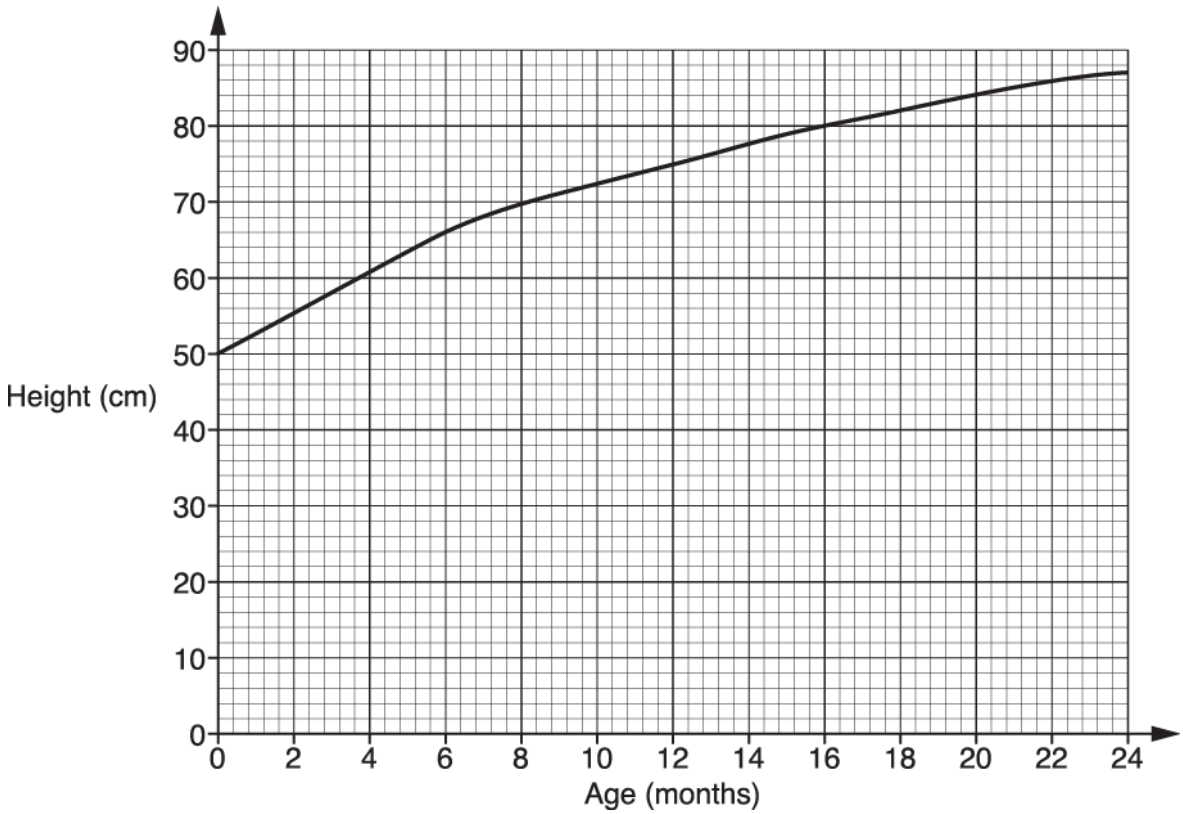
[1]

(iii) Work out the mode of their wages.

£_____thousand

[1]

4(a). This graph shows Riley's height for the first two years of his life.



How tall was Riley when he was born?

_____ cm

[1]

(b). How tall was Riley on his first birthday?

_____ cm

[1]

(c). How old was Riley when he was 71 cm tall?

_____ months

[1]

(d). How much taller did he grow between 15 months and 21 months?

_____ cm

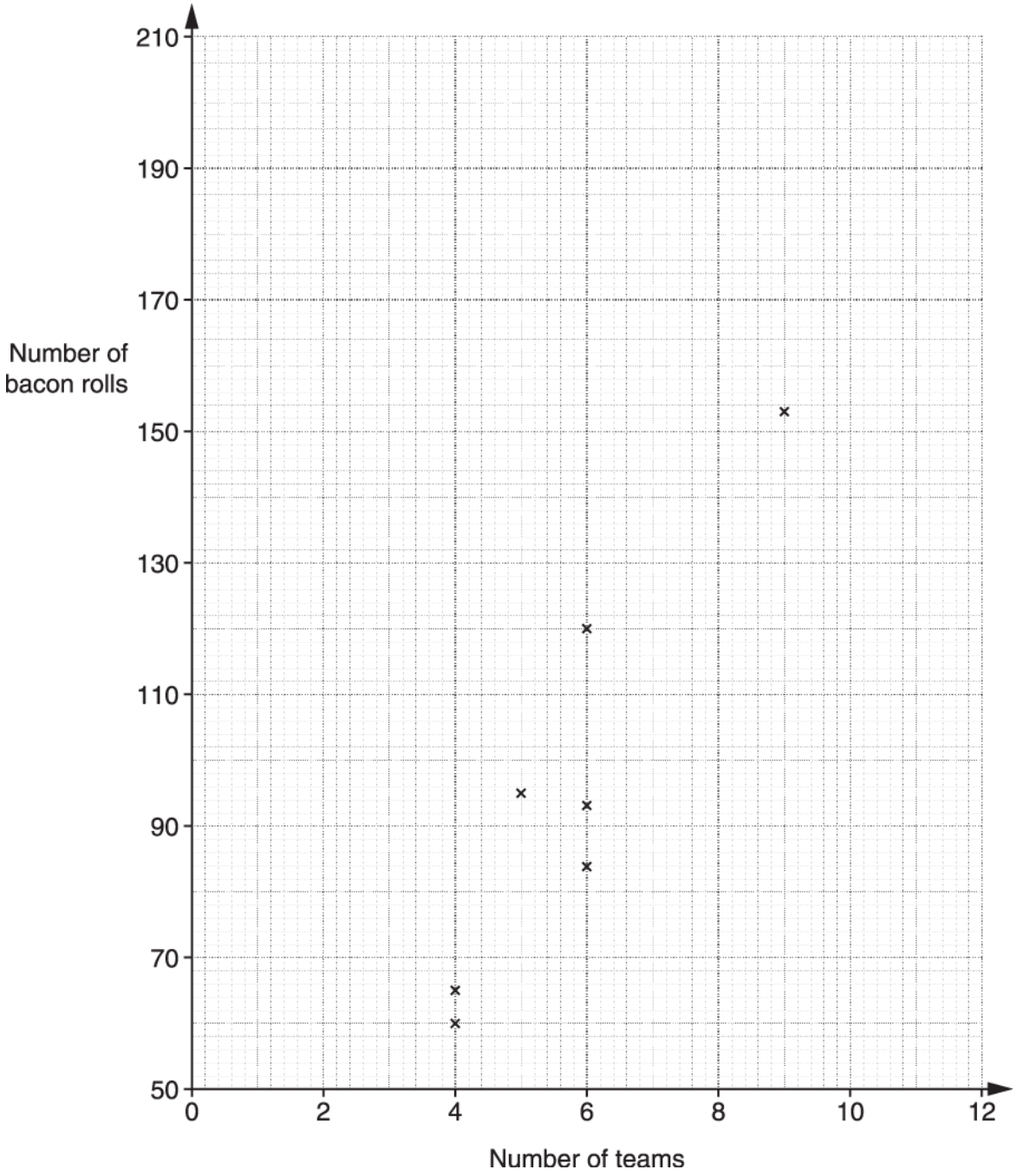
[1]

5(a). The *Tigers* rugby club provides bacon rolls on match days.

The organisers recorded how many bacon rolls they provided when different numbers of teams played.

Number of teams	4	4	5	6	6	6	9	9	11	12	12
Number of bacon rolls	60	65	95	84	93	120	153	117	176	156	206

The first 7 values are plotted on a scatter graph.



Complete the scatter graph.

[2]

(b). What type of correlation is there between the number of teams and the number of bacon rolls?

_____ [1]

(c). Draw a line of best fit on your scatter graph.

[1]

(d). The club buys bacon rolls in packs of 6. Each pack costs £4.
There are 8 teams playing on one match day.

Use your line of best fit to help you work out how much it costs the club to provide bacon rolls on that day.

_____ **[4]**

6. Here are the attendances at five home games of a local football club.

10 007 11 031 9386 10 904 11 247

(i) Find the median of these attendances.

(i) _____

[2]

(ii) Calculate the mean of these attendances.

(ii) _____

[2]

7(a). Dale asked each of 10 students from class 11M how many items they had downloaded the previous day.
Here are their responses.

5	0	4	12	17	22	0	15	7	20

Find the mode.

_____ [1]

(b). Find the median.

_____ [2]

(c). Dale also asked each of 10 students from class 11Y how many items they had downloaded the previous day.
The range of their responses was 21 and the mean of their responses was 14.

Calculate the appropriate values for class **11M** so that you can complete the following statements.

(i) Class 11 _____ downloaded more items on average because _____

_____ [4]

(ii) Class 11_____ had a greater spread of items downloaded because _____

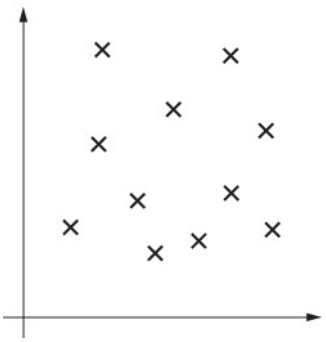
_____ [2]

8(a). Describe the correlation shown in each of these scatter graphs.

If appropriate, also describe the strength of the correlation.

.....

.....



.....

.....

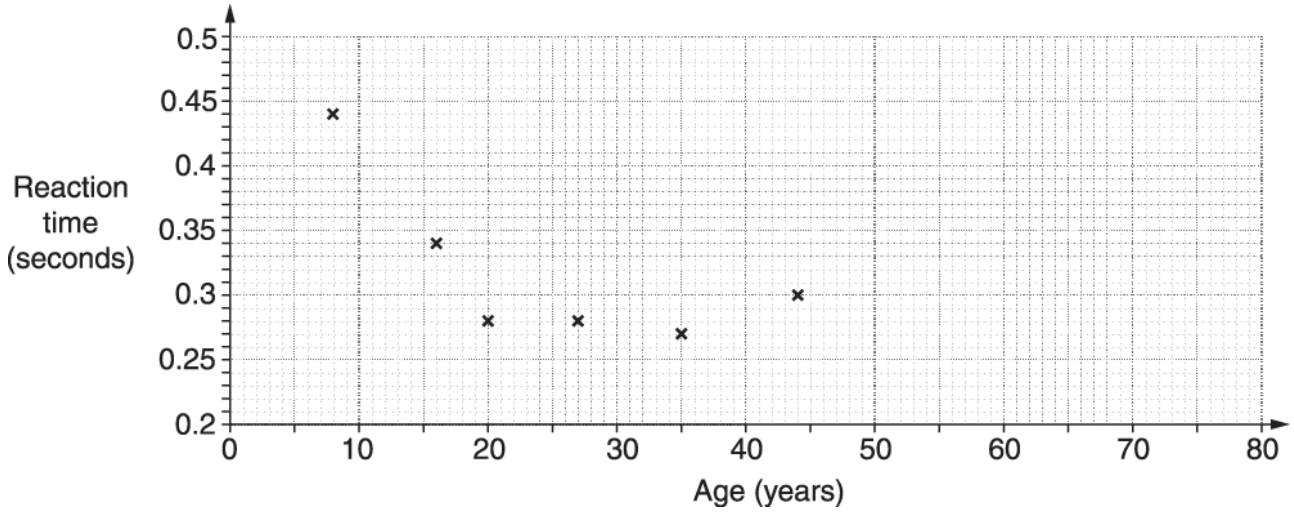
[3]

(b). A student measures the reaction time for each of ten people of different ages.

The results are given in this table.

Age (years)	8	16	20	27	35	44	56	65	70	79
Reaction time (seconds)	0.44	0.34	0.28	0.28	0.27	0.30	0.28	0.34	0.38	0.40

The results are plotted on a scatter graph.



(i) Complete the scatter graph.
The first six results have been plotted for you.

[2]

(ii) Why is it not sensible to draw a line of best fit?

---

[1]

(iii) Describe the relationship between age and reaction time shown by your graph.

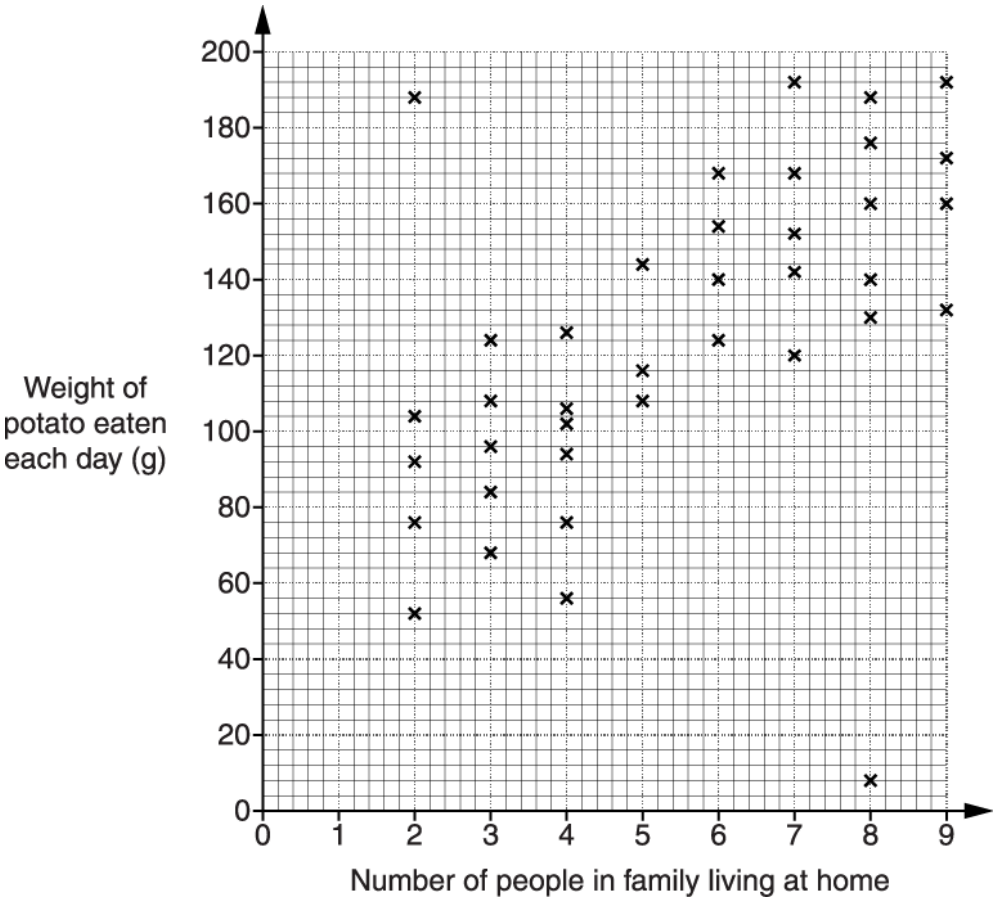
---

[1]

9. Nikki asked some people in her school these questions.

How many people in your family live at home, including you?
About what weight of potato, in grams, do **you** eat each day?

She plotted the results on this scatter graph.



(i) There are two points that do not appear to fit the pattern of Nikki's results.

Write down the answers that **one** of these two people gave to Nikki.

Number in family _____ and weight of potato eaten _____ g

[1]

(ii) What does Nikki's scatter diagram suggest about the weight of potato eaten by a person and the number of their family living at home?

_____

_____ **[1]**

(iii) Describe the type of correlation shown in the scatter diagram.

(iii) _____ **[1]**

10(a) Here is a list of numbers.

.

18 7 40 32 7 11 18 67 11 7 46

Find the mode.

_____ [1]

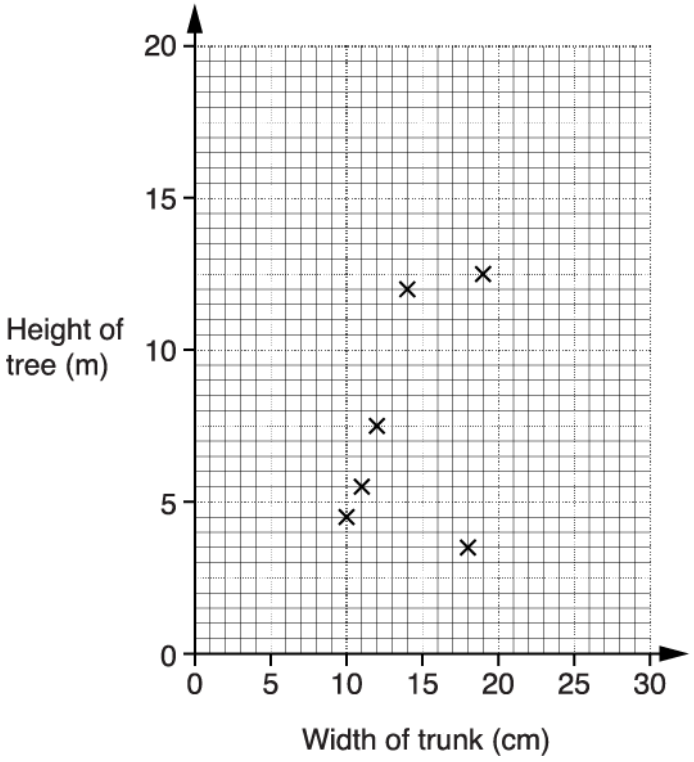
(b). Find the range.

_____ [1]

11(a) Amber measures the heights of some young trees and the widths of their trunks.

. The results are shown in the table below.

Width of trunk (cm)	10	11	12	14	18	19	22	23	28	29
Height of tree (m)	4.5	5.5	7.5	12	3.5	12.5	11.5	16	15	18



The first six points have been plotted on the scatter diagram.

Complete the diagram by plotting the last four points.

[2]

(b). State the correlation shown by the scatter diagram.

_____ [1]

(c). Use your diagram to describe the relationship between the width of a tree trunk and the height of the tree.

_____ [1]

(d).

(i) Draw a line of best fit on the diagram.

[1]

(ii) Amber has a tree with a trunk width of 25 cm.

Use your diagram to estimate the height of this tree.

(ii) _____ m **[1]**

(e). One of these trees is from a different species.

On the diagram put a circle around the point for that tree.

[1]

12. The lengths of Desmond's telephone calls, in minutes, are summarised in the table below.

Length of call (t minutes)	Number of calls		
$0 < t \leqslant 10$	0		
$10 < t \leqslant 20$	3		
$20 < t \leqslant 30$	3		
$30 < t \leqslant 40$	6		
$40 < t \leqslant 50$	8		
$50 < t \leqslant 60$	5		

Calculate an estimate of the mean length of Desmond's calls.

_____ minutes **[4]**

13. The table below summarises the lengths of Kyle's phone calls during the month.

Length of call (t minutes)	Frequency		
$0 < t \leq 2$	19		
$2 < t \leq 4$	12		
$4 < t \leq 6$	8		
$6 < t \leq 8$	7		
$8 < t \leq 10$	4		

Calculate an estimate of the mean length of a call.

_____ minutes **[4]**

14(a) 21 students completed a science test.

. Their teacher recorded their results in this table.

Mark	Frequency
4	1
5	1
6	4
7	2
8	5
9	6
10	2

What is the mode of the marks?

_____ [1]

(b). Work out the range of the marks.

_____ [1]

(c). Work out the median of the marks.

_____ [2]

15. A zoo has 8 elephants.
The ages of the elephants are

18	2	7	44	57	36	23	31

(i) Work out the range of the elephants' ages.

(i) _____ [1]

(ii) Work out the median age of the elephants.

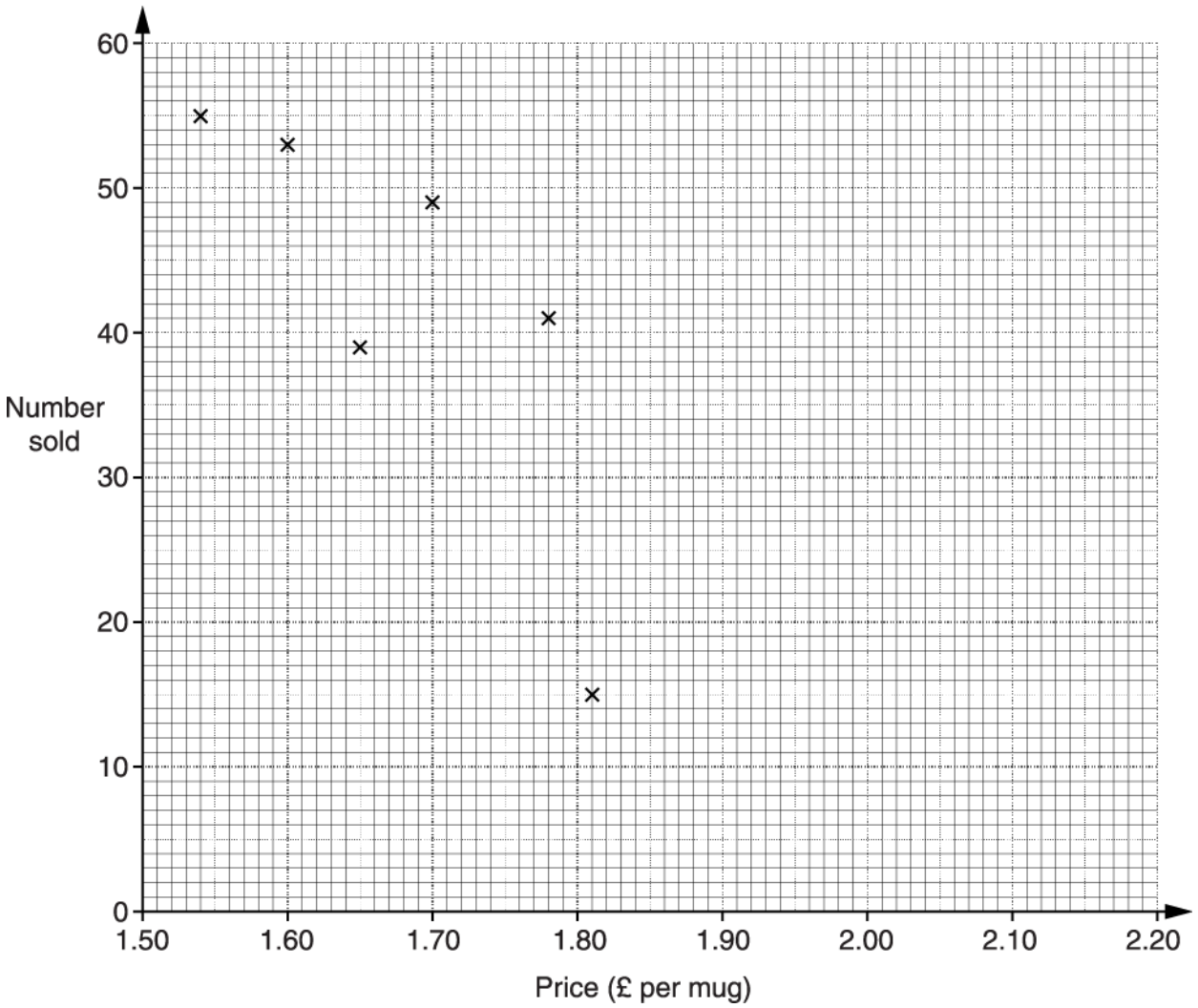
(ii) _____ [2]

16(a) Chico sells coffee in his café.

. He changes the price of a mug of coffee every day.

The table shows the number of mugs of coffee he sells and the price on each of ten days.

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
Price (£ per mug)	1.54	1.60	1.65	1.70	1.78	1.81	1.88	2.05	2.14	2.20
Number sold	55	53	39	49	41	15	40	25	28	21



The first six points have been plotted on the scatter diagram.

Complete the scatter diagram by plotting the last four points.

[2]

(b). Describe the correlation shown.

_____ [1]

(c). Draw a line of best fit on the diagram.

[1]

(d). The café closed early one day.

Put a ring around the cross that shows this day.

[1]

(e). One day Chico charges £2.00 per mug of coffee.

Use the diagram to estimate how much money **in total** Chico takes this day on coffee.

£ _____ [2]

END OF QUESTION PAPER

Question			Answer/Indicative content	Marks	Part marks and guidance	
1			Midpts 25, 35, 45… seen or implied	M1	For 3 or more correct; need not be used	eg may be seen by table
			$f \times x$ attempted	M1	Sum seen or at least 3 products seen FT *their* 'midpoints'; *their* 'midpoints' need to be in the correct class eg correct products are 75, 245, 585, 330, 65	eg allow 2nd **M1** for use of endpoints not midpoints; 1300 implies first two Ms; working for 2nd **M1** may be by table First two **M1**s may be earned for correct work seen even if not then used in the final answer
			(*Their* sum of $f \times x$) ÷ 30 soi	M1	If correct: 1300 ÷ 30	May be earned even if their 'midpoints' are not in the correct class eg Midpoint used as 25 throughout earns **M0M0M1** (*their fx* = 75, 175, 325 etc then 750 ÷ 30)
			43.3(3…)	A1	Allow **A1** for 43 if correct method seen Allow **B4** for 43.3(3…) **SC2** for 38.3(3…) or for 48.3(3…) **Examiner's Comments** Was not well done. Those who got to 1300 often divided by 5. A very common error was just to add up the frequencies and then divide that total by 5. However, candidates seem to be getting better at showing working..	Common with Higher
			Total	**4**		
2	a	i	75–95	1		
		ii	140–170	1		
		iii	The **(i)** prediction is more reliable, as it is within the range of the given data	2	**B1** for **(i)** prediction identified with partial reason	

Question			Answer/Indicative content	Marks	Part marks and guidance	
	b		No, because there may be other factors involved	2	**B1** for 'No', with partial reason	
			Total	**6**		
3		i	23 [000] nfww	2	**M1** for putting at least 9 of the wages in order	15,16,16,16,22,23,23,25,27 ,34,61 Cover errors and check remaining wages for 9 in order
		i				<u>Examiner's Comments</u> All parts were answered very well. In (i) a small number of candidates picked out the middle reading (25) of the list given. Where the data was re-listed in order, an occasional slip was made either by listing one number twice, or by omitting one. The concepts of range and mode were well understood by most, though one or two got them muddled. Occasionally the range was incorrect due to the smallest term misidentified as 16.
		ii	46 [000]	1		
		iii	16 [000]	1		
			Total	**4**		

Question			Answer/Indicative content	Marks	Part marks and guidance	
4	a		50	1		Examiner's Comments Many candidates demonstrated reading of the graph correctly, and drawing lines with a ruler resulted in more accurate answers.This was mostly correctly answered.
	b		75	1		Allow 74 – 76 Examiner's Comments This was the least well answered as many misread the graph giving an answer in the range 50 – 55, reading the height at 1 month instead of 1 year.
	c		9	1		Allow 8.5 – 9.5 Examiner's Comments A common error was from using the first line above 70, so reading from 72 instead of 71. This led to an answer of 10. Other common errors were answers in the range 8 – 8.4.
	d		6	1		Allow 5 – 7 Examiner's Comments The correct method was used by nearly all candidates with the majority of incorrect answers just outside range.
			Total	4		

Question			Answer/Indicative content	Marks	Part marks and guidance	
5	a		4 correct points	2	**B1** for 1 point correct Examiner's Comments This first common question was well answered and most candidates plotted the four points correctly.	± one small square Overlay available Ignore any joining or extra points
	b		Positive	1	Examiner's Comments Many knew that the correlation was positive. Less able candidates attempted to describe "more teams, more rolls" and gained no marks.	Ignore strong etc
	c		Correct straight line	1	Examiner's Comments Many candidates scored a mark for the line of best fit, although a number were out of tolerance. The common errors were to try to make the line pass through the origin or through the maximum point.	Within overlay 4.5 ≤ teams ≤ 11.5 Condone good freehand
	d		76, 80, 84, 88 or 92 cao consistent with their number of rolls and with all correct supporting working	4	**M1** for 115 to 140 or *their* number of rolls **M1** for (115 to 140) ÷ 6 or *their* number of rolls ÷ 6 **M1** for (19, 20, 21, 22, 23 or 24) × 4 or *their* integer quotient × 4	 FT *their* line if outside range (may be a curve) ± 1 small square soi by 19 to 24 used in a calculation but nor 6 × 4 = 24 May be rounded to multiple of 6

Question			Answer/Indicative content	Marks	Part marks and guidance	
					If 0 scored **SC1** for 76, 80, 84, 88 or 92 without supporting working. Examiner's Comments Almost all candidates read a correct value from the graph and some candidates also divided by 6 and then multiplied by 4, although often listing methods were seen. Less able candidates read from the graph and gave the value as their answer.	
			Total	8		
6		i	10 904	2	**M1** for correct order seen	
		ii	10 515	2	nfww **M1** for attempt at sum of all five [= 52 575 if correct] Or **SC1** for answer of 43577(.4) Examiner's Comments The majority of candidates gave correct answers in this question. (ii) was done quite well but common errors included 52 575 from not dividing by 5.	[Answer from forgetting to press = before dividing]
			Total	4		

Question			Answer/Indicative content	Marks	Part marks and guidance	
7	a			1	Examiner's Comments Candidates often mixed up mean, median and mode in all parts. A common wrong answer for the mode was 22, this being the maximum of the given data.	
	b		9.5	2	**M1** for at least 9 numbers ordered correctly or for at least one of 7 and 12 identified Examiner's Comments Most candidates managed to score some marks, although the correct answer for the median was not common. Candidates usually scored at least the method mark for ordering the numbers or for recognising the median was dependent on the two middle numbers, 17 and 22.	
	c	i	[Mean for 11 M =] 10.2	3	**nfww** **M1** for 5 + 0 + ... + 20 or for 102 and **M1** for ÷ 10	Condone omission of 0s M2 is implied by (e.g.) Median = 10.2

Question			Answer/Indicative content	Marks	Part marks and guidance	
		i	Y .... their mean was larger	1	Allow for Y and 14 and 10.2 or for Y and 3.8 mentioned Must see evidence of attempt to calculate a mean Examiner's Comments This part was generally not well done, with only the very best candidates scoring full marks. Many candidates did not realise that they had to actually calculate the mean and the range for Class 11M despite this being stated explicitly in the question. It was not unusual to see the range mentioned in part (i) and the mean in part (ii).	
		ii	[Range for 11 M =] 22	1		
		ii	M ..... their range was larger	1	Allow for M and 21 and 22 or for M and 1 mentioned Must see evidence of attempt to calculate a range, e.g. 22 or 1 Examiner's Comments This part was generally not well done, with only the very best candidates scoring full marks. Many candidates did not realise that they had to actually calculate the mean and the range for Class 11M despite this being stated explicitly in the question. It was not unusual to see the range mentioned in part (i) and the mean in part (ii).	
			Total	9		

Question			Answer/Indicative content	Marks	Part marks and guidance	
8	a		Negative	B1		
			Weak	B1	‘Strong’, does not score (Indep)	Allow ‘moderate’, ‘medium’ ‘quite / fairly strong’ ‘low’, ‘poor’ etc
			No oe	1	‘Scattered’ or ‘random’ without ‘no’ does not score Examiner's Comments The final question was also common to both tiers.Many lost a mark for describing the correlation in the first case as strong. Many also lost a mark in the second case for, after stating there was no correlation, then illogically, describing its strength. Weaker candidates clearly had no idea of correlation and wrote descriptions of the data being spread out or connected.	Strong / weak implies a correlation so does not score

Question			Answer/Indicative content	Marks	Part marks and guidance	
	b	i	4 points correct	2	B1 for 2 points correct Or B1 for 2 or more columns correct height <u>Examiner's Comments</u> Many used the scale correctly to complete the scatter graph and most candidates wrote a response to the final two parts. A common error in part (ii) was, effectively, to say “Because there isn't one” without explaining why. These candidates often used many words to do this. Some gave a succinct and correct response that the data formed a curve or there was no (linear) correlation.	□ half a small square. Use overlay as a guide. If columns then mark consistently left, middle or right of top
		ii	The points are nowhere near a straight line oe	1	Accept ‘No correlation’, ‘points form a curve’, there is no linear correlation, the plotted points do not form a line <u>Examiner's Comments</u> In part (ii) many candidates gave partially correct responses but, because there was only 1 mark, these were insufficient to score. A common error was to say that, as people aged their reaction times became slower, without describing the improvement from very young age to around 20 years of age. Some candidates misread the data and thought that a **higher** time meant **better** reactions.	Random’, ‘scattered’ does not imply no correlation

Question			Answer/Indicative content	Marks	Part marks and guidance	
		iii	[Getting older means] reaction time decreases [remains stable] then starts to increase.	1	Condone 'slow' then 'fast' then 'slow' soi If describing just the ends or just the middle, need to see comparatives such as slower or fastest etc.	Do not accept a list of ages and reaction times alone. Do not accept "It starts high then falls and rises again" or converse (as, in either case, "it" is undefined)
			Total	7		
9		i	8 and 8 or 2 and 188	1	Ignore other correct pair	One right pair and one or two wrong score 0 marks
		ii	More in family, more [potatoes] eaten oe	1		More family more weight
		iii	Positive	1	Ignore qualifiers eg weak or strong with positive Examiner's Comments A disappointing number of candidates could not read the scale to give the coordinates of one of the anomalous points; (2, 184) was a common wrong answer. However, most described the correlation and named it correctly.	0 for weak or strong only
			Total	3		
10	a		7	1	Examiner's Comments The majority of candidates were able to answer this question correctly.	
	b		60	1	Examiner's Comments The majority of candidates were able to answer this question correctly.	
			Total	2		

Question			Answer/Indicative content	Marks	Part marks and guidance	
11	a		Four points correctly plotted	2	**B1** for 2 points correctly plotted **Examiner's Comments** Most candidates attempted to plot the 4 points. Quite a number made errors in the scale on the y axis and so failed to gain full marks. 1 mark for 2 or 3 points plotted was common. Some candidates were careless in their plotting and others had points which were far too large, candidates should be encouraged to use a sharp pencil for completing graph work.	Overlay gives guidance, the tolerance ± ½ small square
	b		positive	1	**Examiner's Comments** Very well answered. It was pleasing to note that the correct term (positive) was used to describe the correlation rather than a sentence to describe what was happening. Very few incorrect answers were seen; they included an even selection from negative, no correlation, wordy answers e.g. “goes up”.	ignore embellishments accept + ve

Question			Answer/Indicative content	Marks	Part marks and guidance	
	c		the height increases as the width increases oe	1	accept any equivalent response	**Exemplar Response** Taller trees have wider trunks (1) Thicker trees are taller (1) Trees with a bigger trunk are taller (1) The thicker the tree the higher the trunk (1) Both go up (1) The higher the wider (1 BOD) The smaller the width the shorter the tree (1) Positive [correlation] (0) The height and the width both change (0) Height is greater than the width (0) Bigger trees have bigger trunks (0) Smaller the width the taller the tree (0) The bigger the width of the trunk the larger the tree (0) The height and the width both change (0)

Question			Answer/Indicative content	Marks	Part marks and guidance	
					Examiner's Comments Most candidates were able to describe the relationship correctly though the use of English was generally poor. Incorrect responses often failed to focus on the relationship, some had attempted to describe the nature of each measurement numerically as opposed to stating how one affects the other e.g. the height is always bigger or the height is bigger than the width, but this was infrequent.	
	d	i	correct ruled line of best fit	1	Crossing on “w = 10” 3.5 –7.5 and on “w = 25” 12.5–17.5	use overlay to judge the validity of the line of best fit
		ii	12 – 18	1	Examiner's Comments In (i) very few incorrect lines were seen. A minority drew zigzags, or a rough freehand curved line etc. Many were then able to use their line to gain a correct answer in part (ii).	
	e		(18, 3.5) indicated on diagram	1	Examiner's Comments The final part of this question showed that candidates had a good understanding of outliers, almost all candidates identified the correct point. Some had circled the point (29,18) thinking that the outlier was the point furthest to the right.	
			Total	7		

Question			Answer/Indicative content	Marks	Part marks and guidance	
12			38.6 or 39	4	**B1** for at least 4 mid-points seen (from 5, 15, 25, 35, 45, 55) or implied by products **M1** for Σmf where m is a value within each group allow one error **M1dep** for *their* '965' ÷ Σf (25) **Examiner's Comments** Many candidates were able to score, usually for the midpoints and the sum of the midpoints multiplied by the frequencies added. Some candidates lost the second mark as they did not attempt to add these products. Several then went on to divide by 6 or 180 rather than 25.	**isw** rounding 39 must not come from wrong working ie [0] + 45 + 75 + 210 + 360 + 275 = 965
			Total	4		

Question			Answer/Indicative content	Marks	Part marks and guidance	
13			3.6 **nfww**	4	**B1** for midpoints **soi** [1, 3, 5, 7, 9] **M1** for 19 × 1 + 12 × 3 + 8 × 5 + 7 × 7 + 4 × 9 condone one error or omission **M1 dep** for *their* 180 ÷ *their* 50 **Examiner's Comments** Only a minority of candidates knew how to approach finding the mean from a grouped frequency table. Of these many found an estimate for the total length of calls,180, but then either did not know what to do with this and left it or divided it by the total number of intervals, 5, rather than the total frequency, 50. There were a few good solutions. A common error was to find the total frequency, 50, and then divide this by the total number of intervals, 5.	Condone one error or omission **FT** *their* 'midpoints' where each midpoint is any point/endpoint in the interval 19 + 36 + 40 + 49 + 36 or 180 seen implies **B1M1** For **FT** eg endpoints used gives 38 + 48 + 48 + 56 + 40 implies **B0M1** *Their* 50 is from attempt to sum frequencies Attempt to divide *their* sum by *their* 50 implied by correct answer to division after total seen, dependent on previous **M1**
			Total	4		

Question			Answer/Indicative content	Marks	Part marks and guidance	
14	a		9	1	Examiner's Comments Many confused marks with frequency, consequently answers of 6 for the mode were quite common. Those who did work with marks usually found the mode and range correctly, but then did not appreciate the different frequencies of the different marks and gave an answer of 7. Data expressed in this tabular form is more difficult to work with and candidates will need to think carefully about how to apply their statistical skills when interpreting it.	
	b		6	1	Examiner's Comments Many confused marks with frequency, consequently answers of 5 (from 6 – 1) for the range were quite common. Those who did work with marks usually found the mode and range correctly, but then did not appreciate the different frequencies of the different marks and gave an answer of 7. Data expressed in this tabular form is more difficult to work with and candidates will need to think carefully about how to apply their statistical skills when interpreting it.	

Question			Answer/Indicative content	Marks	Part marks and guidance	
	c		8	2	M1 for attempt to find the middle number when marks are in order Examiner's Comments Many confused marks with frequency, consequently answers of 6 for the mode in part (a), 5 (from 6 – 1) for the range in part (b) and 2 for the median in part (c) were quite common. Those who did work with marks usually found the mode and range correctly, but then did not appreciate the different frequencies of the different marks and gave an answer of 7. Data expressed in this tabular form is more difficult to work with and candidates will need to think carefully about how to apply their statistical skills when interpreting it.	any indication where correct median is to be found is acceptable
			Total	4		

Question			Answer/Indicative content	Marks	Part marks and guidance	
15		i	55	1		
		ii	27	2	**M1** for ordered list of 8 values or 23 and 31 identified Examiner's Comments Part (i) was generally well answered, common incorrect answers were 57 and 2 – 57, in (ii) many candidates were correctly able to identify the median although some left the answer as 23, 31. A small number did not order the list and used 44 and 57 as the middle values, others wrote down the gap 8. Very few candidates attempted to calculate the mean.	List could be seen in earlier part of the question, unless alternative method leads to an incorrect answer
			Total	3		

Question			Answer/Indicative content	Marks	Part marks and guidance	
16	a		4 points correctly plotted (±1 mm)	2	**B1** for any two points correctly plotted	
	b		negative	1		Ignore any extra statements such as 'strong'
	c		ruled line of best fit between 1.60 and 2.10	1	tolerance on 1.60: 45 – 55 and on 2.10: 20 – 30	use overlay and ignore any lines joining up the points
	d		(1.81, 15) indicated on graph	1		
	e		Strict follow through from *their* line of best fit tolerance ± 2 for answer **nfww**	2FT	**M1FT** for a correct reading from their single ruled line **Examiner's Comments** The plotting of the points was, in most cases done accurately, the main problems were (2.20, 21) and (1.88, 40) where the scale did seem to confuse some. Some were difficult to judge given the thickness of the pencil. In (b) most did give the correct response, the most common incorrect responses were 'positive' and 'no correlation' while others described the relationship rather than the correlation. The line of best fit was usually ruled and within tolerance, although some did go outside the right-most limits. A small minority joined up the points. In part (d) most gave the correct answer and in (e) some misread the number sold from their line of best fit and a few gave that number rather than doubling their reading, in doing so some made further numerical errors.	allow tolerance ±1 on number sold no **FT** from a zig-zag line
			Total	7		