Measures of Location/Spread

SCAN ME

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SCAN ME

1 Four teams took part in a quiz that had seven different rounds.
The table below summarises the results for each of the rounds.

	Team 1	Team 2	Team 3	Team 4
Round 1 Score	8	6	6	8
Round 2 Score	7	6	1	9
Round 3 Score	5	2	8	9
Round 4 Score	6	8	10	9
Round 5 Score	6	8	5	8
Round 6 Score	6	5	5	8
Round 7 Score	5	6	3	5

(a) Work out the median score during round 3. **(1)**

(b) By considering the range, determine which team had the most consistent scores. **(2)**

(c) By considering the interquartile range, determine which team has the most consistent scores. **(2)**

(Total for Question 1 is 5 marks)

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2 There are 70 teachers who work at school A and 50 teachers who work at school B.

A sample of 11 teachers from school A are selected and their ages are shown below.

26 43 50 31 48 x 39 39 30 26 42

The interquartile range of the sample is 14.

(a) Explain why the median age of the sample must be 39. **(1)**

(b) Work out two possible values for x. **(2)**

A sample of 7 teachers from school B are selected and their ages are shown below.

24 29 33 35 36 40 42

(c) Compare the ages of teachers who work at school A with the ages of teachers working at school B. **(2)**

(Total for Question 2 is 5 marks)

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3 A traffic officer recorded the speeds of 2400 vehicles on a motorway.

They recorded the speeds of cars as they passed under a bridge until they had 800 cars from each of the three lanes.

The table below shows information about the speeds of the vehicles in mph.

	Lane 1	**Lane 2**	**Lane 3**
Lowest Speed	55	57	63
Q_1	58	59	64
Q_2	59	62	65
Q_3	60	64	70
Greatest Speed	61	69	71

(a) Name the type of sampling method used by the traffic officer. **(1)**

(b) Work out the lane for which the speeds of the vehicles were most consistent.
Give a reason for your answer. **(2)**

(c) Write down the percentage of the vehicles in lane 1 that were travelling below 58 mph. **(1)**

(d) Work out how many of the vehicles were travelling more than 64 mph. **(2)**

(Total for Question 3 is 6 marks)

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4 The table below shows the GCSE grades of Year 12 students taking A-Level maths at a college.

GCSE Grade	Frequency (f)
6	8
7	17
8	14
9	12

(a) Work out the range of the GCSE grades. **(1)**

(b) Work out the median GCSE grade. **(1)**

(c) Work out the lower quartile of the GCSE grades. **(1)**

(d) Work out the upper quartile of the GCSE grades. **(1)**

(Total for Question 4 is 4 marks)

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5 A company makes chocolate bars using two different machines.
The table below summarises information about the masses of 300 chocolate bars made on machine A.

Mass of Chocolate Bar (m grams)	$116 \leq m < 118$	$118 \leq m < 120$	$120 \leq m < 122$	$122 \leq m < 124$
Frequency (Machine A)	44	176	75	5

(a) Use linear interpolation to calculate an estimate for the median mass of the 300 chocolate bars made by machine A. Give your answer to 2 decimal places. **(2)**

(b) Use linear interpolation to calculate an estimate for the interquartile range of the 300 chocolate bars made by machine A. Give your answer to 2 decimal places. **(3)**

The company also records the masses of 300 chocolate bars made on machine B.

For machine B: $Q_1 = 117.9$ g $Q_2 = 120.1$ g $Q_3 = 121.4$ g

The company requires that the chocolate bars produced are close to 120 g.
If the mass is too low, customers may complain. If the mass is too high, chocolate is being wasted.

(c) Using your answers to parts (a) and (b) suggest a reason why the company may prefer to use

(i) machine A
(ii) machine B **(3)**

(Total for Question 5 is 8 marks)

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6 The race times for runners of the Brighton Half Marathon are shown below.

Race Time (t minutes)	Frequency (f)
$60 \leq t < 90$	437
$90 \leq t < 120$	3657
$120 \leq t < 150$	3053
$150 \leq t < 180$	846
$180 \leq t < 210$	152
$210 \leq t < 240$	21

The winner completed the race in 1 hour, 7 minutes and 17 seconds.

(a) Use linear interpolation to calculate an estimate for the median race time giving your answer in hours, minutes and seconds. **(2)**

The actual median time for the race was 1 hour, 59 minutes and 57 seconds.

(b) Give a reason why your answer to part (a) is different to the true median time. **(1)**

(c) Use linear interpolation to calculate an estimate for the 10^{th} to 90^{th} interpercentile range of the race times. Give your answer in hours, minutes and seconds. **(3)**

(Total for Question 6 is 6 marks)

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7 The following table summarises the maximum daily temperatures in a city, T °C to the nearest degree, recorded for the months May to October in a particular year.

Temperature (T °C)	13 – 17	18 – 22	23 – 27	28 – 32
Frequency (f)	25	32	70	57

(a) Use linear interpolation to calculate an estimate for the interquartile range for the temperatures. Give your answer to 2 decimal places. **(3)**

(b) Use linear interpolation to calculate an estimate for the 38th percentile for the temperatures. Give your answer to 2 decimal places. **(2)**

Sunny correctly calculates an estimate for the 85th percentile for the temperatures as 30.1 °C

Sunny claims "This means that 15% of the temperatures were greater than 30.1°C"

(c) Explain why Sunny's claim could be incorrect. **(1)**

(Total for Question 7 is 6 marks)

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8 The following table summarises the annual salaries, £S to the nearest £1000, of employees at a company in the year 2023.

Salary (£S)	20,000 – 29,000	30,000 – 39,000	40,000 – 49,000	50,000 – 59,000
Frequency (f)	25	15	6	2

(a) Use linear interpolation to calculate an estimate for the 20th to 80th interpercentile range of the annual salaries in 2023. Give your answer to the nearest pound. **(3)**

The company claims that between 2023 and 2024 they increased annual salaries by 10%.

For the 2024 salaries: Q_1 = £27,000 Q_2 = £31,000 Q_3 = £41,000

(b) Use linear interpolation to calculate Q_1, Q_2 and Q_3 for the salaries in 2023. **(3)**

(c) Comment on the company's claim. **(1)**

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Question 8 continued

(Total for Question 8 is 7 marks)

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