

2. Keith records the amount of rainfall, in mm, at his school, each day for a week. The results are given below.

2.8 5.6 2.3 9.4 0.0 0.5 1.8

Jenny then records the amount of rainfall, x mm, at the school each day for the following 21 days. The results for the 21 days are summarised below.

$$\sum x = 84.6$$

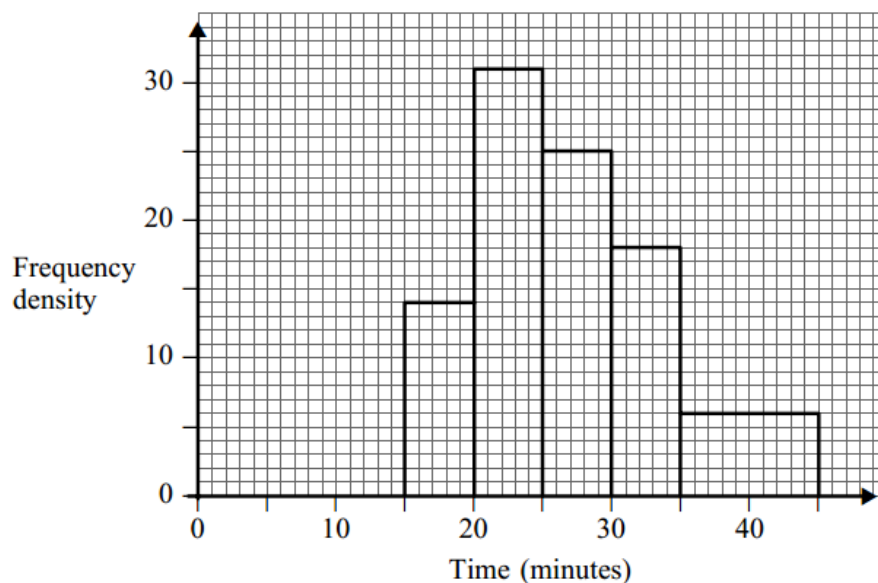
- (a) Calculate the mean amount of rainfall during the whole 28 days. (2)

Keith realises that he has transposed two of his figures. The number 9.4 should have been 4.9 and the number 0.5 should have been 5.0
Keith corrects these figures.

- (b) State, giving your reason, the effect this will have on the mean. (2)

Question Number	Scheme	Marks
2.		
(a)	$2.8 + 5.6 + 2.3 + 9.4 + 0.5 + 1.8 + 84.6 = 107$ mean = $107 / 28 (= 3.821\dots)$ (awrt 3.8)	M1 A1 (2)
(b)	It will have no effect since one is 4.5 under what it should be and the other is 4.5 above what it should be.	B1 dB1 (2) [4]
Notes		
(a)	M1 for a clear attempt to add the two sums. Accept a full expression or $2.8 + 5.6 + \dots + 84.6 = x$ where $100 < x < 110$ i.e. seeing at least two correct terms of Keith's and the 84.6 with a slip. A1 for awrt 3.8 (Condone 1 dp/2sf here since data is given to 1 dp or 2 sf) Accept $\frac{107}{28}$ or $3\frac{23}{28}$ or any exact equivalent Correct answer implies M1A1	
(b)	1 st B1 for clearly stating that it will have no effect. ("roughly the same" is B0 B0) 2 nd dB1 for a supporting reason that mentions the fact that the increase and decrease are the same and gives some numerical value(s) to support this. e.g. Sum of Keith's observations is still 22.4 (or mean is still 3.2) or Sum is still 107 or $9.4 - 4.9 = 5 - 0.5$ (o.e.) This second B1 is dependent on their saying there is no effect so B0B1 is not possible.	

- 3 A survey was made of the times taken by 500 children to complete a gymnastics circuit. The results are shown on the following histogram.



- (a) Copy and complete the following table of cumulative frequencies.

Time, in minutes, up to	15	20	25	30	35	45
Cumulative frequency	0	70				500

(3 marks)

- (b) Estimate the number of children who took more than 40 minutes to complete the circuit.
(1 mark)

- (c) Use linear interpolation to estimate the median time.

(3 marks)

3 (a)	225, 350, 440 in table	B3,2,1	3	-1 for each error
(b)	Est. no of children = 30	B1F	1	ft wrong CF for 35 min
(c)	Est. median = $25 + 5\left(\frac{250 - 225}{350 - 225}\right)$	M1A1F		Condone, eg, 250.5 for 250 Use of 20 for 25: M1A0A0
	... = 26 (minutes)	A1F	3	NMS 2/3; ft one small error
	Total		7	

6 The heights, x cm, of the 10 girls in an athletics team are such that

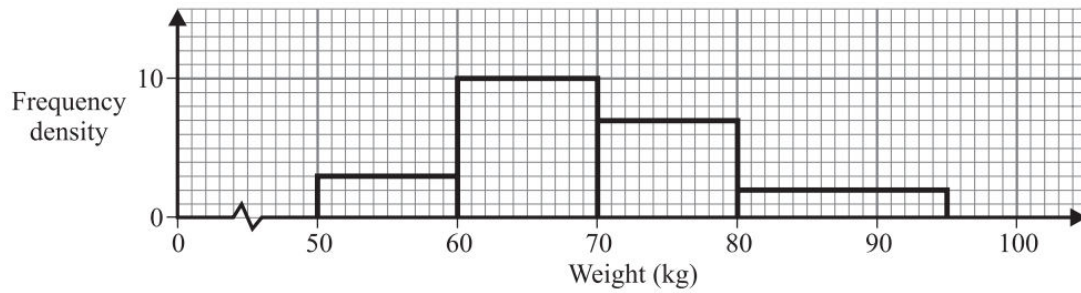
$$\sum x = 1550 \text{ and } \sum x^2 = 241\,250.$$

(a) Find the mean and variance of x . (3 marks)

(b) One girl, who is 173 cm tall, drops out of the team. Calculate the mean and variance of the heights of the remaining nine members of the team. (5 marks)

Q	Solution	Marks	Total	Comments
6	(a) Mean x is 155	B1	3	Allow NMS; condone absence of units throughout Accept AWRT 71
	Variance is $24\,125 - 155^2$	M1		
	... = 100	A1		
	(b) $\sum x = 1377$ now	M1	5	
	So mean height is 153 cm	A1		
	$\sum x^2 = 241\,250 - 173^2 (= 211\,321)$	M1		
Variance is $\frac{241\,250 - 173^2}{9} - 153^2$	m1			
... $\approx 71 \text{ cm}^2$	A1	5		
Total			8	

8 The histogram shows the weights of a group of university students.



It is given that there were 100 students with weights of between 60 kg and 70 kg.

- (a) Find the number of students in the group. (2 marks)
- (b) Using linear interpolation, calculate an estimate of the median weight. (3 marks)
- (c) Calculate an estimate of the mean weight. (4 marks)
- (d) Explain why, using the information given in the histogram, it is only possible to calculate **estimates** for the median and mean weights. (2 marks)

8	(a)	No of students (n) = $30 + 100 + 70 + \dots + 30 = 230$	B1 B1F	2	NMS 2/2; ft one error in line above
	NB If candidate misunderstands the word 'group' in (a), allow full credit for the calculation if it appears in (b).				
8	(b)	Median is m th reading, $m \approx \frac{1}{2}n$	M1		PI
		Estimated median $60 + 10\left(\frac{m - 30}{100}\right)$... ≈ 68.5 (kg)	m1 A1	3	Allow 68 or 69 if supported by calculation
8	(c)	Use of mid-interval values	M1		Allow even if one value wrong
		Calculation of $\sum xf$	M1		using x values within appropriate intervals and frequencies from the histogram
8		Division by n	m1		Dependent only on previous M mark
		Estimated mean 69.7 (kg)	A1	4	NMS 2/4; Allow 70 if supported by calculation
8	(d)	Weights are grouped	E1		
		Unknown spread	E1	2	
		Total		11	