

Averages, range and sampling

Foundation and Higher tiers | Total marks: 103

Marks

- M** Method mark, for a correct method. It can be implied by a correct answer.
- A** Accuracy mark, for a correct answer. It needs the method mark before it.
- B** A mark for a correct value or statement, with or without working.
- ft** Follow through: the mark is given for using an earlier wrong answer correctly.
- oe** Or equivalent.
- [a, b]** Any value from a to b inclusive.

Questions

Q	Skill	Spec	Tier	Grade	Calculator	Marks
1	Mode and range of a list	S4	Foundation	1	No	2
2	Median and mean of a list	S4	Foundation	2	No	3
3	Mode and mean from a frequency table	S4	Foundation	3	No	4
4	Missing value from a change in the mean	S4	Foundation	4	No	3
5	Choosing an average when there is an outlier	S4	Foundation	4	No	3
6	Estimating from a sample, and its limitations	S1	Common	4	No	3
7	Comparing two sets of data with the mean and range	S4	Foundation	4	No	4
8	Median of prices, and a price from a new median	S4	Foundation	4	No	3
9	Finding values from the averages and range	S4	Foundation	5	No	3
10	Median and interquartile range; comparing two sets	S4	Higher	6	No	5
11	Unknown frequency from the mean	S4 A17	Common	6	No	4
12	Effect on the mean and range of changing every value	S4	Foundation	6	No	2
13	An unknown group size from the change in the mean	S4 A17	Common	7	No	4
14	Mean and median of algebraic values: a quadratic	S4 A18	Higher	9	No	5
15	Range and mean of decimal data	S4	Foundation	2	Yes	3
16	Median of ten maze times	S4	Foundation	2	Yes	3

Q	Skill	Spec	Tier	Grade	Calculator	Marks
17	Totals and percentages from a frequency table	S4 R9	Foundation	3	Yes	4
18	Using the total behind a mean	S4	Foundation	3	Yes	3
19	Using a sample to estimate for a population	S1 S5	Common	4	Yes	5
20	Mean from a frequency table and choosing an average	S4	Foundation	4	Yes	4
21	Grouped data: modal class and an estimate of the mean	S4	Foundation	5	Yes	6
22	Combined mean from two groups	S4	Foundation	5	Yes	4
23	Correcting a mean	S4	Foundation	5	Yes	4
24	A mean from percentages, and working back	S4 R9	Foundation	6	Yes	5
25	Combined mean: finding the size of a group	S4 A17	Common	7	Yes	4
26	Two missing frequencies from the total and the estimated mean	S4 A19	Common	7	Yes	6
27	Combined mean with a ratio and a percentage	S4 R5 R9 A17	Common	8	Yes	4
	Total					103

Question 1 S4 · Foundation · Grade 1 · 2 marks

Q	Answer	Mark	Comments
1(a)	17	B1	
1(b)	8	B1	

Question 2 S4 · Foundation · Grade 2 · 3 marks

Q	Answer	Mark	Comments
2(a)	9	B1	
2(b)	$70 \div 8$	M1	oe
	No and 8.75	A1	ft their median from (a)

Question 3 S4 · Foundation · Grade 3 · 4 marks

Q	Answer	Mark	Comments
3(a)	1	B1	
3(b)	$0 \times 4, 1 \times 12, 2 \times 7, 3 \times 9, 4 \times 8$	M1	at least 4 correct products, may be in the table
	$85 \div 40$	M1	their total of products $\div 40$
	2.125	A1	accept 2.13 or 2.1 with working

Question 4 S4 · Foundation · Grade 4 · 3 marks

Q	Answer	Mark	Comments
4	$(7 + 4 + 10 + 11) \div 4$ or 8	M1	the mean of the four cards
	$(\text{their } 8 + 1) \times 5$ or 45	M1	oe, the total of the five cards
	13	A1	

Question 5 S4 · Foundation · Grade 4 · 3 marks

Q	Answer	Mark	Comments
5(a)	$300 \div 8$	M1	oe
	37.5	A1	
5(b)	No, with a reason	B1	eg 82 is an outlier, or the mean is more than seven of the eight ages, or the median (31.5) is more typical

Question 6 S1 · Common · Grade 4 · 3 marks

Q	Answer	Mark	Comments
6(a)	$\frac{18}{60} \times 840$ or $840 \div 60 (= 14)$	M1	oe, or 30%
	252	A1	
6(b)	a reason	B1	eg only Year 7 were asked, so the sample does not represent the school; or older students may travel differently

Question 7 S4 · Foundation · Grade 4 · 4 marks

Q	Answer	Mark	Comments
7	$54 \div 6$	M1	oe
	Cara's mean 9 and range 6	A1	
	compares the means in context	B1ft	eg Cara scored higher on average
	compares the ranges in context	B1ft	eg Ana's scores were more consistent

Question 8 S4 · Foundation · Grade 4 · 3 marks

Q	Answer	Mark	Comments
8(a)	£2.49	B1	
8(b)	$2 \times 2.52 - 2.49$ or $2.49 + x = 2 \times 2.52$	M1	oe, the eighth price and £2.49 are the middle two prices
	£2.55	A1	

Question 9 S4 · Foundation · Grade 5 · 3 marks

Q	Answer	Mark	Comments
9	4, 4, 5 as the three smallest	B1	or 13 as the largest
	5×7 or 35	M1	the total of the five numbers
	4, 4, 5, 9, 13	A1	in any order

Question 10 S4 · Higher · Grade 6 · 5 marks

Q	Answer	Mark	Comments
10(a)	3.1	B1	
10(b)	2.4 and 3.8 identified as the quartiles	M1	or 3.8 – 2.4
	1.4	A1	
10(c)	compares the medians in context	B1	eg the parcels at depot A were heavier on average. ft their median
	compares the interquartile ranges in context	B1	eg the masses at depot A were more consistent (less spread out). ft their IQR

Question 11 S4 A17 · Common · Grade 6 · 4 marks

Q	Answer	Mark	Comments
11	$1 \times 5 + 2x + 3 \times 9 + 4 \times 6$ or $56 + 2x$	M1	the total number of runs
	$20 + x$	M1	the total frequency
	$56 + 2x = 2.5(20 + x)$	M1	oe, ft their expressions
	12	A1	

Question 12 S4 · Foundation · Grade 6 · 2 marks

Q	Answer	Mark	Comments
12(a)	34	B1	
12(b)	27	B1	

Question 13 S4 A17 · Common · Grade 7 · 4 marks

Q	Answer	Mark	Comments
13	$6n$	M1	the total of her first cards
	$6n + 3n$ or $9n$	M1	the total of all her cards
	$9n = 7.5(n + 3)$	M1	oe, eg $1.5n = 22.5$
	15	A1	

Question 14 S4 A18 · Higher · Grade 9 · 5 marks

Q	Answer	Mark	Comments
14	median = $2x - 1$ and mean = $\frac{x^2 + 4x + 8}{5}$	M1	oe
	$x^2 + 4x + 8 = 5(2x - 1 + 4)$	M1	oe
	$x^2 - 6x - 7 = 0$ and $(x - 7)(x + 1) = 0$	M1	oe, a correct method to solve their quadratic
	$x = 7$ with $x = -1$ rejected	A1	eg -1 is less than 3, so the numbers would not be in order
	46	A1	the numbers are 3, 7, 13, 13, 49

Question 15 S4 · Foundation · Grade 2 · 3 marks

Q	Answer	Mark	Comments
15(a)	0.45	B1	
15(b)	$5.45 \div 6$	M1	oe, the total of the six masses $\div 6$
	0.91	A1	accept 0.91 or [0.908, 0.909]

Question 16 S4 · Foundation · Grade 2 · 3 marks

Q	Answer	Mark	Comments
16(a)	the times in order, or 40.68 and 41.38 identified	M1	oe
	41.03	A1	
16(b)	40.68	B1ft	ft their ordered list

Question 17 S4 R9 · Foundation · Grade 3 · 4 marks

Q	Answer	Mark	Comments
17(a)	$1 \times 138, 2 \times 95, 3 \times 61, 4 \times 44, 5 \times 22$	M1	at least four correct products, may be in the table
	797	A1	
17(b)	$\frac{127}{360} \times 100$	M1	oe, $61 + 44 + 22 = 127$ out of 360
	35.3	A1	accept 35.3 or [35.27, 35.28]

Question 18 S4 · Foundation · Grade 3 · 3 marks

Q	Answer	Mark	Comments
18	13×3.74	M1	oe
	48.62	A1	the total mass of the 13 parcels
	No with 50.07 kg, or with 1.38 kg of space left	A1	

Question 19 S1 S5 · Common · Grade 4 · 5 marks

Q	Answer	Mark	Comments
19(a)	$1184 \div 8$	M1	oe
	148	A1	
19(b)	their $148 \times 2000 (= 296\,000)$	M1	oe
	296	A1ft	ft their mean $\div 1000 \times 2000$
19(c)	use a larger sample	B1	oe

Question 20 S4 · Foundation · Grade 4 · 4 marks

Q	Answer	Mark	Comments
20(a)	$4 \times 3, 4.5 \times 5, 5 \times 9, 5.5 \times 12, 6 \times 8, 6.5 \times 6, 7 \times 2$	M1	at least five correct products, may be in the table
	their $246.5 \div 45$	M1	dep on the previous M1
	5.48	A1	accept 5.48 or [5.477, 5.478]
20(b)	the mode, with a reason	B1	eg it is the size sold most often; or the mean (5.48) is not a size you can order

Question 21 S4 · Foundation · Grade 5 · 6 marks

Q	Answer	Mark	Comments
21(a)	$10 < d \leq 20$	B1	oe
21(b)	midpoints 5, 15, 25, 35, 45	M1	at least four correct, may be in the table
	$5 \times 5 + 15 \times 14 + 25 \times 12 + 35 \times 10 + 45 \times 6 (= 1155)$	M1	oe, at least four products using midpoints
	their $1155 \div 47$	M1	dep on the previous M1
	24.6	A1	accept 24.6 or [24.57, 24.58]
21(c)	the exact distances are not known	B1	oe, eg midpoints are used for each group

Question 22 S4 · Foundation · Grade 5 · 4 marks

Q	Answer	Mark	Comments
22(a)	$18 \times 41 (= 738)$ or $12 \times 36.5 (= 438)$	M1	
	$(738 + 438) \div 30$	M1	oe
	39.2	A1	
22(b)	an explanation	B1	eg there are more adults than children, so the two means cannot just be averaged; or she needs the total of all the scores

Question 23 S4 · Foundation · Grade 5 · 4 marks

Q	Answer	Mark	Comments
23(a)	28×61.25 or 1715	M1	the total of the marks he used
	their 1715 – 47 + 74 or 1742	M1	oe, or $27 \div 28$ added to 61.25
	62.21	A1	accept 62.21 or [62.214, 62.215]
23(b)	a correct explanation	B1	eg one mark went up and none went down, so the middle marks cannot be lower

Question 24 S4 R9 · Foundation · Grade 6 · 5 marks

Q	Answer	Mark	Comments
24(a)	0.35×12.40 (= 4.34) or 0.45×8.15 (= 3.6675) or 0.2×21.60 (= 4.32)	M1	oe, eg uses 100 customers: $35 \times 12.40 = 434$
	$4.34 + 3.6675 + 4.32$	M1	oe, eg $(434 + 366.75 + 432) \div 100$
	£12.33	A1	accept 12.3275
24(b)	$(13 - 4.34 - 3.6675) \div 0.2$	M1	oe, eg $(1300 - 434 - 366.75) \div 20$
	£24.96	A1	accept 24.9625

Question 25 S4 A17 · Common · Grade 7 · 4 marks

Q	Answer	Mark	Comments
25	24×8.5 or 204	M1	the girls' total
	$7b$ and $7.9(24 + b)$	M1	oe, using b for the number of boys
	$204 + 7b = 7.9(24 + b)$	M1	oe, or $14.4 = 0.9b$
	16	A1	

Question 26 S4 A19 · Common · Grade 7 · 6 marks

Q	Answer	Mark	Comments
26(a)	$a + b = 88$	M1	oe, eg $9 + a + 47 + b + 6 = 150$
	midpoints 12, 16, 20, 24, 30 used with the frequencies	M1	eg $108 + 16a + 940 + 24b + 180$
	$108 + 16a + 940 + 24b + 180 = 150 \times 19.44$	M1	oe, eg $16a + 24b = 1688$
	a correct method to eliminate one unknown	M1	eg $16a + 16b = 1408$ subtracted, giving $8b = 280$
	$a = 53$ and $b = 35$	A1	
26(b)	$18 < m \leq 22$	B1ft	ft their a and b

Question 27 S4 R5 R9 A17 · Common · Grade 8 · 4 marks

Q	Answer	Mark	Comments
27	uses 4 boys and 5 girls (or $4n$ and $5n$) and $1.08g$ for the boys' mean	M1	oe
	$4 \times 1.08g + 5g = 9 \times 152.4$	M1	oe, eg $9.32g = 1371.6$
	$g = 1371.6 \div 9.32 (= 147.167\dots)$ and $\times 1.08$	M1	oe
	158.9	A1	accept 158.9 or [158.94, 158.95]