
STATISTICS

Paper 1

SPECIMEN MARK SCHEME

4040/01

For Examination from 2018

2 hours 15 minutes

MAXIMUM MARK: 100

This document consists of **6** printed pages.

MARK SCHEME NOTES

The following notes are intended to aid interpretation of mark schemes in general, but individual mark schemes may include marks awarded for specific reasons outside the scope of these notes.

Types of mark

- M** Method marks, awarded for a valid method applied to the problem.
- A** Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. For accuracy marks to be given, the associated Method mark must be earned or implied.
- B** Mark for a correct result or statement independent of Method marks.

When a part of a question has two or more 'method' steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. The notation '**dep**' is used to indicate that a particular M or B mark is dependent on an earlier, asterisked, mark in the scheme.

The notation '**ft**' implies that the A or B mark indicated is allowed for work correctly following on from previously incorrect results. Otherwise, A and B marks are given for correct work only.

Abbreviations

- AG** answer given on question paper
awrt answer which rounds to
cao correct answer only
dep dependent
ft follow through after error
oe or equivalent
SC special case
soi seen or implied
www without wrong working

Question	Answer	Marks
1(a)	mode	B1
1(b)	range	B1
1(c)	median	B1
1(d)	standard deviation	B1

Question	Answer	Marks
2(a)(i)	quota	B1
2(a)(ii)	systematic	B1
2(b)	employment status	B1
	because working women may need to be at work in the afternoon <i>[any other reasonable data item/reason B1/B1, e.g. whether or not a woman has any children/because a woman with children may prefer to attend in the afternoon when the children are at school]</i>	B1

Question	Answer	Marks
3(a)	25	B1
3(b)	actors who have worked in LA and R but not M	B1
3(c)	correct method for number of actors (13 + 5 + 3 + 4 + 9 + 6)	M1
	40/48 oe	A1
3(d)	4/9	B1

Question	Answer	Marks
4(a)	6	B1
4(b)	$(6 + 0 + 8 + 2 + 1 + 6 + 0 + 9 + 6 + 4 + 1)/11$ (= 43/11)	M1
	3.9	A1
4(c)	ordering of data	M1
	4	A1
4(d)	3 ft	B1

Question	Answer	Marks
5(a)	as the value of one of the variables increases, the value of the other also increases	B1
5(b)	positive and strong	B1
	negative and weak	B1
5(c)	any diagram with positive correlation	B1
	diagram with less than perfect positive correlation	B1
5(d)	appropriate use of positive/negative and strong/weak for their diagram in (c) ft	B1

Question	Answer	Marks
6(a)	$(70 - 55)/100 \times 80$	M1
	\$12 million	A1
6(b)	$(35/100) \times 360$	M1
	126°	A1
6(c)	any use of squares of radii	M1
	correct use of squares of radii	M1
	3.5 cm	A1

Question	Answer	Marks
7(a)	at least two of 15, 22 and 17	B1
	54	B1
7(b)	any appreciation of area being proportional to frequency (<i>can be earned here or in (c)</i>)	M1
	6	A1
7(c)	rectangle in correct position with height 5	A1
7(d)	modal class	B1
7(e)	product of two probabilities with denominators 70 and 69	B1
	$3540/4830$ oe	B1

Question	Answer	Marks
8(a)	attempted use of class mid-points (3.0 3.3 3.5 3.7 3.9 4.1 4.4) *	M1
	correct method for mean dep	M1
	accurate expression for mean ($\sum fx = 139.1$ $\sum f = 38$)	A1
	3.66	A1
	finding values of $f \times$ variable squared	M1
	correct method for SD or variance dep	M1
	correct expression for SD or variance ($\sum fx^2 = 513.65$ mean = 3.66 or better or 3.6 or 3.7)	A1
	0.343	A1
8(b)(i)	Q	B1
8(b)(ii)	T	B1
8(c)	38×3.70 (= 140.6)	M1
	180 – <i>their</i> 140.6 (= 39.4)	M1
	<i>their</i> 39.4/180	M1
	0.219 or 0.22	A1

Question	Answer	Marks
9(a)	any one age group rate multiplied by standard population figure	M1
	sum of four such products	M1
	$(50 \times 0.18) + (184 \times 0.22) + (136 \times 0.25) + (15 \times 0.35)$	A1
	88.7	A1
9(b)	correct method for any age group	M1
	145 828 714 87	A1
9(c)	<i>their</i> values from (b) added (= 1774)	M1
	2900 + 4500 + 5250 + 5800 (= 18450)	M1
	$(\textit{their} 1774 / \textit{their} 18450) \times 1000$	M1
	96.2	A1
9(d)	7.8 used anywhere and 8.5 not used	M1
	<i>their</i> 18450 \times 2	M1
	$\times 7.8/1000$ or $\times 8.5/1000$	M1
	<i>their</i> births – <i>their</i> deaths (= 1774 – 288)	M1
	1486	A1

Question	Answer	Marks
10(a)	8 33 85 166 245 313 350 365 (allow B1 follow through for one error)	B2
10(b)	correct horizontal plots *	M1
	correct vertical plots *	M1
	suitable curve dep (earned provided at least one M scored)	A1
10(c)(i)	21 °C	B1
10(c)(ii)	Q1 = 15.1 °C – 15.5 °C	B1
	Q3 = 26.5 °C – 27.0 °C	B1
	use of IQR = Q3 reading – Q1 reading	M1
	11 °C – 11.9 °C	A1
10(d)(i)	2 °C	B1
	<i>their</i> (c)(i) + 2 °C ft	B1
10(d)(ii)	<i>their</i> (c)(ii) ft	B1
10(e)	attempt to read cf value for T = 34 °C (\approx 345) and subtract from 365	M1
	20 ft	A1

Question	Answer	Marks
11(a)	correctly plotted points <i>(allow B1 for 6 or 7 correct)</i>	B2
11(b)	indication of need to order x values	M1
	$(927 + 1085 + 1219 + 1361)/4$	A1
11(c)	correct method for LSA	M1
	$(559.75, 25.75)$	A1
11(d)	correct method for gradient using any pair of averages	M1
	$m = 0.0280$ or 0.028	A1
	$c = 10.0$ to 10.1	B1
11(e)	it indicates the number of teachers required for a school with zero pupils	B1
11(f)	reasonable line through seven points with a clear outlier above their line	B1
11(g)	correct method for gradient using points chosen from line	M1
	$m = 0.035$ to 0.038	A1
	<i>their</i> intercept correct to nearest integer ft	B1
11(h)	any indication of recognition that m is related to pupil-teacher or teacher-pupil ratio	M1
	Belpert because there are more teachers per pupil oe so pupils receive more individual attention ft (or possibly Astra because there are fewer teachers per pupil oe so more opportunities for individual learning ft) <i>choice consistent with reason</i>	A1