

## **MARK SCHEME for the October/November 2015 series**

### **4040 STATISTICS**

**4040/13**

Paper 1, maximum raw mark 100

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2015 series for most Cambridge IGCSE<sup>®</sup>, Cambridge International A and AS Level components and some Cambridge O Level components.

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## 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 symbol  $\nabla$  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

Page 3	Mark Scheme	Syllabus	Paper
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1	(i) 5		B1
	(ii) $4 + 5 + 6 + 6 + 7 + 3$ 31		M1 A1
	(iii) 4		B1
	(iv) identifies their 16th student 3		M1 A1
2	(i) $100^\circ \pm 2^\circ$		B1
	(ii) $"100"/360 \times 212 (= 58.88888888 \dots)$ 59		M1 <sup>↖</sup> A1 <sup>↖</sup>
	(iii) $\sqrt{(137/212)} \times 3$ 2.41 cm		M1 A1
	(iv) larger as a proportion		B1
3	(i) ordered list/register $175/25 = 7 \rightarrow$ every 7th random start in range 1–7		B1 B1 B1
	(ii) $52/175 \times 25 (= 7.42857 \dots)$ 7		M1 A1
	(iii) depends on where they start OR 60 not a multiple of 7 OR differently ordered lists		B1
4	(i) 49		B1
	(ii) $36/41 \times 100$ 87.8(%)		M1 A1
	(iii) $(57 + 45)/492$ 20.7(%)		M1 A1
	(iv) boys increasing OR girls constant OR overall increase		B1
5	(i) 0.3		B1
	(ii) $7/10$ $\times 3/9$		B1 B1
	(iii) $7/10 \times 6/9 \times 3/8$ $7/40$ $7/24$ OR $1 - (7/30 + \textit{their P}(1) + \textit{their P}(3))$ calculated		M1 A1 B1

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6	(i) (a) colour/shape/material etc.	B1
	(b) e.g. number of sides etc.	B1
	(c) mass/length of side/area etc.	B1
	(ii) (a) 11	B1
	(b) 22	B1
	(c) 30	B1
7	(a) product of correct pair of probabilities for SS, SG, GS or GG (stop stop, stop go etc.) 1 – GG or SS + SG + GS 0.791	M1 M1 A1
	(b) (i) $0.5 \times 0.78$ 0.39	M1 A1
	(ii) $0.5 \times (1 - 0.64)$ 0.18	M1 A1
	(iii) $1 - (0.39 + 0.18)$ 0.43	M1 A1
	(iv) $(1 - "0.43") \times (0.78)^2$ 0.347	M1 <sup>1/2</sup> A1
	(v) $0.36 \times 0.78 (= 0.2808)$ $0.36 \times 0.22 \times 0.36 (= 0.028512)$ $0.64 \times 0.36 \times 0.78 (= 0.179712)$ addition 0.489	M1 M1 M1 M1 A1

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8	(i) 8 points correct (B1 for 6 or 7 correct)	B2
	(ii) any correct method for either semi-average (37.5, 31.7) (57.5, 45.7)	M1 A1 A1
	(iii) all 3 correctly plotted (ft their semi-averages) straight line through at least two of their plotted averages	B1 B1
	(iv) correct ratio using two of the averages or two points on their line $m = 0.7$ substitution $c = 5.45$	M1 A1 M1 A1
	(v) original length of spring	B1
	(vi) (a) 35 cm	B1
	(b) 58 cm (ft their line or equation, $\pm 0.5$ if using line)	B1 <sup>ft</sup>
	(vii) Because 75 g is outside the range of the data the reading at 42 g is likely to be more reliable	M1 A1
9	(i) 10	B1
	(ii) (a) 47 s	B1
	(b) reading from cf of 35 (= 44 s) reading from cf of 105 (= 51 s) "51" – "44" (provided at least one B1 earned) 7 s	B1 B1 M1 <sup>ft</sup> A1
	(c) 33 s–33.5 s	B1
	(iii) (a) reading from time of 40 s 18	M1 A1
	(b) reading from time of 49 s (= 88) – "18" 70	M1 <sup>ft</sup> A1
	(iv) $89/140 \times 100$ 64th	M1 A1
	(v) $60/100 \times 130$ 78 So max. is 70 (ft their (iii) (b) and "78")	M1 A1 B1 <sup>ft</sup>

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<b>10 (i)</b>	correct use of cross-over 3	M1 A1
<b>(ii) (a)</b>	$2.5 \times 2$ 5	M1 A1
<b>(b)</b>	$1.5 \times 6 + "5"$ 14	M1 <sup>ft</sup> A1
<b>(iii)</b>	$8/27 \times 1.5 (= 0.444 \dots)$ + 2.5 2.94 cm	M1 M1 A1
<b>(iv)</b>	443/60 7.38 $3489/60 - (443/60)^2 (= 3.636388888\dots)$ $\sqrt{\quad}$ 1.91	M1 A1 M1* M1dep A1
<b>(v)</b>	9.38 ( <i>ft their mean</i> ) 1.91 ( <i>ft their sd</i> )	B1 <sup>ft</sup> B1 <sup>ft</sup>
<b>11 (i)</b>	$21/3500 \times 1000 = 6$	B1
<b>(ii)</b>	$12/b \times 1000 = 2.5$ 4800	M1 A1
<b>(iii)</b>	5 7.5	B1 B1
<b>(iv)</b>	75 (21 + 12 + 27 + 15) 15700 (3500 + 4800 + 5400 + 2000) "75"/"15 700" $\times 1000$ 4.78	M1 M1 M1 <sup>ft</sup> A1
<b>(v)</b>	15	B1
<b>(vi)</b>	Any correct product of death rate and standard pop Sum of 4 such products $(6 \times 0.21) + (2.5 \times 0.29) + (5 \times 0.35) + (7.5 \times 0.15)$ <b>ft</b> 4.86	M1 M1 A1 <sup>ft</sup> A1
<b>(vii)</b>	Because it has a lower SDR Birchville	M1 A1