

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
GCE Ordinary Level

**MARK SCHEME for the October/November 2009 question paper
for the guidance of teachers**

4040 STATISTICS

4040/02

Paper 2, maximum raw mark 100

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- 1 (i) Any valid argument relating to use of true, rather than stated, class limits. B1
- (ii) 2 15 35 57 74 79 B1
- (iii) Determination of 60th item as the upper quartile B1
 $129.5 +$
 $[\text{'their } 3/17] \times 20$ M1
 133.0 g (must be 1dp) A1
- [6]
- 2 (i) Any valid comment relating to the fact that $P(A) + P(B)$ is greater than 1. B1
- (ii) $P(A \cup B) = P(A) + P(B) - P(A \cap B) = 0.55 + 0.7 - 0.4$
Correct use of formula M1
 $= 0.85$ A1
In (iii) allow ft only if results are valid probabilities.
- (iii) (a) $1 - 0.85 = 0.15$ WWW (ft 1 – 'their 0.85') B1ft
- (b) Use of $P(A) + P(B) - 2P(A \cap B) = 0.55 + 0.7 - 0.8$
or 'their (ii)' – 0.4
or $0.6 - \text{'their (iii) (a)'}$
Any valid method M1
0.45 A1ft
- [6]
- 3 (i) A (Simple) random sampling B1
D Systematic sampling B1
- (ii) Unbiased A C D Biased B E B2
(–1 each error or omission)
- (iii) B biased because the claims do not all have an equal chance of selection B1
E biased because doesn't involve random selection (or any other valid statement) B1
- [6]
- 4 A False B1
B False B1
C False B1
D True B1
E True B1
F False B1
- [6]
- 5 (i) Three dual bars with all heights correct. B1*
Full annotation. B1*dep
- (ii) Two bars of equal height with sections numerically correct. B1**
Full annotation B1**dep

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- (iii) Dual chart illustrates comparison of the two years for each hospital
Sectional chart illustrates comparison of use of each hospital in each year

- 6 (i) Attempted use of an assumed mean of 299 M1
Mean of X = 0.63 A1
Use of X-values in a correct formula for s.d. or variance M1
s.d. = 0.43 A1
- (ii) Mean of results = 299.63 B1ft
s.d. of results = 0.43 B1ft

[6]

- 7 (a) Any appreciation of the mean being affected by both increases M1
Attempt to use a valid standardisation procedure for the mean M1
 $\{[230 - 20] \times 35\} / 30 + 25$ or valid argument using multiples of s.d. above or below mean M1
Mean = \$270 A1
Any appreciation of the s.d. being affected by only the per subject increase M1
New s.d. = $90 \times (35/30)$ M1
= \$105 A1
- (b) (i) 32 and 24 seen as marks for Papers I and II B1
 $48 \times (5/4) = 60$ B1
Final mark = $32 + 24 + 60 = 116$ B1
- (ii) Correct standardisation method applied (may be implied by correct answer for either Paper I or Paper II mark) M1*
Scaled Paper I mark = 35 A1
Scaled Paper II mark = 30 A1
Scaled Paper III mark = 50 B1
Summing the scaled marks dep M1*
 $35 + 30 + 50 = 115$ A1

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- 8 (i) Attempt to sum relevant angles and express as a proportion of 360

$$P(W) = 1/10 = 0.1$$

$$P(L) = \frac{1}{2} = 0.5$$

$$P(SA) = 2/5 = 0.4$$

(The M1 may be implied by any one correct probability.)

Sequence of outcomes	Probability	Amount won (\$)
W	$1/10 = 0.1$	5
L	$\frac{1}{2} = 0.5$	0
SA W	$1/25 = 0.04$	6
SA L	$1/5 = 0.2$	1
SA SA W	$2/125 = 0.016$	7
SA SA SA	$8/125 = 0.064$	3
SA SA L	$2/25 = 0.08$	2

- (ii) Correct sequences (–1 each error or omission)

B2

- (iii) Correct probabilities (–1 each error or omission, but allow ft from (i) for first two)

B2

- (iv) Correct amounts won (–1 each error or omission)

B2

- (v) Appreciation of need to select outcomes which win \$2.
0.08 (ft sum of prob of selected outcomes)

M1

A1ft

- (vi) Attempt at correct method of finding expected amount won
\$1.40
Comparison of result with \$2.
Loss of 60 cents.

M1*

A1

dep M1*

A1ft

[16]

- 9 (i) Insurance and Tax = 440 = 450
Maintenance = $55 \times (19000/1000)$
= 1045 = 1050
Fuel $(0.9 \times 19000 \times 7.8)/100$
= 1333.8
= 1350

B1

M1

A1

M1

A1

A1

- (ii) Any attempt to relate weights to total costs
3 : 7 : 9

M1

A1

- (iii) Fuel price relative = $(1.08/0.9) \times 100 = 120$
(needn't be evaluated, but to score MUST include '×100')
Following M-marks may score using 'their' figures

B1

$$[(111 \times 3) + (108 \times 7) + (120 \times 9)] / (3 + 7 + 9) \text{ correct numerator}$$

M1

divided by correct denominator dep M1*

$$= 2169/19 = 114.2$$

A1

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- (iv) $(2820 \times \text{'their 114.2'})/100$
 $= \$3220$ must be to nearest \$10
- (v) Any valid comments score, e.g.
 May have changed to a car with a different consumption B1
 May have travelled a considerably different distance B1
[16]
- 10** (i) $.2 \times .2 \times .2$ or $1/5 \times 1/5 \times 1/5$ M1
 $= 0.008$ or $1/125$ A1
- (ii) $(.2)^3 + (.35)^3 + (.45)^3$ or $(1/5)^3 + (7/20)^3 + (9/20)^3$
 sum of three products each containing three terms M1
 sum of correct products A1
 $= 0.142$ or $71/500$ A1
- In (iii), (v) and (vi) accept decimal results to 3sf or more.
- (iii) $.35 \times .35 \times .45$ or $7/20 \times 7/20 \times 9/20$ M1*
 $\times 3$ dep M1*
 $= 0.165375$ or $1323/8000$ A1
- (iv) $.35 \times .45 \times .2$ or $7/20 \times 9/20 \times 1/5$ M1
 $\times 6$ M1
 $= 0.189$ or $189/1000$ A1
- (v) Sight of 0.65 or $13/20$ (anywhere) B1
 $.35 \times .35 \times .65 \times 3$ or $7/20 \times 7/20 \times 13/20 \times 3$ M1
 $= 0.238875$ or $1911/8000$ A1
- (vi) $[\text{'their (i)}] / [\text{'their (ii)}]$ M1
 $= 0.0563$ or $4/71$ A1ft
[16]
- 11** (i) Because each value is the average of an even number of observations (or equivalent comment.) B1
- (ii) $w = 246$ $x = 483$ $y = 59.375$ one mark for each B3
- (iii) The value for quarter I of 2008 is not given (or equivalent comment) B1
- (iv) Suitable scales used B1
 Full annotation B1
 Correct plots (ft 'their' y) –1 each error or omission B3
- (v) Single straight line passing centrally through the plotted points M1
 The overall trend is a gradual decrease in sales A1
- (vi) Any appreciation of the fact that the quarterly components must sum to 0 M1
 $q = 6.9$ A1
- (vii) Attempt to read the line at the correct point AND subtract 5.9 M1
 Value from 'their' reading A1ft
[16]