

Edexcel GCSE

Statistics 1389

Paper 1H

June 2007

advancing learning, changing lives

Mark Scheme

## NOTES ON MARKING PRINCIPLES

### 1 Types of mark

M marks: method marks

A marks: accuracy marks

B marks: unconditional accuracy marks (independent of M marks)

### 2 Abbreviations

cao - correct answer only

ft - follow through

isw - ignore subsequent working

SC: special case

oe - or equivalent (and appropriate)

dep - dependent

indep - independent

### 3 No working

If no working is shown then correct answers normally score full marks

If no working is shown then incorrect (even though nearly correct) answers score no marks.

### 4 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.

Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader. If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work. If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

If there is no answer on the answer line then check the working for an obvious answer.

### 5 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.

Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

**6 Ignoring subsequent work**

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: eg. incorrect cancelling of a fraction that would otherwise be correct

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect eg algebra.

Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

**7 Probability**

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).

Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.

If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

**8 Linear equations**

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

**9 Parts of questions**

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

1389 / 1H - SECTION A				
No	Working	Answer	Mk	Notes
1 (a)		23.39	1	B1
(b) (i)		EITHER: Petroleum OR Petrol		B1
(ii)		EITHER: Natural gas OR Gas	2	B1
(c)		They are <b>decreasing</b> over time	1	B1
2 (a)		<u>Number</u> has increased  Larger area/ same proportion but larger circle	2	B1 for 'increase'/ 'went up'/ 'got bigger'/ 'doubled', etc oe B1 for 'larger area'/ 'bigger area'/ 'pie chart bigger'/ 'size of pie chart doubled'/ 'bigger radius' etc oe
(b)		To get a representative sample	1	B1 for 'representative' oe
(c)	$\frac{81}{386} \times 40 (= 8.39)$	8	1	B1 for 8 or 9
3 (a)	$\frac{40}{N} = \frac{5}{40}$	320	2	B2 for 320 cao  (B1 for $\frac{5}{40}$ or $\frac{1}{8}$ or 0.125 or $\frac{40}{5}$ or 8 seen)
(b)		The size of the population is unchanged/ the population is well mixed	1	B1 for reason eg 'constant population'/ 'mixed population'/ 'marks are permanent'/ 'equally likely to catch the fish the second time'/ 'same proportion in second catch'/ 'for every 40 fish in the lake 5 will be marked', etc oe

## 1389 / 1H - SECTION A

No	Working	Answer	Mk	Notes
4 (a)		EITHER: The <b>whole population</b> is used. OR: It will give <b>unbiased</b> results. OR: It will give <b>accurate</b> results. (or equivalents)	1	B1
(b)		EITHER: Answers are <b>easy to put into</b> (Accept any one of) <b>tables, graphs or pictures</b> . OR: The <b>answers are easy to understand</b> . OR: The <b>questions are easy to understand</b> . OR: The <b>questions are easy to answer</b> . ( or equivalent)	1	B1
(c)		EITHER: Do a <b>pilot</b> . OR: <b>Test it</b> . OR: <b>Trial it</b> . ( or equivalent)	1	B1
(d)		EITHER: Do you <b>agree or disagree</b> that the proposed pension scheme should be compulsory. <input type="checkbox"/> Agree <input type="checkbox"/> Disagree OR: Should the proposed pension scheme be compulsory. Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know <input type="checkbox"/> (or equivalents)	2	B1 B1 (Second B for boxes)

## 1389 / 1H - SECTION A

No	Working	Answer	Mk	Notes
5 (a)	$\sum d^2 = (20)$	0.83(3...)	3	M1 using differences in rank M1 for attempt to find $\sum d^2$ A1 for 0.83 or better
(b)	$1 - \frac{6 \times 20}{9(9^2 - 1)} =$	'The greater the GDP (wealth) the greater the life expectancy'; Strong/good/positive correlation	2	B2 ft for 'The greater the GDP (wealth) the greater the life expectancy' oe (B1 ft for 'positive' oe) (ft (a) only if $ r  \leq 1$ )
6(a)(i)		Qualitative		B1
(ii)		Quantitative	2	B1
(b)		<u>C</u> Plus EITHER: It will give a <b>more representative</b> sample OR: It will <b>cover more hours</b> . (or equivalents)	1	B1
(c)		<u>Z</u> Plus EITHER: A tally is <b>quick to use</b> . OR: It is <b>easy</b> to work out totals for a tally. (or equivalents)	1	B1

1389 / 1H - SECTION A				
No	Working	Answer	Mk	Notes
7 (a)	$\frac{10.85 - 10.95}{0.238} =$ $\frac{48.36 - 49.62}{1.290} =$	<p>−0.42(0...)</p> <p>−0.97(6...)</p>	3	<p>M1 for a clear attempt to use <math>\frac{x - \mu}{\sigma}</math></p> <p>M1 for a correct substitution (may be implied by correct answer)</p> <p>A1 cao for both (truncated or rounded)</p>
(b)		<p>Roman Sebrle performed better in the 400m race. His standardised score is further from the mean</p>	2	<p>B1 (dep) ft for '400m better' oe</p> <p>B1 (dep) ft for reason, e.g. 'score further from mean' or 'larger negative score' oe</p> <p>(dep on both method marks in (a)).</p>
8 (a)		Systematic sampling	1	B1 for 'systematic' or 'periodic'
(b)		95	1	B1 for 95 or 95.0 or 95.4 or 95.44
(c)	$505 - 3 \times 1.6 =$ or $500 + 3 \times 1.6 =$	<p>500.2 or 504.8</p> <p>Peter should 'reset the machine'</p>	3	<p>M1 for <math>505 - 3 \times 1.6</math> or <math>500 + 3 \times 1.6</math></p> <p>A1 for 500.2 cao or 504.8 cao</p> <p>A1 for 'reset' or 'readjust' oe</p> <p><b>Alternative scheme:</b></p> <p>M1 for <math>(500 - 505)/1.6</math></p> <p>A1 for -3.1(25)</p> <p>A1 for 'reset' or 'readjust' oe</p>

## 1389 / 1H - SECTION B

No	Working	Answer	Mk	Notes
1 (a)		Trend line - (between (1996, 190) and (1997, 190) at one end and (2002, 270) and (2003, 270) at other. The line must at least cover 1998 to 2002	1	B1
(b)		It is rising. (or equivalent)	1	B1
(c)		Anything between 280 - 290 Allow mark for digits 280 and 290 e.g. 280000 Ignore units	1	B1
(d)		EITHER: It goes <b>outside the range</b> of the data. OR: It involves <b>extrapolation</b> . Oe	1	B1
(e)		No. £273 000 million is well below the trend OR Any other sensible answer.	2	B1 B1
2 (a)		Negative skew	1	B1 for 'negative' or 'minus'
(b)		50	1	B1 for 50 or 0.5 or 'half' or $\frac{1}{2}$ oe
(c) (i)		51	3	B1 for 51 cao
(ii)		44		B1 for answer in range 43 - 44 cao
(iii)		58		B1 for answer in range 57 - 60 cao
(d)	IQR = 58 - 44 58 + 1.5 × IQR =	79 86 > 79      86 is an outlier	3	M1 for attempt to find 1.5 × 'IQR' A1 for answer in range 76.5 - 85.5 A1 (dep) for conclusion, e.g. 86 > 'a' (where a is in range 76.5 - 85.5) or '86 is an outlier' oe



1389 / 1H - SECTION B				
No	Working	Answer	Mk	Notes
(e)		Box plot drawn	3	M1 for drawing a box plot with median at '51' A1 for whiskers at 32 <u>and</u> 70 or 'a' or 86 (where a is in the range 76.5 - 85.5) A1 for 86 shown as outlier
(f)		The people in tour A are generally older than the people in tour B but the ages have a wider IQR	2	aspect 1: a comment that compares the medians, e.g. tour A older/higher median oe aspect 2: a comment that compares the spread, e.g. tour B wider range/smaller IQR oe aspect 3: a comment that describes the skew of tour B, e.g. symmetrical/no skew/normal B2 for 2 aspects (B1 for 1 aspect)
3 (a)		Negative/ linear correlation	1	B1 for 'negative'/'size of skull decreases with age' oe
(b)		(1.4, 113)	2	B2 for (1.4, 113) cao (B1 for 1.4 or 113 seen ,or for (113, 1.4))
(c) (i)		(1.4, 113 ) plotted	2	B1 (1.4, 113 ) $\pm$ one 2mm square
(ii)		Line of best fit drawn		B1 for line of best fit with 'intercept' in range 200 - 250 on vertical axis and 2.5 - 3 on horizontal axis
(d)		130 - 170	1	B1 for answer in range 130 - 170
(e)		Not typical of the data, it is a long way from the rest of the data. There may be a reason for this eg the skull is from a juvenile ape	2	B1 for recognising the skull is not typical B1 for a statistical or a practical reason why the skull may not be typical (SC B2 for 'yes, may be a baby (ape) oe

## 1389 / 1H - SECTION B

No	Working	Answer	Mk	Notes
(f)		A very small volume will be predicted (which may not be feasible for this type of ape)	1	B1 for a statistical or a practical reason, e.g. 'can not assume the trend will continue/ a very small volume will be predicted (which may not be feasible for this type of ape)/ a negative volume is predicted', etc oe
(g)	$\frac{\text{difference in } y}{\text{difference in } x}$	$a = -80 \pm 20$ $b = 225 \pm 25$	3	M1 for $\frac{\text{difference in } y}{\text{difference in } x}$ to find gradient (may be implied by appropriate triangle on graph), or an attempt to solve simultaneous equations using two points on their line. A1 for $a = -80 \pm 20$ B1 ft for $225 \pm 25$ or for 'their intercept' from a line of best fit
(h)		$a$ gives the (average) decrease in volume per million years	2	B2 for 'decrease (or increase) in volume per (million) year(s)' oe (B1 for incomplete description involving rate, e.g. 'decrease (or increase) per (million) year(s)' or 'decrease/ increase in volume')

## 1389 / 1H - SECTION B

No	Working	Answer	Mk	Notes
4 (a)		Branches marked on tree diagram	3	B1 for $\left(\frac{1}{5}\right), \frac{4}{5}$ (left branches) B1 for $\left(\frac{1}{3}\right), \frac{2}{3}$ (top right branches) B1 for $\frac{1}{4}, \frac{3}{4}$ (bottom right branches)
(b)	$\frac{1}{5} \times \frac{1}{3}$	$\frac{1}{15}$	2	M1 for $\frac{1}{5} \times \frac{1}{3}$ or $0.5 \times 0.33(3\dots)$ A1 for $\frac{1}{15}$ or $0.066(6\dots)$ or $0.067$
(c)	$\left(\frac{1}{5} \times \frac{2}{3}\right) + \left(\frac{4}{5} \times \frac{1}{4}\right)$	$\frac{1}{3}$	3	M1 for " $\frac{1}{5} \times \frac{2}{3}$ " or " $\frac{4}{5} \times \frac{1}{4}$ " (follow through probabilities in tree diagram) M1 for addition of two products from correct branches A1 for $\frac{1}{3}$ or (e.g. $\frac{20}{60}$ ) or $0.33(3\dots)$
(d)		Binomial	1	B1 for 'binomial' cao
(e)	$5(0.8)(0.2)^4$	0.0064	2	B1 for $0.2$ or $\frac{1}{5}$ seen (may be implied by answer) B1 for $0.0064$ or $\frac{4}{625}$

## 1389 / 1H - SECTION B

No	Working	Answer	Mk	Notes
(f)	0.33, <u>0.41</u> , 0.20	4	2	M1 for attempting to evaluate at least one other probability A1 for 4 cao
5 (a)	$\frac{(9 \times 1.5) + \dots}{200} =$ $\frac{1290.5}{200} =$	6.4525	3	M1 for $fx$ with $x$ within interval (including ends) at least two consistently M1 for $\frac{\sum fx}{200}$ A1 for 6.45(25) cao
(b)	Frequency density	Bars with correct heights and widths Heights: 3(k), 23.5 (k), 38 (k), 30 (k), 11.5 (k)	3	B2 for 5 rectangles with correct widths and heights (allow $\pm$ half 2mm in the heights) (B1 for 3 rectangles with correct widths and heights (allow $\pm$ half 2mm in the heights)) B1 for key or 'frequency density' (SC if 0/3 award M1 if clearly using area or freq. density)
(c)	$6 + \frac{6}{60} \times 2 =$	6.2	2	B2 for an answer which rounds to 6.2 (B1 for 100 or 100.5 (customers) seen or implied)
(d)		False, as 'mean > median' or 'positive skew'	2	B1 for 'false' oe B1 for reason, e.g. 'mean > median' or 'positive skew' or 'not symmetrical'

## 1389 / 1H - SECTION B

No	Working	Answer	Mk	Notes
6 (a)		Quicker/ cheaper/ easier Unknown origin/ may be unreliable	2	B1 for advantage eg 'quicker/ cheaper/ easier' B1 for disadvantage eg 'unknown origin/ may be unreliable'/ '(information) may be out of date'
(b)	eg $\frac{137000}{128000} \times 100 =$	107.0(3) 106.2(0) 107.5(6)	3	M1 for eg $\frac{137000}{128000} \times 100$ (may be implied by correct answer) A2 for 107.0(3), 106.2(0), 107.5(6) rounded or truncated (A1 for any one correct)
(c)		106.4 - 106.9	2	M1 for attempt to find $\sqrt[4]{106.7 \times p \times q \times r}$ , where $p$ , $q$ and $r$ are ft from (b) A1 for 106.4 - 106.9
(d)		On average, the price of these houses has increased by 6.8(6) % each year.	2	B1 ft for 'increase' B1 ft for 6.8(6)% rounded or truncated (ft their positive number in (c)).