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Examiners' Report June 2008

GCSE

GCSE Statistics 1389

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Publication Code – UG020458

June 2008

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1. PRINCIPAL EXAMINER'S REPORT – PAPER 1389/1F

1.1. GENERAL COMMENTS

1.1.1. This paper was accessible to the majority of the candidates and there was little evidence to suggest that they were short of time.

1.1.2. The average attainment of candidates this year is slightly lower than last year but many of the weaker candidates were able to make some progress in questions throughout the paper.

1.1.3. The presentation of work was generally good. Most candidates showed the intermediate stages in their calculations and written responses were usually done in the spaces provided.

1.1.4. When comparing distributions candidates should be encouraged to compare summary statistics rather than particular point values in the data.

1.1.5. Candidates should be advised that all comparison should be made explicit.

1.1.6. When defining a random sample the random process should be clearly defined.

1.2. INDIVIDUAL QUESTIONS

1.2.1. Question A1

This question was generally done well. Most candidates were able to draw a suitable data capture sheet. Many numbered each of the 50 spins. Common incorrect answers here were sample space diagrams and tree diagrams.

1.2.2. Question A2

Part (a) was not done well. Only a small proportion of the candidates were able to correctly assign the words to the particular types of data. In part (b), most candidates were able to work out the correct mean from the numbers given in the table. Candidates who made an error in calculating the total number of umbrellas sold were able to score a mark for dividing their total by 12.

1.2.3. Question A3

Parts (a) and (b) were done well by most of the candidates. In part (c), a significant number of candidates did not score the mark because they referred to the number of people in Northern Ireland and/or the United Kingdom rather than the percentage. A typical incorrect answer here was 'more people in Northern Ireland'. A small number of candidates compared only a single age group (usually 15 – 19).

1.2.4. Question A4

Generally this question was generally done very well. In part (a), the vast majority of candidates were able to write down the required air temperature. In part (b), most candidates were able to describe the correlation as negative, and there were many correct answers involving a practical interpretation. In part (c), the vast majority of candidates were able to plot the mean point and draw a suitable line of best through it, but some drew the line to intercept with the origin. In part (d), most candidates were able use the line of best to find an estimate of the height, but a significant number of these were unable to interpret the scale used on the axis. A common incorrect answer here was 2.56. A small number of candidates incorrectly gave the intercept on the *y*-axis for their answer.

1.2.5. Question A5

Parts (a) and (b) were generally done very well. In part (c), many candidates were able to score a mark for comparing the overall change in temperature between these years. A typical response here was ‘hotter in 1983’, but few went on to compare the general change in temperatures with depth or with duration. A significant number of candidates compared temperatures in individual cells rather than the overall changes over the period. Some candidates interpreted the diagram as showing a change in the depth of the sea over this period rather than a change in the temperature.

1.2.6. Question A6

Part (a) was done well by the vast majority of the candidates. In part (b), most candidates were able to describe the trend as increasing, but some, perhaps thinking that a correlation was involved, gave their answer incorrectly as ‘positive trend’. Some candidates worked out the differences in the mean ages for successive years but then did not tie these together to describe the overall trend of the data. In part (c), most candidates were able to identify the correct column in the table, but only the best candidates managed to describe how this showed that there were more male births for each of the years during this period. Some candidates simply said that this was shown in the column Male births per 1000 female births without explaining how this was shown, whilst others just compared one of the years and did not say that this was true for all the years. In part (d), only the best candidates were able to infer the trend from the table and give a suitable reason for their answer. A significant number of candidates did not appreciate that it was the trend in the data that was the subject of the question. A typical insufficient reason here was ‘the percentages for mothers not born in the UK are low, so the percentages of mothers born in the UK are high’.

1.2.7. Question A7

Part (a) was done well by most of the candidates. Only the best candidates were able to score both marks in part (b). Few candidates attempted this question by first drawing a tree diagram. Common incorrect answers here were (0.6 + 0.7 =) 1.3 and (1.3/2 =) 0.65.

1.2.8. Question B1

Parts of this question were done well by many candidates. In part (a), the vast majority of the candidates were able to write down the total number of medals from the composite bar chart. In part (b), most candidates were able to work out the number of gold medals. The most common incorrect answer here was 4. In part (c), most candidates were able to draw a suitable composite bar chart. Some candidates either had difficulty interpreting the scale accurately or made an error in adding the cumulative totals of the medals. A significant number of candidates drew their bar chart upside down. In part (d), about a third of the candidates were able to calculate the angle in the pie chart accurately, but there were many who simply measured the angle and consequently scored no marks. Parts (e) and (f) were generally done well. In part (f) the vast majority of candidates were able to complete the table so that it contained a total of 72 medals.

1.2.9. Question B2

This question was done well by most candidates. In part (a), many candidates were able to complete the table accurately to score all 3 marks. A surprising number of candidates did not use a '5-bar gate' to represent a group of 5 in the table but they were not penalised. Parts (b) and (c) were generally done well. In part (c), most candidates were able to score 2 marks for comparing and contrasting information from the table. The most common responses here were, typically, 'more males than females', 'more males than females aged 21 – 30' and 'same number of females in each age group'.

1.2.10. Question B3

Only the best candidates were able to do well on all of this question. In part (a), about three quarters of the candidates were able to complete the table accurately. In part (b), about half the candidates were able to write down the model number of eggs. A common incorrect answer here was 16. In part (c), only the best candidates were able to use their values from the table to work out the mean. Common incorrect methods here were 62/6 and 620/6. Part (d) was not done well. Few candidates were able to find the median from the frequency table. Common incorrect answers here were 9.5 (the median of the numbers 7, 8, 9, 10, 11, 12) and 13.5 (the 'median' of the numbers 2, 8, 12, 15, 16, 9). Part (e) was not done well. Few candidates were able to say which average would best describe the number of eggs in a nest. The most common correct answer here was, typically, 'mean, uses all data'.

1.2.11. Question B4

Part (a) was done well by most candidates but some, as usual, confused this census with the National Census. The most common correct answers here were ‘cheaper’ and ‘quicker’. Part (b) was done very poorly. Hardly any candidates were able to write a suitable sample frame. Many thought that this question was asking about a type of sampling technique. Part (c) was not done well. Many candidates did not appreciate that it is necessary to uniquely label each of the sample elements before using a random process to select them. A common incorrect answer for the random selection process was, typically, ‘use a calculator’. The random process must be clearly defined. Part (d) was generally done well. In (i), most candidates were able to score both marks for a suitable question with response boxes. In (ii), most candidates were able to write down a suitable statistical diagram to show the results, but only about half of these could give a suitable reason for their choice of diagram. A common correct answer here was ‘bar chart- shows the result clearly’. A common incorrect answer here was ‘tally chart- easy to use’. Part (d) was not done well. Only the best candidates were able to give two correct reasons for a pilot survey. Common incorrect answer here were that the pilot survey was being used ‘to check the results from the main survey’ or ‘to see if it is worth doing the actual survey’.

1.2.12. Question B5

In part (a), about a quarter of the candidates were able to score all the marks for calculating and plotting the moving averages. Those candidates unable to calculate moving averages, e.g. those who continued the sequence of numbers by subtracting 0.3 each time to get 54.4 and 54.1, were still able to score a mark for plotting three correct moving averages from the table. Most candidates realised that the moving averages need to be plotted at periods 2, 3, 1... but a few started at 1 (rather than 2). Part (b) was generally done well. Many candidates were able to describe the trend as decreasing and most did not refer to particular moving average values. Part (c)(i) was not done well. A significant number of candidates referred to a specific period in the table, typically, ‘May – Aug in 2005’ (which was also the smallest value in the table), rather than the common seasonal period during these years. In part (c)(ii), about only the best candidates were able to give a sensible reason for the reduced number of cars made in this period, many of these were based on the period being in summer. A common acceptable answer here was, typically, ‘workers on holiday so less made’, and a common unacceptable answer here was, typically, ‘summer so people like to walk’. Only the very best candidates were able to score both marks in part (d). Popular incorrect methods here were $\frac{166}{159}\times 100$ (common), $\frac{159}{166}$, 166 – 159, $\frac{166+169}{2}$ and $\frac{166\times 159}{100}$ (rare).

1.2.13. Question B6

Part (a) was generally done well. Most candidates were able to score at least 1 mark for this question. Part (b) was not done well. Few candidates understood what was meant by the skewness of the distribution, many thought that this was something to do with spread. Part (c) was done well only by the best candidates. A common insufficient answer here was ‘Grey squirrels are heavier than Red squirrels’, i.e. neither the medians nor the spreads of the distributions were compared. When comparing distributions candidates should be encouraged to compare summary statistics rather than particular point values such as the highest and lowest values or quartiles. Some candidates produced answers involving an implied comparison, e.g. ‘the median for the Grey squirrels is 500 and the median for the Red squirrels is 300’. Candidates should be advised that all comparison should be made explicit. In part (d), only the best candidates were able to use the box plots accurately to determine a particular type of squirrel. A common insufficient response here was, typically, ‘if it’s heavy it’s grey’.

2. PRINCIPAL EXAMINER'S REPORT – HIGHER PAPER 1389/1H

2.1. GENERAL COMMENTS

2.1.1. The paper seemed to be accessible to most students and almost all had adequate time to complete.

2.1.2. The quality of work was good for many questions but there was a tendency not to base answers on the statistics. This was particularly the case in question B8 where candidates often wrote about the physical attributes of squirrels rather than the statistical evidence shown by the data and box plots.

2.1.3. Handwriting was often poor and candidates wrote outside the boundaries of the answer space. The space given is always adequate for a correct answer to be given even if the candidate's handwriting is large.

2.1.4. It was noticeable that some candidates had not covered some aspects of the specification. Often the topics missed out were relatively easy for candidates to understand and get marks on. One felt that some able candidates did not get marks commensurate with their ability because of this.

2.2. INDIVIDUAL QUESTIONS

2.2.1. Question A1

This question was often answered well although some candidates incorrectly thought that lack of labelling with percentages was misleading.

2.2.2. Question A2

It was pleasing to see that candidates often got part (b) correct. Many seem at last to know what is meant by trend and few wrote about the numbers. Most candidates recognised that the 'Male Births per 1000 female births' was the key to answering part (c) but they failed to say that all numbers in that column were over 10000.

Candidates often got only ½ for part (d). They often failed to give a correct reason. This was strange since they needed to understand the last column to get the first mark. Generally the incorrect reasons given were none statistical.

2.2.3. Question A3

The whole of this question was usually answered well. The most common error was in part (c) where candidates referred to the population, number or amount of people, rather than the percentage.

2.2.4. Question A4

Most candidates could get marks on this question with parts (a) and (b) almost always being correct. In part (c) candidates often showed no working but did manage to get the correct answer. A large minority did 62 divided by 6 and got 10.3 which they often rounded to 10 – this got no marks. Another common incorrect answer was 9.5

Part (e) was done better than expected – more candidates seem to understand the benefits of the different measures of centrality than in past years.

2.2.5. Question A5

This is a fairly standard question requiring 'bookwork' knowledge. It is disappointing to find so many candidates getting it wrong. Part (a) was often answered none statistically with comments about flying and aeroplanes. There are still a lot of candidates that don't understand the concept of random sampling. Systematic sampling was often described in part (c).

2.2.6. Question A6

Part (a) was answered well but it was not uncommon to see the average monthly rental for June (or sometimes May) being found instead of July.

2.2.7. Question A7

Part (a) was generally answered well. Many candidates struggled with part (b). It was common to see $\sqrt{5196408}$ used for Σx. Sometimes candidates attempted to use the given value of Σx^2 in the wrong version of the formula for standard deviation. Other errors included Σx^2 being divided by 6422 (or their answer to part (a))^2 divided by 8

Candidates often got quite muddled with part (c) Many though that 720 was the new mean. Others thought that the mean would rise because another number was being added on. Of those who correctly recognised that the mean would be lower most could not explain clearly the reason why.

2.2.8. Question A8

This question was only tackled with any degree of success by the most able. In part (a) a minority recognised the significance of 2 standard deviations but many got an incorrect final answer of 95% or 5%.
If they did get (a) correct, in (b) the commonest error was to consider 2.5% less than 260gm to show it was still above 250gm.

Very few candidates could see any connection between part (a) and part (b). A fair sized minority got one mark in (b) for saying it did conform but they clearly did not understand why.

2.2.9. Question B1

Part (a) was done extremely well. Most candidates do know what a box plot looks like. The rest of the question was only done well by a minority of candidates.

Part (b) clearly asked for the skewness to be described. A statistical description is required. Answers such as 'even' or 'to the right' were not accepted. Some candidates ignored the question and compared the quartiles.

Part (c) is a question that has cropped up in several past papers and still candidates get it wrong. In this case they compared the squirrels – bushy tails, fat, thin etc. rather than the **distribution** of the squirrels. To compare distributions you need to compare, as a minimum, a measure of centrality and a measure of spread. In the case of a box plot this means comparing the medians and either the range or the IQR. Candidates who had some idea of what to do often called Q_2 the mean rather than the median.

Part (d) again often elicited comments on the physical attributes of the squirrels rather than using the box plots. Those candidates that did use the box plots often only considered squirrels of 300gm or 500 gm.

In this question a number of candidates thought that the same answers would do for all parts and put in several double headed arrows to hedge their bets. This does not make it any easier to get marks. Unless the candidates makes it quite clear that the answer he wants considering is in a different place the answer next to the question is the one that is marked.

2.2.10. Question B2

Most candidates could do part (bi) but otherwise this question was very badly done. Most candidates had no idea how to complete a Venn diagram. A few candidates managed to do all of (b) correctly despite having an incorrect Venn diagram.

In (c) most candidates used 200 for the denominator of the fraction rather than 131

2.2.11. Question B3

Part (b) was well done although the wording was often poor. Many candidates found the equation difficult to find. The intercept was sometimes correct but the gradient was often inverted. Candidates should be encouraged to draw larger triangles on their graphs if finding the gradient – it is very difficult to do from a tiny triangle.

Often the answer to part (d) was correct. Few candidates used their answer to part (c) choosing to read the value off the graph instead.

2.2.12. Question B4

Part (a) was quite well done but parts (b) and (c) were done badly. Few candidates mentioned that the numbers would be very small to represent the country. They also did not realise the possible bias created by using only 10 towns. Candidates did not seem to appreciate that you should always try to use closed answers if possible.

2.2.13. Question B5

Part (a) was generally correct. In part (b) answers such as mode or frequency were common suggesting that candidates do not really understand the meaning of the word ‘distribution’.

Many candidates knew nothing about the Binomial but those who had covered this topic made sensible attempts at part (c). Some rounded prematurely and in part ii) candidates often finished half way through.

2.2.14. Question B6

Candidates who had studied standardised scores had little difficulty in gaining full marks on part (a). Some candidates could not actually do the calculation. They wrote55 – 52/ 15 but then put the answer 51.5 not taking into account the order of operations rules.

Part (b) was answered well on the whole. There was a significant number of candidates who put ‘Tyson did better in statistics because they are both out of 100 and he got a higher mark in statistics’, clearly missing the concept of comparing with the group.

The answers to part (c) were a bit more ‘hit and miss’. A small majority of candidates managed to understand that statistics was easier but few commented on the spread or variability of the marks. A number of candidates did not really understand the question and commented on the group’s performance compared to Tyson.

2.2.15. Question B7

Students who had studied this topic generally managed to get 5 out of the 6 marks. Part (a) was well done with just a few candidates reversing the ranks. Occasionally candidates squared and got negative numbers which gave them incorrect Σd^2.

In part (b) some candidates forgot the 1 of the short formula, or put it at the top of the fraction. Some candidates made arithmetical errors giving them an answer well outside the range -1 to +1. They did not seem to realise that this was not an acceptable answer and went on to try to interpret it.

In part (c) most candidates got one mark for putting positive correlation but few also gave a correct interpretation in context. Inadequate answers such as ‘there is an association between the two’ were fairly common.

2.2.16. Question B8

This question was well done by a good proportion of the candidates. Answers were a great improvement on previous years. Part (a) was often correct although some candidates seemed to make a guess at where the bars should be.

In part (b) candidates often commented on just the most common shoe size not understanding that the manufacturer would be able to decide how many of each size to make.

In part (c) many candidates managed to get 100.100.5 or 10/10.5 and were able to identify the group that contained the value. The majority then went on to incorrectly pick the middle of the group 262.5 scoring 2/3 marks. The idea of interpolation was ignored.

A pleasing number of candidates understood the concept of the median of grouped data even if they were unable to find the exact value within the group.

2.2.17. Question B9

Many candidates gained at least 5 marks for this question. Correct answers were usually found in part (a) and plotted correctly in part (b). A small number of candidates plotted the points in quarters 1 and 2 of year 4. The line of best fit was usually quite well drawn although a few candidates just joined the points.

In (d) candidates often got the correct answer but then were not able to use this in conjunction with their trend line to do (e) Of those managing to do this few remembered to give their answer in hundreds.

3. PRINCIPAL EXAMINER'S REPORT – COURSEWORK 1389/02

3.1. GENERAL COMMENTS

3.1.1. Most centres organised their work well though some are still using excessive packaging which is costly in terms of postage and moderation time. Treasury tags or string are the preferred method of securing work and it does help if pages are numbered.

3.1.2. A minority of centres caused problems by failing to send their work to the moderator on time. Most of the work was accompanied by candidate record forms signed by both the teacher and candidate. Some candidate numbers were missing which causes additional work for the moderator. A number of centres did not send the work of the highest and lowest marked candidates; these are essential to the moderation process. The marks on the candidate record forms did not always match the marks on the OPTEMS and the breakdown of marks by strand was omitted by a few centres. The candidate record forms will be removed during moderation and centres are advised to ensure the candidates name and number is also clearly marked on at least the first page of the coursework.

3.1.3. Where present, annotation was very helpful in showing the moderator where the centre marks were being awarded. This enabled the moderator to agree or explain why their mark disagreed with that given by the centre.

3.1.4. Some centres showed no evidence of internal moderation. In a number of cases obvious inconsistencies were seen where marks had not been agreed across the centre. Centres do not seem to realise that this can penalise some of their candidates. Centres should look at the Coursework Guide for exemplification of the criteria and examples of marked coursework.

3.2. COURSEWORK TASKS

Mayfield High was still by far the most popular task but much of the resulting coursework lacked spontaneity and individuality.

Very few centres encouraged a free choice of topic. Creativity and enthusiasm were seen when candidates followed a line of investigation which had captured their interest. These projects were generally awarded better marks particularly in strand 1.

AJB Sports and Estimation both saw a rise in popularity and candidates produced some interesting work. Other projects which were investigated all met the assessment criteria including Share prices, Micro Climates and House Prices. Some of these showed welcome evidence of different subject departments working together.

3.2.1. ASSESSMENT

Strand 1a: Planning

There was a marked weakness in the planning of work this year. A lot of work appeared to be teacher – led with candidates producing very similar plans. Often coursework evolved and there was no forward planning of strategy to tackle the hypotheses – sometimes it was difficult to even find the hypotheses. This is understandable with weak candidates but able candidates should recognise the need for a forward plan but allow for things evolving should the results suggest it would be a good idea. To say 'I will use lots of diagrams and calculations' is insufficient. We need to know, in the introduction, what exact techniques will be used to tackle each hypothesis and why. Centres are reminded that the project should form a coherent whole not a series of vaguely related investigations. Marks are awarded for the quality and succinct use of the correct statistical techniques. Many projects are still too long as candidates attempt to demonstrate all known statistical techniques many of which are redundant. For example instead of calculating the mean, mode and median the candidate might say 'I will calculate the median to avoid extreme values' in their plan and then just carry out that calculation unless, of course, they need all 3 e.g to test for the normal distribution.

A mark of 3 requires the candidate to plan the use of at least 'C' grade techniques to make comparisons. Many centres awarded marks of 4 or above without a justified use of 'A' grade techniques to compare between sections of the population or with the Normal Distribution. The candidate must fore see and plan for possible problems which might arise.

Many centres concentrated on describing their data collection rather than what they were going to do with the data.

Strand 1b: Collecting Data

Many candidates still give a textbook list of all known sampling methods with their definitions. A properly justified convenience sample is worth marks if used to collect primary data.

Care must be taken when using a stratified sample. It is only appropriate if the strata are drawn together within the project. Many candidates took stratified samples with small samples for each strata. These were then used as sub samples within the project and were not of adequate size. The candidate should choose the best sampling method for the project they are undertaking and explain why.

'I am taking a particular type of sample to avoid bias' is of little value unless the candidate explains what bias means and what might have happened if they had not taken that particular sample.

Mark 3 requires the technique for choosing a correctly named sample to be fully explained. The candidate must consider problems within their data for a mark of 4 or above. A number of more able candidates failed to consider anomalies.

Strand 2a: Analysis, Presentation and Diagrams
This strand was the most accurately marked by centres and good use was made of ICT.

There were some strange scatter graphs e.g. boys' weight plotted against girls' weight which demonstrate a lack of understanding. Scatters were often drawn with inappropriate lines of best fit and a contradictory comment made.

The lack of units detracted from many diagrams particularly box plots. To achieve marks at grade C and above the diagrams must be drawn to enable comparisons to be made, have a sensible scale and be properly labelled with units.

Even the most able candidates failed to discuss the scales they used. When unequal class intervals were used they were rarely properly discussed or justified.

Strand 2b: Calculations
Most of the projects did include calculations often using higher level techniques.

The calculation of Spearmans coefficient of rank correlation or Standard Deviation is only worthy of mark 7 if it is planned, its use justified and the result interpreted. Spearmans' was often calculated on an inappropriately small sample often where there was obviously no correlation.

Strand 3: Interpretation
This was generally the weakest area in performance and the most generously marked. The better interpretation came from centres where an analytical approach to data-handling had clearly been started lower down the school, and the candidates were able to apply their results intelligently but this is a demanding skill.

The weaker candidates described their calculations but failed to interpret their results in the context of the original problem.

Only the very best students really understand the concept of spread and many gave very peculiar interpretations of the range, inter-quartile range and standard deviation. Some of the best candidates use the mean and standard deviation to justify the normal distribution.

Only the very best candidates evaluated their projects or discussed the significance of what they had found in context.

3.3. CONCLUSION

There was some really impressive work in which candidates demonstrated enthusiasm and a depth of understanding for the techniques they employed. These left us feeling very privileged. Too many candidates are still spending too much time producing repetitive diagrams and calculations without a clear aim as to why they are doing so; leading to superficial interpretations and not enhance learning or understanding.

Thank you to the teachers at all of our centres for the time and effort they have put in enabling their candidates to experience a statistical investigation from conception through to interpretation and evaluation. This is essential if they are to appreciate the power and value of statistics in today's world.

4. STATISTICS

4.1. MARK RANGES AND AWARD OF GRADE

Unit/Component	Maximum Mark (Raw)	Mean Mark	Standard Deviation	% Contribution to Award
1389/1F	80	43.2	12.3	75
1389/1H	100	52.8	18.3	75
1389/02	40	21.0	5.3	25

4.2. GRADE BOUNDARIES

The table below gives the lowest raw marks for the award of the stated uniform marks (UMS).

	Max	A*	A	B	C	D	E	F	G
1F	80				**47**	38	29	**21**	13
1H	100	74	**58**	42	**27**	**17**	12		
02	40	30	**26**	22	**18**	**15**	13	**11**	9

4.3. OVERALL GRADE BOUNDARIES

The table below gives the minimum subject marks required for each overall grade.

	A*	A	B	C	D	E	F	G
Foundation				54	42	31	20	9
Higher	74	60	46	32	22	17		