



General Certificate of Secondary Education

Mathematics (Modular) 4302

Specification B

Examiners' Report

2006 examination – November series

- Module 1
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Set and published by the Assessment and Qualifications Alliance.

The Assessment and Qualifications Alliance (AQA) is a company limited by guarantee registered in England and Wales 3644723 and a registered charity number 1073334. Registered address AQA, Devas Street, Manchester. M15 6EX.

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Specification B

Module 1: Handling Data (Written)

Foundation Tier

General

This paper was accessible to its target group and the general standard was fairly good. Candidates gained credit for showing working, although a significant number failed to do this in parts of the paper. There were a few challenging questions. There was no evidence of lack of time and there were few questions not attempted. Probability questions were in general answered using the correct notation, hardly any candidates used “out of” or “in” and ratio was not seen. Some candidates were ill equipped and often did not use ruler or pencil for diagrams.

Topics that were well done included:

- bar charts
- probability
- interpreting a pictogram
- drawing a line of best fit.

Topics which candidates found difficult included:

- obtaining the median from a stem-and-leaf diagram
- drawing a pie chart
- relative frequency.

Question 1 (a) *14 and 7 and correct tallies* (c) *Sunny*
 (d) *Sunny was the most common type of weather*

Many fully correct answers were seen to part (a). Some candidates failed to complete the tallies in the table and there were a few incorrect totals usually of 19 or 12. The most common error in part (b) was not having a linear scale on the vertical axis of the bar chart. A small number of candidates did not understand the word ‘similarity’.

Question 2 *Mode = 5; mean = 6*

A minority of candidates were confused with the terms mean, median and mode. A great majority had no problem in scoring full marks on this question. Where marks were lost it was generally for not stating which average was being found. A common error for the mode was to give the range or median and a common error for the mean was 24 or an answer of 20.25 from incorrect computation.

Question 3 (a) *83* (b) *66*

Most candidates were able to obtain 83 in part (a). Part (b) was very poorly done with hardly any candidates realising how to locate the median from this stem-and-leaf diagram. A number of candidates identified 65 and 67 or 5 and 7. Many answers of 65 were seen from using the middle as the 10th item.

Question 4 (a) *0.4* (b) *0.1*

This question was generally well-answered, although in part (a) some candidates simply added the wrong two probabilities namely 0.50 and 0.25. It was also common to see the answer ‘0.25 or 0.15’. Part (b) was answered very well as most candidates realised that probabilities summed to 1.

Question 5 (a) 2000 (b) 52

A pleasing number of candidates gained marks for this new topic. Part (a) was generally well answered but 200 was often seen. Part (b) was not so well answered with a lot of misreading of the scale. The common incorrect answers of 152, 151 or 51 were often seen but 50% was common as were 25% 25.5% or 26% since some candidates thought they had to divide by 2. A few attempted to add up the increases from one year to the next but were largely unsuccessful.

Question 6 *Unlikely; certain; impossible*

Responses to this question were generally mixed with a large variety of incorrect answers; many candidates thought the probability of a person living to an age of 100 years was 'likely' or 'certain' - possibly because they knew of someone of that age. Quite a large number of candidates thought it 'likely' or 'certain' that there were 8 Sundays in a month!

Question 7 (a) 5 (b) 11 (c) 8

Parts (a) and (b) were well done. Candidates showed a clear lack of understanding of the term range in part (c) and often found the total of all of the weeks or subtracted week 1 from week 5 to obtain a result of $11 - 6 = 5$. Many arithmetical errors of $14 - 6 = 9$ or 7 were also seen. A small number of candidates left the answer as $6 - 14$.

Question 8 (a) Friday (b) 90° (c) $\frac{1}{4}$ (e) *You cannot answer negatively*

Part (a) was successfully done by many of the candidates. The most common wrong answer seen was Thursday. Part (b) was also answered well. Units of % or $^\circ\text{C}$ were often seen. $\frac{1}{3}$ was a very common incorrect answer in part (c). A surprising number of candidates could not calculate the correct angles for the pie chart without a calculator. Some showed the correct method but could not do anything with it. Many other candidates could not correctly halve the values. In general the pie chart drawing was very messy, often drawn without a ruler and with poor accuracy using a protractor. Candidates should be reminded to take the appropriate equipment into the examination and strongly urged to use a ruler and pencil for drawing diagrams. Some good responses were seen in part (e), mainly pointing out that you could not say that the play was bad. Many candidates did not fully understand what was required and made comments focussing on the number of people watching, the price of tickets or refreshments and the good car parking. A few said they could not comment because they did not see the play while some complied with the instruction and simply ticked a box.

Question 9 (b) *Approximately 4.2*

The need to use a ruler was paramount in part (a). This was very well done by all but the weakest candidates. Part (b) was usually answered correctly and many candidates who were unsuccessful in part (a) read off the correct value although an answer of 3.5 from misreading the scale was not uncommon.

Question 10 (a) $\frac{3}{20}$, $\frac{6}{20}$, $\frac{3}{20}$, $\frac{2}{20}$, $\frac{3}{20}$, $\frac{3}{20}$
(b) *2, because there are a lot more 2's than any other number*

Part (a) was not well answered with few correct responses seen. The usual incorrect answer of frequencies was seen in a large majority of cases. Of those who did write relative frequencies, a small proportion missed one number when counting. Part (b) was usually answered correctly, although a frequent incorrect response to part (b) arose from a misunderstanding of the term "biased towards", responses indicating an understanding of the term "biased", but against rather than towards. 6 was also a common answer.

Higher Tier

General

The paper was generally accessible to the target group. The full range of marks was seen. Several candidates left some questions un-answered. Working (where seen) was usually easy to follow but basic multiplication on section B was sometimes lacking. Graphs were quite well drawn.

Topics that were well done included:

- basic probability
- time series
- cumulative frequency
- scatter graph.

Topics which candidates found difficult included:

- stratified sampling
- histogram
- relative frequency
- moving averages
- conditional probability.

Question 1 (a) 0.4 (c) 0.1

This question was generally well-answered, although in part (a) some candidates simply added the wrong two probabilities, 0.50 and 0.25. Most candidates realised that probabilities summed to 1 in part (b).

Question 2 (a) 2000 (b) 52

A large number of candidates gained marks on this new topic. Part (a) was generally well answered. Many candidates misread the scale. Incorrect answers of 152, 151 or 51 were commonly seen but 50% was also occasionally seen.

Question 3 (a) 5 to less than 10 (b) 58, 74, 89, 100 (c) About "36"

10 to less than 15 was the most common error in part (a). The table was usually correct in part (b) - the lead in was helpful although some incorrect additions led to totals other than 100. The cumulative frequency graph was usually well drawn but there were a few frequency polygons drawn and a number of candidates did not plot at the upper class boundaries. Candidates failed to read the horizontal scale properly and would often read from 16, which was by far the most common error, or from 17.5 or 18.5. Some candidates who did read from the correct value of 17 on the horizontal scale then failed to subtract their reading of the graph from 100.

Question 4 32

There appeared to be a lot of confusion with this question. A number of students correctly identified the numbers for all three strata and then picked the correct value to score all three marks. Others tried various methods with limited success. A few candidates rounded prematurely and were penalised.

Question 5 11

This was a challenging question that a number of candidates could not deal with. A common mistake was to treat the frequency densities as if they were frequencies. The candidates had the idea that the median was the middle number in an array but failed to realise that with a histogram the median value would cut the area (frequency) in half. A large number of candidates managed to find the middle of the number of houses 80 or the middle of the area 40 cm^2 but could not use interpolation to identify the median. There

was very little if any evidence that the candidates had interpolated correctly even when the answer was correct.

Question 6 (c) *The weight of the babies increase as their lengths increase*
 (d) *Approximately 4.2 kg* (e) *Danger of extrapolation*

Part (a) was very well done by all but the weakest candidates. The need to use a ruler is paramount to draw a line of best fit. It was pleasing to see 'strong' being used in identifying correlation in part (c). Many candidates who were unsuccessful in part (b) read off the correct value although many answers appeared from misreading the scale. Most answers to part (e) were acceptable but some candidates gave an answer referring to, for example, smoking, environmental problems or being out of town.

Question 7 (a) $\frac{3}{20}, \frac{6}{20}, \frac{3}{20}, \frac{2}{20}, \frac{3}{20}, \frac{3}{20}$

(b) *2, because there are a lot more 2's than any other number* (c) *10*

Few correct responses were seen to part (a). The usual incorrect answer of frequencies was seen in a large majority of cases. Part (b) was usually answered correctly. Occasionally an incorrect response of 4 was seen in part (b) which indicated an understanding of the term "biased", but against rather than towards. The correct answer of 10 was frequently seen in part (c), and '10 out of 100' was also perfectly correct but a fraction $\frac{10}{100}$ was penalised. Centres and candidates need to be aware of these types of answer as expectations are not probabilities.

Question 8 (a) $\frac{7}{10}$ (b) $\frac{49}{100}$

This question was well done. Some candidates used $\frac{7}{10} \times \frac{7}{10} = \frac{14}{20}$; $\frac{7}{10} + \frac{7}{10} = \frac{14}{20}$, $\frac{7}{10} \times \frac{2}{2}$ or $\frac{14}{10}$ or just gave $\frac{7}{10}$ again in part (b).

Question 9 *91*

Incorrect readings from the given trend line was often seen. Candidates, even at higher level, have lots of difficulties in reading a scale that does not increase in single units. Perhaps because graphs and scales are usually given in examination questions candidates appear to have little experience of drawing graphs and using different types of linear scales. A large majority of candidates did not know how to calculate a forecast and would simply write down a trend value or even extend the trend line to beyond the graph and try to read off a trend value at December 2006.

Question 10 $\frac{9}{38}$

The more able candidates were well prepared for this type of question. Many candidates scored full marks and seemed to fully understand sampling without replacement. A number of candidates did score one mark for a fully correct sampling with replacement method, however a minority of candidates lost marks due to poor arithmetic. Few candidates used tree diagrams.

Module 2: Handling Data (Coursework)

General

There were only minor improvements in the work submitted for this series and some centres submitted inappropriate tasks or else offered work that did not easily allow the criteria to be met. For example, some of the work submitted for the handling data task did not fully address the minimum requirements of the AO4 criteria so could not be supported. This was particularly the case where the work was dual entered for GCSE Statistics without addressing the need to “evaluate the effectiveness of the overall strategy and make a simple assessment of limitations”.

Nonetheless, the majority of candidates were suitably prepared for this coursework component but some candidates were disadvantaged by a lack of understanding about the criteria.

Centres are asked to encourage candidates to show all their working. Candidates need to be told that it is their responsibility to communicate their thinking at each stage of the work. It is not the moderator/examiner’s responsibility to try to guess what the candidate was thinking when they wrote their work up. Similarly, it is not the centre’s role to credit work where candidates do not communicate their statistical thinking.

Administration

Most centres were sufficiently well organised although a number of centres failed to meet the AQA-set deadlines for the submission of coursework. Some centres did not use the latest Candidate Record Forms or else failed to complete all the required information on these forms especially information such as centre numbers and candidate numbers.

Similarly, teacher and candidate authentications are essential to confirm that the work is the candidate’s own. Authenticating the work was still problematic in some centres, resulting in work having to be returned and authentications sought, thus slowing down the process and reducing the time available to moderators and examiners.

Centres are reminded that:

- *deadline dates are not optional and should be adhered to except in special circumstances with the agreement of AQA*
- *all work submitted must be authenticated by the teacher/lecturer as well as the candidate - arrangements may need to be made to ensure that this happens*
- *sufficient work must be undertaken under the direct supervision of a teacher/lecturer for the work to be confidently authenticated*
- *task starters and/or any other material used (for example writing frames, help sheets or marking schemes) should be forwarded with the coursework for information*
- *centres devising their own assessment criteria should ensure that these criteria include reference to the original coursework criteria*
- *coursework presented should be sequenced with page numbers and should identify candidate details on each page*
- *the use of plastic wallets and elaborate folders to contain coursework is actively discouraged and treasury tags should be used to bind work together*

The following comments are offered under each of the three strands

1. Specifying the problem and planning

This strand is about choosing a problem and deciding and planning what needs to be done. The strand requires the candidate to provide clear aims, consider the collection of data (sample size and sample method), identify practical problems and explain how they might overcome them. For the higher marks,

candidates need to decide upon a suitable sampling method, explain what steps were taken to avoid possible bias and provide a well-structured report.

2. Collecting, processing and representing the data

This strand is about collecting data and using appropriate statistical techniques and calculations to process and represent the data. Diagrams should be appropriate and calculations (mostly) correct. For the higher marks, candidates need to accurately use statistical techniques and calculations from the Higher tier GCSE Mathematics specification content, giving reasons for their inclusion.

3. Interpreting and discussing the results

This strand is about commenting, summarising and interpreting data. The discussion should link back to the original problem and provide an honest evaluation (strengths and weaknesses) of the work as a whole. For the higher marks, candidates need to provide sophisticated and rigorous interpretations of their data and provide an analysis of how significant their findings are.

The following additional comments from moderators' and examiners' reports might be useful to centres in preparing candidates for the handling data coursework.

Specifying the problem and planning

- *Greater consideration needs to be given to the planning of the task and the choice of sample....stratified sampling is not always appropriate.*
- *Little thought was often given to the sample size and why, for example, 30 people or 100 words might be an appropriate sample size.*
- *Little detail was often given of how the sampling was actually undertaken in order to avoid bias and ensure that the sample was truly representative.*
- *Many of the hypotheses set were rather simplistic and there was little consideration given to how the work might be extended and developed.*
- *Candidates are encouraged to pursue one hypothesis in some depth rather than a number of hypotheses superficially.*
- *An award of mark 5 can only be given if the task is substantial and developed beyond the original task at a level commensurate with grade C.*
- *Databases, where used, should be sufficiently large to allow sampling to take place and provide a variety of possible extensions to the original task.*
- *For the higher marks, work requires careful specification and evidence of extensive, independent thought.*
- *Candidates should be encouraged to make greater use of pilot surveys, control groups and pre-testing as appropriate to the task.*

Collecting, processing and representing the data

- *Calculations and representations need to be considered for their relevance to the problem. Statistics for the sake of statistics gains few marks.*
- *Statistical representations and calculations add little to the task unless their inclusion is explained and the outcomes interpreted.*
- *Many representations were too small or inaccurate to provide useful information. Calculations should be accurate.*
- *Cumulative frequency diagrams are most appropriate for continuous and/or grouped data.*
- *The use of techniques such as standard deviation and rank correlation are not indicators for the higher marks unless they are appropriate, explained and interpreted.*

Interpreting and discussing the results

- *Too often, conclusions made little use of the representations and calculations provided and were not always related back to the original hypothesis.*
- *Suggestions that the hypothesis is proven or disproven need to be backed up with evidence from the candidate's own work.*
- *Candidates are now showing evidence of evaluating their strategy focussing on each aspect of their work.*

- *Simplistic evaluations such as those suggesting the use of a bigger sample need to explain why, or else consider other possible areas for improvement.*
- *Comments on representations and calculations were often descriptive eg “the distribution is negatively skewed” without interpreting this in terms of the hypothesis.*
- *For the higher marks, candidates must recognise possible limitations to their strategies.*

Further support

Additional support is provided through the AQA network of coursework advisers. Further details about standardisation meetings and coursework advisers can be obtained by contacting the AQA (Manchester) office.

Option T – Teacher-Assessed

The tasks set were mostly appropriate and allowed candidates to make some progress against the assessment criteria. AQA-set tasks were again popular with *Read All About It* a particular favourite for many centres. An increasing number of centres also made use of the *Where in the World* task which offered many opportunities for candidates to pursue cross-curricular work with geography and citizenship.

Centres are asked to note that the provision of the original mark schemes for the AQA-set tasks was intended to provide suggestions for possible routes through these tasks. The teachers’ notes in the right-hand column are not intended as a replacement for the minimum requirements and original criteria against which all tasks should be used when assessing coursework.

Mark schemes produced prior to 2003 and mark schemes from other awarding bodies often caused problems where centres took insufficient notice of the original criteria. Centres are advised to contact their coursework adviser if they are not sure about the suitability of mark schemes being used.

Similarly, tasks produced prior to 2003 and tasks from other awarding bodies also caused problems especially where tasks were over prescriptive or else the tasks were not suitable for candidates on the Higher tier. Again, centres are advised to contact their coursework adviser if they are not sure about the suitability of tasks being used.

Centres are reminded that all coursework submitted under Option T must be suitably annotated to explain how work has been assessed and how marks have been arrived at. This information is usually included on the Candidate Record Form under the heading of key evidence. Any other information provided by the teacher/lecturer about how the task was undertaken or any comment to explain a candidate’s thinking will be considered by the moderator in the assessment of the work.

Finally, moderators reported that a small number of centres were not undertaking sufficient internal moderation to ensure that the work submitted produced a valid rank order. Regular internal moderation opportunities are essential to keep staff (especially new staff and part-time staff) up to date with the additional exemplification offered and ensure that marking is consistent across all staff in each examination session.

Option X – Externally-Assessed

The AQA-set tasks allowed candidates the opportunity to make some progress against the assessment criteria and thus gain credit for their performance. The most popular tasks were *Read All About It* and *Guestimate*. In most cases, however, the tasks were rarely extended beyond the original to produce a substantial task. In particular, too much work in the *Guestimate* task concentrated on the guesses rather than the errors.

Pulse Rates and *Reaction Times* were less favoured, presumably due to the amount of time required to set up the experiments to collect data. Centres' attention is drawn to the *Census at School* website at www.censusatschool.ntu.ac.uk where candidates may collect data on reaction times from a database.

An increasing number of centres also made use of the *Where in the World* task which offered many opportunities for candidates to pursue cross-curricular work with geography and citizenship.

Care should be taken to ensure that candidates are discouraged from following similar 'pathways' making use of similar representations and calculations. It was often difficult to differentiate between the responses of different candidates except where centres provided additional comments to explain. Sampling should ensure that candidates are making use of different data sets.

Annotation is not required for coursework submitted under Option X but any information provided by the teacher/lecturer about how the task was undertaken or any comment to explain a candidate's thinking will be considered by the examiner in the assessment of the work.

Module 3: Number and algebra (Written)

Foundation Tier

General

This was the first paper for the new two-tier specification. There were challenging questions but also many that presented opportunities for candidates to show their knowledge. Many candidates were unable to process basic calculations involving decimals and fractions. Work on percentages and ratio also proved difficult. However, there were many good candidates who did display their arithmetical skills.

Many candidates presented their answers clearly with the supporting working evidence. However, some candidates may have penalised themselves by not showing evidence of their working and therefore failing to obtain available method marks. On Section A some candidates either did not have a calculator or chose not to use one. Build-up methods are sometimes appropriate but standard methods may allow some candidates to gain higher marks.

Topics that were done well included:

- missing numbers in calculations
- solving problems involving money
- simple time problems
- division of integers in context.

Topics which candidates found difficult included:

- meter reading problem
- fractions and percentages
- sharing in a ratio
- explanation involving squaring numbers
- rounding to decimal places and significant figures
- fraction to decimal conversion
- multiplication of two decimals.

Question 1 (a) 46 (b) 12 (c) 87 (d) 2

This was a good start to the paper for most candidates with a large majority being successful on parts (a) and (b). Part (c) proved the most challenging.

Question 2 (a) 700 (b) £42

Many candidates were not familiar with the workings of a meter reading. Many though, benefited from the opportunity for follow through marks in part (b) with the majority of candidates scoring at least one mark. Errors in the use of pounds instead of pence were quite common.

Question 3 (a)(i) £8.33 (ii) £1.67 (b) £2 £1 20p 1p

This was a very well answered question with candidates often gaining full marks in all parts.

Question 4 (a) 1.42 (b) 1.35

There was a mixed response to both parts. Roughly a half of the candidates gave the correct response in each part. Answers of 1.41 were common in (a).

Question 5 (a) 10 (b) 12

Part (a) was answered well though some candidates did not know what to do with the remainder or decimal. Just over one half of the candidates correctly identified the remainder as 12. Those who attempted build up methods were far less successful than those who did the division or worked from $28 \times 10 = 280$.

Question 6 £52.75

This question proved too difficult for many candidates but a number of good responses were seen. Many thought that dividing by five or successive halving would eventually lead to getting five percent. Others stated an incorrect value for 10% without showing how they had obtained it and then halved this. This did not score any marks. Use of calculator was rarely evident.

Question 7 (a) £495 (b) £385

In part (a) many candidates only found one quarter of the amount and failed to multiply by three. However a pleasing number of correct answers were seen with just over a half of candidates gaining full marks. In part (b) many candidates began by dividing 660 in turn by 2, 3 and 7 or even 10. Some who correctly found the sum of the parts went on to multiply this by 660 or 7 while others added or subtracted it from 660. Quite a number of candidates simply wrote an answer on the answer line with no working. However, a small number of candidates were clearly well-versed in ratio techniques and had few problems with this question.

Question 8 (a) 256 (b) 0.4 (c)(i) 73.9319(...) (ii) 70

In parts (a) and (b) just under a half of candidates were successful. Part (c)(i) was not as well done. Many were unable to deal with the combination of powers and addition. In part (c)(ii) many candidates attempted to round their answer from part (i) but frequently it was to the nearest integer, or 1 dp or 2 sf. Some candidates simply moved the decimal point along the number. A correct rounding was not seen very often.

Question 9 Answer in the range 5.4 to 5.6 gallons inclusive

Many candidates were able to score at least one mark on this question by starting it in the correct way, usually by 1.76×25 . Better candidates could then deal with the further work needed to get the final

answer. There was evidence of premature approximation when they chose to start by working out $8 \div 1.76$ but these candidates could still gain marks if they continued to follow a correct method.

Question 10 *Evaluates a number between 0 and 1 exclusive*

This was a very poorly attempted question. Very few candidates were able to identify that decimals were needed here to exemplify the situation. Many tried squaring positive whole numbers and gave up when it was clear that there was no positive outcome from doing this. Others tried squaring negative numbers incorrectly.

Question 11 (a) 3 hours (b)(i) 30 minutes (ii) $\frac{1}{2}$ hour

Parts (a) and (b)(i) were very well answered. In part (b)(ii), it was disappointing to see a third of candidates unable to correctly identify that 30 minutes was equal to half an hour.

Question 12 (a) 130 (b) 1900 (c) 1678 (d) 700 (e) 80

Less than half of the candidates obtained 130 in part (a), occasionally due to not knowing the current year. Parts (b) and (c) were well done. There were many answers in (d) and (e) where the candidate chose to ignore the movement of the digit after the multiply or divide by 10 and instead gave the value of the digit in the original number.

Question 13 *9 miles*

A significant number of candidates got this completely correct but others made careless arithmetical errors such as $30 - 12 = 28$ or mixed up which sections of the motorway had equal distances, often coming up with answers of 6 or 8.

Question 14 (a) 8 (b) 200 (c) $\frac{3}{8}$

Part (a) was quite well answered by those who divided by 2 twice or divided by four. Well over a half of the candidates gained full marks. In part (b) there were the expected sights of 10 and 6 instead of 25 and 8 respectively, but a significant number of candidates managed to score at least one mark here. Part (c) was not attempted well overall. However, it was encouraging to see some good answers here. The requirement to obtain a common denominator was not known by large numbers of candidates.

Question 15 (a) 0.8 0.786 0.09 (b) 0.79 (c) 0.375 (d) 0.07

Part (a) was the most successfully attempted part. Part (b) showed that few understood how to round to two decimal places. Many thought the fraction was equal to 0.38 in part (c) and many thought 0.1×0.7 was equal to 0.7 in part (d). Hardly any candidates knew they needed to divide 3 by 8 in part (c).

Question 16 *60%*

Fully correct answers were seen but only from the best candidates. Many incorrect totals were seen even though the total of 500 was given in the stem of the question. Build-up methods rarely gained any marks.

Question 17 *£22.50*

A significant number of candidates gained some credit on this question. Many found the total of £25 but were unable to deal with the 10% reduction in any way. Others tried to find 10% of each item separately but this also led to many computational errors. Careless arithmetical errors led some to lose marks.

Question 18 (a) £24.50 (b) £25.49

Part (a) was answered well by about a third of the candidates but part (b) proved more challenging with answers of £25.50 quite common. Others failed to appreciate the discrete nature of money.

Question 19

The concept of prime factors was not understood by many candidates. A large number of candidates opted to start with their own factor tree, but these often contained mistakes and some candidates did not know what to do when 2 was no longer a factor. The correct answer was seen on only a few occasions.

Higher Tier

General

This was the first paper of the new two-tier specification. It was very evident that a large number of candidates were not prepared for some topics. This was mainly for the more difficult questions on proportion, surds, graphs and indices but also applied to some of the earlier questions. The higher grade questions were challenging but many of the responses clearly showed that candidates had little or no idea how to proceed.

Most candidates showed their working and gave themselves opportunities to gain method marks and some good answers were seen.

Topics that were done well included:

- units conversion
- straightforward percentage problems in context
- estimating a calculation.

Topics which candidates found difficult included:

- reciprocals
- using a calculator for complex calculations
- proportion
- graphical solution of equation
- surds
- indices.

Question 1 £594

Most candidates found this a straightforward opening question. However a significant number had no idea how to proceed on this standard question.

Question 2 Answer in the range 5.4 to 5.6 gallons inclusive

This was well attempted with many gaining full marks. Of the others a significant number scored 1 mark, usually for multiplying 25 by 1.76. A similar number of candidates failed to score at all. There was evidence of premature approximation when they chose to start by working out $8 \div 1.76$ but these candidates could still gain marks if they continued to follow a correct method.

Question 3 *Evaluates a number between 0 and 1 exclusive*

This question resulted in a mixed response. Most candidates squared numbers but often used negative integers which frequently produced a negative answer. However, there were candidates who realised a number between 0 and 1 was needed and they usually squared it accurately.

Question 4 (a) £2 (b) 12% (c) £46.50

About two thirds of the candidates gained either 2 or 3 marks in part (a). The build-up method met with mixed success. Simply stating an incorrect value for 10% without showing working did not gain any method marks. A common mistake was to give an answer of £94 but this did gain 2 marks. A significant number of candidates tried to decrease £92 by $17\frac{1}{2}\%$ which gained no marks at all. In part (b) there were some very good answers gaining full marks with only a few of these using a build-up method. A significant number gained 1 mark, usually for obtaining the £9 difference in price. Part (c) was the least well answered part of this question. Those that knew the method were usually successful in obtaining the correct answer, although a few did not remember to convert their calculator answer of 46.5 into correct money notation and carelessly lost a mark.

Question 5 (a) 1.25 (b)(i) 8.55087(...) (ii) 8.6

The problem in part (a) was the lack of understanding of the meaning of reciprocal rather than with the use of the calculator. In part (b)(i) many candidates had difficulty in using their calculator when more than one process was involved. There was a little more success in rounding to 2 significant figures although this continues to cause problems for many. Rounding to two decimal places was evident and some candidates did not appreciate that the answer should be an approximation to part (b)(i).

Question 6 8×10^5

Some candidates were unable to convert 0.8×10^6 to correct standard form.

Question 7 (a) $y = \frac{200}{x^2}$ (b) 2.5

Many candidates did not attempt this question. Many of those that did had clearly not been prepared for this topic. A few fully correct answers were seen. Others used direct proportion (some accounting for the x^2 with others just using x). Candidates are strongly advised to read the question carefully as using the wrong type of proportion is a costly error. Presentation of work was often poor with notation becoming confused from one step to the next. Part (b) was challenging even for those who did well in part (a).

Errors occurred in manipulating $32 = \frac{200}{x^2}$ to obtain x .

Question 8 39.3%

This was attempted better than Question 7 and over half managed to score some marks. Unfortunately the most common score was 1 mark, usually for obtaining 36%. Weaker candidates often just added 6% to this. Those who were able to interpret the question correctly often went on to gain full marks. Some approximated prematurely and gave an answer of 39%. This still gave them 3 marks and if 39.3 had been seen in their working they were awarded 4 marks.

Question 9 (a) 60% (b) 250 ml (c) 210 ml

Part (a) was answered well. Those who used a conventional percentage calculation were usually correct but errors occurred when candidates chose to work from 500 ml \equiv 100% and then attempted to build up to the % for 300 ml. Part (b) was answered quite well but a surprisingly large number became confused with the context and failed to gain this mark. Part (c) produced a slightly better success rate. A common

error was to add half of 500 to 140 producing an answer of 390 ml. For the first question on Section B the overall response was not as good as expected.

Question 10 £22.50

This was answered well with over three quarters gaining full marks. Many others scored 2 marks. Some basic arithmetical errors were made. Considering that the numbers involved were straightforward these were careless mistakes that should have been avoided.

Question 11 8000 or 8048

This was quite well answered with many candidates scoring at least 2 marks. Those candidates who realised that the numbers required rounding and chose to work to 1 significant figure usually gained marks. A number failed to work out the final calculation correctly after using appropriate approximations, but still gained 2 marks.

Question 12 (a) $2 \times 3 \times 5^2$ (b) 75

Part (a) was answered well by many candidates but the number who failed to score at all was higher than expected. In part (b) most correct answers were just written down, although use of Venn diagrams was seen to good effect. A significant number wrote down a common factor that was not the highest. This gained 1 mark if they selected 15 or 25.

Question 13 26 300

This standard form question produced a better response than the question on the same topic in Section A. About a half of the candidates gained full marks. Some had no idea how to deal with the numbers based on their attempt to complete the subtraction.

Question 14 (a) *Points plotted accurately and joined with a smooth curve*
(b) *Two x values that are their graph's intersections with the x axis*
(c) $-1.9 \leq x \leq -1.6$ and $1.6 \leq x \leq 1.9$

Many candidates were not prepared for this question with a large number not able to gain even the first mark in part (a) for plotting the points. Most of those that did plot successfully were not able to draw an acceptable smooth curve. A sharp pencil and a single curve are needed. More candidates would be able to identify errors made in plotting if they had a better understanding of the expected shape of a quadratic graph. Part (b) was not answered well with those who had not attempted (a) obviously unable to gain marks here. Some did know where to look on the graph. Part (c) was very poorly answered. Most candidates had no idea how to proceed and some ignored the instruction to draw a linear graph and drew another quadratic one.

Question 15 (a) $8\sqrt{3}$ (b) $3\sqrt{7}$

Many candidates were clearly not prepared for this topic. Better candidates knew what to do and scored well.

Question 16 (a) 3^{20} (b) $\frac{1}{100}$

Adding the powers was seen in part (a) but so were attempts at evaluation. The better candidates were able to pick up marks in part (b). However the majority of candidates failed to score.

Module 4: Using and Applying Mathematics (Coursework)

General

There were only minor improvements in the work submitted for this series and some centres submitted inappropriate tasks or else offered work that did not easily allow the criteria to be met. There was an increase in the numbers of centres submitting work from other awarding boards such as the 'T totals' task where there was a noticeable lack of manipulative (grade B) type algebra to award some of the higher marks requested especially where the algebra included was limited to adding a series of simple expressions.

Nonetheless, the majority of candidates were suitably prepared for this coursework component but some candidates were disadvantaged by a lack of understanding about the coursework criteria. In a significant minority of centres there was still a tendency to overmark at the top of the mark range and undermark at the bottom end of the mark range.

Centres are asked to encourage candidates to show all their working. Candidates need to be told that it is their responsibility to communicate their thinking at each stage of the work. It is not the moderator/examiner's responsibility to try to guess what the candidate was thinking when they wrote their work up. Similarly, it is not the centre's role to credit work where candidates do not communicate their mathematical thinking.

Administration

Most centres were sufficiently well organised although a number of centres failed to meet AQA-set deadlines for the submission of coursework. Some centres did not use the latest Candidate Record Forms or else failed to complete all the required information on these forms especially information such as centre numbers and candidate numbers.

Similarly, teacher and candidate authentications are essential to confirm that the work is the candidate's own. Authenticating the work was problematic in some centres resulting in work having to be returned and authentications sought thus slowing down the process and reducing the time available to moderators and examiners.

Centres are reminded that:

- *deadline dates are not optional and should be adhered to except in special circumstances with the agreement of AQA*
- *all work submitted must be authenticated by the teacher/lecturer as well as the candidate - arrangements may need to be made to ensure that this happens*
- *sufficient work must be undertaken under the direct supervision of a teacher/lecturer for the work to be confidently authenticated*
- *task starters and/or any other material used (for example writing frames, help sheets or marking schemes) should be forwarded with the coursework for information*
- *centres devising their own assessment criteria should ensure that these criteria include reference to the original coursework criteria*
- *coursework presented should be sequenced with page numbers and should identify candidate details on each page*
- *the use of plastic wallets and elaborate folders to contain coursework is actively discouraged and treasury tags should be used to bind work together*

The following comments are offered under each of the three strands for the using & applying task.

1. Making and monitoring decisions to solve problems

This strand is about deciding what needs to be done, then doing it. The strand requires candidates to select an appropriate approach, obtain information and introduce their own questions which develop the

task further. For the higher marks candidates need to analyse alternative mathematical approaches and apply, independently and extensively, a range of appropriate techniques.

2. Communicating mathematically

This strand is about communicating what is being done using words, tables, diagrams and symbols. Candidates should consider the appropriateness of their chosen presentation and amend this as necessary. For the higher marks candidates will need to use mathematical symbols accurately, concisely and efficiently in presenting a reasoned argument.

3. Developing skills of mathematical reasoning

This strand is about testing, explaining and justifying what has been done and requires the candidate to search for patterns and provide generalisations. Generalisations should then be tested, justified and explained. For the higher marks candidates will need to provide a sophisticated and rigorous justification, argument or proof considering the conditions under which it remains valid.

The following additional comments from moderators' and examiners' reports might be useful to centres in preparing candidates for the using and applying mathematics coursework.

Making and monitoring decisions to solve problems

- *An award of mark 5 can only be given where the task is independently extended beyond the original problem set.*
- *An award of mark 6 is appropriate where a candidate 'pulls together' their various algebraic investigations at a level commensurate with grade B work.*
- *The inclusion of an algebraic formula is, on its own, insufficient to suggest an award of mark 6.*
- *An award of mark 7 can only be given where the candidate co-ordinates three features or variables at a level commensurate with grade A work.*
- *The inclusion of an algebraic formula such as $t = g(l-1)(w-1)$ is not usually indicative of mark 7 without further supportive work.*
- *An award of mark 8 is appropriate where a candidate explores a task **extensively** and **independently**.....similar work is unlikely to be independent.*

Communicating mathematically

- *Candidates should not waste time drawing tables and/or graphs unless they are relevant, commented upon and interpreted.*
- *All candidates should be encouraged to make better use of algebra to provide a commentary for the work.*
- *An award of mark 4 requires candidates to consider their representations (tables or graphs) and make some appropriate and correct comment.*
- *An award of mark 5 can only be given (as best fit) where candidates make use of algebra rather than simply making an algebraic statement.*
- *Substitution into the candidate's own derived formula might be sufficient to suggest an award of mark 5.*
- *An award of mark 6 can only be given where candidates show **sustained** evidence of correct and convincing algebraic manipulation, factorisation or transposition at a level commensurate with grade B work.*
- *The use of algebra for proving and justifying must be accurate and convincing. Centres are advised to check the accuracy of algebraic manipulation and ensure that all working is clearly shown.*
- *Pattern spotting is not a higher level technique and an algebraic approach to the work is necessary for the higher marks.*

Developing skills of mathematical reasoning

- *Where generalisations are written down it is important that they are adequately explained in the text to confirm the candidate's own understanding.*
- *Testing should be undertaken on candidate's own generalisations and make use of new data with a comment to say whether the test works or not.*
- *An award of mark 5 can only be given where candidates justify (ie prove) why a generalisation works.....repeated numerical substitution does not constitute a proof.*
- *An award of mark 7 under this strand can only be given where strand 1 has been awarded a mark of 7 or 8.*
- *An award of mark 8 would usually require the candidate to give some consideration to the conditions under which their proof remains valid.*

Further support

Additional support is provided through the AQA network of coursework advisers who are assigned to each AQA centre. Further details about standardisation meetings and coursework advisers can be obtained by contacting the AQA (Manchester) office.

Option T – Teacher-assessed

The tasks set were generally appropriate and allowed candidates to make some progress against the assessment criteria. The AQA-set tasks were particularly popular, especially the *Number Grid* task. However, this task often suffered from excessive teacher guidance so that work followed the same format with little evidence of candidates really understanding what they were doing.

Centres are asked to note that the provision of the original mark schemes for the AQA-set tasks was intended to provide suggestions for possible routes through these tasks. The teachers' notes in the right-hand column are not intended as a replacement for the minimum requirements and original criteria against which all tasks should be used when assessing coursework.

Mark schemes produced prior to 2003 and mark schemes from other awarding bodies often caused problems where centres took insufficient notice of the original criteria. Centres are advised to contact their coursework adviser if they are not sure about the suitability of mark schemes being used.

Similarly tasks produced prior to 2003 and tasks from other awarding bodies also caused problems especially where tasks were over prescriptive or else the tasks were not suitable for candidates on the higher tier. Again, centres are advised to contact their coursework adviser if they are not sure about the suitability of tasks being used.

Centres are reminded that all coursework submitted under Option T must be suitably annotated to explain how work has been assessed and how marks have been arrived at. This information is usually included on the Candidate Record Form under the heading of key evidence. Any other information provided by the teacher/lecturer about how the task was undertaken or any comment to explain a candidate's thinking will be considered by the moderator in the assessment of the work.

Finally, moderators reported that a small number of centres were not undertaking sufficient internal moderation to ensure that the work submitted produced a valid rank order. Regular internal moderation opportunities are essential to keep staff (especially new staff and part-time staff) up to date with the additional exemplification offered and ensure that marking is consistent across all staff in each examination session.

Option X – Externally-Assessed

The AQA-set tasks allowed candidates the opportunity to make some progress against the assessment criteria and thus gain credit for their performance. The most popular task seen was *Number Grid* but much of the work received from individual centres was very similar in terms of content and routes through the problem. The task often suffered from excessive teacher guidance so that work followed the same format with little evidence of candidates really understanding what they were doing.

Centres are reminded that the tasks titled *Round and Round* and *Tangled Triangle* have now been withdrawn from the list and can no longer be submitted under Option X. Submissions of these titles can only be made under Option T (ie teacher assessed and board moderated).

Annotation is not required for coursework submitted under Option X but any information provided by the teacher/lecturer about how the task was undertaken or any comment to explain a candidate's thinking will be considered by the examiner in the assessment of the work.

Mark Range and Award of Grades

Module 1: Handling Data Written Paper

Tier	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
Foundation Tier	40	40	23.5	7.1
Higher Tier	40	40	21.6	6.6

For modules which contain only one component, scaled marks are the same as raw marks.

Module 1 Foundation Tier (31 490 candidates)

Grade	Max mark	C	D	E	F	G
Scaled Boundary Mark	40	31	25	20	15	10
Uniform Boundary Mark	45	40	33	26	20	13

Module 1 Higher Tier (51 545 candidates)

Grade	Max. mark	A*	A	B	C	D
Scaled Boundary Mark	40	31	26	21	16	11
Uniform Boundary Mark	66	59	53	46	40	33

Module 2: Handling Data Coursework

The following statement has been issued on behalf of all awarding bodies in England, Wales and Northern Ireland.

In 2003 there was a change to the coursework requirement for all GCSE mathematics specifications in that two tasks were now mandatory. The previous practice of marking the two pieces against the assessment criteria and selecting the better mark in each of the three strands no longer applies and all six strand marks now count (there were new criteria for the handling data task).

All awarding bodies agreed to set boundaries for the June 2003 examinations with A, C and F being fixed at 37, 26 and 14 respectively. These boundaries were continued for 2004, 2005 and again for 2006.

The two coursework tasks are assessed separately in this modular mathematics specification and the two modules have different boundaries. The sum of the two marks at any grade boundary is in line with the agreed inter-awarding body boundaries.

Option	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
T – internally assessed	24	24	12.7	3.8
X – externally assessed	24	24	10.9	3.3

For modules which contain only one component, scaled marks are the same as raw marks.

Module 2 Option T (429 candidates)

Grade	Max mark	A*	A	B	C	D	E	F	G
Scaled Boundary Mark	24	20	17	14	12	10	8	6	4
Uniform Boundary Mark	60	54	48	42	36	30	24	18	12

Module 2 Option X (773 candidates)

Grade	Max mark	A*	A	B	C	D	E	F	G
Scaled Boundary Mark	24	20	17	14	12	10	8	6	4
Uniform Boundary Mark	60	54	48	42	36	30	24	18	12

Module 3: Number and Algebra Written Paper

Tier	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
Foundation Tier	64	64	29.4	12.4
Higher Tier	64	64	29.2	12.9

For modules which contain only one component, scaled marks are the same as raw marks.

Module 3 Foundation Tier (5374 candidates)

Grade	Max mark	C	D	E	F	G
Scaled Boundary Mark	64	44	35	26	17	8
Uniform Boundary Mark	79	68	57	46	34	23

Module 3 Higher Tier (7374 candidates)

Grade	Max. mark	A*	A	B	C	D
Scaled Boundary Mark	64	51	40	29	19	12
Uniform Boundary Mark	114	103	91	80	68	57

Module 4: Using and Applying Mathematics Coursework

Option	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
T – internally assessed	24	24	16.1	3.3
X – externally assessed	24	24	12.1	2.8

Module 4 Option T (531 candidates)

Grade	Max mark	A*	A	B	C	D	E	F	G
Scaled Boundary Mark	24	23	20	17	14	12	10	8	6
Uniform Boundary Mark	60	54	48	42	36	30	24	18	12

Module 4 Option X (58 candidates)

Grade	Max mark	A*	A	B	C	D	E	F	G
Scaled Boundary Mark	24	23	20	17	14	12	10	8	6
Uniform Boundary Mark	60	54	48	42	36	30	24	18	12

Definitions

Boundary Mark: the minimum (scaled) mark required by a candidate to qualify for a given grade. Although component grade boundaries are provided, these are advisory. Candidates’ final grades depend only on their total marks for the subject.

Mean Mark: is the sum of all candidates’ marks divided by the number of candidates. In order to compare mean marks for different components, the mean mark (scaled) should be expressed as a percentage of the maximum mark (scaled).

Standard Deviation: a measure of the spread of candidates’ marks. In most components, approximately two-thirds of all candidates lie in a range of plus or minus one standard deviation from the mean, and approximately 95% of all candidates lie in a range of plus or minus two standard deviations from the mean. In order to compare the standard deviations for different components, the standard deviation (scaled) should be expressed as a percentage of the maximum mark (scaled).

Aggregation and Grading

In order to ensure fairness to all candidates, the marks of all module tests must be standardised to ensure that no candidate is penalised (or advantaged) by taking a slightly more (or less) demanding test than the other tests set on the same module.

This standardisation is achieved by converting scaled marks into uniform marks using a uniform mark scale (UMS). For modules that contain only one component, scaled marks are the same as raw marks.

In order to convert the scaled marks into uniform marks, the grade boundary marks for each module are first determined following the grade awarding procedures set out in the *GCSE, GCE, VCE and GNVQ Code of Practice*. These boundary marks are converted to the equivalent uniform marks (see table below). Marks between two boundaries are converted appropriately, for example a Module 1 mark halfway between bottom B and bottom C is converted to a uniform mark of 43. Module results are reported in terms of uniform marks.

The maximum UMS mark available for each module depends on the weighting of the module in the scheme of assessment. Details of the uniform mark scales are provided below.

	UMS Marks					
	Module 1	Module 2	Module 3	Module 4	Module 5	GCSE Award
Max UMS	66	60	114	60	300	600
A*	59	54	103	54	270	540
A	53	48	91	48	240	480
B	46	42	80	42	210	420
C	40	36	68	36	180	360
D	33	30	57	30	150	300
E	26	24	46	24	120	240
F	20	18	34	18	90	180
G	13	12	23	12	60	120

The uniform marks for the five modules are added in order to determine the overall grade for candidates who are entered for the subject award. By agreement with the regulatory authorities, overall grades are restricted to the range available for the tier of entry for the terminal module, Module 5. Thus, for example, a candidate who is entered for the Intermediate tier of Module 5 (grade range B – E) and who obtains a total uniform mark above the grade A threshold will receive an award of grade B for the subject, while a candidate who is entered for the Intermediate tier of Module 5 and who obtains a total uniform mark below the grade E threshold will be Unclassified.