GCSE

Mathematics B (MEI)

General Certificate of Secondary Education **J519**

Examiners' Reports

June 2011

J519/R/11

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Any enquiries about publications should be addressed to:

OCR Publications
PO Box 5050
Annesley
NOTTINGHAM
NG15 0DL

Telephone: 0870 770 6622
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EXAMINERS' REPORTS

Chief Examiner's Report

The number of candidates was relatively low but all the papers produced scores covering a wide range. In B291, B293 and B294 virtually the whole range was covered. In B292, whilst there were only a few scores in the 90s, there was still a wide range of results. This meant that the papers differentiated very well. The candidature was quite mixed but all the papers had a substantial number of very good candidates where the quality of the work was most impressive. The statistical effect of this was that most of the papers' distributions departed from the normal. Papers B291 and B293 had a marked negative skewness. B292 was more normal whilst B294 was bimodal. The candidature changed slightly in that there were relatively fewer entries from secondary comprehensive schools and more from Further Education Colleges.

Areas highlighted by examiners which would improve candidates' performance include working not being well set out and sometimes not there at all and unclear crossing out and replacement of answers. Whilst there was some impressive algebra from some candidates it remains a problem for many. Many do equations by just doing a numerical search. It is quite possible that a clearly laid out algebraic response will be required in future questions which test 'quality of written communication' and so a numerical search will not be credited.

Verbal reasoning responses remain a problem for many candidates. Standard responses that show basic understanding of statistical data and reasons for steps in geometrical working are examples of these. In the latter case many candidates still confuse working with geometrical reasons.

No apologies are made for highlighting yet again the problems of Arithmetic in non-calculator sections at both Foundation and Higher Tiers. Even Higher Tier candidates are often hindered by their inability to carry out the simple processes. Fractions particularly are a problem and many candidates simply do not answer fraction questions. Many candidates when needing to do $a - b$ or $a \div b$ make errors in the order of the calculation. Even on the calculator sections this is the case. Many automatically take the smallest from the biggest and divide the biggest by the smallest. Non-calculator methods for finding percentages of quantities are rarely successful on the calculator paper, as numbers are likely to be more difficult.

B291 Paper 1 (Foundation – Modular)

General Comments

Candidates appeared to have plenty of time on both sections.

Questions 8, 9, and 19 were common, all or in part, with questions 1, 4 and 11, respectively of Paper 3.

The paper discriminated well with marks across the whole range. A significant proportion of candidates earned 60 marks or over. Only a quarter of the candidates earned less than half marks.

Some candidates forfeited marks by not showing working, which might have earned method marks where their final answer was incorrect.

Comments on Individual Questions

SECTION A

1 Most candidates earned at least some of the marks on this question, with radius, circumference and centre appearing to be the best known parts of the circle.

2 This pictogram question was very well answered, with few errors.

3 In part (a), both (i) and (ii), were correctly answered by a very large proportion of candidates, and only those in the lowest quartile had any problems with part (b).

4 It was pleasing to see a large majority of candidates being successful with their subtraction in part (a), though some of the remainder, using "alternative" methods were confused about whether to add or subtract the "bits", such as the 7, the 60 and the 4.

In part (b) a large majority were completely successful, with errors mainly occurring in the multiplication, and most being able to earn the mark for subtracting their total from £10.

5 Area in part (a) was better answered than the un-named "perimeter" in part (b), where 10 was a common wrong answer.

6 Both the angle measuring in part (a) and the angle drawing in part (b) were accurately executed in most cases, though some candidates used the wrong scale on the protractor, giving the acute angle instead of the obtuse, and vice versa.

7 Most candidates answered part (a) correctly, but many did not extend the idea to complete the table in part (b). Some managed to draw the graph in part (c) without the table and some who had completed the table failed to draw the graph. Some plotted the points but failed to join them to complete the straight line. Parts (b) and (c) together formed a good discriminator across the whole ability range.

8 This question was another good discriminator. The most common error in the stem and leaf diagram was to have 10, 20, 30 etc in the stem instead of 1, 2, 3 etc. The similar facilities of the two parts mask the fact that some candidates completed the stem and leaf diagram in part (a) but made errors, the common ones being the answers 37.5 and 8, in finding the median in part (b). Other candidates failed to complete the diagram, or ignored it, and rewrote an ordered list in order to find the median.

9 Foundation candidates found both parts of this question challenging. In part (a) the most common method was to break down the percentages, and many managed to show that 90 = 60%, but were unable to progress to finding what 6 was as a percentage, despite often having, for example 60 = 40%, or other stages which nearly took them there.

In part (b) few backed up their answer with any figures, but many gave a vague answer about a different conclusion because some had not voted.

SECTION B

10 All parts of this question were well done, with a very large majority of candidates earning 3 or 4 marks.

11 Nearly half the candidates earned full marks in this question, with another third calculating the angle correctly, but being unable to explain the reason.

12 A large majority of candidates answered part (a) correctly, though some hadn't read the stem of the question and were unsure what the "large square" was. In part (b) the area of the square was sometimes given as 9, but many candidates unsuccessfully counted squares, getting answers from 3 to 7.5. A few were presumably aiming for the area of all four squares, with answers as diverse as 13 and 27. Many candidates did not use the first two parts to answer (c). Some obtained a correct answer here after having one or both earlier answers incorrect. This question was quite a good discriminator across the ability range.

13 It was good to see the majority of candidates able to calculate the fraction in part (a). Finding the square, part (b), and square root, part (c), were very well done. Only a few fell into the trap of doubling instead of squaring in (b); a slightly larger proportion calculated the square root correctly in (c).

14 In part (a) most candidates calculated the mean correctly, the common wrong answer being 8, which is both the mode and the median.

The most common "explanation" in part (b) was that 13 did not appear in the list of numbers, rather than noting that it is larger than all the numbers in the list.

15 Both points were correctly plotted by almost three quarters of the candidates, with only a few making careless errors or reversing the coordinates.

16 Almost three quarters of candidates performed the substitution in part (a) correctly. Common wrong answers included 14, from adding everything together, 68, obtained from 23 + 45, and 50 from failing to apply operations in the right order.

Collecting like terms in part (b) was less well done, with errors in the signs being common, and some who simply had no idea how to add terms together.

17 In part (a) many candidates offered terms like "even number", "round number" and "it divides by 10". There were also references to clocks and minutes. Successful candidates sometimes actually showed how it helped, as in "it means you just have to multiply the numbers by 6".

The two upper quartiles of candidates produced very good pie charts, and many other managed to label their sectors in the correct size order. A small number had sectors which only filled part of the circle.

18 Over a third of candidates gained one mark by working out the area of the base of the cuboid, but few progressed beyond this. The volume of a cube with side 1.5m was sometimes calculated, and cubing the 3.15 was also quite common.

19 About a third of candidates managed the conversion in part (a), and a similar number gained at least one mark in the rearrangement of the formula, either by subtracting 32 or by dividing by 9/5. However most then omitted brackets, or had performed the operations in the wrong order and few achieved full marks. The conversion in (c) was performed successfully by a few who had not managed the rearrangement, as well as by only some of those who had coped with the algebra.

B292 Paper 2 (Foundation – Terminal)

General Comments

Almost all candidates had been appropriately entered for this tier as evidenced by there being hardly any extremely high or low marks. They all appeared to have sufficient time to complete each section of the paper.

Candidates' presentation once again showed an improvement on the previous year. Few answers were unclear, although some candidates overwrite to change an answer which often means that it is not clear which is the final answer.

In preparation for the fact that the new AO2 and AO3 will be assessed when centres switch to the new mathematics specifications, it is worth noting that questions 3, 4, 8, 11, 12 (b), 13(c) and 16 are typical of the type of open approach, problem solving or reasoning questions that candidates are going to encounter.

There did appear to be a greater care shown by candidates to produce accurate work for this paper; however candidates still lose accuracy marks through not checking in questions involving basic numeracy skills and tallying.

Comments on Individual Questions

SECTION A

1 A large majority were able to gain good marks on this question. Part (a) was slightly better answered – those who got it wrong usually chose the word 'likely' rather than the correct word, 'unlikely'.

2 Most candidates scored 4 marks for fully correct answers or 3 marks for fully correct methods. Some candidates neglected to add in one of the three parts of the total cost.

3 This question was poorly answered with a significant number gaining no marks at all. In part (a) most candidates made mistakes on each fraction. In part (b), which few could handle, separate subtraction of numerators and denominators was a common wrong method.

4 This question produced a spread of marks with most candidates able to gain some marks, but few able to gain full marks. Parts (a)(ii) and (iv) were the best answered. In part (b) candidates who drew sketches often were more successful.

5 This first algebra question on the paper was poorly answered by all but the stronger candidates. Correct algebraic manipulation was not seen very often; however in this instance candidates could score full marks for the correct answer gained by any method. Centres should be aware that with the introduction of 'Quality of written communication' marks in the new specifications questions may well be set that expect a good algebraic argument to be shown.

6 Finding the next term in the sequence was a problem in which most candidates were able to gain success and part (a) was the source of good marks for almost all. The first two linear sequences were extremely well answered. Just a few candidates misread the instructions and tried to describe some rule for each sequence which did not gain them any marks.

Part (b)(ii) was not so well answered with candidates finding descriptive communication difficult. It was not sufficient for them to say that the next term was three. Some sense that the sequence would keep repeating was required.

7 This ratio question was common with the Higher Tier paper, as were all the remaining questions in section A. It was fairly well done, although inefficient methods were used frequently. Around just under half of candidates gained full marks, so this was a good source of marks for stronger candidates.

8 Candidates were almost all familiar with the topic of correlation, with almost all of them able to identify a graph of perfect positive correlation and one that showed no correlation. When it came to the more nuanced descriptions, many candidates were not so successful.

9 Most candidates were unable to explain how the formula in part (a) related to the situation. Common errors were to try and give an example of costs that worked, thinking that *a* represented the number of apples; or only addressing the issue of why '200' was in the formula. Many scripts had no response to part (c)(i), which resulted in low marks for part (ii) also. Even those with two intersecting lines often did not give the point of intersection as their answer to this final part.

10 It was only some of the strongest candidates who could gain marks on this final question in section A. In part (a), a number of unconvincing methods were seen and although marks were available for convincingly working backwards from 108º, it was common to see instances where candidates got the sum of interior angles by multiplying by 5 and then used this divided by 5 to show the angle should be 108º. This circular argument did not get any credit.

In part (b) there were a few clear structured solutions, but many candidates showed no understanding of standard 3-letter angle notation.

SECTION B

11 This question produced a wide spread of marks, with roughly equal numbers of candidates scoring at each level. Part (a) was answered correctly by most. In the other parts, there was evidence that many candidates were unfamiliar with the types of tables from which they were being asked to extract data. In parts (c) and (d) some candidates gained method marks when they had misinterpreted the tables, but were aware of the calculation required.

12 This was another question which produced a wide spread of marks. Part (a) was generally well answered, and parts (b) and (c) were good differentiators between weaker and stronger candidates. Good answers to (b) were those that clearly showed what units were being referred to. Some candidates wrote statements such as '¾ = 750' without giving their units, and consequently could not be credited.

13 Candidates generally tackled this question well, with almost all being able to find at least one valid point D. Almost all candidates were also familiar with the word 'congruent' and with the correct notation for coordinates.

14 This question was generally well answered. Careless tallying was the cause of some dropped marks. A small number of candidates demonstrated poor understanding of the second decimal place, perhaps reading 1.25 as 'one point twenty five' which they perceived as larger than 1.4.

15 This was another question that produced a wide spread of results. Parts (a) and (b) were generally well answered, but only the stronger candidates got parts (ii) and (iii) correct. Most candidates used correct probability notation, and where they did not, they were only

penalised once. In (b)(i), good candidates tended to organise their results by considering all pairs starting with one colour at a time.

16 Few candidates were able to give good reasons for their conclusions. Only the very strongest realised in part (b) that the reason why a square number could never be negative involved consideration of squaring positives as well as squaring negatives. Part (a) was better answered than part (b).

17 This question on scale drawings was another question that acted as a good differentiator, with a spread of marks achieved. The use of the scale in parts (b) and (c) was well handled by average and strong candidates. However, few candidates appeared sufficiently prepared when it came to handling bearings. Many of them did not measure from the North line; so a common, erroneous, answer in part (a) was 135º.

18 Fewer than half of candidates gained any credit for this question. Common wrong answers were 5.535 (where candidates had divided denominator by numerator) and 2.776 (where they had not accounted for the dividing line acting as a bracket). Many of those who got the correct answer were unable to round it to 3 decimal places, and some of those who got the wrong answer did not show their unrounded answer and so were unable to be credited for any rounding skills.

19 Both parts of this question proved difficult for some candidates. In part (a) the concept of a negative power seemed unfamiliar to even strong candidates. Some simply subtracted 5 from 8 rather than the correct way round. In part (b) a common misconception was not using the same value of x for each part of the expression. Also some candidates multiplied by 3 and 2 rather than taking powers. This lead to a frequently seen wrong answer of 4.6. Stronger candidates could often do increasingly accurate trials, but were unable to interpret these into the correct answer.

20 This question was a good differentiator at the top end. Stronger candidates could often draw an enlargement without reference to the centre, but only a few used the centre; the best answers usually showed their construction lines. The word 'rotation' was not always familiar to candidates. Many stronger candidates gave the angle and direction of rotation, but only a few could give the centre also. Answers which described a combination of two transformations were penalised.

B293 Paper 3 (Higher – Modular)

General Comments

The paper discriminated well with marks across the whole range.

The perception of the examiners was that there were a number of candidates for whom entry at Foundation Tier would have served them better. Taking this paper cannot have been a very good experience for them.

On section A, a number of candidates struggled with basic arithmetic.

Essential working was usually shown, but some was muddled and not clearly laid out. If a correct method could not be discerned then part marks could not be awarded.

All candidates appeared to have sufficient time to complete the paper.

Comments on Individual Questions

SECTION A

1 Those who understood stem and leaf diagrams rarely made an error.

2 Algebra continues to be a difficulty. A number of candidates treated the expressions as equations and produced answers for *x.*

3 It appeared that a number failed to read the question properly and therefore did not realise that the diagram was a 3-D representation of a solid with an end the shape of a trapezium.

Part (b) was marked on a follow through basis so this enabled many candidates to score the marks for part (b) even if they had been unable to succeed in (a).

4 Many candidates used mathematical practice but for most of them the difficulty in obtaining 1% and hence 6% meant that they were unsuccessful.

In part (b) the better candidates understood that their reasoning had to be backed by arithmetic justification and completed it well. Others, however, offered confusing and sometime contradictory statements, often backed by incorrect arithmetic.

5 The arithmetic work with fractions produced mixed responses with many succeeding.

A number of candidates were unperturbed by reaching an answer of greater than 5 or less than 2 in part (a). A rough check would have meant that these answers could be seen to be impossible proving that an error must have been made.

6 The usual errors in manipulation were seen. These included sign errors in isolating $3x$ in part (a) and reaching $x - 4 = 20$ in part (b).

Here too candidates usually omitted to check their answers.

7 Frequency density was not well understood. Many just added the heights of the bars while others made adjustments to some of the bars but not to all that were necessary.

8 Part (a) was not well done with a variety of incorrect responses to both parts. The zero power was understood better than the negative power. More candidates were successful with part (b), though a significant number did not count the zeros in the second part correctly.

SECTION B

9 A large majority did this question well although some were unable to write their interpretations clearly.

10 This question was also quite well done with just a handful confusing area with circumference and radius with diameter.

11 Part (a) was usually correct. Fewer were successful with changing the subject of the formula in part (b) was very poor.

In part (c) candidates were required to show their working. The rubric specifically states that failure to do so may result in a loss of marks. There were some marks available here even for those who were using the incorrect formula that had been derived in part (b) but when there was no working it was not possible to award them. Answers were accepted from candidates who decided that a temperature in a cook book would certainly not be given to 2 decimal places, and possibly not even to the nearest degree.

12 For full marks it was expected that the mid-interval values used were 50.5, 150.5 etc. Most candidates ignored the fact that the inequality signs were different for the end points of the groupings and took the mid intervals 50, 150, for which most of the marks were available.

Part (c) needed some insight and only a few candidates gave a satisfactory explanation. Although the explanations in part (d) were more straightforward they often not well written and difficult to follow. These are standard responses which could be learnt.

13 In this multi-step question the majority gained some of the marks. Most found the third side of the triangle by Pythagoras but many were unable to find the time taken given the speed and the distance. The need to convert units was the biggest stumbling block.

14 About half the candidates could adapt the given proof to the new situation but a significant number could make no progress. This meant that partial success was comparatively rare.

In part (b) many did not realise that to disprove an assertion all that is needed is a single counter-example. Many of those who did give such an example then failed to draw a conclusion. For instance 1 + 2 + 3 + 4 = 10 is only of value if it then asserted that 10 is not a multiple of 4.

15 In part (a) about half the candidates could make no progress with this question which was aimed at the higher grades. Of those who used one of the possible correct methods most were completely successful. A few candidates deduced correctly that the radius of the base is the same proportion of the 21 cm as the proportion of the angle, namely 5/6. In that case the radius of the base is 21 x 5/6 = 17.5 and this process resulted in easy marks in a very short time. Those who substituted for π sometimes did not work accurately enough to get an answer that was neither exact or in the required range.

In part (b), many forgot that the height of the cone had to be found by Pythagoras and used the slant height instead.

B294 Paper 4 (Higher – Terminal)

General Comments

The paper discriminated well with marks across the whole range. At the top end there were some extremely impressive scripts with scores in the high 90s and even a few with full marks. There remain however a large number of candidates who clearly would have been more comfortable at Foundation Tier.

Although the algebra from the better students was very good as was the vector work. These topics are not well done by weaker candidates and there is some evidence that a few topics such as vectors and conditional probability have not been studied at all by some candidates.

Questions requiring reasons or elements of proof were again disappointing. In particular candidates have not learnt the standard geometric reasons.

All candidates appeared to have sufficient time. Working was usually present though sometimes rather poorly laid out.

On section A, arithmetic remains a problem for many candidates and leads to a substantial loss of marks.

Comments on Individual Questions

SECTION A

1 Both parts of this question were done extremely well. Just a few made arithmetic errors.

2 This question too was extremely well done. Almost all were correct in parts (c) and (d) and just a few errors in parts (a) and (b).

3 In part (a), despite being asked to show that the interior angle of a regular pentagon was 108º, many candidates started with the total angle = 540º. The completely correct solutions were split between those using (n – 2) × 90 and those using exterior angle = 360 ÷ n in approximately the ratio 1 : 2.

The majority were able to find the correct answer in part (b) but quite a number could get no further than angle EAG = 162º. A number made arithmetic errors and some seemed not to understand the three letter notation for angles.

4 In part (a), most were able to explain the 200 but a number suggested 3a + 5b meant 3 apples and 5 bananas rather than 3a being the cost of the apples and 5b being the cost of the bananas.

Part (b) was well done with the majority obtaining both marks and almost all writing 4a + 2b, although some put this equal to 1.64. The majority were able to draw the correct line and most were able to read off the coordinates of the point of intersection as the required answer. A significant number however did not realise that this was the solution required and also a significant number drew no line at all.

5 In part (a), a large majority were able to give the correct three terms although a few gave non-numerical solutions or substituted other numbers than 1, 2, 3.

Part (b) was much less well done with n – 3 being the most popular answer. Most' who realised that the n term was –3n' also got the 23 as the number term.

6 Unusually (b) was the best done part with most using the method of writing the numbers out as ordinary numbers. The reason for (a) and (b) being less well done was probably the difficulty with negative number rules although a number made errors with 4.2 × 5 and 4.2 ÷ 5.

7 Stronger candidates did the numerical parts of this question quite well but often gave inadequate reasons. There were a variety of approaches to part (a). It was expected that candidates would use co-interior (or allied) angles but many added construction lines such as producing OA, AO or CO and some gave the correct reasons from obtaining BAO = 26º. Most however did not give a satisfactory reason as to why angle FAO was a right angle.

Similarly there were a variety of approaches to part (b) with some finding the reflex angle AOC, others joined A and C to a point on the major arc AC and others joined OB. Here the correct reasons were more common. A common misconception was that angle OCB was the angle in the alternate segment to angle BAF.

8 In part (a), although most realised that the length was $\frac{30}{2\sqrt{3}}$ most could not rationalise the denominator of the expression. Part (b), although marked on a follow through basis, could not be done if the answer to (a) was not in the form a√3 and hence most lost the mark.

9 The better candidates did this well but all too often candidates appeared unfamiliar with vector work. In part (a) those who knew what to do sometimes could not simplify the vector. In part (b) many were able to obtain the vector AD but could not get the vectors in a form such that the proof could be completed. A number joined P to G and tried to prove that OGDA was parallelogram. All were unable to justify that OPG was a straight line.

10 Approximately half the candidates realised that *a* was 4 but far fewer knew that *b* was 180 ÷ 3.

SECTION B

11 The majority were successful with part (a) although the order of operations led to errors and some could not round to three significant figures. More candidates achieved success with the more complicated calculation in part (b), though similar errors appeared here also.

12 Almost all candidates recognised that Ali's results were more reliable as he had recorded more cars. The majority were also successful with part (b) although some worked rather too approximately and some failed to give a whole number of cars.

13 This topic has not been asked for some time and some were clearly unfamiliar with the concept of a Retail Price Index. Nevertheless approximately half were successful with part (a). Common errors were misreading the year and trying a sort of compound interest approach. Rather more were successful with part (b) which could be done without an appreciation of the concept of an index. The most common error was to find the increase as a percentage of the 2008 value. A significant number used non-calculator techniques rather than a direct calculation of the percentage. This was usually unsuccessful.

14 Part (a) was done quite well with the most common errors being to omit part of the description or to get the direction of the rotation. A significant minority of candidates ignored the emboldened 'single' and gave a combination of transformations. The negative scale factor in part (b) led naturally to this part being found more difficult. Nevertheless a large number were successful. Some candidates used a positive scale factor, others a fractional one and a number of candidates used the wrong centre.

15 Most candidates found the correct solution to part (a). Some made a sign error or inequality error in making x the subject and others solved an equation instead of the given inequality. In part (b) better candidates did well but many gave the inequalities the wrong way round and many could not obtain the equation $x + y = 6$ which was expected to be known, rather than having to be worked out.

16 The majority knew that the angle was unchanged but large numbers used the scale factor for the angle. Although the majority were successful with part (b) a significant number used the scale factor rounded to 1.3 and divided by that, thus producing an inaccurate answer. Also a number of candidates produced the answer 9 from 11 – 2.

17 Although many did part (a) well, a large number could make no correct progress after multiplying out the brackets. Part (b) was designed for the more able candidates and many of these did it well although some could not simplify their expression. Many did not make h the subject of either equation or divide the two equations.

18 Although a significant number of candidates knew that the graph was a circle, the majority did not. Some tried to choose values and plot the graph but this was almost always unsuccessful as both signs were not given. Of those who knew that the graph was a circle, a number thought the radius was 4.5. In part (b)(i) those who knew to substitute $2x + 1$ for y in $x^2 + y^2 = 9$ were often successful but most candidates could not proceed. Most candidates attempted the formula solution for the quadratic equation but often made sign or substitution errors. Some failed to round their answers to 2 decimal places. A few tried factorising despite the instruction about decimal places. A number of successful candidates were unable to, or forgot to, find the y-coordinates.

19 Although there were many excellent accurate histograms drawn, many of the candidates simply drew a frequency diagram.

20 In part (a) many candidates correctly tried to multiply two probabilities together. Many candidates omitted to recognise that the probability changed after the first selection or changed one of the numbers but not both. A significant number added the probabilities. Similarly in part (b) most multiplied two probabilities but most did not recognise the conditional probability and/or did not consider the reverse order of the selections.

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

14 – 19 Qualifications (General)
Telephone: 01223 553998
Facsimile: 01223 552627
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