GCSE

Mathematics B (MEI)

General Certificate of Secondary Education **GCSE J519**

Reports on the Units

June 2010

J519/R/10

This report on the Examination provides information on the performance of candidates which it is hoped will be useful to teachers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding of the specification content, of the operation of the scheme of assessment and of the application of assessment criteria.

Reports should be read in conjunction with the published question papers and mark schemes for the Examination.

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General Certificate of Secondary Education

Mathematics B (MEI) (J519)

REPORTS ON THE UNITS

Chief Examiner's Report

Although the number of candidates was relatively low, all the papers produced scores covering a wide range. In B291, B293 and B294 virtually the whole range was covered. In B292 there were very few scores above 90 but nevertheless the rest of the range was well covered. Thus the papers differentiated very well. The candidature was quite mixed but all the papers had a substantial number of very good candidates. The statistical effect of this was that all the papers' distributions departed from the normal. Papers B291, B292 and B293 had a marked negative skewness, whilst B294 was bimodal.

Areas highlighted by examiners which would improve candidates' performance include the lack of clearly set out working, indeed in some cases no working at all, lack of basic drawing equipment and unclear crossing out and replacement of answers.

Verbal reasoning responses remain a problem for many candidates. Whilst some of these cannot be learnt, some can. The 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. In the new specifications examiners are required to test quality of written communication and so, whereas at the moment, examiners often give the benefit of the doubt, this will no longer be possible.

No apologies are made for highlighting again the problems over Arithmetic in non-calculator sections. at both Foundation and Higher tiers. Even higher candidates are often hindered by their inability to carry out simple processes. Fractions particularly are a problem and many candidates simply omit fraction questions. Division seems an alien concept to many candidates. Even on the calculator sections repeated addition or subtraction is often seen. At Higher tier candidates often use inefficient methods for numerical work that would be more appropriate to non-calculator sections. This is particularly noticeable in repeated percentage change questions.

B291

General Comments

This was the modular paper for the Foundation tier of MEI. Section A was non-calculator.

Candidates appeared to have plenty of time on both sections.

Questions 9a, 10 and 18 were common, all or in part, with questions 6, 4 and 11, respectively of Paper 3.

There was a good range of marks, with some candidates achieving full marks, and all questions proving accessible to the top quartile of candidates. Candidates of all abilities earned marks in at least some parts of the earlier questions, with only a small number of candidates achieving less than a quarter of the total marks.

Clear setting down of working would aid candidates in organising their thoughts, and enable them to earn part marks where the final answer has not been correctly reached.

Comments on Individual Questions

SECTION A

1 The usual errors were seen, such as 0.59 = 5/9 in part (a)(i), $\frac{3}{4}$ = 34% in part (a)(ii) and 20% = $\frac{1}{20}$ in part (a)(iii). In part (b), difficulty in division led to incorrect answers. Part (a)(i) was the least well done part of this question.

2 There were many correct solutions, but some candidates chose a parallel line in both parts or a perpendicular line in both parts, or confused the two meanings.

3 It was good to see correct explanations rather than just the calculation shown.

4 Good understanding of the "word formula" was demonstrated, with both parts of the question being well done by many.

5 In part (a), the multiple of 5 was usually correct; 6 and 8 were frequent suggestions for square numbers, and 28 was the most common wrong suggestion for a factor of 14.
In part (b) many candidates correctly explained the meaning of "cube of 2", though "he should have written the 3 at the top" did not to go quite far enough and so was not accepted.

6 In part (a), the most frequent mistakes were errors with the signs or incomplete simplification.
The simple equations in part (b) were often solved correctly, though leaving the answer as, for example, 16 – 5 = 11 should be discouraged, as it is not really answering the question "What is x?" Part (i) was done better than part (ii) by lower ability candidates.
"$3a + 5 = 8$" was a frequent double error in part (c).

7 In part (a)(i), the probability of a total of 13 was least well done, particularly by the lowest quartile of candidates. Perhaps they had not realised you cannot score 13 on two dice. Otherwise this question showed good understanding, particularly of exclusive probabilities in part (b).

8 The relatively unstructured nature of this question caused problems for many. 6 × 15 was quite regularly seen, and various multiples of 54.2. A good number did manage to earn the marks for 9.2 cm of white card in part (a), and for 20.6 as the height of two postcards in part (b).

9 A common error in part (a) was to correctly find that 600 g = 100 straws, and 150 g = 25 straws, but then add the wrong things together, often giving an answer of 625. In (b) repeated halving of previous values failed to give factors of 240. A "rough guess" usually attempted to close the gap, but destroyed the idea of ratio.

10 Too many candidates did long multiplication in both parts, failing to round the numbers in part (a) or to use the given calculation in part (b).

SECTION B

11 (a) Almost 100% of candidates labelled the square correctly, but T was frequently in a triangle or the rhombus, and R in the trapezium or rectangle.
(b) The right angle in (iii) was most often identified correctly, but all parts were well done.
(c)There were many correct definitions of "reflex", but "it's on the outside" wasn't sufficiently mathematical.

12 Part (a) was well done.
In part (b), candidates often doubled instead of squaring, but there were many correct solutions, showing, encouragingly, that calculators were being used.

13 The graph in part (a) was completed well by almost all candidates, though there was some (un-penalised) variation in bar width, which should be avoided.
Part (b)(i) was well done.
In part (b)(ii), many candidates made sensible comparisons of the two distributions, though some failed to mention which school they were commenting on.

14 The mode and median in part (a), was slightly better done than the mean in part (b) by the weaker candidates. Some confusion between the different statistical terms was seen, and some lost marks through numerical errors, even though they were allowed a calculator on this section of the paper. This question discriminated well across the range of candidates.

15 In part (a), most errors were of the "$3m = 36$" (with $m = 6$) type, or errors in the order of operations.
In part (b), $(6 \times 2 - 6) \div 2$ was often calculated.

16 The conversion graph was used correctly by all but a small number of candidates. Parts (a) and (b) were both well done.

17 The dimensions were frequently added, or some combination of surface areas found. The units were often incorrect or omitted. The top quartile of candidates made few errors.

18 Much adding of lengths, or multiplying together every number in the question, was seen in part (a).
Few attempts to use the formula for area of a circle appeared In part (b).
In part (c), there were pleasing responses involving correct use of the candidates' values from the earlier parts.

B292

General Comments

This was the second year in which there was a June sitting for the Foundation paper B292. Candidates were almost all well suited to this paper, with very few exceptional or disastrous scripts. There were only a handful of results above 85% or below 10%.
Candidates appeared to have sufficient time to complete each section of the paper.

For the calculator section it now appears rare for candidates not to have a calculator. Centres also appear to be preparing candidates better for the fact that marking is done online using scanned scripts. Fewer answers were overwritten or unclear; however it can prove costly to candidates when they do not make their final answer clear, so centres should continue to stress the need for clarity.

As in January, candidates were much more willing to attempt questions that ask for a verbal explanation. However, on this paper, the answers to these questions were frequently incorrect, highlighting a lack of conceptual understanding of data handling.

Compared to the January sitting, there were fewer marks lost through careless mistakes.

Some candidates were not properly equipped for the examination. Their lack of response to some questions particularly in section B would appear to be due to the unavailability of angle measurers or rulers.

Comments on Individual Questions

SECTION A

1 Part (a) was well answered even by weaker students. A very small minority were unhappy to have a half of a shape without it being split down the middle. An equally small number incorrectly gave $\frac{3}{10}$ as 3%.
Part (b) caused more problems for weak candidates, although some were able to gain a method mark by finding one comparable equivalent such as
20% = 0.2.

2 Almost all candidates were able to name the shapes and to identify a congruent pair. Common errors occurred when candidates were confused by the shapes being set at an angle, and with candidates identifying a similar pair

3 Parts (a), (b) and (d) of this question were generally well answered with pleasantly few candidates reversing their coordinates or giving four lines of symmetry. Few of them could identify a Rhombus, most writing down Kite instead (at this level, the unique name is required).

4 Apart from those candidates who thought that the chance of someone being left-handed was evens, this question caused few problems.

5 This question produced a good spread of marks with no clear pattern as to which fraction was easiest to find. The fraction subtraction in part (b) proved the hardest part, but even this was well answered by good candidates.

6 There were some good answers to parts (a) and (b) of this question, with most candidates making an attempt to 'complete the teacher's comments'. The best answers commented on the mistake in ordering operations and often referred to BIDMAS/BODMAS. Some candidates received credit for trying to explain the correct method.
Parts (c) and (d) were frequently well answered. Common erroneous answers were x^3 for (c) and $z \div y$ for (d).

7 This question was well answered by almost the entire candidature. Some careless errors crept in when repeatedly adding or subtracting 3 for parts (c) and (d). Part (e) produced variable results. Some quite strong candidates simply described the mathematical operations involved rather than explaining why the expression worked within its context.

8 This question was poorly answered by all but the stronger candidates. Many candidates were able to use angles on a straight line to get 70º, but then ended with answers of 70º, or 55º (110 ÷ 2) rather than the correct answer of 40º.

9 Parts (a) and (c) produced some good answers although '3' (as an answer to 2 × 1) was frequently given as the numerator of the fraction in part (a). Part (b) was beyond all but a few candidates. The most common wrong method was to do 11 ÷ 2 leading to a wrong answer of 5.5.

10 All but the weakest candidates found part (a) straightforward, and most were also able to make some progress towards solving part (c). However, very few candidates recognised the fact that 20 throws of a die is insufficient. In part (c), a popular method was to try and start from the ratio of 30:200 and double both parts repeatedly; this gained a method mark, but often candidates were then unable to arrive at 3000 spins and so complete the question.

11 This question was not well answered. Some candidates thought that it was sufficient to do 360 ÷ 8 for part (a), and the few who found the correct interior angle of 135º were rarely able to use this to explain part (b). Part (c) was answered correctly by more candidates than the other parts.

SECTION B

12 This question produced a good spread of results, although it caused no problems for stronger candidates.

13 This question about a pictogram was well answered in the majority of cases. It was particularly pleasing to see many correct pie charts. Some candidates omitted to simplify the fraction in part (c).

14 Most candidates were able to gain some marks from this question, but the work on bearings was not done well by many. Some candidates tried to scale up the angle as well as the distance in part (b).

15 While most candidates were able to attempt part (a), some answers were not sensible, eg £4636. Only the stronger candidates could fully solve part (b), although many could find the number of full litres involved.

16 This question produced a good spread of results. Even the weakest candidates could answer the first part, but only the very strongest could cope with the equation in part (b). Part (c) produced a wide range of answers and candidates were able to gain full marks for lines of points, a straight line or a step graph.

17 Few candidates produced good answers to this question which was also on the higher paper. There was often little comprehension of grouped data. In part (b) many answers were not comparisons. In part (c), candidates often attempted to suggest reasons why the data might be inaccurate rather than why the sample might not be representative; so they suggested that the pupils might not know how long it took them, or might lie.

18 For these transformations, many candidates recognised the reflection, and were able to produce a 3 times enlargement, but fewer were able to give the mirror line, or correctly use the centre of enlargement.

19 It was pleasing to see how well this question and the next one were answered. Here most candidates had a good attempt at prime factorisation. In part (a)(ii) many were able to find a common factor although this was often without recourse to the information previously gained. The question on standard form was answered correctly by over 50% of candidates.

20 Parts (a) and (b) were frequently solved, although formal algebraic methods were less common. Part (c), however, was beyond all but the most able candidates.

B293

General Comments

The impression given was that the candidates performed rather better this series and it was pleasing to see some with full marks in the sections.

Candidates appeared to have time to complete the paper.

Essential working was usually shown, although sometimes this was a little jumbled up and made awarding of part marks difficult.

Comments on Individual Questions

SECTION A

1 Many substituted correctly but could not deal with 5(4 + 2) × 7. Common errors were 5(4 + 2) × 7 + 50 = 5 × 6 + 7 + 50 = 87 and also 30 × 57 or 20 + 70 + 50

2 The question in the questionnaire is bad because of the overlapping regions. Candidates sometimes did not answer the question but rather made alternative suggestions for collecting ages, even simply to cut the question completely as the age is irrelevant. Some thought the intervals should be smaller eg 10-20, 20-30 etc.

3 The drawing was often correct. Some only gave the lower 2 quadrilaterals. Some drew the correct outline but ignored one or both of the internal lines.

4 In part (a), most made sensible estimates but several could not work out the arithmetic accurately. A few tried to use long multiplication and division without estimating.
Part (b) was mostly correct, although a few got their decimal point in the wrong place. A small number tried to do the calculation again from the start.

5 Most gave correct examples. A few did not understand the concept of "counter-example" and offered something else instead, such as "every multiple of 2 is even".

6 Part (a) was usually correct, often by a proportion method.
In part (b) several used the ratios correctly but based on 125 (or even 300) rather than their answer for (a).

7 This was often incorrect. Many who correctly identified "B" were not able to explain why it leads to a volume.

8 In part (a), most collected terms but several who got eg $3x = 7$ then gave the answer as $x = \frac{3}{7}$. A few tried trial & improvement without success.
In part (b) many correctly multiplied the bracket and often achieved the correct answer but several could not collect their terms, often making sign errors such as $4x + 5 = 2x + 14$ so $6x = 9$ or 14. Some could not deal with the bracket but could collect terms, for example $4x + 5 = 2x + 7$ so $2x = 2$.
Many could not get rid of the fraction in part (c) and often found 'x' on each side of their equation and had nowhere to go but which sometimes led to highly fanciful algebra.

9 In part (a), many substituted in the correct formula but several made sign errors such as $x = -4 \pm$ or $\sqrt{16-4}$. Most who attempted completing the square found $(x-2)^2$, but could not complete to obtain the $\sqrt{5}$.
Many made no attempt to factorise in part (b). Several cancelled the x^2 and/or x terms. Better candidates were usually able to factorise, but some gave $(x-1)(x-5)$ in the numerator and a few gave $(x-5)^2$ in the denominator.

SECTION B

10 The plotting of the points in part (a) was often correct but several made scale errors.
In part (b) the line of best fit was usually ruled and mostly within the limits set.
The reading of the required point was generally well done but some there was some misreading of the scale usually, but not exclusively, by those who had made similar errors in (a).
Part (c) was usually correct but with some very strange spelling. When quality of written communication is introduced this could become a problem.

11 At higher level it was expected that most would answer part (a) correctly but some multiplied all the lengths and some added them.
In part (b), most found 1.4 x 1.2 but there were several errors finding the area of the semi-circle. Some used 1.4 instead of 0.7. Several did not divide their result by 2 thus finding the area of "their" circle. A few used circumference instead of area.
In part (c), many gave a correct response from their answers. Some did not bother to work out 10% of the window for their comparison.

12 This was often correct but usually from a trial method. Several who tried to use inequalities could not transpose correctly so gave incorrect values. Some gave one answer only and several substituted incorrectly. Those that got an incorrect set of values usually failed to recognise the strict inequality sign and so included the value 2.

13 In part (b) most recognised that both triangles contained a right angle. Several found equal angles but gave no (or an incorrect) reason. Many mentioned the right angles then assumed the result to give a scale factor. Several who identified equal angles could not give a reason why the triangles might be similar. Many simply said that the triangles were similar because one was an enlargement of the other.
Part (b) was usually correct, sometimes using a trigonometrical method.

14 This standard question was often well done. Most had some idea how to solve by equalising the coefficients of one of the unknowns, but the algebra was not always accurate. A few attempted substitution. Only a small number had no idea and tried to manipulate the given equations or substitute numbers.

15 In part (a) there were a few arithmetic errors in finding products, eg $4 \times 0 = 4$, and some used end points rather than midpoints and there were some with inconsistent “midpoints”. Some divided 66 by 5 and a few 40 by 5.
Part (b) was usually correct though some read the height of the appropriate bar and some looked at several (or all) the intervals often adding the values.
In part (c) several realised the trains in spring tended to be more punctual than in summer, describing it in a variety of ways. However few were able to give a satisfactory second comparison often only commenting on one interval.

16 Many could not identify the angle needed, often FAB or FBC. Most used Pythagoras correctly either once or twice but sometimes only to find BF and then used a correct trigonometrical ratio for the angle they were trying to find. A few confused sin and tan, sometimes in the correct triangle.

B294

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. There were however a large number of candidates who clearly would have been more comfortable at Foundation tier.

The algebra from the better students was very good as was the vector work.

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

Comments on Individual Questions

SECTION A

1 This question was done quite well. Most were able to obtain the angle of a regular octagon, though a few thought the total internal angle was 360°. The explanations were also often satisfactory with most finding the remaining angle was 90° or correctly stating that 360 was not divisible by 135. Some, using the latter explanation, got the division the wrong way round. Most of those who got the 90° recognised that squares were necessary in (b)(ii), but a surprising number did not.

2 Most recognised that $\frac{2}{3}$ and $\frac{1}{6}$ were equivalent to recurring decimals but $\frac{2}{5}$ was also fairly common, presumably because of the odd denominator.

3 Most middle ability and strong candidates had the right idea and wrote down the correct expressions for the other members of the family. Many omitted Amy's age x in their equation. Weaker candidates were unable to express the other ages in terms of x. Those with the correct equation usually obtained the answers in (b), indeed a number obtained the answers without the correct equation.

4 In part (a), about a third of the candidates recognised that there were insufficient throws to conclude that the die was biased. Many, however, thought the unequal frequencies were sufficient to indicate bias.
Part (b) was well done with the majority obtaining the correct answer.

5 Part (a) was extremely well done with the vast majority obtaining the correct answer.
Part (b) was also well done but a number could not multiply 0.3 × 0.3 and others added the probabilities instead of multiplying them.

6 This question was well done. About three-quarters of the candidates were successful with part (a). Whilst not so well done as (a), part (b) was still very well done by better candidates, although some got the wrong number of zeros when changing 1.27×10^8 to an ordinary number.

7 Almost all the candidates were successful with part (a)(i). Part (a)(ii), though less well done, still produced the correct answer from many candidates. One of the most common mistakes was to say that $3x^2 \times 6x^0$ was $18x^3$. Others made errors in the number part or could not cope with the division.
Parts (b) and (c) were aimed at the better candidates and they often did them well. Surprisingly, in (b) more were able to work out 3^{-2} than $4^{3/2}$. In (c) those who knew to multiply by $\sqrt{3}/\sqrt{3}$ were often successful.

8 This question produced a wide range of marks. Weaker candidates were unable to plot the lines but middle ability and stronger candidates were able to plot at least one. $x = -1$ was usually correct, although $y = -1$ and $x = 1$ were quite common. $y = 2x + 1$ was plotted quite well. $2x + 3y = 12$ proved more difficult. Those who were more successful usually knew the intercept method of choosing $x = 0$ and $y = 0$. Those who plotted the lines correctly were able to indicate the correct region. The instruction to indicate which boundaries were included was often ignored. Of those who used dotted line(s), a number did not use it correctly and reversed the usual convention. Without a key this could not be marked correct. Part (b) was meant to test the better candidates and it proved effective in doing so. It was well done by the best candidates.

9 The proofs produced by the better candidates were very impressive and showed a marked improvement on previous years. Weaker candidates often included incorrect assumptions, eg stating angles equal, or made vague general descriptions. Some good candidates proved the congruent triangles but failed to make the correct conclusion at the end.

10 Whilst weaker candidates, as is to be expected, could not cope with vectors, it was very pleasing to see the excellent vector work produced by the better candidates. The fact that over a third of the candidates gained full marks underlined an improvement in vector work.

SECTION B

11 Most candidates did part (a) well although weaker candidates sometimes confused *d* and *n*. Part (b) was usually correct, often after a wrong part (a). Straight lines, series of points and step functions were all accepted. About two-thirds of the candidates gained the mark in part (c) where anywhere in the range $12 < d \leq 13$ was accepted.

12 The vast majority got the modal class correct although a few gave a value in the class not the class itself. In (b) the common errors were to only describe one of the distributions and the misconception that James was more consistent instead of the correct Becky. This misconception that equal frequencies means greater consistency should be addressed. The expected response was that James had the higher mode was also often wrong as candidates were comparing the frequencies of the mode rather than the mode itself. Part (c) was answered better although reasons were sometimes very vague.

13 The vast majority recognised the transformation in part (a) as a reflection but a number did not get the equation of the mirror line with $y = -1$ being fairly common. Most gained full marks for 13b but about a quarter of the candidates just drew an enlargement without using the centre (4, 0).

14 About three-quarters of the candidates carried out the compound interest calculation correctly, but very few took any notice of the instruction to give the answer to a suitable degree of accuracy and gave the answer to the nearest penny or pound. Common errors were using simple interest and numerical errors. Many candidates used inefficient methods on a calculator paper, doing each step at a time rather than multiplying by 0.88^3. In part (b) those who knew the method and recognised the reverse percentage almost always got it right. Thus very few part marks were awarded. All too often the method was to reduce 9460 by 12%.

15 Most candidates were successful with parts (a) and (b)(i). In part (a), some weaker candidates clearly had no idea how to factorise and some stronger candidates were looking for a harder question and gave $(x + 3)(x – 3)$. There were some sign errors in (b)(i). Understandably part (b)(ii) proved much more difficult but better candidates did it very well and about 40% of the candidates produced a perfect solution.

16 Better candidates did part (a) well although about a quarter of the candidates seemed to have no knowledge of moving averages. The plotting of the moving averages was usually quite good but a number did not plot them at the middle of the three days. About half the candidates were able to describe the overall trend. By far the most common error was to describe the daily variation rather than the overall trend.

17 Almost all the candidates who recognised that the variation required squaring the multiplier almost always got the answer right, so the part mark was rarely awarded. All too often the response was $15 \times 3 = 45$.
About 60% of the candidates recognised that graph C was correct. A and B were the usual wrong responses.

18 This question produced a wide spread of marks. For quite a difficult multi-step question it was pleasing to note that about 35% gained full marks. Most of the better candidates recognised that using the cosine rule was necessary to find AB. Weaker candidates often tried to use right-angle triangle trigonometry or Pythagoras. Those using the cosine rule were fairly successful, although some numerical mistakes occurred. A number also went from
$195^2 + 350^2 – 2 \times 195 \times 350 \times \cos 115$ to $24025 \cos 115$. Whilst this is a common mistake it ought to be avoided by simply letting the calculator sort out the order of operations. A number of candidates, who had calculated AB incorrectly, were able to get the method mark for working out the difference in times. Here though multiplying by 1.2, rather than dividing by 1.2, was fairly common. Some candidates made unnecessary complications by changing to minutes, not, in itself, an error but a further source of numerical mistakes.

19 As with question 18 there was impressive work from the better candidates on a difficult question with over 25% getting full marks. For those who knew the method, sign errors in simplifying the equation were fairly common as were similar sign errors in applying the quadratic formula or substituting x values in to find y. As usual $(x + 2)^2$ was sometimes expanded as $x^2 + 4$ but thankfully that was relatively rare. Weaker candidates often tried to use linear simultaneous equation techniques thinking they could eliminate x or y. A number of candidates used the completing the square method and these were often successful.

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