



Pearson

Examiners' Report

Chief Examiner Feedback

Summer 2017

Pearson Edexcel GCSE (9 – 1)
In Mathematics (1MA1)

This document also references the legacy GCSE Mathematics qualification and other qualifications within the Pearson Edexcel portfolio of mathematics qualifications.

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GCSE (9 – 1) Mathematics – 1MA1

Chief Examiner Feedback

Introduction

This report is written for centres. It focuses primarily on the GCSE (9-1) Mathematics 1MA1 qualification, but also makes mention of the legacy 1MA0 qualification, and other related qualifications in the Pearson Edexcel Mathematics portfolio.

This is a general report, summarising and providing some overall detail. For specific detail relating to individual questions, mark schemes, and grade boundaries, centres are referred to the examiner reports produced by individual Principal examiners, and other specific reports issued. These are available on the Pearson Qualifications website as well as the Mathematics Emporium website at www.edexcelmaths.com

In Summer 2017 the new GCSE (9-1) Mathematics 1MA1 qualification was taken for the first time. Alongside this, the legacy GCSE Mathematics 1MA0 was also offered as a resit opportunity for the very last time. The legacy Entry Level Certificate in Mathematics (ELC) was also offered for the last time, with a new Entry Level Certificate being introduced for 2018. The legacy GCSE Statistics qualification will be offered for the last time in June 2018 with a new GCSE (9-1) Statistics launched this year for first qualification in June 2019. Edexcel Awards remain available.

Entry Figures

The tables below shows the entry figures for the legacy and reformed GCSE Mathematics qualifications in summer 2017. Comparison with previous years is difficult, since the entry was split between the two qualifications this year. The legacy entry in 2017 is mostly comprised of resit candidates, and it is therefore no surprise that the bulk of these (62%) were at Foundation tier. The absence of resit candidates will of course have affected the entry pattern for the reformed qualification too.

	GCSE (9-1) Maths 1MA1		GCSE Legacy Maths 1MA0		GCSE Maths (1MA0 & 1MA1)	
	Count	%	Count	%	Count	%
Foundation	180,803	48%	59,925	62%	240,728	51%
Higher	198,182	52%	36,304	38%	234,486	49%
Total	378,985		96,229		475,214	

The reformed GCSE (9-1) Mathematics papers were designed to offer greater challenge than the legacy qualification. The production of specimen and mock papers gave a good indication to centres as to the expected challenge. The Foundation papers were designed to offer a broader range of opportunity than was the case for the legacy specification, whilst the Higher papers were extended at the top to accommodate the new grade 9, with content reduced at the lower end. It was therefore expected that more candidates would opt for Foundation than was previously the case. Whilst this did happen, it is still the case that there are some candidates who struggled with Higher tier. These candidates picked up very few marks and would have been better served sitting Foundation tier papers. There were also a small number of candidates who scored very highly on the Foundation tier papers and would have been better served preparing for and sitting the Higher tier. It is likely that the increased uncertainty with a new qualification would have made these tier entry decisions even more challenging than previously.

GCSE entry for grade 4/5 candidates

There are two main areas which require further debate in centres. The first relates to the grade 4, which is the standard pass grade. There remains a false perception that a grade 4 (broadly aligned with a grade C) is easier to achieve at the Higher Tier than the Foundation Tier. Centres will notice that there is a greater overlap of questions in the new GCSE, between the two tiers. This is deliberate, to afford us quality analysis of performance, so that we can ensure that a grade 4 is the same standard on both tiers, irrespective of how many take the qualification at Foundation and at Higher. The second matter is one which relates to the quality of experience for the candidate. For candidates expected to achieve grade 4 or 5 there is ample opportunity on the Foundation papers for them to show what they can do, and to work through a range of challenging questions. There is far less opportunity on the Higher tier papers than on the Foundation tier papers for this type of candidate to show what they can do, since the Higher papers are designed for candidates expected to achieve the highest grades, and many questions will be inaccessible.

GCSE entry for grade 1/2 candidates

Due to the fact that the foundation tier is now of greater challenge, there are fewer questions targeted at the lowest available grades. Following on from the Summer 2017 examinations, we will be looking closely at the performance of all questions, and the design of these questions, particularly at the lower end of the foundation papers, in order to try to create a situation where grade 1 and 2 candidates have greater access to the GCSE papers, but this must be within the framework determined by Ofqual. For the lowest ability candidates centres may wish to consider the new Entry Level Certificate, which has been re-written to better match with GCSE Foundation papers (see below).

GCSE entry for grade 8/9 candidates

One of the objectives of the reformed GCSE framework is to provide greater challenge and to close the gap between GCSE and GCE examinations in Mathematics. The papers should also allow differentiation at the highest grades. There will always be a discussion about the requirement to make papers more challenging but not off putting when further study is considered. Comments received, and evidence from the papers, would appear to suggest that we have the balance about right, whilst still meeting Ofqual requirements, in giving adequate challenge for the brightest students and trying to ensure that students are better prepared for the move from GCSE to GCE.

Comments received

Centres need to be aware that the reformed GCSE papers have to be set within a framework that is determined by Ofqual. We have received comments referring to the balance of content, difficulty and question type, for example, which are written into the subject conditions and which all boards must follow.

This is made clear in the Ofqual framework, which can be found at: <https://www.gov.uk/government/publications/gcse-9-to-1-subject-level-guidance-for-mathematics>

We are grateful for comments received, all of which are considered as part of our evaluation strategy. Future papers will be considered in the light of our own analysis and evaluation, and taking into account comments received where appropriate.

Candidate performance: GCSE (9-1) Mathematics

Before making some statements about candidate performance, we must acknowledge the considerable work undertaken by our many centres in preparing candidates for the reformed GCSE examinations. The entire senior team of Principal Examiners at Pearson commented that they were impressed by many candidates in presenting their work, their flexibility of approach to the examination papers, and the way in which they approached some of the necessary problem solving. It was noticeable that a greater proportion of the candidates were prepared to make attempts at far more questions than in previous series, irrespective of the challenge. The work of centres in preparing candidates was clearly evident, particularly in those questions which assessed work that was new to this specification.

The quality of presentation seen this year showed some improvement on that seen previously. It was also clear from evidence that a greater proportion of candidates arrived prepared for these examinations, and with the correct equipment in order to be able to answer those questions which required it.

Before the examinations, some had expressed concern as to whether candidates would present themselves for the full spread of three papers. There was no evidence of a

decline in overall performance on the third paper, nor of any decrease in attendance. Again, we must acknowledge the considerable work that centres must have done to assist in this, and in encouraging students to persist through all three papers.

The notes below are designed to assist centres in preparing future candidates. More detailed information, particularly in respect of individual questions, can be found in the individual examiner reports prepared by each of the Principal Examiners.

Foundation Tier: Areas for Improvement

Candidates need to be encouraged to organise their work better, particularly in those questions which required a number of stages through to the solution. Guidance could perhaps be given as to how to set out their work in the space available. But space should not be a constraint: additional paper can be requested if needed.

Some less able candidates may need additional assistance in writing their numbers. For example, 5s, 2s, 7s and 9s. Numbers that are over-written are usually illegible.

In the shorter questions, candidates need to show all stages of working, however trivial. This is particularly the case on the calculator papers, where sometimes the temptation is to just work through to the solution of the problem on the calculator, showing just the answer on the answer line. Writing out the calculator entries alone would be an improvement on no working, but as much detail as possible is preferable.

Number

Manipulation of number appears to be a strength. This is also true on the non-calculator papers, for example in carrying out long multiplication. Recall of basic multiplication facts is not as good, with errors occasionally shown, even on the calculator papers.

Rounding of numbers appears to present difficulties for some. This is particularly the case when rounding to significant figures but sometimes even for those rounding to a given number of decimal places. The effects of rounding are misunderstood, for example when discussing under- or overestimation. Equally, candidates were unable to show knowledge of the new topic of error intervals.

Basic numerical problem solving was usually well done, particularly when the context was money, but when use of other units was required, or some conversion between units was needed, candidates did not perform as well.

Early work on fractions was good, but deteriorated when mixed numbers were introduced.

Writing or using numbers in Standard form is a weakness.

At this tier, performance in the basic skills of algebraic manipulation have improved when compared to previous series, even factorisation; the work of centres in emphasising this for Foundation candidates was rewarded with greater success in this area. Candidates appear to become confused when terms involve indices; for example, the difference between $2a + 2a$ and $2a \times 2a$, which may need greater emphasis for the future.

Use of formulae was good, but substitution remains poor, (e.g. written as 24 when $v = 4$) particularly if negative signs are involved.

Expansion of brackets is getting better, though sometimes spoilt by poor simplification. Inequalities are much better understood.

Derivation of algebraic expressions for the solution of problems needs far more practice, but again improvements here at the simplest stages since writing simple expressions (e.g. $12p$ cups) was done well.

Questions on number sequences continue to be done well.

Remind candidates to attempt to join the points after plotting coordinate graphs; otherwise questions asking for graphs to be drawn are often done well.

Ratio, Proportion and Rates of change

Working with percentages is an essential skill for life, and certainly for GCSE Mathematics. There are many candidates who undertake a division to calculate a percentage, rather than multiplication. Equally, there are many candidates who make it more difficult for themselves on a calculator paper by attempting partitioning methods when working out a percentage. Using multipliers is unpopular at Foundation tier, but is not necessary with a good understanding of percentage. Compound interest does not appear to be a weakness, since it is usually done well, even when simple interest is asked for.

Ratio and use of scaling factors is not well understood. There is a considerable increase in ratio and proportion content in the new specification in this area, and more time spent on this part of the specification will no doubt result in an increase in marks earned in the future. Basic simplification of ratios was not well understood at this tier. Proportion questions were frequently misread, or attempted by trial and improvement methods, whereas a more formal approach would normally result in the correct answer being given.

Geometry and Measures

Candidates' recall of essential formulae was not always successful, in particular those for the area of a triangle, and those related to the circle.

General weaknesses still persist in handling and converting units. Centres need to ensure a greater understanding of metric units of length, mass and capacity especially to dispel the misconception that $1\text{kg} = 100\text{g}$. Candidates appear to have little knowledge of compound units such as average speed and density. Working with time and time duration remains a major weakness.

Many candidates were not able to evidence knowledge of the difference between perimeter and area.

There is some confusion about the descriptive terms relating to transformations; there is some evidence that those who fail to use tracing paper to carry out transformations do less well.

Reasoning skills in geometrical contexts remain weak.

Otherwise mensuration work in problem solving is normally done well.

Probability and Statistics

Understanding scatter diagrams remains a strength, and whilst most can calculate angles for pie charts, understanding the context of proportion in relation to them is poor.

Statistical calculations were normally done well, with only a few candidates mixing up the terms e.g. giving the mean for the range.

Questions that asked for some criticism of a statistical diagram were usually well attempted, the only flaw being answers that were too vague to attract full credit. Where some interpretation is needed, candidates should be advised to write as much detail as is possible; there is no such thing as too much detail!

Scaling of all types of graph continues to present problems; taking readings can be problematic for those who do not draw straight lines to help, since their attention seems to wander across grid lines.

Probability appears to be well understood, but more practice is needed with Venn diagrams and set theory, new to this GCSE.

Higher Tier: Areas for Improvement

Candidates need to be encouraged to organise their work better, particularly in those questions which required a number of stages through to the solution. Guidance could perhaps be given as to how to set out their work in the space available. But space should not be a constraint: additional paper can be requested if needed.

To avoid making unforced errors, candidates need to avoid over-writing figures, and ensure that figures are copied correctly, even within their own working. It is also useful to check that the answers given make sense. Re-reading written responses and explanations may offer opportunities to check that they are sensible and offer an answer appropriate to the demand; this could perhaps be done towards the end of the 1½ hours. Candidates also need to avoid leaving multiple, sometimes conflicting, methods by crossing through work neatly after having replaced it.

As the higher tier papers were designed to accommodate those striving to access the higher grades, it was inevitable that some topics/questions would be out of reach of some of those entered for this tier. In some cases these were questions focusing on new topics to this specification. It is unclear as to whether unfamiliarity was due to a weakness in ability or not having spent sufficient time on a topic. There was no evidence that there was insufficient time to complete the papers.

Number

When handling decimals, candidates need to ensure that they do not round prematurely. When handling fractions, some candidates converted these to equivalent decimals, but in doing so undertook some rounding which resulted in an incorrect final answer being given.

Handling negative number operations remains a weakness.

Manipulation of number appears to be a strength. This is also true on the non-calculator paper, for example in carrying out long multiplication. Recall of basic multiplication facts is not as good, with errors occasionally shown, even on the calculator papers.

Rounding of numbers appears to present difficulties for some. This is particularly the case when rounding to significant figures, but rounding to a given number of decimal places appears to be sound. The effects of rounding are misunderstood by some, for example when discussing under- or overestimation. Equally, candidates were unable to show knowledge of the new topic of error intervals.

Most understand standard form numbers, but calculating using standard form numbers is a weakness. Those who knew how to perform standard form calculations on a calculator had greater success on the calculator papers overall.

Algebra

At this tier, performance in the basic skills of algebraic manipulation have improved when compared to previous series, probably due to the work of centres in emphasising this with candidates. This included expansion of brackets (an essential algebraic skill) and solving equations. Weaknesses persist in factorising trinomials and in rearranging more complex expressions, for example relating to algebraic fractions and making the subject of.

Inequalities are much better understood.

Derivation of algebraic expressions for the solution of problems needs far more practice. Candidates should note that algebraic proof does NOT involve substitution of a range of numbers. Coordinate geometry is also a weakness, but drawing tangents to curves to find gradient was done well. Questions on number sequences also continue to be done well.

It was found that many candidates were unable to match graphs with their equation. The probability of success on these multi-choice type questions is low.

Ratio, proportion and rates of change

Working with percentages is an essential skill for life, and certainly for GCSE Mathematics. There remain many candidates who undertake a division to calculate a percentage, rather than multiplication. Equally, some candidates make it more difficult for themselves on a calculator paper by attempting partitioning methods when working out a percentage.

Compound interest is well understood, but those who use multipliers need to take greater care (avoid $103\% = 1.3$). Ratio and use of ratio and scaling factors in questions is not well understood. There is a considerable increase in ratio and proportion content in the new specification in this area, and more time spent on this part of the specification will no doubt result in an increase in marks earned in the future. Proportion questions were not recognised as such, and as a result were not well done; the language of proportion needs greater emphasis. But overall performance was better when questions were placed in a context.

Geometry and Measures

General weaknesses were evident in handling and converting units. Centres need to ensure a greater understanding of metric units of length, mass and capacity especially to dispel the misconception that $1\text{kg} = 100\text{g}$. Many candidates show weakness in their knowledge of compound units such as average speed and density.

Transformations are generally understood and are a strength in many candidates. In the digital age some confuse clockwise and anti-clockwise. Some are unable to perform

transformations which involve reflections in lines such as $y = x$. There is some evidence that those who fail to use tracing paper to carry out transformations do less well.

There is evidence of confusion about internal and external angles of polygons, even though the size of the angle is presented on the diagram. Candidates should realise something is wrong when writing an angle less than 90° on a diagram where the angle is clearly obtuse.

Working in relation to geometric diagrams is sometimes unclear, particularly in making clear the angle being referred to. The best way to avoid any ambiguity is to write any angles found on the diagram provided; for the award of marks this is taken as evidence of working. Knowledge of facts relating to angles in circles is a weakness.

Reasoning skills in geometrical contexts remain weak; this includes formal proof, such as that needed for congruent triangles. Similar triangles are not always recognised as such and are not well understood.

Recall of trigonometrical formulae (no longer given) is good; it is clear that centres have prepared candidates well for the absence of given formulae in this respect.

Probability and Statistics

Understanding scatter diagrams remains a strength, and cumulative frequency diagrams were also well understood, but histograms proved to be a weakness.

Scaling of all types of graph presents a problem for some candidates; taking readings can be problematic for those who do not draw straight lines to help.

Probability appears to be well understood, with most candidates successfully dealing with repeated probability or within the context of non-replacement, and even when tree diagrams were not provided as scaffolding.

Other qualifications

The following information is presented purely as information to centres, and to offer some different opportunities that centres may not be aware of.

Entry Level Certificate (ELC) in Mathematics

The ELC offers an opportunity for lower ability candidates to qualify at entry level 1, 2 or 3. The assessment is a written test and a task, which can be taken in-house whenever the candidate is ready. When the centre wishes to claim the certificate, the work is sent to a moderator who can then verify the award, at level 1, 2 or 3. For Summer 2018, the ELC has been re-written to complement the GCSE (9-1) Mathematics qualification with a degree of overlap at the lowest levels, both in content and in assessment style. The ELC will offer a different opportunity for candidates not able to access questions on GCSE

examinations and enables them to gain a qualification in Mathematics. It also has the advantage that students can prepare for both GCSE and ELC Mathematics, the latter taken before the GCSE exams. This reformed qualification is entirely appropriate for lower ability candidates. There has already been a lot of interest in the new ELC, details of which can be found below.

<http://qualifications.pearson.com/en/qualifications/edexcel-entry-level-certificate/mathematics-2017.html>

GCSE Statistics

Many centres have in the past made entries for GCSE Statistics alongside GCSE Mathematics. This year, with the introduction of the new GCSE (9-1) Mathematics, many centres felt they needed to concentrate purely on Mathematics for Year 11 students. However, an increasing number felt GCSE Statistics was an appropriate opportunity as an additional qualification for some of their Year 9 or Year 10 students. The current GCSE Statistics qualification is available for the last time in Summer 2018. The reformed GCSE (9-1) Statistics qualification will be introduced from Summer 2019. We already have an accredited specification and sample assessment materials for this new qualification, and will be releasing more course support and specimen papers over the next 12 months. This reformed GCSE will match closely the current GCSE, and will no doubt attract a similar entry as previously. It does not, however, involve controlled assessment. Details of the current and new GCSE Statistics qualifications can be found below.

GCSE Statistics for Summer 2018:

<http://qualifications.pearson.com/en/qualifications/edexcel-gcses/statistics-2009.html>

GCSE (9-1) Statistics for Summer 2019 onwards:

<http://qualifications.pearson.com/en/qualifications/edexcel-gcses/statistics-2017.html>

Edexcel Awards

This suite of qualifications offers additional opportunities for a skills-based award. Offered at different levels and across three sets of content, students find them useful in preparing for GCSE. The Number & Measure awards are also used in vocational areas, to support the continued study of mathematics. Students take them in Year 9, 10 and 11, and as a post-16 qualification. In making an entry, centres make a choice of subject dependent on content; depending on the subject the qualifications are offered at all ability levels. Details are found below.

Edexcel Awards in Number and Measure (Level 1 and Level 2)

<http://qualifications.pearson.com/en/qualifications/edexcel-awards-in-mathematics/number-and-measure.html>

Edexcel Awards in Algebra (Level 2 and Level 3)

<http://qualifications.pearson.com/en/qualifications/edexcel-awards-in-mathematics/algebra.html>

[Edexcel Awards in Statistical Methods \(Level 1, Level 2 and Level 3\)](http://qualifications.pearson.com/en/qualifications/edexcel-awards-in-mathematics/statistical-methods.html#tab-0)
<http://qualifications.pearson.com/en/qualifications/edexcel-awards-in-mathematics/statistical-methods.html#tab-0>

Support for teachers

Details about training courses for all our Mathematics qualifications can be found at:
<http://qualifications.pearson.com/en/support/training-from-pearson-uk.html>

And teachers will find further support and documentation on our emporium site at
www.edexcelmaths.com

Concluding remarks

At Pearson we work hard to offer qualifications that meet the requirements of Ofqual, but also offer students the very best quality qualifications. We will continue to listen to the views of teachers and wherever possible refine the assessment instruments used.

We continue to be the leading examination board for Mathematics qualifications, with more centres than any other board. With this comes a responsibility to continue to work with all these centres in future development.

Alongside the individual examiner reports, I hope centres find this summary report useful. We offer such reports, and our support meetings, in order that teachers can feel confident in preparing further cohorts for qualification.

We look forward to our next series of qualifications over the next 12 months.

