# GCE EXAMINERS' REPORTS

## MATHMATICS
## AS/Advanced

## JANUARY 2014

© WJEC CBAC Ltd.

Grade boundary information for this subject is available on the WJEC public website at: https://www.wjecservices.co.uk/MarkToUMS/default.aspx?l=en

**Online results analysis**

WJEC provides information to examination centres via the WJEC secure website. This is restricted to centre staff only. Access is granted to centre staff by the Examinations Officer at the centre.

**Annual Statistical Report**

The annual Statistical Report (issued in the second half of the Autumn Term) gives overall outcomes of all examinations administered by WJEC. This will be available at: http://www.wjec.co.uk/index.php?nav=51



© WJEC CBAC Ltd.

**MATHMEMATICS**

**General Certificate of Education**

**January 2014**

**Advanced Subsidiary/Advanced**

**C1**

*Principal Examiner:* Dr. E. Read

## General Comments

Performance on this year's paper was very similar to that of previous years and candidates seemed to find most of the questions accessible. There were, however, comparatively few low marks this year. It was only question 4, and to a lesser extent, questions 5 and 10 which caused any real problems.

## Comments on Individual Questions

Q.1 The only problems which arose in this question occurred in part (*d*). Some candidates were unable to make a start while others either forgot that it was a right-angled triangle or put the right angle in the wrong place. Others devised new (incorrect) formulae for the area of a triangle.

Q.2 Although the expression was a little more complicated than is usually the case, this was, as always, a well answered question.

Q.3 Another very well answered question, with hardly any mistakes.

Q.4 Solutions were, in general, rather disappointing. Not all candidates were able to pick up both of the first two marks and in the second part of the question, only a minority had any idea of how to use their answer to solve the given quadratic equation.

Q.5 Some candidates failed to get a start on this question but on the other hand, there were also many fully correct solutions.

Q.6 Most candidates were able to earn the first four marks. But possibly because of the fact that the critical values were $\pm {}^5/_2$, only a relatively small number of candidates were then able to write down the correct range of vales for $k$. Surprisingly many thought that the required range was $-{}^5/_2 < k < {}^5/_2$.

Q.7 Part (*a*) caused few problems, but many of the answers to part (*b*) involved $y = rf(x)$ rather than that $y = f(qx)$.

Q.8 Part (*a*) was well answered although there are still problems with incorrect and inconsistent use of notation. Poor algebraic and manipulative skills prevented many candidates from getting full marks in part (*b*).

Q.9 Almost all candidates were able to earn both marks in part (*a*). In part (*b*), some candidates thought that $(x + 3)$ was a factor of the given cubic expression even though the information given in part (*a*) showed that this was not the case. But generally, a very well answered question.

Q.10 The fact that the coefficient of $x^3$ was negative seemed to cause very few problems in part (*a*). However, in part (*b*), many candidates still drew the graph of a positive cubic. Only a minority were able to earn either of the two marks in part (*c*).

© WJEC CBAC Ltd.

**MATHMEMATICS**

**General Certificate of Education**

**JANUARY 2014**

**Advanced Subsidiary/Advanced**

**C2**

*Principal Examiner:* Dr. E. Read

## General Comments

Performance on this year's paper was similar to last year's. Candidates found the majority of questions to be accessible and it was only questions 2(*b*), 3(*b*), 5(*a*)(ii) and 10 which caused any general difficulty.

## Comments on Individual Questions

Q.1 There were very few problems with this question, as is invariably the case.

Q.2 Part (*a*) was well answered. In part (*b*), some candidates did not realise that the fact that $X$, $Y$, $Z$ were the angles of a triangle implied that $X + Y + Z = 180$. Others were prepared to write down $X = 294°$ and $Y - Z = 200°$.

Q.3 It was in part (*b*) that the problems arose here. Most of the errors which occurred arose when candidates wrote down an expression for $S_{2n}$. Poor algebra also led to a loss of marks when finding the required value for $n$.

4 Although some candidates made errors when calculating the value of $r$ in part (*a*), this was in general a well answered question with many complete solutions.

Q.5 Starting from the cosine rule, most candidates were able to carry out the required algebraic manipulation in part (*a*)(i). In part (*a*)(ii), however, very few realised that the fact that *BDC* was a straight line implied that sum of the two derived expressions for the cosines at *D* had to equal 0. It was still possible to answer part (*b*) without having done part (*a*)(ii) and many candidates were able to do this successfully.

Q.6 This was a very well answered question with many candidates getting full marks.

Q.7 The usual problems arose in the proof in part (*a*), but parts (*b*) and (*c*) were generally well answered.

Q.8 This was a fairly standard question. In part (*c*), some candidates, having correctly derived the equation $2x^2 + 10x + 28 = 0$ then stated they could not factorise the left hand side and therefore the equation had no solutions.

Q.9 Although there were many correct solutions to this question, some failed to make a start while others lost marks because of careless arithmetic errors.

Q.10 Many candidates were able to earn both marks in part (*a*). However, only a minority were then able to go on to give a correct description of the behaviour of the sequence.

© WJEC CBAC Ltd.

**MATHEMATICS**

**General Certificate of Education**

**January 2014**

**Advanced Subsidiary/Advanced**

**C3**

*Principal Examiner:* Dr. E. Read

## General Comments

Candidates found this year's paper to be less accessible than the corresponding papers of recent years, the mean mark being 6 less than last year's mean mark. The questions which caused most problems were 1(*b*), 4, 8 and 10.

## Comments on Individual Questions

Q.1 Part (*a*) caused few problems, but in part (*b*) many candidates simply added 1 to their answer to part (*a*).

Q.2 In part (*a*), it was not uncommon to see angles other than acute angles chosen as possible counter-examples. Part (*b*) was universally well answered, as is always the case.

Q.3 Candidates found very few problems with this question.

Q.4 The fact that an expression for $\frac{dy}{dx}$ was actually given this year caused some confusion and in part (*b*), some candidates proceeded as if the given expression were in fact an expression for *y*. Solutions to part (*c*) were generally disappointing and not all of those who were able to make progress here considered the significance of the given fact that $y = 10$ when $t = 1$.

Q.5 A very well answered question on which the majority of candidates obtained full marks.

Q.6 In part (*a*), many candidates lost a mark as a result of the absence of brackets. In part (*d*), the majority of candidates used the quotient rule correctly but only a minority were then able to carry out the correct algebraic manipulation required to earn full marks. It was particularly disappointing to see several candidates leaving $[(2x + 3) – 3]$ as part of the numerator of their expression.

Q.7 The question on integration seemed to cause few problems. It was particularly pleasing to see so many correct solutions to part (*b*).

Q.8 This was only a short question but it was, in general, poorly answered. Much of the algebraic manipulation of simple linear equations was very disappointing.

Q.9 Many candidates were able to earn full marks on part (*a*) but in part (*b*), it was not uncommon to see the domain of $f^{-1}$ given as [1·5, 1) rather than (1, 1·5].

Q.10 In part (*a*), only a minority of candidates were able to earn the second mark by noting that $g'(x) > 0 \Rightarrow g$ is an increasing function. Many errors were made in finding the domains and ranges in parts (*b*) and (*c*). A significant number of candidates lost the final two marks in part (*d*) by failing to consider both the positive and negative values when taking the square root.

© WJEC CBAC Ltd.

**MATHEMATICS**

**General Certificate of Education**

**January 2014**

**Advanced Subsidiary/Advanced**

**M1**

*Principal Examiner:* Dr. S. Barham

## General Comments

This paper seemed to be well received by most candidates and was of an appropriate standard and length. This first five questions were straight forward and provided a good start to the paper. However, some candidates had trouble with Q6(b), question 7, question 8 and question 9(b).

## Comments on Individual Questions

Q.1 Well done generally with candidates using area under graph in 1(c) being rather more successful than candidates trying to use suvat equations.

Q.2 A good question with a sign error in part (b) being the more common mistake. Many candidates are still splitting up the path unnecessarily in their solution.

Q.3 This was a simple question with almost everyone gaining full marks.

Q.4 Part (a) was well done though some candidates failed to realise that the magnitude of the frictional force was specifically requested in the question. There were some very strange attempts at a solution to part (b) mostly because the candidates did not understand the question.

Q.5 This was another simple question with sin/cos errors or a sign error being the commonest mistakes.

Q.6 Part (a) did not cause many problems. Part (b) was poorly done mostly due to candidates being unable to isolate the forces acting on the trailer or the engine. As is usual with questions of this type, there were some candidates who omitted the component of weight down the plane or the resistance in their equation of motion.

Q.7 As usual, question on this topic was poorly done. Many candidates failed to realise that the reaction at the pivot $Y$ was zero in part (b).

Q.8 A reasonably well done question with the most common error occurring in part (b)(i) where candidates included the weight (which was acting vertically) in their horizontal equation of motion.

Q.9 Part (a) was very well done but most candidates were not able to give a sensible solution to part (b) mostly because of their failure to draw diagrams.

© WJEC CBAC Ltd.

**MATHEMATICS**

**General Certificate of Education**

**January 2014**

**Advanced Subsidiary/Advanced**

**S1**

*Principal Examiner:* Dr. J. Reynolds

## General Comments

The standard of the candidature was generally good. Solutions to the question on continuous probability distributions were better this time with candidates showing more understanding of calculus. Several parts of the questions were found to be surprisingly difficult for many candidates. These are indicated below.

## Comments on Individual Questions

Q.1 It was again disappointing to note that some candidates confused the terms 'independent' and 'mutually exclusive' so that (b) was not as well answered as expected. Some candidates assumed in (a)(i) that *A* and *B* were independent, writing $P(A \cap B) = P(A)P(B) = 0.1$ and then in (ii) writing $P(B \mid A) = P(A \cap B) / P(A) = 0.2$ without realising the significance of this error.

Q.2 This question was well answered by the majority of the candidates and this was the best answered question on the paper.

Q.3 Most candidates solved (a) correctly but some candidates were unable to extend their argument to Catrin winning with her second shot. In (c), some candidates followed the instruction to sum an infinite geometric series but used an incorrect first term and/or common ratio.

Q.4 Part (a) was well answered in general although in (ii) some candidates, as in the January 2013 examination, evaluated the probability by calculating the seven probabilities included in the interval. Although this is a valid method, it is not recommended and the tables should be used. In (b), some candidates attempted to use the Poisson table by rounding 2.46 to 2.5 but this method was not accepted.

Q.5 This was a slightly more difficult question than usual on this topic, the complication being that two coins were drawn at random from the bag. Some candidates were unable to carry out the necessary arithmetic and others simplified the question by considering drawing only one coin from the bag.

© WJEC CBAC Ltd.

Q.6 Most candidates solved (a)(i) correctly but, surprisingly, many were unable to solve (a)(ii). Some candidates gave 7.5 as the most likely value believing it to be equal to the mean. Some candidates simply guessed that the most likely value was 7, others guessed 8, for which no credit was given. Many candidates failed to realise that certain probabilities had to be evaluated. Solutions to (b)(i) were also disappointing with many candidates giving the incorrect answer $W = 10X - 2$ instead of $W = 12X - 20$.

Q.7 Part (a) was well answered by the majority of candidates. In (b)(i), however, some candidates noted that $S = 4$ if the sample values were 1,1,2 but failed to realise that this could happen in three ways, so that the incorrect answer 0.002 was often seen.

Q.8 Part (a)(i) was well answered in general but many candidates gave an incorrect answer to (a)(ii), not realising the difference between 'demand' and 'number of copies sold'. In this case, 20 copies would be sold if the demand is greater than or equal to 20, not equal to 20. Consequently, the incorrect answer 0.0418 was often seen. Many candidates solved (b) correctly although the adjacent values 24 or 26 were sometimes seen.

Q.9 Solutions to this question on continuous probability distributions were better in general than in previous years with candidates showing an improved grasp of calculus.

© WJEC CBAC Ltd.

**MATHEMATICS**

**General Certificate of Education**

**January 2014**

**Advanced Subsidiary/Advanced**

**FP1**

*Principal Examiner:* Dr. J. Reynolds

## General Comments

The candidates were well prepared in general with some excellent scripts submitted. It was, however, disappointing to find that the algebraic skills of a small minority of the candidates were below what is to be expected at this level.

## Comments on Individual Questions

Q.1 This question was well answered in general with algebraic errors seen only occasionally.

Q.2 This question was well answered by the majority of candidates. The most common error was a failure to completely factorise the final answer.

Q.3 Solutions to (a) and (b)(i) were generally good. In (b)(ii), however, most candidates were able to deduce that two of the roots were complex conjugates but some candidates were then unable to find the other two roots. Attempts were seen at using both methods given in the mark scheme but algebraic errors were not uncommon.

Q.4 Solutions were sometimes disappointing with some candidates unable to carry out the algebra required to go from a quadratic equation to a cubic equation.

Q.5 This question was well answered in general although (b) proved to be difficult for some candidates. It has been noted in earlier reports that the most successful approach is via a parametric representation of the line. In this case, the line can be defined by $x = t$, $y = 2t - 1$ and the image of the point $(t, 2t - 1)$ is then found to be $(2 - t, 2t - 2)$. The equation of the image line can then be found by eliminating $t$.

Q.6 Solutions to this question on proof by induction were generally better than in recent years, with an improvement in presentation. It was, however, disappointing to find that solutions to (b) were often poor. Many candidates failed to find the correct inverse for the matrix **A** which led to the incorrect conclusion that the result was not true for $n = -1$.

Q.7 This question was well answered by the majority of candidates. The most common error was to ignore the word 'hence' in (b) and solve the equations either by row reduction or some method of elimination for which no credit was given.

© WJEC CBAC Ltd.

Q.8 Most candidates understand that logarithmic differentiation is required in this type of problem. Some candidates, however, found the differentiation of $\ln(1/x)$ beyond their capabilities. Candidates who wrote $\ln(1/x)$ as $-\ln(x)$ at the outset were generally more successful. Some candidates lost a mark by failing to simplify $g(x)$. In (c), many candidates failed to give the sets of values required in the question. Consequently, this was the worst answered question on the paper.

Q.9 Some candidates failed to understand what was required in (a) and did not therefore simply put $z = 0$. Many candidates knew what had be done in (b) but algebraic errors were fairly common in attempts to find the radius and the coordinates of the centre of the circle.



© WJEC CBAC Ltd.

WJEC
245 Western Avenue
Cardiff  CF5 2YX
Tel No 029 2026 5000
Fax 029 2057 5994
E-mail: exams@wjec.co.uk
website: www.wjec.co.uk

© WJEC CBAC Ltd.