GCE EXAMINERS' REPORTS

MATHEMATICS
AS/Advanced

JANUARY 2011

Statistical Information

This booklet contains summary details for each unit: number entered; maximum mark available; mean mark achieved; grade ranges. *N.B. These refer to 'raw marks' used in the initial assessment, rather than to the uniform marks reported when results are issued.*

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.

MATHEMATICS

General Certificate of Education

January 2011

Advanced Subsidiary/Advanced

Principal Examiner: Dr. E. Read

Unit Statistics

The following statistics include all candidates entered for the unit, whether or not they 'cashed in' for an award. The attention of centres is drawn to the fact that the statistics listed should be viewed strictly within the context of this unit and that differences will undoubtedly occur between one year and the next and also between subjects in the same year.

Unit	**Entry**	**Max Mark**	**Mean Mark**
C1	2686	75	46.4

Grade Ranges

A	57
B	50
C	43
D	36
E	29

N.B. The marks given above are raw marks and not uniform marks.

C1

General Comments

In general, candidates' performance seemed to be better this year, and it was only parts (*b*) and (*c*) of question 8 which caused any serious problems. The number of correct solutions to question 5 was particularly pleasing.

Q.1 Generally well answered. The only part which caused any real problems was (*d*)(ii), where some candidates tried to find the coordinates of *D* by solving simultaneously the equations of *L* and *AB* rather than by substituting 0 for *y* in the equation of *L*. Only a handful of candidates were able to show that the length of $AD = 2{\cdot}5$.

Q.2 Very well answered.

Q.3 Apart from the occasional algebraic error, this question seemed to cause very few problems.

Q.4 The majority of candidates were able to pick up most of the marks in the proof from first principles but unfortunately, there were still many examples of incorrect or inappropriate notation.

Q.5 In general, there was very good use of the binomial theorem and many candidates were able to pick up full marks on this question.

Q.6 Although most candidates were able to show that $p = -\,0{\cdot}7$, not all gave a convincing argument to show that the final term in the expression was – 9. Only a minority were then able to proceed to solve the quadratic equation.

Q.7 Very well answered, as is always the case.

Q.8 Part (*a*) caused very few problems. However, in part (*b*), many candidates tried to find the points of intersection of *C* and *L* by solving simultaneously the equation of *L* with that of the tangent at *P* found in part (*a*). In the same way, in part (*c*), it was not uncommon to see candidates trying to use the gradient of the tangent at *P* of part (*a*) to derive the equation of the normal at a point of intersection of *C* and *L*.

Q.9 Both parts of this question were very well answered.

Q.10 Although the format was slightly different this year to what is usually the case, many candidates were able to get full marks on this question.

MATHEMATICS

General Certificate of Education

January 2011

Advanced Subsidiary/Advanced

Principal Examiner: Dr. E. Read

Unit Statistics

The following statistics include all candidates entered for the unit, whether or not they 'cashed in' for an award. The attention of centres is drawn to the fact that the statistics listed should be viewed strictly within the context of this unit and that differences will undoubtedly occur between one year and the next and also between subjects in the same year.

Unit	Entry	Max Mark	Mean Mark
C2	1004	75	52.1

Grade Ranges

A	61
B	53
C	46
D	39
E	32

N.B. The marks given above are raw marks and not uniform marks.

C2

General Comments

Candidates may have found this year's paper a little more accessible than last year's, and performance was generally good. There were very few questions which seemed to cause any serious problems.

1. Generally well answered, as is usually the case.

2. There were very few problems here. However, in part (*b*), some candidates correctly derived the root of 46° but then subtracted from 180° to obtain a second value.

3. Some of the algebraic manipulation used in deriving the printed equation from the cosine rule was poor, but otherwise this was a well answered question.

4. There were few problems here, but in part (*c*), it was disappointing to see that relatively few candidates used the $\frac{n}{2}(a + l)$ formula to find the required sum.

5. Part (*a*) was well answered. However, in part (*b*), many candidates were unable to write down a correct expression for the *n*'th term while others thought that $5 \times 1{\cdot}1^{n-1} = 5{\cdot}5^{n-1}$. The reasons given to explain why the conjecture could not be correct were many and varied.

6. This was a very well answered question.

7. While many candidates got full marks for this question, it was disappointing to see that many others were only able to earn the mark given for using the fact that $2\log_a 5 = \log_a 5^2$.

8. This was another well answered question. In part (*c*), however, some candidates thought that the fact that they could not factorise $2x^2 + 12x + 25$ was sufficient to show that *L* and *C* did not intersect.

9. Part (*a*) caused no problems but any solution to part (*b*) depended first of all on finding the length of a second side of the given triangle. Not all candidates were able to do this, and some of the methods used by those who did succeed unfortunately led to an inaccurate final result.

MATHEMATICS

General Certificate of Education

January 2011

Advanced Subsidiary/Advanced

Principal Examiner: Dr. E. Read

Unit Statistics

The following statistics include all candidates entered for the unit, whether or not they 'cashed in' for an award. The attention of centres is drawn to the fact that the statistics listed should be viewed strictly within the context of this unit and that differences will undoubtedly occur between one year and the next and also between subjects in the same year.

Unit	Entry	Max Mark	Mean Mark
C3	2179	75	55.4

Grade Ranges

A	63
B	55
C	47
D	39
E	31

N.B. The marks given above are raw marks and not uniform marks.

C3

General Comments

Candidates found this to be an accessible paper and generally performance was good.

1. Generally well answered but some candidates still think that working to three decimal places is sufficient to provide the correct answer.

2. In part (*a*), surprisingly many candidates were unable to use their calculators to correctly calculate the values of sec θ and cosec θ. Very few problems arose in part (*b*).

3. This question was well answered although notation was not always correct and some candidates did not divide correctly by $\frac{1}{t}$.

4. There were few problems here although it is important that candidates realise that in the final line of their solution, they must answer the question and state that their final value is the value of α correct to four decimal places.

5. Overall, this was a well answered question although in part (*a*)(iii), not all candidates were able to earn the final mark by simplifying their expression. A minority of candidates were unable to make any progress in part (*b*).

6. The majority of candidates were able to earn most of the marks on this question.

7. The only difficulty which arose here was that in part (*b*), some candidates were unable to give the required range of values of *x* in a correct mathematical form.

8. There were very few problems here although some of the graphs and labelling were a little untidy.

9. In part (*b*), most candidates knew how to derive an expression for the inverse function but a common error was to choose the positive root and omit the minus sign.

10. Generally well answered, but in part (*a*), not all candidates were able to simplify their expression for $gf(x)$. In part (*c*)(ii) many candidates stated that the given equation had no solution because their chosen value for *k* did not lie within the *domain* of *gf*.

MATHEMATICS

General Certificate of Education

January 2011

Advanced Subsidiary/Advanced

Principal Examiner: Dr. S. Barham

Unit Statistics

The following statistics include all candidates entered for the unit, whether or not they 'cashed in' for an award. The attention of centres is drawn to the fact that the statistics listed should be viewed strictly within the context of this unit and that differences will undoubtedly occur between one year and the next and also between subjects in the same year.

Unit	Entry	Max Mark	Mean Mark
M1	847	75	53.2

Grade Ranges

A	63
B	55
C	47
D	39
E	32

N.B. The marks given above are raw marks and not uniform marks.

M1

General Comments

This paper is a little easier than previous papers on this syllabus. The majority of candidates were well able to make some attempt at all of the questions. There were many scripts of excellent quality, demonstrating a firm grasp of the subject by the candidates. It is pleasing to note some general improvement in the answers to the question on equilibrium under parallel forces (moments), although the question is an easy one of its type. There is a reduction in the number of scripts obtaining less than 25 marks. On the whole, marking this paper had been a pleasurable experience.

Q1. Parts (a) and (b) were well answered generally though the quality of some of the *v-t* graph sketches left something to be desired. Part (c) was badly done by many candidates and numerous candidates thought 24 km makes 2400 m instead of the correct 24000 m. The standard of presentation on this part question was particularly bad.

Q2. This was a particularly well done question with far fewer sign errors than expected. Numerous candidates gained full marks here.

Q3. Part (a) did not posed any problems for most candidates. Part (b) contained less structure than questions of this type in previous papers. It being a two step problem, many candidates were not able to correctly calculate the intermediate value required, which is the velocity of the particle immediately after rebound. Many candidates used their answer in part(a) which is inappropriate. Very few candidates were entirely successful in gaining full marks.

Q4. This is a very standard question on Newton's Experimental Law and generally candidates made satisfactory attempts at a solution. It is disappointing to see many candidates who made arithmetic or algebraic mistakes, consequently obtaining impossible answers failing to realise this and return to check their working.

Q5. This was a well known question which had been set many times in previous papers and there were no real surprises either for the candidates or for the examiners. The standard of presentation on this question was particularly poor generally.

Q6. The commonest error in part (a) was made when applying N2L to the particle moving horizontally on the table. Candidates often thought gravity had an effect by including the weight of the particle in the equation of motion. Part (b) proved too difficult for most candidates who failed to see that all the equations in part (a) also allied with the acceleration equal to zero. In addition, many candidates thought the tension obtained in part (a), when the particles were moving, still applied when the particle was stationery.

Q7. A general improvement in the solution to this question was noted, although this question is an easy one. There were many more candidates than usual who obtained full marks. Mistakes were often algebraic, made in calculating the various distances required involving the unknown *x*.

Q8. This question was well done as usual and proved to be a life saver for many weak candidates. A few candidates made errors in calculating the area of the circle and some added the circle instead of subtracting it. Candidates dealt with the awkward numbers without difficulties. However, a surprising number of candidates were not able to do part (c).

MATHEMATICS

General Certificate of Education

January 2011

Advanced Subsidiary/Advanced

Principal Examiner: Dr. J. Reynolds

Unit Statistics

The following statistics include all candidates entered for the unit, whether or not they 'cashed in' for an award. The attention of centres is drawn to the fact that the statistics listed should be viewed strictly within the context of this unit and that differences will undoubtedly occur between one year and the next and also between subjects in the same year.

Unit	Entry	Max Mark	Mean Mark
S1	941	75	46.9

Grade Ranges

A	57
B	49
C	41
D	33
E	26

N.B. The marks given above are raw marks and not uniform marks.

S1

General Comments

The candidature covered the whole ability range with some candidates submitting excellent scripts but others quite unprepared to take an examination at this level. Many candidates continue to find it difficult to apply calculus to questions on continuous probability distributions.

Q.1 Many candidates failed to realise that the sample space here is the set of 16 ordered pairs of numbers from the set {1,2,3,4). In (b)(ii), it was clear that some candidates did not understand the meaning of the word 'consecutive'.

Q.2 Most candidates solved (a) correctly but (b) caused problems for some who were unable to derive the given quadratic equation. Most candidates who derived the equation solved it correctly although those who gave the two roots, namely 0.4 and 1.6, as possible values of p were penalised.

Q.3 This question was well answered by most candidates, the most common error in (a) being the omission of the factor 6 when multiplying probabilities.

Q.4 Solutions to this question were often disappointing with many candidates reversing the given condition and taking the standard deviation to be twice the mean. This over-simplified the problem and no credit could be given for that error. Algebraic and arithmetic errors were often seen and it was disappointing to note that those candidates who obtained non-integer values for n did not appear to realise that this could not happen.

Q.5 Most candidates solved (a)(i) correctly although the previously reported mis-use of tables was again seen not infrequently in (a)(ii). Candidates who used their calculator software to determine the probability in (a)(ii) were given no credit. As indicated in the syllabus, the only acceptable methods for finding binomial and Poisson probabilities are the use of the appropriate formula or table.

Q.6 This question was well answered by many candidates with tree diagrams again providing the most likely route to the correct answer.

Q.7 Answers to (a) were often disappointing with many alternative incorrect intervals seen for α, eg [0.4,0.6], [0,0.6] and[0,8]. In (a)(ii), candidates who simple showed that $E(X)$ had the same value for two different values of α were not given any credit.

Q.8 In (a)(iii), as in Ques 5(a)(ii), no credit was given for using calculator software to find the probability.

Q.9 As in previous examination sessions, some candidates found the application of calculus to continuous distributions beyond their capability. In (b), the fact that the lower limit for x was 1, and not zero, went unnoticed by some candidates. Very few candidates realised that $F(4) = 1$. Many candidates who realised that the median m satisfied the equation $F(m) = 0.5$ made algebraic errors in manipulating and solving that equation.

MATHEMATICS

General Certificate of Education

January 2011

Advanced Subsidiary/Advanced

Principal Examiner: Dr. J. Reynolds

Unit Statistics

The following statistics include all candidates entered for the unit, whether or not they 'cashed in' for an award. The attention of centres is drawn to the fact that the statistics listed should be viewed strictly within the context of this unit and that differences will undoubtedly occur between one year and the next and also between subjects in the same year.

Unit	Entry	Max Mark	Mean Mark
FP1	288	75	52.3

Grade Ranges

A	62
B	54
C	46
D	38
E	31

N.B. The marks given above are raw marks and not uniform marks.

FP1

General Comments

The candidates were well prepared in general with few poor scripts seen. Solutions to the question on mathematical induction showed a slight improvement overall but many presentations continue to be poor. As indicated below, it is recommended that candidates should not be advised to use the alternative methods mentioned for Ques 4 and Ques 8. Experience in marking scripts has shown that these methods, although valid, are rarely successful.

Q.1 This question was well answered by most candidates, the most common errors being a failure to carry out the algebraic manipulation correctly.

Q.2 Most candidates knew what had to be done here but again the most common errors involved carrying out the row operations incorrectly. Some candidates failed to realise that, having reached the point

$$y + z = -1$$
$$2y + 2z = 3 - \lambda,$$

it was now clear without any further row operation that $3 - \lambda = -2$.

Q.3 Most candidates were able to show that

$$\frac{1}{z} = 1 - 3\mathrm{i}$$

but it was disappointing to see that many then deduced incorrectly that

$$z = 1 - \frac{1}{3}\mathrm{i}\,.$$

Q.4 Solutions to this question were often disappointing. Most candidates knew what to do but many were unable to handle the necessary algebra without making errors. Those candidates who attempted to solve the problem by making the transformation $y = -4/x^2$ were almost invariably unsuccessful. Although this is a valid method, the algebra is often quite tricky (as here) and it is strongly recommended that this method should not be used.

Q.5 A slight improvement in proof by induction was noted this time although for some candidates, the presentation was poor – indeed attempts at solutions using mathematical induction continue to be generally below what can reasonably be expected for candidates working for a qualification in Further Mathematics. Many candidates start the proof by simply writing 'Let $n = k$' and then follow this by 'Let $n = k + 1$'. It is essential to make it clear that the result is being assumed for $n = k$ and then (hopefully) proved for $n = k + 1$. Then the proof often ends, incorrectly, with a statement such as 'true for $n = 1$, $n = k$ and $n = k + 1$, therefore proved by induction'. Statements such as this gain no credit.

Q.6 Most candidates showed, correctly, that det(**A**) = $-2\lambda^2 + 4\lambda - 12$ but many candidates then, inexplicably, simply removed the factor – 2 and stated that this was equal to $\lambda^2 - 2\lambda + 6$, presumably believing that this was the simplification asked for in the question. Most candidates carried out the arithmetic required in (b) correctly.

Q.7 Some candidates were unable to take logarithms correctly prior to differentiation, common errors being

$$\ln f(x) = \ln(2^x) \times \ln(3^{1/x})$$
$$\ln f(x) = \ln(6^{x+1/x}) = (x + 1/x)\ln 6$$

and even $\ln f(x) = \ln(2 \times 3)^{x \times 1/x} = \ln 6$

In (b), some candidates who found the *x* coordinate of the stationary point failed to realise that the stationary value of *f*(*x*) is actually the corresponding value of *y* and did not calculate its value as required.

Q.8 Most candidates answered (a) correctly and then went on to solve (b) correctly. However, candidates who attempted to use 2 × 2 matrices to represent the reflections were often unable to do the algebra required to find the 3 × 3 matrix representing the transformation *T*. It is recommended that in questions involving translations, 3 × 3 matrices should be used throughout.

Q.9 The transformation in this question is a fairly standard one and most candidates found correct expressions for *u* and *v*. In (b), however, many candidates were unable to do the algebra necessary to express *u* in terms of *v*. Candidates who failed to solve (b) rarely went on to solve (c) although (c) could be solved independently of (b) by noting that

$v = 16 \Rightarrow 2xy = 16 \Rightarrow x^3 = 8 \Rightarrow x = 2$ and therefore $y = 4$ so $u = x^2 - y^2 = -12$

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