# EXAMINERS' REPORTS

## LEVEL 2 CERTIFICATE IN ADDITIONAL MATHEMATICS

## SUMMER 2019

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.


| Unit | Page |
|---|---|
| Level 2 Certificate | 1 |

**ADDITIONAL MATHEMATICS**

**Level 2**

**Summer 2019**

## General Comments

There was no evidence to suggest that the examination paper was too long for candidates, as there were clearly responses in later questions.

Whereas many candidates were obviously well prepared for the examination, a few candidates did not seem to have been ready, or mature enough, for this examination.

As item level data is available to all centres, by centre, and for individual candidates with comparison of all candidates sitting these examinations, this report will focus on common errors and misconceptions to aid the interpretation of the data available rather than focus on whether each question was well answered or not.

## Comments on individual questions/sections

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| **1** | Candidates found part (c) the most demanding part of this question. Many candidates did start by considering completing of the square but did not engage with the idea that this was an equation to solve. |
| **2** | Part (b) proved to be the more demanding part of this question, with mistreatment of the index -11. Subtracting 1 from -11 was often incorrectly stated as -10. |
| **3** | The second fraction of the three caused candidates more difficulty than working with the first and third fraction, due to the subtraction. A common denominator of 110 was often seen. The most common error was in the treatment of – (+66). |
| **4** | Notation seems to be the main issue for candidates with knowledge of first principles. Errors came from, for example:<br>• omission of brackets,<br>• $\delta x^2$ for $\delta^2 x^2$,<br>• dx for δx,<br>• δx for dx,<br>• when to write dy/dx and when it is δy/δx,<br>• where the limit as δx or h tends to zero should be written, it is the limit as δx or h tends to 0, not lim δx = 0.<br>All notation needs to be completely accurate for the award of the final accuracy mark.<br>Although use of δx seems to be more common, candidates who had been taught using 'h' often made fewer errors. |

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| **5** | This question was not well answered. Candidates found it difficult to visualise in three dimensions, particularly when considering which of the angles in the triangles would be right angles. Generally, very few candidates had a complete strategy to find the lengths of three sides and then apply the cosine rule. Candidates often did not think carefully enough about their workings, labelling all unknown sides as 'h' for hypotenuse, hence causing confusion for the reader. |
| **6** | In part (a) it was essential to show working, giving the multiplier and the calculation of the denominator. A correct response without working was not awarded marks.<br>A common error with the indices in part (b)(i) was to multiply rather than add. Candidates working with part (b)(ii) as two separate fractions often incorrectly simplified $x^{2/7}/x^{2/7}$. |
| **7** | Most candidates used a substitution method in answering part (a) and (b)(i). Candidates using division seemed to make more errors than candidates using substitution. However, this question was generally well answered. |
| **8** | Many candidates had the correct strategy for answering this question. There were errors on the way, including in the evaluation of the y-coordinates. It is important that sufficient detail showing the use of the second derivative test is noted. There needs to be a clear test for determining the nature of turning points shown. |
| **9** | Many candidates did show working in this question, although a few gave an answer alone and were not awarded any marks as no knowledge of the angles was seen. |
| **10** | Parts (a) and (b) were generally quite well answered.<br><br>There were correct equations seen in part (c), but not always in the form required. However, it was noticed that some candidates had insecure knowledge of finding a mid point of a line, finding the difference and dividing by 2, instead of adding and dividing by two. Although it was the perpendicular gradient that caused the greatest difficulty, with errors including writing down the reciprocal omitting the change of the sign. |
| **11** | Candidates made a reasonably good attempt at sketching the required graph, although occasionally the curve incorrectly showed a convex in part of the sine curve. |
| **12** | Part (a) was generally well answered, with at least one stage of differentiation correct.<br><br>Those candidates with knowledge of integration often had at least 2 terms correct in part (b). Some candidates omitted to include '+c'.<br><br>Many candidates had an idea of evaluating a definite integral in part (c). However, a few candidates substituted 3 and 2 correctly but did not attempt a subtraction. |

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| **13** | A few candidates were only awarded B1 for finding y = 27. Some candidates differentiated correctly to find 10x, however this was sometimes incorrectly labelled as 'y ='. A few candidates did not realise that the gradient when x = 2 could be found by calculating 10 × 2. |
| **14** | Candidates eliminating y were more often working towards correct solutions than candidates deciding to eliminate x.<br>Some candidates omitted to calculate the required values for y. |
| **15** | Many candidates correctly tested by substitution. |
| **16** | Many candidates did attempt to integrate. There were many errors in the integration and in deciding how to use the values 6 and 2 correctly. Some candidates correctly substituted the values 6 and 2 but did not subtract. |

**Summary of key points**

- Three-dimensional geometry seems to cause major issues for candidates, with issues in visualising right-angled triangles and those triangles that are not right-angled.
- Sketching of complex trigonometric graphs is quite well understood, with the use of some key points to aid the construction.
- Correct notation when differentiating from first principles is important. Candidates should pay attention to mathematical notation and its meaning.
- Working is essential in questions that state not to use a calculator. Each stage of working must be shown to receive marks.

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