Pearson Edexcel

Examiners' Report

Principal Examiner Feedback
January 2019

Pearson Edexcel Level 2 Award
In Algebra (AAL20)
Paper 1

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Principal Examiner Feedback – Level 2

Introduction

Students seemed to find that they had sufficient time to complete the paper and it seemed to provide them with the opportunity to display proficiency in all areas of the specification. Many students wrote high scoring papers where the working was clearly and logically presented. Most questions attracted a high number of successful solutions and there were no questions where there were few correct answers. In general, it seems that students were realistically entered for this level 2 qualification with the majority of students obtaining a good mark. Students had a good knowledge of standard techniques and were generally able to manipulate equations, factorise expressions and use formulae with accuracy. The main areas where centres might seek to help students improve their performance are with accuracy in calculating y values for negative values of x in graph questions involving quadratic functions, sketching the graph of a quadratic function and finding (negative) gradients.

Reports on Individual Questions

Question 1

This question was generally well answered. Most students were able to gain all three marks for a complete and correct table showing that they understand the difference between an equation, a formula and an expression. $x^2 = x - 4$ caused the most errors with a significant number of students categorising it as a formula rather than an equation.

Question 2

This question involving inequalities discriminated well.

The great majority of students gave a correct response to part (a) of the question. The most common incorrect response was $x = 14$ though this was not seen very frequently.

In part (b), a large proportion of students were able to get as far as $2y \geqslant -4$ or give $y = -2$ as their final answer. Many students were able to give a completely correct answer. Of those students who scored 1 mark out of the 2 marks available, many got as far as $2y \geqslant -4$ but then gave the final answer $y \leqslant -2$.

Question 3

This question was answered well with a great majority of students scoring full marks. The stages involved in solving the equations were generally recorded clearly.

Nearly all students gave a correct response to part (a) of this question.

A good proportion of students were also able to get part (b) correct and it discriminated well between students of different abilities. There were some students who could make a start but were not able to complete all the stages in the solution of the equation which consisted of terms in n and constant terms on both sides of the equation.

Parts (b) and (c) both acted as good discriminators. Students should expect to have to deal with equations involving fractions somewhere in this paper and it was disappointing to see a significant minority of students could not carry out a first correct step in part (c). This would most likely be multiplying both sides of the equation by 3.

Question 4

There were many good responses to part (a) of this question on graph sketching and this question also discriminated well between students of different abilities. Many students clearly knew exactly what was expected and drew a sketch of an inverted parabola, placed symmetrically about the y axis and with the y intercept marked and labelled at (0, 25). Only a small proportion of students tried to plot and draw a graph. Many students scored partial credit for getting one or two of the aspects listed on the mark scheme correct. It was quite common to see the graph of $y = x^2 - 25$ sketched by weaker students. A few students either drew a straight line or did not attempt the question.

Part (b) of the question was generally well answered with a substantial number of students giving a correct explanation backed up with clear reasoning and sometimes with the use of more advanced mathematical expression such as "as $x \to \infty$, $y \to -\infty$" although this was not expected.

Question 5

Students almost always completed part (a) correctly.

Part (b) was also done very well.

Where there were errors in this question, they usually involved students writing a product of the variables concerned so in part (a) "xy" and in part (b) "mv" were sometimes seen.

Question 6

This question was generally well answered. All students were able to gain some credit for their responses. In part (a), nearly all students scored both marks with a minority of students making errors.

A large majority of students scored at least three of the four marks available in part (b) which mainly tested the laws of indices. Parts (b)(i) and (b)(ii) were very well answered with less success seen in part (b)(iii). In this latter part, incorrect answers commonly seen included $6x^6$, $12x^6$ and $36x^5$ but partial credit could be given in each case.

Question 7

In part (a), most students scored the mark although a small but significant proportion of students gave the answer $5k$.

Nearly all students found the expansion of brackets in part (b) to be straightforward.

Completely correct answers to part (c) were much less frequently seen. Less than half of all students sitting this exam scored both marks here. Errors when dealing with the signs were common. In particular, the final answer $3x + 15y$ reflected the very common error in expanding the second bracket as $-3x + 3y$. Some students who did expand both brackets accurately gave the incorrect final answer $3x - 9y$

Question 8

Most students gained all the marks for their answers to this question. Nearly all students scored the mark for using the conversion graph in part (a).

In part (b), although most students gave a correct answer, a relatively small number of students made errors in their calculation of the difference. Where there were errors, students often scored part marks for at least one correct reading and/or a correct method. A few students subtracted 4 from 16 then converted 12 °C to °F.

Question 9

This question was answered well by many students, though some factorisations of the expressions in parts (b) and (c) were only partial factorisations. These answers were awarded one mark. Students are always advised to check that their factorised expressions are equivalent to the original expression by multiplying out their final answers. Some students who did check their answers wrote factorised expressions correctly in the working space then wrote down the original expression on the answer line.

Question 10

Although there were a good number of fully correct answers to this question, it was one of the least well done questions on the paper.

In part (a) many students made a good start by considering a triangle drawn onto the line but often they used a method which relied on them remembering to add a negative sign where relevant. Students are encouraged to practise the skill of finding negative gradients. Many students gave an equation of the form $y = mx + 3$, often $y = 2x + 3$ and so scored one mark in recognition of them realising the significance of the y intercept in formulating the equation. About a half of all students obtained full marks in this part of the question.

Most students scored the mark in part (b) although the line $x = 3$ was often seen and a significant number of students drew a line not parallel to either axis.

Question 11

Many students provided a good answer to this question, completing the table of values correctly and going on to complete a good drawing of the curve. Where there were errors they usually involved the calculation y values for negative x values. Points were usually plotted accurately. It is a pity that students who make errors do not detect these when attempting to join their points with a curve. The specification requires students to be able to sketch quadratic functions so students should expect a smooth parabola here and are advised to check their working if they do not get one.

Many students were able to score both marks in part (c) for reading off the two values corresponding to $y = 0$ from their graph. Some students did not attempt this part of the question.

Question 12

This question on formulae was answered quite well.

A high percentage of students scored 2 marks for their responses to part (a), although some students, after making a correct substitution, evaluated $5^2 \times 6$ as 10×6 (= 60) or made the error $25 \times 6 = 125$.

Part (b) was well done with the majority of students giving a correct value for r, usually 4. Students who did not do this often completed only part of the method needed and gave 16 as their final value for r. These students scored one mark for dividing 80 by 5 as a first step.

In part (c), about 50% of students were able to change the subject of the formula to score the mark available. Students who were not successful often either subtracted r^2 from v or involved square roots in their algebraic manipulation.

Question 13

This question discriminated well between students of different abilities. Most students showed a good understanding of the notation used and so scored well in parts (a), (b) and (c) of the question.

The majority of students gave a correct response to part (a) of the question. The most common error seen was to include the equality sign in their answer, that is to give the answer $x \geqslant -1$.

A majority of students scored full marks in part (b). Common errors included getting only one end of the interval correct or using full circles instead of empty circles or vice versa.

Most students scored the mark in part (c) but 23 was a common incorrect answer seen.

Part (d) was a good discriminator. Most students were able to get as far as $\frac{7f}{3} < 14$. However, a smaller yet still good percentage of students were able to go beyond this to find the critical value and then give a correct answer. A significant number of students scored two marks for the answer $f = 6$. Students who did not complete a first step successfully often chose to multiply by 3 but did not multiply the 5 by 3 and so could not score any marks.

Question 14

This question attracted a high number of fully correct answers.
Part (a) was nearly always answered correctly but part (b) attracted many and varied incorrect answers with about two thirds of students giving a correct answer.

Question 15

Students could nearly always generate the next term in the sequence in part (a)(i).

Part (a)(ii) was also quite well answered. Errors seen usually involved careless arithmetic.

Part (a)(iii) was successfully answered by most sudents. However "$n + 4$" was seen on occasion. Some students who correctly identified the need to use the common difference 4 and –1 in their expressions gave the incorrect response $-1n + 4$.

Students could usually successfully use the given expression to work out the third term of the sequence defined by the expression given in part (b) of this question. The main error seen was for students to work out the value of the expression $2n - 7$ when $n = 3$ rather than the value of the expression $7 - 2n$.

Part (b)(ii) was less well answered. The approaches were many and varied. Many students solved the equation $17 = 7 - 2n$ to get $n = -5$ but conclusions based on this varied between a correct conclusion that because n is negative, 17 could not be a term in the sequence to the incorrect conclusion that 17 is a term in the sequence because n is an integer. Many students stated that terms of the sequence decreased but did not state the value of the first term or that the values of the expression must all be less than 7. These students could only be given partial credit.

Question 16

This question was a good discriminator.

Most students scored the mark for a correct expression, either simplified or unsimplified in part (a). The most common incorrect answer seen was $40e$.

Part (b) was answered correctly by nearly all students.

Finding the speed or the gradient of the graph in part (c) presented more of a challenge as it demanded combining the skills of reading from the graph, together with finding a gradient involving units of time and possibly division by a decimal. Some students who attempted to find the gradient did not take into account the scales on one or both of the axes. Many students realised that they should use distance divided by time but some of them did not change the 30 minutes to hours and others made errors when working out $2.5 \div 0.5$. About a half of all students gained full marks for this part of the question.

Nearly all students gained at least one mark for their graph in part (d). Drawing the part of the graph which represented Luke's stay at his friend's house proved to be straightforward to most students. A majority of students also drew a correct second line to represent Luke's walk back to the gym. However, for this part, students sometimes drew lines down to the time axis or drew lines with an incorrect gradient.

Question 17

The equation in this question involved both fractions and the appearance of the unknown variable on both sides of the equation. Students who could successfully carry out a first step in the process of solving the equation could usually complete the solution and find the correct value for x. Less successful students often decided that multiplying by 2 was a suitable first operation to apply but could not carry this out with accuracy. They often missed multiplying one of the terms by 2. Some other students added 8 to each side of the equation as a first step successfully but usually they then made errors so examiners could not award more than one mark.

Summary
Based on their performance on this paper, students are offered the following advice:

- practise solving equations where the unknown appears on both sides of the equation

- use a pencil to draw graphs so that you can change your answer if you find a mistake

- ensure you build into your method for finding the gradient of a straight line a safeguard to take into account when the gradient is negative

- practise expanding brackets and simplifying where there is a negative outside the bracket, for example $6(x + 2y) – 3(x + y)$

- practice working out the value of a quadratic expression for negative values of x

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