Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

January 2023

Pearson Edexcel Awards
In Algebra (AAL20) Paper 01

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

January 2023
Publications Code AAL20_01_ER_2301

Edexcel Award in Algebra (AAL20)
Principal Examiner Feedback – Level 2

Introduction

This paper provided students with the opportunity to show what they knew and they appeared to have enough time to complete the paper.

The great majority of students presented responses which were logically and clearly presented. There were many students who showed themselves to be proficient in nearly all areas of the specification. They showed a good knowledge of standard techniques and were generally able to manipulate equations where the variable appears on only one side of the equation, factorise expressions, use formulae with accuracy and plot and draw graphs. The main areas where centres might seek to help candidates improve their performance were in solving equations where the variable appears on both sides of the equation, using the graph of a quadratic function to solve an equation, sketching the graph of a quadratic function and manipulating and simplifying expressions, including those which both involve brackets and where both negative and positive signs appear.
Most questions were attempted by nearly all students. Exceptions to this were questions 10 and 15(c) where the number of students who made no attempt to give answers was greater than on average.

Reports on Individual Questions

Question 1

This question provided a good start to the paper for many students. Nearly all students were successful in parts (a) and (b). A small number of students gave the answer p^{10} in part (a).
Part (c) was also answered quite well but there were a significant number of students who added the indices instead of multiplying them, giving the incorrect response t^6. Some students gave $4t^6$ or $4t^8$ as their answer.
Part (d) acted as a good discriminator with most students able to expand the two sets of brackets but then a much smaller proportion of students able to collect terms correctly. Examiners saw many errors. For example, $n^2 + 2n^2$ was quite often "simplified" to give a term in n^4 such as $2n^4$ and $-3n + 10n$ was often simplified to $-13n$.

Question 2

Parts (a) and (b) of this question were answered correctly by the vast majority of students. Part (c) was answered less successfully. Students seem to be generally less confident in dealing with equations where the variable appears on both sides of the equation. A good number of students who did not obtain the correct solution were, however, able to score 1 mark for a correct first step. The appearance of $3w$ on the left hand side and $4w$ on the right hand side of the equation seemed to cause a particular challenge. Students not well practised in writing down a full equation at each stage often subtracted $3w$ from $4w$ and added 6 to 2, giving the final answer of 8. These students usually gained no marks whereas students who wrote $3w = 4w + 8$ or $-w = 2 + 6$ could be awarded at least one mark.

Question 3

Part (a) of this question was usually answered correctly. £25 was the most commonly seen incorrect answer.
Part (b) was also answered well though there were more incorrect responses to this part of the question. 7 was quite frequently given instead of 8 for the lower bound of the inequality.

Question 4

Higher attaining students often found this question to be straightforward and scored all five marks.
Part (a)(i) was almost always answered correctly and answers to part (ii) were usually correct. Where errors did creep in, it was often because $15 \div 2$ had been evaluated incorrectly or because $7.5 + 4$ was evaluated as 7.9. In these

cases, one mark could usually be awarded for obtaining the correct value for the fourth term of the sequence.
The correct expression for the *n*th term of the sequence in part (b) was given by a large proportion of students. The most commonly seen incorrect answers seen were $n + 6$,
$1n + 6$, $n - 6$ and $6n + 6$.

Question 5

Part (a) of this question was successfully answered by the large majority of students.
However, part (b) was rarely answered correctly. Many candidates made errors when expanding the brackets and the expression $m^4 - 4m^4 - 4m^3$ was commonly seen. Students writing this could have scored one of the marks available, for $-3m^4$ if they correctly simplified the expression but only a few students did this. Another common error was for students to write $m^4 - 4m^3$ as $-4m$ as a first step, then multiply this by the bracket, thus showing a lack of understanding of the order of operations. Some students treated the expression $m^4 - 4m^3(m - 1)$ as $(m^4 - 4m^3)(m - 1)$ and expanded this to give four terms.

Question 6

The great majority of students were able to correctly identify the expression $\sqrt{a+4}$ in the table. In cases where this was not so, the formula $m = 2n^2$ was usually chosen.

Question 7

This question was answered well. Students usually completed the table accurately and drew a correct straight line using a ruler. Occasionally, lines were drawn freehand and this was accepted provided the intention was clear. In cases where the table was not fully correct, usually either all the entries were incorrect or there was an incorrect entry for $x = -4$. There were some students who gave one incorrect value and did not realise this when they plotted their points and showed one of them not in line with the others.

Question 8

Part (a) of this question was nearly always answered correctly.

It was encouraging to see that students also usually scored both of the marks available in part (b) for a fully factorised expression. There were very few students who gave a partially factorised expression as their answer.

Part (c) was also answered quite well. A high proportion of students fully factorised the given expression. However there were a greater number of students who only partially factorised this expression compared to part (b). $5ax(2a + 5ax)$ was by far the most common partial factorisation seen. A small number of students tried to combine the 2 terms of $10a^2x + 25a^2x^2$ and gave answers such as $35a^4x^3$. These students clearly showed little understanding of the process of factorisation.

Question 9

Most students gave a fully correct list of integers in response to part (a) of this question. Some students scored one mark because they either did not include 2 in their list or they included −3. Usually, just one of these errors was seen which suggests a lack of attention to considering the inequality signs given in the question.

Part (b) was answered successfully by most students and examiners accepted any variable used in the answer, for example $x \geq -3$. Acceptable answers given in the form $-3 \leq q$ were often seen. Incorrect answers seen included those without reference to the variable, for example "−3 <" and "−3 ≤". These were not accepted. Other incorrect responses included the commonly seen "$-3 \leq q < 5$". This seemed to indicate that students did not understand the significance of the arrow on the end of the line.

For their response to part (c), students usually drew a line between −8 and 0 and often used correct notation at each end of the line. Sometimes full circles were used.

Part (d) of the question was not answered well. Though a good proportion of students were able to identify the critical value of 3.5, many of them gave the incorrect $x \le 3.5$ as their final answer. Less successful students made elementary errors in trying to isolate the term in x and incorrect inequalities such as $2x \ge -7$ were often seen. Fallacious arguments equivalent to $-2x \le -7$ so $x \le 3.5$ were also often seen. Students scoring full marks often gave their answer in the form $3.5 \le x$.

Question 10

Most students made a good attempt at this question though a small but significant proportion of students either did not attempt the question or seemed unfamiliar with the process of writing expressions from "real life" situations.

Part (a) of the question was generally answered well. While examiners expected to see the response, $5t$, they accepted $5 \times t$ and similar use of the multiplication sign in parts (b) and (c).

Part (b) was also generally well answered though there were more incorrect expressions seen than in part (a). Incorrect expressions seen included $8t$, $5(t + 3)$, and $3t + 5$.

Many students were able to give a fully correct formula in response to part (c) of the question. Where a fully correct formula was not given, some students scored two marks for the expression $3m + 2p$ and many other students scored one mark for giving a formula for T as a linear combination of m and p, often for $T = m + p$.

Question 11

This question proved to be a good discriminator with some lower attaining students not able to identify that the graph sketched should be a U shaped parabola. Straight lines were seen occasionally. However, a large percentage of students did draw a parabola with correct orientation and most of them placed the vertex at the origin. Of students scoring one of the two marks available, many drew the vertex of the parabola at the point with coordinates $(0, \frac{1}{4})$. Some other students placed the vertex on the positive y-axis but did not identify exactly where.

A considerable number of students attempted to calculate and plot points then draw the curve whereas the intention of the question was for students to sketch the general shape of the curve and label the point of intersection with the y-axis, in this case at the vertex (0, 0).

Question 12

This question was answered well and nearly all students were successful in part (a)(i) of the question. Part (a)(ii) was also usually correctly answered though a significant number of students substituted the value of m into the equation to show $-10 + 3n = 14$ but then made an error in solving the resultant equation. Students who did this often deduced incorrectly that $3n = 4$.

Part (b) was also quite well done by those students who organised their work clearly and wrote each step down. $n = \frac{m-14}{3}$ was a commonly seen incorrect answer given by students who often showed little organised working.

Part (c) of the question was answered completely correctly by about two thirds of all students taking the paper. Some students did not evaluate $\sqrt{100}$

and a surprisingly common mistake seen was for students to evaluate $\sqrt{100}$ as 50. Part (ii) was less well answered than part (i). Most students did not show clear logical steps to find the value of *d* and where they did, they often made the incorrect first step of multiplying by 2. The best approach in this question was perhaps a trial and improvement method substituting in values for *d* until the value of $\sqrt{\frac{d}{2}}$ was found to be 3. Examiners do not necessarily expect to see a formal approach to solving an equation involving a square root. 9 and 36 were often seen incorrect answers. Sometimes 18 was seen in the working space accompanied by an incorrect answer on the answer line.

Question 13

Nearly all students were able to give a correct answers to part (a) of this question. Part (b) was also done well. Most students were also able to find the correct speed to answer part (c) though there were a significant number of students who made no attempt to give an answer or who gave the incorrect answer, 20. There was no real calculation needed for this part as it was clear from the graph that Hannah had driven at constant speed over a distance of 40 km and it had taken her one hour. The question was therefore more that of understanding the meaning of speed rather than that of finding the gradient of the graph.

Completing the speed-time graph in part (d) of the question acted as a discriminator between students of different attainment. Only the higher attaining students scored both marks for a fully correct graph. Students should be aware that they needed to show a speed of 0 for the period between 50 and 60 minutes and draw a line clearly on the graph to show this. All too often a sloping line was drawn from the point $(\frac{5}{6}, 72)$ either with a negative gradient meeting the time axis at $(1\frac{5}{6}, 0)$ or at (2, 0) or with a positive gradient. Sometimes, students drew a line joining $(\frac{5}{6}, 72)$ to (1, 40) then drew a horizontal line from (1, 40) to (2, 40). Examiners were able to give one mark for such a response. Some horizontal lines stretched beyond the point (2, 40) with the consequence to the student of losing a mark. Vertical lines at 50 minutes and 1 hour were often drawn and were condoned.

Question 14

There were a good number of fully correct answers to this question.

For part (a), a significant number of students gave one of the forms $y = \frac{4}{6}x$ or $y = \frac{2}{3}x + 0$ as their answer. Both of these were accepted for full marks as equivalent to $y = \frac{2}{3}x$. Where students did not give a correct equation, they often showed a correct method to find the gradient of the line and so scored one mark.

In part (b), students who were not able to draw correct lines often drew $y = 3$ for $x = 3$ and identified one of the axes as the line with equation $y = x$.

Question 15

This question was a good discriminator across the attainment range. The table of values in part (a) of this question was often completed successfully with all 4 missing values correct. Where there were errors, it was often because a value of 0 was given corresponding to $x = -2$. This error obviously led to an incorrect curve being drawn in part (b). Examiners were disappointed that hardly any students making this error seemed surprised by the general shape of their graph and so did not go back to check their calculations. In general the plotting of points from the table was accurately done and, where possible, a smooth curve was drawn through the points.
Using the graph to solve the equation given in part (c) of the question provided more of a challenge. A significant minority of students did not attempt this part of the question. Students who did use a correct method usually, but not always, read off values from the graph accurately. Solutions given in a form involving pairs of coordinates could not be awarded full marks as the equation was an equation in x only.

Question 16

This question was answered quite well and there were a good number of fully correct answers. In part (a) there were two possible preferred first steps, either adding 4 to each side of the equation or multiplying throughout the equation by 3. Those students who added 4 to each side usually went on to give a correct solution though there were a few students who, after writing the correct statement $\frac{x}{3} = 12$, gave $x = 4$ as their solution. Students who chose multiplying by 3 as their first step were generally less successful as they often did not multiply the 4 by 3 and wrote $x – 4 = 24$ followed by the incorrect solution $x = 28$.
For part (b) nearly all students expanded the brackets first. This was generally done correctly and students could usually reach the stage $8y = 4$. The most common error seen was for students to follow this with the solution $x = 2$ instead of $x = \frac{1}{2}$. Some students did not simplify $\frac{4}{8}$. Students are advised to check that fractions given as answers are in their simplest form.

Question 17

Some students did not use the scales on the axes but instead counted squares to find the gradient in part (a) of this question. A consequence of this was that these students usually gave an answer of 1. No marks could be awarded to such responses. However, the majority of students did use a correct method and were awarded the 2 marks available.

There were significantly fewer correct interpretations of the gradient in part (b) compared to the number of correct answers in part (a). Many explanations either described either the weight of grass seed as being proportional to the area of the lawn or that the gradient represented the weight of grass seed needed per *A* square metres. Unfortunately examiners could not give credit to these explanations and a statement amounting to “the weight of grass seed needed per square metre” was required. Students should be advised to take care with their descriptions and make it clear it is for each unit of the variable on the *x*-axis, in this case “per square metre” not “per square metres” or “for every 1 square metre” and not “for A square metres”.

Explanations such as “the amount of grass seed needed per area of lawn” and “the weight increases as the area increases” were deemed too vague to be awarded the mark.

Summary

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

- practise collecting terms to simplify expressions, in particular taking into account + and − signs.
- ensure you take signs into account when expanding brackets in expressions, particularly those which involve negative signs outside the brackets, for example in $m^4 - 4m^3(m-1)$.
- practise solving equations from graphs of a quadratic functions.
- remember to use the scales on the axes when calculating the gradient of a straight line graph.
- practise how to interpret the gradient of a straight line graph in a real life context.

Pearson Education Limited. Registered company number 872828
with its registered office at 80 Strand, London, WC2R 0RL, United Kingdom