Pearson Edexcel

# Examiners' Report
# Principal Examiner Feedback

## January 2022

Pearson Edexcel Awards
In Algebra Level 2 (AAL20) Paper 01

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

**Introduction**

Students appear to have been able to complete the paper in the time allowed and the paper allowed them to show their knowledge and skills. Few students scored very low marks and there were many excellent scripts seen by examiners. Work seen generally showed clear logical progression so that part marks could often be awarded where fully correct answers were not seen.

A majority of students showed proficiency across most areas of the specification. However, there were still a significant proportion of students who tried the more informal approach of writing down operations and their inverses when solving equations and when changing the subject of a formula. This approach was often not successful.

**Reports on Individual Questions**

**Question 1**

This question provided a good start to the paper for many students. Nearly all students were successful in part (a).

Part (b) did not attract many fully correct answers with many students only partially simplifying the expression given. Often, students multiplied the 3 and 5 to get 15 and included $d^3$ in their answer. A significant proportion of students left multiplication signs in their answers and responses such as $15 \times d^3 \times 2 \times c$ were commonly seen. Students and centres are reminded that full simplification is required in order to access full marks. Lower attaining students often gave responses such as $15 + d^3 + 2c$, responses which could not be awarded any marks.

Parts (c), (d) and (e) involved using laws of indices and were generally well attempted, though there were a significant number of students who added the indices instead of multiplying them in part (c) and who wrote $x^5$ as their answer. The incorrect response $3x^6$ was also seen quite often. Most students did however get the correct answer, $x^6$.

Students usually scored at least one mark in part (d) for either 12 or $a^3$ as part of their answer or for writing $(2a)^2$ as $4a^2$. Common errors seen included expanding $(2a)^2$ as $4a$ or multiplying $3a$ by $2a$ as a first step. Incorrect final answers seen included $12a$, $12a^2$, $6a^2$ and $6a^4$. A good number of students gave the answer $3a \times 4a^2$, an expression which was not fully simplified and so could only be awarded 1 mark. About a half of all students gave a fully correct answer.

Part (e) was answered successfully by most students. The most common error seen here was for students to give $4w^3$ as their answer showing a lack of appreciation that the index associated with *w* is 1. A small number of lower attaining students included a 6 in their answer, possibly confusing 8 ÷ 2 with the laws of indices.

**Question 2**

Students usually scored at least 2 of the 3 marks available for their responses to this question, showing that they generally had a good understanding of the terms expression, equation and formula. There was no one error which was much more commonly seen than others. About two thirds of all students taking the examination scored full marks.

**Question 3**

A large majority of students gained the mark for a correct response to this question. Examiners accepted a correct expression whether it was in fully simplified form or not, so answers such as $\frac{n}{8}$ × 5, $5\left(\frac{n}{8}\right)$ and *n* ÷ 8 × 5 were accepted though the "neater" $\frac{5n}{8}$ might be viewed as a more appealing answer. A significant minority of students gave a formula rather than an expression. This was usually accepted provided it contained a correct expression.

**Question 4**

This question discriminated well between students taking the examination. The first two parts involved substitution into a simple formula and solving a simple equation. These parts were usually well done.

The last part of the question requiring students to change the subject of a formula was well done by higher attaining students. Most students made a good start by either multiplying out the brackets correctly or by subtracting 7 from each side of the formula and many students also completed a second step correctly to gain further credit. However, a common error was for students to show the intention to divide by 4 as a first step but then write $\frac{g}{4} = h + f + 7$ Students who tried to use the more informal method of writing down inverse operations without writing down both sides of the formula at each stage were not as successful in gaining marks unless they obtained a correct answer. That said, there were a good proportion of fully correct answers in total.

**Question 5**

Another good discriminator, this question involved the use of a graph to change between UK pounds and Indian rupees. It was common to see 3 marks scored in part (a) but no marks scored in either part (b) or part (c).

Many students showed a clear strategy in order to change £150 into rupees. They usually employed a method breaking down the £150 into £70 and £80 or into 3 lots of £50. Where students showed their working clearly, this almost always led to an answer in the accepted range. However, many students did not record their strategy in a clear manner with working scattered all over the working space in an apparently random way. There were also a number of students who built inaccuracy into their calculations by using small amounts such as £10 changed to rupees and then multiplying by 15. Some students used the scale incorrectly, for example reading 4050 instead of 4500 from the vertical axis.

Part (b) provided more of a challenge than part (a) though there were still a good proportion of fully correct responses. Students are advised to show how they calculate a gradient, for example by drawing a triangle on the line and marking the increase in number of pounds and the increase in the number of rupees on the sides of the triangle before showing a division in the working space. The absence of such detail makes it difficult for examiners to award part marks where the final answer given is incorrect. Some students did not use the scales on the axes to calculate the gradient and so could not be awarded any marks in this part of the question.

Part (c) was the least well answered part of the question. Some students did not answer the question in context and tried to interpret what a gradient is in general. Where students did use a context, often answers were too vague. Statements such as “the more pounds the more rupees”, “how many rupees are in a number of UK pounds”, “the change from pounds to rupees” and “pounds to rupees conversion” were not acceptable. Examiners expected to see a statement explicitly stating that the gradient represented the fact that £1 = 90 rupees or that the gradient represents the exchange **rate.** For example, statements such as “the exchange rate of pounds to rupees” or “the number of rupees per pound” scored the mark available.

**Question 6**

This question was very well answered with nearly all students being able to give fully correct answers by completing the table, plotting points and drawing the line accurately. Surprisingly, the most common error was for students to get the *y* values corresponding to positive *x* values incorrect.

**Question 7**

Nearly all students successfully answered parts (a) and (b) of this question.
Part (c) was also answered quite well. The most common loss of marks for responses to this part of the question occurred when a student left their answer in the form $\frac{14}{4}$. For the accuracy mark to be awarded, examiners needed to see 3.5, $3\frac{1}{2}$ or $\frac{7}{2}$.
Parts (c) and (d) focussed on equations where the unknown variable appeared on both sides of the equation. Fully correct answers were less frequently seen to these parts of the question, particularly to part (d) where most students were able to carry out a first step accurately to score the first mark, usually by multiplying out at least one pair of brackets and write down the resulting equation. However, they were usually unable to carry out further steps with accuracy and only about a third of students got to the stage where terms in *n* were isolated on one side of the equation. Relatively few students obtained a correct answer.

**Question 8**

There were many good responses to part (a) of this question on graph sketching. Examiners were generous in their assessment of whether a curve was symmetrically placed about the *y*-axis and many students benefitted from this. A significant number of students sketched a graph more like that given by the equation $y = x^2 - 3$ or by the equation $y = 3 - x^2$. Students are reminded that they need to clearly label the point of intersection with the *y*-axis, in this case with the number 3. It is encouraging to report that most students appreciate the difference between the requirement to sketch a graph and the requirement to draw a graph, that is that a sketch does not include the calculation of the coordinates and the plotting of many points.
Part (b) of the question was correctly answered by higher attaining students but there were many incorrect or unclear responses seen.

**Question 9**

Many students answered this question well and about a quarter of all students scored full marks. However, errors in the table were commonly seen, particularly involving the calculation of *y* values for negative *x* values. Points were usually plotted accurately but where there were incorrect values in the table, this usually resulted in a curve which was clearly not a smooth parabola. Most students did not seem to question this, and it was disappointing to find that they did not appear to check their working to see if their calculation of values in the table contained errors. Some students lost a mark when drawing their graph because they joined the points (1, −4) and (2, −4) with a straight line rather than a smooth curve.

Not all students attempted part (c) testing the use of the graph to find an estimate for one solution of the given equation. About a third of students scored both marks in this part of the question.

**Question 10**

Part (a) of this question was usually correctly answered though the incorrect response $7p - 3$ was seen quite often.

Part (b) was also well answered, and it was a relatively rare to see examiners award no credit for responses seen. The vast majority of students scored at least one mark for the correct expansion of at least one bracket. Many of the students who scored one mark did, in fact, expand both brackets correctly only to get a wrong final answer because either they simplified their expression incorrectly or they did not simplify it at all. A very common error seen was to see

$2x^2 - 2xy + xy - 2y$, a correct but unsimplified expression, followed by

$2x^2 - 3xy - 2y$, an incorrect final answer. There were also many cases where poor algebra led from a correct unsimplified answer to a rather bizarre, unexpected final expression.

**Question 11**

This question was a good discriminator across the ability range with most students able to score at least one of the three marks available. However, only a minority of students scored full marks.

Many students included a horizontal line on their graphs and many students showed a journey length of 30 minutes. However, few students were able to include both of these aspects on their graph. A considerable number of students drew a line from (0, 0) with a positive gradient, so showing a constant acceleration rather than a constant speed. Thankfully quite a good proportion of these students showed a journey length of 30 minutes so gaining some credit for their response. Straight lines drawn from (0, 0) to (30, 40) were often drawn, demonstrating that there was some confusion between a speed of 40 km/h and a distance of 40 km.

**Question 12**

Students were usually able to score at least 4 marks in total for their answers to this question. Where answers were not fully correct, it was often because one or more of the expressions were only partial factorisations and so could usually be given some credit. This was more often the case in part (c) than in either part (a) or part (b). It was quite unusual in parts (a) and (b), but more common in part (c), to find that factorised expressions were not equivalent to the original expression when multiplied out.

**Question 13**
A majority of students gave a correct response in each part of this question, particularly in parts (a), (b) and (c).
For their answers to part (a) nearly all students gave the correct answer of 3. A small number of students gave an incorrect answer, usually 2.
Most students also scored full marks in part (b). Few errors were seen but where there were errors, they included getting only one end of the interval correct or using a full circle instead of an empty circle or vice versa.
Part (c) was also well answered. Answers written in the form $0 < x$ rather than $x > 0$ were seen often and were awarded the available mark.
At least 2 marks were often obtained by students in part (d) for finding the critical value, 4.5 or equivalent, and about a third of all students gave a fully correct answer. Those students who did not gain any credit in this part of the question often indicated that they would multiply each side of the inequality by 3 but then wrote $4r + 2 > 24$. Students were generally more successful if they wrote down both sides of the inequality at each stage. Students are urged to do this rather than use inverse operations and merely write down numbers, sometimes apparently randomly.

**Question 14**
Although there were some fully correct answers to this question, this was one of the least well answered questions on the paper.
In part (a) students were asked to place $T$ on the time axis. However, a considerable number of students placed the letter at the point where the first and second line segments met.
A common error in part (b) was for students to change the subject in $T = kU$ to give $k = \frac{T}{U}$ as their answer instead of the value, 3. Only about 1 in every 6 students answered part (b) correctly.

**Question 15**
Questions focussing on finding the equation of a straight line graph usually prove to be good discriminators in the examination. This was no exception. A good proportion of students scored at least 1 mark, either for a correct method to find the gradient or more commonly for giving an answer of the form $y = mx + 3$, $m \neq 0$. The incorrect answers $y = \frac{1}{2}x + 3$ and $y = mx + 3$ were seen quite often and were awarded one of the two marks available. Fully correct answers were only obtained by higher attaining students.

**Question 16**

This question was generally well answered. Students could usually work out the 7th term of the sequence in part (a).

About two thirds of all students answered part (b) successfully. Students who wrote down an equation then solved it were more successful than students who tried to use inverse operations because those students who used inverse operations often started by dividing 97 by 3 instead of adding 2. A surprising number of students substituted 97 into $3m - 2$ and obtained the answer 289.

Two marks were usually awarded to students in part (c) for a fully correct expression for the *n*th term though there were some students who gave the incorrect answer $8n + 4$.

**Question 17**

This question was another good discriminator with students usually scoring at least 2 or 3 marks for their answers.

Nearly all students showed a good understanding of the scale used on the time axis and were successful in part (a).

Finding the speed in part (b), that is the gradient of the graph, proved to be more of a challenge to some students. A significant number of students tried to find the average speed over the two hour period instead of the gradient of part of the graph which was associated with Saira walking, so answers of 2.5 were often seen, instead of the correct answer of 4. Sometimes, students could identify that they needed to calculate $2 \div 0.5$ or $3 \div 0.75$ but were unable to process this accurately. Other students used minutes as their unit of time and showed calculations such as $2 \div 30$. One mark was awarded to students who were unable to convert this to km/h.

Completing the graph in part (c) was usually correctly done and a majority of students scored both marks for their graph. Some students drew a graph where the line representing Fred's wait at the leisure centre was missing.

## 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.
- remember that when asked to simplify expressions, you are expected to simplify the expressions down to their simplest form, that is to fully simplify the expression.
- practise how to find an equation of a straight line from its graph.
- practise how to find and interpret the gradient of a graph in a real life context.

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