Examiners' Report
Principal Examiner Feedback

January 2023

Pearson Edexcel Awards
In Algebra (AAL30)
Paper 01

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Edexcel Award in Algebra (AAL30)
Principal Examiner Feedback – Level 3

Introduction

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

All questions were attempted by the majority of students and from the standard of answers seen students appeared well prepared. It was pleasing to see many correct answers and a good range of knowledge displayed by the cohort.

It was pleasing to see a good amount of working being shown.

Although a few arithmetic errors were seen these were not a dominant feature on any question.

Reports on Individual Questions

Question 1

This question provided a good start to the paper and was accessible to all students.
Part (a) was very well answered and almost all answers were correct.
Part (b) was not as well answered as part (a) with *y* often given as the answer. y^0 was also popular but $y^0 = 1$ or an answer of 1 was required. Centres should remind students that full simplification is required for this specification.
In part (c) the combination of a fraction to a negative power was challenging for some, unfortunately some of those who understood the algebra left the answer as $\frac{x^5}{1}$ which is not a full simplification; x^5 was required.
In part (d) the expansion of the brackets was very well answered and the vast majority produced a correct 3 term expression. Some chose to factorise to $4(f^2 - 4f + 4)$ which was accepted but then some students went on to remove the factor of 4 from the answer and gave a final incorrect answer of $f^2 - 4f + 4$ and thus did not score the accuracy mark.

Question 2

All parts of this question were well attempted by students. In part (a) very few incorrect responses were seen. Part (b) was very well answered and where students did not gain full marks they were often awarded a mark for $3y(4x - 3)$ and $5(4x - 3)$. In part (c) students generally recognised this as a difference of 2 squares and factorised correctly into the two brackets. A common error seen was to write the answer as$(5e)^2 - (6h)^2$. Part (d) provided the greatest challenge on this question with some students expanding and simplifying the numerator and denominator of the fraction, leading to an answer of $\frac{3w^2-12}{2w^2-8}$; this alone was awarded no marks until some factorisation was seen. The most efficient method of factorising $3w - 6$ in the numerator and $2w + 4$ in the denominator was rarely seen. A few students substituted in a numerical value to arrive at an answer of $\frac{3}{2}$, this was not awarded any credit as students had to show it was true for all values of w.

Question 3

This question was well answered with almost two thirds of the cohort scoring full marks. Surprisingly the drawing of the line $x = -1$ was the source of most mistakes. Students should be encouraged to plot three of points for each line and use a ruler to ensure the lines drawn are accurate. Most students who drew at least two correct lines successfully chose the correct region for R.
The standard of answers for this question was very good.

Question 4

Almost all students were able to successfully recognise the equation of a circle with a radius of 4 units, centre (0, 0) and use a pair of compasses to accurately graph their answer. It was pleasing to note that very few students attempted to draw a freehand circle. The correct equipment is required for this construction question.

Question 5

Most students were able to gain 4 or more marks on this question.
In part (a), those that did not score full marks successfully arrived at $y = \frac{2}{3}x + 4$ but then found it difficult to convert this equation into the required format. Centres should note writing equations of straight lines is a set format is a requirement of this specification.
In part (b) the understanding of the relationship between gradients of lines which are perpendicular was well understood but the error often seen was a simple arithmetic error in calculating the value of the constant in the equation and thus led to the accuracy mark not being awarded.

Question 6

Part (a) was well answered and students were familiar with the language of direct proportion and were able to arrive at the correct answer. Part (b) discriminated well between students. Those who were confident working with indirect proportion were generally able to set up a correct equation, e.g. $p^2 = \frac{k}{r^3}$ and substitute in the correct values to find k.
Many then progressed to substituting in $3^{\frac{1}{3}}$ into the equation to gain the 3 available method marks. From here the progression was varied and

errors in applying the powers were common, as was confusing $3^{\frac{1}{3}}$ with the mixed number $3\frac{1}{3}$, this confusion often led to the last mark not being awarded.

Question 7

Part (a) was a well answered question with the vast majority realising the requirement to work with the discriminant and gaining full marks. In part (b) the students work was more variable. Many correct answers were seen but likewise some students found it difficult to score marks on this question. This topic is one were centres could improve student outcome by more practise, particular using arithmetic with negative numbers and fractions.

Question 8

Part (a) was answered correctly by most students. Of the errors seen, some rearranging to isolate the terms in *x* were incorrect, using negative numbers was usually the issue, or a final answer of $x = -\frac{2}{3}$ was given. Part (b) discriminated well between students. Those who realised they needed to collect all the terms onto one side of the inequality generally went on to factorise correctly and identify the critical values. From here, progression was mixed. Students who sketched a graph, tended to give the correct final inequality. It was disappointing to see many students who attempted to collect all the terms on one side make errors with $x^2 - x - 12$ commonly seen.

Question 9

For parts (a) and b) the majority of answers were fully correct with most students knowing the difference between the *n*th term and the sum to *n* terms and the associated formulae. When marks were not awarded it was usually because there were errors in the recall of the appropriate formulae. There were also some errors seen in the arithmetic required in this question.

In part(c) most answers were correct. The methods employed were split between using $a + (n - 1)d$ and merely writing out the sequence, at this level it is better if students are confident with using the correct formula.

Question 10

A good number of fully correct responses were seen to this question. Those students who chose to rearrange the linear equation to make x the subject tended to have greater success as this led to an easier two term quadratic to solve. Having said this it should be noted that a number of students, having successfully factorised their two term quadratic did not realise that this had a second solution of 0, thus limiting themselves to three marks. The students who rearranged the linear equation to give $2y = x + 3$ often did not appreciate that squaring this would give them an expression for $4y^2$ and interpreted this as $2y^2$ so went on to double their expression, this meant their substitution was incorrect.
Centres are advised to practise questions where $x = 0$ or $y = 0$ is a solution to a quadratic factorisation as this was the biggest reason for students not gaining either of the accuracy marks.
Learners should also recognise that simultaneous equations with quadratics should result in two sets of solutions.

Question 11

Part (a) was very well answered, most students were able to calculate and plot the required points. Some free hand curves were better than others but a few students used line segments to join the points, this is not acceptable when a curve is required.
In part (b) far too many students read off the roots of the curve and did not engage with the line $y = 2$. This is an area the students still require further practise.

Question 12

In part (a) full marks were awarded to most students. Where errors were made this was frequently with applying the incorrect order of operations and calculating 2×5^2 as $(2 \times 5)^2$; the use of BIDMAS should be a solid skill for any level 3 student.
Part (b) provided a greater challenge to students, although a good number of fully correct responses were seen. Clear attempts were made to correctly clear the fraction and isolate the terms in t leading to $4Bt + wt = 2w^2$ thus gaining the two method marks available. From here though some students struggled to make the correct progress to the final answer, often undoing previous steps of working.

Question 13

In part (a) the modal mark was two out of three. The quadratic formula was well known and substitution usually correct, although as often is the case, the negative signs caused some errors. Some students found it difficult to simplify the correct expression with a denominator of 6 to a correct expression with a denominator of 3.
Part (b) was more challenging but a good number of fully correct answers were seen. Some students took out a common factor of 4 and then either struggled with the fractions or when they tried to get back to the required form. Those that tried to use
$(2x - a)^2$ often chose 6 rather than 3 for the value of a.
In the sketch for part (c) many parabola's in the correct orientation were seen and often with (0, 10) marked in some way but the correct value for the turning point was less frequently seen.

Question 14

Part (a) allowed many students to demonstrate that they knew how to rationalise a denominator of this form. There was a relatively even split between those who chose to multiply by $\frac{\sqrt{5}}{\sqrt{5}}$ and those who chose to multiply by $\frac{7\sqrt{5}}{7\sqrt{5}}$. The final answer was not required to be simplified, so the commonly seen answer of $\frac{7\sqrt{5}}{245}$ gained full marks. A few arithmetic errors were seen with the calculation of 49×5.
Part (b) was less well answered and it should be noted that working out was often disorganised and difficult to follow or track to the final answer. Those students who were most successful at this question took the approach of writing the two separate fractions with a common denominator rather than attempting to rationalise both fractions separately.
Organising work in a logical manner is a good skill for centres to encourage in students.

Question 15

Many students recognised the hyperbola equation and gained a mark for sketching a curve in the correct orientation. Either one or two correct asymptotes were drawn and used by a good number of students but even though asked for in the question the y intercept was often not stated on the graph. The correct use of labels is a requirement in this question and needless marks were lost by poor labels or no labels.

Students achieved the full range of marks on this question and it was pleasing to see that most graphs were sketched and fewer students did not try to plot these graphs.

Question 16

Part (a) was accessible to many students, who appreciated that the acceleration of the car was equal to zero when the gradient of the graph was zero, which occurred at the turning point. A common incorrect answer of zero was seen. In part (b) it was pleasing to see a good number of students using the formula for the trapezium rule rather than dividing into separate trapeziums. The latter approach was of course credited. There were often correct methods seen with arithmetic errors leading to answers of 45 or 65 due to poor addition of the correct values. Students should read the limits around the area carefully as some did attempt to find the area under the full graph and this is not the question asked.
Part (c) was answered correctly by most students who knew that the area under the graph was equivalent to the distance travelled. A few incorrect responses of acceleration were seen.

Question 17

For part (a) many correct answers were seen; of those that were not correct some were able to work with one of the requirements (the stretch or the reflection).

Part (b) was slightly more successful than part (a). When incorrect, the most common error was to halve the x co-ordinate rather than double it.

Summary

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

- practise giving the equation of straight lines in all formats
- remember the formulae required for this specification
- take care when manipulating artimetic particularly with fractions and neagtive numbers
- check that your final answer responds to the question asked and is in the required format.

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