Pearson Edexcel

Examiners' Report

Principal Examiner Feedback
January 2019

Pearson Edexcel Level 3 Award
In Algebra (AAL30)
Paper 1

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

Introduction

This level 3 examination paper provided all students with the opportunity to succeed in this qualification. It was accessible to students.

Good students were able to display a wide range of skills and techniques. These included graph sketching and algebraic manipulation. Students who are yet to reach the borderline often display stronger skills in either graph sketching or algebraic manipulation.

A small number of students continue to lose marks through avoidable arithmetic errors particular with simple fractions and negative numbers. Students should be encouraged to check their calculations and see if there results are reasonable to the context set.

Reports on Individual Questions

Question 1

Part (a) was very well answered by many students, with the correct factorised expression given. When full marks were not awarded it was common to award 1 mark for a correct partial factorisation, for example $b(a + c) – d(a + c)$. Some students were however, unable to deal correctly with the negative signs and gave an answer of $b (a + c) – d (a – c)$.

This part was also well answered, with many students able to give a fully correct factorisation. Where a correct response was not seen 1 mark was frequently awarded for a correct partial factorisation such as $3rt(4r-3rt^2)$. Students should be encouraged to check their factorisation by multiplying out their expression as $3r^2t(4-3t)$ was seen a number of times but is not a correct partial factorisation so cannot gain any marks on this specification.

Question 2

This question required 4 straight lines to be drawn. Not all students could manage this with the line most common error seen being the wrong drawing of $y = 3x$; often this was drawn as $y = 6x$. Occasionally one of the lines was just missed out. Of those that drew all the lines most students then went on to indicated correctly the required region.

Question 3

This question was well attempted by students who were often able to progress to a fully correct solution, starting correctly by either multiplying through by the denominators or

writing both sides of the equation with a common denominator, usually 24. In some cases basic arithmetic error were seen and prevented full marks being awarded.
2 marks were frequently awarded for correctly isolating the terms in x, or finding -11 as the critical value but the final mark was lost by then having the incorrect inequality sign in the final answer or less commonly an equals sign.

Question 4

A very well answered question with students gaining good marks in all parts of the question. They displayed good skills when dealing with quadratic equations.

Some students left their answers in the form $\frac{(2 \pm \sqrt{8})}{2}$ which was perfectly acceptable, others went on to cancel down to $1 \pm \sqrt{2}$, this was also an acceptable answer (even if also divided by 1). Once an answer of the correct form was seen the marks could be awarded as the objective here was to correctly use the quadratic formula.

In part (b) a very small minority of students did fail to collect terms together and tried to solve before getting to the $f(x) = 0$ stage but this method proved unsuccessful. A few students correctly factorised but then wrote down the incorrect solutions, often wrong signs used, or sometimes just one solution was given, both solutions were required for full marks.

In part (c) some answers were not fully processed to a final number or negative signs were ignored by a few students. The vast majority of students correctly answered this question.

Question 5

In part (a) a good number of fully correct responses were seen but many students were unable to correctly apply the power to both parts of the expression. $4p^{-\frac{1}{2}}$ and $16p^{-\frac{1}{2}}$ were commonly seen incorrect responses worthy of 1 mark. Another answer commonly seen was f $\frac{1}{2p^{\frac{1}{2}}}$ this could also be awarded 1 mark.
In part (b) correctly applying the laws of indices in this question was a challenge for many students. Many were able to gain a mark for showing a correct first step, most commonly inversing the second fraction and showing the intent to multiply. From here a wide range of errors and misconceptions of applying the laws of indices and dealing with fractions were seen. It is worth noting that a final answer in the form $\frac{u^{\frac{3}{2}}}{m^{\frac{-5}{2}}}$ is not fully simplified and was awarded 1 mark only.

In part (c) students were often familiar with the concept of subtracting fractions by writing them over a common denominator. However, incorrectly cancelling terms from the numerators and denominators showed a lack of understanding of the full the process required. Another error seen was the incorrect distribution of the negative sign over the bracket and this error led to the loss of the accuracy mark.

Question 6

Part (a) was well answered by most students. For those that did not gain full marks, most students successfully managed the rearrangement required to arrive at *y*= but too many quoted the gradient as either $\frac{1}{2}$ or $-\frac{x}{2}$ and lost the final accuracy mark.

In part (b) the vast majority of the students who gained both marks in (a) also gained the mark in (b) with the main error being not correctly isolating the gradient.

Question 7

In both parts of the question it was pleasing to note that the majority of the students knew the required formulas.

In part (a) the formula was worthy of 1 mark, $-5n+29$ was acceptable in this part for 1 mark. However, this method often lead to an error in part (b) with students stating the first terms as 29 not 24. The other error seen in part (a) was to ignore the negative sign and give a positive answer of 471.

In part (b) substitution of the correct values was required and this was often successfully done. Although sometimes the substitution of a negative number was unclear as to whether the intention was to multiply (n-1) by -5 or subtract 5 from (n-1), centres should encourage students to clear write down their working. Often the next step was required to see the true intention of the substitution. In cases of ambiguity marks cannot be awarded.

Often the accuracy mark was lost due to poor arithmetic, for example adding and subtracting with the negative values or even multiplying by 100 incorrectly. Care over calculations should be taken.

Question 8

The modal score for this question was 6 marks. However a very small number of students scored no marks. The manipulation of surds did prove challenging for some students, although there were some students who showed better understanding when attempting part (b) than for part (a) and (c).

Common errors seen included only squaring the $\sqrt{5}$ and forgetting to square the 2 in c^2 or the not dealing with the negative s sign in d^2 or evaluating 4 + 5 instead of 4 × 5.

In part (b) the majority of students expanded to get 4 correct terms although a few then lost the negative sign associated with the 10 when it came to collecting like terms and so their final answer was not accurate. The expansion was equally as successful whether before or after substitution.

Part (c) seemed prone to arithmetic errors. Some students simplified quickly

to $\frac{\sqrt{5}}{3\sqrt{5}}$ but often failed to could cancel the $\sqrt{5}$ and either left it in this unsimplified form or got to $\frac{1}{3}$ by rationalising. There others who saw the $2\sqrt{5} + \sqrt{5}$
as a denominator and went straight to rationalising this method was successful for many students.

Question 9

In part (a) many correct answers were seen however when full marks were not given most students were able to gain 1 mark for the correct substitution into the given formula.
The most successful approach was to work with fractions, writing the value as an improper fraction and then square rooting. Students who attempted to work in decimals or mixed numbers were often unable to then evaluate $\sqrt{1.44}$ or $\sqrt{1\frac{11}{25}}$ correctly and so did not again the accuracy mark.

In part (b) there were many well-structured and correct solutions given. Of those who did not gain full marks an error was often introduced at the step when multiplying through by c, $cm^2 = b - 1$ was a commonly seen error.

Question 10

Most students were awarded at least one mark for correct use of the gradient in producing an equation in the form $y = \frac{4x}{5} + c$. However, although the correct substitution was often seen further marks were not awarded as the manipulation of the numbers was incorrect. Again negative signs were not dealt with correctly in rearranging to final the value of *c* or to give the final answer in the correct format. Centres are reminded to ensure that students sitting a level 3 qualification practise the manipulation of algebra and numbers sufficiently to keep arithmetic errors to the minimum.

Part (b) was on the whole better answered than part (a). There appeared to be less arithmetic mistakes but still the ability to work with fractions would benefit from further practice.

It was pleasing to see that many students understood the relationship of gradients for perpendicular lines and that they were then able to explain their understanding to the required level for this qualification. The use of both negative and reciprocal was often seen and was required. The term ‘flipping’ is not acceptable at this level of mathematics.

Question 11

A well answered question indicating that students were very familiar and confident in dealing with an inverse proportion question as correct answers to both parts were seen in most attempts.

Where errors were made it was usually due to an attempt to use direct rather than inverse proportion or to evaluate *k* as 10 but then incorrectly place it in the final formula.

Question 12

The standard of answers seen for this question varied greatly in both approach and accuracy.

Most students understood the need to divide the area up into strips and either used the trapezium rule formula or did the strips separately. Unfortunately those that used the trapezium rule often forgot that the y_0 value was 0 and started at y_0=5.6 thus missing out the first strip. The strip width of 0.2 also lead to some problems, with a few students forgetting to use it at all or because of the decimal value it did lead to errors in multiplication.

Another error arose when students thought the area 'stopped' at a point where the curve also stopped and a handful of students disregarded the rectangle joining (0.8,5) to (1,5) to (1,0) and (0.8,0).

Virtually all students scored the mark for distance in part (b) and the value required in part (c).

Question 13

Very few students gained full marks on this question.

In part (a) a good number of correct solutions were seen, however there were some cases where only 2 correct solutions were given or only 1 correct value.

Many students failed to engage fully with part (b). They found this question particularly challenging and often students attempted to transform the given curve to match the new equation rather than manipulate the given equation to match the equation of the given graph. Readings taken often taken at y = 20, y = -16 or y = -32 after incomplete manipulation was seen.

Question 14

This is a standard question for this specification but there are many students who were unable to produce paired solutions.

It was common to see a quadratic equation in one variable, whilst working in x was the easier option many chose to form an equation in y only. Common errors seen at this stage included substituting y + 2 for x or even x + 2 for x.

Once the equations $x^2 + 2x = 0$ or $y^2 - 2y = 0$ were achieved there were a large proportion of students who could not solve these equations. Some students divided both sides by a variable and thus losing an answer or merely ignoring the zero solution. Also some students failed to find the second variable values even when they had solved for both initial values.

A good number of solutions were not incorrect but merely incomplete. Centres should remind students to fully answer the questions set.

Question 15

This was a well answered question with students generally recognising that in both parts of the question the required transformations were translations and attempting a translation, in the correct direction.

In part (a) where only 1 mark only was achieved this was commonly due to either translating the given graph by 45° in the wrong direction or translating the point at $x = -315$ to $x = -360$ but not within tolerance in the y direction.

In part (b) the most common error seen was a translation of 2 squares, rather than the required 2 units.

Question 16

In part (a) most students were able to arrive at the critical values of -1 and 5 but some were unable to convert these into the required inequalities. By far the most successful students were those who drew a sketch graph to realise the regions of the graph needed.

In part (b) the vast majority of students knew that the discriminant was required. Some also knew that it had to be strictly less than 0 and usually arrived at $b^2 < 1600$ but in most of the solutions this was translated as only meaning $b < 40$ and the negative root was not considered. Both conditions were required for full marks.

Question 17

This question was not well answered.

The coefficient of x^2 being greater than 1 meant that this question was a challenge for many students. In part (a) the most consistent error was halving the coefficient of x xto give a final answer of $(2x-14)^2 – 196$.

In part (b) a follow through mark could be awarded provided that part (a) was in the correct form. However this mark was not frequently awarded. (7, -49) was often given as the answer from a correct solution in part (a) or (14, -196) from the incorrect response noted above. This again demonstrates that many students were not able to appreciate the difference when the coefficient of *x* is not equal to 1.

Question 18

Curve sketching still poses a challenge for some students whilst others produce fully correct diagrams.

For those diagrams that were not fully correct some students were awarded marks for using the correct intercepts on the axes. The concept of a parabola having a line of symmetry being parallel to the *x*-axis rather than the *y*-axis was the most common difficulty with parabolas of the wrong orientation often being drawn.

In part (b) there were some who appreciated the need for a rectangular hyperbola. The asymptote at x =-5 often shown but the *y* intercept at 0.2 caused some problems, both as the intercept but also the ability to show this number on the axes. Some students tried to show a scale in fractional form. It is worth noting that a label is sufficient and a fully labelled axis is not required for a sketch.   The *x*-axis was also an asymptote and the graphs sketched did not always taken into account some even turning away from the axis.

Summary

In summary centres are advised to:

- encourage the use of both positive and negative roots
- emphasis the difference between sketching a curve and plotting a curve
- check through arithmetic at the end of each question.

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